LAKE ECOSUMMARY

Lake Nona, April 25, 2013



Figure 1. Lake Nona on April 25, 2013.

DEP conducted water quality and biological sampling on April 25, 2013 at Lake Nona to assess attainment of designated uses. Water quality results met all applicable limits and plant community data met expectations for a healthy, well-balanced lake.

Background

Although a healthy, well -balanced lake 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 $\leq$ 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 assessments are often used in conjunction with one another because it is possible to detect imbalances in the plant community while the algal community appears healthy (and vice versa).

Methods

The DEP Central District Office conducted a LVI and collected field parameter data and water samples on April 25, 2013 on Lake Nona (Figure 2). Samples were collected 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 3), 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 LT7500.

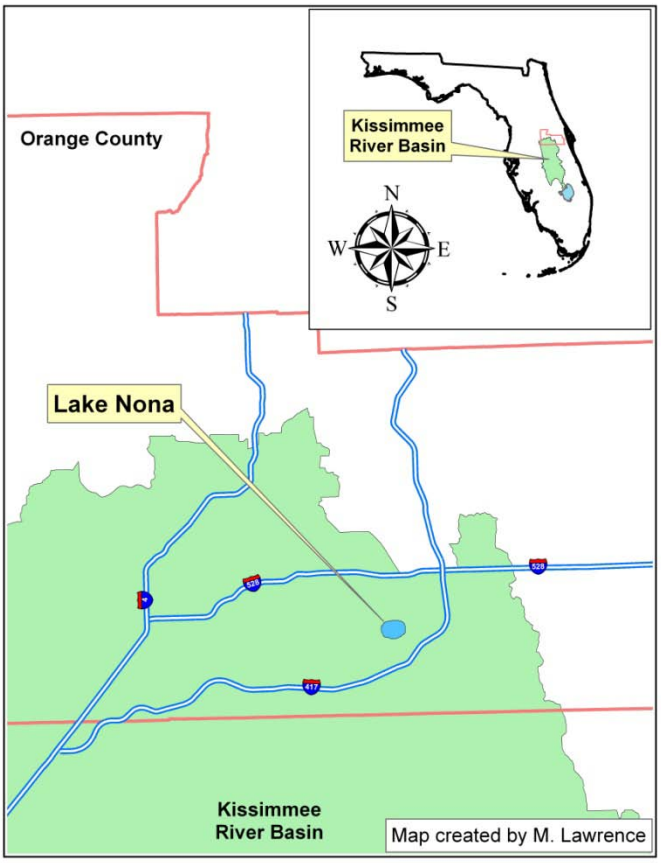


Figure 2. Location Map of Lake Nona

Site Information

Lake Nona, located in the southeast corner of the City of Orlando in Orange County, is part of the Upper Kissimmee River Basin. Lake Nona has a surface area of approximately 587 acres. Surface water enters Lake Nona via sheet flow over some cultivated vegetation, natural vegetation and a small overflow ditch from Orland International Airport property. Most of the stormwater from the airport is captured and treated by Rapid Infiltration Basins. Surface water leaves the lake flowing toward Red Lake to the southeast (Figure 2).

A well-preserved wetland buffer zone separates the lake from intensive human activities on the north side, but is diminished on portions of the east and west shorelines where the lake is adjacent to a golf course fairway and Orlando International Airport property. Littoral zone vegetation is still intact in these areas. The south side of the lake has an intact wetland buffer occupying the zone in between the lake and upland, non-cultivated natural vegetation. (Figure 1., 4. and 5.) The large percentage of natural area and wetland buffer around Lake Nona has contributed to maintaining the water quality and exceptional plant community.

Results

Water Quality

Newly proposed water quality criteria from 62-302, Florida Administrative Code (F.A.C.), require that low alkalinity, low color lakes have a maximum chlorophyll *a* concentration of 6 µg/L. On April 25, 2013, Lake Nona's chlorophyll *a* concentration was 2.9 µg/L, which is well below the criterion. The concentration of total nitrogen (TN) in the sample collected on April 25, 2013 (0.39 mg/L) was well below the newly proposed water quality criterion of 0.93 mg/L as was the total phosphorus (TP) concentration (0.010 mg/L) well below the newly proposed water quality criterion (0.03 mg/L). All other parameters met their applicable limits. However, it should be noted that compliance with lake numeric nutrient criteria cannot be determined with a single sample; all criteria limits are based on annual geometric means not to be surpassed more than once in a three year period. Please see Table 1 for other results. A field blank for chlorophyll *a* was collected and was below detection limit.

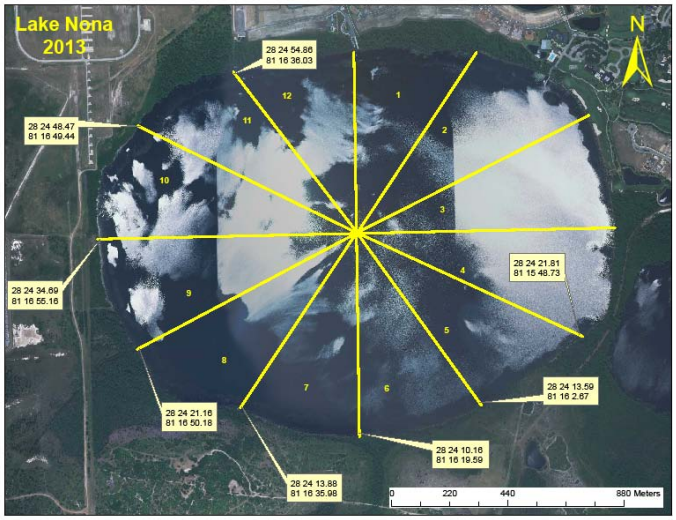


Figure 3. Sampling map of Lake Nona. Sections 2, 5, 8 and 11 were sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center.

Table 1. Water quality results from surface water samples collected on April 25, 2013 at Lake Nona by FDEP. Water quality criteria from Chapter 62-302, F.A.C.

Analyte	4/25/13 Result	Comment	Applicable Class III Water Quality Criteria
Water Temperature (°C)	25.6		
Field pH (SU)	7.76		
Field Dissolved Oxygen (mg/L)	8.45		≥ 5
Field Specific Conductance (µmhos/cm)	151		"Not to exceed 50% of background or 1275 µmhos/cm"
Alkalinity (mg $CaCO_3$/L)	6.9	A	
Total Dissolved Solids (mg/L)	70		
Total Suspended Solids (mg/L)	2	I	
Fluoride (mg F/L)	0.077	I	
Color (PCU)	15		
Sulfate (mg SO4/L)	14		
Chloride (mg CI/L)	27		
Turbidity (NTU)	1.3		
Chlorophyll *a* (µg/L)	2.9		<6.0**
Total Phosphorus (mg/L)	0.010	I	< 0.03**
Total Nitrogen (mg/L)	0.39		<0.93**
Nitrate+Nitrite (mg/L)	0.004	U	
Ammonia-N (mg N/L)	0.003	I	
Total Kjeldahl Nitrogen (mg/L)	0.39		
Ortho Phosphate (mg P/L)	0.004	U	
Organic Carbon (mg C/L)	6.4		
Secchi disk depth (m)	2.0		

**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.
I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
A – Value reported is the mean of two or more determinations



Figure 4. Shoreline of Lake Nona.

Lake Vegetation Index

The LVI score for this lake was 87 out of a possible 100 points, corresponding with a Category I "Exceptional" designation. Table 2 contains the species list and occurrence information for this sampling event. Three invasive exotic plants, *Ludwigia peruviana* (primrose willow), *Nephrolepis cordifolia* (sword fern), and *Panicum repens* (torpedo grass) were observed in the sections sampled, but the beneficial native grass *Panicum hemitomon* (maidencane), codominated three of the sections with the benificial submersed plant *Mayaca fluviatillis* (bogmoss). *Mayaca fluviatillis* (bogmoss) dominated the remaining section.



Figure 5. Close-up of shoreline of Lake Nona.

Table 2. Species list for the April 25, 2013 LVI at Lake Nona. P = present, D = dominant, C = codominant.

SCIENTIFIC NAME	COMMON NAME	SECTIONS:	2	5	8	11
Andropogon	BROOM GRASS		P	P		P
Baccharis	SALT MYRTLE			P		P
Bacopa caroliniana	WATER HYSSOP		P		P	P
Blechnum serrulatum	SWAMP FERN		P	P	P	
Cephalanthus occidentalis	BUTTON BUSH				P	
Eleocharis baldwinii	SPIKE RUSH		P			
Eleocharis elongata	ELONGATED SPIKE RUSH		P	P	P	
Eriocaulon	HAT PIN		P			
Eriocaulon compressum	HAT PIN		P			P
Eupatorium capillifolium	DOG FENNEL		P	P		P
Fuirena scirpoidea	RUSH FUIRENA		P	P	P	P
Gordonia lasianthus	SWAMP BAY		P		P	P
Hydrocotyle	PENNYWORT		P	P	P	P
Hypericum	ST JOHN'S WORT		P			
Hypericum fasciculatum	ST JOHN'S WORT		P	P	P	P
Hyptis alata	MUSKY MINT		P			P
Ilex cassine	DAHOON HOLLY		P	P		
Itea virginica	VIRGINIA SWEETSPIRE				P	
Ludwigia (unknown nativity)	WATER PRIMROSE				P	P
Ludwigia peruviana	PRIMROSE WILLOW		P			
Lyonia lucida	FETTER BUSH		P			
Magnolia virginiana	SWEET BAY		P	P	P	
Mayaca fluviatilis	BOG MOSS		C	D	C	C
Mikania scandens	CLIMBING HEMPVINE			P		
Myrica cerifera	WAX MYRTLE		P	P	P	P
Myriophyllum native	WATER MILFOIL		P	P		
Najas guadalupensis	SOUTHERN NIAD				P	
Nephrolepis cordifolia	SWORD FERN				P	P
Nuphar	COW LILY		P		P	P
Nymphaea odorata	FRAGRANT WATER LILY		P	P	P	P
Nymphoides aquatica	BANANNA LILY		P	P	P	P
Nyssa sylvatica biflora	SWAMP TUPELO			P	P	
Panicum hemitomon	MAIDENCANE		C	P	C	C
Panicum repens	TORPEDO GRASS		P			P
Pinus	PINE TREE		P	P	P	P
Pluchea odorata	SWEETSCENT					P
Pontederia cordata	PICKERELWEED				P	P
Rubus	BLACK BERRY		P			P
Sabal palmetto	SABAL PALM		P			
Sacciolepis striata	AMERICAN CUPSCALE GRASS		P			
Sagittaria lancifolia	DUCK POTATO				P	
Salix caroliniana	CAROLINA WILLOW		P			
Sambucus canadensis	ELDERBERRY		P			
Schoenoplectus etuberculatus	CANBY'S BULRUSH		P			
Smilax	BINDWEED				P	
Spartina bakeri	CORDGRASS			P		
Syngonanthus flavidulus	YELLOW HATPIN				P	
Taxodium	CYPRESS TREE		P	P	P	P
Thelypteris palustris pubescens	FERN		P			
Triadenum virginicum	MARSH ST. JOHN'S WORT		P			P
Typha	CAT TAIL		P			
Utricularia gibba	TANGLED BLADDERWORT					P
Utricularia inflata	SWOLLEN BLADDERWORT					P
Vaccinium corymbosum	NORTHERN HIGHBUSH BLUEBERRY					P
Vitis rotundifolia	GRAPE VINE		P	P	P	P
Woodwardia virginica	CHAIN FERN					P

Summary

Lake Nona represents a minimally disturbed system compared with other lakes in the immediate area. Although the abundance of periphyton (attached algae) is increasing from past observations around the Nona Clubhouse Ramp and Clubhouse, Lake Nona has maintained good water quality and an exceptional plant community.

Water quality results were well within acceptable limits for chlorophyll *a,* total nitrogen and total phosphorus on April 25, 2013. The Lake Vegetation Index score, 87 out of a possible 100, corresponded with an "Exceptional" designation.

A management plan to prevent potential nutrient loading from its watershed and to keep submersed and emergent exotic vegetation from invading and establishing will ensure stability in Lake Nona's water chemistry and plant community.

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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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