



LAKE ECOSUMMARY

Lake Mills

June 13 and October 24, 2012

DEP conducted water quality and biological sampling at Lake Mills, in conjunction with the Seminole County Water Quality Section, on June 13 and October 24, 2012, to assess attainment of designated uses. Water quality results met all applicable limits. Plant community data indicated that Lake Mills 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 CaCO₂), 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 CaCO₂) 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

The DEP Central District Office conducted a LVI, collected water chemistry and field parameter data on Lake Mills on June 13, 2012. A second LVI and field parameters were conducted on October 24, 2012. Both sample events were a cooperative effort with Seminole County Water Quality Section. 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 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 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 Mills, located in Geneva, Seminole County, is part of the Middle St. Johns River Basin. The lake has a surface area of approximately 239 acres and an average depth of 2.9 m (9.6 ft). Surface water enters the South West corner of Lake Mills through Mills Creek, flowing through Lake Mills Park. Surface water leaves the lake on the Eastern side through Mills Creek which flows to the Big Econlockhatchee River. The Lake Mill's watershed is primarily residential on the west side of the lake, and low density residential with scattered groves, cattle fields and natural space remaining to the south and east.

Results

Water Quality

On June 13, 2012, Lake Mill's chlorophyll *a* concentration (2.4 µg/L), complied with the adopted criterion of 6 µg/L. The concentration of total nitrogen (TN) in the sample collected on June 13, 2012 (0.5 mg/L) also complied with the newly adopted water quality criterion of 0.93 mg/L. Total phosphorus (TP) concentration (0.013 mg/L), also met the newly adopted water quality criterion 0.03 mg/L. All other water quality parameters also met their applicable limits. Note that compliance with nutrient criteria cannot be determined with a single sample; compliance is based on annual geometric means not to be surpassed more than once in a three year period. Please see Table 1 for other results. Quality assurance data from a chemistry duplicate sample are included.

Table 1. Water quality results June 13, 2012 and October 24, 2012 at Lake Mills.

Analyte	06/13/12 Result	06/13/12 Duplicate Result	10/24/12 Result	Applicable Class III Water Quality Criteria
Field Temperature (°C)	29.7		25.6	
Field pH (SU)	7.2		7.3	
Field Dissolved Oxygen (mg/L)	7.6		7.58	≥ 5
Field Specific Conductance (µmhos/cm)	219		188	Not to exceed 50% of background or 1275 µmhos/cm
Secchi disk depth (m)	3.0		2.2	
Alkalinity (mg CaCO ₃ /L)	14 A	13		
Color (PCU)	19 A	19		
Turbidity (NTU)	1.4	1.4		
Chlorophyll <i>a</i> (µg/L)	2.4	2.4		<6*
Total Phosphorus (mg/L)	0.013	0.013		0.03*
Nitrate+Nitrite (mg/L)	0.005	0.004		
Ammonia mg/L)	0.011	0.010		
Total Kjeldahl Nitrogen (mg/L)	0.50	0.45		
Total Nitrogen (mg/L)	0.5	0.45		0.93*

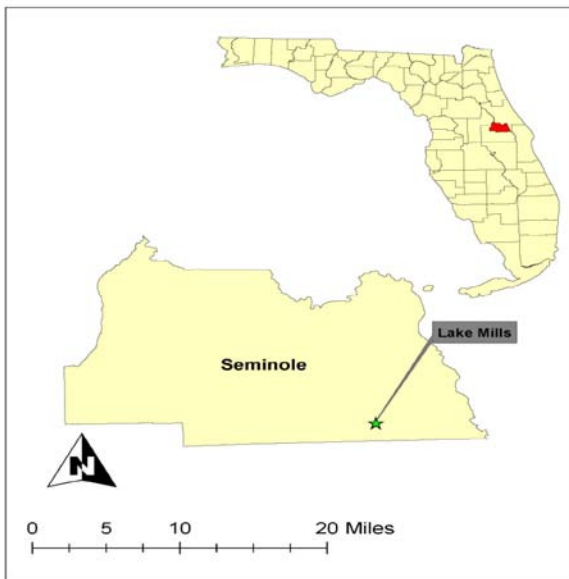


Figure 1. Location Map of Lake Mills

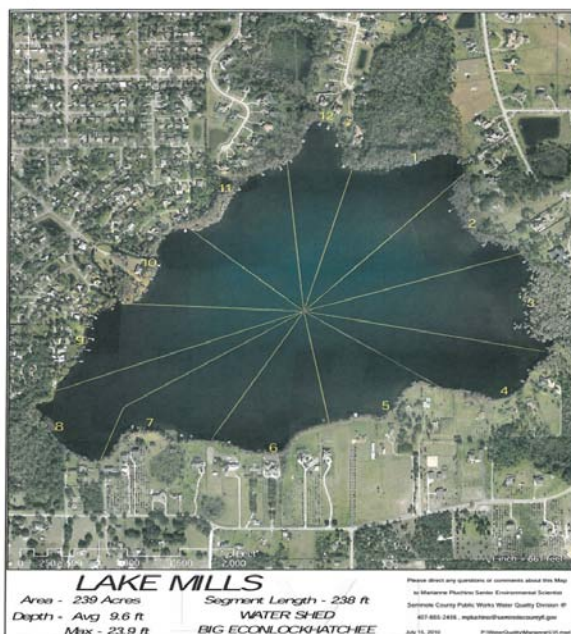


Figure 2. Sampling map of Lake Mills. Sampled for the Lake Vegetation Index on June 13, 2012 and October 24, 2012. .

*newly adopted 62-302 FAC thresholds for Annual Geometric Mean Total
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

Lake Vegetation Index

The LVI score for Lake Mills on June 13, 2012 was 58 out of a possible 100 points, corresponding with a "Healthy" designation. A follow up LVI was performed on October 24, 2012 and scored a 65 out of a possible 100 points, also corresponding with a "Healthy" designation. **Table 2** and **Table 3** contain the species list and occurrence information for these sampling events.

A total of 9 invasive exotic plants were observed in the sampled sections on June 13, 2012. *Hydrilla verticillata* codominated two sections of the lake with *Taxodium* (cypress). *Vallisneria americana* (eel grass), a beneficial submersed plant, codominated one section with *Taxodium* and dominated another.

A total of 8 invasive exotic plants were observed in the sampled sections on October 24, 2012. *Typha* (cattails) dominated one section and codominated another section with *Paspalidium geminatum* (Kissimmee grass). Of the remaining two sampled sections, one was codominated by the beneficial plants *Paspalidium geminatum* (Kissimmee grass) and *Vallisneria americana* (eel grass) and no dominant specie was chosen for section 10.

Summary

Lake Mill's water quality and plant community data, as sampled on June 13, 2012 and October 24, 2012, indicated that the lake met expectations for a healthy, well-balanced lake. Total Nitrogen, Total Phosphorus and Chlorophyll *a* concentrations complied with applicable state water quality criteria. Note that compliance with nutrient criteria cannot be determined with a single sample; compliance is based on annual geometric means not to be surpassed more than once in a three year period.

LVI scores of 58 June 13, 2012 and 65 on October 24, 2012 both correspond with a category II "Healthy" designation. A successful *Hydrilla* treatment

coordinated by Seminole County Water Quality Section was likely responsible for the improvement of the LVI score from June to October.

Lake Mills would benefit from a continued management plan to control nutrient loading from its watershed, promote native submersed and littoral vegetation and upland buffers, and control 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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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>

Table 2. Species list for the June 13, 2012 LVI at Lake Mills.

An asterisk (*) indicates an invasive exotic plant species.

P = present D = dominant, C = codominant.

Species	Common Name	Sections:	6	3	12	9
Acer rubrum	RED MAPLE		P	P	P	P
Alternanthera philoxeroides*	ALLIGATOR WEED		P			
Andropogon	BROOM GRASS		P			
Aster carolinianus	CLIMBING ASTER		P	P		
Baccharis	SALT MYRTLE		P	P		
Bacopa caroliniana	LEMON BACOPA		P			P
Bidens mitis	SMALLFRUIT BEGGARTICKS				P	
Boehmeria cylindrica	FALSE NETTLE; BOG HEMP		P			
Cephalanthus occidentalis	COMMON BUTTONBUSH		P	P	P	P
Ceratophyllum demersum	COONTAIL					P
Cladium jamaicense	JAMAICA SWAMP SAWGRASS				P	
Colocasia esculenta*	TARO; WILD TARO		P	P		
Commelina*	COMMELINA		P			
Crinum americanum	SEVEN-SISTERS; STRING-LILY		P	P	P	P
Cyperus odoratus	FRAGRANT FLATSEGE					P
Eichhornia crassipes*	WATER HYACINTH			P		
Eleocharis	SPIKE RUSH		P			
Eleocharis baldwinii	BALDWIN'S SPIKERUSH; ROADGRASS			P	P	
Eupatorium californifolium	DOGFENNEL		P	P	P	
Fuirena scirpoidea	SOUTHERN UMBRELLASEGE					P
Hydrilla verticillata*	HYDRILLA		C	C	P	P
Hydrocotyle	MARSHPENNYWORT		P	P	P	
Ilex cassine	DAHOON		P	P	P	
Juncus marginatus	SHORE RUSH; GRASSLEAF RUSH			P		
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW			P	P	
Micranthemum glomeratum	MANATEE MUDFLOWER			P		
Mikania scandens	CLIMBING HEMPVINE		P			
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE			P	P	
Najas guadalupensis	SOUTHERN WATERNYMPH					P
Nitella	NITELLA		P	P		
Nuphar	YELLOW COW LILY		P	P	P	P
Nyssa sylvatica biflora	SWAMP TUPELO		P			
Osmunda cinnamomea	CINNAMON FERN			P		
Osmunda regalis	ROYAL FERN			P	P	
Panicum hemitomon	MAIDENCANE		P	P	P	
Panicum repens*	TORPEDO GRASS		P	P	P	P
Parthenocissus quinquefolia	VIRGINIA CREEPER; WOODBINE					P
Pontederia cordata	PICKERELWEED		P	P	P	P
Sabal palmetto	CABBAGE PALM		P			
Sagittaria lancifolia	DUCK POTATO		P			
Sagittaria subulata	AWL-LEAF ARROWHEAD					P
Salix caroliniana	CAROLINA WILLOW					P
Sapium sebiferum*	CHINESE TALLOW		P			
Symphotrichum elliotii	ELLIOTT'S ASTER					P
Taxodium	CYPRESS TREE		C	C	C	P
Typha	CAT TAIL			P	P	P
Vallisneria americana	TAPEGRASS; AMERICAN EELGRASS		P	P	C	D
Vitis	GRAPE VINE		P	P		
Vitis rotundifolia	GRAPE VINE				P	
Wedelia trilobata*	CREEPING OX EYE		P			P
Woodwardia virginica	VIRGINIA CHAIN FERN				P	

Table 3. Species list for the October 24, 2012 LVI at Lake Mills.

An asterisk (*) indicates an invasive exotic plant species.

P = present D = dominant, C = codominant.

Species	Common Name	Sections:	4	1	7	10
Acer rubrum	RED MAPLE		P			P
Amaranthus australis	SOUTHERN AMARANTHUS		P	P	P	P
Aster	CLIMBING ASTOR		P			P
Baccharis	SALT BUSH			P		P
Bidens alba	BIDENS			P		
Canna flaccida	GOLDEN CANNA		P	P		
Casuarina equisetifolia*	AUSTRALIAN PINE				P	
Cephalanthus occidentalis	COMMON BUTTONBUSH					P
Cicuta maculata	SPOTTED WATER HEMLOCK		P	P	P	P
Cladium jamaicense	SAWGRASS		P	P		P
Colocasia esculenta*	TARO; WILD TARO		P	P	P	
Cornus foemina	SWAMP DOGWOOD		P			
Cyperus alternifolius*	UMBRELLA SEDGE					P
Cyperus odoratus	FRAGRANT FLATSEGE					P
Cyperus polystachyos	MANYSPIKE FLATSEGE				P	
Echinochloa	BARNYARD GRASS					P
Eichhornia crassipes*	WATER HYACINTH		P			
Eleocharis cellulosa	GULF COAST SPIKERUSH			P	P	P
Eleocharis interstincta	KNOTTED SPIKERUSH				P	
Erechtites hieraciifolia	AMERICAN BURNWEED				P	P
Eupatorium capillifolium	DOGFENNEL		P	P	P	P
Fraxinus	FRAXINUS					P
Fuirena scirpoidea	SOUTHERN UMBRELLASEGE		P			
Habenaria repens	WATERSPIDER FALSE REINORCHID				P	
Hibiscus coccineus	SCARLET ROSEALLOW		P			
Hydrocotyle	MARSHPENNYWORT		P	P	P	P
Ilex cassine	DAHOON		P			P
Ipomoea	MORNING GLORY		P	P		
Ludwigia	PRIMROSE WILLOW		P			P
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW				P	
Ludwigia octovalvis	MEXICAN PRIMROSEWILLOW				P	P
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW		P	P	P	P
Magnolia virginiana	SWEETBAY		P			
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE		P			P
Nuphar	COW LILY		P			
Nymphaea odorata	AMERICAN WHITE WATERLILY		P			
Nyssa sylvatica biflora	SWAMP TUPELO		P			
Panicum hemitomon	MAIDENCANE		P	P	P	
Panicum repens*	TORPEDO GRASS		P	P	P	P
Parthenocissus quinquefolia	VIRGINIA CREEPER; WOODBINE				P	P
Paspalidium geminatum	EGYPTIAN PASPALIDIUM; KISSIMMEEGRASS		C	P	C	P
Pluchea camphorata	CAMPHORWEED				P	
Polygonum punctatum	DOTTED SMARTWEED				P	P
Pontederia cordata	PICKERELWEED		P	P	P	P
Sabal palmetto	CABBAGE PALM		P	P	P	P
Sagittaria lancifolia	BULLTONGUE ARROWHEAD		P	P	P	P
Salix caroliniana	CAROLINA WILLOW		P	P	P	P
Sambucus canadensis	ELDERBERRY		P	P	P	P
Schinus terebinthifolius*	BRAZILIAN PEPPER				P	P
Schoenoplectus	BULL RUSH				P	
Schoenoplectus californicus	GIANT BULL RUSH					P
Schoenoplectus pungens	SWORD GRASS				P	P
Schoenoplectus tabernaemontana	SOFT STEM BULL RUSH		P	P	P	
Taxodium	CYPRESS TREE		P	P	P	P
Typha	CAT TAIL		P	D	C	P
Urochloa mutica*	PARA GRASS					P
Utricularia foliosa	LEAFY BLADDERWORT		P	P		
Vallisneria americana	TAPEGRASS; AMERICAN EELGRASS		C	P	P	P
Vigna luteola	HAIRYPOD COWPEA				P	P
Vitis	GRAPE VINE		P	P		P

