LAKE ECOSUMMARY

Orange Pond

WBID 3486

Columbia County

DEP conducted biological sampling at Orange Pond (STORET #43566) in Columbia County on July 9, 2013, and water quality sampling on April 17, 2012, to assess attainment of designated uses. Based on this sampling event, the lake exceeded the nutrient thresholds for colored lakes; however the thresholds represent annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three calendar year period. Additional sampling is needed to fully assess compliance with nutrient criteria. The plant community as assessed by the Lake Vegetation Index (LVI) had a healthy balance of macrophytes, with an overall dominance of native maiden cane grass.

Background

Healthy, well-balanced lake communities may be maintained with some level of human activities, but excessive human disturbance 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 a particular waterbody exceeding water quality criteria (Chapter 62-302, Florida Administrative Code [F.A.C.]), 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. DEP assesses the health of plant communities in Florida lakes, as one indication of whether adverse impacts to biological communities have occurred.

Methods

The LVI was performed on July 9, 2013, by the DEP Northeast District Office. On April 16, 2013, surface water samples were collected by St. Johns River Water Management District 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).

Chlorophyll *a* is a measure of algal biomass in the water column. Chapter 62-302.531, F.A.C., provides numeric criteria for chlorophyll *a*, total nitrogen (TN), and total phosphorus (TP) in lakes (Table 1). If the annual geometric mean chlorophyll *a* (calculated with at least four samples, representing seasonal variability) does not exceed the chlorophyll *a* value for the lake type in Table 1, then the TN and TP criteria for that calendar year shall be the annual geometric means of lake TN and TP samples, subject to the minimum and maximum limits in Table 1. If there are insufficient data to calculate the annual geometric mean chlorophyll *a* for a given year or the annual geometric mean chlorophyll *a* exceeds the values in Table 1 for the lake type, then the applicable numeric interpretations for TN and TP shall be the minimum values in Table 1.

Table 1. Numeric nutrient criteria in lakes, 62-302.531 (2)(b)(1), F.A.C. AGM = annual geometric mean

Long Term Geometric Mean Lake Color and Alkalinity	AGM Chlorophyll *a*	AGM TP Range	AGM TN Range
> 40 Platinum Cobalt Units	**20 µg/L**	**0.05 to 0.16[1] mg/L**	**1.27 to 2.23 mg/L**
≤ 40 Platinum Cobalt Units and > 20 mg/L $CaCO_3$	**20 µg/L**	**0.03 to 0.09 mg/L**	**1.05 to 1.91 mg/L**
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L $CaCO_3$	**6 µg/L**	**0.01 to 0.03 mg/L**	**0.51 to 0.93 mg/L**

[1] For lakes with color > 40 PCU in the West Central Region, the maximum TP limit is 0.49 mg/L

Dissolved Oxygen

Rule 62-302.533 (1), F.A.C., states that no more than 10 percent of the daily average percent dissolved oxygen (DO) saturation values shall be below 67 percent in the Panhandle West bioregion, 38 percent in the Peninsula and Everglades bioregions, or 34 percent in the Northeast and Big Bend bioregions. Percent saturation takes into account factors such as temperature, atmospheric pressure, and salinity. For lakes, the daily average DO level shall be calculated as the average of measurements collected in the upper two meters of the water column at the same location on the same day.

The daily average freshwater DO criterion is preferentially assessed using daily average values calculated from full days of diel (collected over a 24 hour period) monitoring data. If diel monitoring data are not available (as was the case for this report), instantaneous samples are used to assess the DO criterion by comparing the instantaeous value with a time-of-day-specific translation of the daily average criterion. The equations to calculate the time-of-day-specific translation of the daily average criterion are cited in 62-303.420(9), F.A.C., and a spreadsheet calculator for this purpose is available at: http://www.dep.state.fl.us/water/wqssp/dissoxy.htm.

Lake Vegetation Index

The Lake Vegetation Index (LVI) assesses how closely the plant community of a lake resembles a native undisturbed community. The LVI was sampled and calculated per DEP SOP LVI 1000 and calculated per DEP SOP LVI 2000. Species lists were developed for four of twelve sections of the lake (Figure 2), 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 of disturbance) of the dominant species. Chapter 62-303.330 and 62-303.430, F.A.C., provide that a LVI score of 43 or greater meets the expectation of a healthy, well balanced community, and scores below 43 are considered impaired.



Figure 1. Sampling map of Orange Pond Sections [3,6,9,12] was sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center.



Figure 2. Photo of Orange Pond on 07/09/2013.

Site Information

Orange Pond is a high color low alkalinity pond. Orange Pond is a private pond surrounded by land owned by the Green family. The surrounding land is used for cattle grazing. The cattle use the lake for drinking and cooling themselves. This cattle activity causes non-point source pollution to the lake from cow waste and runoff into the pond. There is a small creek on the southern end of Orange pond that drains to Hancock Lake. Orange pond is in the Lake Lona Drain watershed basin (WBID 3486). The Lake Lona Drain is a large area of pastureland containing several lakes. The Landscape Development Intensity (LDI) index score for Orange Pond is 2.06. The LDI score indicates relatively little development surrounding the lake.

Results

Water Quality

Water quality results are shown in Table 2. Based on this sampling event, the lake exceeded the nutrient thresholds for colored lakes; however the thresholds represent annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three calendar year period. Additional sampling is needed to fully assess compliance with nutrient criteria.

Table 2. Water quality sample results from 4/16/2013 at Orange Pond. Field measurements from 07/09/2013.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	29.4		
Field pH (SU)	6.83		
Field Dissolved Oxygen (mg/L)	4.56		
Field Dissolved Oxygen (% saturation)	60		34%
Field Specific Conductance (µmhos/cm)	59		
Alkalinity (mg $CaCO_3$/L)	4.8		
Color (PCU)	280		
Chlorophyll a (µg/L)	4.6		< 20 µg/L;
Total Phosphorus (mg/L)	0.64		0.05 mg/l
Nitrate+Nitrite (mg/L)	0.26		
Ammonia (mg/L)	0.077		
Total Kejldahl Nitrogen (mg/L)	1.7		
Total Nitrogen (mg/L)	1.96		1.27 mg/l

Algae

There were large floating rafts of filamentous algae, around the perimeter of the lake. In addition there were floating algae on the surface of the water.

Lake Vegetation Index

The LVI score for this lake was 58 out of a possible 100 points, corresponding with a "Healthy" designation. Table 3 contains the species list and occurrence information for this sampling event. A total of 3 invasive exotic plants were observed in the lake. The dominant vegetation for all sectors was *Panicum hemitomon*. Panicum hemitomon is a common grass surrounding lakes.

Table 3. Species list for the 7/9/2013 LVI at Orange Pond.

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

P = present, D = dominant, C = co dominant.

Species	Common name	3	6	9	12
Acer rubrum	RED MAPLE	P	P		
*Alternanthera philoxeroides**	ALLIGATOR WEED*	P	P	P	P
Andropogon	BROOM GRASS		P	P	P
Azolla caroliniana	CAROLINA MOSQUITO FERN	P	P	P	
Brasenia schreberi	WATERSHIELD			P	
Carex albolutescens	GREENWHITE SEDGE		P		
Centella asiatica	SPADELEAF		P	P	P
Ceratophyllum demersum	COONTAIL		P		
Cyperus ligularis	SWAMP FLATSEDGE	P	P	P	
Cyperus odoratus	FRAGRANT FLATSEDGE	P	P		
Cyperus polystachyos	MANYSPIKE FLATSSEDGE			P	
Diodia virginiana	VIRGINIA BUTTONWEED	P	P	P	P
Eclipta alba	YERBA DE TAGO		P	P	
*Eichhornia crassipes**	WATER HYACINTH*	P	P	P	P
Eleocharis submersed viviparous (species unknown)	VIVIPAROUS SPIKERUSH	P	P	P	
Eupatorium capillifolium	DOGFENNEL	P	P	P	P
Galium tinctorium	STIFF MARSH BEDSTRAW	P	P	P	
Hydrocotyle	MARSHPENNYWORT	P	P	P	P
Hypericum mutilum	DWARF ST.JOHN'S-WORT			P	
Juncus marginatus	SHORE RUSH; GRASSLEAF RUSH			P	
Juncus repens	LESSER CREEPING RUSH		P		

Lemna minor	COMMON DUCKWEED	P	P	P	P
Liquidambar styraciflua	SWEETGUM		P	P	
Ludwigia arcuata	PIEDMONT PRIMROSEWILLOW		P	P	
Ludwigia suffruticosa	SHRUBBY PRIMROSEWILLOW			P	
Luziola fluitans	SOUTHERN WATERGRASS	P	P	P	P
Micranthemum umbrosum	SHADE MUDFLOWER	P	P		
Nelumbo lutea	AMERICAN LOTUS	P	P	P	P
Nymphoides aquatica	BIG FLOATINGHEART	P	P	P	P
Panicum hemitomon	MAIDENCANE	D	D	D	D
Paspalum notatum	BAHIAGRASS	P	P	P	P
Polygonum hydropiperoides	MILD WATERPEPPER; SWAMP SMARTWEED		P	P	P
Polygonum pensylvanicum	PENNSYLVANIA SMARTWEED		P	P	
Pontederia cordata	PICKERELWEED	P	P	P	P
Ptilimnium capillaceum	MOCK BISHOPSWEED; HERBWILLIAM		P	P	
Rhexia mariana	PALE MEADOWBEAUTY; MARYLAND MEADOWBEAUTY		P	P	
Sagittaria filiformis	THREADLEAF ARROWHEAD	P	P	P	P
*Sapium sebiferum**	CHINESE TALLOW*				P
Sida rhombifolia	CUBAN JUTE; INDIAN HEMP		P	P	
Spirodela polyrhiza	GREATER DUCKWEED	P	P	P	P

Conclusion

The LVI results indicated a balanced macrophyte community. Based on one sampling event, the water samples did not meet Class III criteria for nitrogen and phosphorus;however, compliance with lake numeric nutrient criteria involves an annual geometric mean based on at least four samples. Orange Pond would benefit from allowing a buffer zone of vegetation to grow around the lake. Some city governments require a six foot buffer strip of no mowing and no fertilizing adjacent to water bodies. An increased buffer can decrease the nonpoint source pollution from entering the lake. Links to Best Management practices are at the bottom of the report and give good recommendations for environmental practices.

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, Department of Environmental Protection- Northeast District- Biological Scientist

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