LAKE ASSESSMENT REPORT FOR ROUND LAKE IN HILLSBOROUGH COUNTY FLORIDA

Date Assessed: June 26, 2007
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Reviewed by: Jim Griffin, Ph.D.

INTRODUCTION

This assessment was conducted to update existing physical and ecological data for Round Lake on the Hillsborough County Watershed Atlas (**http://www.hillsborough.wateratlas.usf.edu/**). The project is a collaborative effort between the University of South Florida's Center for Community Design and Research and Hillsborough County Stormwater Management Section. The project is funded by Hillsborough County and the Southwest Florida Water Management District's Northwest Hillsborough, Hillsborough River and Alafia River Basin Boards. The project has, as its primary goal, the rapid assessing of up to 150 lakes in Hillsborough County during a five year period. The product of these investigations will provide the County, lake property owners and the general public a better understanding of the general health of Hillsborough County lakes, in terms of shoreline development, water quality, lake morphology (bottom contour, volume, area etc.) and the plant biomass and species diversity. These data are intended to assist the County and its citizens to better manage lakes and lake centered watersheds.

Figure 1. General Photograph of Round Lake taken on June 26, 2007.

The first section of the report provides the results of the overall morphological assessment of the lake. Primary data products include: a contour (bathymetric) map of the lake, area, volume and depth statistics, and the water level at the time of assessment. These data are useful for evaluating trends and for developing management actions such as plant management where depth and lake volume are needed.

The second section provides the results of the vegetation assessment conducted on the lake. These results can be used to better understand and manage vegetation in your lake. A list is provided with the different plant species found at various sites around the lake. Potentially invasive, exotic (non-native) species are identified in a plant list and the percent of exotics is presented in a summary table. Watershed values provide a means of reference.

The third section provides the results of the water quality sampling of the lake. Both field data and laboratory data are presented. The trophic state index (TSI) [i] is used to develop a general lake health statement, which is calculated for both the water column with vegetation and the water column if vegetation were removed. These data are derived from the water chemistry and vegetative submerged biomass assessments and are useful in understanding the results of certain lake vegetation management practices.

The intent of this assessment is to provide a starting point from which to track changes in your lake, and where previous comprehensive assessment data is available, to track changes in the lake's general health. These data can provide the information needed to determine changes and to monitor trends in physical condition and ecological health of the lake.

Section 1: Lake Morphology

Bathymetric Map[ii]. The bottom of the lake was mapped using a Lowrance LCX 26C HD Wide Area Augmentation System (WAAS)[iii] enabled Global Positioning System (GPS) with fathometer (bottom sounder) to determine the boat's position, and bottom depth in a single measurement. The result is an estimate of the lake's area, mean and maximum depths, and volume and the creation of a bottom contour map (Figure 2). Besides pointing out the deeper fishing holes in the lake, the morphologic data derived from this part of the assessment can be valuable to overall management of the lake vegetation as well as providing flood storage data for flood models. Table 1 provides the lake's morphologic parameters in various units.

Table 1. Lake Morphologic Data (Area, Depth, and Volume)

Parameter	Feet	Meters	Acres	Acre-ft	Gallons
Surface Area (sq)	431,105.6	40,051.02	9.9		
Mean Depth	9.47	2.89			
Maximum Depth	24.24	7.39			
Volume (cubic)	3,526,131	99,849		80.9	26,377,472
Gauge (above datum)	52.24				

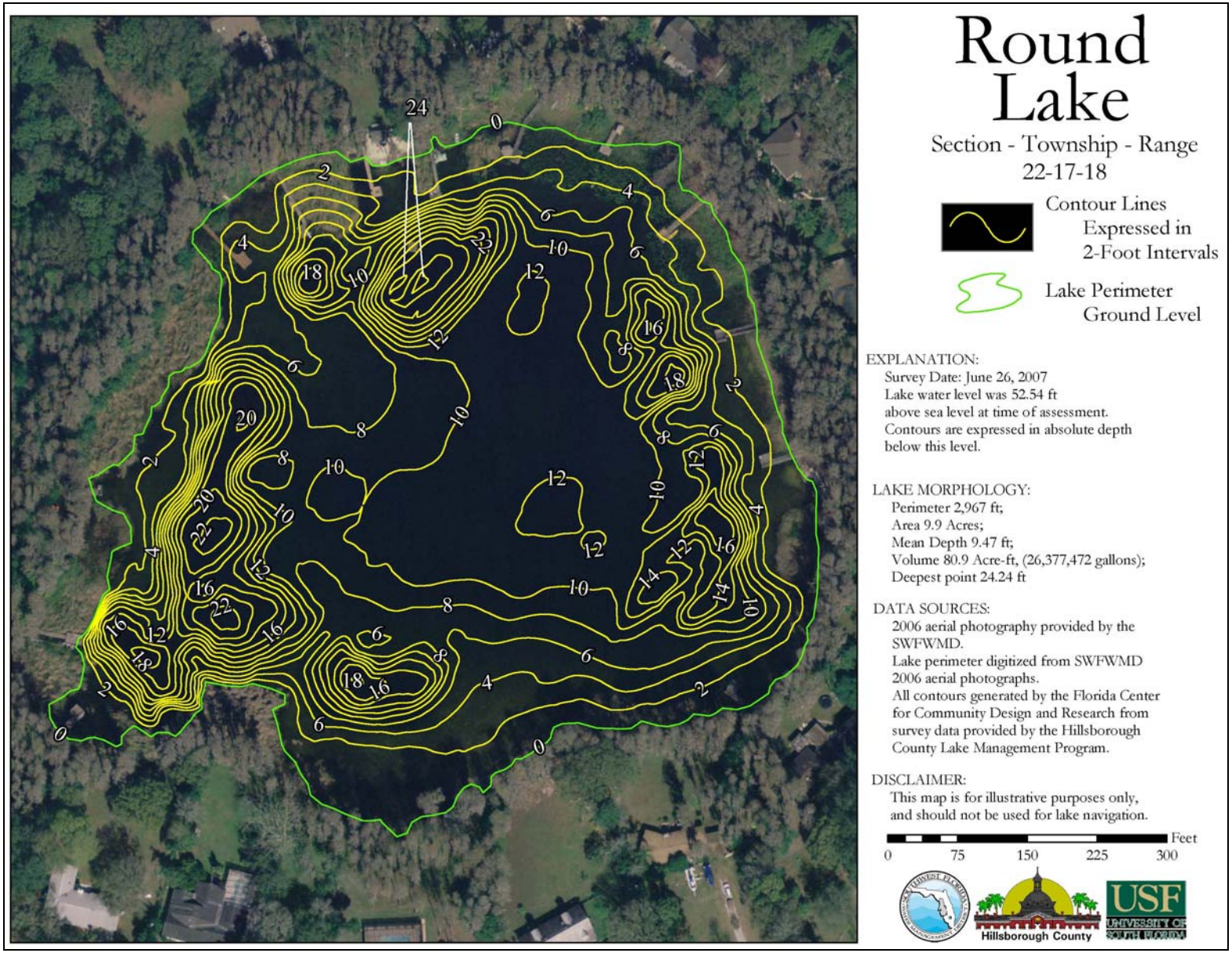


Figure 1. Contour map for Round Lake. The mapping technique used in 2007 employs a standard DGPS for horizontal position and a fathometer for depth.

Section 2: Lake Ecology (vegetation)

The lake's apparent vegetative cover and shoreline detail are evaluated using the latest lake aerial photograph as shown in Figure 3 and by use of WAAS enabled GPS. Submerged vegetation is determined from the analysis of bottom returns from the Lowrance 26c HD combined GPS/fathometer described earlier. As depicted in Figure 3, ten vegetation assessment sites were chosen for intensive sampling based on the *Lake Assessment Protocol* (copy available on request) for a lake of this size. The site positions are set using GPS and then loaded into a GIS mapping program (ArcGIS) for display. Each site is sampled in the three primary vegetative zones (emergent, submerged and floating)[iv]. The latest aerials high resolution aerial photos are used to provide shore details (docks, structures, vegetation zones) and to calculate the extent of surface vegetation coverage. The primary indices of submerged vegetation cover and biomass for the lake, percent area coverage (PAC) and percent volume infestation (PVI), are determined by transiting the lake by boat and employing a fathometer to collect "hard and soft return" data. These data are later analyzed for presence and absence of vegetation and to determine the height of vegetation if present. The PAC is determined from the presence and absence analysis of 100 sites in the lake and the PVI is determined by measuring the difference between hard returns (lake bottom) and soft returns (top of vegetation) for sites (within the 100 analyzed sites) where plants are determined present.

The data collected during the site vegetation sampling include vegetation type, exotic vegetation, predominant plant species and submerged vegetation biomass. The total number of species from all sites is used to approximate the total diversity of aquatic plants and the percent of invasive-exotic plants on the lake (Table 2). The Watershed value in Table 2 only includes lakes sampled during the lake assessment project begun in May of 2006. These data will change as additional lakes are sampled. Tables 3 through 7 detail the results from the 2007 aquatic plant assessment for you lake. These data are determined from the 10 sites used for intensive vegetation surveys. The tables are divided into Floating Leaf, Emergent and Submerged plants and contain the plant code, species, common name and presence (indicated by a 1) or absence (indicated by a blank space) of species and the calculated percent occurrence (number sites species is found/number of sites) and type of plant (Native, Non-Native, Invasive, Pest). In the "Type" category, the term invasive indicates the plant is commonly considered invasive in this region of Florida and the term "Pest" indicates that the plant has a greater than 55% occurrence in your lake and is also considered a problem plant for this region of Florida, or in a non-native invasive that is or has the potential to be a problem plant in your lake and has at least 40% occurrence. These two terms are somewhat subjective; however, they are provided to give lake property owners some guidance in the management of plants on their property. Please remember that to remove or control plants in a wetland (lake shoreline) in Hillsborough County the property owner must secure an Application To Perform Miscellaneous Activities In Wetlands (http://www.epchc.org/forms_documents.htm) permit from the Environmental Protection Commission of Hillsborough and for management of in-lake vegetation outside the wetland fringe (for lakes with an area greater than 10 acres), the property owner must secure a Florida Department of Environmental Protection permit (http://www.dep.state.fl.us/lands/invaspec/).

Table 2 Total diversity, percent exotics, and number of EPPC pest plants

Parameter	Lake	Watershed
Total Plant Diversity (# of Taxa)	50	139
% Non-Native Plants	12%	15.11%
Total Pest Plant Species	5	13

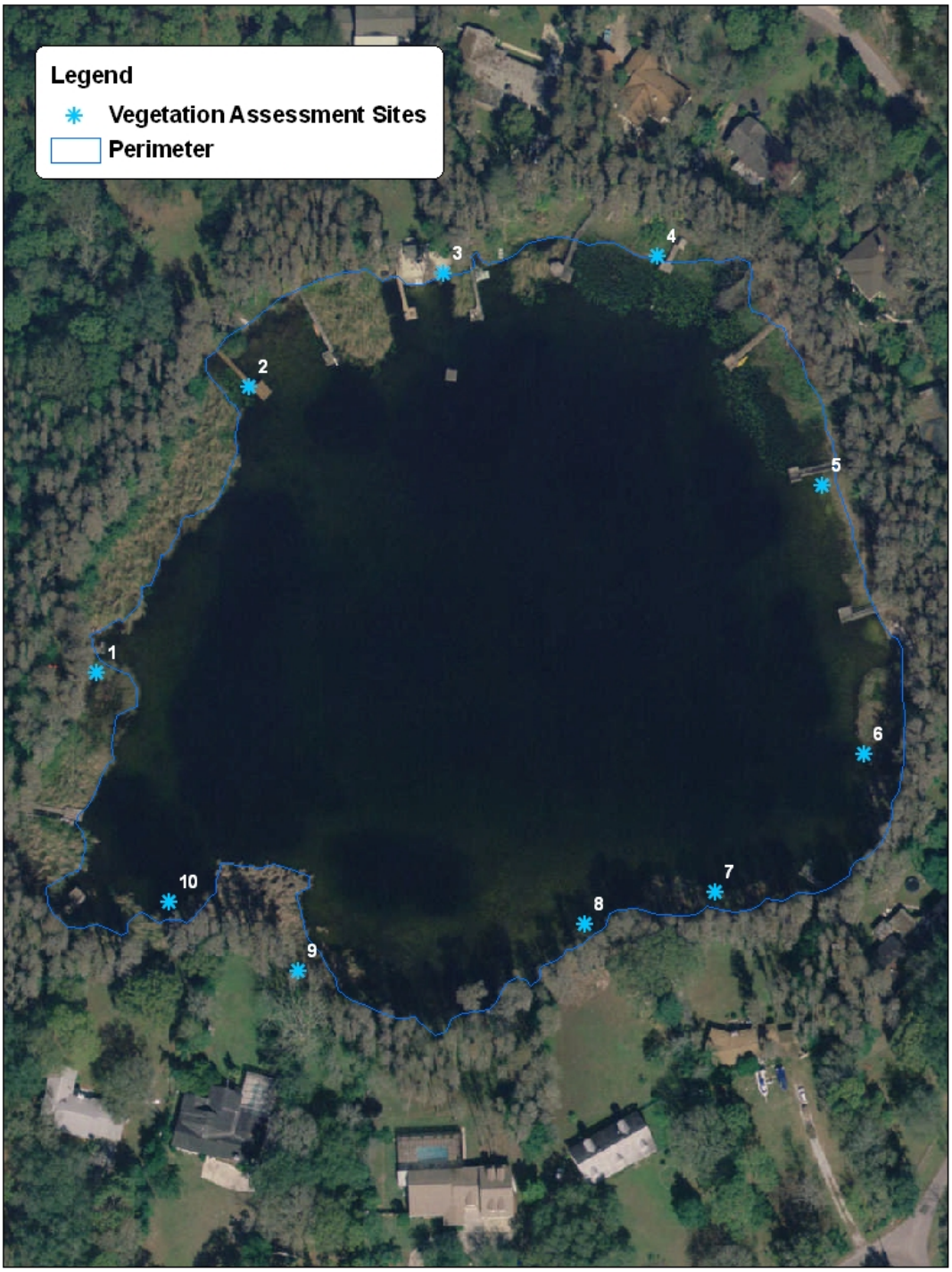


Figure 3. 2006 six-inch resolution aerial photograph showing location of vegetation assessment sites on Round Lake. Major emergent and floating vegetation zones as well as structures such as docks are also observable in this aerial.

Table 3. List of Floating Leaf Zone Aquatic Plants Found

Floating Leaved Vegetation														
Code	Native, Non-Native (NN), Invasive (I), Pest (P)	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	% Occurrence
HYE	Native	Hydrocotyl umbellata	Manyflower Marshpennywort, Water Pennywort	1	1	1	1	1	1	1	1	1		90.00%
NLM	Native	Nuphar lutea var. advena	Spatterdock, Yellow Pondlily		1	1	1	1				1		50.00%

Figure 4. *Nuphar lutea var. advena,* Spatterdock, Yellow Pondlily, is a common native floating leaved vegetation in Florida Lakes. This species provides shelter and habitat to species of fish and invertebrates at various stages of development.

Table 4 List of Emergent Zone Aquatic Plants Found

Emergent Vegetation														
Code	Native, Non-Native (NN), Invasive (I), Pest (P)	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	% Occurrence
PHN	Native	Panicum hemitomon	Maidencane	1	1	1	1	1	1	1	1	1	1	100.00%
TDM	Native	Taxodium distichum	Bald Cypress	1	1	1	1	1	1	1	1	1	1	100.00%
PRS	NN, I, P	Panicum repens	Torpedo Grass	1	1	1	1	1	1	1	1	1		90.00%
MSS	Native	Mikania scandens	Climbing Hempvine	1	1	1	1	1	1	1	1		1	90.00%
LPA	Native, P	Ludwigia peruviana	Peruvian Primrosewillow	1	1				1	1	1		1	60.00%
STS	NN, I, P	Schinus terebinthifolius	Brazilian Pepper	1	1		1		1		1		1	60.00%
CAA	Native	Centella asiatica	Asian Pennywort, Coinwort, Spadeleaf	1				1	1		1	1		50.00%
PNA	Native	Phyla nodiflora	Frog-fruit, Carpetweed, Turkey Tangle Fogfruit	1				1	1		1	1		50.00%
PCA	Native	Pontederia cordata	Pickerel Weed	1	1		1		1			1		50.00%
TYP	Native	Typha spp.	Cattails	1	1	1						1	1	50.00%
COM	Native	Commelina spp.	Dayflower	1			1	1	1					40.00%
BLS	Native	Blechnum serrulatum	Swamp Fern	1	1	1	1							40.00%
APS	NN, I, P	Alternanthera philoxeroides	Alligator Weed	1			1	1	1					40.00%
LRS	Native	Ludwigia repens	Creeping Primrosewillow, Red Ludwigia	1				1	1	1				40.00%

Table 5. List of Emergent Zone Aquatic Plants Found

Emergent Vegetation														
Code	Native, Non-Native (NN), Invasive (I), Pest (P)	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	% Occurrence
BOC	Native	Boehmeria cylindrica	Bog Hemp, False Nettle	1		1			1	1				40.00%
PLU	Native	Pluchea spp.	Marsh Fleabane,Camphorweed				1		1	1				30.00%
OCA	Native	Osmunda cinnamomea	Cinnamon Fern	1				1					1	30.00%
COS	Native	Cephalanthus occidentalis	Common Buttonbush		1				1				1	30.00%
ACE	Native	Acer rubrum var. trilobum	Southern Red Maple				1	1			1			30.00%
BID	Native	Bidens spp.	Bur Marigold	1					1					20.00%
DVA	Native	Diodia virginiana	Buttonweed					1	1					20.00%
CYO	Native	Cyperus odoratus	Fragrant Flatsedge	1			1							20.00%
AST	Native	Aster spp.	Aster spp., Elliot's Aster				1			1				20.00%
PBA	Native	Persea borbonia	Redbay		1		1							20.00%
SAM	Native	Sambucus canadensis	Elderberry				1		1					20.00%
WAX	Native	Myrica cerifera	Wax Myrtle		1				1					20.00%
SSM	NN, I	Sapium sebiferum	Popcorn Tree, Chinese Tallow Tree					1				1		20.00%
BMI	Native	Bacopa monnieri	Common Bacopa, Herb-Of-Grace						1					10.00%
CAM	Native	Crinum americanum	Swamp lily							1				10.00%
EAA	Native	Eclipta alba (prostrata)	False Daisy, Yerba De Tajo			1								10.00%
TGA	Native	Thalia geniculata	Fireflag, Arrowroot			1								10.00%

Table 6. List of Emergent Zone Aquatic Plants Found

Emergent Vegetation														
Code	Native, Non-Native (NN), Invasive (I), Pest (P)	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	% Occurrence
IRI	Native	Iris spp.	Flag					1						10.00%
NSS	Native	Nephrolepsis spp.	Sword Fern					1						10.00%
RF	Native	Osmunda regalis	Royal Fern								1			10.00%
EBI	Native	Eleocharis baldwinii	Baldwin's Spikerush, Roadgrass					1						10.00%
SCS	Native	Scirpus cubensis	Burhead Sedge,Cuban Scirpus			1								10.00%
LOP	Native	Ludwigia spp.	Water Primroses, Primrosewillow									1		10.00%
PEP	Native	Persea palustris	Swampbay							1				10.00%
QPS	Native	Quercus phellos	Willow Oak			1								10.00%
SAL	Native	Salix spp.	Willow				1							10.00%
CCA	NN, I	Cinnamomum camphora	Camphor-tree				1							10.00%
RBA	Native	Ruellia brittoniana	Britton's Wild Petunia						1					10.00%
GTM	Native	Galium tinctorium	Stiff Marsh Bedstraw									1		10.00%
HSS	Native	Hibiscus spp.	Hibiscus						1					10.00%

Figure 5. *Typha spp.,* Cattails, are a common emergent vegetation that can form a dense rim of vegetation around waterbodies. *Typha spp.* provides habitat for several species of birds, reptiles, fish and invertebrates native to Florida.

Table 7. List of Submerged Zone Aquatic Plants Found

Submerged Vegetation

Code	Native, Non-Native (NN), Invasive (I), Pest (P)	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	% Occurrence
ALG	Native, P	Algal Spp.	Algal Mats, Floating	1	1	1	1	1	1	1	1	1	1	100.00%
NGS	Native	Najas guadelupensis	Southern Waternymph	1	1	1	1	1	1	1	1	1	1	100.00%
UTA	Native	Utricularia spp.	Bladderwort	1	1	1	1		1				1	60.00%
CHA	Native	Chara spp.	Muskgrass					1	1			1		30.00%
NIT	NN, I	Nitella spp.	Nitella	1					1		1			30.00%

Figure 6. *Algal Spp.,* Algal Mats, are a native species and is common in Florida waterbodies. However, when exposed to excessive nutrients such as runoff fertilizer from lawns these species can experience rapid population growth covering much of the surface and subsurface of the lake, causing dissolved oxygen levels to lower and smothering other submerged vegetation.

Section 3: Lake Water Chemistry

A critical element in any lake assessment is the long-term water chemistry data set. The primary source of water quality trend data for Florida Lakes is the Florida LAKEWATCH volunteer and the Florida LAKEWATCH water chemistry data. Unfortunately, Round Lake has not had a volunteer since 1998 and not trend data was available through LAKEWATCH. The Southwest Florida Water Management District conducted a study of the lake between 1996 and 1997 (http://www.hillsborough.wateratlas.usf.edu/upload/documents/Round%20mfl%20memo%20feb2003.pdf) and these data are available on the Water Atlas Data Download component. Figure 7 below shows a graph of the TSI over this period. Round Lake is a clear water lake (color < 40 pcu) and as such it must maintain a TSI of below 40 to not be considered impaired by the State of Florida guidelines[v]. The lake is not considered impaired by FDEP. No recent trend data exist and it is important that the LAKEWATCH sampling be resumed to track the condition of this lake.

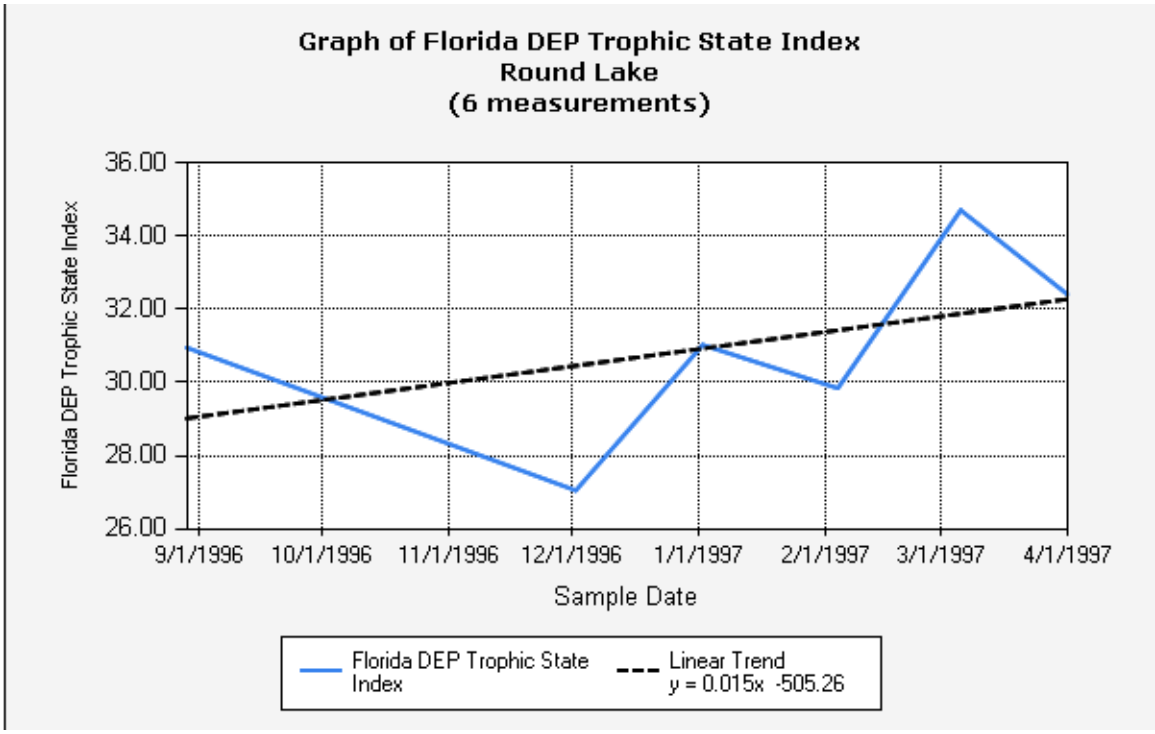


Figure 7. TSI trend data from Southwest Florida Water Management District data for Round Lake (new Water Atlas Data Download display http://www.hillsborough.wateratlas.usf.edu/DataDownload/?rid=2879.

As part of the lake assessment the physical water quality and chemical water chemistry of a lake are measured. These data only indicate a snap shot of the lakes water quality; however they are useful when compared to the trend data available from LAKEWATCH or other sources. Table 8 contains the summary water quality data and index values and adjusted values calculated from these data. The total phosphorus (TP), total nitrogen (TN) and chlorophyll (a) water chemistry sample data are the results of chemical analysis of samples taken during the assessment and analyzed by the Hillsborough County Environmental Protection Commission laboratory. These data indicate an increase in the nutrient abundance in the lake since the SWFWMD study and a shift from a phosphorus limited system to a balanced system. The lake chemistry and TSI (37.89) calculated from our study data indicates a lake in transition and additional data is needed to fully understand the changes in lake chemistry.

Table 9 contains the field data taken in the center of the lake using a multi-probe (we use either a YSI 6000 or a Eureka Manta) which has the ability to directly measure the temperature, pH, dissolve oxygen (DO), percent DO (calculated from DO, temperature and conductivity) and Turbidity. These data are listed for three levels in the lake and twice for the surface measurement. The duplicate surface measurement was taken as a quality assurance check on measured data. These data indicate a well mixed lake with moderate productivity.

Table 8. Water Quality Parameters (Laboratory)

Summary Table for Water Quality		
Parameter	***Value***	***Comment***
TP ug/L	21.00	
TN mg/L	0.45	
Chla ug/L	3.60	
Chla TSI	35.25	
TP TSI	38.23	
TN TSI	40.19	
Secchi Disk (ft)	8.64	
TSI	37.89	Balanced
PAC	56%	
PVI	17%	
Adj TP ug/L	11.12	P from Veg Added
Adj TN mg/L	0.15	N from Veg Added
Adj Chla ug/L	0.001	Chla from Veg Added
Adj TSI	42.42	With additional nutrients

Table 9. Water Quality Parameters (Field-Eureka)

Sample Location	Time	Temp (^{o}C)	Dissolved Oxygen (%)	DO (mg/L)	PH (SU)	Secchi Depth (ft)
Surface	31.99	75.05	5.32	8.01	31.99	
Mid	31.03	68.57	4.94	7.87	31.03	
Bottom	30.05	65.47	4.8	7.72	30.05	
Surface	31.97	74.62	5.29	8.01	31.97	
Mean Value	31.26	70.9275	5.0875	7.9025	31.26	8.64

Table 8 also provides data derived from the vegetation assessment which is used to determine an adjusted TSI. This is accomplished by calculating the amount of phosphorus that could be released by existing submerged vegetation if this vegetation were treated with an herbicide or managed by the addition of Triploid Grass Carp (*Ctenopharyngodon idella*). While it would not be expected that all the vegetation would be turned into available phosphorus by these management methods, the data is useful when planning various management activities. Approximately 56 % of the lake has submerged vegetation present and this vegetation represents about 17 % of the available lake volume. The vegetation holds enough nutrients to add about 11.12μg/L phosphorus, 0.15 mg/L nitrogen an a minimal amount of chlorophyll to the water column. Because the growth of algae in the water is regulated by the availability of nitrogen and phosphorus, (the lake is balanced), the release of this or these nutrients would stimulate algal growth. These changes in the water chemistry and biology would be indicated by an increased TSI from37.9 to about 42.4. The lake water clarity which is indicated by the Secchi Disk (SD)

value at 8.64 feet would be reduced under these conditions. Also, if the higher TSI persisted, the lake could be classified as impaired.

To better understand many of the terms used in this report, we recommend that you visit the Hillsborough Watershed Atlas (http://www.hillsborough.wateratlas.usf.edu) and explore the "Learn More" areas which are found on the resource pages. Additional information can also be found using the Digital Library on the website.

Section 4: Conclusion

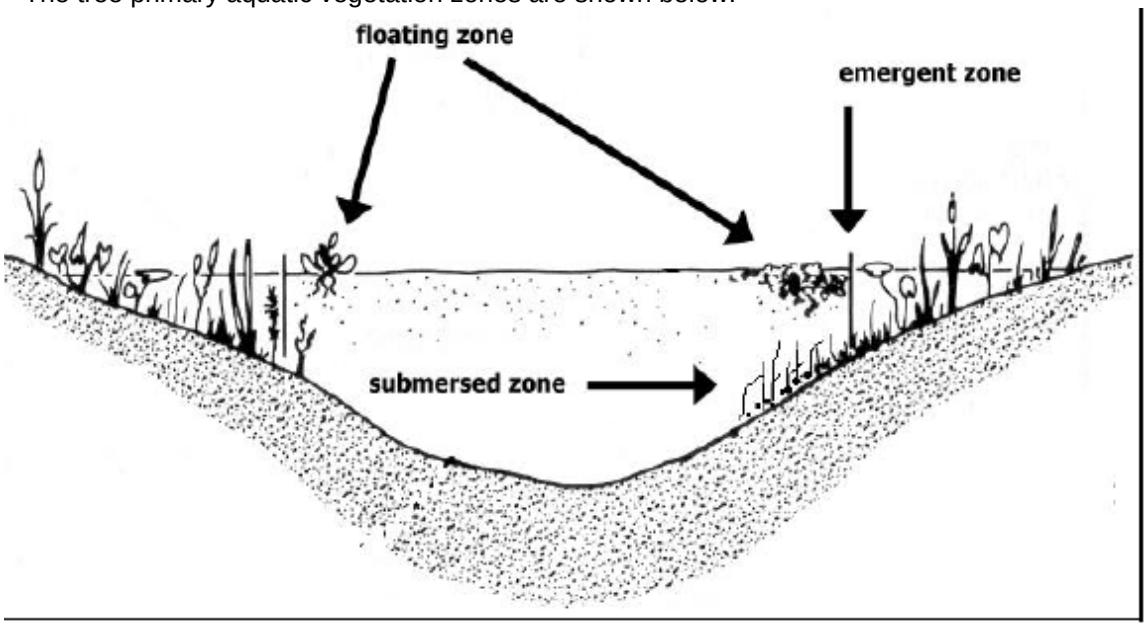
Round Lake is a small area (10 acre) lake that would be considered in the mesotrophic or good category of lakes based on water chemistry. It has a higher than normal concentration of aquatic vegetation. About 56 % of the open water areas contain submerged vegetation. Vegetation helps to maintain the nutrient balance in the lake as well as provide good fish habitat. The lake has many open water areas that support various types of recreation and has a good diversity of plant species. The primary Pest plants in the lake include *Panicum repens, Ludwigia peruviana, Schinus terebinthifolius, Alternanthera philoxeroides, Algal Spp*. For more information and recent updates please see the Hillsborough Watershed Atlas (water atlas) website at: http://www.hillsborough.wateratlas.usf.edu .

[i] "Trophic" means "relating to nutrition." The Trophic State Index (TSI) takes into account chlorophyll, nitrogen, and phosphorus, which are nutrients required by plant life. For more information please see *learn more* at:
http://www.hillsborough.wateratlas.usf.edu/lake/default.asp?wbodyid=5105&wbodyatlas=lake

[ii] A bathymetric map is a map that accurately depicts all of the various depths of a water body. An accurate bathymetric map is important for effective herbicide application and can be an important tool when deciding which form of management is most appropriate for a water body. Lake volumes, hydraulic retention time and carrying capacity are important parts of lake management that require the use of a bathymetric map.

[iii] WAAS is a form of differential GPS (DGPS) where data from 25 ground reference stations located in the United States receive GPS signals form GPS satellites in view and retransmit these data to a master control site and then to geostationary satellites. The geostationary satellites broadcast the information to all WAAS-capable GPS receivers. The receiver decodes the signal to provide real time correction of raw GPS satellite signals also received by the unit. WAAS enabled GPS is not as accurate as standard DGPS which employs close by ground stations for correction, however; it was shown to be a good substitute when used for this type of mapping application. Data comparisons were conducted with both types of DGPS employed simultaneously and the positional difference was determined to be well within the tolerance established for the project.

[iv] The tree primary aquatic vegetation zones are shown below:



[v] A lake is impaired if " (2) For lakes with a mean color less than or equal to 40 platinum cobalt units, the annual mean TSI for the lake exceeds 40, unless paleolimnological information indicates the lake was naturally greater than 40, or
For any lake, data indicate that annual mean TSIs have increased over the assessment period, as indicated by a positive slope in the means plotted versus time, or the annual mean TSI has

increased by more than10 units over historical values. When evaluating the slope of mean TSIs over time, the Department shall use a Mann's one-sided, upper-tail test for trend, as described in Nonparametric Statistical Methods by M. Hollander and D. Wolfe (1999 ed.), pages 376 and 724 (which are incorporated by reference), with a 95% confidence
level."
Excerpt from Impaired Water Rule (IWR). Please see:
http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf