



Lake Commiston

LAKE HABITAT ASSESSMENT, LAKE VEGETATION INDEX, SUBMERGED
VEGETATION SURVEY AND WATER QUALITY

David Eilers | USF Water Institute | June 14, 2018

Methods

STUDY AREA ANALYSIS

The watershed containing Lake Commiston was analyzed using ESRI ArcGIS 10.2. Using this software with 2011 Hillsborough County aerial, Land Use/ Land Cover (LULC), Landscape Development Intensity (LDI) Index values were calculated for the 100 meter buffer surrounding the lake following the procedures of Reiss & Brown 2012 (Reiss & Brown. 2012. Landscape Development Intensity (LDI) Index User's Manual. H.T. Odum Center for Wetlands, University of Florida. March 2012). According to Reiss and Brown "The LDI represents a human disturbance gradient for wetland systems. The LDI is an integrated measure of human activity, combining the effects from air and water pollutants, physical damage, changes in the suite of environmental conditions ... on the structure and processes of landscapes and ecosystems... Natural, undeveloped LU/LC classes have a LDI index value of one. In the Florida framework, the maximum LDI index score is approximately 42."

The LDI is calculated by multiplying each land use coefficient by the percentage of the area of interest occupied by that land use, and then summing the results. The Florida Department of Environmental Protection (DEP) uses the LDI as a tool to estimate potential land use impacts on streams, lakes, and wetlands. LDI values less than two (≤ 2) can be considered minimally disturbed."

LAKE BATHYMETRY AND MORPHOLOGICAL CHARACTERISTICS ASSESSMENT

The **Bathymetric Map**¹ provides the lake's morphologic parameters in various units. The bottom of the lake was mapped using a Lowrance HDS 5 Gen 2 Wide Area Augmentation System (WAAS)² 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. 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.

¹ 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.

² WAAS is a form of differential GPS (DGPS) where data from 25 ground reference stations located in the United States receive GPS signals from GPS satellites in view and retransmit these data to a master control site and then to geostationary satellites. For more information, see end note 2.

LAKE VEGETATION INDEX ASSESSMENT

Hillsborough County requested the implementation of the Florida Department of Environmental Protection methods for Lake Vegetation Index (LVI 1000) (<http://www.dep.state.fl.us/water/sas/sop/sops.htm>) using forms FD 9000-03 (Physical/Chemical Characterization), FD 9000-06 (Lake Habitat Assessment) FD 9000-27 (LVI Field Sheet) and FD 9000-31 (Lake Observation Field Sheet).

The Lake Vegetation Index (LVI) is a rapid assessment protocol in which selected sections of a lake are assessed for the presence or absence of vegetation through visual observation and through the use of a submerged vegetation sampling tool called a Frodus. The assessment results provide a list of species presents and the dominant and where appropriate co-dominant species that are found in each segment. These results are then entered into a scoring table and a final LVI score is determined. LVI scores provide an estimate of the vegetative health of a lake. Our assessment team was trained and qualified by FDEP to conduct these assessment as an independent team and must prequalify each year prior to conducting additional assessments. The LVI method consists of dividing the lake into twelve pie-shaped segments (see diagram below) and selecting a set of four segments from the twelve to include in the LVI. The assessment team then travels across the segment and identifies all unique species of aquatic plant present in the segment. Additionally, a Frodus is thrown at several points on a single five-meter belt transect that is established in the center of the segment from a point along the shore to a point beyond the submerged vegetation zone. For scoring, the threshold score for impairment is 37.

Four metrics are utilized in the Lake Vegetation Index Survey; Dominant Coefficient of Conservatism (CoC), Percent Florida Exotic Pest Plant Council Type 1 (% FLEPPC), Percent Native Taxa, Percent Sensitive Taxa.

The Dominant Coefficient of Conservatism (CoC) metric for the dominant or co-dominate species in each section. The CoC applies a score of 0-10 to each species based on its ecological tolerances and fidelity to pre-settlement conditions. Species with higher scores show a high fidelity to native, undisturbed habitats and are typically sensitive to alterations. Available CoC scores can be obtained from LT 7000 from the Florida Department of Environmental Protection at: <http://www.dep.state.fl.us/water/sas/sop/sops.htm>.

The percent FLEPPC (Florida Exotic Pest Plant Council) Category 1 invasive exotic taxa in a single sampling unit (pie slice) by dividing the number of FLEPPC Category I taxa by the total number of taxa in that sampling unit. Multiply result times 100. Refer to Appendix LVI 1000-1 to determine which plants are on the FLEPPC Category 1 list. Note that not all exotic taxa should be included in this metric, only those listed in Appendix LVI 1000-1 as Category 1 FLEPPC. If the FLEPPC updates their list of Category 1 exotics, those updates shall not be reflected in this calculation until they are included in Appendix LVI 1000-1.

The percent native taxa in a single sampling unit (pie slice) is calculated by dividing the number of native taxa by the total number of taxa in that sampling unit. Multiply result times 100. Nativity status is determined by the Plant Atlas from the Institute for Systematic Botany, and is listed in Appendix LVI 1000-1. For informational purposes, visit the website

<http://www.florida.plantatlas.usf.edu/>. Taxa that are native according to the Plant Atlas from the Institute for Systematic Botany but are not on the list in Appendix LVI 1000-1 may be included in this metric calculation, but inclusion of these additional taxa is not required.

The percent sensitive taxa in a single sampling unit by summing the number of taxa with a C of C (Coefficient of Conservatism) score ≥ 7 and then dividing by the total number of taxa in that sampling unit. Multiply result times 100. Refer to Appendix LVI 1000-1 for a list of C of C scores.

The collected bathymetric data is analyzed for submerged aquatic vegetation (SAV) calculations including the percentage of the surface area of the lake inhabited by SAV as well as an estimate of the percent volume of the lake inhabited by SAV. SAV is an important component to a lakes nutrient cycling as well as chlorophyll concentrations due to the SAV and phytoplankton competing for available nutrients in the water column. In addition SAV serves a vital role as habitat for many species of macroinvertebrates and fish as well as substrate for epiphytic algae.

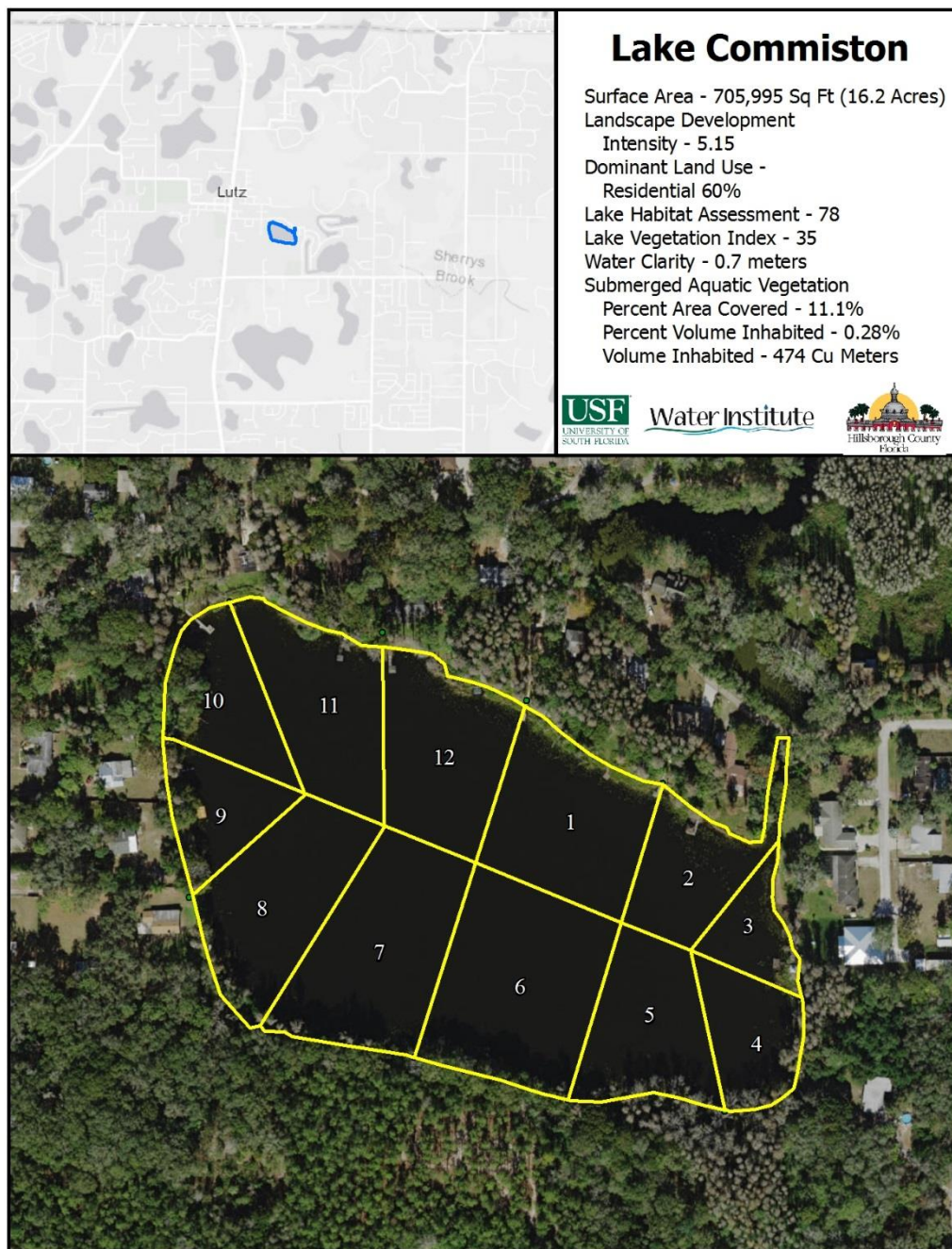
WATER QUALITY ASSESSMENT

Physical water quality samples were taken using a Eureka Manta Sub-2 multiprobe pre and post calibrated on the day of the assessment. Measurements taken with this device include: depth, conductivity, pH, Dissolved Oxygen (mg/l and % Saturation) and salinity. Chemical water parameters were collected and preserved on ice by USF Water Institute staff and analyzed at the Environmental Protection Commission of Hillsborough County Laboratory. Analysis include; Chlorophyll (a, b, c, t and corrected), Alkalinity, Color, EColi, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen. The results of the water quality sampling effort will be discussed in the framework of the FDEP Numeric Nutrient Criteria

Study Area

Lake Commiston is located north of Sunset Lane in the Lutz area of Hillsborough County, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Lake Commiston is dominated by Residential land use (60%) and Natural Lands (39.4%) land uses. The resulting LDI value for the 100 meter buffer around Lake Commiston is 5.15.

FIGURE 1: 2018 LAKE COMMISTON ASSESSMENT STUDY AREA MAP



Lake Bathymetry and Morphological Characterization

Lake Commiston is a depressional system that has been heavily altered in the past due to dredge and fill operations prior to residential construction. The evidence from this activity is shown as the series of deep holes along the northern shoreline. The deepest natural depth in the lake was a little over 13 feet deep, however the dredging activities have left several areas over 20 feet in depth.

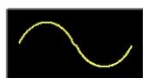
At the time of the assessment, Lake Commiston was experiencing normal water levels (61.27 feet above sealevel NAVD 88) resulting in a 16.2 acre water body. Lake Commiston at the time of the assessment had a mean water depth of 8.37 feet and a maximum observed depth of 23.23 feet. The volume at this time was approximately 44,181,809 gallons. Figure 2 shows the resulting bathymetric contour map for Lake Commiston from data collected on June 14, 2018. The collected data has been overlain the 2016 Hillsborough County aerals.

Table 1: Morphological Calculations for Lake Commiston

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	705,995	65,589	16.2		
Mean Depth	8.37	2.55			
Maximum Depth	23.23	7.08			
Volume (cubic)	5,906,208	167,244		135.6	44,181,809
Gauge (NAVD 88)	61.27	18.68			

Figure 2: 2017 1-Foot Bathymetric Contour Map for Lake Commiston

Commiston Lake



Contour Lines
Expressed in
1-Foot Intervals



Lake Perimeter
Ground Level

EXPLANATION:

Survey Date: June 14, 2018
Water level was 61.27' NAVD 88
at the time of the assessment.
Contours are expressed in absolute depth
below this level.

LAKE MORPHOLOGY:

Perimeter 3,774 ft;
Area 16.2 Acres;
Mean Depth 8.4 ft;
Volume 135.6 Acre-ft, (44,181,809 gallons);
Deepest point 23.23 ft

DATA SOURCES:

2016 aerial photography provided by
Hillsborough County.
Lake perimeter digitized from Hillsborough
County 2016 aerial photographs.
All contours generated by the USF Water
Institute from survey data collected by
USF Water Institute Lake and Stream
Assessment Program.

DISCLAIMER:

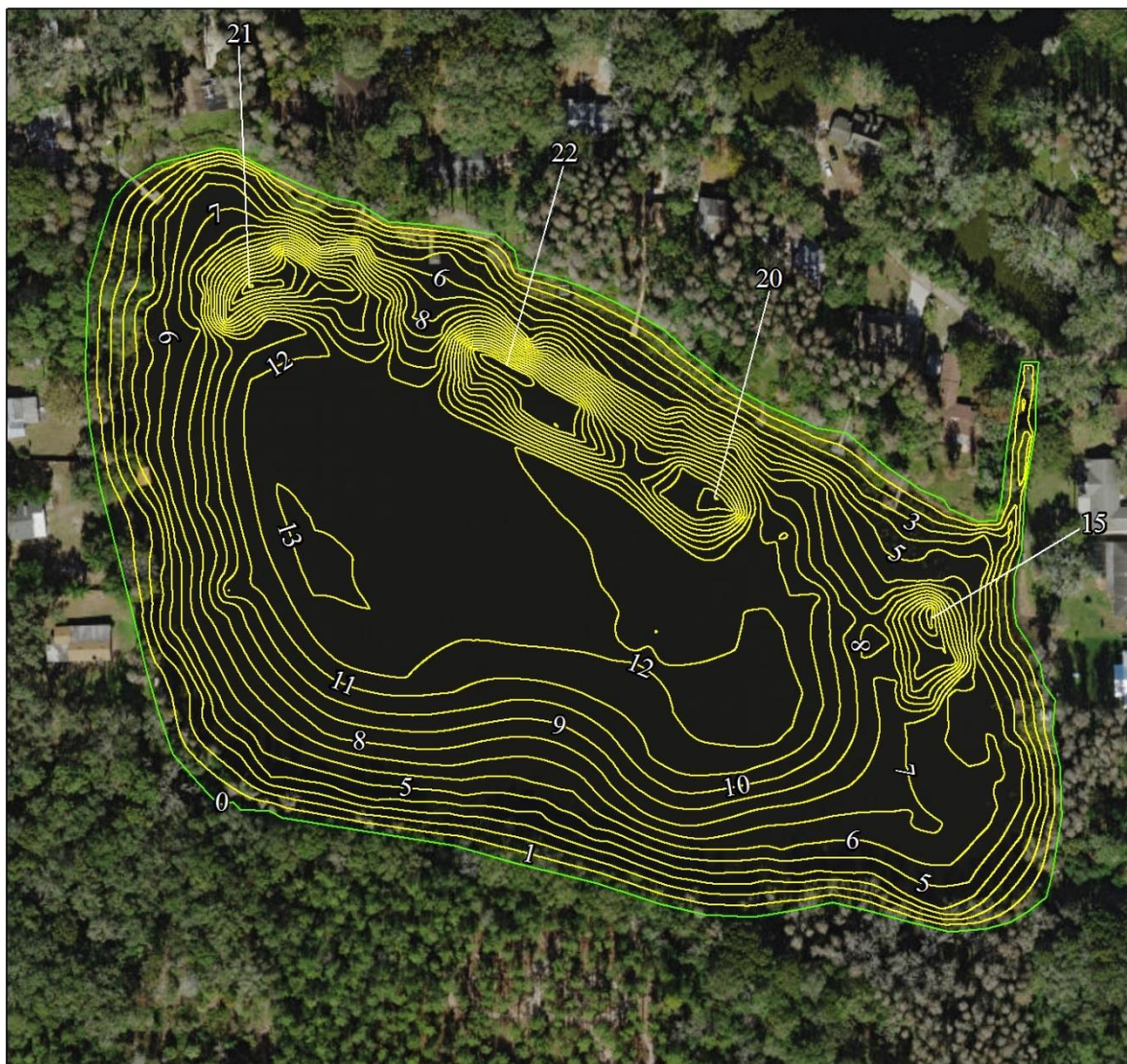
This map is for illustrative purposes only,
and should not be used for lake navigation.



Water Institute



0 90 180 360 Feet



Lake Habitat and Lake Vegetation Index Assessment



Figure 3 Overview photograph of Lake Commiston showing typical shoreline vegetation as well as the undeveloped northern shore.

The lake assessment for Lake Commiston was conducted on June 14, 2018. Lake Commisyon received a lake habitat assessment (FEDP form FD 9000-6) score of 78 due to suboptimal scores for Vegetation Quality, Stormwater Inputs, Bottom Substrate Quality, Lakeside Adverse Human Alterations, Upland Buffer Zone and Adverse Watershed Land Use. Marginal scores were achieved for Secchi.

The water in Lake Commiston was characterized as highly tannic and slightly turbid with a color value of 60.3 PCU. The secchi disk depth was 0.7 meters in part due to the high tannins and turbidity. The vegetation quality of the plants in and buffering Lake Commiston are predominantly native species with moderate growths of non-native nuisance species such as *panicum repens*. Some direct inputs of stormwater were noted through pipes and ditches to the lake. The bottom substrate quality was dominated by sand with coarse particulate organic matter near shore and some accumulation of muck. Approximately 45% of the surrounding land has been developed for residential housing including several docks. Some homeowners have maintained an upland buffer zone along the shoreline while others have removed this vegetation for turf grass lawns.

Figure 4 Lake Commiston had a buffering zone of emergent vegetation surrounding the lake containing a mixture of native and invasive species.



The Lake Vegetation Index identified 35 species of wetland vegetation growing in the four selected sections along Lake Commiston. The majority of these species (26) are native species. The remaining 9 species (*Panicum repens*, *Alternanthera philoxeroides*, *Oxycaryum cubense*, *Salvinia minima*, *Colocasia esculenta*, *Cyperus alternifolius*, *Ruellia simplex*, *Sapium sebiferum* and *Ludwigia peruviana*) are non-native and invasive to this region. The vegetation community along Lake Commiston is dominated by a variety of emergent species including *Panicum repens*, *Oxycaryum cubense*, *Taxodium* and *Ludwigia peruviana*. The water's surface in Lake Commiston was dominated by *Nuphar* (Figure 5).

A total of 1 species of submerged aquatic vegetation was observed, *Eleocharis baldwinii*. Submerged vegetation was rarely observed in the lake due to the low water visibility and tanins blocking available light. By analyzing the collected sonar chart, submerged aquatic vegetation potentially covered approximately 11.01% of the surface area Lake Commiston. This submerged vegetation inhabits an estimated 0.28% of the water volume in Lake Commiston. Figure 6 shows the results of the SAV analysis indicating the location and percent of the water column inhabited by SAV.

The calculated LVI score for Lake Commiston was 35, below the impairment threshold of 37. Figure 8 shows the map of Lake Commiston detailing the LVI regions used for the assessment

(Regions 2, 5, 8, 11). Table 2 details the species list results of the Lake Vegetation Index. Table 3 details the scoring result for the Lake Vegetation Index.

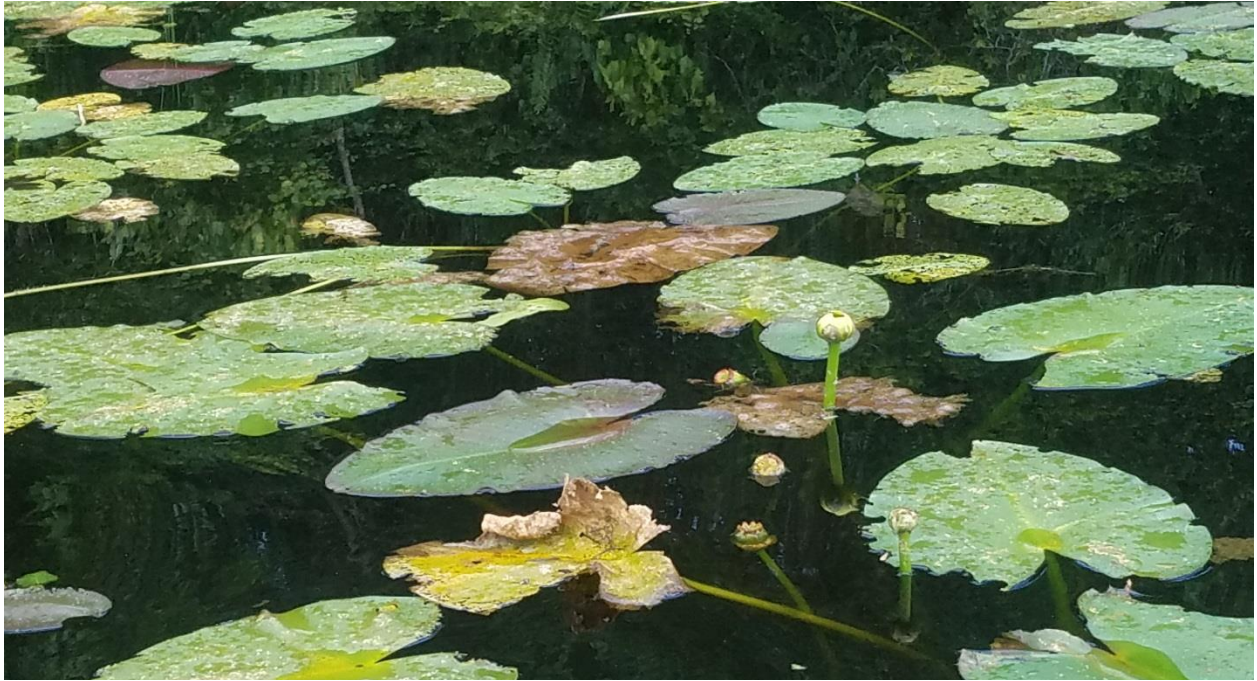
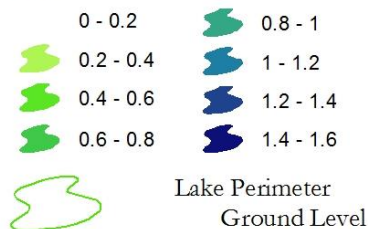


Figure 5 Nymphaea odorata dominated the water surface in Boot Lake

Commston Lake

Height of Vegetation

Feet



EXPLANATION:

Survey Date: June 14, 2018
 Water level was 61.27' NAVD 88 at the time of the assessment.
 Submerged Aquatic Vegetation was analyzed from collected sonar data.
 The height of the SAV where present is shown in 0.2 foot increments.

DATA SOURCES:

2014 aerial photography provided by Hillsborough County.
 Lake perimeter digitized from Hillsborough County 2014 aerial photographs.
 All contours generated by the USF Water Institute from survey data collected by USF Water Institute Lake and Stream Assessment Program.

SAV STATISTICS:

Area 77,716 square ft; 1.8 Acres;
 (11.01% of Lakes Surface Area)
 Mean SAV Height 0.22 ft;
 Volume 16,751 Cubic ft, (125,310 gallons);
 (0.28% of Lakes Volume)



Water Institute



0 90 180 360 Feet

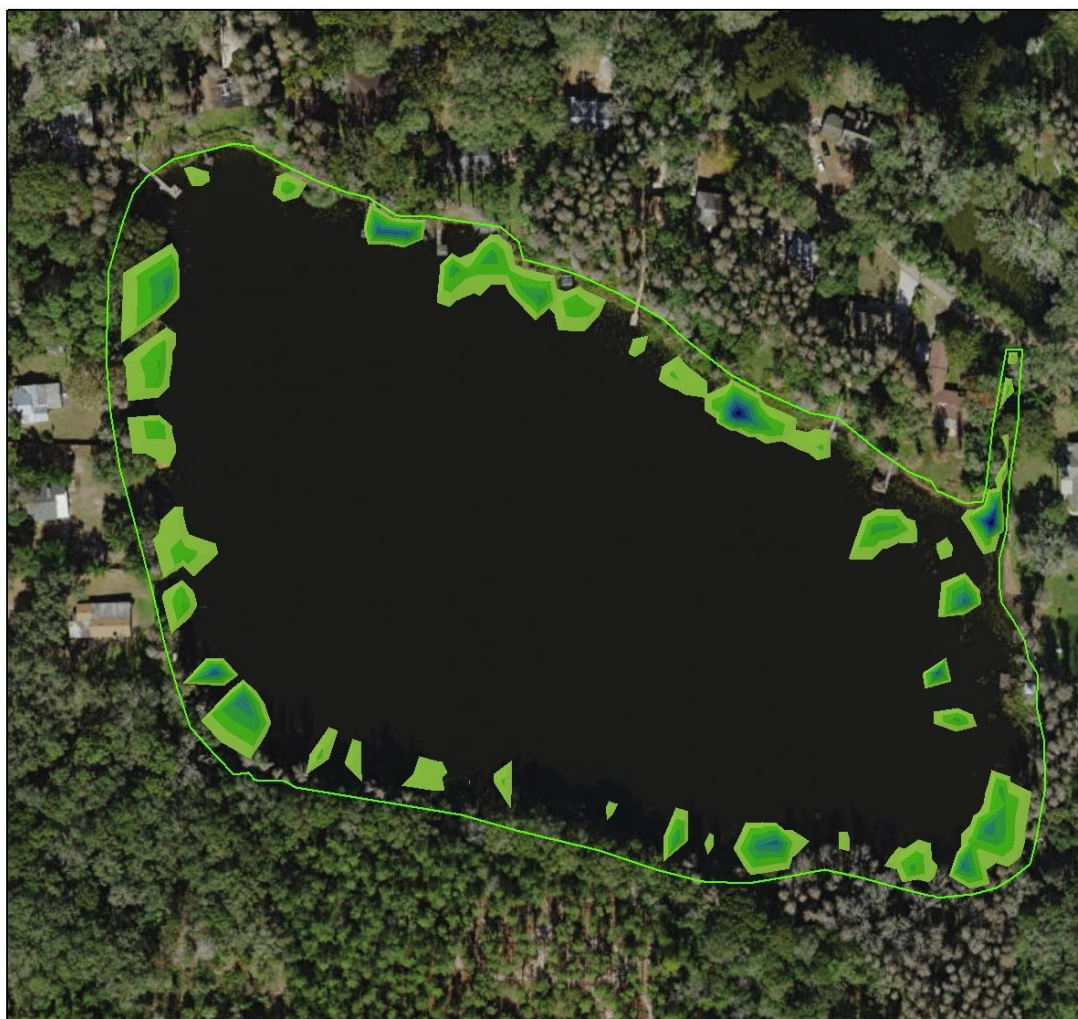


Figure 6 Lake Commiston Submerged Aquatic Vegetation Assessment Results



Figure 7: Lake Vegetation Index region map for Lake Commiston

Table 2: Lake Vegetation Index results for Lake Commiston 6/14/2018

SPECIES	CofC	2	5	8	11
Acer rubrum	4.65	1	1	1	1
Alternanthera philoxeroides	0.00	1	1	1	1
Blechnum serrulatum	5.50	1	1	1	1
Cyperus haspan	4.00	1	1	1	1
Hydrocotyle	2.00	1	1	1	1
Ilex cassine	6.00	1	1	1	1
Ludwigia peruviana	0.00	1	1	1	1
Mikania scandens	1.95	1	1	1	1
Myrica cerifera	2.00	1	1	1	1
Nuphar	3.50	D	D	C	C
Oxycaryum cubense	0.50	1	1	1	C
Panicum repens	0.00	1	1	C	1
Salvinia minima	0.00	1	1	1	1
Taxodium	7.00	1	1	1	1
Cyperus surinamensis	2.03	1		1	1
Eleocharis baldwinii	2.82	1	1		1
Boehmeria cylindrica	5.00		1	1	
Cephalanthus occidentalis	5.00		1	1	
Colocasia esculenta	0.00		1		1
Cyperus polystachyos	1.56			1	1
Panicum hemitomon	5.82		1		1
Pontederia cordata	5.38		1	1	
Quercus nigra	2.50	1		1	
Sacciolepis striata	5.35			1	1
Sapium sebiferum	0.00			1	1
Typha	1.00	1			1
Cyperus alternifolius	0.00				1
Gordonia lasianthus	7.00			1	
Ludwigia octovalvis	2.00			1	
Magnolia virginiana	7.00				1
Nyssa sylvatica biflora	7.00		1		
Persea palustris	7.00			1	
Pluchea baccharis	5.45			1	
Ruellia simplex	0.00				1
Salix caroliniana	2.95	1			

Table 3: Scoring Summary for the Lake Vegetation Index

LVI Score Summary	Region			
	2	5	8	11
Total # of taxa in sampling unit	19	21	26	25
% Native taxa in sampling unit	73.68421	71.42857	76.92308	64
% FLEPPC CAT 1 taxa in sampling unit	15.78947	19.04762	15.38462	24
% Sensitive taxa in sample unit	5.263158	9.52381	11.53846	8
Dominant CoC in sample unit	3.5	3.5	1.75	2
Native Score $((x-62.5)/37.5)$ or $((x-66.67)/25.89)=$	0.270924	0.1838	0.396025	0
Invasive FLEPPC 1 Score $(1 - (x/30))=$	0.473684	0.365079	0.487179	0.2
Sensitive Score $(x/(27.78 \text{ or } 20)) =$	0.263158	0.47619	0.576923	0.4
Dominant CoC Score $(x/(7.91 \text{ or } 7)) =$	0.5	0.5	0.25	0.285714
Raw Score Total = N+I+S+D =	1.507766	1.525069	1.710127	0.885714
Division Factor = (3 D=0 or 4) =	4	4	4	4
Average LVI dividend = Raw /DF	0.376941	0.381267	0.427532	0.221429
South				
LVI Score for sampling unit =	37.69414	38.12674	42.75318	22.14286
Total LVI SCORE =	35			

Water Quality Assessment

Limited long-term water quality data is available for Lake Commiston. The majority of the available data was collected as part of the University of Florida LAKEWATCH program (1997-2007). Table 4 provides a summary of the Physical/Chemical conditions recorded at the middle of Lake Commiston.

Table 4: Lake Commiston Water Quality (Field)

Depth (m)	Temp °C	pH	DO (mg/L)	DO (%sat)	Cond (unho/cm)	Salinity (ppt)	Secchi Depth (m)
0.55	30.81	7.91	7.62	100.8	142	0.07	0.7
2.07	28.06	6.81	1.19	15.0	138.4	0.06	
3.6	23.0	6.94	0.33	3.9	196.3	0.09	
POR	25.40	7.01	5.49	67.34	199.8	0.09	1.30

The chemical water quality analysis for Lake Commiston is shown in Table 5 for the sample taken on June 14, 2018. Table 6 includes this data in the numeric nutrient criteria framework using the data from this assessment as well as the available LAKEWATCH geometric mean values for the period of record since complete data for the past three years for available parameters is not available. Total Phosphorous values were above the nutrient threshold for colored lakes in the west central region with insufficient data developed by FDEP of 0.05 mg/l with a value of 0.178 mg/l for the POR and above the threshold for the single sample with a value of 0.059 mg/l. Total Nitrogen values were below the nutrient threshold for colored lakes with insufficient data developed by FDEP of 1.27 mg/l with a value of 1.021 mg/l for the POR data. The Total Nitrogen value associated with the sample for this assessment was 0.839 mg/l. Chlorophyll-a corrected values are below the nutrient threshold for colored lakes developed by FDEP of 20.0 µg/l with a value of 11.5 µg/l. The UF LAKEWATCH data is for uncorrected chlorophyll-a and has a mean value for the period of record of 11.94 µg/l.

Bacteria testing showed low levels of E. Coli (20 colonies/100ml) and Enterococci (13 colonies/100ml) below the rules set forth in FDEP 62-302.530 (<https://www.flrules.org/gateway/RuleNo.asp?title=SURFACE%20WATER%20QUALITY%20STANDARDS&ID=62-302.500>) "Most Probable Number (MPN) or Membrane Filter (MF) counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period."

Table 5: Lake Commiston Water Quality Results from 6/14/18 (Laboratory)

Parameter	Lake Commiston (Center)	POR Mean Value	Units
Alkalinity	22.0		mg/LCaCO ₃
Nitrates/Nitrites	0.011	0.011	mg/L
E. Coli	20	20	#/100 ml
Enterococci	13	210	#/100 ml
Chlorophyll a	14.3	11.94	ug/L
Chlorophyll b	0.5		ug/L
Chlorophyll c	1.2		ug/L
Chlorophyll t	15.5		ug/L
Chlorophylla Corr	11.5		ug/L
Chlorophyll-pheo	5.4		ug/L
Ammonia	0.008	0.14	mg/L
Kjeldahl Nitrogen	0.839	0.769	mg/L
Total Nitrogen	0.839	1.021	mg/L
Total Phosphorus	0.059	0.178	mg/L
Color(345)F.45	60.3		Pt/Co

Table 6: Numeric Nutrient Criteria Framework

Parameter	Value
Geometric Mean (Geomean) Color (pcu)	60.3
Number of Samples	1
Geometric Mean Alkalinity (mg/L CaCO_3)	22.0
Number of Samples	1
Lake Type	Colored Alkaline
Chlorophyll a Criteria (ug/L)	20
Insufficient for Geomean Criteria then P mg/L	0.05
Insufficient for Geomean Criteria then N mg/L	1.27
Geomean Chla ug/L	11.5
Geomean TP mg/L	0.178
Geomean TN mg/L	1.021
Number of Samples	611
Potential Impaired Chlorophyll a	Not Impaired
Potential Impaired TP	Impaired
Potential Impaired TN	Not Impaired

Conclusion

The results of the assessment of Lake Commiston shows an impaired lake based on Total Total Phosphorous concentrations according to the FDEP numeric nutrient criteria using the single sample taken during this assessment and limited long term water quality record from Lakewatch. The sampling data was insufficient to calculate proper FDEP Numeric Nutrient Criteria values. Consistent Long term sampling would be necessary to determine actual NNC values. The system also shows disruption in the vegetation communities according to the Lake Vegetation Index with low overall species (35), moderate occurrences of non-native, invasive species and several sensitive plant species with an overall LVI score of 35. The assessment also revealed a small submerged aquatic vegetation community comprising 1 species occupying 11.01% of the surface area and 0.28% of the volume of Lake Commiston.