

Lake White Trout

Methods

Study Area Analysis

The watershed containing Lake White Trout was analyzed using ESRI ArcGIS 10.2. Using this software with 2014 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 Brown & Vivas 2003, 2005 (Brown & Vivas. 2003. A Landscape Development Intensity (LDI) Index. Center for Environmental Policy, Department of Environmental Engineering Sciences, University of Florida. Technical Report Submitted to the Florida Department of Environmental Protection) and (Brown & Vivas. 2005. Landscape development intensity index. Environmental Monitoring and Assessment 101: 289-309.) According to Brown and Vivas, “The intensity and aerial extent of human activities in a landscape may adversely affect the ecological processes of natural communities...the Landscape Development Intensity Index (LDI) functions as an objective measure of how human disturbance affects biological, chemical, and physical processes of aquatic systems. By incorporating non-renewable energy input expenditures... natural systems were assigned a non-renewable empowerment density of 0. The landscape development intensity (LDI) index is calculated as the percentage area within the catchment of a particular type of land use multiplied by the coefficient of energy use associated with that land use, summed over all land use types found in the catchment.”

Lake Bathymetry and Morphological Characteristics Assessment

The **Bathymetric Map**ⁱ 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)ⁱⁱ 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.

ⁱ 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.

ⁱⁱ 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) are 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, Fecal Coliform, 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 White Trout is located north of Bush Blvd, between North Dale Mabry Highway and Orange Grove Drive in Greater Carrollwood, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Lake White Trout is dominated by Low Density, <2 dwelling units/acre (31.34%), Medium Density, 2>5 dwelling units/acre (26.68%), and High Density, 6 or more dwelling units/acre (17.87%) land uses. The resulting LDI value for the 100 meter buffer around Lake Dan is 2.39. The LDI value calculated for the FDEP WBID containing Lake White Trout was 6.82 with approximately 32.76% High Density, 6 or more dwelling units/acre, 15.86% Medium Density, 2>5 dwelling units/acre, and 10.8% Commercial and Services natural landscapes.

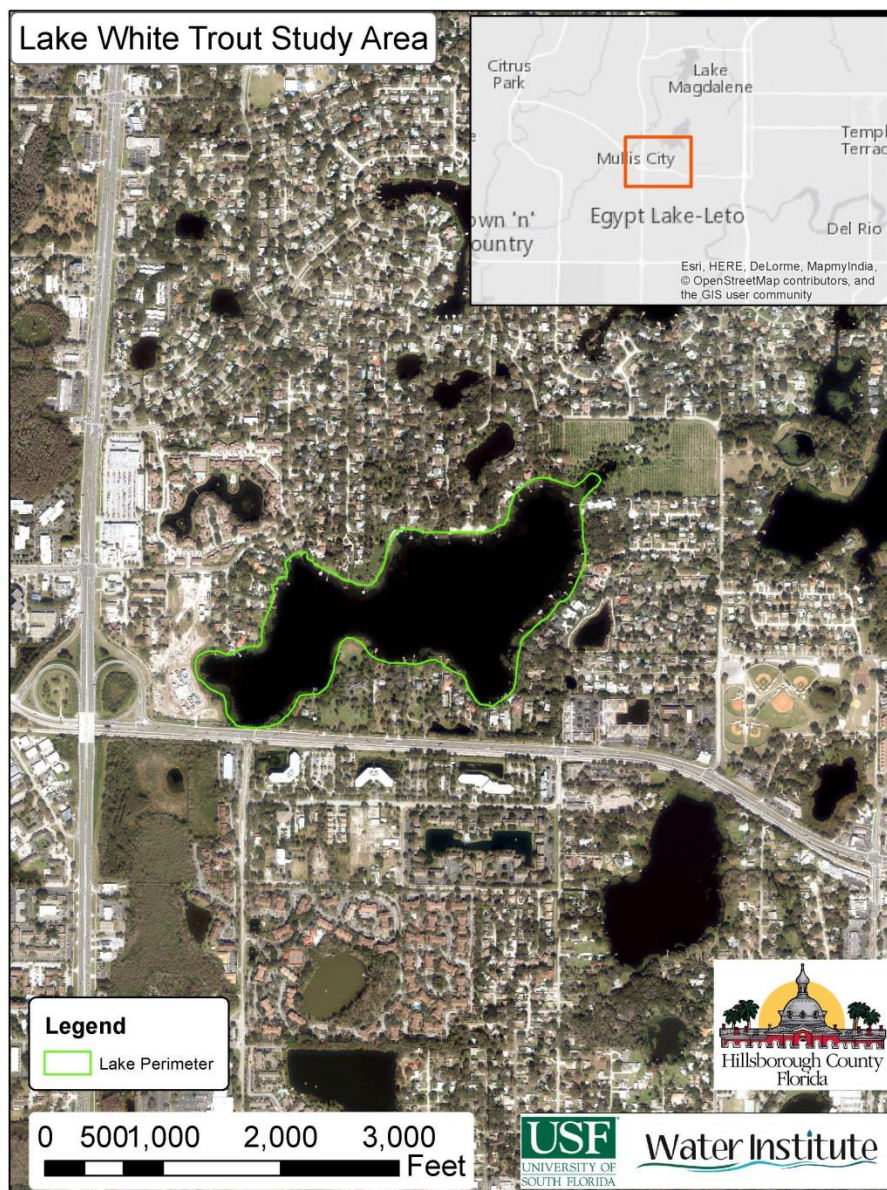


Figure 1 2016 Lake White Trout Assessment Study Area Map

Lake Bathymetry and Morphological Characterization

Lake White Trout is a relatively deep 75.5 acre lake, in an urban residential landscape. Lake White Trout at the time of the assessment had a mean water depth of 9.6 feet and a maximum observed depth of 27.4 feet. The volume at this time was approximately 245,815,593 gallons. Figure 2 shows the resulting bathymetric contour map for Lake White Trout from data collected on July 28, 2016. The collected data has been overlain the 2016 Hillsborough County aerals.

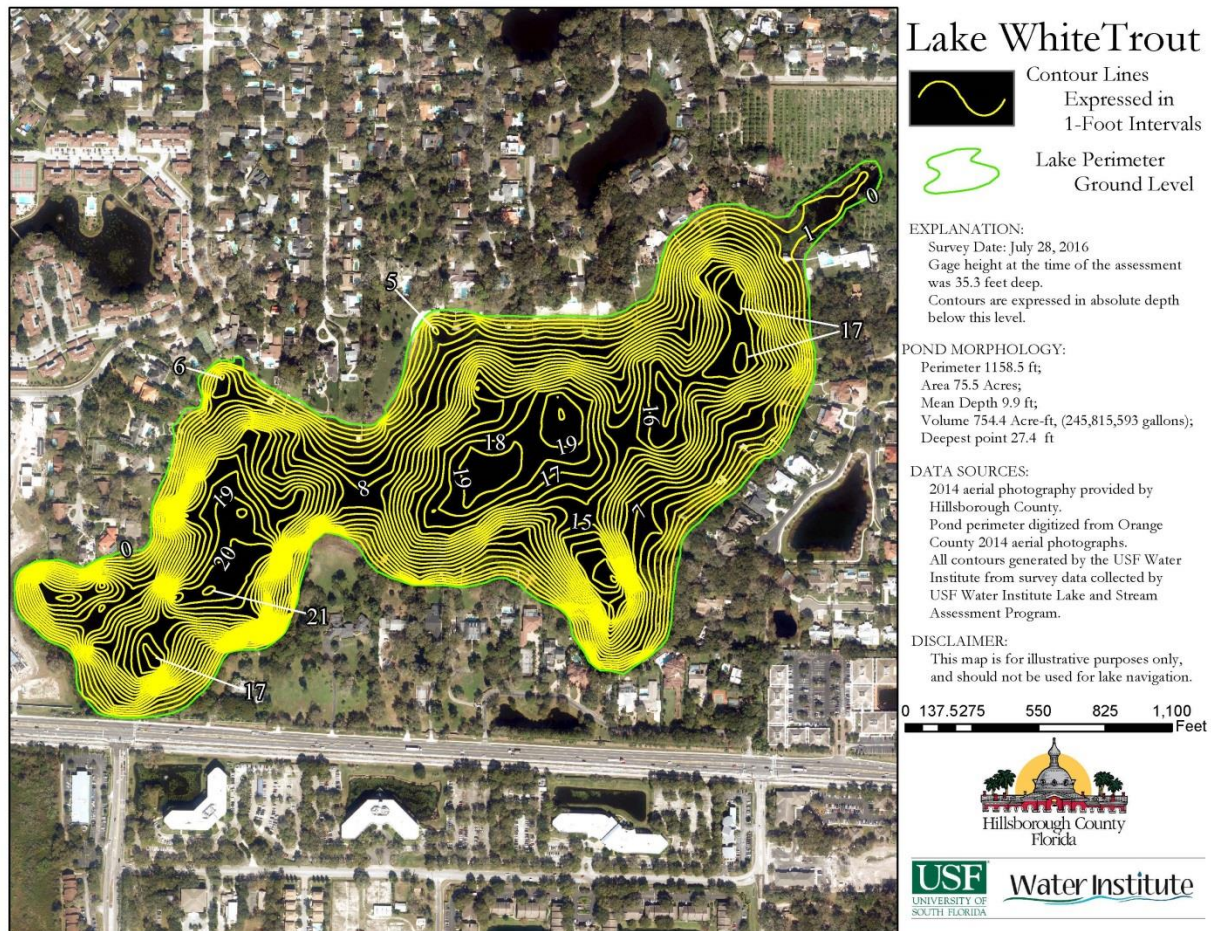


Figure 2 2016 1-Foot Bathymetric Contour Map for Lake White Trout.

Table 1 Morphological Calculations for Lake White Trout.

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	3,289,579	305,609	75.5	0	0
Mean Depth	9.99	3.04	0	0	0
Maximum Depth	27.4	8.37	0	0	0
Volume (cubic)	32,860,537	930,498	0	754.4	32,860,537
Gauge (relative)	35.3	10.76	0	0	0

Lake Vegetation Index Assessment



Figure 3 Overview photograph of Lake White Trout.

The lake assessment for Lake White Trout was conducted on July 28, 2016. Lake White Trout received a lake habitat assessment (FEDP form FD 9000-6) score of 64 due to optimal scores for Secchi and suboptimal scores for Bottom Substrate Quality. Marginal scores were achieved for Vegetation Quality, Stormwater Inputs and Adverse Watershed Land Use. Lakeside Adverse Human Alterations and Upland Buffer Zone received poor scores.

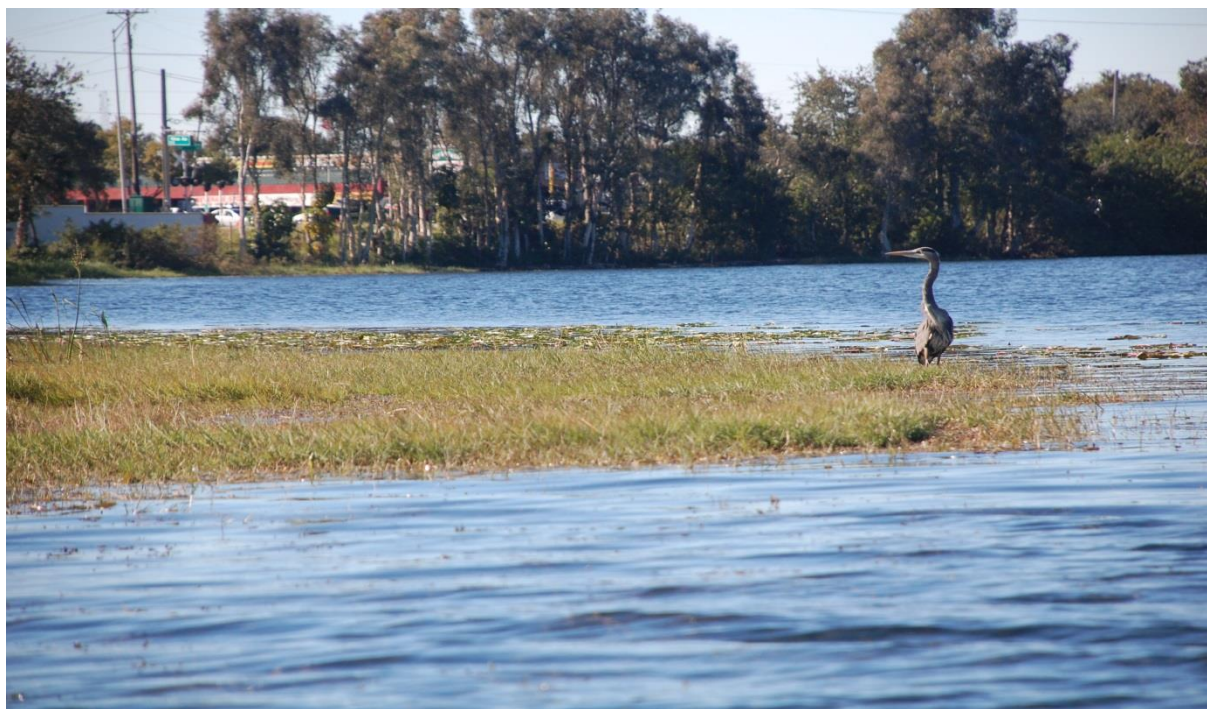


Figure 4 Lake White Trout had a limited buffering zone of emergent vegetation surrounding the lake containing a mixture of native and invasive species.

The Lake Vegetation Index identified 43 species of wetland vegetation growing in the four selected sections along Lake White Trout. The majority of these species (32) are native species. The remaining 11 species (Shown in Bold on Table 2) are non-native and invasive to this region. The vegetation community along Lake White Trout is dominated by a variety of emergent species including *Melaleuca quinquenervia* (Figure 5). The water's surface in Lake White Trout was dominated by *Nymphaea odorata* and *Nymphaea capensis* (Figure 6). The calculated LVI score for Lake White Trout was 26, below the impairment threshold of 37 due to the proliferation and dominance by *Hydrilla verticillata*. Figure 7 shows the map of Lake White Trout detailing the LVI regions used for the assessment. Table 2 details the species list results of the Lake Vegetation Index. Table 3 details the scoring result for the Lake Vegetation Index. Submerged vegetation was abundant during the assessment dominated by *Hydrilla verticillata*. By analyzing the collected sonar chart, submerged aquatic vegetation covered approximately 72% of the surface area of Lake White Trout. This submerged vegetation inhabits an estimated 30.2% of the water volume in Lake White Trout.



Figure 5 *Melaleuca quinquenervia* on Lake White Trout.



Figure 6 *Nymphaea capensis* on Lake White Trout.

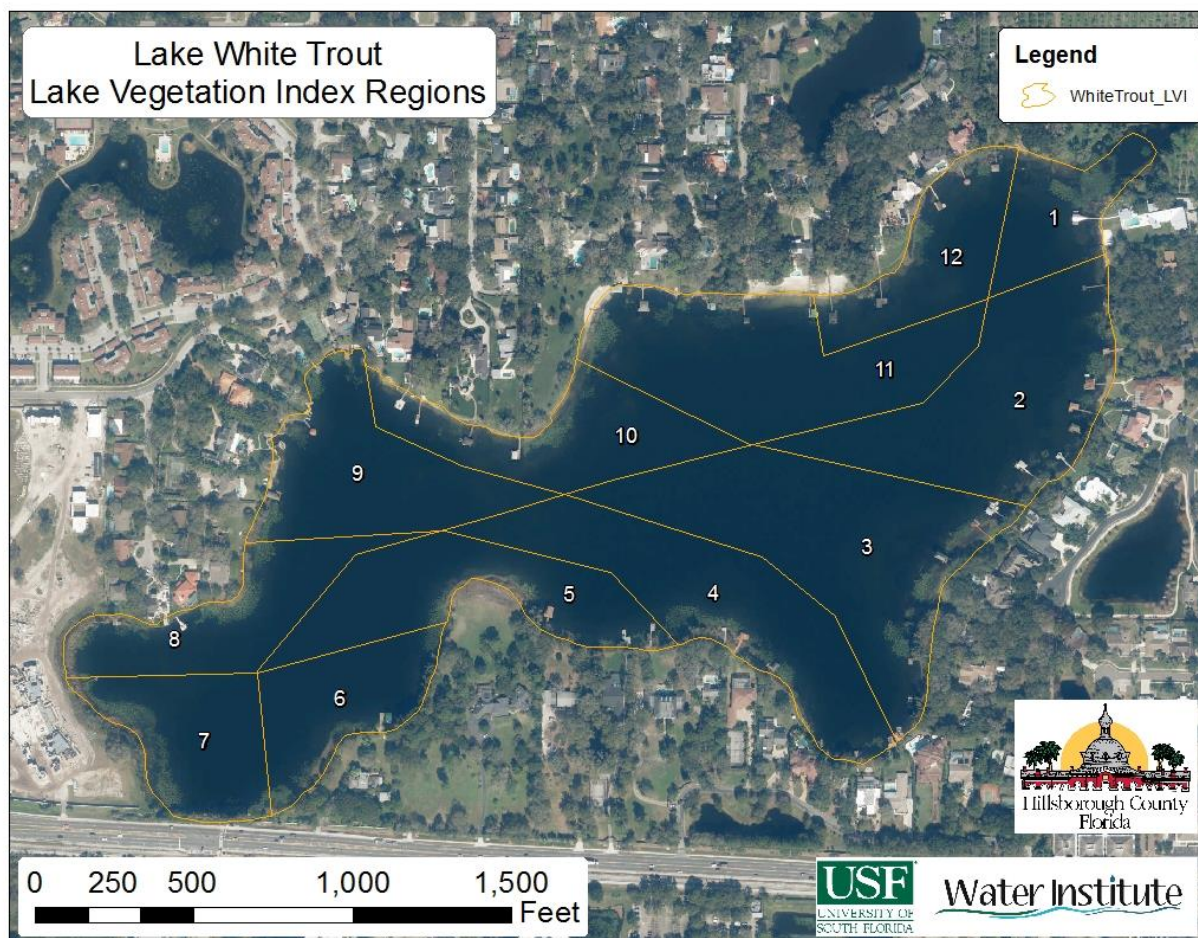


Figure 7 Lake Vegetation Index region map for Lake White Trout.

Table 2 Lake Vegetation Index results for Lake White Trout 7/28/2016.

SPECIES	Region				
	CofC	1	4	7	10
Acer rubrum	4.65			1	
Alternanthera philoxeroides	0.00	1	1	1	1
Baccharis				1	
Bacopa caroliniana	4.50	1		1	1
Bacopa monnieri	3.50	1	1	1	1
Blechnum serrulatum	5.50			1	
Boehmeria cylindrica	5.00		1	1	
Commelina diffusa	2.02	1			
Cyperus odoratus	3.00	1	1	1	1
Cyperus polystachyos	1.56	1		1	1
Cyperus surinamensis	2.03	1		1	
Diodia virginiana	3.00				1
Echinochloa walteri	2.50	1			
Eleocharis interstincta	7.80			1	
Eupatorium capillifolium	0.83			1	
Fuirena scirpoidea	5.50		1		1
Hydrilla verticillata	0.00	c	d	d	d
Hydrocotyle	2.00	1	1	1	1
Juncus effusus	2.00			1	
Ludwigia leptocarpa	3.00	1	1		1
Ludwigia peruviana	0.00	1	1	1	
Melaleuca quinquenervia	0.00		1	1	
Myrica cerifera	2.00			1	
Najas guadalupensis	5.07	1	1		
Nitella	6.00	1	1	1	1
Nuphar	3.50	1			
Nymphaea capensis	0.50		1	1	
Nymphaea odorata	5.00	c	1	1	1
Panicum hemitomon	5.82			1	
Panicum repens	0.00	1	1	1	1
Pontederia cordata	5.38	1		1	
Potamogeton diversifolius	6.00				
Potamogeton illinoensis	6.64	1	1	1	1
Sagittaria lancifolia	3.00	1	1	1	1
Sagittaria latifolia	3.50				
Salix caroliniana	2.95			1	
Salvinia minima	0.00	1		1	
Schinus terebinthifolius	0.00			1	
Schoenoplectus tabernaemontani	5.55			1	
Sphagneticola trilobata	0.00			1	
Typha	1.00		1	1	1
Urochloa mutica	0.00		1	1	
Utricularia gibba	6.37	1		1	1
Utricularia radiata	6.01		1		1
Vallisneria americana	7.00	1	1	1	1

Table 3 Scoring Summary for the Lake Vegetation Index

LVI Score Summary	Region			
	1	4	7	10
Total # of taxa in sampling unit	23	21	35	19
% Native taxa in sampling unit	73.91	66.67	71.43	84.21
% FLEPPC CAT 1 taxa in sampling unit	17.39	23.81	20.00	10.53
% Sensitive taxa in sample unit	4.35	4.76	5.71	5.26
Dominant CoC in sample unit	2.50	0	0	0

Native Score $((x-62.5)/37.5)$ or $((x-66.67)/25.89)=$	0.280	0	0.184	0.678
Invasive FLEPPC 1 Score $(1 - (x/30))=$	0.420	0.206	0.333	0.649
Sensitive Score $(x/(27.78 \text{ or } 20)) =$	0.217	0.238	0.286	0.263
Dominant CoC Score $(x/(7.91 \text{ or } 7)) =$	0.357	0	0	0
Raw Score Total = $N+I+S+D =$	1.275	0.444	0.803	1.590
Division Factor = $(3 \text{ D}=0 \text{ or } 4) =$	4	4	4	4
Average LVI dividend = Raw /DF	0.319	0.111	0.201	0.397
South				
LVI Score for sampling unit =	32	11	20	40
Total LVI SCORE =	26			

Water Quality Assessment

Long-term water quality data is not available for Lake White Trout. The available data was collected as part of this lake assessment. Table 4 provides a summary of the Physical/Chemical conditions recorded at the middle of Lake White Trout.

Table 4 Lake White Trout Water Quality (Field)

Depth (m)	Temp (C)	pH	DO (mg/L)	DO (% Sat)	Cond (umho/cm)	Salinity (ppt)	TDS (mg/L)	Secchi Depth (m)
0.24	32.42	8.59	7.67	103.7	224.1	0.1	143.4	3.2
2.94	31.22	8.32	7.36	97.5	223.3	0.1	142.9	
5.59	28.74	6.61	0	0	240	0.11	153.6	
0.06	32.61	8.14	7.71	104.6	224.3	0.1	143.5	

The chemical water quality analysis for Lake White Trout is shown in Table 5 for the sample taken on July 28, 2016. Table 6 includes this data in the numeric nutrient criteria framework using the data from this assessment since geometric mean values for the past three years for available parameters are not available. Total Phosphorous values were above the nutrient threshold for colored alkaline lakes in the west-central region with insufficient data developed by FDEP of 0.05 mg/l with a value of 0.017 mg/l. Total Nitrogen values were above the nutrient threshold for colored alkaline lakes with insufficient data developed by FDEP of 1.27 mg/l with a value of 0.508 mg/l. Chlorophyll-a values are below the nutrient threshold for colored alkaline lakes developed by FDEP of 20.0 µg/l with a value of 5.4 µg/l.

Bacteria testing showed low levels of Fecal Coliform (8 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 White Trout Water Quality Results from 7/28/2016 (Laboratory)

Parameter	Value	Units
Alkalinity	34.0	mg/LCaCO ₃
Nitrates/Nitrites	0.003	mg/L
Fecal Coliform	8	#/100 ml
Enterococci	140	#/100 ml
Chlorophyll a	6.1	ug/L
Chlorophyll b	2.6	ug/L
Chlorophyll c	1.6	ug/L
Chlorophyll t	8.4	ug/L
Chlorophylla Corr	5.4	ug/L
Chlorophyll-pheo	6.6	ug/L
Ammonia	0.006	mg/L
Kjeldahl Nitrogen	0.505	mg/L
Total Nitrogen	0.508	mg/L
Total Phosphorus	0.017	mg/L
Color(345)F.45	54.4	Pt/Co

Table 6 Numeric Nutrient Criteria Framework

Parameter	Value
Geometric Mean (Geomean) Color (pcu)	54.4
Number of Samples	1
Geometric Mean Alkalinity (mg/L CaCO ₃)	34.0
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	5.4
Geomean TP mg/L	0.017
Geomean TN mg/L	0.508
Number of Samples	1
Potential Impaired Chlorophyll a	Not Impaired
Potential Impaired TP	Not Impaired
Potential Impaired TN	Not Impaired

Conclusion

The results of the assessment of Lake White Trout shows no impairment based on Total Nitrogen, Total Phosphorous and Chlorophyll-a concentrations according to the FDEP numeric nutrient criteria using the single sample taken during this assessment. Long term sampling would be necessary to determine actual NNC values, particularly the long term Color measurement for classification. The system also shows impairment in the vegetation communities according to the Lake Vegetation Index with moderate overall species, high occurrences of non-native, invasive species (including dominance) and some sensitive plant species with an overall LVI score of 26. Bacteria sampling also revealed elevated biomass of Fecal Coliform bacteria present at the time of the assessment.