



Lake Gibson

LAKE VEGETATION INDEX ASSESSMENT

David Eilers | USF Water Institute | June 17, 2021

Methods

STUDY AREA ANALYSIS

The watershed containing Lake Gibson was analyzed using ESRI ArcGIS 10.2. Using this software with 2020 Polk County aerial, 2017 FDEP Land Use/ Landscape Support Index (LU), 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 VEGETATION INDEX ASSESSMENT

Polk 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 9000-27 (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 43.

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.

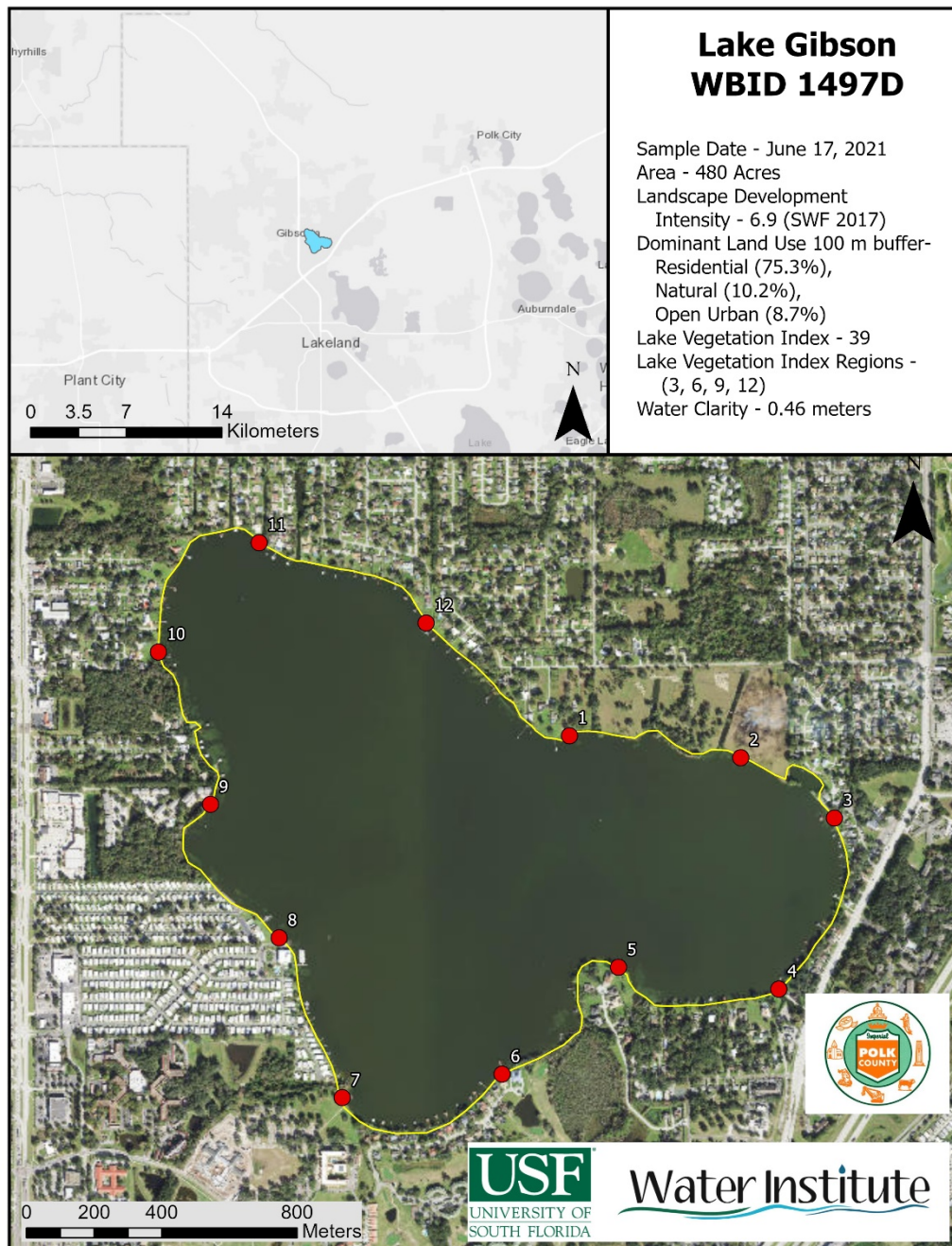
WATER QUALITY ASSESSMENT

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.

Study Area

Lake Gibson is located in the Peace River – Saddle Creek Watershed in Polk County, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Lake Gibson is dominated by Residential (75.3%), Natural (10.2%) and Open Urban (8.7%) land uses. The resulting LDI value for the 100 meter buffer around Lake Gibson is 6.9.

FIGURE 1: 2021 LAKE GIBSON ASSESSMENT STUDY AREA MAP



Lake Habitat and Lake Vegetation Index Assessment



Figure 2 Overview photograph of the Lake Gibson showing typical shoreline vegetation.

The lake assessment for the Lake Gibson was conducted on June 17, 2021. The water in Lake Gibson was characterized as turbid and green. The secchi disk depth was 0.46 meters (1.5 feet). The vegetation quality of the plants in Lake Gibson are predominantly native species (69.4%) with moderate growths of non-native nuisance species such as *Urochloa mutica* and *Panicum repens*. Some direct inputs of stormwater were noted through pipes to the lake but the majority of stormwater reaches the lake through sheet flow off residential lawns. The bottom substrate quality was dominated by sand with some accumulation of muck and coarse particulate organic matter.



Figure 3 *Nuphar* was a dominant species along the shorelines of Lake Gibson.

The Lake Vegetation Index identified 36 species of wetland vegetation growing in the four selected sections along Lake Gibson. The majority of these species (27) are native species. The remaining 9 species (*Panicum repens*, *Alternanthera philoxeroides*, *Urochloa mutica*, *Colocasia esculenta*, *Sphagneticola trilobata*, *Schinus terebinthifolius*, *Eichhornia crassipes*, *Sapium sebiferum* and *Ludwigia peruviana*) are non-native and invasive to this region. The emergent vegetation community along Lake Gibson is limited by the large amount of seawall along the shoreline. *Panicum repens*, *Urochloa mutica* and *Typha* were common in areas where seawalls were absent. The floating leaved vegetation community in Lake Gibson was dominated by *Nuphar*. *Nuphar* was dominant or co-dominant in all four sections of the LVI. Submerged aquatic vegetation was present in Lake Gibson, but growth was limited by the low light penetration in the water column. The only species of submerged vegetation was *Vallisneria spiralis*.

The calculated LVI score for Lake Gibson was 39, below the impairment threshold of 43 classifying the result as “Impaired”. The main issues with the vegetation community is the limited total taxa due to seawalls and the presence of several invasive species. Figure 4 shows the map of Lake Gibson detailing the LVI regions used for the assessment (Regions 3, 6, 9, 12). Table 1 details the species list results of the Lake Vegetation Index. Table 2 details the scoring result for the Lake Vegetation Index.

Table 1: Lake Vegetation Index results for Lake Gibson 6/17/21. "C" and "D" values indicate the species was dominant or co-dominant in the region. Species in bold indicate non-native, invasives.

SPECIES	CofC	3	6	9	12
Acer rubrum	4.65	1	1	1	1
Nuphar	3.50	C	C	D	D
Panicum repens	0.00	1	1	1	1
Taxodium	7.00	1	1	1	1
Typha	1.00	1	1	1	1
Urochloa mutica	0.00	1	1	1	1
Vallisneria americana	7.00	C	C	1	1
Alternanthera philoxeroides	0.00		1	1	1
Colocasia esculenta	0.00	1	1	1	
Cyperus odoratus	3.00	1	1	1	
Hydrocotyle	2.00		1	1	1
Liquidambar styraciflua	2.50		1	1	1
Mikania scandens	1.95	1	1		1
Pontederia cordata	5.38	1	1		1
Sagittaria lancifolia	3.00	1	1		1
Salix caroliniana	2.95		1	1	1
Schinus terebinthifolius	0.00		1	1	1
Schoenoplectus californicus	5.00		1	1	1
Sphagneticola trilobata	0.00		1	1	1
Eupatorium capillifolium	0.83	1	1		
Ludwigia peruviana	0.00	1	1		
Myrica cerifera	2.00		1	1	
Paspalidium geminatum	5.50		1		1
Quercus laurifolia	4.00		1		1
Sambucus nigra	1.48		1	1	
Sapium sebiferum	0.00		1	1	
Andropogon virginicus	3.00	1			
Echinochloa walteri	2.50	1			
Eichhornia crassipes	0.00				1
Ludwigia octovalvis	2.00	1			
Persicaria glabra	4.50	1			
Persicaria hydropiperoides	2.50	1			
Pluchea baccharis	5.45	1			
Ptilimnium capillaceum	2.73	1			
Rumex verticillatus	3.17	1			
Sesbania herbacea	1.00		1		

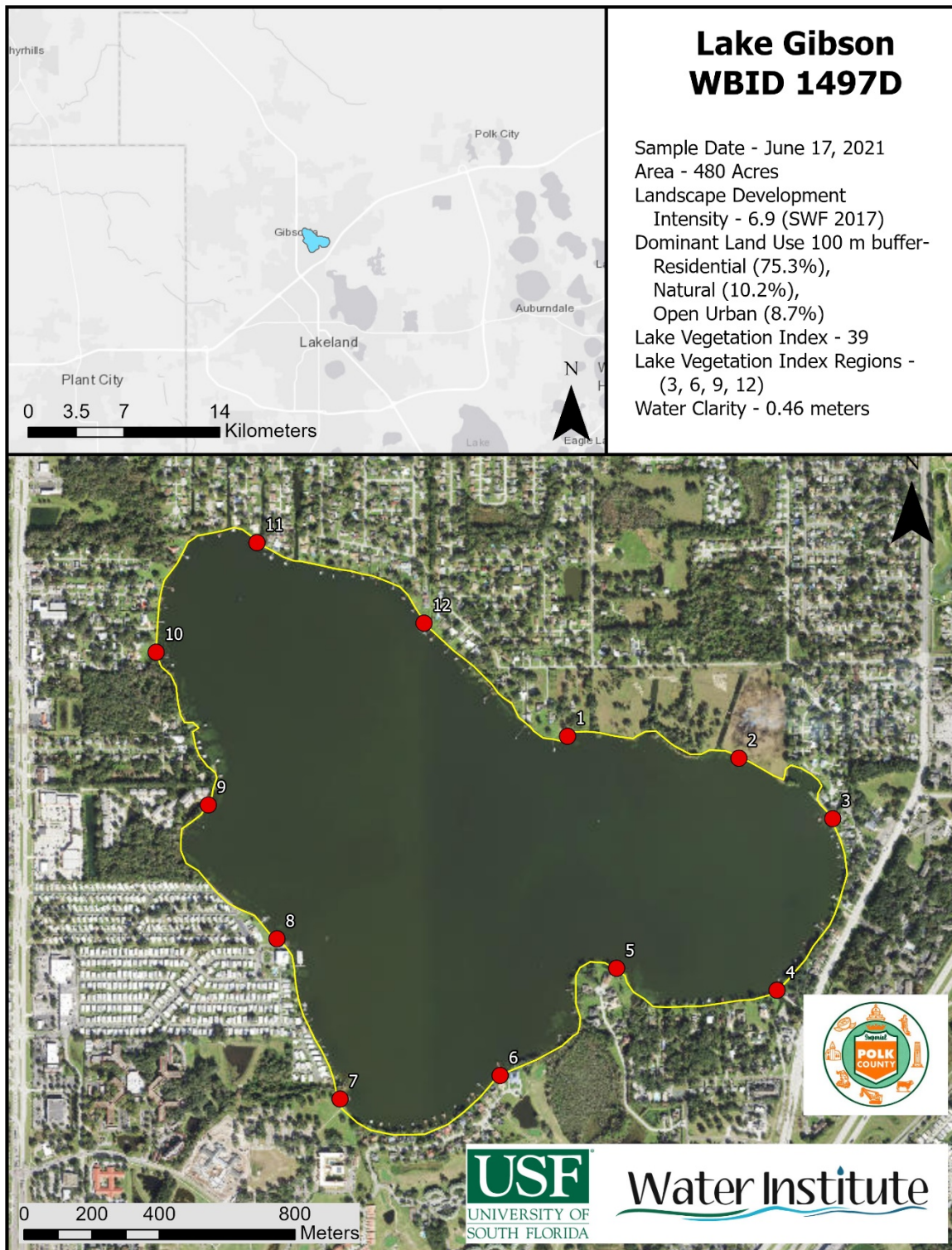


Figure 4: Lake Vegetation Index region map for Lake Gibson

Table 2: Scoring Summary for the Lake Vegetation Index

LVI Score Summary	3	6	9	12
Total # of taxa in sampling unit	22	27	19	20
% Native taxa in sampling unit	81.81818	70.37037	63.15789	70
% FLEPPC CAT 1 taxa in sampling unit	18.18182	22.22222	26.31579	20
% Sensitive taxa in sample unit	9.090909	7.407407	10.52632	10
Dominant CoC in sample unit	5.25	5.25	3.5	3.5

Native Score $((x-62.5)/37.5)$ or $((x-66.67)/25.89)=$	0.585098	0.142927	0	0.128621
Invasive FLEPPC 1 Score $(1 - (x/30))=$	0.393939	0.259259	0.122807	0.333333
Sensitive Score $(x/(27.78 \text{ or } 20)) =$	0.454545	0.37037	0.526316	0.5
Dominant CoC Score $(x/(7.91 \text{ or } 7)) =$	0.75	0.75	0.5	0.5
Raw Score Total = N+I+S+D =	2.183583	1.522556	1.149123	1.461954
Division Factor = (3 D=0 or 4) =	4	4	4	4
Average LVI dividend = Raw /DF	0.545896	0.380639	0.287281	0.365489
South				
LVI Score for sampling unit =	54.58957	38.06391	28.72807	36.54886

Total LVI SCORE = 39

Water Quality Assessment

During the assessment of Lake Gibson, a Measurement specialties Manta sub-2 water quality probe was used in the central portion of the lake to capture physical water quality parameters. Table 3 provides a summary of the Physical/Chemical conditions recorded at the middle of the Lake Gibson.

Table 3: Lake Gibson Water Quality (Field)

Depth (m)	Temp °C	pH	DO (mg/L)	DO (%sat)	Cond (unho/cm)	Salinity (ppt)	Secchi Depth (m)
0.11	28.11	9.35	8.47	107.3	199.3	0.09	0.46
1.05	27.92	9.18	6.39	80.7	200.6	0.09	
1.85	27.91	9.11	6.38	80.6	200.7	0.09	

At the time of the assessment, the water in Lake Gibson was turbid and green with a secchi disk depth of 0.46 meters (1.51 feet). This value is near the mean value of secchi disk readings for the past ten years according to the Polk County Water Atlas (<https://polk.wateratlas.usf.edu/lake/waterquality.asp?wbodyid=160368&wbodyatlas=lake>).

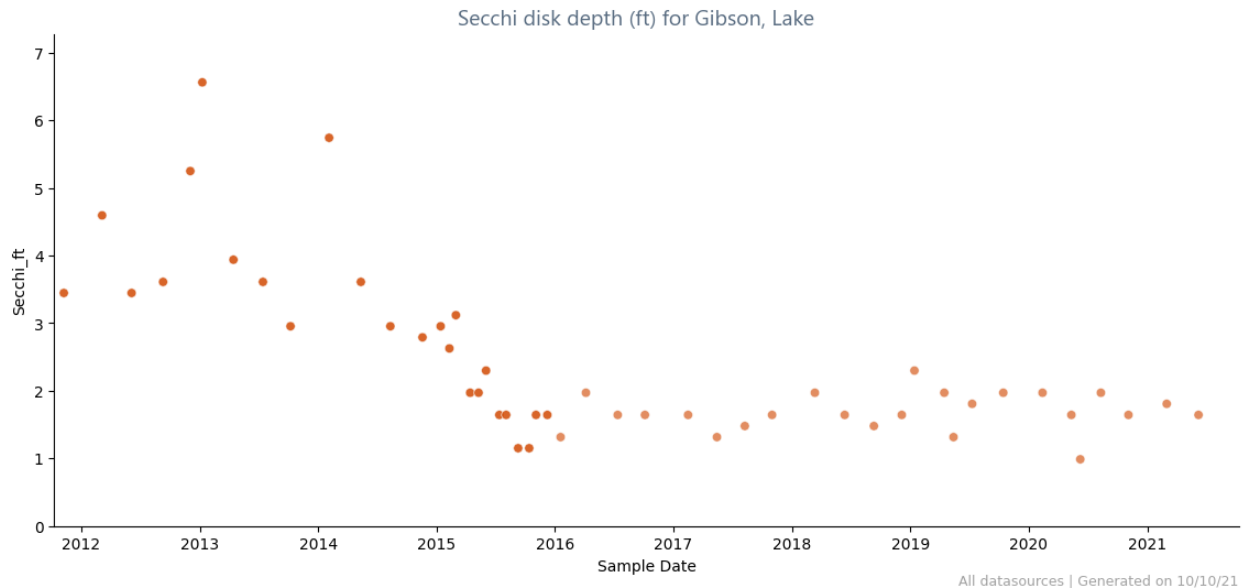


Figure 5 Secchi Disk Depth values for the previous ten years for Lake Gibson

Conclusion

The results of the assessment of Lake Gibson shows an impaired lake based on the results of the Lake Vegetation Index with a score of 39, below the impairment threshold of 43 set by the Florida Department of Environmental Protection. Residential (75.3%), Natural (10.2%) and Open Urban (8.7%) land uses dominated the 100 meter buffer around the lake. The shoreline vegetation was dominated by *Typha*, *Urochloa mutica* and *Panicum repens* and included several Non-native FLEPPC Category I plants. The floating leaved vegetation community was dominated by *Nuphar*. The submerged aquatic vegetation community was limited in Lake Gibson with only *Vallisneria americana* being present in the four regions of the LVI. Lake Gibson had a low Secchi Disk value at the time of the assessment with a value of 0.46 meters (1.51 feet).