



Lake Rogers

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

David Eilers | USF Water Institute | May 13, 2021

Methods

STUDY AREA ANALYSIS

The watershed containing the Lake Rogers was analyzed using ESRI ArcGIS 10.6. Using this software with 2020 ESRI Basemaps aerial, 2017 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 FDEP (<https://floridadep.gov/dear/bioassessment/content/bioassessment-ldi-hdg-bcg>). “The Landscape Development Intensity index (LDI) is an estimate of how much humans have altered an area of interest around a waterbody. Various land use types (low density residential, row crops, industrial, natural) are assigned coefficients of land use intensity based on estimates of the amount of human energy that is put into those land use types. 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. For streams and rivers, DEP typically uses a LDI calculated for the 100 m buffer of the waterbody for 10 km upstream of the point of interest. For lakes and isolated wetlands, DEP typically uses a LDI calculated for the 100 m buffer around the waterbody. 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 Elite 7 Ti Wide Area Augmentation System (WAAS)² enabled Global Positioning System (GPS) with Totalscan transducer (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 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.

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.

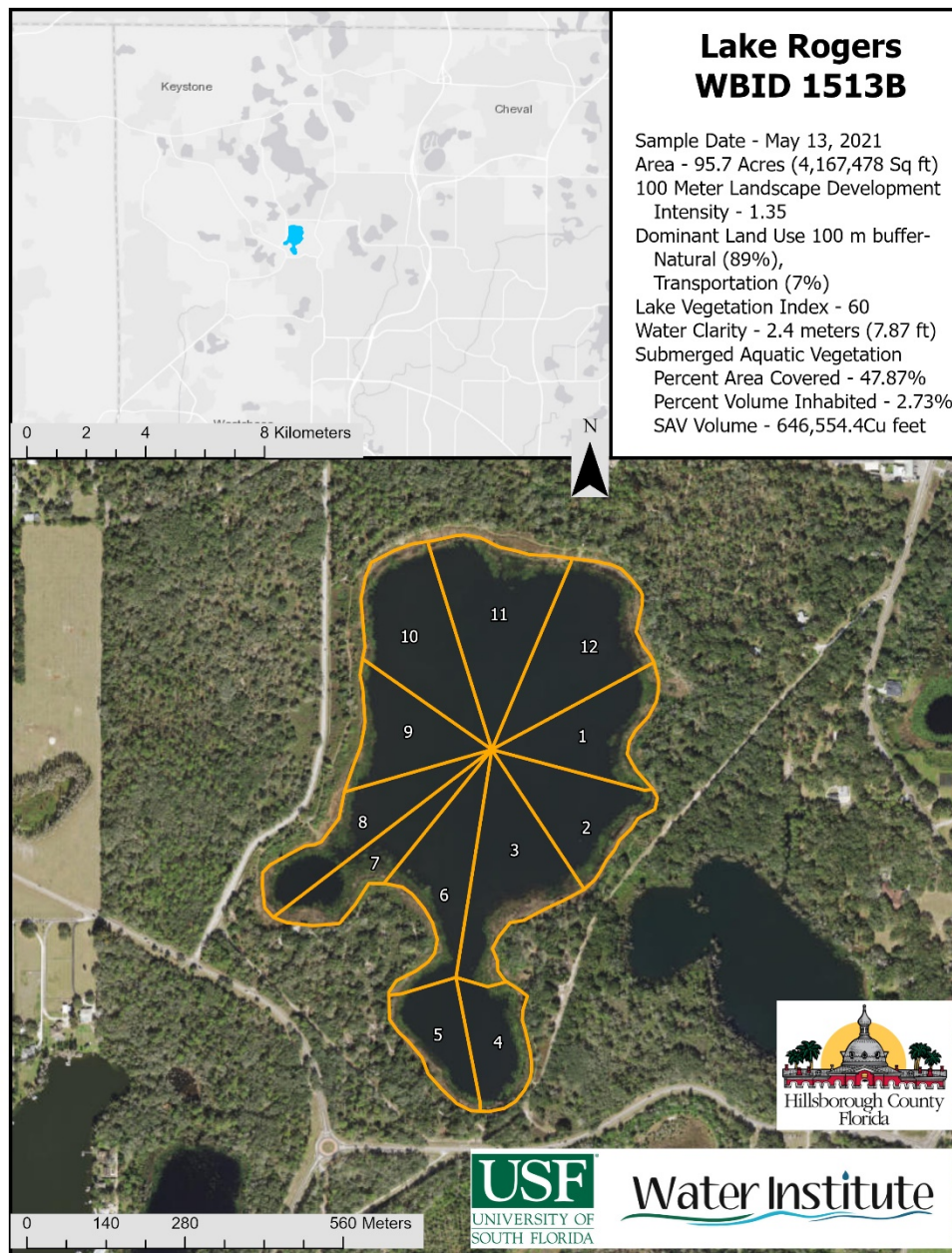
WATER QUALITY ASSESSMENT

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 Hillsborough County Public Utilities 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 Rogers is located in the Coastal Old Tampa Bay Watershed in north-western Hillsborough County, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Lake Rogers is dominated by Natural (89%), Transportation (7%) and Residential (2%) land uses. The resulting LDI value for the 100 meter buffer around Lake Rogers is 1.35.

FIGURE 1: 2021 Lake Rogers ASSESSMENT STUDY AREA MAP



Lake Bathymetry and Morphological Characterization

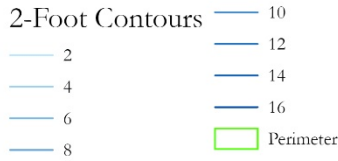
At the time of the assessment, Lake Rogers was experiencing normal water levels (33.72 feet above sea level NAVD 88) resulting in a 95.7 acre water body. Lake Rogers at the time of the assessment had a mean water depth of 5.7 feet and a maximum observed depth of 17.02 feet. The volume at this time was approximately 177,189,032 gallons. Figure 2 shows the resulting bathymetric contour map for Lake Rogers from data collected on May 13, 2021. The collected data has been overlain the 2020 Hillsborough County aeriels.

Table 1: Morphological Calculations for Lake Rogers

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	4,167,478	387,168	95.7		
Mean Depth	5.7	1.73			
Maximum Depth	17.02	5.19			
Volume (cubic)	23,686,564	670,722		543.8	177,189,032
Gauge (NAVD 88)	33.72	10.28			

Figure 2: 2021 2-Foot Bathymetric Contour Map for Lake Rogers

Lake Rogers WBID 1513B



EXPLANATION:

Survey Date: May 13, 2021
 Water level was 33.72ft NAVD 88
 at the time of the assessment.
 Contours are expressed in absolute depth
 below this level.

LAKE MORPHOLOGY:

Perimeter 10,611 ft;
 Area 95.7 Acres;
 Mean Depth 5.7 ft;
 Volume 543.8 Acre-ft, (177,189,032 gallons);
 Deepest point 17.02 ft

DATA SOURCES:

2020 aerial photography provided by
 ESRI.
 Lake perimeter digitized from ESRI 2020
 aerial imagery.
 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.



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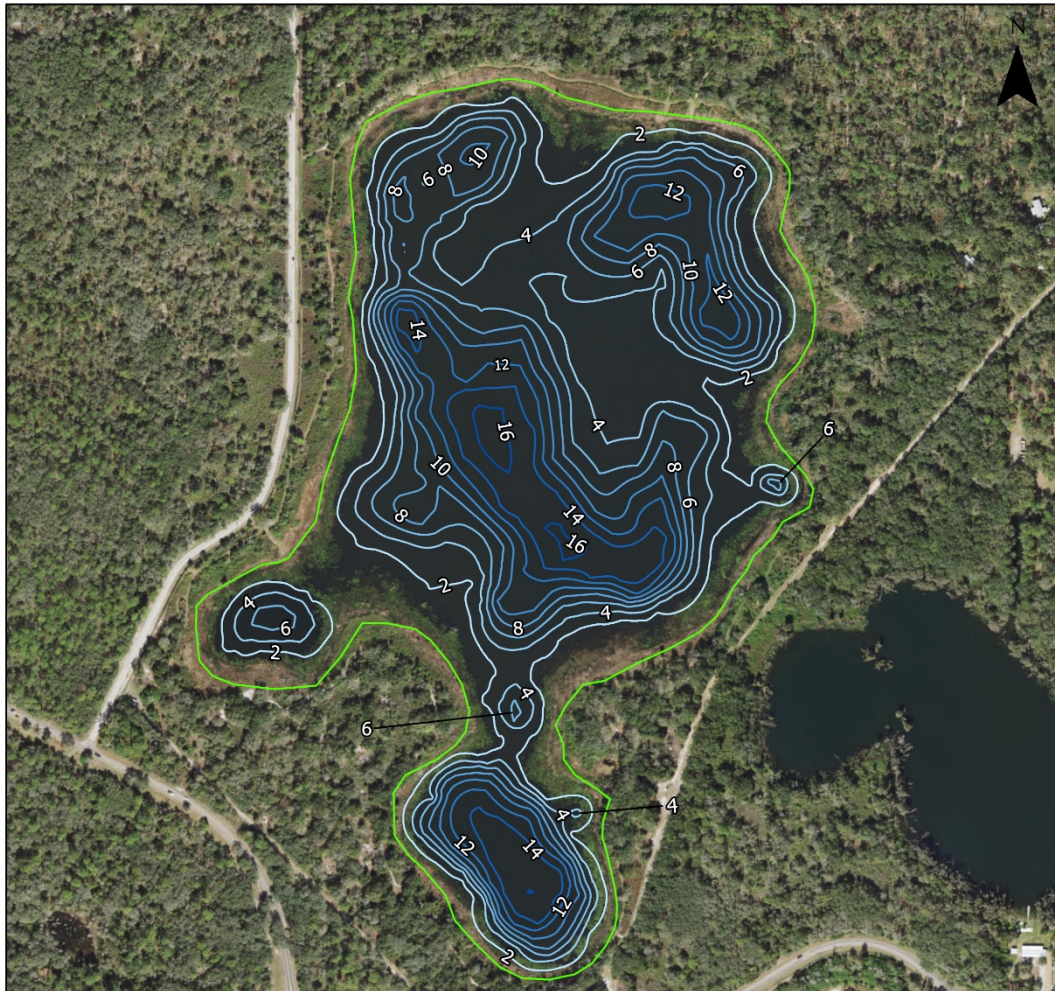
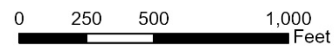




Figure 3 Overview photograph of Lake Rogers showing typical shoreline vegetation

Lake Habitat and Lake Vegetation Index Assessment

The lake assessment for Lake Rogers was conducted on May 13, 2021. The water in Lake Rogers was characterized as clear with a color value of 20.4 PCU. The secchi disk depth was 2.4 meters in part due to the low tannins and turbidity. The vegetation quality of the plants in and buffering Lake Rogers are predominantly native species with minor growths of non-native nuisance species such as *Schinus terebinthifolius*, *Panicum repens* and *Melaleuca quinquenervia*. Stormwater reaches the lake via sheet flow from surrounding natural land cover. The bottom substrate quality was dominated by sand with coarse particulate organic matter near shore. The lack of development along the shoreline has maintained the diverse emergent vegetation community with few invasive species and several sensitive species. The largest factor influencing the emergent vegetation community is the alteration of water levels by augmentation with ground water.



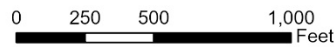
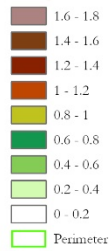
Figure 4 Nymphaea odorata was a common floating leaved vegetation in Lake Rogers during the assessment.

The Lake Vegetation Index identified 43 species of wetland vegetation growing in the four selected sections along Lake Rogers. The majority of these species (39) are native species. The remaining 4 species (*Panicum repens*, *Schinus terebinthifolius*, *Melaleuca quinquenervia* and *Ludwigia peruviana*) are non- native and invasive to this region. The vegetation community along Lake Rogers is dominated by a variety of emergent species including *Fuirena scirpoidea*, *Panicum hemitomon* and *Rhynchospora microcephala*. The water's surface in Lake Rogers was dominated by *Nymphaea odorata*. A total of five species of submerged aquatic vegetation were observed, *Eleocharis* (submersed viviparous), *Utricularia inflata*, *Utricularia purpurea*, *Potamogeton pectinatus* and *Potamogeton diversifolius* with *Eleocharis* being the dominant species. Submerged vegetation was abundant in Lake Rogers in part due to abundant available light and suitable bottom substrates. By analyzing the collected sonar chart, submerged aquatic vegetation potentially covered approximately 47.87% of the surface area of Lake Rogers. This submerged vegetation inhabits an estimated 2.73% of the water volume in Lake Rogers. Figure 5 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 Rogers was 60, above the impairment threshold of 43 indicating that the vegetation community is "Healthy". Figure 6 shows the map of Lake Rogers 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.

Lake Rogers

Height of Vegetation (feet)



EXPLANATION:

Survey Date: May 13, 2021
 Water level was 33.72 ft 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:

2020 aerial photography provided by ESRI.
 Lake perimeter digitized from Hillsborough County 2020 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 1,995,097 square ft; 45.8 Acres;
 (47.87% of Lake Surface Area)
 Mean SAV Height 0.3 ft;
 Volume 646,554 Cubic ft, (4,836,597 gallons);
 (2.73% of Lakes Volume)



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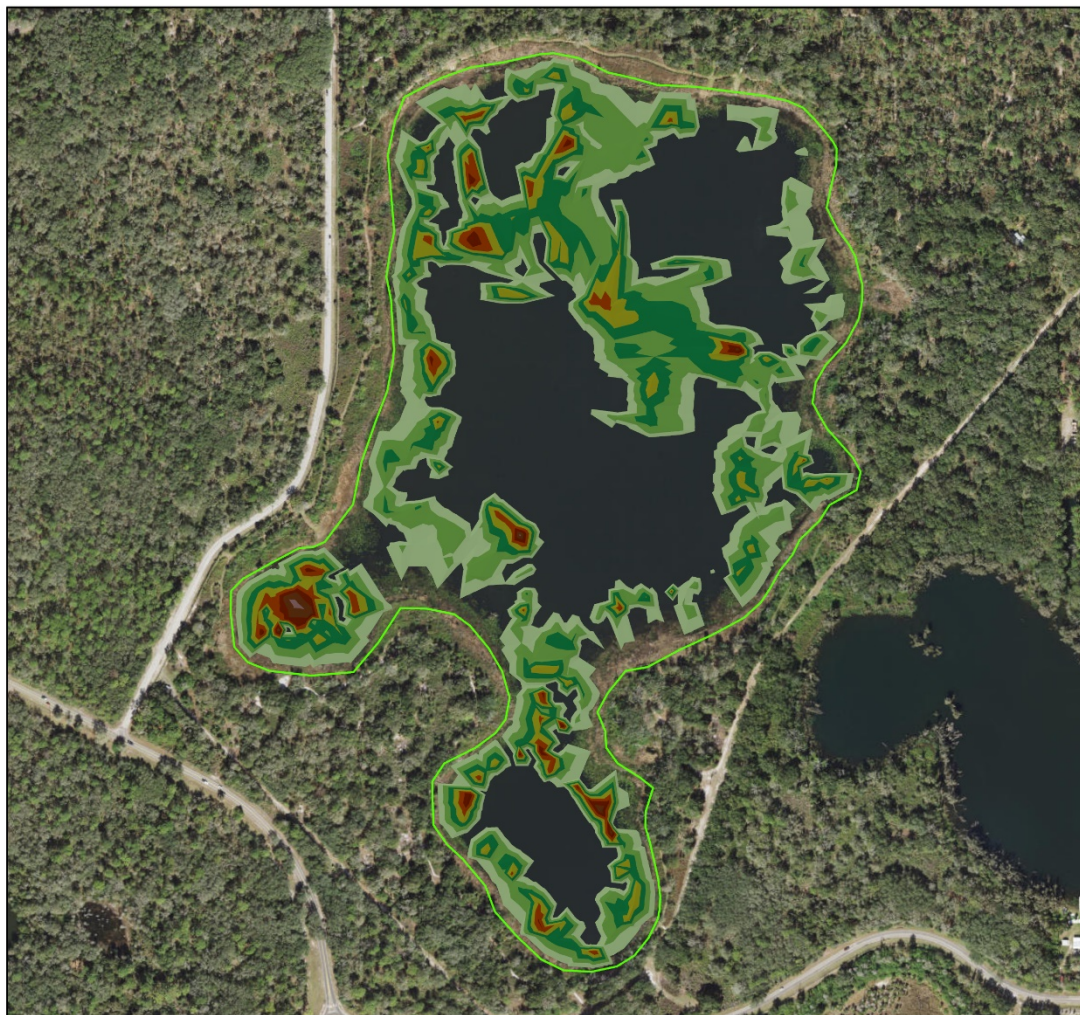


Figure 5 Lake Rogers Submerged Aquatic Vegetation Assessment Results

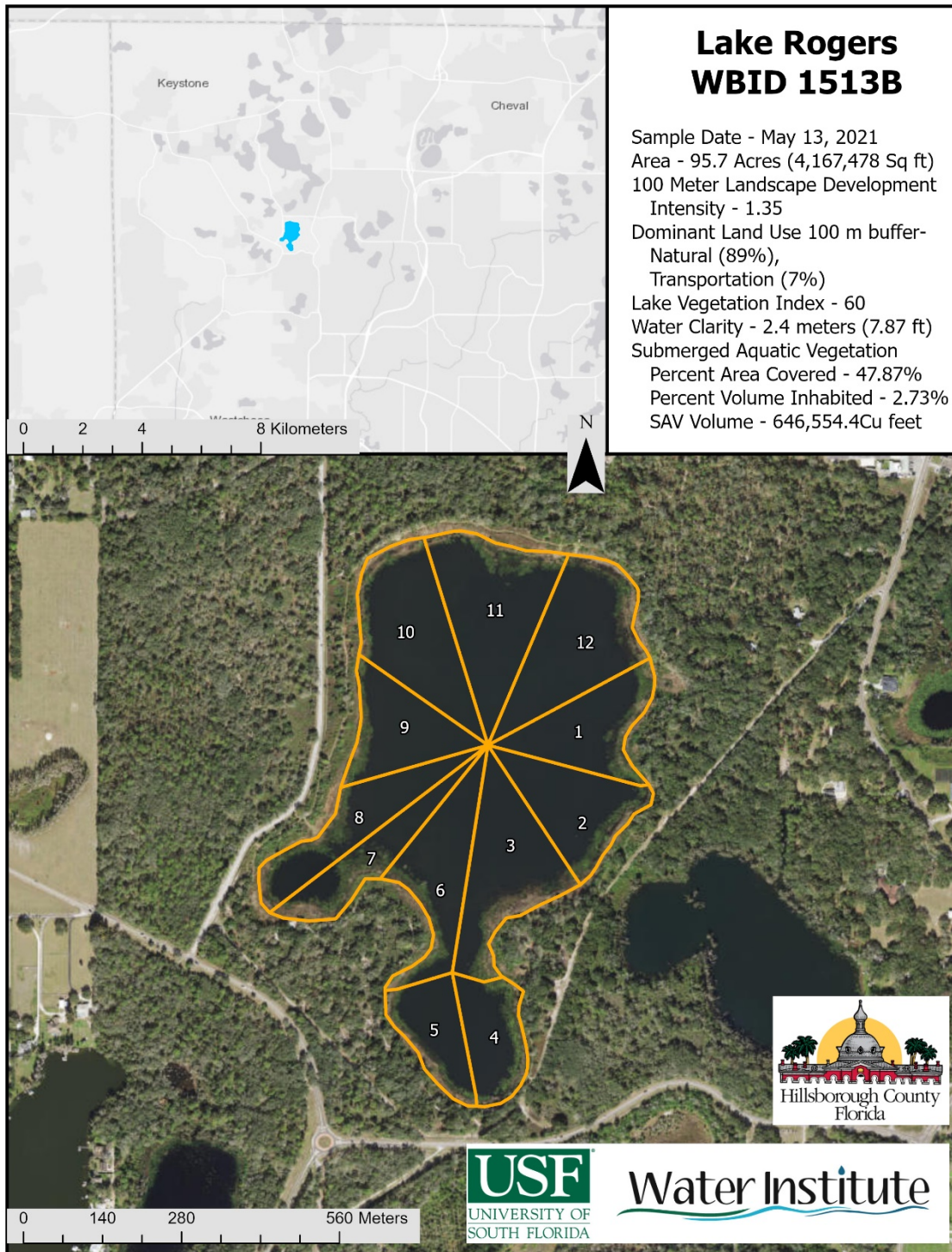


Figure 6: Lake Vegetation Index region map for Lake Rogers

Table 2: Lake Vegetation Index results for Lake Rogers May 13, 2021

SPECIES	CofC	2	5	8	11
Andropogon virginicus	3.00	1	1	1	1
Cephalanthus occidentalis	5.00	1	1	1	1
Cyperus haspan	4.00	1	1	1	1
Eleocharis (submersed viviparous but unable to ID to species)	3.00	D	C	D	D
Eupatorium capillifolium	0.83	1	1	1	1
Fuirena scirpoidea	5.50	1	1	1	1
Ludwigia peruviana	0.00	1	1	1	1
Melaleuca quinquenervia	0.00	1	1	1	1
Nymphaea odorata	5.00	1	C	1	1
Panicum hemitomon	5.82	1	1	1	1
Rhynchospora microcephala	3.50	1	1	1	1
Sagittaria graminea	5.53	1	1	1	1
Utricularia inflata	5.85	1	1	1	1
Utricularia purpurea	6.50	1	1	1	1
Xyris platylepis	5.32	1	1	1	1
Erechtites hieracifolia	1.00	1		1	1
Hypericum fasciculatum	8.00	1		1	1
Ludwigia linearis	5.72		1	1	1
Panicum repens	0.00		1	1	1
Potamogeton pectinatus	7.80		1	1	1
Sabatia grandiflora	6.00	1	1	1	
Xyris jupicai	3.51	1		1	1
Baccharis halimifolia	2.53		1		1
Cyperus odoratus	3.00		1		1
Cyperus polystachyos	1.56		1		1
Eleocharis baldwinii	2.82	1	1		
Eleocharis cellulosa	7.80			1	1
Juncus repens	5.00		1	1	
Lachnanthes caroliniana	3.76		1	1	
Mikania scandens	1.95		1	1	
Sacciolepis striata	5.35	1			1
Acer rubrum	4.65		1		
Blechnum serrulatum	5.50		1		
Cladium jamaicense	8.00	1			
Cyperus erythrorhizos	2.89				1
Ludwigia arcuata	3.50		1		
Luziola fluitans	4.00		1		
Pluchea baccharis	5.45				1
Pontederia cordata	5.38			1	
Potamogeton diversifolius	6.00	1			
Rhexia alifanus	4.60		1		
Salix caroliniana	2.95				1
Schinus terebinthifolius	0.00		1		

Table 3: Scoring Summary for the Lake Vegetation Index

LVI Score Summary	2	5	8	11
Total # of taxa in sampling unit	23	32	27	29
% Native taxa in sampling unit	91.30435	87.5	88.88889	89.65517
% FLEPPC CAT 1 taxa in sampling unit	8.695652	12.5	11.11111	10.34483
% Sensitive taxa in sample unit	8.695652	3.125	11.11111	10.34483
Dominant CoC in sample unit	3	4	3	3

Native Score $((x-62.5)/37.5)$ or $((x-66.67)/25.89)=$	0.9515	0.804558	0.858204	0.887801
Invasive FLEPPC 1 Score $(1 - (x/30))=$	0.710145	0.583333	0.62963	0.655172
Sensitive Score $(x/(27.78 \text{ or } 20)) =$	0.434783	0.15625	0.555556	0.517241
Dominant CoC Score $(x/(7.91 \text{ or } 7)) =$	0.428571	0.571429	0.428571	0.428571
Raw Score Total = N+I+S+D =	2.524999	2.11557	2.47196	2.488786
Division Factor = (3 D=0 or 4) =	4	4	4	4
Average LVI dividend = Raw /DF	0.63125	0.528892	0.61799	0.622197
South				
LVI Score for sampling unit =	63.12499	52.88924	61.799	62.21966

Total LVI SCORE = 60

Water Quality Assessment

Limited long-term water quality data is available for Lake Rogers. The available data was collected by USGS, FDEP, Southwest Florida Water Management District, Hillsborough County and University of Florida LAKEWATCH program (1985-2021), however this dataset is incomplete with recent years having sparse data. There were no samples available from October 2013 until 2021. As part of this assessment four samples were taken during May, June, July and August of 2021. Table 4 provides a summary of the Physical/Chemical conditions recorded at the middle of the Lake Rogers during the assessment in 2021.

Table 4: Lake Rogers Water Quality (Field)

Date	Depth (m)	Temp °C	pH	DO (mg/L)	DO (%sat)	Cond (unho/cm)	Salinity (ppt)	Secchi Depth (m)
5/13/21	0.18	29.34	4.45	7.26	93.9	76.7	0.04	2.4
5/13/21	2.56	29.36	4.41	7.33	94.9	76.7	0.04	
5/13/21	4.69	29.34	4.36	7.23	93.6	76.6	0.04	
6/10/21		31.0	5.05	6.80	91.6	93.1	0.04	
7/28/21		32.2	6.37	6.69	91.8	78.3	0.03	
8/10/21		31.2	6.03	8.21	111.0	86.7	0.04	

The chemical water quality analysis for Lake Rogers is shown in Table 5 for the samples taken on 5/13/21, 6/10/21, 7/28/21 and 8/10/21. Table 6 includes this data in the numeric nutrient criteria framework using the data from this assessment as well as the available geometric mean values for the period of record since complete data for the past three years for available parameters is not available. Color values for the period of record data have a geometric mean value of 10.86 PCU, classifying it as a clear water lake (less than or equal to 40 PCU). Total Alkalinity period of record geometric mean value is 2.14 mg/L classifying the lake as acidic (less than or equal to 20 mg/L). The NNC thresholds for a clear, acidic lake with insufficient data to calculate NNC (Previous three years with at least 3 samples per year in separate seasons) are 6 µg/L for Chlorophyll-a Corrected for Phaeophytin, 0.01 mg/L for Total Phosphorous and 0.51 mg/L for Total Nitrogen.

Geometric mean Chlorophyll-a corrected values for the 2021 data is 1 µg/L. Period of record Chlorophyll-a corrected geometric mean was 4.27 µg/L. Total Phosphorous mean values for the most recent data were inconclusive of the nutrient threshold for clear acidic lakes in the west central region with insufficient data with a value of 0.068 mg/l due to the four samples carrying QA qualifiers indicating a value below the minimum detection limit for the method used. The geometric mean value for the period of record is 0.011 mg/L. Total Nitrogen values were below the nutrient threshold for clear, acidic lakes with insufficient data developed by FDEP of 0.51 mg/l with a value of 0.290 mg/l for the most recent data. The geometric mean for the period of record was 0.482 mg/L.

Bacteria testing showed low levels of E. Coli (<1 colonies/100ml) and Enterococci (1.7 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 Rogers 2021 Water Quality Results (Laboratory)

Parameter	5/13/2021	6/10/2021	7/28/2021	8/10/2021	POR Mean Value	Units
Alkalinity	< 5.0	< 5.0	< 5.0	< 5.0	2.14	mg/LCaCO ₃
E Coli	<1.0	<1.0	<1.0	<1.0		#/100ml
Enterococci	4	1	2	1	2.9	#/100 ml
Chlorophyll a	2	1	4.4	1.9	3.23	ug/L
Chlorophyll b	1	1	1	1	1.33	ug/L
Chlorophyll c	1.1	1	1	1	1.19	ug/L
Chlorophyll t	3.1	1	4.4	1.9		ug/L
Chlorophyll a Corrected	1	1	1	1	4.27	ug/L
Ammonia	<0.073	<0.073	<0.073	<0.073	0.026	mg/L
Nitrates/Nitrites	<0.043	<0.043	<0.043	<0.043	0.01	mg/L
Kjeldahl Nitrogen	0.364	0.249	0.268	0.29	0.538	mg/L
Total Nitrogen	0.36	0.25	0.27	0.29	0.482	mg/L
Total Phosphorus	<0.068	<0.068	<0.068	<0.068	0.011	mg/L

Table 6: Numeric Nutrient Criteria Framework

Parameter	Value
Geometric Mean (Geomean) Color (pcu)	10.68
Number of Samples	104
Geometric Mean Alkalinity (mg/L CaCO_3)	2.14
Number of Samples	78
Lake Type	Clear Acidic
Chlorophyll a Criteria (ug/L)	6
Insufficient for Geomean Criteria then P mg/L	0.01
Insufficient for Geomean Criteria then N mg/L	0.51
Geomean Chla Corrected ug/L (3-year)	1.0
Geomean TP mg/L (3-year)	< 0.068
Geomean TN mg/L (3-year)	0.290
Number of Samples (3-year)	4
Potential Impaired Chlorophyll a	Not Impaired
Potential Impaired TP	Inconclusive
Potential Impaired TN	Not Impaired

Conclusion

The results of the assessment of Lake Rogers shows a healthy lake based on Total Nitrogen and Chlorophyll-a corrected concentrations according to the FDEP numeric nutrient criteria using the four samples taken during this assessment. 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 with a minimum of three samples per year for the previous three years. The most recent year of data for Total Phosphorous is inconclusive for the nutrient threshold as the minimum detection limit of the method used was not suitable. The system also shows health in the vegetation communities according to the Lake Vegetation Index with high overall species (43), moderate occurrences of non-native, invasive species and few sensitive plant species with an overall LVI score of 60. The assessment also revealed abundant submerged aquatic vegetation community comprising five species occupying 47.87% of the surface area and 2.73% of the volume of Lake Rogers.