



Lake Hooker

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

David Eilers | USF Water Institute | August 28, 2024

Methods

STUDY AREA ANALYSIS

The watershed containing Lake Hooker was analyzed using ESRI ArcGIS Pro. Using this software with 2023 ESRI Basemaps aerial, 2020 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.

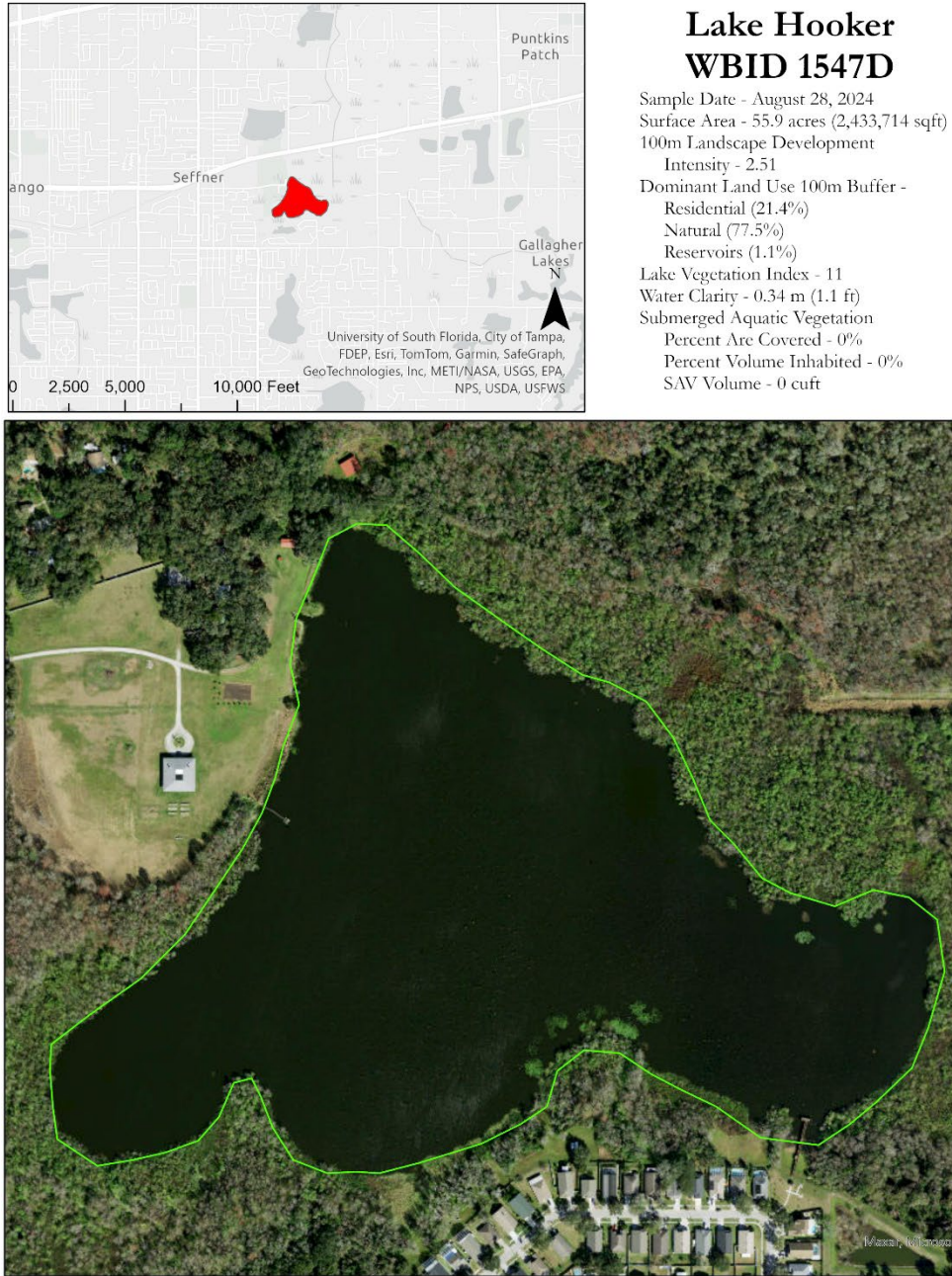
WATER QUALITY ASSESSMENT

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, E Coli, 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. Due to the lack of public access to the majority of lakes in Hillsborough County, the majority of available water quality samples are from the resident volunteer LAKEWATCH program. This data is being included in the analysis of Hillsborough County lakes.

Study Area

Lake Hooker is located in the Hillsborough Bay Watershed in north-western Hillsborough County, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Lake Hooker is dominated by natural (77.5%) and residential (21.4%) land uses. The resulting LDI value for the 100 meter buffer around Lake Hooker is 2.51.

FIGURE 1: 2024 LAKE HOOKER ASSESSMENT STUDY AREA MAP



Lake Bathymetry and Morphological Characterization

At the time of the assessment, Lake Hooker was experiencing normal water levels (42.37 feet NAVD88 on staff gauge) resulting in a 55.9 acre water body. Lake Hooker at the time of the assessment had a mean water depth of 2 feet and a maximum observed depth of 3.9 feet. The volume at this time was approximately 36,740,863 gallons. Figure 2 shows the resulting bathymetric contour map for Lake Hooker from data collected on August 28, 2024. The collected data has been overlain the 2022 ESRI Basemap aerials.

Table 1: Morphological Calculations for Lake Hooker

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	2,433,714	226,098	55.9		
Mean Depth	2.0	0.62			
Maximum Depth	3.90	1.19			
Volume (cubic)	4,911,505	139,077		112.8	36,740,863
Gauge (NAVD 88)	42.37	12.91			

Figure 2: 2024 2-Foot Bathymetric Contour Map for Lake Hooker

Lake Hooker

Contour (ft)

- 1
- 2
- 3
- Perimeter

EXPLANATION:
Survey Date: August 28, 2024
Water level was 42.37 ft NAVD88 at the time of the assessment.
Contours are expressed in absolute depth below this level.

LAKE MORPHOLOGY:
Perimeter 7564.2 ft;
Area 55.9 Acres;
(2,433,714 Sqft)
Mean Depth 2 ft;
Volume 112.8 Acre-ft,
(36,740,863 gallons);
Deepest point 3.9 ft

DATA SOURCES:
2023 aerial photography provided by ESRI.
Lake perimeter digitized from Hillsborough County 2023 aerial photographs.
All contours generated by the USF Water Institute from survey data collected by USF Water Institute Lake and Stream

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

0 100 200 400
Feet

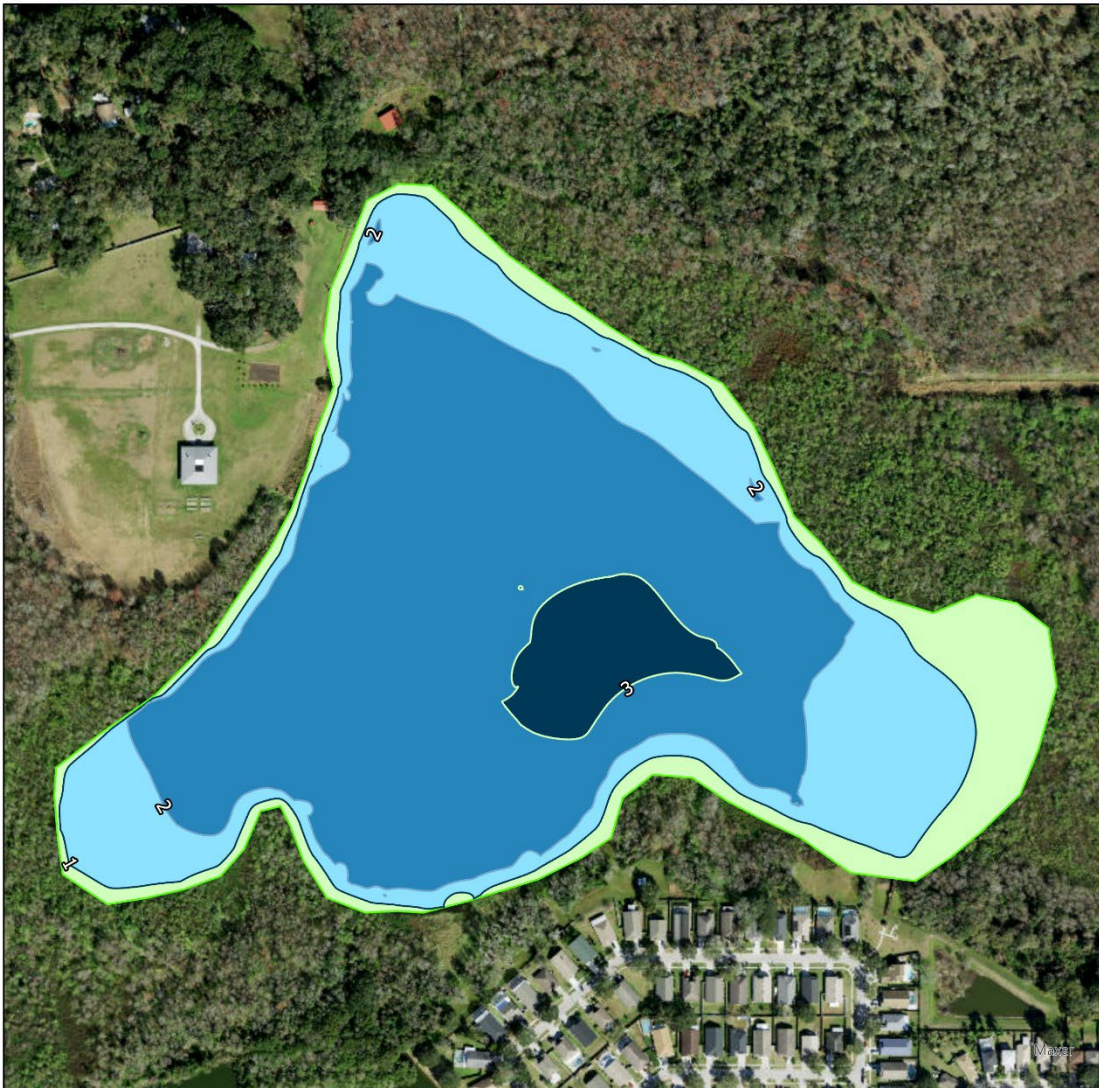




Figure 3 Overview photograph of Lake Hooker showing *Ludwigia leptocarpa* which was present in all regions but dominant in region 2

Lake Habitat and Lake Vegetation Index Assessment

The lake assessment for Lake Hooker was conducted on August 28, 2024. The water in Lake Hooker was characterized as tannic with turbid water. The secchi disk depth was .33 meters limiting the growth of submersed aquatic vegetation. The vegetation quality of the plants in and buffering Lake Hooker are predominantly native species with extensive growths of the non-native invasive species *Panicum repens* as it was present in all regions but dominate in region 2. The percentage of non-native FLEPPC 1 species ranged from 26.67% (region 8) to 35% (region 5). Stormwater reaches the lake predominately via street flow over non-cultivated and/or natural vegetation. The bottom substrate quality was dominated organic fibrous and smooth material such as peat and muck and lacked any submersed vegetation.

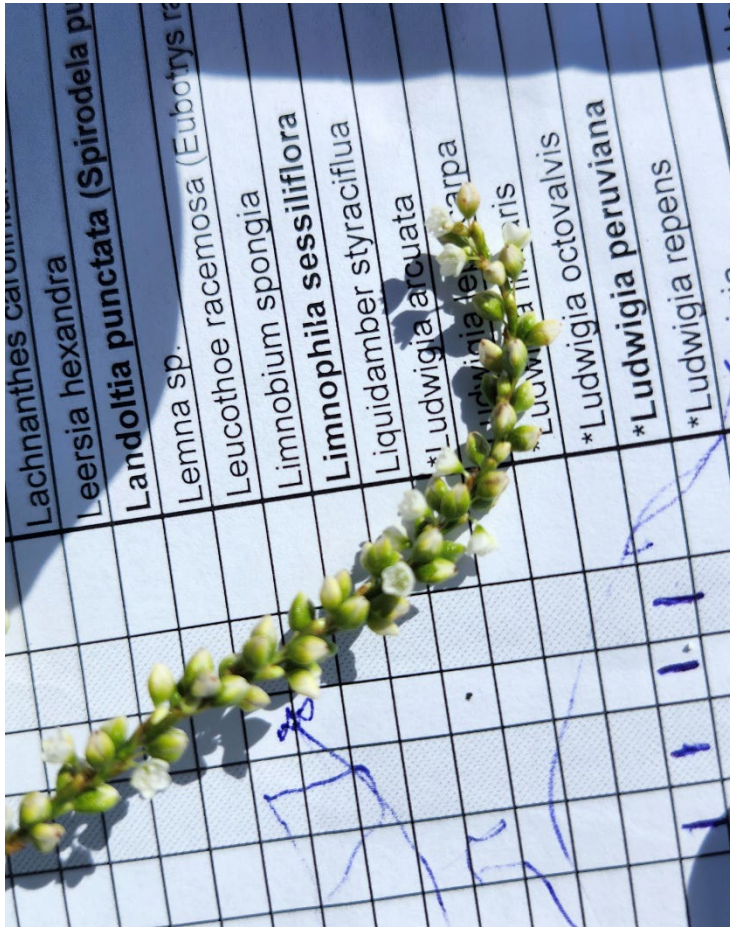


Figure 4 *Persicaria punctata* which was found at Lake Hooker in regions 5, 8, and 11 but dominant in region 11

The Lake Vegetation Index identified 26 species of wetland vegetation growing in the four selected sections along Lake Hooker. The majority of these species (17) are native species. The remaining 9 species (*shown in bold in Table 2*) are non- native or invasive to this region. The edges of the lake are dominated by species able to rapidly colonize following the frequent disturbance of mowing, such as *Panicum repens*. At the time of the assessment the water transparency was .7 m (2.3 ft). Low annual average secchi disk depths and low maximum water depth leads to a littoral zone being dominated by emergent vegetation. There are three emergent vegetative species who were dominant and co-dominant, *Ludwigia leptocarpa* dominate in region 5, *Persicaria punctata* co-dominant in region 11, and *salix caroliniana* being dominant in both regions 2 and 8 and co-dominate in region 11.

Figure 5 shows the results of the SAV analysis and how there were no submersed aquatic vegetation found during the assessment.

The calculated LVI score for Lake Hooker was 11, below the impairment threshold of 43 indicating the vegetation community is showing evidence of being “Impaired”. Figure 6 shows the map of Lake Hooker 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 Hooker

 Perimeter

No submersed aquatic vegetation was observed at the time of the assessment.

0 100 200 400
 Feet

EXPLANATION:

Survey Date: August 28, 2024
Water level was 42.37 ft NAVD88 at the time of the assessment. Submersed Aquatic Vegetation was analyzed from collected sonar data. The height of the SAV where present is shown in 1 foot increments.

DATA SOURCES:

2023 aerial photography provided by ESRI.
Lake perimeter digitized from Hillsborough County 2023 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 0 square ft; 0 Acres;
(0% of Lake Surface Area)
Mean SAV Height 0 ft;
Volume 0 Cubic ft, (0 gallons);
(0% of Lakes Volume)



Water Institute



Figure 5 Lake Hooker Submersed Aquatic Vegetation Assessment Results

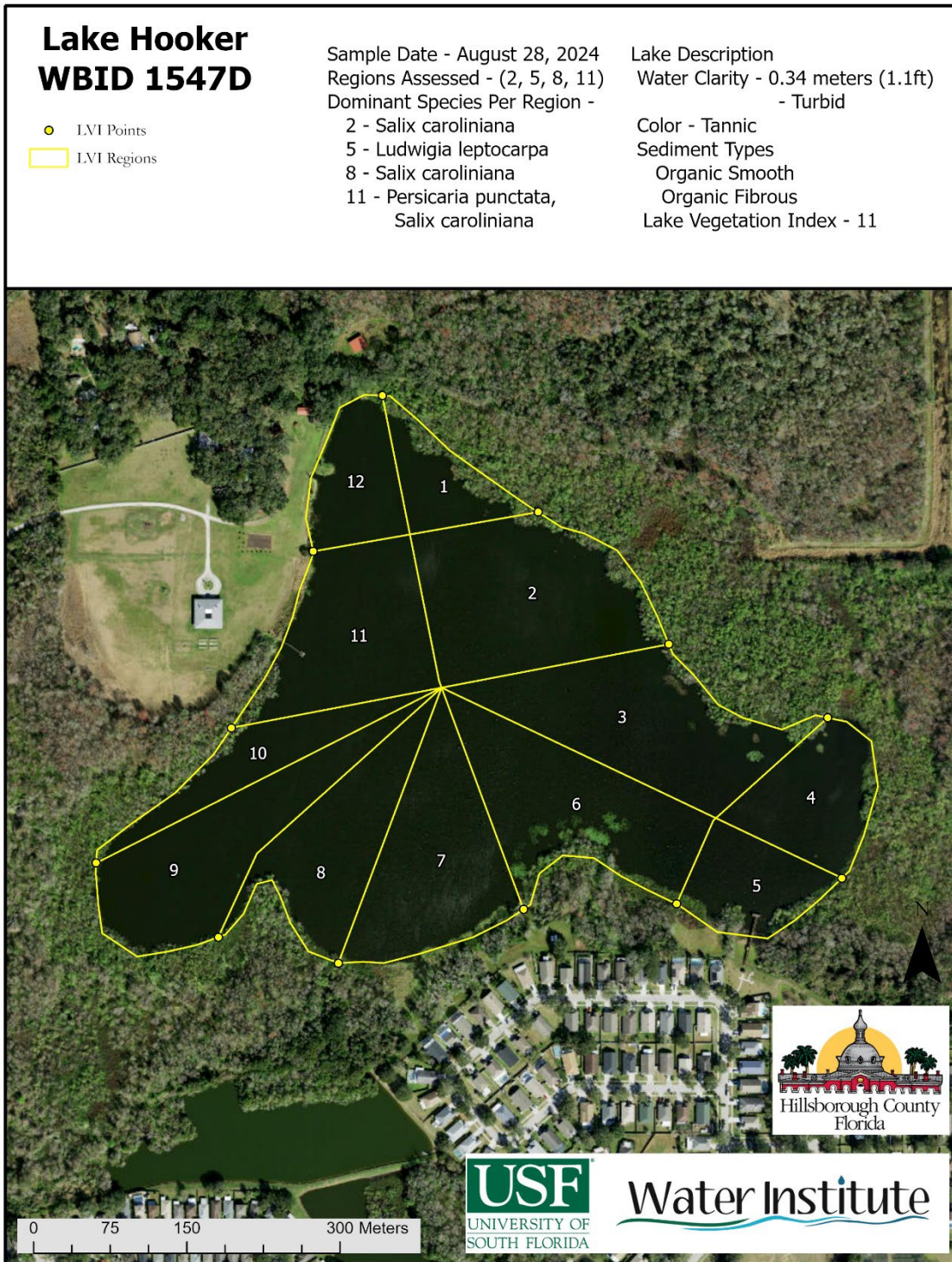


Figure 6: Lake Vegetation Index region map for Lake Hooker

Table 2: Lake Vegetation Index results for Lake Hooker August 28, 2024. In this table, “p” represents the taxa was present in the region while “c” and “d” denotes the taxa as being co-dominant or dominant in the vegetation region.

Taxon	Regions				Occurrences	C of C Score	FLEPPC Status	Wetland Status	Nativity
	2	5	8	11					
<i>Acer rubrum</i>	p	p	p	p	4	4.65	Not Listed	FACW	Native
<i>Alternanthera philoxeroides</i>	p	p	p	p	4	0.00	Category 2	OBL	Exotic
<i>Blechnum serrulatum</i>	p				1	5.50	Not Listed	FACW	Native
<i>Cyperus odoratus</i>	p	p	p	p	4	3.00	Not Listed	FACW	Native
<i>Echinochloa walteri</i>		p			1	2.50	Not Listed	FACW	Native
<i>Eichhornia crassipes</i>	p	p	p	p	4	0.00	Category 1	OBL	Exotic
<i>Hydrocotyle</i>	p	p	p	p	4	2.00	Not Listed	FACW	Native
<i>Hymenachne amplexicaulis</i>		p			1	0.00	Category 1	OBL	Exotic
<i>Lemna</i>		p			1	1.00	Not Listed	OBL	Native
<i>Ludwigia grandiflora</i>		p	p	p	3	0.00	Not Listed	OBL	Exotic
<i>Ludwigia leptocarpa</i>	p	d	p	p	4	3.00	Not Listed	OBL	Native
<i>Ludwigia peruviana</i>	p	p	p	p	4	0.00	Category 1	OBL	Exotic
<i>Mikania scandens</i>			p		1	1.95	Not Listed		Native
<i>Myrica cerifera</i>				p	1	2.00	Not Listed	FAC	Native
<i>Panicum hemitomom</i>	p	p		p	3	5.82	Not Listed	OBL	Native
<i>Panicum repens</i>		p			1	0.00	Category 1	FACW	Exotic
<i>Paspalidium geminatum</i>	p			p	2	5.50	Not Listed	OBL	Native
<i>Paspalum repens</i>		p			1	5.60	Not Listed	OBL	Native

Taxon	Regions				Occurrences	C of C Score	FLEPPC Status	Wetland Status	Nativity
	2	5	8	11					
<i>Persicaria punctata</i>		<i>p</i>	<i>p</i>	<i>c</i>	3	3.00	Not Listed	OBL	Native
<i>Pistia stratiotes</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	4	0.00	Category 1	OBL	Exotic
<i>Salix caroliniana</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>c</i>	4	2.95	Not Listed	OBL	Native
<i>Sapium sebiferum</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	4	0.00	Category 1	FAC	Exotic
<i>Sesbania herbacea</i>		<i>p</i>			1	1.00	Not Listed	FAC	Native
<i>Thelypteris interrupta</i>			<i>p</i>		1	6.74	Not Listed	FACW	Native
<i>Typha</i>			<i>p</i>	<i>p</i>	2	1.00	Not Listed	OBL	Native
<i>Urochloa mutica</i>		<i>p</i>		<i>p</i>	2	0.00	Category 1	FACW	Exotic

Table 3: Scoring Summary for the Lake Vegetation Index

LVI Sample Result: 11				
Region		South		
Metric / Section	2	5	8	11
Total # Taxa	13	20	15	17
% Native Taxa	62%	55%	60%	59%
% FLEPPC 1 Taxa	31%	35%	27%	29%
% Sensitive Taxa	0	0	0	0
Dom Taxa Count	1	1	1	2
CofC Dom Taxa	2.95	3.00	2.95	2.98
Section LVI	11	11	13	11

Water Quality Assessment

Long-term water quality data is available for Lake Hooker. The available data was collected by Lakewatch, Southwest Florida Water Management District, Florida Department of Environmental Protection and Hillsborough County Environmental Services. Table 4 provides a summary of the Physical/Chemical conditions recorded at the middle of the Lake Hooker during the assessment in 2024.

Table 4: Lake Hooker Water Quality 8/28/2024 (Field)

Meter Readings:	Depth (M)	Temp (°C)	pH (SU)	D.O (MG/L)	D.O Sat. (%)	Cond. (UMHO/CM)	Salinity (PPT)
Top:	0.34	29.9	9.03	9.8	110	0.187	0.08
Mid-Depth:	0.68	28.79	7.02	4.5	55.6	0.186	0.08
Bottom:	1.07	28.77	6.94	3.42	42.2	0.186	0.08

The chemical water quality analysis for Lake Hooker is shown in Table 5 for the samples taken on 8/28/2024. Table 6 includes this data in the numeric nutrient criteria framework using the data from this assessment. There is insufficient data on the water color and alkalinity, but observations show that Lake Hooker is a colored lake. The NNC thresholds for a colored lake with sufficient data to calculate NNC (Previous three years with at least 4 samples per year in separate seasons) are 20 µg/L for Chlorophyll-a Corrected for Phaeophytin, 0.05-0.49 mg/L for Total Phosphorous and 1.27-2.23 mg/L for Total Nitrogen.

There is a lack of data for the previous three years, and insufficient data for the year 2024. The geometric mean Chlorophyll-a corrected value for 2024 is 103.97 µg/L, the total Phosphorous geometric mean for 2024 is 0.662 mg/L, and the total Nitrogen geometric mean for 2024 is 4.28 mg/L.

Bacteria testing showed low levels of E. Coli (7.81 colonies/100ml) and Enterococci (98.04 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 Hooker 2024 Hillsborough County Environmental Services Water Quality Results (Laboratory)

Parameter	2022	2023	2024	POR Mean Value	Units
Alkalinity	No data	No data	27.2	No data	mg/LCaCO3
Color	No data	No data	No data	No data	PCU
E Coli	No data	No data	7.81	8.91	#/100ml
Enterococci	No data	No data	98.04	121.65	#/100 ml
Chlorophyll a	No data	No data	117.569	131.27	ug/L
Chlorophyll b	No data	No data	9.74	10.63	ug/L
Chlorophyll c	No data	No data	4.25	4.93	ug/L
Chlorophyll a Corrected	No data	No data	103.97	113.77	ug/L
Ammonia	No data	No data	No data	No data	mg/L
Nitrates/Nitrites	No data	No data	No data	No data	mg/L
Kjeldahl Nitrogen	No data	No data	0.662	0.966	mg/L
Total Nitrogen	No data	No data	4.279	3.917	mg/L
Total Phosphorus	No data	No data	0.662	0.556	mg/L

Table 6: Numeric Nutrient Criteria Framework

Parameter	Value
Geometric Mean Color (pcu)	No data
Number of Samples	0
Geometric Mean Alkalinity (mg/L CaCO ₃)	No data
Number of Samples	0
Lake Type	Colored

Year (# of Samples)	Geomean Chla Corrected (µg/L)	Chlorophyll a Criteria (µg/L)	Geomean Total Phosphorous (mg/L)	Total Phosphorous Criteria (mg/L)	Geomean Total Nitrogen (mg/L)	Total Nitrogen Criteria (mg/L)
2022 (0)	No data	< 20	No data	< 0.05	No data	< 1.27
2023 (0)	No data	< 20	No data	< 0.05	No data	< 1.27
2024 (6)	103.97	< 20	0.662	< 0.05	4.279	< 1.27

Conclusion

Lake Hooker is a predominately residential lake in the Coastal Old Tampa Bay Watershed of Hillsborough County, Florida. The results of the assessment of Lake Hooker shows an unhealthy lake based on Chlorophyll-a, Total Nitrogen and Total Phosphorous concentrations as well as there being a lack of data according to the FDEP numeric nutrient criteria using a combination of Lakewatch, Southwest Florida Water Management District and Hillsborough County Environmental Services datasets.

The system does show impairment in the vegetation communities according to the Lake Vegetation Index with abundant invasive species (9) and an overall LVI score of 11. The assessment also revealed no submerged aquatic vegetation community within Lake Hooker