Hobbs Lake

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

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Methods

STUDY AREA ANALYISIS

The watershed containing the Hobbs Lake was analyzed using ESRI ArcGIS Pro. Using this software with 2022 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 form 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

Hobbs Lake 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 Hobbs Lake is dominated by residential (61%) and natural (30%) land uses. The resulting LDI value for the 100 meter buffer around Hobbs Lake is 5.25.

FIGURE 1: 2023 HOBBS LAKE ASSESSMENT STUDY AREA MAP

Hobbs Lake
WBID 1478F

Sample Date - July 24, 2023
Surface Area - 65.6 acres (2,856,708 sqft)
100m Landscape Development Intensity - 5.25
Dominant Land Use 100m Buffer -
- Residential (61%)
- Natural (30%)

Lake Vegetation Index - 58
Water Clarity - 1.13m (3.7ft)
Submerged Aquatic Vegetation
- Percent Area Covered - 26.7%
- Percent Volume Inhabited - 2.7%
- SAV Volume - 673,639 cubic feet

Lake Bathymetry and Morphological Characterization

At the time of the assessment, Hobbs Lake was experiencing normal water levels (61.78 feet NAVD88 on staff gauge) resulting in a 65.6 acre water body. Hobbs Lake at the time of the assessment had a mean water depth of 8.8 feet and a maximum observed depth of 20.25 feet. The volume at this time was approximately 188,188,445 gallons. Figure 2 shows the resulting bathymetric contour map for Hobbs Lake from data collected on July 24, 2023. The collected data has been overlain the 2022 ESRI Basemap aerials.

Table 1: Morphological Calculations for Hobbs Lake

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	2,856,708	265,395	65.6		
Mean Depth	8.8	2.68			
Maximum Depth	20.25	6.17			
Volume (cubic)	25,156,961	712,359		577.5	188,188,445
Gauge (NAVD 88)	61.78	18.83			

Figure 2: 2023 2-Foot Bathymetric Contour Map for Hobbs Lake

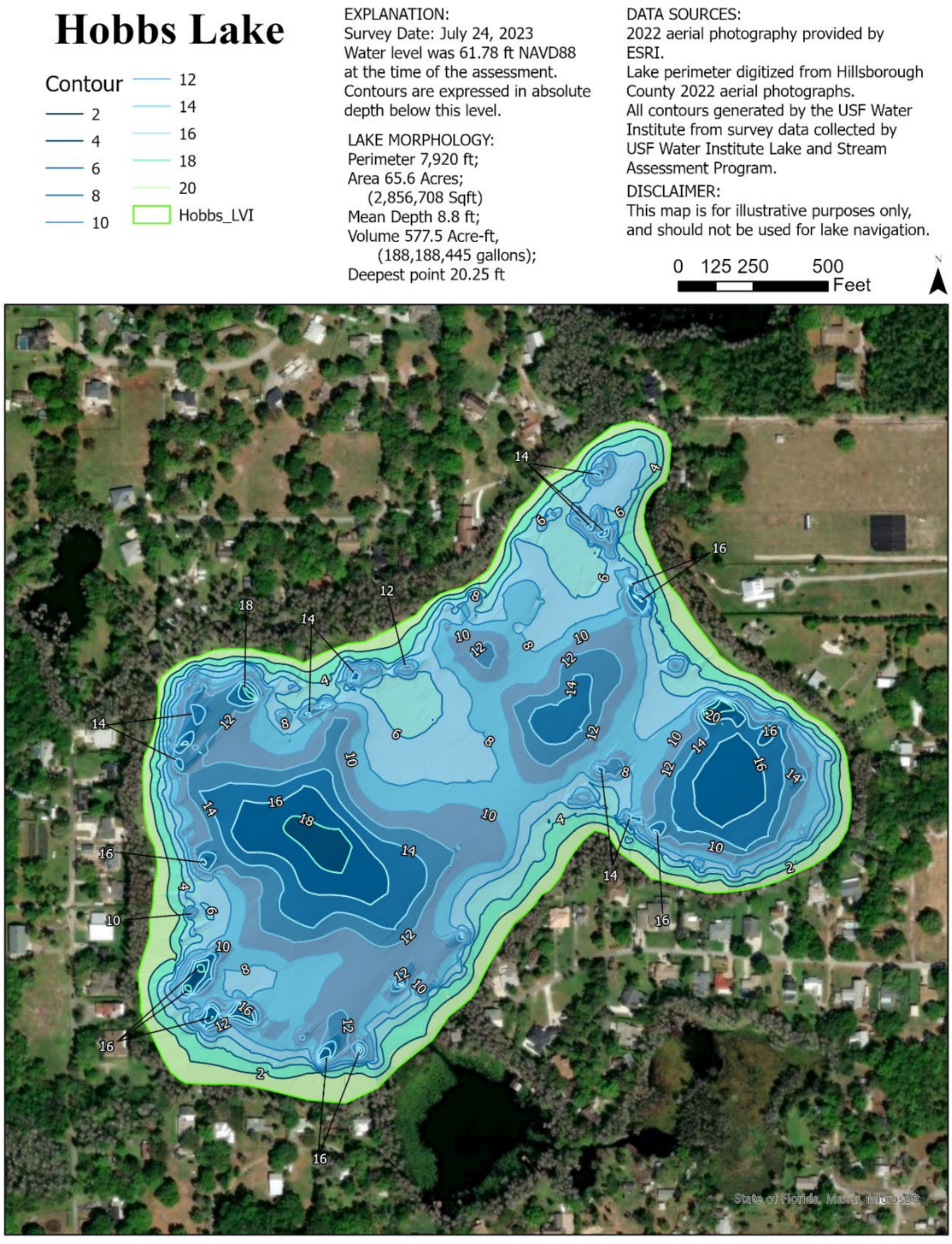

Figure 3 Overview photograph of Hobbs Lake showing the typical shoreline along region 2 of the Lake Vegetation Index.

Lake Habitat and Lake Vegetation Index Assessment

The lake assessment for Hobbs Lake was conducted on July 24, 2023. The water in Hobbs Lake was characterized as tannic and turbid. The secchi disk depth was 1.13 meters limiting the depth of the submerged aquatic vegetation community. The vegetation quality of the plants in and buffering Hobbs Lake are predominantly native species with moderate growths of non-native invasive species such as *Melaleuca quinquenervia* and *Panicum repens*. The percentage of non-native FLEPPC 1 species ranged from 8% (region 2) to 23% (region 5). Stormwater reaches the lake predominately via sheet flow from surrounding residential land cover. The development along the shoreline has maintained the nearshore *Taxodium* however the shrub and native ground cover communities have largely been removed for residential turf grasses. The bottom substrate quality was dominated by sandy/silt with coarse particulate organic matter near shore and submersed vegetation.

Figure 4 Residential shorelines on Hobbs Lake were largely maintained for residential turf grass or cleared entirely of the shrub and groundcover strata.

The Lake Vegetation Index identified 34 species of wetland vegetation growing in the four selected sections along Hobbs Lake. The majority of these species (26) are native species. The remaining 8 species (*shown in **bold** in Table 2*) are non- native or invasive to this region. The vegetation community along the shorelines of Hobbs Lake has been altered by lawn maintenance activities leaving a *Taxodium* canopy with a sparse shrub and ground cover community. The edges of the lake are dominated by species able to rapidly colonize following the frequent disturbance of mowing, such as *Panicum repens* and *Cyperus odoratus.* At the time of the assessment the water transparency was 1.13 m (3.7 ft). This observed secchi disk value is below the long term seasonal averages available at https://cdn.wateratlas.org/i/charts/Lake/5042/Secchi_ft-seasonal.svg . Despite the relatively low water transparency at the time of the assessment, Hobbs Lake featured an extensive submersed aquatic vegetation community. Six species of submersed aquatic vegetation were observed during the lake vegetation index. The submersed macroalgaes *Nitella* and *Chara* were both co-dominant species in LVI regions. The floating leaved vegetation community had 3 species observed with *Nymphaea odorata* being dominant in region 5.

By analyzing the collected sonar chart, submerged aquatic vegetation potentially covered approximately 26.69% of the surface area of Hobbs Lake. This submerged vegetation inhabits an estimated 2.68% of the water volume in Hobbs Lake. Figure 5 shows the results of the SAV analysis indicating the location and height of SAV estimated from collected sonar readings.

The calculated LVI score for Hobbs Lake was 58, above the impairment threshold of 43 indicating the vegetation community is showing evidence of being “Healthy”. Figure 6 shows the map of Hobbs Lake 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.

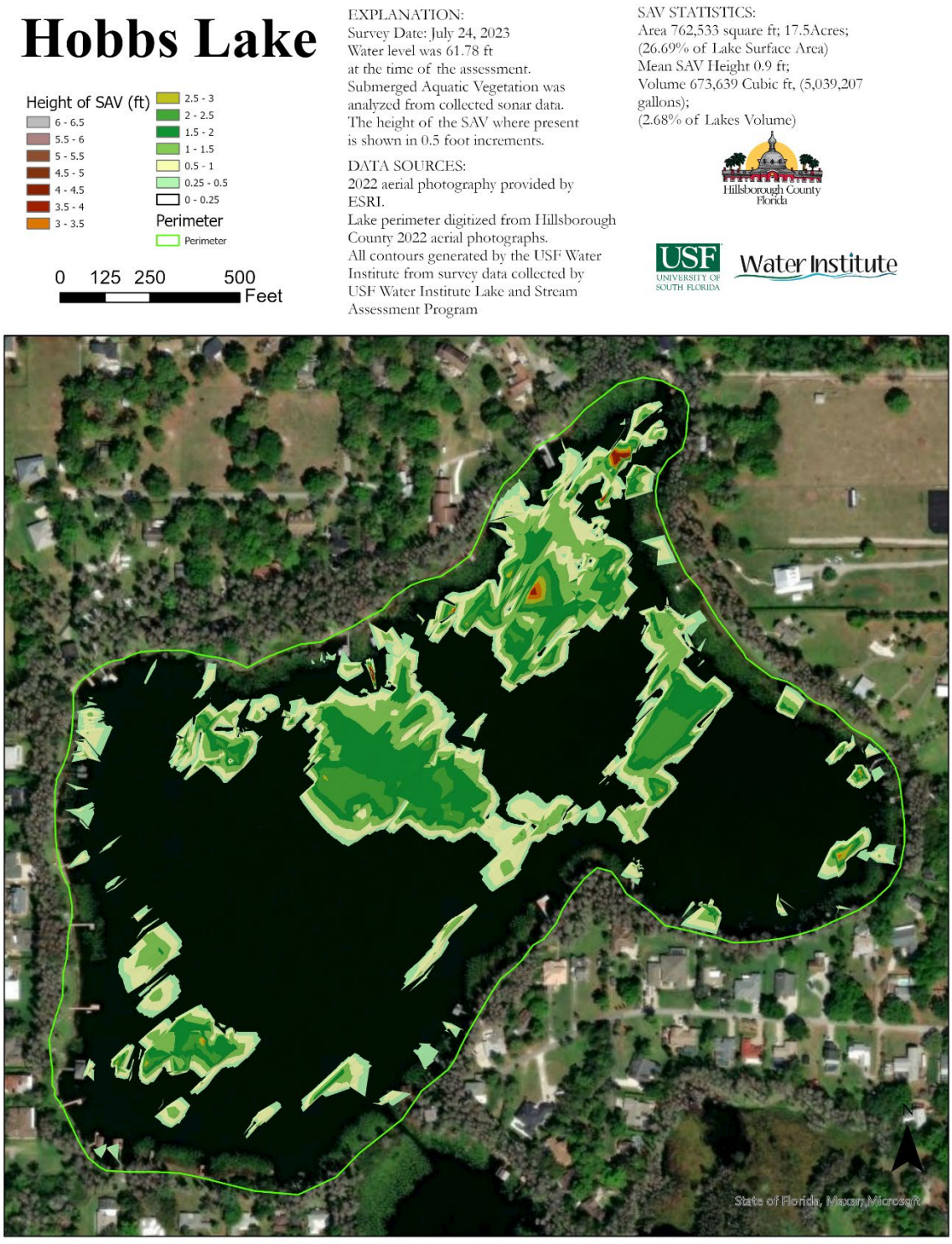

Figure 5 Hobbs Lake Submerged Aquatic Vegetation Assessment Results

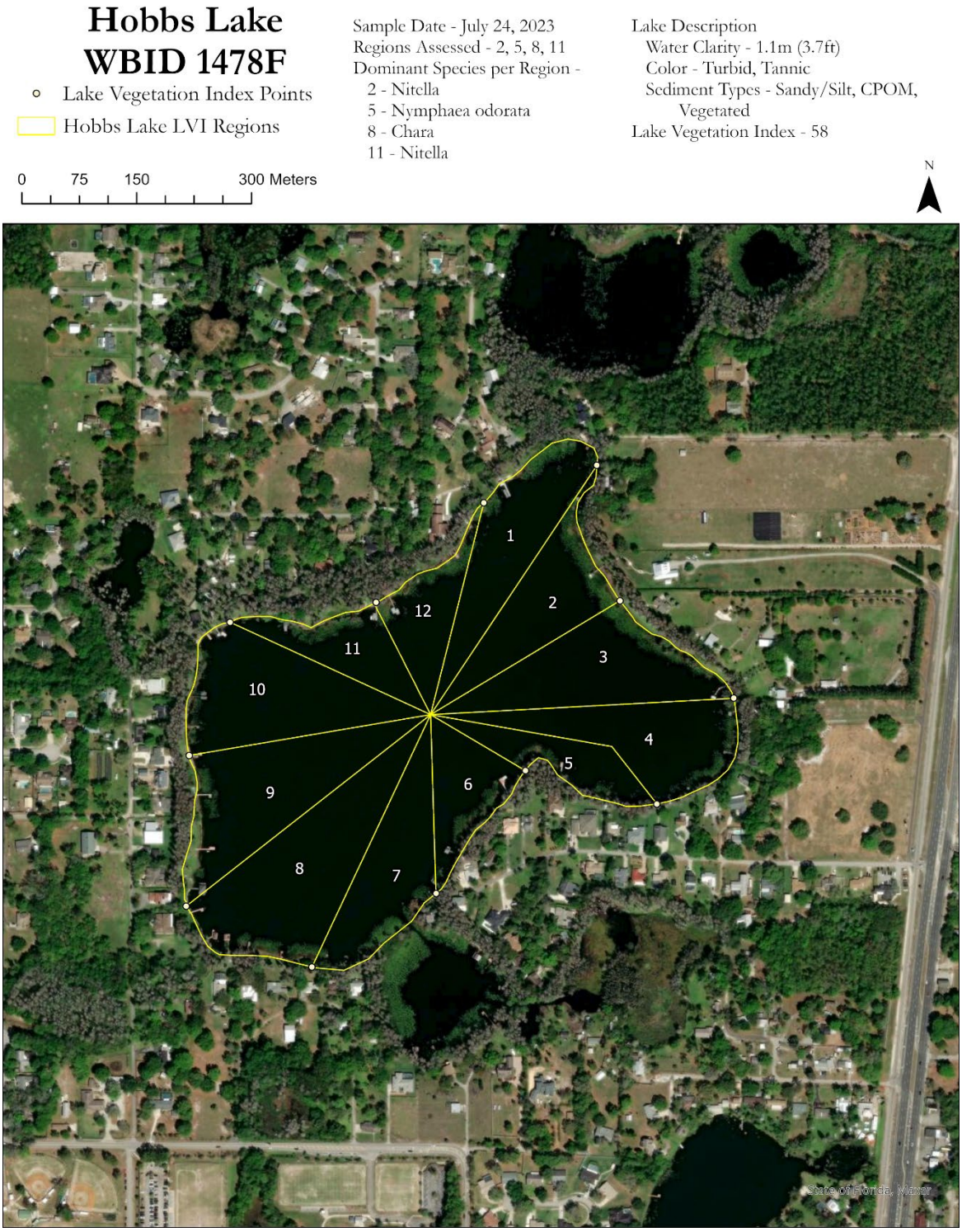

Figure 6: Lake Vegetation Index region map for Hobbs Lake

Table 2: Lake Vegetation Index results for Hobbs Lake July 24, 2023. 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	CofC Score	FLEPPC Status	Wetland Status	Nativity	Region				Occurrence
					2	5	8	11	
Cyperus odoratus	3.00	-	FACW	Native	p	p	p	p	4
Hydrocotyle	2.00	-	FACW	Native	p	p	p	p	4
Nymphaea odorata	5.00	-	OBL	Native	p	d	p	p	4
Panicum repens	0.00	Category 1	FACW	Exotic	p	p	p	p	4
Pontederia cordata	5.38	-	OBL	Native	p	p	p	p	4
Taxodium	7.00	-	OBL	Native	p	p	p	p	4
Typha	1.00	-	OBL	Native	p	p	p	p	4
Vallisneria americana	7.00	-	OBL	Native	p	p	p	p	4
Fuirena scirpoidea	5.50	-	OBL	Native	p	-	p	p	3
Melaleuca quinquenervia	0.00	Category 1	FAC	Exotic	p	p	p	-	3
Mikania scandens	1.95	-	-	Native	p	p	-	p	3
Nitella	6.00	-	OBL	Native	d	-	p	d	3
Nuphar	3.50	-	OBL	Native	p	p	p	-	3
Salix caroliniana	2.95	-	OBL	Native	p	p	p	-	3
Sphagneticola trilobata	0.00	Category 2	FACW	Exotic	-	p	p	p	3
Chara	3.90	-	OBL	Native	p	-	d	-	2
Eleocharis baldwinii	2.82	-	OBL	Native	p	p	-	-	2
Lachnanthes caroliniana	3.76	-	FAC	Native	p	-	p	-	2
Ludwigia octovalvis	2.00	-	OBL	Native	p	p	-	-	2
Ludwigia peruviana	0.00	Category 1	OBL	Exotic	-	p	-	p	2
Panicum hemitomon	5.82	-	OBL	Native	p	p	-	-	2
Sagittaria lancifolia	3.00	-	OBL	Native	-	p	p	-	2
Sesbania punicea	0.00	Category 2	FAC	Exotic	p	p	-	-	2
Cephalanthus occidentalis	5.00	-	OBL	Native	p	-	-	-	1
Cyperus surinamensis	2.03	-	FACW	Native	-	p	-	-	1
Eleocharis geniculata	2.50	-	OBL	Native	p	-	-	-	1
Eupatorium capillifolium	0.83	-	FAC	Native	-	-	-	p	1
Ludwigia erecta	2.55	-	OBL	Native	-	-	p	-	1
Myrica cerifera	2.00	-	FAC	Native	-	-	-	p	1
Pluchea baccharis	5.45	-	FACW	Native	-	-	p	-	1
Sapium sebiferum	0.00	Category 1	FAC	Exotic	-	p	-	-	1
Schinus terebinthifolius	0.00	Category 1	FAC	Exotic	-	p	-	-	1
Utricularia gibba	6.37	-	OBL	Native	p	-	-	-	1
Utricularia radiata	6.01	-	OBL	Native	p	-	-	-	1

Table 3: Scoring Summary for the Lake Vegetation Index

LVI Sample Result:				58
Region	South			
Metric / Section	2	5	8	11
Total # Taxa	24	22	19	15
% Native Taxa	88%	68%	84%	80%
% FLEPPC 1 Taxa	8%	23%	11%	13%
% Sensitive Taxa	8%	9%	11%	13%
Dom Taxa Count	1	1	1	1
CofC Dom Taxa	6.00	5.00	3.90	6.00
Section LVI	70	37	60	65

Water Quality Assessment

Limited long-term water quality data is available for Hobbs Lake. 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 Hobbs Lake during the assessment in 2023.

Table 4: Hobbs Lake Water Quality 7/24/2023 (Field)

Meter Readings:	Depth (M)	Temp (°C)	pH (SU)	D.O (MG/L)	D.O Sat. (%)	Cond. (UMHO/CM)	Salinity (PPT)
Top:	**0.34**	**31.9**	**6.34**	**7.45**	**101**	**115**	**0.05**
Mid-Depth:	**0.89**	**31.9**	**6.41**	**6.94**	**94.5**	**115**	**0.05**
Bottom:	**1.77**	**31.8**	**6.5**	**6.64**	**90.3**	**113**	**0.05**

The chemical water quality analysis for Hobbs Lake is shown in Table 5 for the samples taken on 6/29/23 and 7/24/23. Table 6 includes this data in the numeric nutrient criteria framework using the data from this assessment. The long term color data have a geometric mean value of 10.7 PCU, classifying it as a clear water lake (less than 40 PCU). Total Alkalinity period of record geometric mean value is 16.5 mg/L, classifying it as "soft". The NNC thresholds for a clear - soft lake with insufficient data to calculate NNC (Previous three years with at least 4 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. The inconsistent and spotty nature of the dataset leads to many potential issues with proper classification of numeric nutrient criteria for color and alkalinity with recent year's data being collected by SWFWMD and Hillsborough County. There is a large gap until 2009 LAKEWATCH data. This older data has lower color values with a range of 1 to 17 PCU over 15 samples. The SWFWMD data for 2020-2022 ranges from 15.6 to 24.7 PCU. Assuming the lake would be classified as a colored water lake with additional sampling, the numeric nutrient criteria thresholds would rise to 20 µg/L for Chlorophyll-a Corrected, 0.05 mg/L for Total Phosphorous and 1.27 mg/L for Total Nitrogen.

Geometric mean Chlorophyll-a corrected sampling was insufficient in 2021 and 2023 to calculate annual geometric mean values. The 2022 Chlorophyll-a corrected annual geometric mean was 6.36 µg/L. Total Phosphorous geometric mean values for the most recent data were above the nutrient threshold for clear, soft lakes in the peninsula region with in sufficient data with a value of 0.012 mg/L (2022). Total Nitrogen values were above the nutrient threshold for clear, soft lakes with insufficient data with a value of 0.558 mg/L (2022). For each of these values exceed thresholds.

Bacteria testing showed low levels of E. Coli (3.6 colonies/100ml) and Enterococci (5.3 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: Hobbs Lake 2023 Hillsborough County Environmental Services Water Quality Results (Laboratory)

Parameter	6/29/2023	7/24/2023	POR Mean Value	Units
Alkalinity	18.1	16.7	16.5	**mg/LCaCO3**
Color			10.7	**PCU**
E Coli	3.1	4.1	3.6	**#/100ml**
Enterococci	8.6	2.0	5.3	**#/100 ml**
Chlorophyll a	8	12.0	3.3	**ug/L**
Chlorophyll b	2.5	2.5	2.5	**ug/L**
Chlorophyll c	2.5	2.5	2.5	**ug/L**
Chlorophyll a Corrected	7.2	12.0	9.4	**ug/L**
Ammonia	<0.073	<0.073	0.021	**mg/L**
Nitrates/Nitrites	<0.043	<0.043	0.007	**mg/L**
Kjeldahl Nitrogen	1.01	0.909	0.777	**mg/L**
Total Nitrogen	1.01	0.91	0.44	**mg/L**
Total Phosphorus	<0.068	0.150	0.024	**mg/L**

Table 6: Numeric Nutrient Criteria Framework

Parameter	Value
Geometric Mean Color (pcu)	10.7
Number of Samples	25
Geometric Mean Alkalinity (mg/L $CACO_3$)	16.5
Number of Samples	20
Lake Type	Clear soft

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)
2021 (2)		< 6		< 0.01		< 0.51
2022 (4)	6.36	< 6	0.012	< 0.01	0.558	< 0.51
2023 (2)		< 6		< 0.01		< 0.51

Conclusion

Hobbs Lake is a predominately residential lake in the Coastal Old Tampa Bay Watershed of Hillsborough County, Florida. The results of the water quality assessment of Hobbs Lake is unclear based on Chlorophyll-a, Total Nitrogen and Total Phosphorous concentrations due to insufficient data availability.

The system does show moderate health in the vegetation communities according to the Lake Vegetation Index with several invasive species (7) and an overall LVI score of 58. The assessment also revealed a submerged aquatic vegetation community comprising 6 species occupying 26.69% of the surface area and 2.68% of the volume of Hobbs Lake.