# Valrico 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 Valrico Lake was analyzed using ESRI ArcGIS 10.6. Using this software with 2020ESRI 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.

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[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, 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

Valrico Lake is located in the Hillsborough Bay Watershed in central Hillsborough County, Florida. The Landscape Development Intensity Index of the 100 meter buffer around Valrico Lake is dominated by Residential (62.1%), Natural (30%) and Open Urban (7.8%) land uses. The resulting LDI value for the 100 meter buffer around Valrico Lake is 5.18.

*FIGURE 1: 2021 VALRICO LAKE ASSESSMENT STUDY AREA MAP*
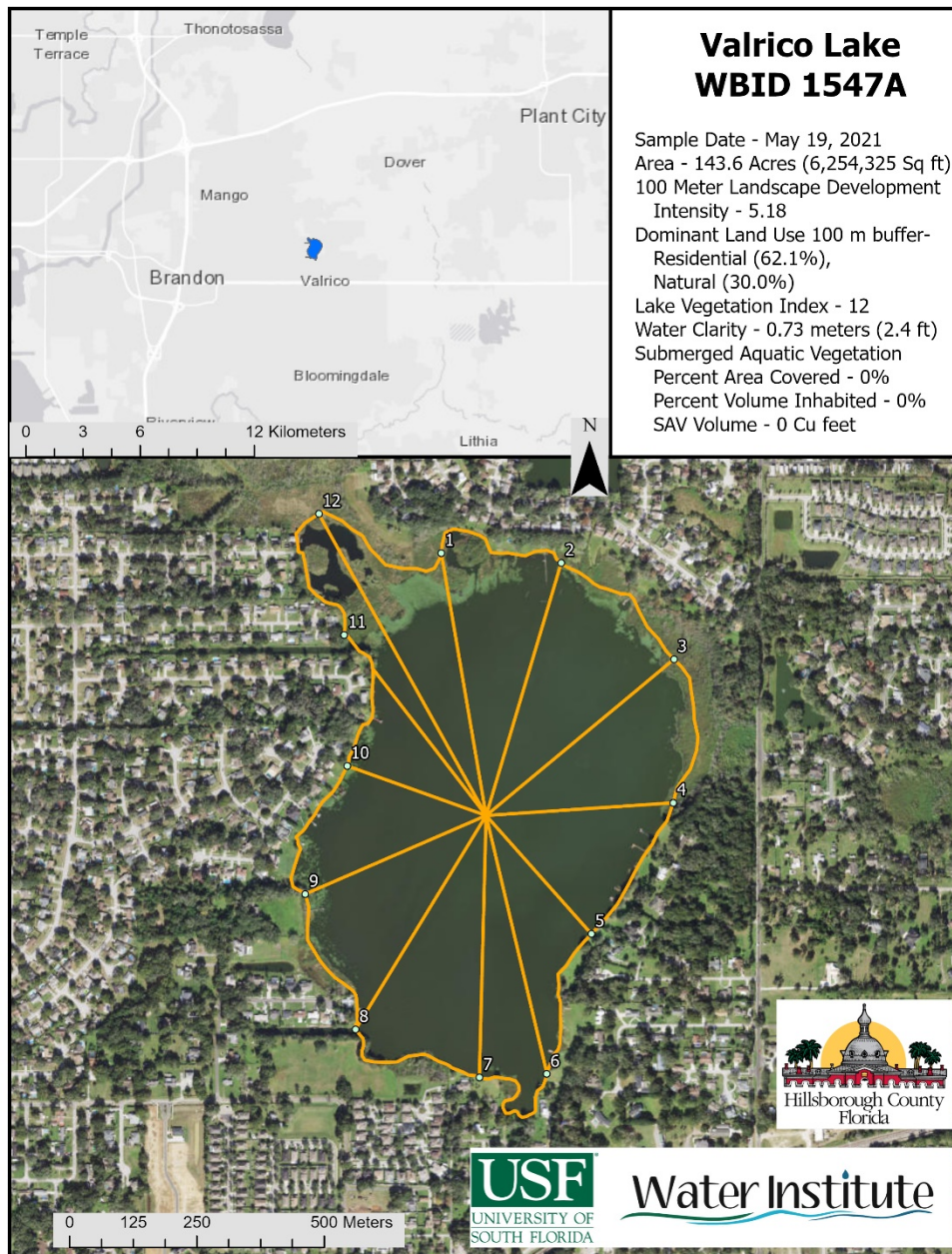
# Lake Bathymetry and Morphological Characterization

At the time of the assessment, Valrico Lake was experiencing normal water levels (43.76 feet above sea level NAVD 88) resulting in a 143.6 acre water body. Valrico Lake at the time of the assessment had a mean water depth of 3.5 feet and a maximum observed depth of 5.61 feet. The volume at this time was approximately 164,767,284 gallons. Figure 2 shows the resulting bathymetric contour map for Valrico Lake from data collected on May 19, 2021. The collected data has been overlain the 2020 Hillsborough County aerials.

*Table 1: Morphological Calculations for Valrico Lake*

| Parameter | Feet | Meters | Acres | Acre-Ft | Gallons |
|---|---|---|---|---|---|
| Surface Area (sq) | 6,254,325 | 581,041 | 143.6 | | |
| Mean Depth | 3.5 | 1.07 | | | |
| Maximum Depth | 5.61 | 1.71 | | | |
| Volume (cubic) | 22,026,029 | 623,702 | | 505.7 | 164,767,284 |
| Gauge (NAVD 88) | 43.76 | 13.34 | | | |

# Valrico Lake WBID 1547A

Contour
—— 1
—— 2
—— 3
—— 4
—— 5
☐ Perimeter

**EXPLANATION:**
Survey Date: May 19, 2021
Water level was 43.76 ft NAVD 88
at the time of the assessment.
Contours are expressed in absolute depth
below this level.

**LAKE MORPHOLOGY:**
Perimeter 15,150 ft;
Area 143.6 Acres;
Mean Depth 3.5 ft;
Volume 505.7 Acre-ft, (164,767,284 gallons);
Deepest point 5.61 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
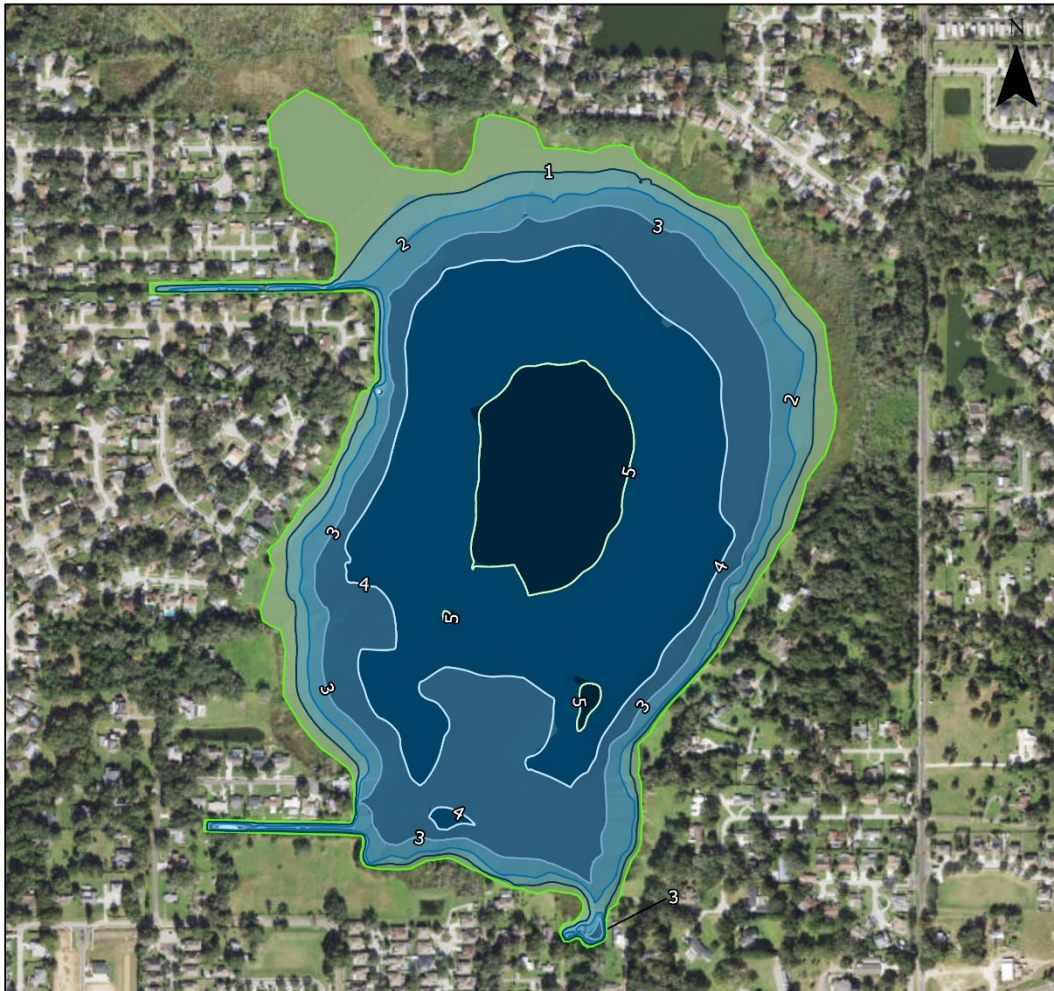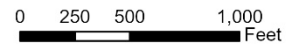Assessment Program.

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

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Florida

0    250    500    1,000
Feet

*Figure 3 Overview photograph of Valrico Lake showing typical shoreline vegetation*

## Lake Habitat and Lake Vegetation Index Assessment

The lake assessment for Valrico Lake was conducted on May 19, 2021. The water in Valrico Lake was characterized as colored with a color value of 60 PCU. The secchi disk depth was 0.73 meters in part due to the high tannins and turbidity. The vegetation quality of the plants in and buffering Valrico Lake are predominantly native species with significant growths of non-native nuisance species such as *Eichhornia crassipes, Panicum repens and Oxycaryum cubense*. Stormwater reaches the lake via sheet flow from the surrounding residential and natural land cover. The bottom substrate quality was dominated by sand/silt with coarse particulate organic matter near shore. The largest factor influencing the emergent vegetation community is the alteration of shorelines by homeowners.

*Figure 4 Eichhornia crassipes was a common floating leaved vegetation in Valrico Lake during the assessment.*

The Lake Vegetation Index identified 44 species of wetland vegetation growing in the four selected sections along Valrico Lake. The majority of these species (31) are native species. The remaining 13 species (*shown in bold in Table 2*) are non- native and invasive to this region. The vegetation community along Valrico Lake is dominated by a variety of emergent species including *Oxycaryum cubense, Panicum repens* and *Ludwigia peruviana.* The water's surface in Valrico Lake was dominated by *Nuphar* and *Eichhornia crassipes*. A total of one species of submerged aquatic vegetation was observed, *Utricularia gibba* is a native species that does not root into substrates and is commonly seen tangled in floating leaved and emergent vegetation. Submerged vegetation was sparse in Valrico Lake in part due to reduced available light and bottom substrates. Due to the unrooted nature, this species is not typically seen in sonar chart data. By analyzing the collected sonar chart, submerged aquatic vegetation potentially covered approximately 0% of the surface area of Valrico Lake. This submerged vegetation inhabits an estimated 0% of the water volume in Valrico Lake. Figure 5 shows the results of the SAV analysis indicating the location and height of SAV.

The calculated LVI score for Valrico Lake was 12, below the impairment threshold of 43 indicating that the vegetation community is "Impaired". Figure 6 shows the map of Valrico Lake detailing the LVI regions used for the assessment (Regions 1, 4, 7, 10). Table 2 details the species list results of the Lake Vegetation Index. Table 3 details the scoring result for the Lake Vegetation Index. The main issues causing the impairment were the abundance of invasive species (29.5%), including *Eichhornia crassipes* which was dominant or codominant in all four regions of the LVI.

# Valrico Lake

☐ Perimeter

## Height of Vegetation (feet)

### Elevation

☐ 0 - 0

EXPLANATION:
Survey Date: May 19, 2021
Water level was 43.76 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 0 square ft; 0 Acres;
(0% of Lake Surface Area)
Mean SAV Height 0.0 ft;
Volume 0 Cubic ft, (0 gallons);
(0% of Lakes Volume)

N

| 0 | 250 | 500 | 1,000 |
Feet

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**Water Institute**

Hillsborough County
Florida

No submerged vegetation was
observed in Valrico Lake at the
time of the assessment.

*Figure 5 Valrico Lake Submerged Aquatic Vegetation Assessment Results*
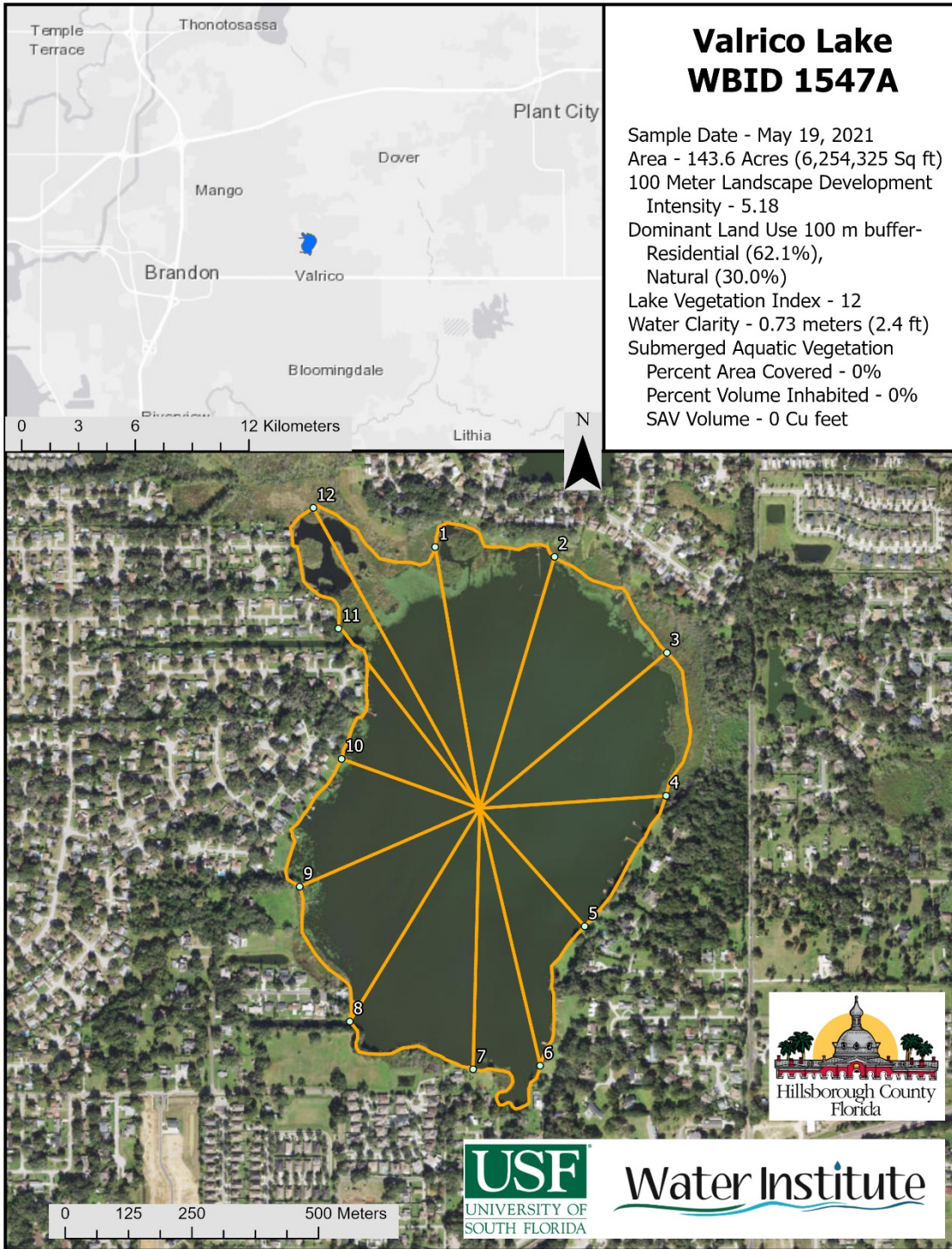
*Figure 6: Lake Vegetation Index region map for Valrico Lake*

*Table 2: Lake Vegetation Index results for Valrico Lake May 19, 2021*

| SPECIES | CofC | 1 | 4 | 7 | 10 |
|---|---|---|---|---|---|
| **Alternanthera philoxeroides** | 0.00 | 1 | 1 | 1 | 1 |
| **Eichhornia crassipes** | 0.00 | C | D | D | C |
| Hydrocotyle | 2.00 | 1 | 1 | 1 | 1 |
| Ludwigia leptocarpa | 3.00 | 1 | 1 | 1 | 1 |
| Micranthemum glomeratum | 5.85 | 1 | 1 | 1 | 1 |
| **Oxycaryum cubense** | 0.50 | 1 | 1 | 1 | 1 |
| **Panicum repens** | 0.00 | 1 | 1 | 1 | 1 |
| Persicaria glabra | 4.50 | 1 | 1 | 1 | 1 |
| **Ludwigia peruviana** | 0.00 | 1 | 1 | 1 | |
| Mikania scandens | 1.95 | 1 | 1 | 1 | |
| Nuphar | 3.50 | C | 1 | | C |
| Salix caroliniana | 2.95 | 1 | 1 | 1 | |
| **Salvinia minima** | 0.00 | 1 | 1 | 1 | |
| **Sapium sebiferum** | 0.00 | 1 | 1 | 1 | |
| Taxodium | 7.00 | 1 | 1 | | 1 |
| Typha | 1.00 | 1 | 1 | 1 | |
| **Urochloa mutica** | 0.00 | | 1 | 1 | 1 |
| Bacopa monnieri | 3.50 | 1 | 1 | | |
| Cyperus odoratus | 3.00 | 1 | | 1 | |
| Ludwigia arcuata | 3.50 | | 1 | | 1 |
| Myrica cerifera | 2.00 | 1 | | 1 | |
| Panicum hemitomon | 5.82 | | 1 | 1 | |
| Cyperus polystachyos | 1.56 | | | 1 | |
| Diodia virginiana | 3.00 | | | | 1 |
| Eleocharis baldwinii | 2.82 | | | | 1 |
| Erechtites hieracifolia | 1.00 | 1 | | | |
| Juncus effusus | 2.00 | 1 | | | |
| **Landoltia punctata** | 0.00 | 1 | | | |
| Lemna | 1.00 | 1 | | | |
| **Myriophyllum aquaticum** | 0.98 | 1 | | | |
| **Nymphoides cristata** | 0.00 | 1 | | | |
| **Paspalum urvillei** | 0.00 | | | 1 | |
| Phyla nodiflora | 1.92 | | | | 1 |
| **Pistia stratiotes** | 0.00 | 1 | | | |
| Pluchea baccharis | 5.45 | 1 | | | |
| Pontederia cordata | 5.38 | 1 | | | |
| Ptilimnium capillaceum | 2.73 | | | 1 | |
| Ricciocarpus natans | 6.00 | 1 | | | |
| Sagittaria lancifolia | 3.00 | 1 | | | |
| Sambucus nigra | 1.48 | | | 1 | |
| Spirodela polyrhiza | 2.95 | 1 | | | |
| Thalia geniculata | 6.00 | | 1 | | |
| Thelypteris interrupta | 6.74 | 1 | | | |
| Utricularia gibba | 6.37 | 1 | | | |

*Table 3: Scoring Summary for the Lake Vegetation Index*

| LVI Score Summary | 1 | 4 | 7 | 10 |
|---|---|---|---|---|
| Total # of taxa in sampling unit | 33 | 21 | 22 | 15 |
| % Native taxa in sampling unit | 66.66667 | 61.90476 | 59.09091 | 66.66667 |
| % FLEPPC CAT 1  taxa in sampling unit | 21.21212 | 28.57143 | 27.27273 | 20 |
| % Sensitive taxa in sample unit | 3.030303 | 4.761905 | 0 | 6.666667 |
| Dominant CoC in sample unit | 1.75 | 0 | 0 | 1.75 |

| | 1 | 4 | 7 | 10 |
|---|---|---|---|---|
| Native Score ((x-62.5)/37.5) or ((x-66.67)/25.89)= | 0 | 0 | 0 | 0 |
| Invasive FLEPPC 1 Score (1 - (x/30))= | 0.292929 | 0.047619 | 0.090909 | 0.333333 |
| Sensitive Score (x/(27.78 or 20)) = | 0.151515 | 0.238095 | 0 | 0.333333 |
| Dominant CoC Score (x/(7.91 or 7)) = | 0.25 | 0 | 0 | 0.25 |
| Raw Score Total = N+I+S+D = | 0.694444 | 0.285714 | 0.090909 | 0.916667 |
| Division Factor = (3 D=0 or 4) = | 4 | 4 | 4 | 4 |
| Average LVI dividend = Raw /DF South | 0.173611 | 0.071429 | 0.022727 | 0.229167 |
| LVI Score for sampling unit = | 17.36111 | 7.142857 | 2.272727 | 22.91667 |

**Total LVI SCORE =**                  **12**

# Water Quality Assessment

Limited long-term water quality data is available for Valrico Lake. The available data was collected by USGS, FDEP, Southwest Florida Water Management District, Hillsborough County and University of Florida LAKEWATCH program (1979-2021. As part of this assessment three samples were taken during May, June and July of 2021. Table 4 provides a summary of the Physical/Chemical conditions recorded at the middle of the Valrico Lake during the assessment in 2021.

*Table 4: Valrico Lake Water Quality (Field)*

| Date | Depth (m) | Temp °C | pH | DO (mg/L) | DO (%sat) | Cond (unho/cm) | Salinity (ppt) | Secchi Depth (m) |
|------|-----------|---------|------|-----------|-----------|----------------|----------------|------------------|
| 5/19/21 | 0.39 | 29.54 | 8.32 | 8.69 | 105.9 | 175.8 | 0.08 | 0.73 |
| 5/19/21 | 1.13 | 25.94 | 8.46 | 7.56 | 92.1 | 175.6 | 0.08 | |
| 5/19/21 | 1.63 | 25.96 | 6.87 | 2.72 | 33.2 | 289.6 | 0.13 | |
| 6/15/21 | 0.5 | 29.2 | 8.59 | 9.06 | 118 | 214 | 0.1 | |
| 7/21/21 | 0.5 | 30.7 | 8.19 | 7.88 | 106 | 172 | 0.08 | |

The chemical water quality analysis for Valrico Lake is shown in Table 5 for the samples taken on 5/19/21, 6/15/21 and 7/21/21. 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. Color values for the period of record data have a geometric mean value of 24.0 PCU, classifying it as a clear water lake (less than or equal to 40 PCU). Total Alkalinity period of record geometric mean value is 29.7 mg/L classifying the lake as alkaline (greater than or equal to 20 mg/L). The NNC thresholds for a clear, alkaline lake with sufficient data to calculate NNC (Previous three years with at least 3 samples per year in separate seasons) are 20 µg/L for Chlorophyll-a Corrected for Phaeophytin, 0.09 mg/L for Total Phosphorous and 1.91 mg/L for Total Nitrogen.

Geometric mean Chloropyll-a corrected values for the 2019-2021 data is 23.7 µg/L (59.39 µg/L in 2019, 21.48 µg/L in 2020 and 2.39 µg/L in 2021). Period of record Chlorophyll-a corrected geometric mean was 33.52 µg/L. Total Phosphorous mean values for the 2019-2021 data were 0.095 mg/L in 2019, 0.084 mg/L in 2020 and 0.122 mg/L in 2021. These values exceed the thresholds for 2019 and 2021. The geometric mean value for the period of record is 0.061 mg/L. Total Nitrogen values were below the nutrient threshold for clear, alkaline lakes with sufficient data developed by FDEP of 1.91 mg/l with a value of 0.936 mg/L in 2019, 1.280 mg/L in 2020 and 1.045 mg/L in 2021. The geometric mean for the period of record was 1.045 mg/L.

2021 Bacteria testing showed low levels of E. Coli (14.6 colonies/100ml) and Enterococci (20 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: Valrico Lake 2021 Water Quality Results (Laboratory)*

| Parameter | 5/19/2021 | 6/15/2021 | 7/21/2021 | POR Mean Value | Units |
|---|---|---|---|---|---|
| Alkalinity | 31.9 | N/A | N/A | 29.7 | mg/LCaCO3 |
| E Coli | 6.30 | 58.3 | 8.5 | 16.4 | #/100ml |
| Enterococci | 29.9 | 43.1 | 6.2 | 16.8 | #/100 ml |
| Chlorophyll a | 45.1 | 61.1 | 29.6 | 18.9 | ug/L |
| Chlorophyll b | 2.80 | 3.4 | 1.7 | 2.9 | ug/L |
| Chlorophyll c | 2.8 | 3.4 | 1.7 | 2.4 | ug/L |
| Chlorophyll t | 45.1 | 61.1 | 31.7 | 12.09 | ug/L |
| Chlorophyll a Corrected | 2.8 | 3.4 | 1.7 | 33.5 | ug/L |
| Ammonia | <0.073 | <0.073 | <0.073 | 0.013 | mg/L |
| Nitrates/Nitrites | <0.043 | <0.043 | <0.043 | 0.006 | mg/L |
| Kjeldahl Nitrogen | 1.99 | 1.75 | 1.46 | 1.099 | mg/L |
| Total Nitrogen | 1.990 | 1.750 | 1.460 | 1.045 | mg/L |
| Total Phosphorus | 0.149 | 0.141 | 0.081 | 0.061 | mg/L |

*Table 6: Numeric Nutrient Criteria Framework*

| Parameter | Value |
| --- | --- |
| Geometric Mean (Geomean) Color (pcu) | 24.0 |
| Number of Samples | 91 |
| Geometric Mean Alkalinity (mg/L CACO3) | 29.7 |
| Number of Samples | 51 |
| Lake Type | Clear Alkaline |
| Chlorophyll a Criteria (ug/L) | 20 |
| Sufficient for Geomean Criteria then P mg/L | 0.09 |
| Suffcient for Geomean Criteria then N mg/L | 1.91 |
| Geomean Chla Corrected ug/L (3-year) | 23.7 |
| Geomean TP mg/L (3-year) | 0.095 |
| Geomean TN mg/L (3-year) | 1.145 |
| Number of Samples (3-year) | 24 |
| Potential Impaired Chlorophyll a | Impaired |
| Potential Impaired TP | Impaired |
| Potential Impaired TN | Not Impaired |

## Conclusion

The results of the assessment of Valrico Lake shows an impaired lake based on Total Phosphorous and Chlorophyll-a corrected concentrations according to the FDEP numeric nutrient criteria using the data from the past 3 years. The system also shows impairment in the vegetation communities according to the Lake Vegetation Index with moderate overall species (44), high occurrences of non-native, invasive species and few sensitive plant species with an overall LVI score of 12. The assessment also revealed a reduced submerged aquatic vegetation community comprising one species occupying 0.0% of the surface area and 0.0% of the volume of Valrico Lake.