VENICE GARDENS LAKE BATHYMETRY, SUBMERGED AQUATIC VEGETATION AND SEDIMENT SURVEY

FINAL REPORT TO SARASOTA COUNTY

APRIL 2018

Authors

David Eilers, M.S., USF Water Institute, University of South Florida

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BACKGROUND

The University of South Florida Water Institute (WI) was tasked with assessing the bathymetry, submerged aquatic vegetation (SAV) community and bottom sediments for Venice Gardens Lake near Venice, Florida. Venice Gardens Lake has had a persistent phytoplankton bloom and elevated nutrient concentrations. The goal of this assessment was to gather baseline information about the lake to better characterize the lake in terms of bathymetry, SAV species composition, their relative dominance, distribution, percent area covered and percent volume inhabited as well as the bottom sediments. The field data was collected on March 19-21, 2018.

METHODOLOGY

TASK 1 BATHYMETRIC SURVEY ASSESSMENT

Bathymetric mapping will produce maps of the lake depth and stage:volume relationships. The information will be useful to determine the volume of water storage in the system, statistical characteristics of the depths and areas suitable for planting of aquatic vegetation. These factors are vital to lake management for treating nuisance vegetation, understanding nutrient loading and maintaining the waterbody. This task includes bathymetric assessment of Venice Gardens Lake, calculation of the morphology statistics and creation of a map display from the assessment data showing 1-foot bathymetric contours. Venice Gardens Lake will be mapped using a 10' JonBoat equipped with a Lowrance HDS-5 Gen2 with Structure Scan. Transects will be driven parallel to the shoreline beginning as close to shore as feasible (depth of 1.5 feet) and will be spaced approximately 30 feet apart towards the center of the lake for mapping purposes. Depth and GPS locations are recorded during transects. This recorded data is then processed in ArcGIS 10.5.1 to create models of the lakes bathymetry used for display and calculations.

TASK 2 SUBMERGED AQUATIC VEGETATION ASSESSMENT

Submerged Aquatic Vegetation (SAV) consists of a taxonomically diverse collection of plants and macroalgae which are typically rooted and grow completely underwater. Shoreline grasses and other emergent, plants that may be rooted in the water but grow out of the water are not included in SAV. Floating Leaved vegetation such as Water Lilly's and Water Hyacinth are not included in SAV as well. Identification of areas with or without submerged aquatic vegetation can serve as a vital collection of data for understanding the nutrient cycle in lakes due to the vegetation's uptake of nitrogen and phosphorous preventing undesirable concentrations of phytoplankton. Understanding the species present, dominance and their spatial distribution is vital to maintaining a healthy lake. The submerged aquatic vegetation also plays a vital role as habitat for many species of gamefish as well as macroinvertebrates.

To accomplish these tasks the WI utilized a dual sampling method including manual vegetation sampling and analysis of concurrently collected sonar data. During this procedure Venice Gardens Lake was mapped using a 10' JonBoat equipped with a Lowrance HDS-5 Gen2 with Structure Scan. Transects were spaced approximately 30 feet apart for mapping purposes. The information from the Lowrance unit was saved to a SD card for data transfer in the laboratory for data analysis. SONAR TRX software was utilized to analyze the collected sonar data to determine;

1) The presence or absence of SAV at each sonar "ping" – an individual sonar depth reading with GPS data

2) The height of the SAV where present
3) The deep water extent of the SAV community.

The results of the SAV analysis are provided as a table of percent area covered (PAC) with SAV of the surface area of Venice Gardens Lake, percent volume inhabited (PVI) with SAV of the total volume of Venice Gardens Lake and the deep water extent of the SAV community.

Concurrently, a frodus sampling device (double sided rake) was used to sample the SAV community. This device was deployed multiple times per transect in the zone of SAV where SAV has been detected during the sonar based assessment as well as in depths beyond the normal deep edge of SAV. These samples were used to determine a species presence list for the SAV community as well as determine dominant species. SAV species were identified in the field when possible. All unknown species or species that require further effort to identify, filamentous algae for example, were collected and preserved on ice for later identification. At each sample deployment;

1) A GPS waypoint coordinate was taken
2) All species contained in the sample were identified
3) A dominant species was determined

From the collected data, GIS layers were generated for the manual vegetation sampling locations, SAV dominant species, PAC of SAV, height of SAV and PVI by SAV.

If SAV is not observed during the assessment, manual sampling will be conducted on a rate of 3 samples per acre to provide quality assurance of the sonar data. A polygon indicating locations of viable SAV planting sites based on water depths and available Secchi Depth values using a calculation of 1.7 x mean secchi depth supported by Florida LakeWATCH (http://lakewatch.ifas.ufl.edu/circpdffolder/Circular111.pdf) will be created

TASK 3 LAKE SEDIMENT ASSESSMENT

The sediments found in lakes often serve a role in the nutrient cycling and storage. To better understand the nutrient cycle in a lake it is valuable to know where deposits of nutrient rich organic “muck” are found and approximately how deep these accumulations extend. The distribution of sand and clay sediments are also important to understand to identify areas of sedimentation and erosion.

This task includes an exploratory sampling of benthic sediments in Venice Gardens Lake. A manual sampling technique using a Wildco Hand Core Sediment Sampler will be utilized to capture data for the depth of sediments from water sediment interface to firm sediments. With this sample, a GPS point will be taken, bottom sediments will be collected and classified as muck, sand or clay as well as intermediates between (Muck-sand, Sand-Clay for example) and relative percentages of each in the sample will be recorded. The collected sediment sample will be photographed. A total of 20 sediment samples will be taken on Venice Gardens Lake. Samples will be collected based on locations of interest (Inputs, outputs, ends of canals, stormwater outfalls and areas of accumulation).

In addition to the manual samples, a raster (matrix of cells organized into a grid where each cell contains a value representing information) of relative bottom hardness will be created by analyzing the collected sonar returns. In this procedure, the ratio of emitted signal to backscatter returns is analyzed using Dr.Depth software package. The resulting raster dataset indicates where areas of “softer” bottom sediments (higher value returns, typically muck) and “harder” bottom sediments (low value returns, typically sand or rock) are located.

RESULTS

TASK 1 BATHYMETRIC SURVEY ASSESSMENT

The bathymetric mapping process was conducted over three days. The Southeast portion of the lake was mapped on 3/19/2018 with a gauge elevation (elevation of the surface of the water at the time of the assessment) of 10.38 ft NGVD 29 (9.26 ft (NAVD 88)). The Southwest portion of the lake was mapped on 3/20/2018 with a gauge elevation of 10.38 ft NGVD 29 (9.26 ft (NAVD 88)). Shortly after completing the southwest portion of the lake a significant rain event occurred. The north portion of the lake was mapped on 3/21/2018 with a gauge elevation of 10.51 ft NGVD 29 (9.39 ft (NAVD 88)). All collected bathymetric data was standardized to the gauge height for 3/21/2018. It should be noted that Venice Gardens Lake is currently below the controlled weir elevation of 11.0 ft NGVD 29 (9.88 ft NAVD 88) by 0.49 ft.

As a whole, Venice Gardens Lake covers 69.1 acres, contains 71,481,638 gallons of water, had an average depth of 3.17 ft and a maximum depth of 6.46 ft. There were variations between the different sections of the lake with the southwest portion of the lake being the shallowest with a mean depth of 2.35 ft and a maximum of 5.31 ft. The North section of Venice Gardens Lake had the deepest mean depth at 3.39 ft and the southeast section had the deepest maximum depth at 6.46 ft. Below is a summary table of the morphological characteristics of Venice Gardens Lake broken down by section and the lake as a whole.

Table 1 Venice Gardens Lake Morphological Calculations

Lake Name	Assessment Date	Water Surface Elevation (FT NGVD29)	Water Surface Elevation (FT NAVD88)	Secchi Disk (FT)	AV Surface Area (Square FT)	Surface Area (acres)	AV Volume (Cubic FT)	AV Volume (acre-foot)	Volume (gal)	Mean Depth (FT)	Max Depth (FT)	Perimeter (FT)
Venice Gardens North	3/21/2018	10.51	9.39	0.5	1,740,398	40.0	5,902,338	135.5	44,152,858	3.39	5.52	16,959
Venice Gardens Southwest	3/20/2018	10.38	9.26	0.8	445,163	10.2	1,045,059	24.0	7,817,636	2.35	5.31	7,569
Venice Gardens Southeast	3/19/2018	10.38	9.26	0.7	824,456	18.9	2,608,242	59.9	19,511,144	3.16	6.46	15,213
Venice Gardens Lake	3/19-21/2018	10.51	9.39	0.66 Mean Value	3,010,016	69.1	9,555,639	219.4	71,481,638	3.17	6.46	39,740

The resulting bathymetric contour maps for Venice Gardens Lake are shown in figures 1-4 for the entire lake (Figure 1), north section (Figure 2), southwest section (Figure 3) and the southeast section (Figure 4). Morphological calculations of each section are shown on the accompanying maps.

Venice Gardens Lake

Legend

CONTOUR

- -6
- -5
- -4
- -3
- -2
- -1
- Gauge_Location
- Perimeter

EXPLANATION:
Survey Dates: March 19-21, 2018
Gauge Height was 10.51 NGVD 29
at the time of the assessment.
Contours are expressed in absolute depth
below this level.

LAKE MORPHOLOGY:
Perimeter 39,740 ft;
Area 69.1 Acres;
Mean Depth 3.17 ft;
Volume 219.4 Acre-ft, (71,481,638 gallons);
Deepest point 6.46 ft

DATA SOURCES:
2017 aerial photography provided by FDOT.
Lake perimeter digitized from FDOT 2017 aerial photographs.
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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0 187.5375 750 1,125 1,500 Feet

Sarasota County

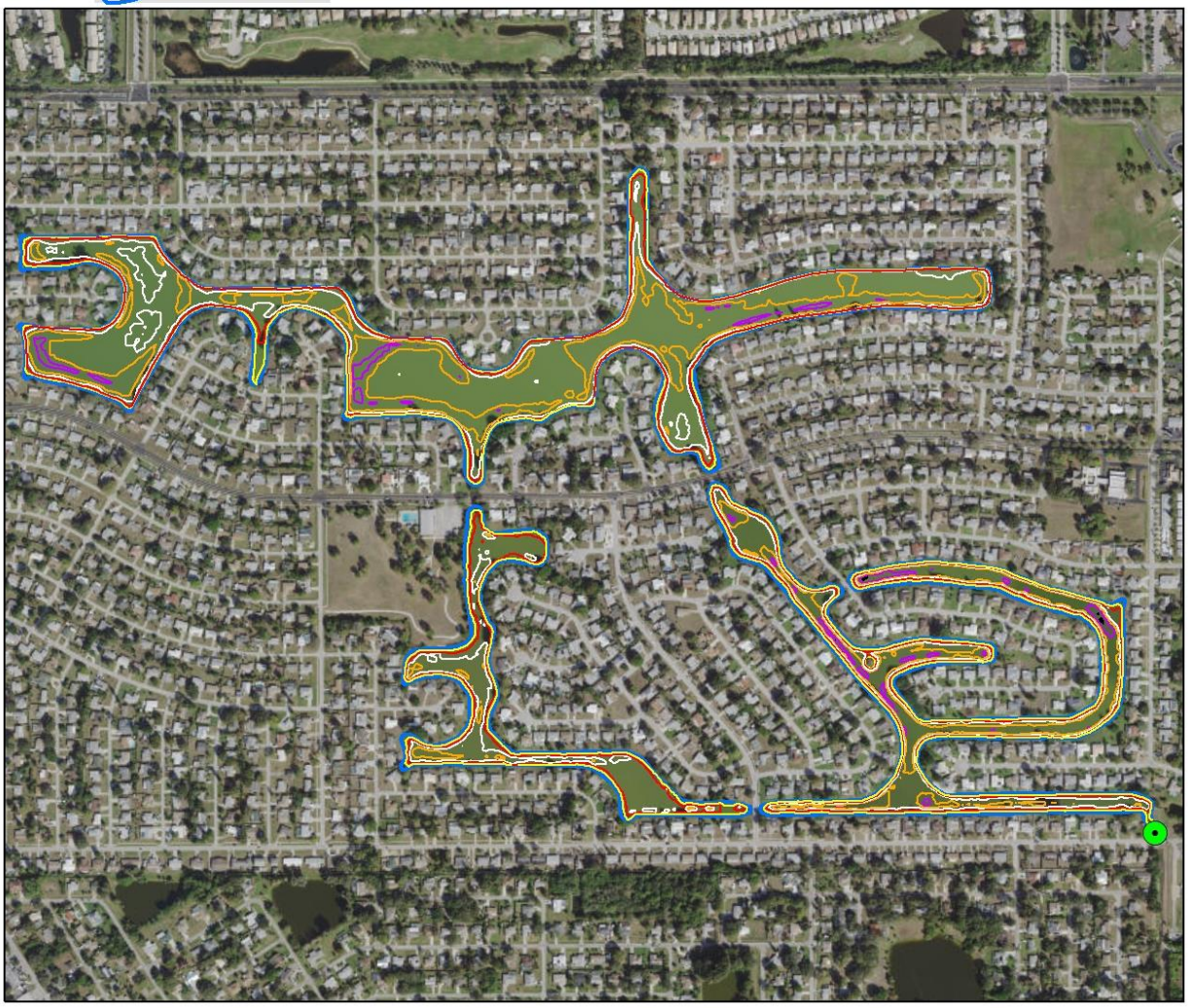

Figure 1 Venice Gardens Lake Overview 1-Foot Bathymetric Contour Map

Venice Gardens Lake North

Legend

CONTOUR

- -6
- -5
- -4
- -3
- -2
- -1
- Perimeter

EXPLANATION:
Survey Dates: March 21, 2018
Gauge Height was 10.51 NGVD 29
at the time of the assessment.
Contours are expressed in absolute depth
below this level.

LAKE MORPHOLOGY:
Perimeter 16,959 ft;
Area 40.0 Acres;
Mean Depth 3.39 ft;
Volume 135.5 Acre-ft, (44,152,858 gallons);
Deepest point 5.52 ft

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

0 350 700 1,400 Feet

DATA SOURCES:
2017 aerial photography provided by FDOT.
Lake perimeter digitized from FDOT 2017 aerial photographs.
All contours generated by the USF Water Institute from survey data collected by USF Water Institute Lake and Stream Assessment Program.

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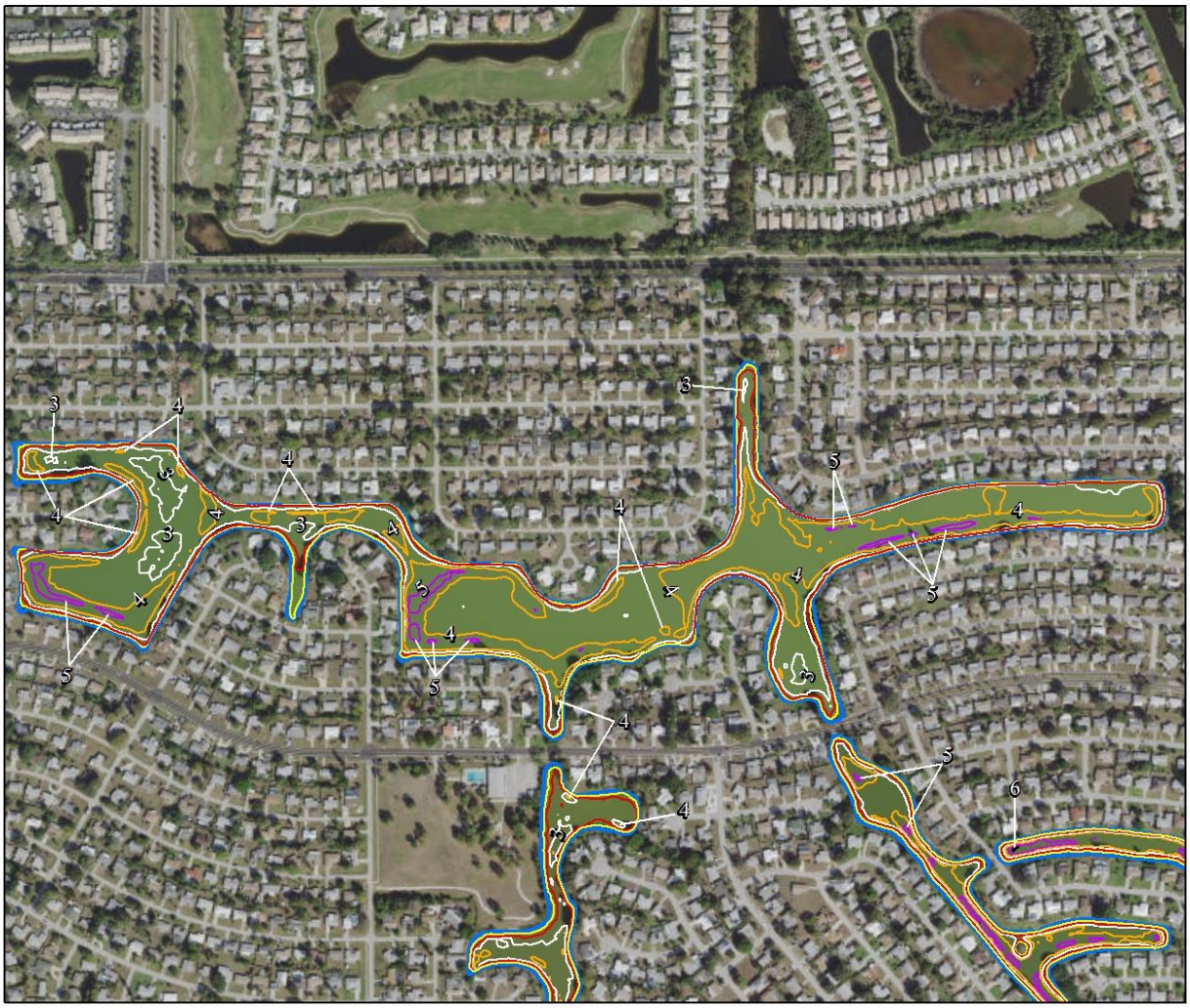

Figure 2 Venice Gardens Lake North Section 1-Foot Bathymetric Contour Map

Venice Gardens Lake Southwest

Legend

CONTOUR

- -6
- -5
- -4
- -3
- -2
- -1
- Perimeter

EXPLANATION:
Survey Dates: March 20, 2018
Gauge Height was 10.51 NGVD 29 at the time of the assessment.
Contours are expressed in absolute depth below this level.

LAKE MORPHOLOGY:
Perimeter 7,569 ft;
Area 10.2 Acres;
Mean Depth 2.35 ft;
Volume 24.0 Acre-ft, (7,817,636 gallons);
Deepest point 5.3 ft

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0 62.5125 250 375 500 Feet

DATA SOURCES:
2017 aerial photography provided by FDOT.
Lake perimeter digitized from FDOT 2017 aerial photographs.
All contours generated by the USF Water Institute from survey data collected by USF Water Institute Lake and Stream Assessment Program.

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Sarasota County

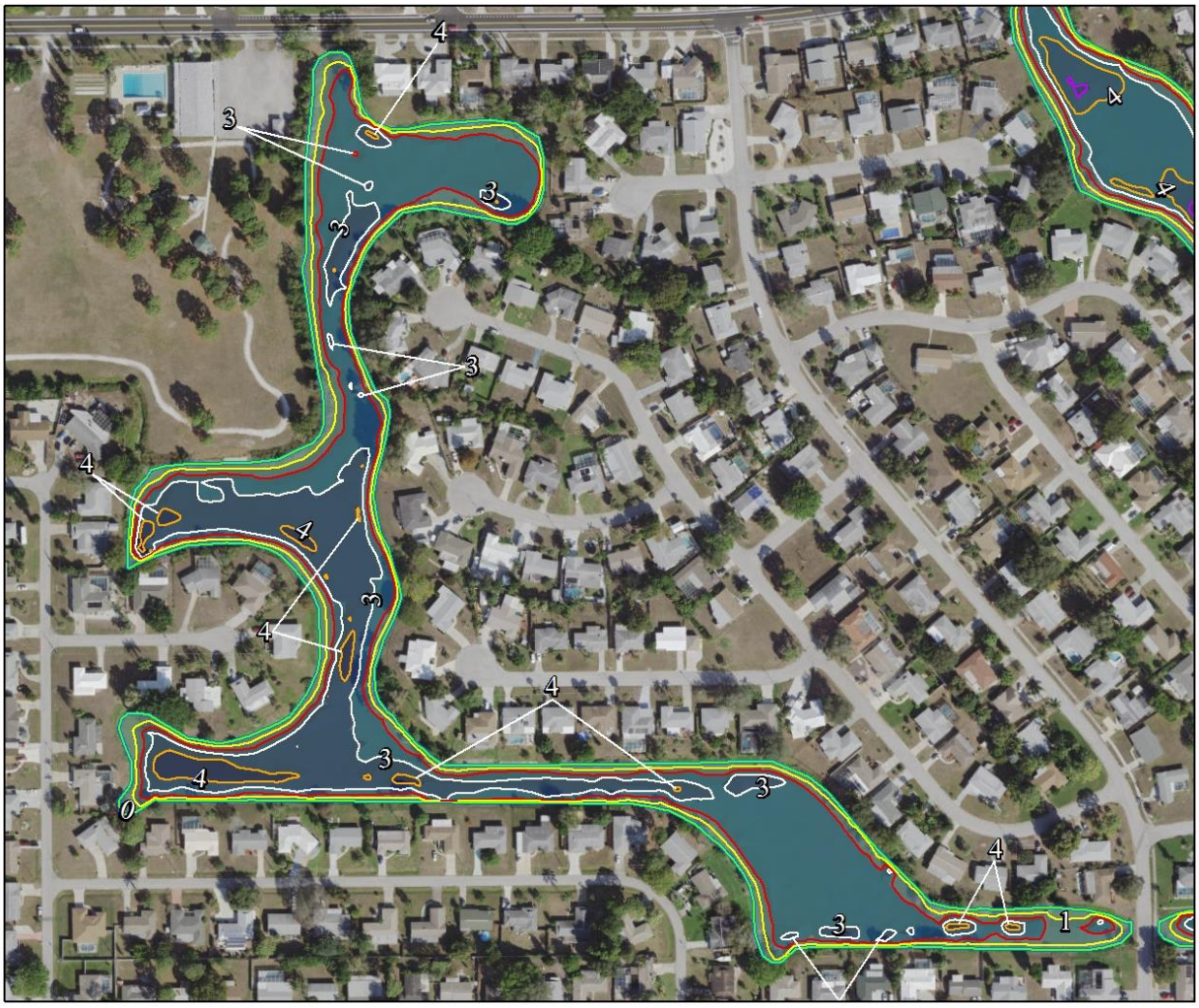

Figure 3 Venice Gardens Lake Southwest Section 1-Foot Bathymetric Contour Map

Venice Gardens Lake Southeast

Legend

Gauge_Location

CONTOUR

-6

-5

-4

-3

-2

-1

Perimeter

EXPLANATION:
Survey Dates: March 19, 2018
Gauge Height was 10.51 NGVD 29 at the time of the assessment.
Contours are expressed in absolute depth below this level.

LAKE MORPHOLOGY:
Perimeter 15,213 ft;
Area 18.9 Acres;
Mean Depth 3.16 ft;
Volume 59.9 Acre-ft, (19,511,144 gallons);
Deepest point 6.46 ft

DATA SOURCES:
2017 aerial photography provided by FDOT.
Lake perimeter digitized from FDOT 2017 aerial photographs.
All contours generated by the USF Water Institute from survey data collected by USF Water Institute Lake and Stream Assessment Program.

DISCLAIMER:
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0 75 150 300 450 600 Feet

Sarasota County

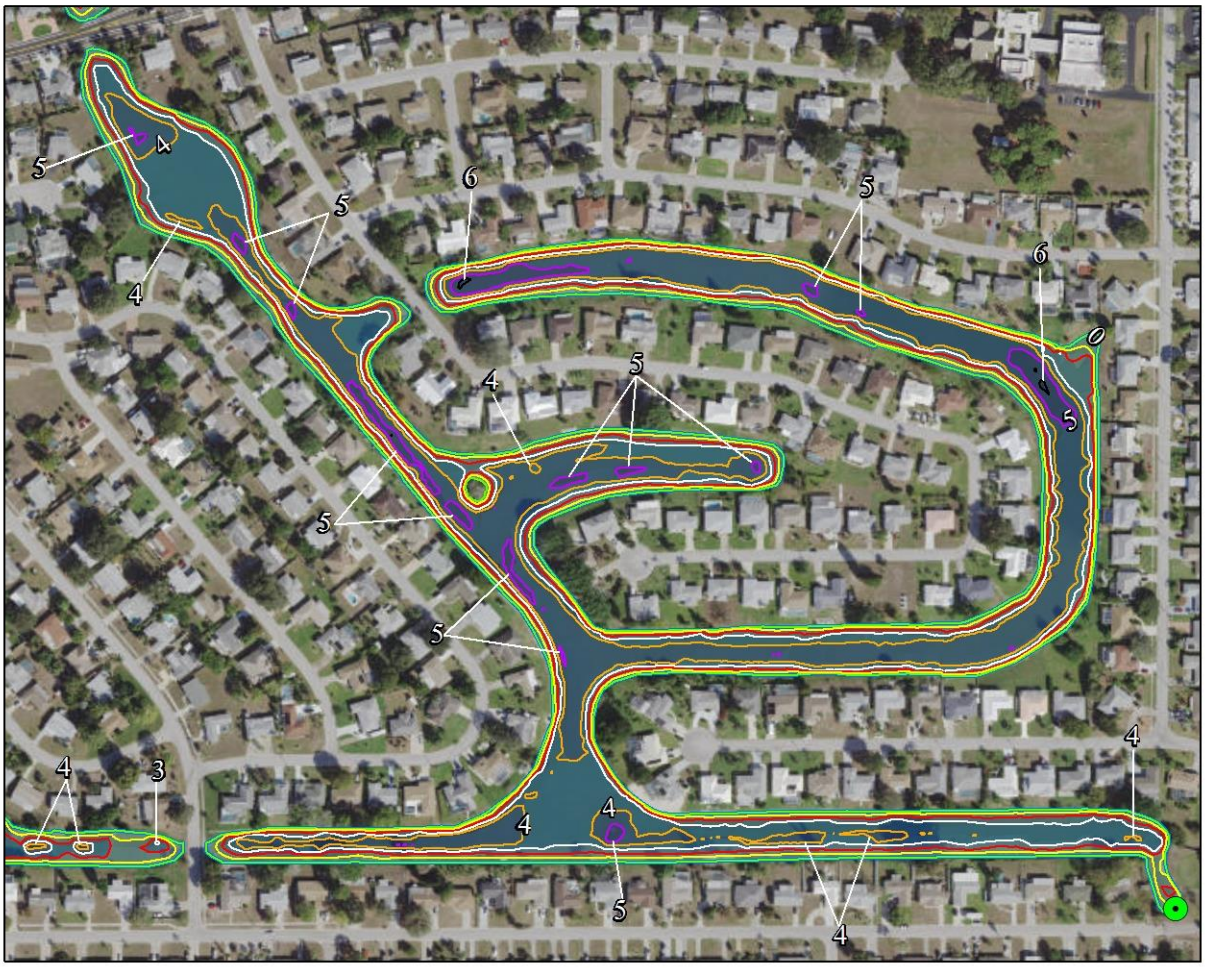

Figure 4 Venice Gardens Lake Southeast Section 1-Foot Bathymetric Contour Map

TASK 2 SUBMERGED AQUATIC VEGETATION ASSESSMENT

Collected sonar data was analyzed in SONAR TRX software to determine the presence/absence of SAV as well as the height of SAV where present and percentage of the volume of Venice Gardens Lake occupied by SAV. To accomplish this task the depth data was exported from the sonar data for all sonar pings. Next, first echo returns were manually digitized and calculated to correspond to the top of the SAV sonar signals. The resulting first echo return data corresponds to the depth at the top of SAV at each sonar ping. Figure 5 shows an example of the SONAR TRX processing window where the sonar chart indicates vertical spikes of SAV as the light green/yellow above the bottom, indicated by the top of the red/yellow band.

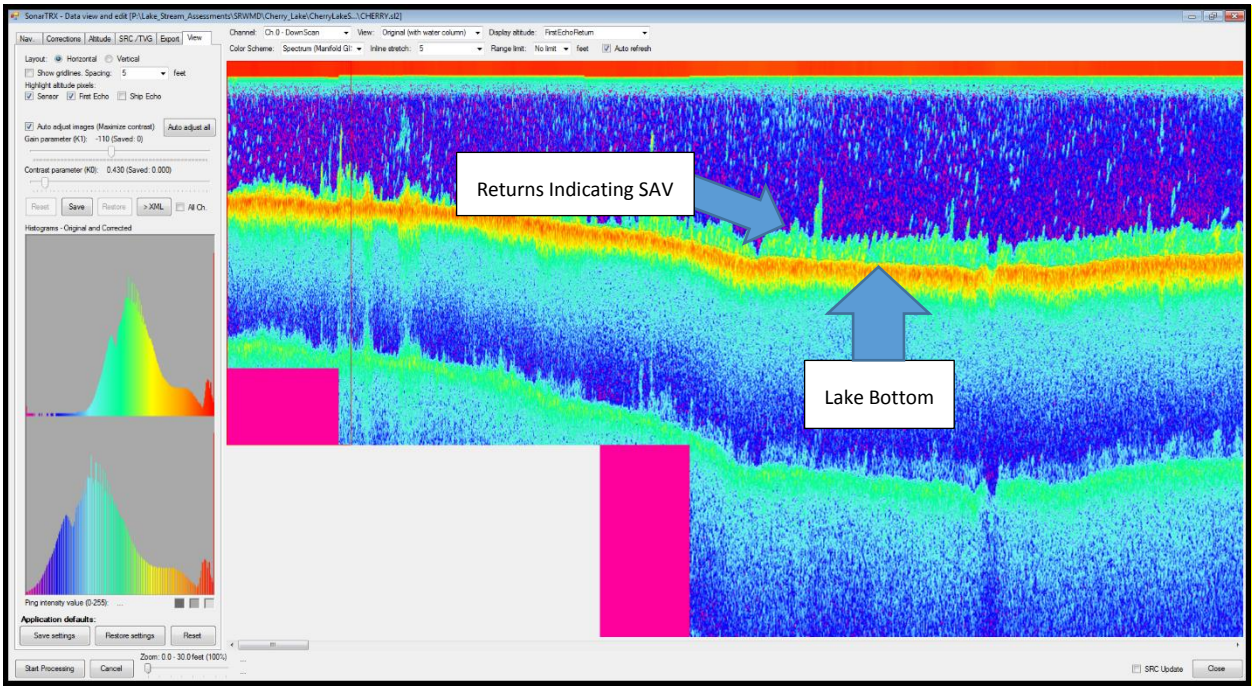

Figure 5 SONAR TRX screen showing SAV returns

From the depth and top of SAV data, the height of SAV and the percent inhabited of SAV in the water column was calculated for each ping. The resulting data was processed in ArcGIS to generate rasters of SAV height, SAV PAC and SAV PVI.

The analysis of the sonar data and resulting raster datasets showed that Venice Gardens Lake does not contain SAV. Figure 6 is an example of the collected sonar on Venice Gardens Lake for comparison with Figure 5. The absence of SAV resulted in a percent surface area covered (PAC) of 0%, see Figure 7 which shows SAV presence/absence as well as the results of the manual SAV sampling effort. This SAV community occupies approximately 0% of the volume of Venice Gardens Lake (PVI) as shown in Figure 8. Figure 9 shows the height of SAV raster for Venice Gardens Lake. There was not a deep edge of the SAV community identified as SAV was not observed in the lake. The Sonar derived data is summarized below in Table 2.

Concurrently collected while recording the sonar data, 245 manual vegetation samples were taken with the frodus device. The samples were analyzed for species present and a dominant species for each sample was assigned. The manual sampling did not identify any species of SAV during the assessment. The results are included in Figure 7 and summarized in Table 3. The raster of dominant species of SAV is shown in Figure 10 and Table 4.

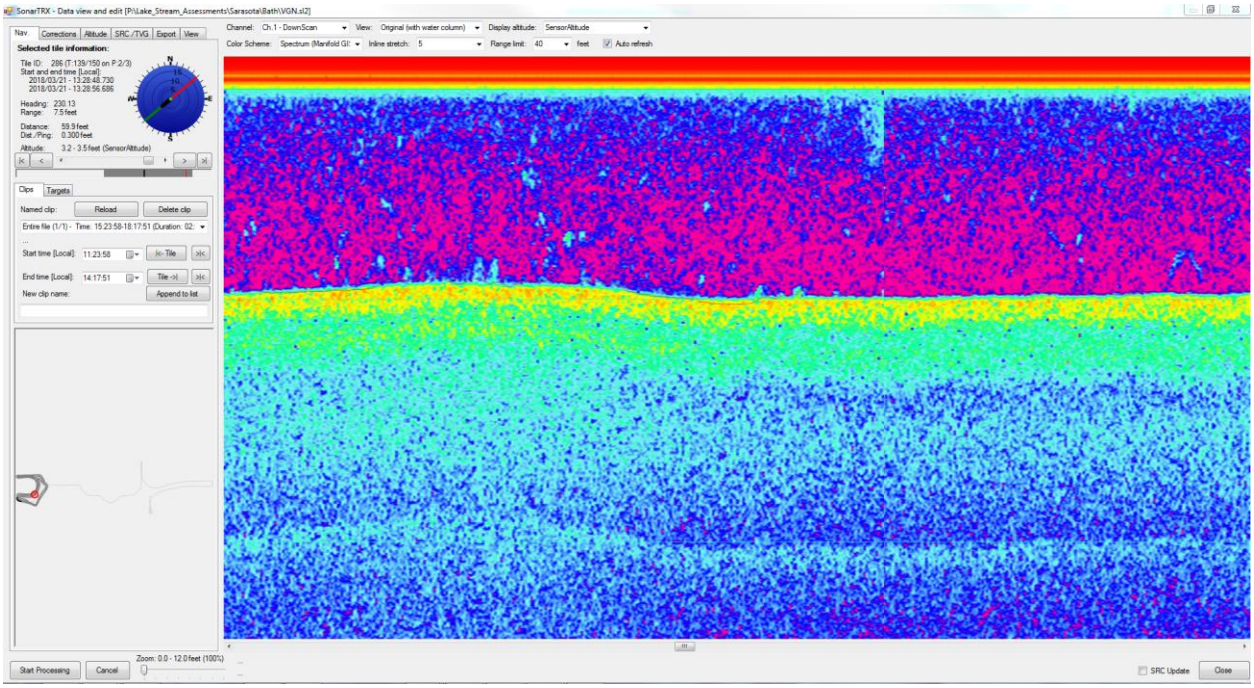

Figure 6 Typical Sonar Return Chart on Venice Gardens Lake Indicating a Lack of Returns Indicating SAV compared to the example shown previously in Figure 5

SAV Sonar Derived Statistics	
Parameter	**Value**
Percent Area Covered (PAC)	0%
Percent Volume Inhabited (PVI)	0%
Mean SAV Height	N/A
Estimated Deep Edge of SAV	N/A

Table 2 Summary Statistics for Sonar Derived Data for Venice Gardens Lake

Species	Code	Number of Samples Present	Percentage of Samples Present	Number of Samples Dominant	Percentage of Samples Dominant
No Vegetation	NONE	245	100%	245	100%
Total Samples	**245**				

Table 3 Summary of Manual SAV Sampling Results for Venice Gardens Lake. No SAV species were observed in the 245 samples. The lake was dominated by a lack of SAV.

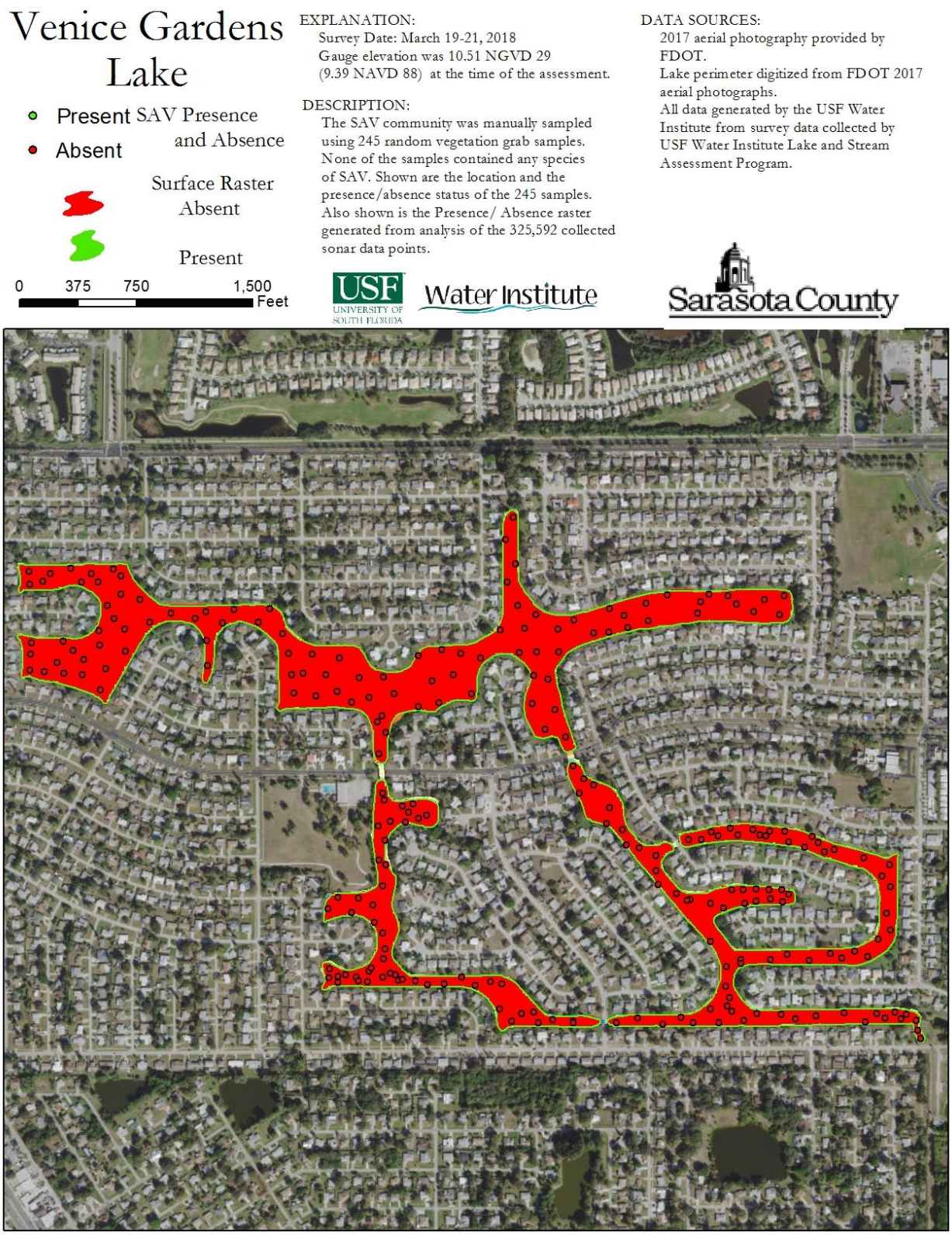

Figure 7 Venice Gardens SAV community Presence and Absence raster and manual SAV sampling results. The SAV community occupies 0% of the surface area of the lake.

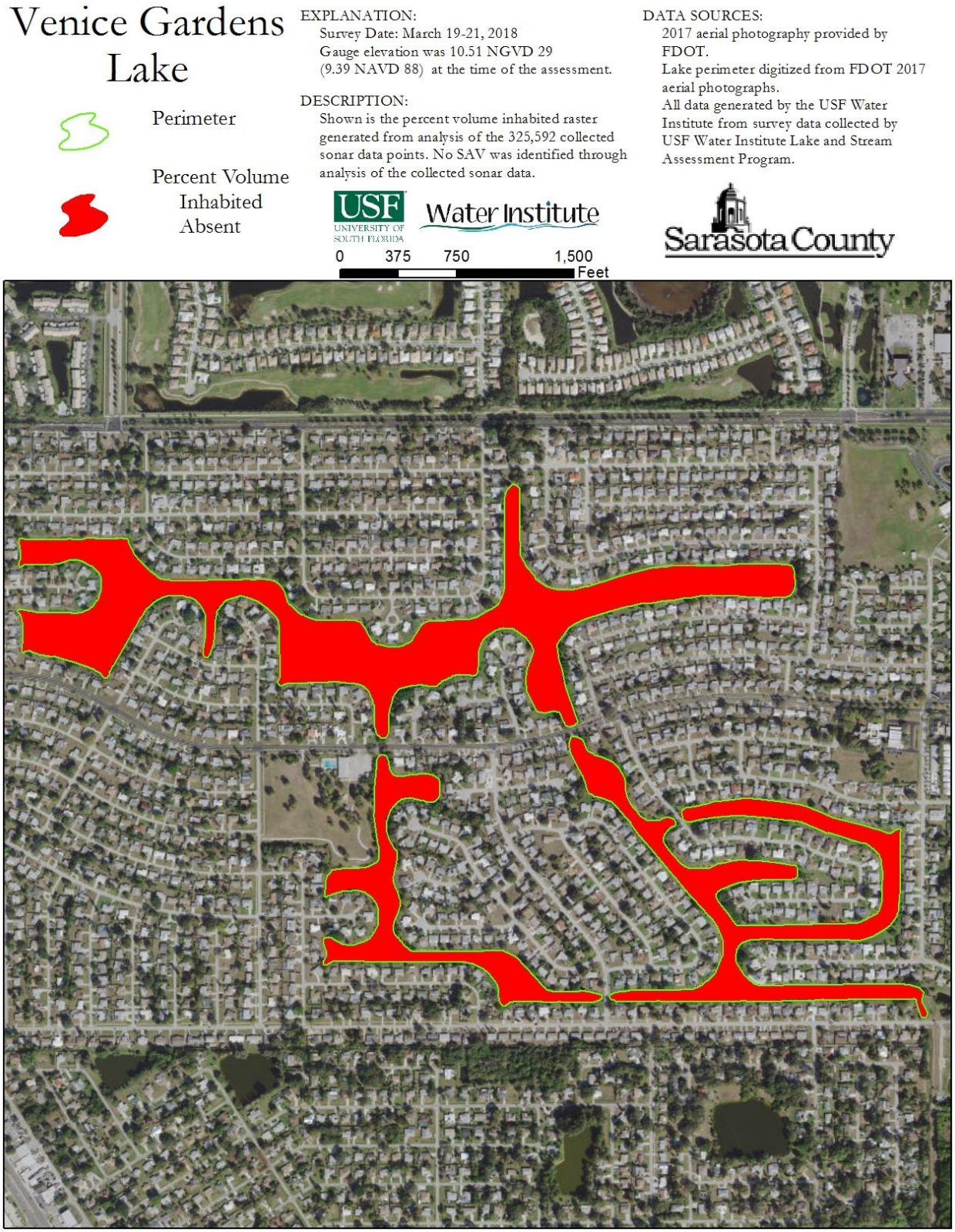

Figure 8 Venice Gardens Lake SAV Percent Volume Inhabited (PVI) raster. Classified values indicate the percentage of the water column occupied by SAV at a location. The PVI for the entire lake was 0%

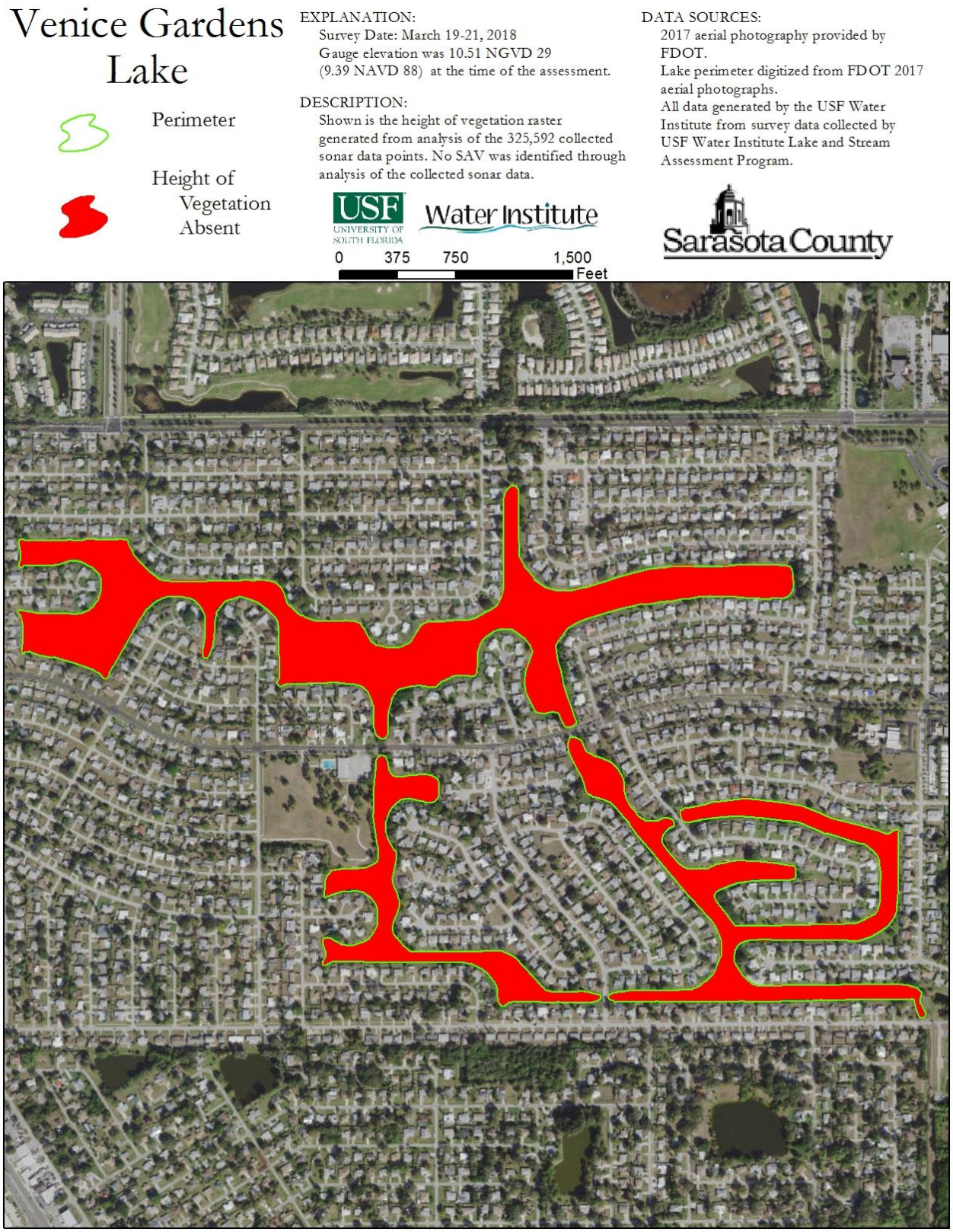

Figure 9 Venice Gardens Lake Height of SAV raster. Classified values indicate the height in feet above the bottom of the lake of the SAV community.

Figure 10 Polygons indicating the spatial distribution of SAV dominant species in Venice Gardens Lake.

Table 4 Summary of SAV Dominant Species Surface Area for Venice Gardens Lake

Dominant Vegetation	Surface Area (ft^2)	Acres	Percent Area Covered
NONE	3,010,016	69.1	100%

The SAV community in Venice Gardens Lake is noticeably absent. The system is dominated by phytoplankton as opposed to SAV and other aquatic macrophytes. The lack of an SAV community has multiple potential causes. First, the water clarity is extremely low with an average secchi disk depth during the assessment of 0.66 feet. Using a factor supported by Florida LakeWATCH (http://lakewatch.ifas.ufl.edu/circpdffolder/Circular111.pdf) of 1.7 x average secchi depth in feet for the low light potential of supporting SAV, the inhabitable depth for SAV in Venice Gardens Lake is approximately 1.12 feet. Long term water clarity data should be collected to determine a true mean secchi disk depth for the lake. Based on this calculation and the collected sonar bathymetry data, a raster was generated indicating potential areas where a SAV replanting effort could be effective at the current water level shown in Figure 11. It is important to note that at the time of the assessment the water level was 0.49 feet below the control elevation of the outfall weir and as such the raster indicating potential planting areas is larger than what will be suitable when the lake is at normal water levels.

The second factor currently inhibiting SAV growth is the relatively steep “littoral zone” in Venice Gardens Lake. Much of the shoreline of the lake has been armored with seawalls resulting in the water depth immediately water-ward of the seawall being beyond the depth of the low light potential of SAV.

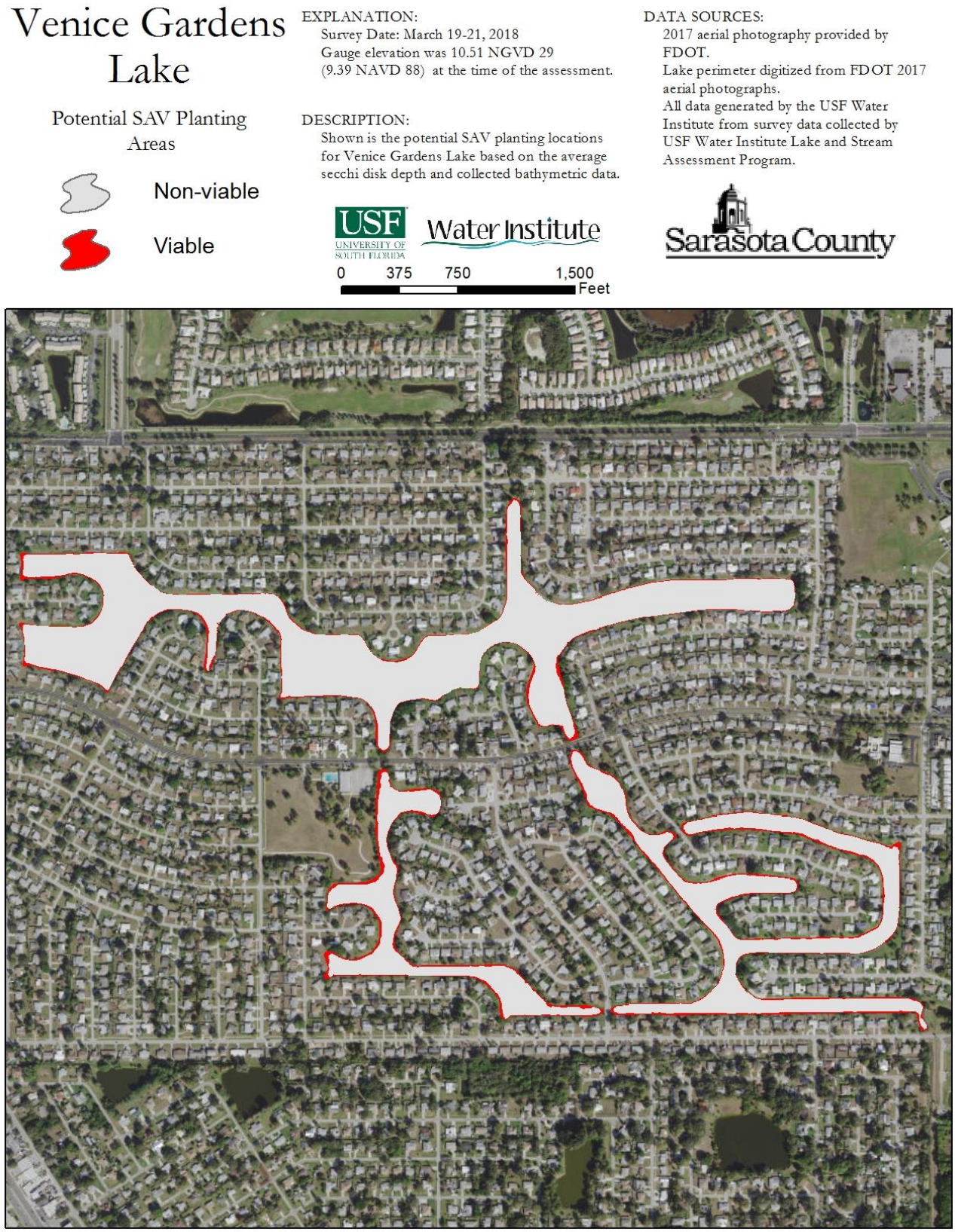

Figure 11 Potential SAV Planting Locations for Venice Gardens Lake

TASK 3 EXPLORATORY SEDIMENT SAMPLING

The sediments found in lakes often serve a role in the nutrient cycling and storage. To better understand the nutrient cycle in a lake it is valuable to know where deposits of nutrient rich organic "muck" are found and approximately how deep these accumulations extend. The distribution of sand and clay sediments are also important to understand to identify areas of sedimentation and erosion.

A total of twenty manual sediment samples were collected with a Wildco manual core sediment sampler. Procedures for collecting the samples followed FDEP guidance (https://floridadep.gov/sites/default/files/WMS-SamplingManual.pdf). In this sampling, the manual core sediment sampler was pressed while rotating into the sediments until significant resistance is encountered and normal body generated force does not further depress the coring device. Plastic core liners and retainer caps were utilized to confine the collected sample. Depth of water to sediment interface and depth of sample below sediment interface were recorded along with the samples GPS coordinates.

The sediment samples were photographed and described. In this process, each sediment sample was measured for overall height. Each major stratification was measured for height and described for color, texture and material description. The dominant stratification in the sample was recorded and an estimate of the percentage of the dominant stratification to the complete sample was noted. Stratifications were classified as sand, clay or muck using methods for determining soil texture by the feel method (http://www.floridahealth.gov/environmental-health/onsite-sewage/training/_documents/FLORIDA%20DOH%20BASIC%20SOILS%20TRAINING%20PROGRAM%20MANUAL%20MAY%202015.pdf). Sand dominant stratifications were gritty to the touch, with visible grains to the naked eye and retained little water. Clay dominant stratifications were sticky to the touch and retained water. Muck dominant stratifications were greasy to the touch. The images from the sediment sampling are included in the Appendix (Appendix A – Field Sediment Samples, Appendix B – Sediment Sample Processing).

The samples varied greatly between samples dominated by firm sand to samples dominated by consolidated muck. The results of the manual sediment sampling is shown in table form with descriptions in Tables 5 and 6. Six of the manual sediment samples were dominated by sand, the remaining fourteen were dominated by muck. Tables 7 and 8 summarize the individual sediment sample on Venice Gardens Lake.

The collected sonar data was processed for the ratio of transmitted signal to the backscatter return signal in Dr.Depth software. The result is a unitless measure of relative bottom hardness. The created raster indicates areas where the sediments are "harder" (low values, typically representing sand) or "softer" (high values, typically representing muck). Figures 12 through 15 show the processed relative bottom hardness raster along with the location, dominant sediment type and sediment depth (height of sample below sediment-water interface for the manual samples.

LAKE	DATE	DESCRIPTION	Depth Below Water-Sediment Interface (Ft)	Dominant Sediment Type	Percentage of Sample Dominant Type	LATITUDE	LONGITUDE	Water Depth to Sediment Interface (Ft)
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN SANDY MUCK, PUDDING CONSISTENCY DARK BROWN MUCK ON BOTTOM	2.5	MUCK	75	27.07682	-82.41860	3.52
VENICE GARDENS NORTH	3/21/2018	UNCONSOLIDATED LIGHT BROWN SANDY MUCK, DARK BROWN PUDDING CONSISTENCY MUCK ON BOTTOM	3	MUCK	95	27.07539	-82.41830	3.68
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN SAND WITH ORGANIC DEBRIS	0.5	SAND	80	27.07614	-82.41636	4.63
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN UNCONSOLIDATED MUCK, BROWN CONSOLIDATED MUCK BELOW	3	MUCK	85	27.07580	-82.41509	2.58
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN SAND WITH ORGANIC DEBRIS	0.25	SAND	90	27.07557	-82.41361	4.14
VENICE GARDENS NORTH	3/21/2018	UNCONSOLIDATED LIGHT BROWN MUCK, DARK BROWN MUCK PUDDING CONSISTENCY ON BOTTOM	0.75	MUCK	75	27.07394	-82.41173	3.25
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN SAND WITH ORGANIC DEBRIS	0.25	SAND	85	27.07563	-82.40947	4.88
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN UNCONSOLIDATED MUCK, BROWN CONSOLIDATED MUCK BELOW	2	MUCK	80	27.07757	-82.40916	2.14
VENICE GARDENS NORTH	3/21/2018	LIGHT BROWN UNCONSOLIDATED MUCK, BROWN CONSOLIDATED MUCK BELOW	2	MUCK	90	27.07432	-82.40841	2.77
VENICE GARDENS NORTH	3/21/2018	BROWN MUCK, PUDDING CONSISTENCY DARK BROWN MUCK ON BOTTOM	3	MUCK	85	27.07623	-82.40591	4.07

Table 5 Results of the Manual Sediment Sampling with Descriptions for Venice Gardens Lake North

LAKE	DATE	DESCRIPTION	Depth Below Water-Sediment Interface (Ft)	Dominant Sediment Type	Percentage of Sample Dominant Type	LATITUDE	LONGITUDE	Water Depth to Sediment Interface (Ft)
VENICE GARDENS SOUTHEAST	3/19/2018	LIGHT BROWN FINE SAND WITH ORGANICS	0.3	SAND	80	27.06897	-82.40689	4.26
VENICE GARDENS SOUTHEAST	3/19/2018	LIGHT BROWN UNCONSOLIDATED MUCK WITH SAND BOTTOM	1.75	MUCK	90	27.07299	-82.40753	3.78
VENICE GARDENS SOUTHEAST	3/19/2018	LIGHT BROWN FINE SAND WITH ORGANIC DEBRIS	0.6	SAND	75	27.06876	-82.40109	2.78
VENICE GARDENS SOUTHEAST	3/20/2018	BROWN UNCONSOLIDATED MUCK, PUDDING LIKE CONSISTENCY ON BOTTOM	2.5	MUCK	95	27.06925	-82.40489	3.45
VENICE GARDENS SOUTHEAST	3/20/2018	BROWN UNCONSOLIDATED MUCK, LIGHT BROWN SAND ON BOTTOM	3	MUCK	85	27.07006	-82.40461	4.28
VENICE GARDENS SOUTHEAST	3/20/2018	BROWN UNCONSOLIDATED MUCK, LIGHT BROWN SAND ON BOTTOM	3.5	MUCK	85	27.07106	-82.40523	4.04
VENICE GARDENS SOUTHWEST	3/20/2018	BROWN CONSOLIDATED MUCK, PUDDING LIKE CONSISTENCY ON BOTTOM	3.25	MUCK	98	27.07265	-82.41120	2.06
VENICE GARDENS SOUTHWEST	3/20/2018	BROWN CONSOLIDATED MUCK, LIGHT BROWN SAND ON BOTTOM	2.75	MUCK	95	27.07101	-82.41189	3.03
VENICE GARDENS SOUTHWEST	3/20/2018	BROWN UNCONSOLIDATED MUCK, LIGHT BROWN SAND ON BOTTOM	2.75	MUCK	95	27.06975	-82.41258	4.21
VENICE GARDENS SOUTHWEST	3/20/2018	LIGHT BROWN FINE SAND WITH ORGANICS	0.5	SAND	95	27.06897	-82.40793	1.98

Table 6 Results of the Manual Sediment Sampling with Descriptions for Venice Gardens Lake Southeast and Southwest

LAKE	Sediment Sample Height (In)	LAYER_1	LAYER_2	LAYER_3	LAYER_4	Reference Picture
VENICE GARDENS NORTH	17.5	0 - 0.25 Tan Fine Sand	0.25 - 13 Brown Consolidated Muck	13 - 17.5 Brown Unconsolidated Muck		VGN_1
VENICE GARDENS NORTH	18	0 - 4 Dark Grey Consolidated Muck (Pudding)	4 - 13 Brown Consolidated Muck	13 - 18 Brown Unconsolidated Muck		VGN_2
VENICE GARDENS NORTH	5.5	0 - 4 Tan Sand with Organics	4 - 5.5 Tan Mucky Sand			VGN_3
VENICE GARDENS NORTH	17	0 - 2 Dark Brown Consolidated Muck (Pudding)	2 - 11 Brown Consolidated Muck	11 - 17 Light Brown Unconsolidated Muck		VGN_4
VENICE GARDENS NORTH	3.5	0 - 3 Light Brown Fine Sand	3 - 3.5 Light Brown Mucky Sand			VGN_5
VENICE GARDENS NORTH	12.5	0 - 2 Dark Brown Consolidated Muck (Pudding)	2 - 9.5 Brown Consolidated Muck	9.5 - 12.5 Brown Unconsolidated Muck		VGN_6
VENICE GARDENS NORTH	5.5	0 - 5 Light Brown Fine Sand	5 - 5.5 Light Brown Consolidated Muck			VGN_7
VENICE GARDENS NORTH	16.5	0 - 1.5 Dark Brown Sandy Muck	1.5 - 10 Dark Brown Consolidated Muck	10 - 16.5 Brown Unconsolidated Muck		VGN_8
VENICE GARDENS NORTH	15	0 - 1 Dark Brown Sandy Muck	1 - 3 Dark Brown Consolidated Muck	3 - 8 Brown Consolidated Muck	8 - 15 Brown Unconsolidated Muck	VGN_9
VENICE GARDENS NORTH	20	0 - 10 Dark Brown Consolidated Muck	10 - 20 Brown Unconsolidated Muck			VGN_10

Table 7 Sediment Sample Descriptions for Venice Gardens Lake North

LAKE	Sediment Sample Height (In)	LAYER_1	LAYER_2	LAYER_3	LAYER_4	Reference Picture
VENICE GARDENS SOUTHEAST	4.5	0 - 4.5 Light Brown Sand, fine with oranic matter				VGSE_1
VENICE GARDENS SOUTHEAST	10.5	0 - 5.5 Light Brown Consolidated Muck	5.5 - 10.5 Light Brown Unconsolidated Muck			VGSE_2
VENICE GARDENS SOUTHEAST	8	0 - 8 Light Brown Fine Sand with Organic Matter				VGSE_3
VENICE GARDENS SOUTHEAST	13	0 - 0.5' Brown Sandy Muck	0.5 - 7 Brown Consolidated Muck (Pudding)	7 - 13 Unconsolidated Light Brown Muck		VGSE_4
VENICE GARDENS SOUTHEAST	18	0 - 4 Tan Sand, Fine	4 - 13 Brown Consolidated Muck (Pudding)	13 - 18 Light Brown Unconsolidated Muck		VGSE_5
VENICE GARDENS SOUTHEAST	19	0 - 3 Tan Sand Fine	3 - 6 Brown Consolidated Muck with Black/ Grey Streaks	6 - 16 Brown Consolidated Muck	16 - 19 Brown Unconsolidated Muck	VGSE_6
VENICE GARDENS SOUTHWEST	19	0 - 15 Brown Consolidated Muck (Pudding)	15 - 19 Brown Unconsolidated Muck			VGSW_1
VENICE GARDENS SOUTHWEST	18	0 - 2.5 Light Brown Fine Sand	2.5 - 14 Brown Consolidated Muck	14 - 18 Brown Unconsolidated Muck		VGSW_2
VENICE GARDENS SOUTHWEST	18	1 - 2.5 Light Brown Fine Sand	2.5 - 7 Brown Consolidated Muck	7 - 18 Brown Unconsolidated Muck		VGSW_3
VENICE GARDENS SOUTHWEST	6.5	0 - 6.5 Light Brown Fine Sand with Organics				VGSW_4

Table 8 Sediment Sample Descriptions for Venice Gardens Lake Southeast and Southwest

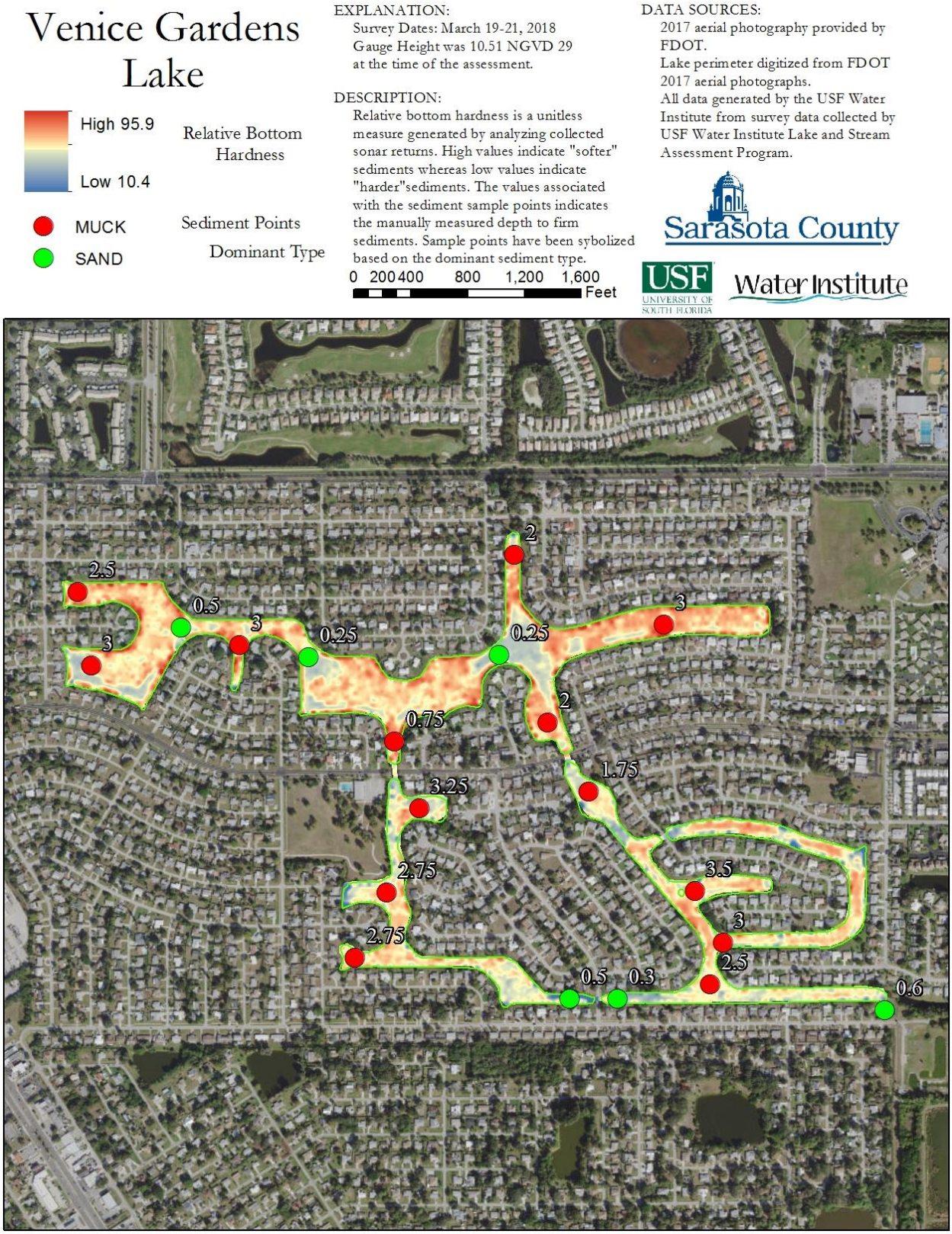

Figure 12 Relative Bottom Hardness Raster, dominant sediment type and Sediment Depth for Manual Samples

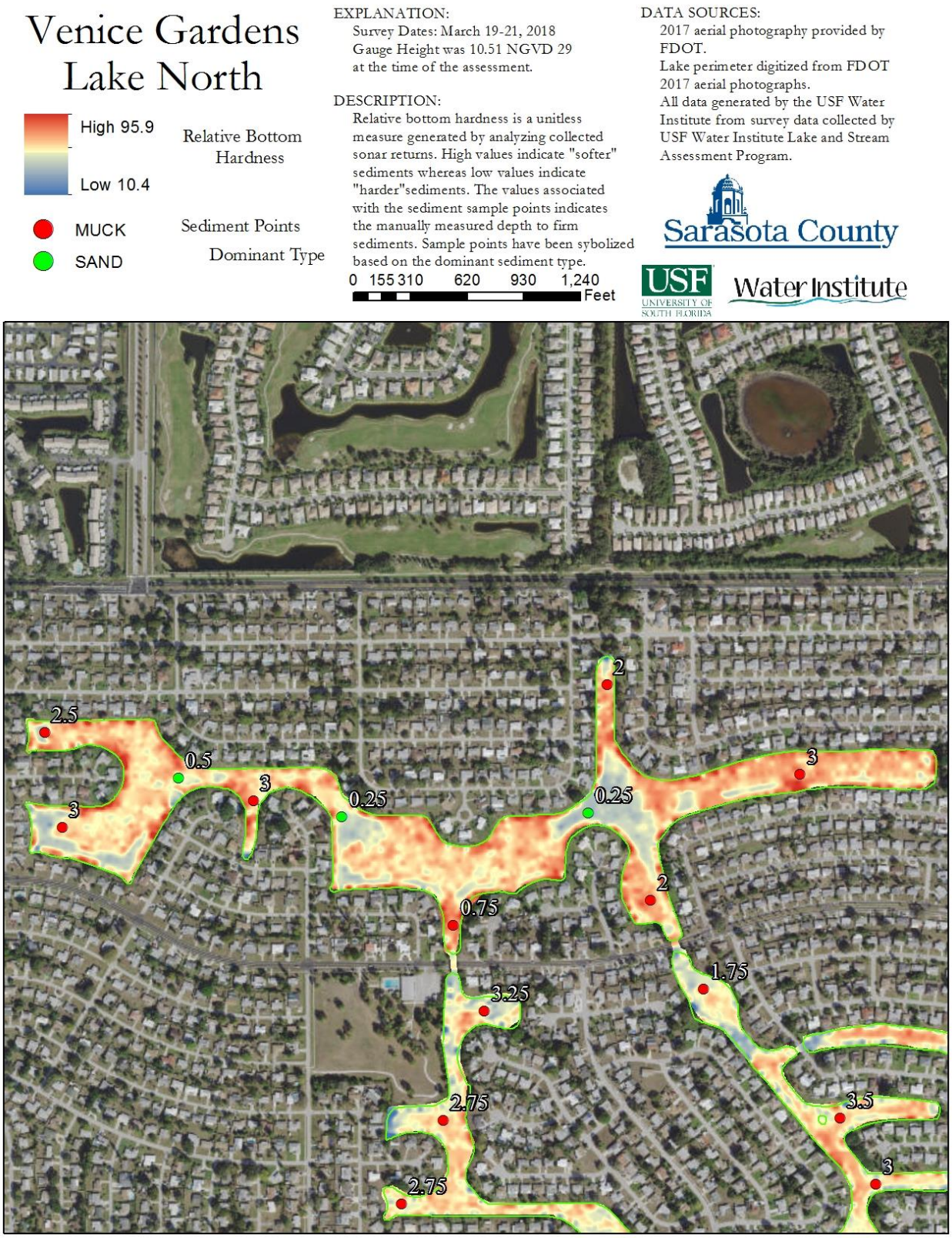

Figure 13 Relative Bottom Hardness Raster, dominant sediment type and Sediment Depth for Manual Samples

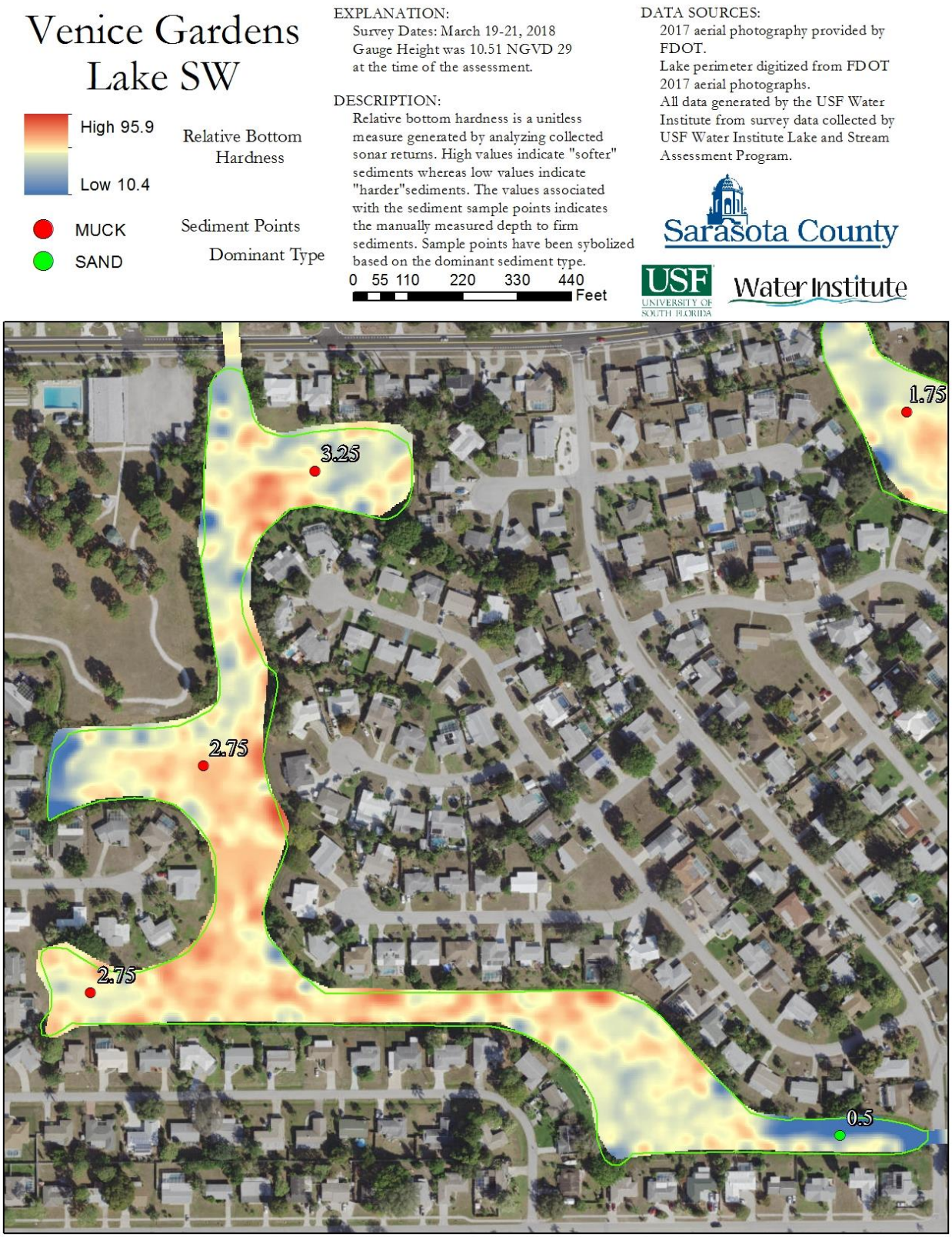

Figure 14 Relative Bottom Hardness Raster, dominant sediment type and Sediment Depth for Manual Samples

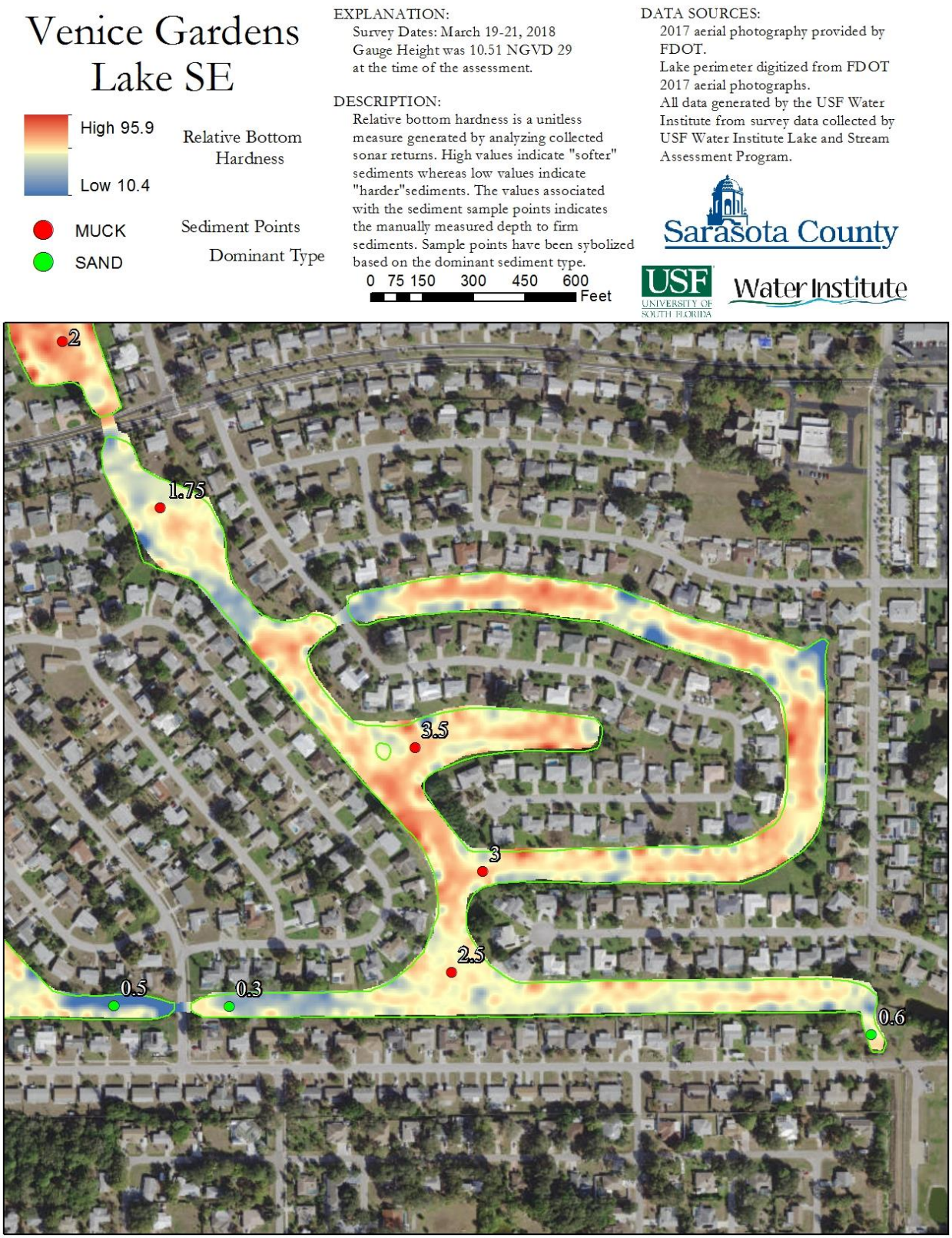

Figure 15 Relative Bottom Hardness Raster, dominant sediment type and Sediment Depth for Manual Samples

CONCLUSION

Venice Gardens Lake near Venice, Florida is a eutrophic system dominated by phytoplankton fueled by elevated nutrients (Phosphorous and Nitrogen). Limited water quality for the lake is available at the Sarasota Water Atlas (http://www.sarasota.wateratlas.usf.edu/lake/waterquality.asp?wbodyid=16762&wbodyatlas=lake) with a sampling date range of 4/7/2014 – 10/19/17. This assessment is intended to assist in establishing data for fundamental components of the lakes morphology and their potential roles in nutrient cycling.

Bathymetric data was collected to characterize the lakes morphology in terms of volume, mean and max depths as well as the spatial distribution of bottom depths. The results of the bathymetric mapping assessment showed that Venice Gardens Lake is a shallow water system with a mean depth of 3.17 feet and a max depth of 6.46 feet at the water elevation during the assessment of 10.51 ft NGVD 29 (9.39 ft NAVD 88). The control elevation for the outfall weir on Venice Gardens Lake is 11.0 ft NGVD 29 (9.88 ft NAVD 88). At the control elevation height, the mean depth of the lake would be 3.66 ft and a max depth of 6.95 ft. The lake shoreline has been armored with seawalls and rock rubble creating a steep slope near shore with a narrow littoral zone in about half of the lake.

Submerged vegetation assessments were performed to characterize the aquatic macrophyte community present on Venice Gardens Lake. SAV plays a vital role in nutrient cycling in Florida lakes by utilizing nutrients from the water column as well as sediments to grow, reducing the uptake of the nutrients by phytoplankton. The SAV assessment used two methods of assessment, sonar derived data and manual sampling. The collected sonar data contained 325,592 data points which were analyzed for presence and absence of SAV. When present, the height of SAV was measured on the sonar chart. During this portion of the assessment, no submerged vegetation was observed in Venice Gardens Lake. The manual sampling portion of the assessment included 245 random grab samples using a “frodus” device. SAV was not observed on any of the random grab samples. Due to the importance of the SAV community, a map indicating the potential areas that could be planted with SAV was generated using a factor of 1.7x mean secchi depth value. During the assessment, the mean secchi depth value was 0.66 feet, so an estimate of 1.122 feet was generated as the extent of inhabitable bottom depths at the current water level.

Lake exploratory sediment sampling was used to generate some basic data about the bottom sediments of Venice Gardens Lake. Twenty manual sediment cores were taken to estimate the thickness of soft sediments and determine types of sediments present (sand, muck, clay). Six of the samples (30%) were dominated by sand sediments with little accumulation of soft organic matter. The remaining contained consolidated and unconsolidated muck as the dominant type.

APPENDIX A –FIELD SEDIMENT SAMPLING

Below are the images collected during the field portion of the sediment sampling efforts.

Figure 16 Venice Gardens Lake North Sediment Sample 1

Figure 17 Venice Gardens Lake North Sediment Sample 2

Figure 18 Venice Gardens Lake North Sediment Sample 3

Figure 19 Venice Gardens Lake North Sediment Sample 4

Figure 20 Venice Gardens Lake North Sediment Sample 5

Figure 21 Venice Gardens Lake North Sediment Sample 6

Figure 22 Venice Gardens Lake North Sediment Sample 7

Figure 23 Venice Gardens Lake North Sediment Sample 8

Figure 24 Venice Gardens Lake North Sediment Sample 9

Figure 25 Venice Gardens Lake North Sediment Sample 10

Figure 26 Venice Gardens Lake North Sediment Samples 1-5

Figure 27 Venice Gardens Lake North Sediment Samples 6-10

Figure 28 Venice Gardens Lake Southeast Sediment Sample 1

Figure 29 Venice Gardens Lake Southeast Sediment Sample 2

Figure 30 Venice Gardens Lake Southeast Sediment Sample 3

Figure 31 Venice Gardens Lake Southeast Sediment Sample 4

Figure 32 Venice Gardens Lake Southeast Sediment Sample 5

Figure 33 Venice Gardens Lake Southeast Sediment Sample 6

Figure 34 Venice Gardens Lake Southwest Sediment Sample 1

Figure 35 Venice Gardens Lake Southwest Sediment Sample 2

Figure 36 Venice Gardens Lake Southwest Sediment Sample 3

Figure 37 Venice Gardens Lake Southwest Sediment Sample 4

Figure 39 Venice Gardens Lake Southeast and Southwest Sediment Samples. Southwest samples are 1-4 on the left, southeast samples are 5-10 on the right

APPENDIX B –SEDIMENT SAMPLE PROCESSING

The following are the images taken during the sediment sample processing efforts and are intended to give a sense of the materials in the samples.

Figure 40 Venice Gardens Lake North Sediment Sample Processing 1

Figure 41 Venice Gardens Lake North Sediment Sample Processing 2

Figure 42 Venice Gardens Lake North Sediment Sample Processing 3

Figure 43 Venice Gardens Lake North Sediment Sample Processing 4

Figure 44 Venice Gardens Lake North Sediment Sample Processing 5

Figure 45 Venice Gardens Lake North Sediment Sample Processing 6

Figure 46 Venice Gardens Lake North Sediment Sample Processing 7

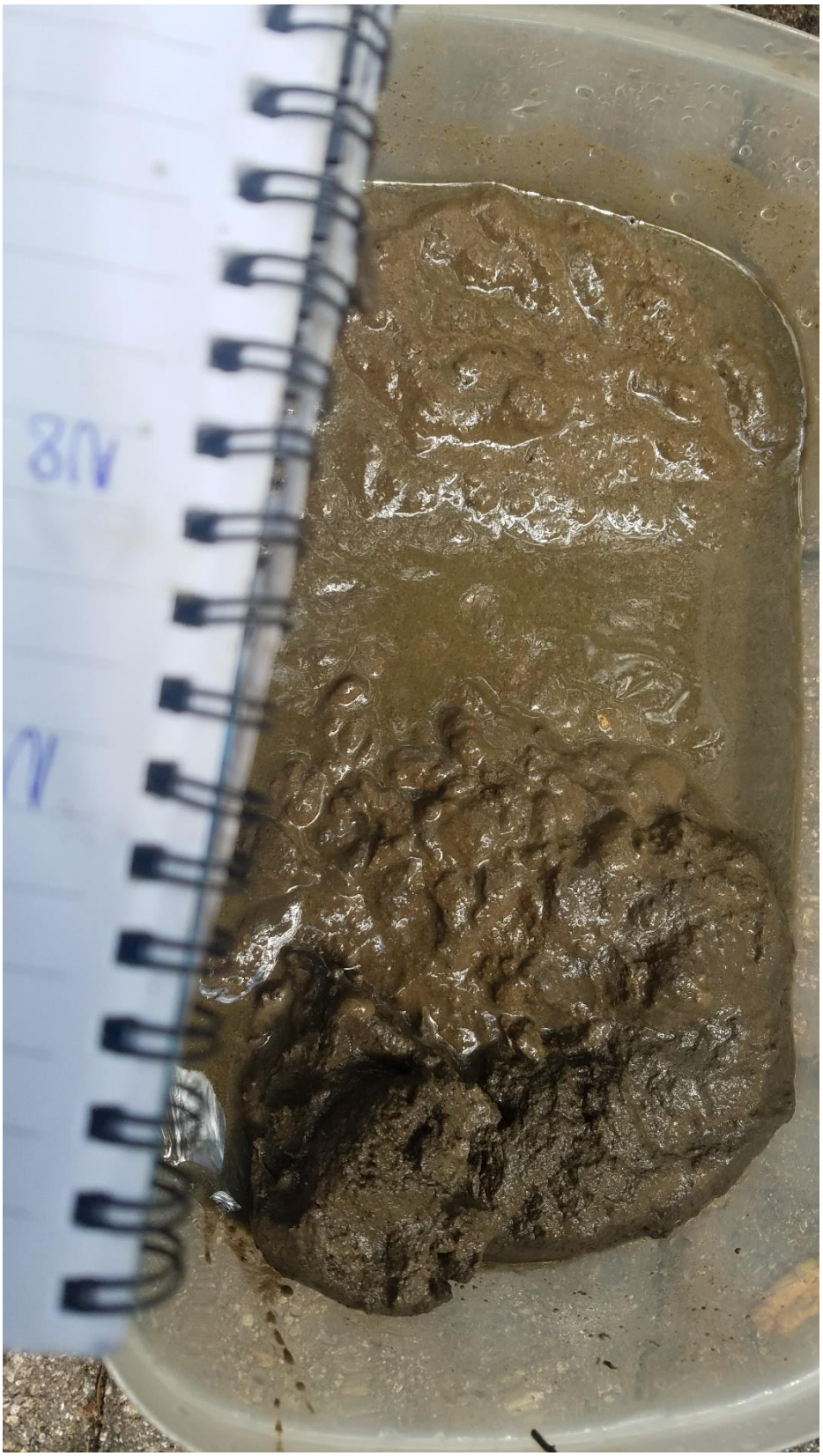

Figure 47 Venice Gardens Lake North Sediment Sample Processing 8

Figure 48 Venice Gardens Lake North Sediment Sample Processing 9

Figure 49 Venice Gardens Lake North Sediment Sample Processing 10

Figure 10 Venice Gardens Lake Southeast Sediment Sample Processing 1

Figure 11 Venice Gardens Lake Southeast Sediment Sample Processing 2

Figure 12 Venice Gardens Lake Southeast Sediment Sample Processing 3

Figure 13 Venice Gardens Lake Southeast Sediment Sample Processing 4

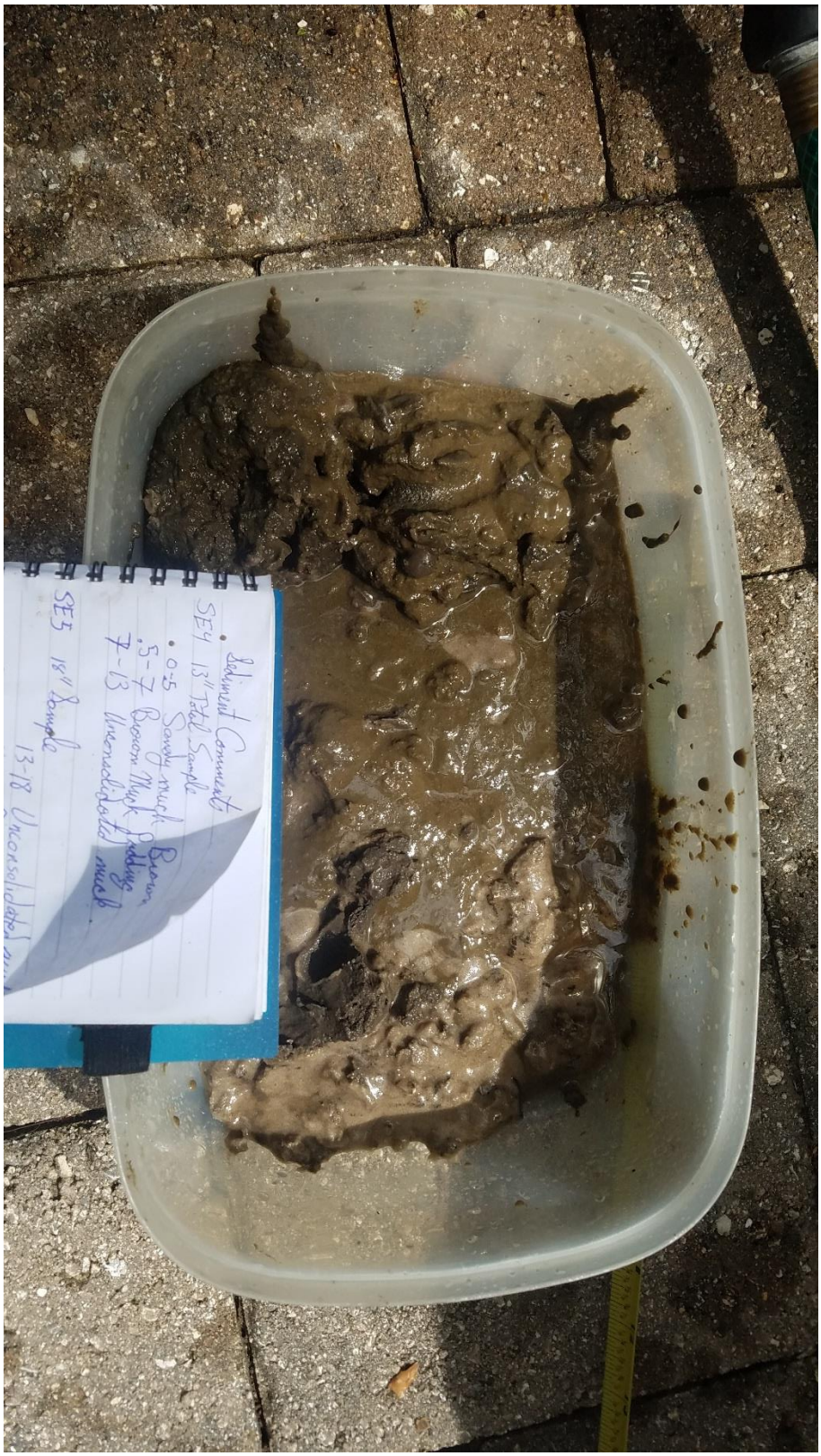

Figure 14 Venice Gardens Lake Southeast Sediment Sample Processing 5

Figure 15 Venice Gardens Lake Southeast Sediment Sample Processing 6

Figure 16 Venice Gardens Lake Southwest Sediment Sample Processing 1

Figure 57 Venice Gardens Lake Southwest Sediment Sample Processing 2

Figure 58 Venice Gardens Lake Southwest Sediment Sample Processing 3

Figure 17 Venice Gardens Lake Southwest Sediment Sample Processing 4