TAYLOR ENGINEERING, INC.

Submerged Resource Survey

Fisherman's Wharf Marina
St. Lucie County, Florida
October 2016

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Submerged Resource Survey
Fisherman's Wharf Marina
St. Lucie County, Florida

Prepared for

St. Lucie County

by

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C2016-042
October 2016

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1.0 INTRODUCTION

St. Lucie County is proposing to improve the Fisherman's Wharf Marina located in Ft. Pierce, St. Lucie County, Florida, between the Port of Ft. Pierce and the western terminus of the South Causeway (SR A1A) crossing the Indian River (Figure 1). A primary component of the proposed improvement plan includes rehabilitation of the existing bulkhead. St. Lucie County contracted Taylor Engineering to survey a portion of the marina basin and adjacent submerged lands to map and characterize submerged natural resources. Data collected during the survey will support the planning, design, and permitting phases of the proposed improvements and will provide the basis for assessing potential natural resource impacts related to the project. This report documents the results of the submerged natural resources survey.

2.0 SITE DESCRIPTION

The study area comprises 2.62 acres and consists of the submerged lands located within 120 feet seaward of the existing marina bulkhead alignment (Figure 2). Wet slip boat storage at the marina is currently inactive due to the deteriorating state of the existing bulkhead with the exception of a few slips that support the bait shop/boat rental outfit on the property. The double lane boat ramp also continues to operate. St. Lucie County staff indicated that the marina had been largely inactive for approximately two months prior to the resource survey.

3.0 TECHNICAL APPROACH

3.1 Survey Methodology

The study area falls within the natural range of *Halophila johnsonii* (Johnson's seagrass), a federally-listed threatened species. Accordingly, Taylor Engineering employed a survey methodology consistent with the recommendations of the Johnson's Seagrass Recovery Team for large sites (National Marine Fisheries Service [NMFS], 2002). The survey recommendations for large sites apply to investigation areas greater than one hectare (2.47 acres). The survey included a preliminary visual reconnaissance of the study area followed by intensive sampling within areas identified as seagrass habitat. In addition, Taylor Engineering mapped and characterized shoreline wetland vegetation occurring within the study area. The following subsections detail the field survey approach.

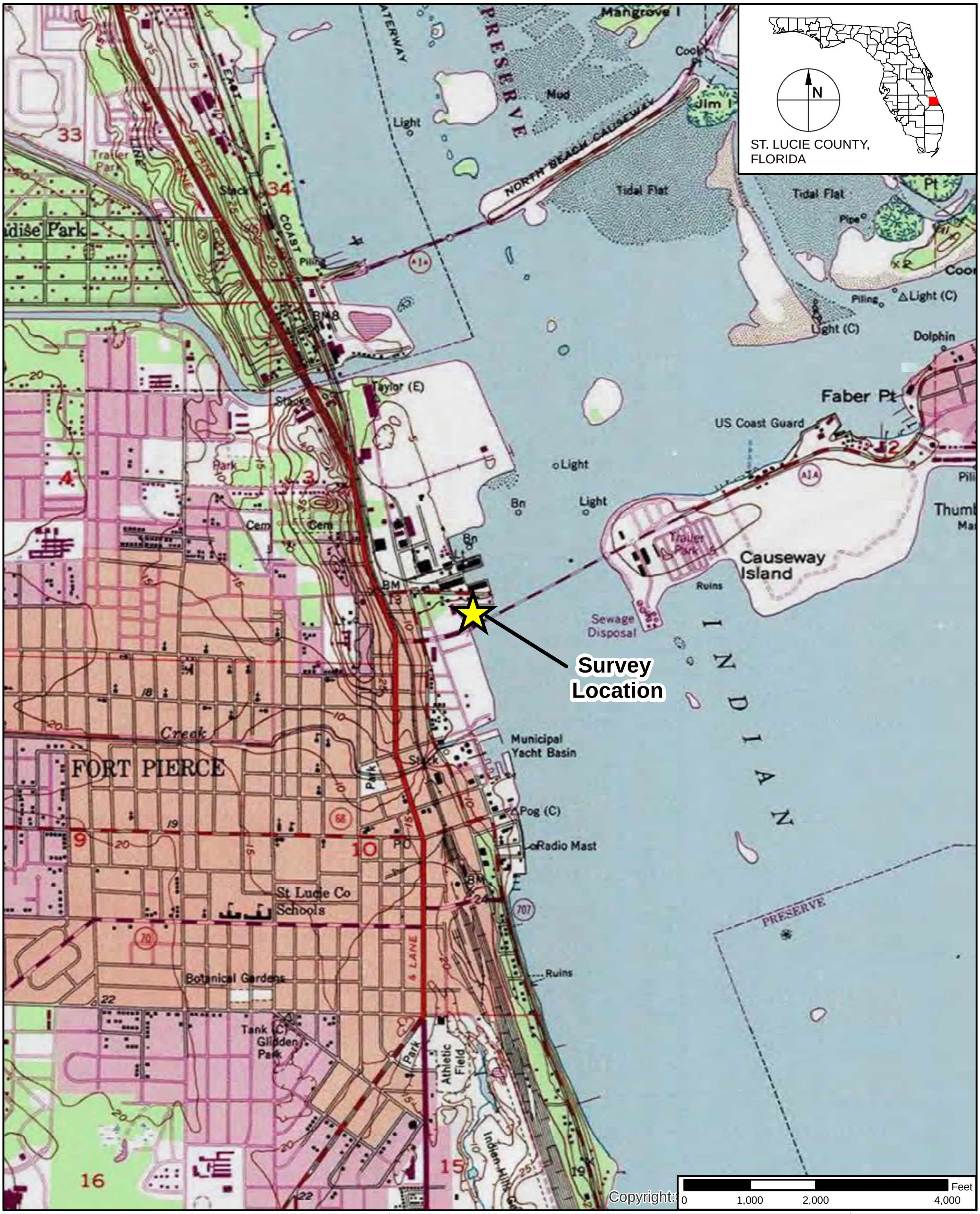

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FIGURE 1
LOCATION MAP
FISHERMAN'S WHARF SUBMERGED RESOURCE SURVEY
FT. PIERCE, ST. LUCIE COUNTY, FLORIDA

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3.1.1 Preliminary Visual Reconnaissance

In accordance with Johnson's seagrass survey protocol, Taylor Engineering environmental staff performed a preliminary in-water visual reconnaissance to determine the general occurrence and distribution of seagrasses within the project area and to confirm the presence of *H. johnsonii*. The preliminary reconnaissance consisted of a Taylor Engineering biologist snorkeling along sinuous transects spaced approximately 20 – 30 feet apart covering the entire 2.62-acre survey area (Figure 2). The diver used marker buoys to delineate the extent of seagrass habitat or the location of other sensitive submerged resources encountered during the preliminary assessment. Taylor Engineering environmental staff used a Trimble™ differentially-corrected global positioning system (DGPS) with sub-meter accuracy to record the horizontal location of the marker buoys.

3.1.2 Line Intercept Sampling

For the detailed portion of the survey, Taylor Engineering environmental staff established a series shore-perpendicular transects within the study area. Fifteen transects spaced at approximate 12-meter intervals along the submerged bottom extended across the length of the study area (Figure 2). Field staff used the DGPS to navigate to each transect endpoint. Flagged PVC stakes or weighted buoys marked the transect endpoints. A weighted nylon line marked in one meter increments extended along the submerged bottom between the transect endpoints to establish the transect line. Field staff swam along each transect and collected line intercept data to delineate resource habitat and substrate along the entire transect length. Additional qualitative data recorded along each transect included seagrass species composition and estimates of relative cover (i.e., sparse, low, moderate, dense). Field staff used the DGPS to record the location of seagrass bed edges along each transect and between transects as necessary. These data provided the basis for developing resource maps in ArcGIS.

3.1.3 Quadrat Sampling

Taylor Engineering environmental staff collected quantitative data along each transect using a quadrat sampling approach. This approach included deploying a 1-square meter quadrat subdivided into 100 sub-units at the 0 point and at 6-meter intervals along each transect. Quadrat data collection only occurred if the sampling station fell within areas identified as seagrass habitat. At each quadrat location, field staff collected data for each species present including the number of sub-units containing at least one seagrass shoot, the average cover abundance score (Braun-Blanquet, 1965), and additional information

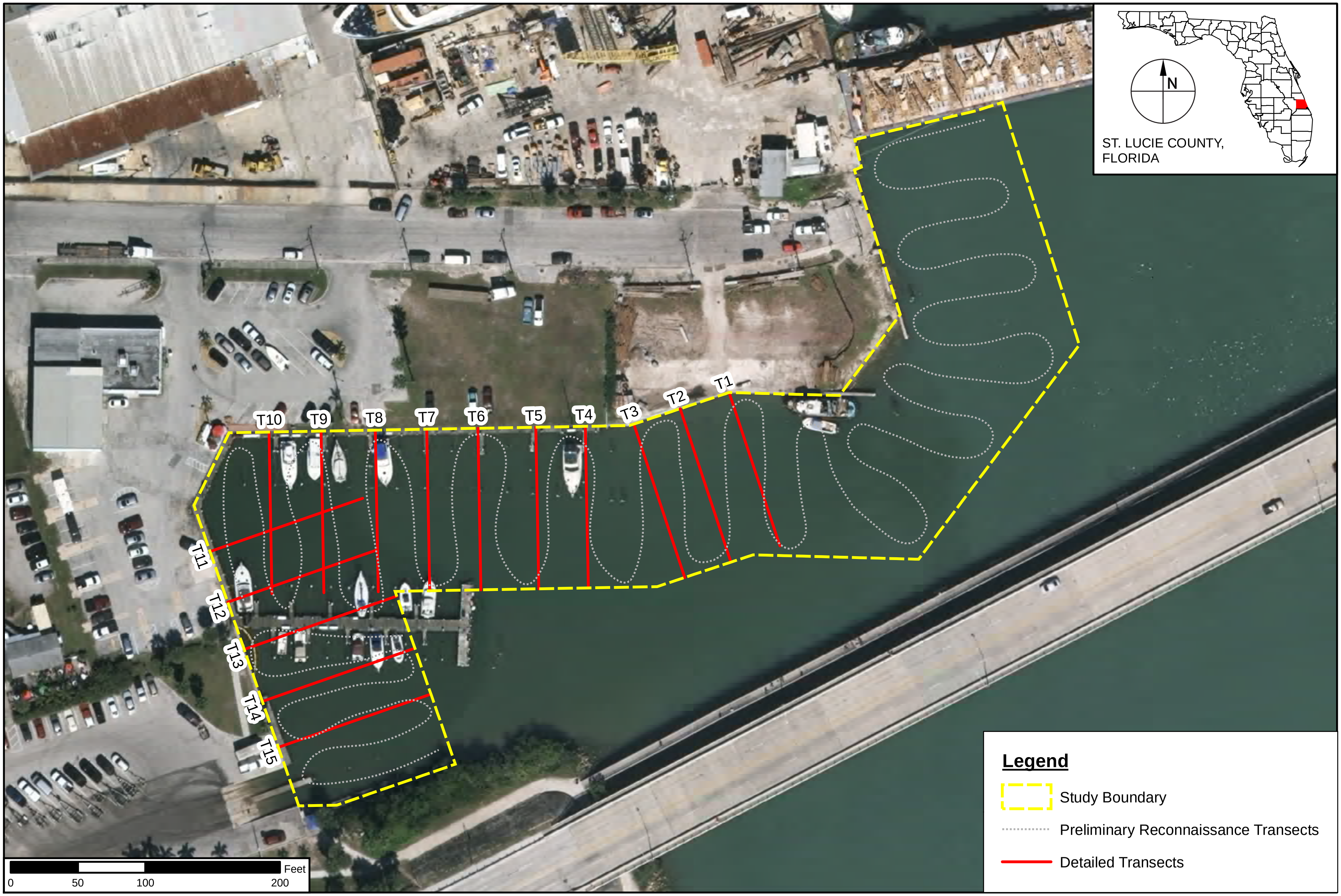

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FIGURE 2
SURVEY BOUNDARY AND TRANSECT LOCATIONS
FISHERMAN'S WHARF SUBMERGED RESOURCE SURVEY
FT. PIERCE, ST. LUCIE COUNTY, FLORIDA

Notes:
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(e.g., water depth, substrate conditions) as appropriate. For each quadrat, field staff assigned a cover abundance score for each species present based on the following cover scale values (Braun-Blanquet scale):

0.1 = Solitary shoot
0.5 = Few shoots with less than 5% cover
1.0 = Numerous shoots but less than 5% cover
2.0 = Any number of shoots with 5 – 25% cover
3.0 = Any number of shoots with 25 – 50% cover
4.0 = Any number of shoots with 50 – 75% cover
5.0 = Any number of shoots with greater than 75% cover

3.1.4 Shoreline Wetland Vegetation Assessment

Field staff evaluated the study area shoreline for the presence of wetland vegetation. Field staff collected qualitative data (e.g., species and general characteristics) and mapped the vegetation location using the DGPS.

3.2 Seagrass Data Analysis

Following data collection, Taylor Engineering staff used the quadrat data and applied the Braun-Blanquet (1965) methodology to calculate the frequency of occurrence, abundance, and density for each species present along each transect. The equations for each of these metrics follow.

Frequency of occurrence (%) = (Number of occupied sub-units / total number of sub-units) x 100
Abundance = Sum of Braun-Blanquet cover score values / number of occupied quadrats
Density = Sum of Braun-Blanquet cover score values / total number of quadrats

4.0 RESULTS AND DISCUSSION

Taylor Engineering environmental staff conducted the survey on August 22 – 23, 2016 within the annual survey window (June 1 – September 30) recommended by NMFS. Weather during the survey included sunny to partly cloudy skies, 85 – 90 degree temperatures, and light (~0 – 8 mph) winds with directions ranging from north to east. The in-water work occurred during incoming tides with variable water clarity and underwater visibility conditions. In general, underwater visibility ranged from about one to five feet. Shallow water depths ranging from approximately one to eight feet allowed for using snorkeling equipment to complete the survey.

4.1 General Resource Occurrence and Distribution

Marine seagrass species observed within study area included paddle grass (*Halophila decipiens*), Johnson's seagrass (*Halophila johnsonii*), shoal grass (*Halodule wrightii*), and manatee grass (*Syringodium filiforme*) (Figure 3). The primary seagrass habitat identified during the survey consisted of monospecific beds of *H. decipiens* occurring throughout the majority of the marina basin. Smaller, multi-species beds consisting of *H. decipiens* intermixed with *H. johnsonii* and *H. decipiens* intermixed with *H. johnsonii*, *H. wrightii*, and *S. filiforme* occurred adjacent to the bulkhead between Transects 2 and 4 near the central portion of the study area. Green macroalgae (*Caulerpa* sp.), commonly occurred within seagrass habitat occupied by *H. decipiens*. In total, 1.27 acres of seagrass habitat occurred within the 2.62-acre study area (Figure 3). Appendix A contains a summary of seagrass metrics for each transect where seagrasses occurred. Appendix B contains representative photographs depicting site conditions.

Sediments within the study area ranged from fine sand to silt. In general, the coarsest sediments (sand) occurred at the eastern end of the study area. This area lies outside of the protected portion of the marina basin and experiences strong currents. Moving west into the marina basin the sediments become finer (higher silt fraction) with the finest sediments occurring near the basin terminus. Surface sediments near the northwestern corner of the marina basin consisted almost entirely of silt — up to two feet thick in some areas. Substrate consisting entirely of silt still supported seagrass growth. Two stormwater outfalls discharge into the marina basin and likely provide a source for silt accumulation (Figure 3). A small sand shoal has developed at the discharge point of the southern outfall.

Concrete rubble (ranging from cobble to boulder size) occured at the base of the bulkhead on the eastern end of the study area (Figure 3). The rubble was likely placed during or after bulkhead construction to protect the bulkhead toe from scour. Minimal sessile marine organism growth occurred on the concrete rubble.

Shoreline wetland vegetation was limited to six small (one to four feet in height) mangroves — five black (*Avicennia germinans*) and one white (*Laguncularia racemosa*) — growing within the intertidal zone among the concrete rubble at the eastern end of the study area (Figure 3). A couple patches

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FIGURE 3
RESOURCE MAP
FISHERMAN'S WHARF SUBMERGED RESOURCE SURVEY
FT. PIERCE, ST. LUCIE COUNTY, FLORIDA

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of sea oxeye (*Borrichia frutescens*), a transitional species, occur above the mean high water line in the same area.

4.2 Seagrass Frequency of Occurrence

Frequency of occurrence, expressed as a percentage, estimates how often a particular species occurs at a specific location (e.g. quadrat, transect, study area). *H. decipiens* occurred within quadrats along all 15 transects and had the highest frequency of occurrence within the study area with a mean of 18.4% and a range of 8.2 – 36.8%. *H. johnsonii* occurred at only two of the 15 transects and had a mean frequency of occurrence of 0.3% (range = 0 – 3.0%) over the entire study area. Considering only the two transects where *H. johnsonii* occurred, the mean frequency of occurrence increased to 2.2%. Neither *H. wrightii* nor *S. filiforme* occurred within quadrats at the sampling locations.

4.3 Seagrass Abundance

Abundance provides a metric to evaluate the density of a particular species where it occurs. *H. decipiens* abundance values ranged from 1.10 to 2.40 with a mean of 1.78. This abundance value generally corresponds to a percent cover between 5 and 25% (see Section 3.1.3). *H. johnsonii* had a mean abundance value of 1.00. A mean abundance value of 1.00 corresponds to a percent cover of less than 5%.

4.4 Seagrass Density

The density metric evaluates a species' density over the entire transect rather than only where the species occurs. For this reason, density values are generally lower than abundance values.

Density values for *H. decipiens* ranged from 1.08 to 2.40 with a mean of 1.71 across all transects. Density values for *H. johnsonii* ranged from 0.17 to 0.33 with a mean of 0.25 for transects where the species occurred. Taking into account all transects within the study area, the mean density of *H. johnsonii* decreased to 0.03.

5.0 CONCLUSIONS

The Fisherman's Wharf study area contains a substantial quantity of seagrass habitat. State and federal regulations protect seagrass resources. Accordingly, lead state and federal regulatory agencies (in this case, the Florida Department of Environmental Protection [FDEP] and the U.S. Army Corps of

Engineers) will require the applicant to demonstrate that the proposed project design avoids and minimizes potential seagrass impacts to the greatest extent practicable. Unavoidable impacts to seagrass resources will require compensatory mitigation.

To determine the amount of mitigation required, the agencies will require a functional analysis of both the impact and the proposed mitigation using an assessment tool such as the FDEP's Uniform Mitigation Assessment Methodology (UMAM). The assessment takes into account the existing and proposed conditions of the impact site to calculate a "functional loss" value. Applying the UMAM tool, the existing seagrass habitat within the Fisherman's Wharf survey area will score relatively low compared to a reference community. Reasons contributing the lower scoring include the industrialized location, sediment and water quality conditions, and overall lower quality community structure of the seagrass habitat.

For the mitigation, the UMAM assessment similarly considers the existing and proposed condition of the mitigation site, but also takes into account the time lag (amount of time it will take to reach the target community) and the risk involved (likelihood of mitigation success or failure). The mitigation assessment results in a "functional gain" value. The regulatory agencies will require a functional gain that is equal to or greater than the functional loss to fully compensate for the resource impact.

Typical seagrass mitigation projects include measures such as transplanting the seagrass out of harm's way; restoring existing, damaged seagrass habitat; or creating new seagrass habitat (e.g., filling or excavating an area to create suitable elevations for seagrass growth). Given the species present, seagrass densities, and sediment conditions, seagrass transplantation at the Fisherman's Wharf site would be extremely difficult. Therefore, seagrass habitat restoration and/or creation likely provide the most viable mitigation alternatives to compensate for this particular project site. Regulatory agencies also typically require annual mitigation area monitoring for a permit-specified period (e.g., once per year for five years following mitigation construction) to ensure that the mitigation project is successful and adequately offsets the seagrass impact. For unsuccessful mitigation projects, regulatory agencies will require corrective measures and, potentially, additional mitigation to ensure full compensation for the impact.

REFERENCES

Braun-Blanquet, J. 1965. Plant Sociology: the study of plant communities. Hafner Publications, London. 439p.

National Marine Fisheries Service (NMFS). 2002. Final Recovery Plan for Johnson's Seagrass. (http://www.nmfs.noaa.gov/pr/pdfs/recovery/johnsonsseagrass.pdf), accessed September 2016

APPENDIX A

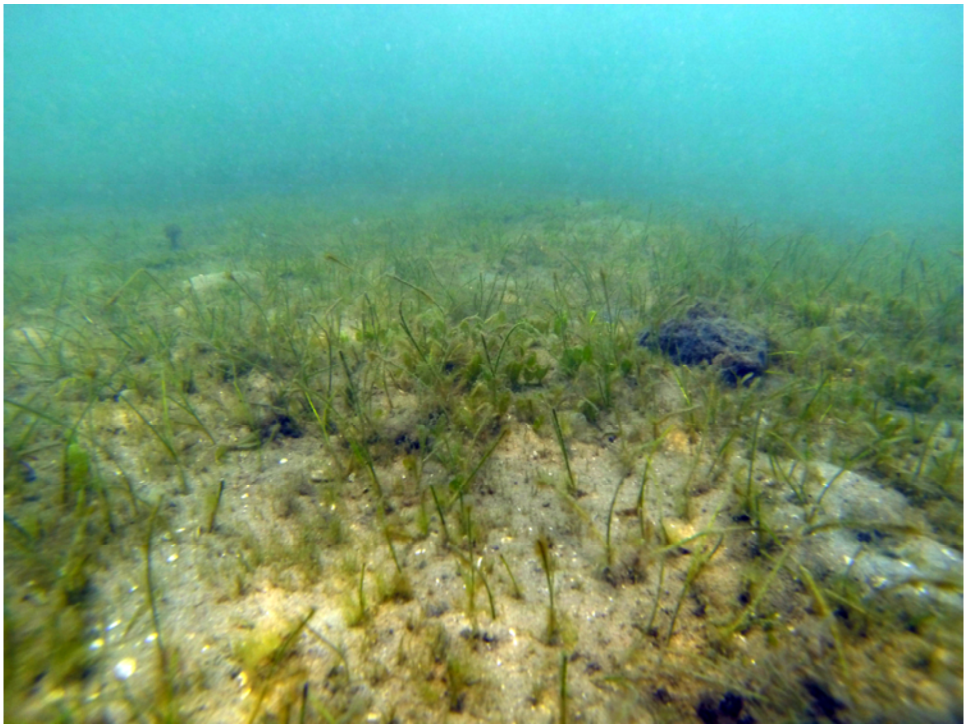
Summary of Transect Data

Summary of Transect Data

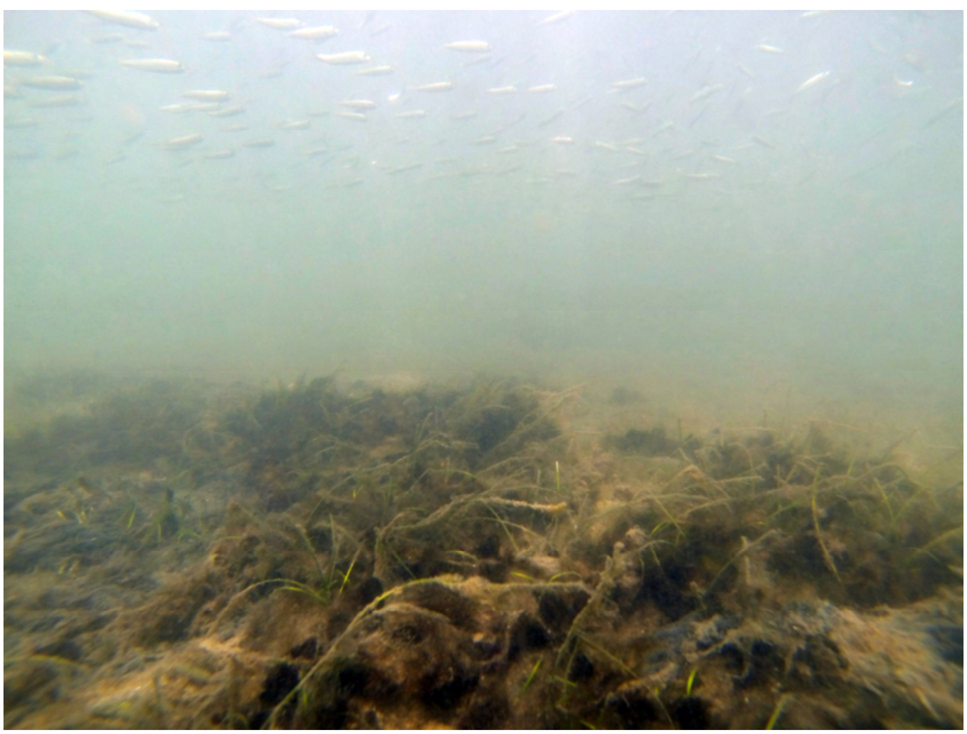
Transect	Species	Total Quadrats	Occupied Quadrats	Total Sub Units	Occupied Sub Units	Sum Cover Scores	Frequency of Occurrence (%)	Abundance	Density
1	Hd	6	5	600	72	8	12.0	1.60	1.33
2	Hd	6	6	600	221	13.5	36.8	2.25	2.25
2	Hj	6	1	600	8	1	1.3	1.00	0.17
3	Hd	6	6	600	160	13	26.7	2.17	2.17
3	Hj	6	2	600	18	2	3.0	1.00	0.33
4	Hd	5	5	500	181	12	36.2	2.40	2.40
5	Hd	6	6	600	118	11	19.7	1.83	1.83
6	Hd	6	6	600	135	12	22.5	2.00	2.00
7	Hd	6	5	600	59	6.5	9.8	1.30	1.08
8	Hd	4	4	400	114	9	28.5	2.25	2.25
9	Hd	5	5	500	53	6	10.6	1.20	1.20
10	Hd	5	5	500	55	8	11.0	1.60	1.60
11	Hd	5	5	500	63	8	12.6	1.60	1.60
12	Hd	5	5	500	118	10	23.6	2.00	2.00
13	Hd	4	3	400	39	6	9.8	2.00	1.50
14	Hd	5	5	500	41	5.5	8.2	1.10	1.10
15	Hd	3	3	300	25	4	8.3	1.33	1.33

APPENDIX B

Site Photographs

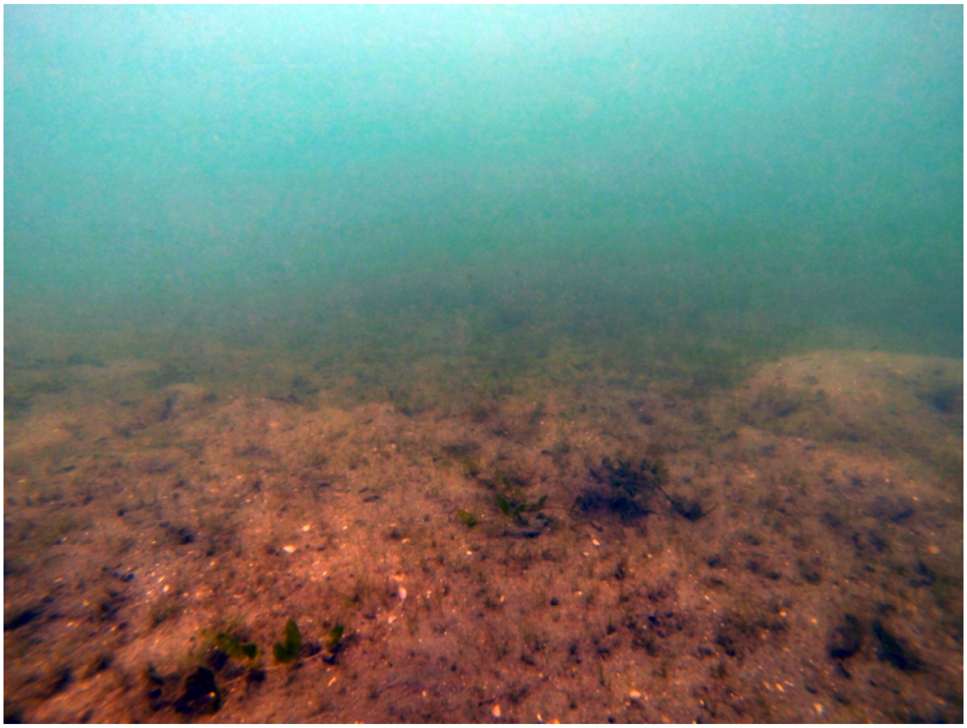


Photograph 1 *H. decipiens* mixed with *H. wrightii*

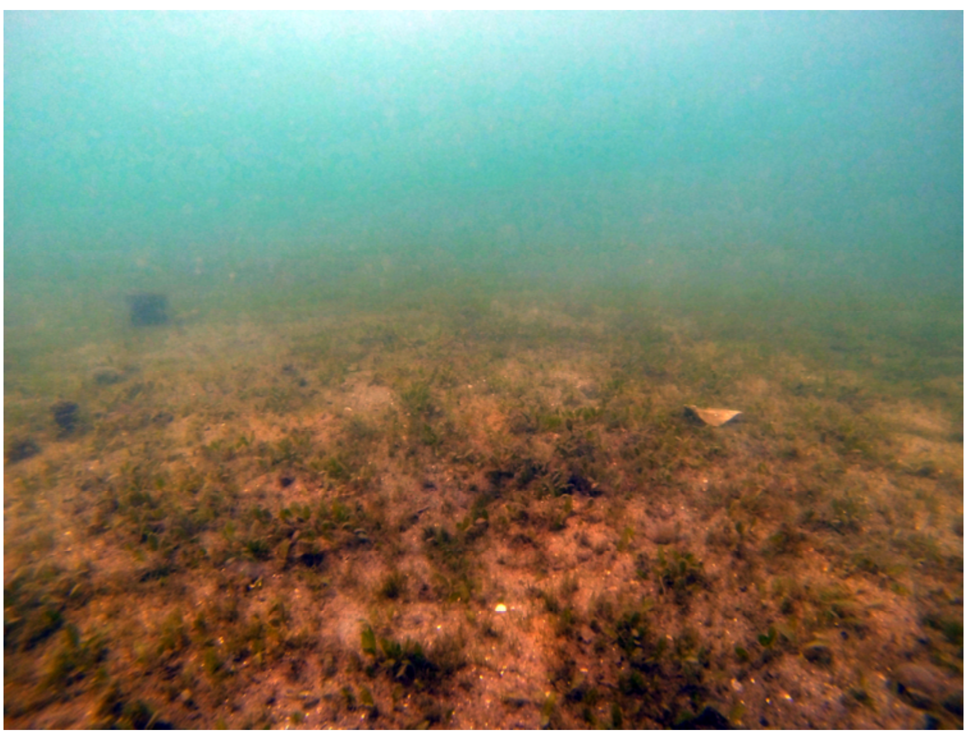


Photograph 2 *S. filiforme* heavily fouled with algae growth

Note: All photographs enhanced for clarity using Adobe Photoshop Auto Levels function.

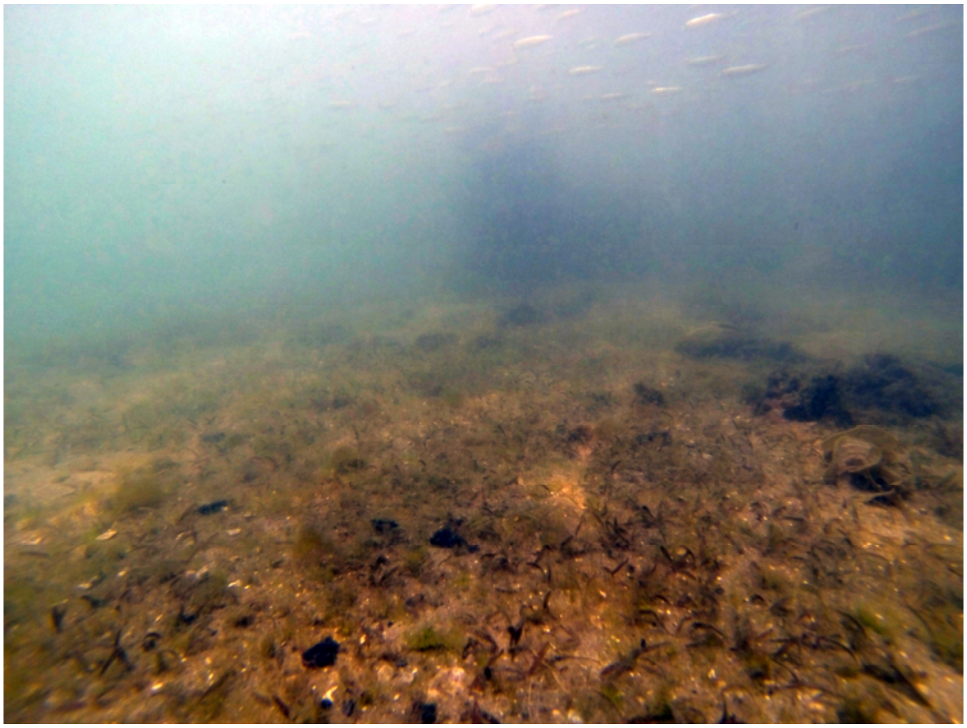


Photograph 3 Sparse *H. decipiens*

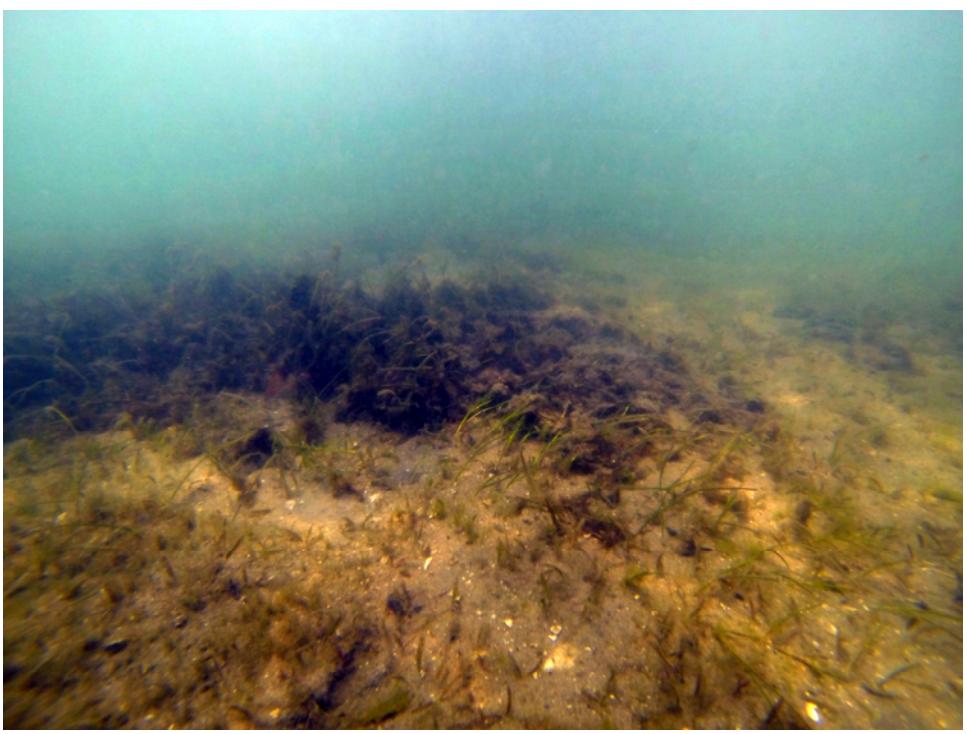


Photograph 4 Moderate-density patch of *H. decipiens*

Note: All photographs enhanced for clarity using Adobe Photoshop Auto Levels function.

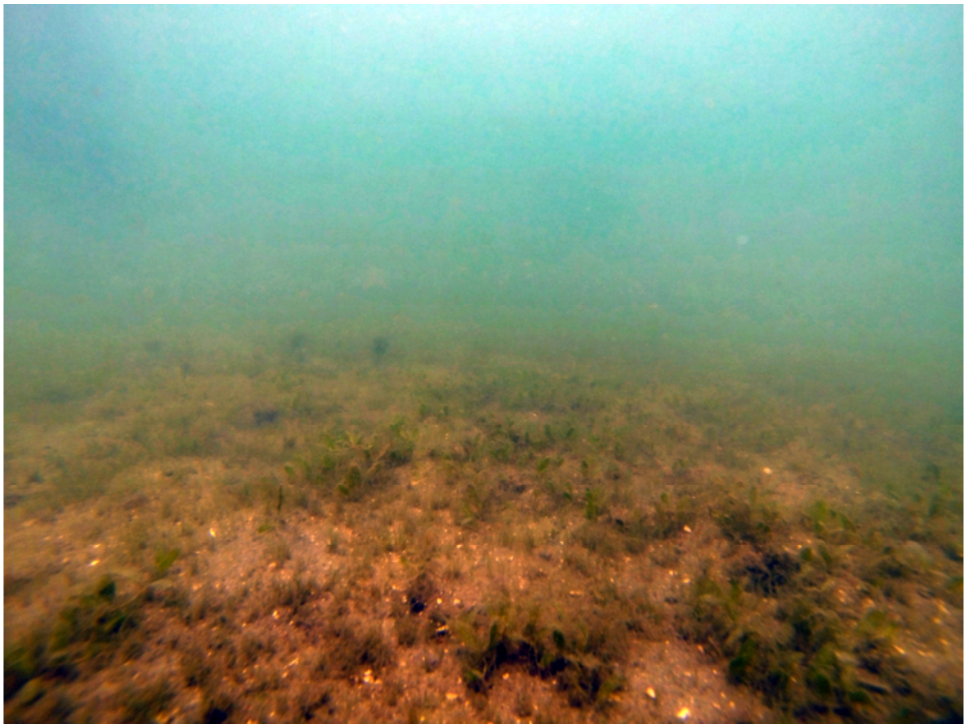


Photograph 5 Small patch of *H. johnsonii*



Photograph 6 *H. johnsonii* mixed with *H. wrightii* and *S. filiforme*

Note: All photographs enhanced for clarity using Adobe Photoshop Auto Levels function.



Photograph 7 Low-density patch of *H. decipiens*

Note: All photographs enhanced for clarity using Adobe Photoshop Auto Levels function.