Aerial Mapping and Monitoring Techniques Applied by SWFWMD for Seagrass, Swamps, and Coastal Wetland Habitats

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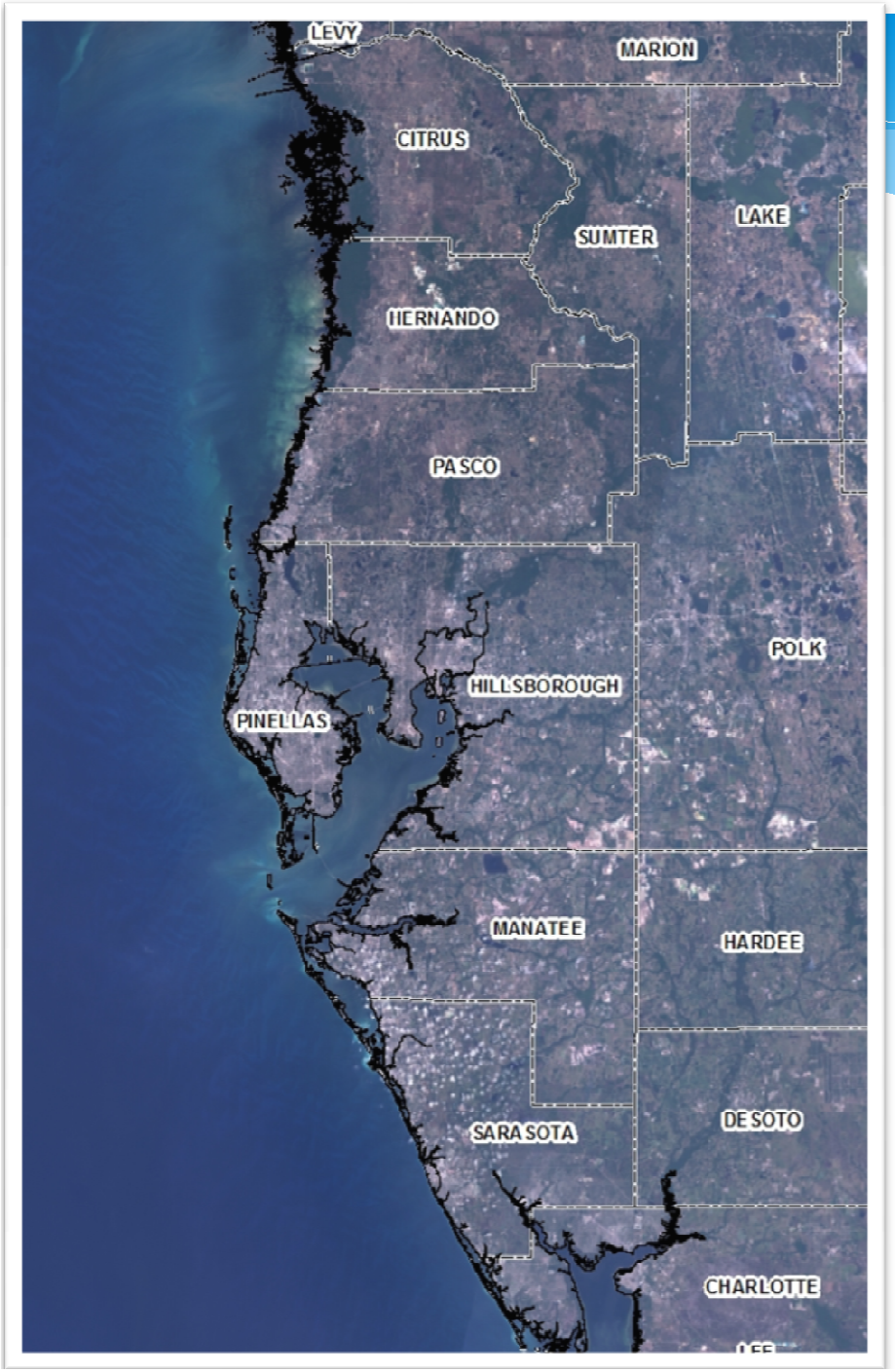
Surface Water Improvement and Management Program (SWIM)

Southwest Florida Water Management District

Overview

* Seagrass Mapping
* Flatford Swamp Mapping
* Coastal LiDAR Assessments
* Coastal Habitat Monitoring

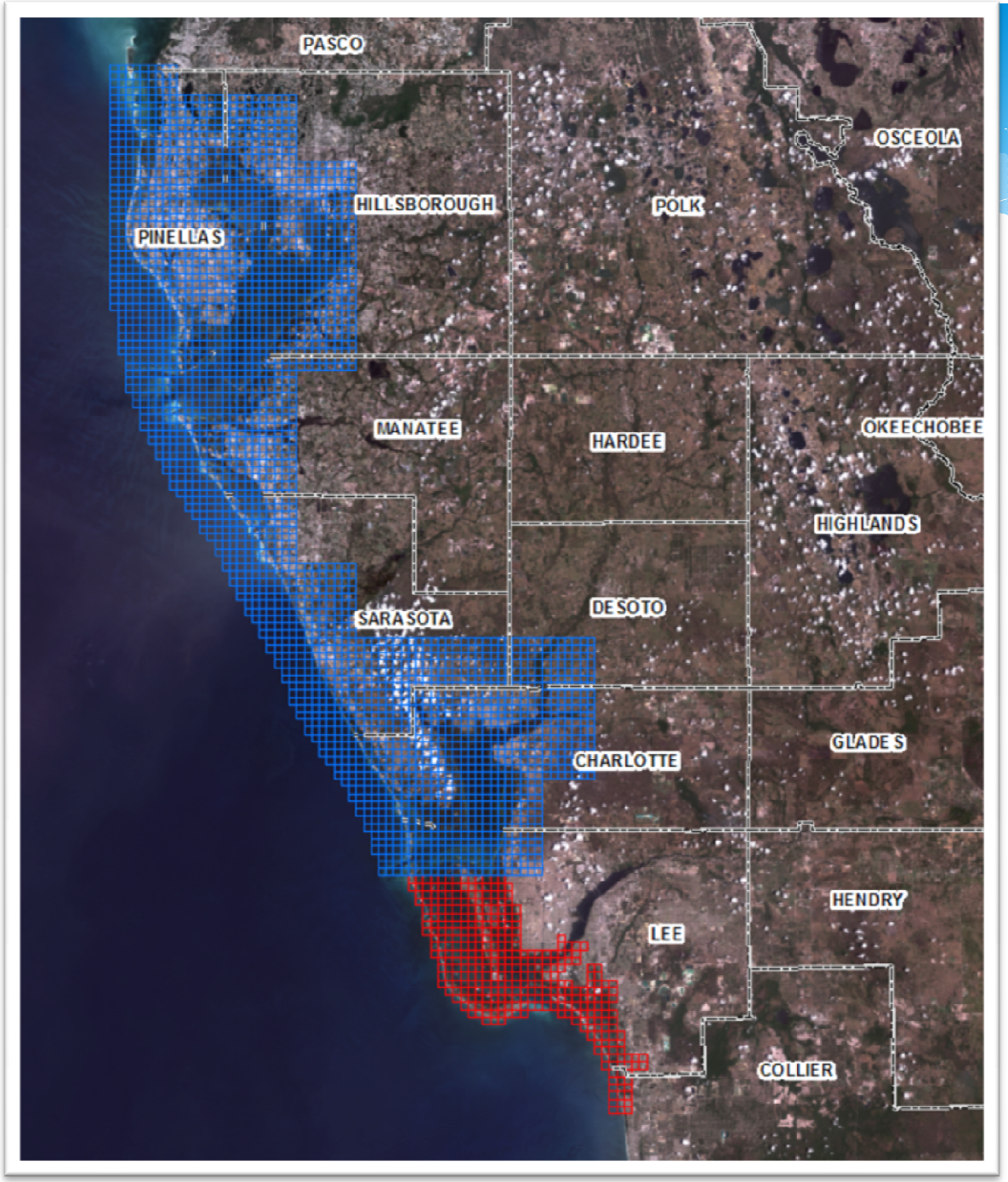
SWFWMD Coastal Extent



Seagrass Mapping

Aerial Mapping

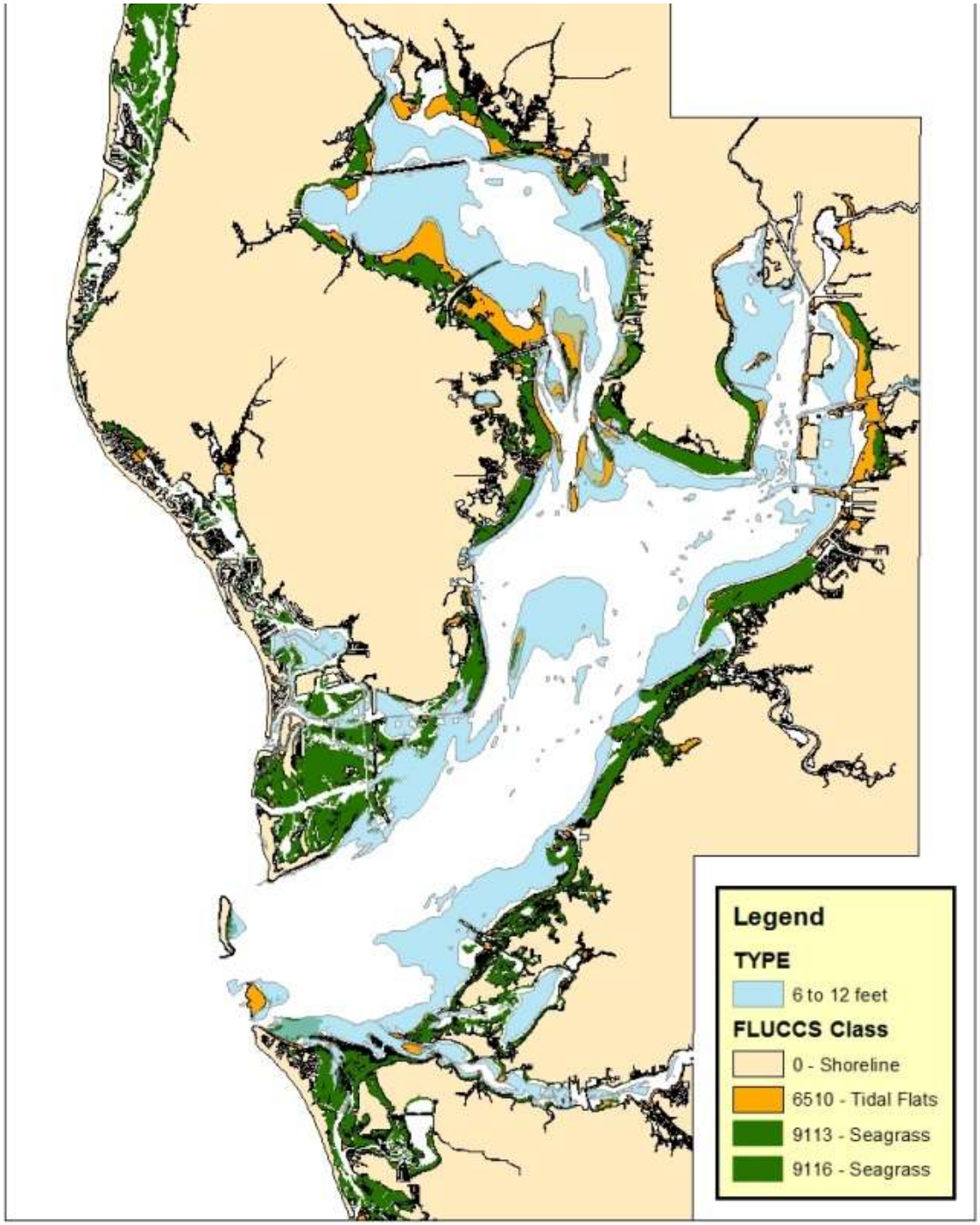
* Acquire Imagery
  * Collection Window Dec – Feb
  * 1 ft. digital natural color imagery
* Photo-Interpretation:
  * Delineate Polygons & Classify Benthic Features
* Field Verification
* Accuracy Assessment



2014 Seagrass Mapping Area of Interest

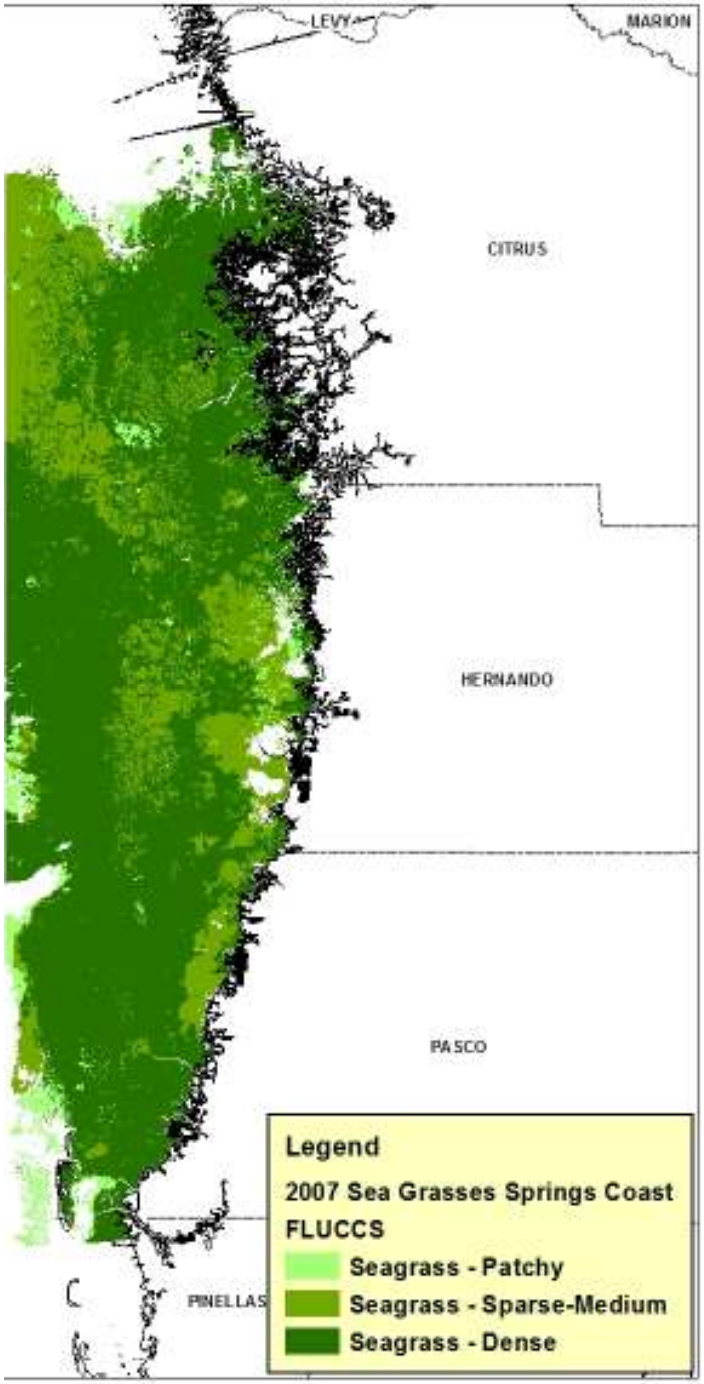
South West Florida WMD
2852 Tiles, ~ 2539 sq. miles

South Florida WMD
370 Tiles, ~ 330 sq. miles



2012 Tampa Bay Seagrass Map

* SWIM Waterbodies & Coastal Pinellas Co.
  * Mapped on a **2-year** cycle
  * 1988 – 2014 (current)

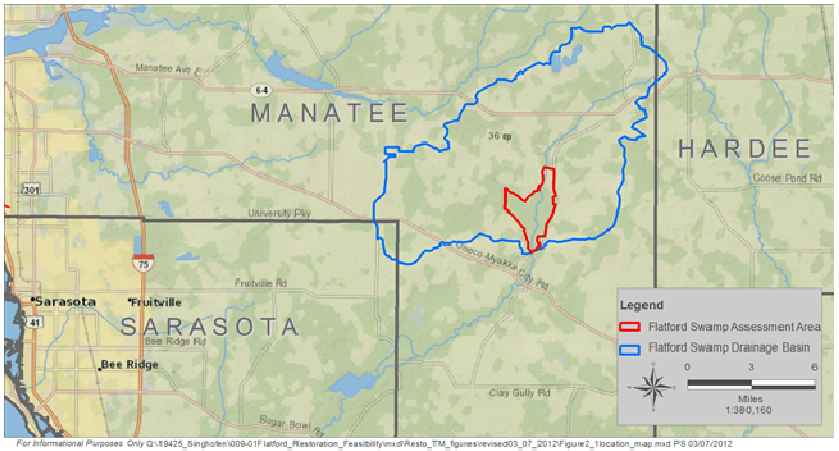


2007 Springs Coast Seagrass Map

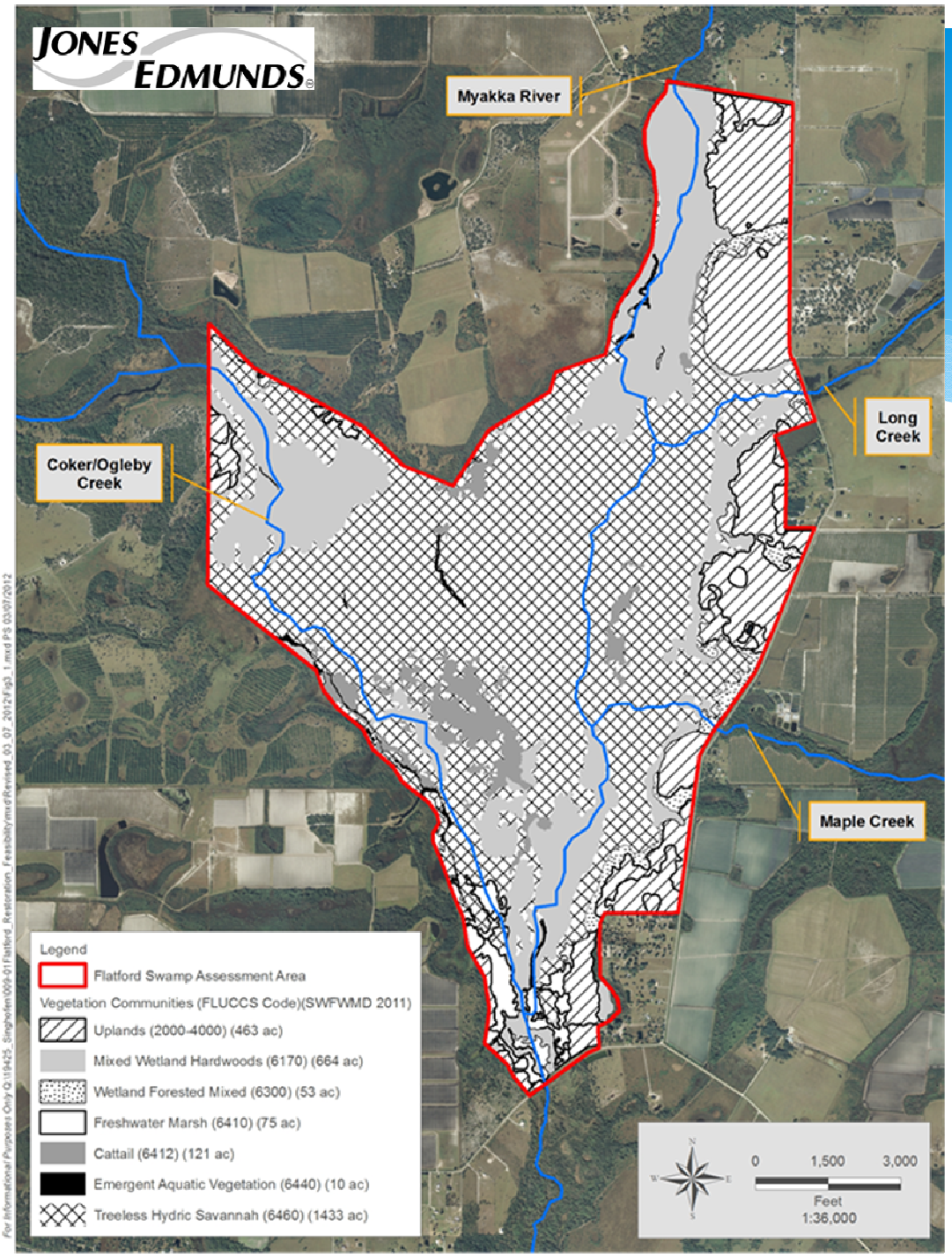
* Tarpon Springs to Waccasassa Bay
  * to approx. 20 mi Offshore
  * Mapped: 1999, 2007, 2012
  * As of 2015, Mapped on a **4-year** cycle

Flatford Swamp Mapping

Flatford Swamp Restoration



* Upper Myakka R. Watershed
  * 4.5 mi² wetland
  * District owns 2,357 acres
* Historically forested wetland with some herbaceous wetlands
* Hydrological alterations
* Caused tree mortality and community shifts
* Goal: re-establish historical hydroperiods



2011 Vegetation Map

* Traditional photo-interpretation
* 1 ft. CIR scanned film photography
* FLUCCS classification
* Objective – baseline data for restoration alternatives analysis

Future Efforts

* Challenging location to map/poor site access
* Pilot HD Video with GPS tracking complete
* Mapping expected to continue in conjunction with hydrologic restoration

Coastal LiDAR Assessment

Al Karlin, Ph.D., GISP & James F. Owens, PSM
Southwest Florida Water Management District

in association with

David Ledgerwood, President & Edward Beute, PSM
Aerial Cartographics of America
and
James Van Rens, President & Andres Vargas, Application Engineer
Riegl USA

Topo-Bathymetric LiDAR for Coastal Restoration

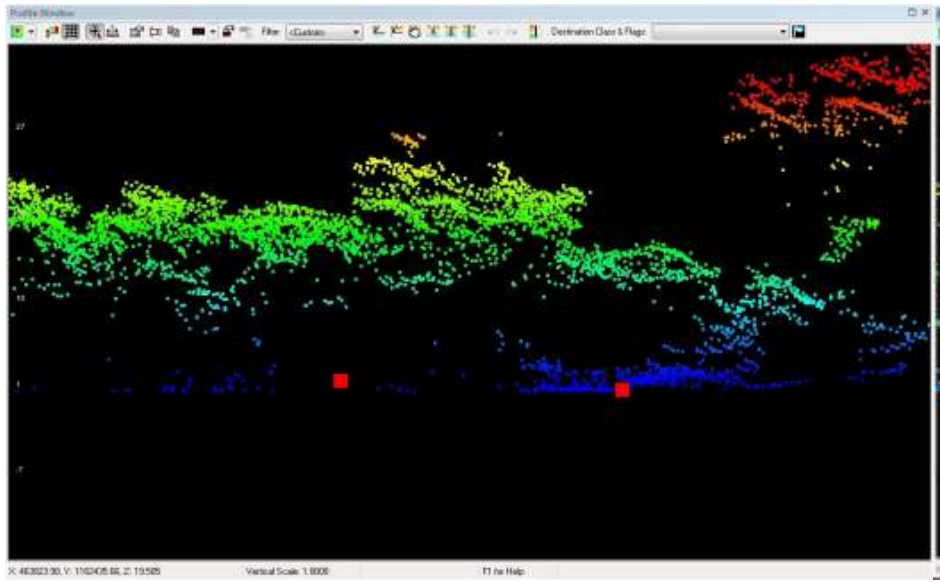
* Restoration requires re-grading
* Accurate topographic information is needed
* Sabal Palm trees greater than 6’ to be mapped for relocation efforts

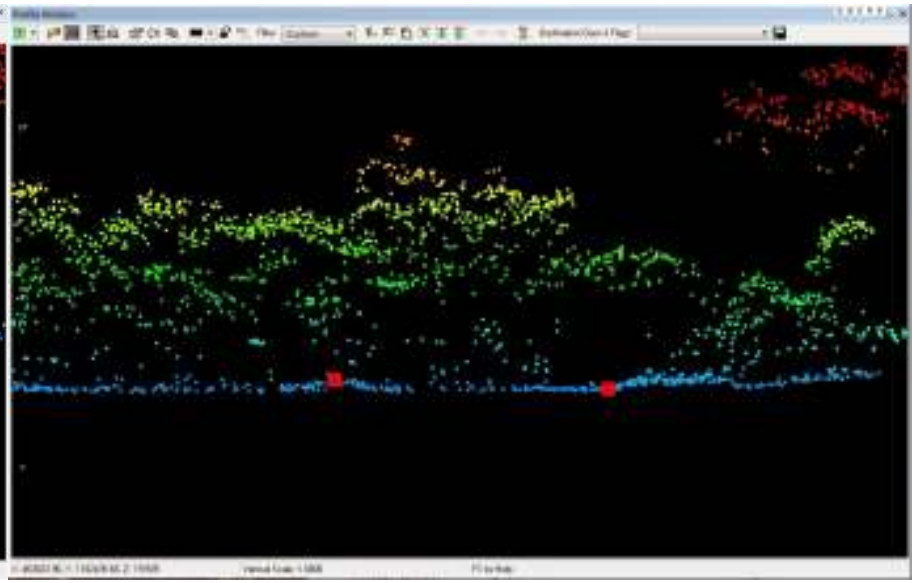
Multi-wave LiDAR Assessment

* Can suitable Fundamental and Supplemental Vertical Accuracies be achieved to meet the project requirements?
* Can either the infra-red or green laser penetrate through dense vegetation such as Mangrove and Brazilian Pepper Tree?
* Can the green laser provide near-offshore bathymetry suitable for the project?
* Can the green laser be used to map hard-bottom features, such as oyster beds?

LiDAR Mission

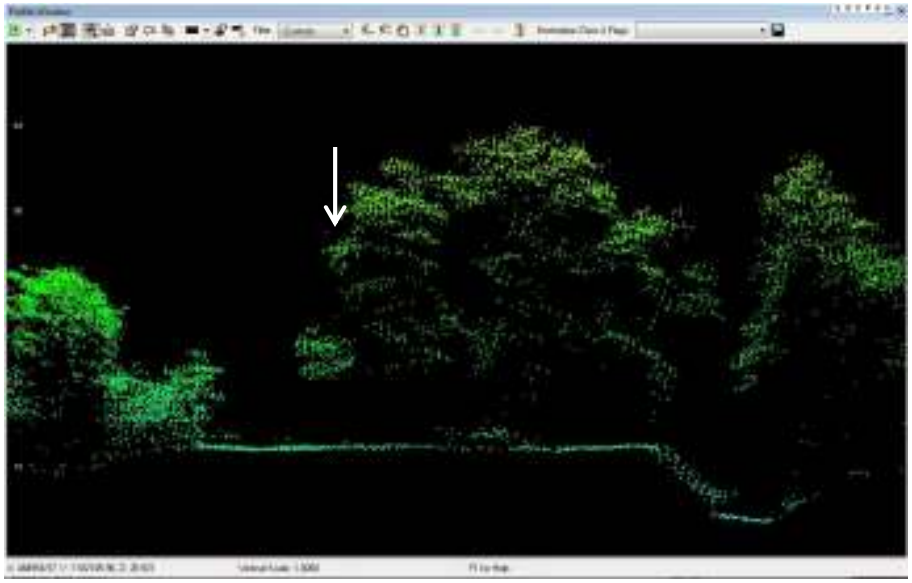
General Accuracy Results
Ground Check Points (Dense Vegetation)



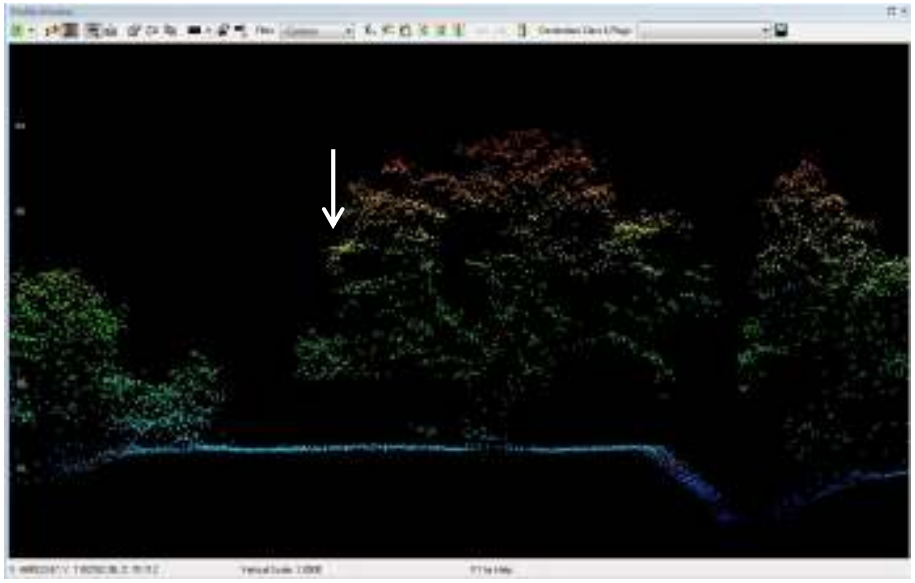


Palm Tree (Frog Creek)Results

Although Sabal Palms (*Sabal palmetto*) are identified by their spectral signature, we need to use the LiDAR to determine their height above ground.

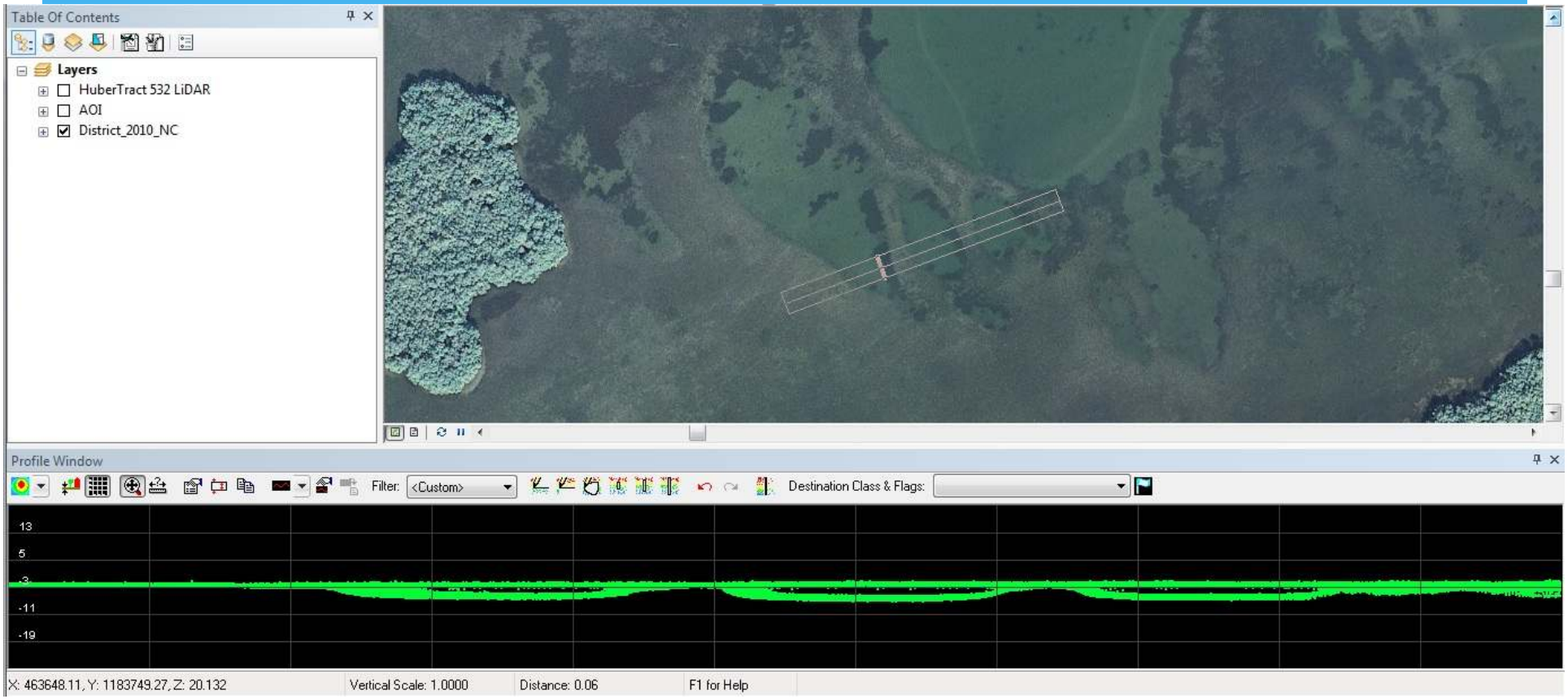


Green Laser



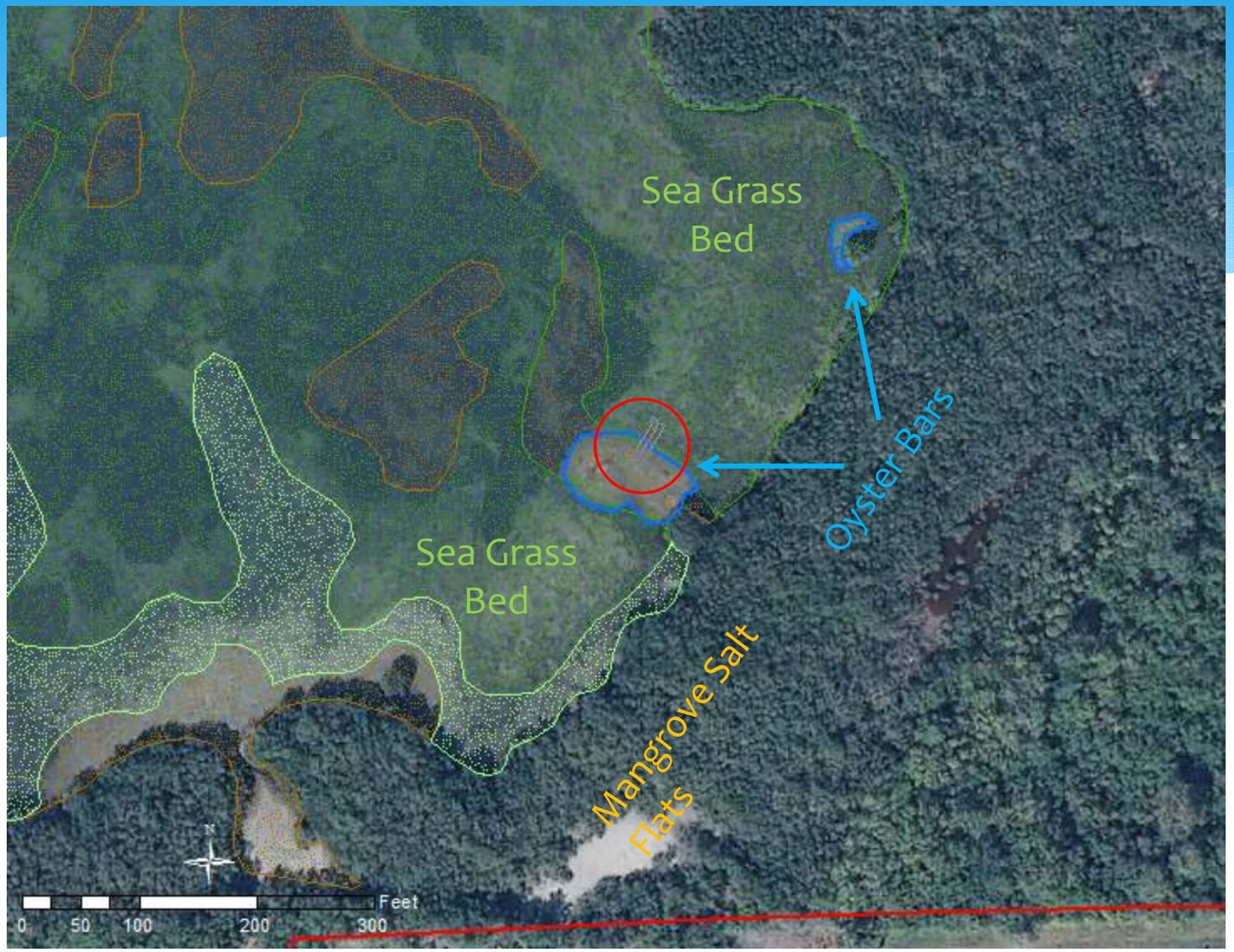
Infra-Red Laser

Near-Offshore Bathymetric Results
Huber Tract

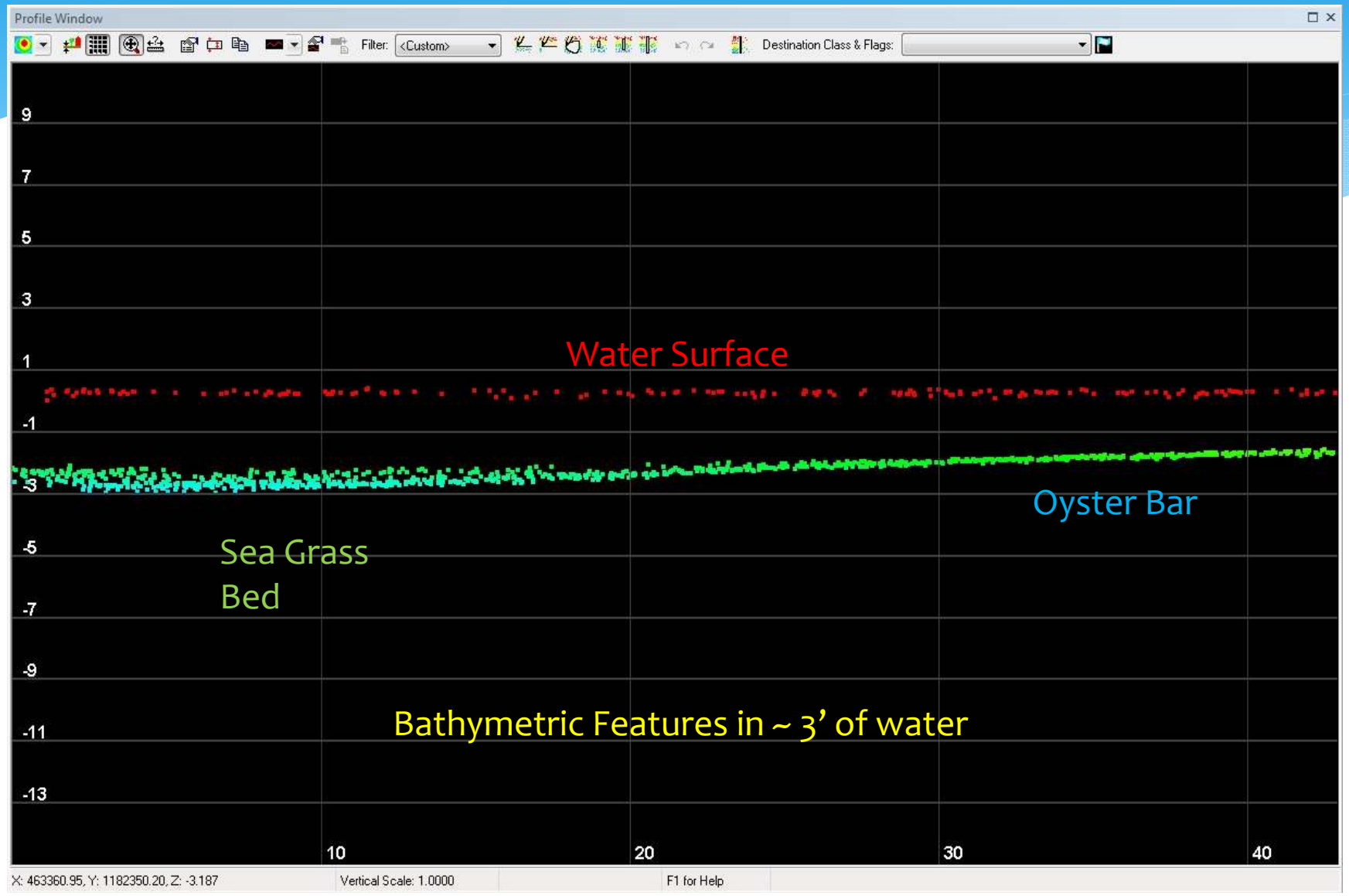


Off-shore deep-water pools ~ 1.5m below surface

Oyster Bar Results



Oyster Bar Results



Conclusions

* The vertical accuracies obtained from both the LMS VQ-820-G and LMS Q680i completely met the Fundamental and Supplemental Vertical Accuracies required for this restoration project,

* The LMS VQ-820-G laser provided a greater number of returns in the vegetation and in the trees, and penetrated through the near-shore water column, but

* The LMS Q680i laser penetrated better to ground through dense mangrove (mostly Avicenna germinans) and Brazilian Pepper Tree (Schinus terebinthifolius) stands,

* The LMS VQ-820-G laser penetrated the water surface of the borrow pit to a depth of one Secchi Disk. The laser penetrated the clear, Terra Ceia Bay water and defines both sea grass beds and oyster bars, and

* The combination of the green and infra-red lasers saved the District between $250,000 - $275,000 in conventional survey costs, and was accomplished in about one-quarter of the time!

Coastal Habitat Monitoring

Annual Assessments

* Track changes and evaluate success of SWIM restoration projects
* Monitor exotic/nuisance species

Establish a Baseline

* Digitize and georeference design plans
* Create photostations

Project Goals

* Monitor project success
* Ensure site maintenance
* Create GIS Portal for quick reference