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

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Overview

* Seagrass Mapping
* Flatford Swamp Mapping
* Coastal LiDAR Assessments
* Coastal Habitat Monitoring
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
- 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
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)
Although Sabal Palms (*Sabal palmetto*) are identified by their spectral signature, we need to use the LiDAR to determine their height above ground.
Near-Offshore Bathymetric Results
Huber Tract

Off-shore deep-water pools ~ 1.5m below surface
Oyster Bar Results

Water Surface

Sea Grass
Bed

Oyster Bar

Bathymetric Features in ~ 3’ of water
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