

# THE APPLICATION OF DRONE TECHNOLOGY TO MONITOR AND ASSESS COASTAL ENVIRONMENTS AND PROJECTS

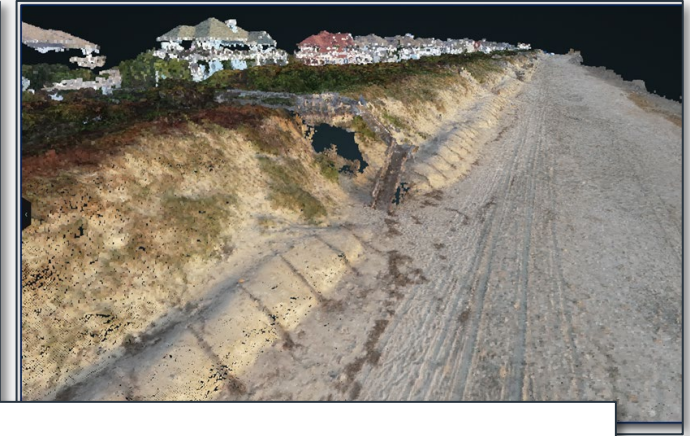
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Adam Priest, P.E., Coastal Engineer, Coastal Protection Engineering



**FSBPA 38<sup>th</sup> Annual National Conference on Beach Preservation Technology**  
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# WHY USE DRONES IN COASTAL ENVIRONMENTS?

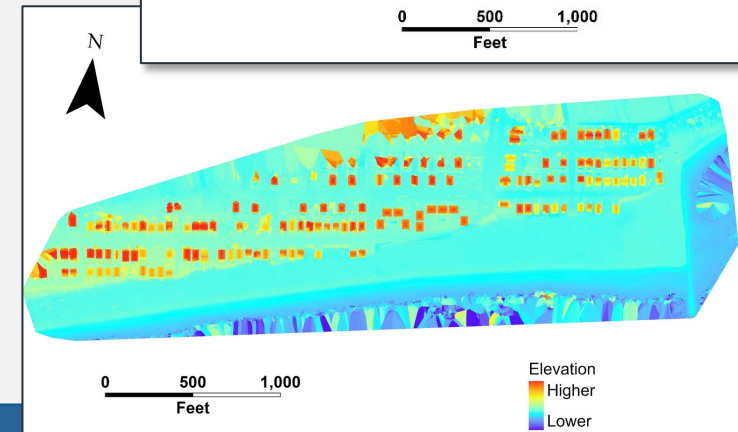
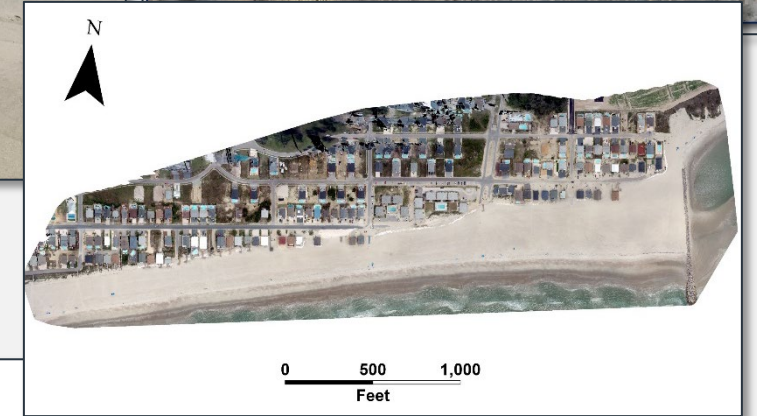
- Cost Effective
- Time Efficient
- Easy to Use
- Rapid Deployment
- Access Capability
- Unique Viewpoint
- Quick Analysis (2D & 3D)



Phantom 4 RTK



Mavic 3 Enterprise



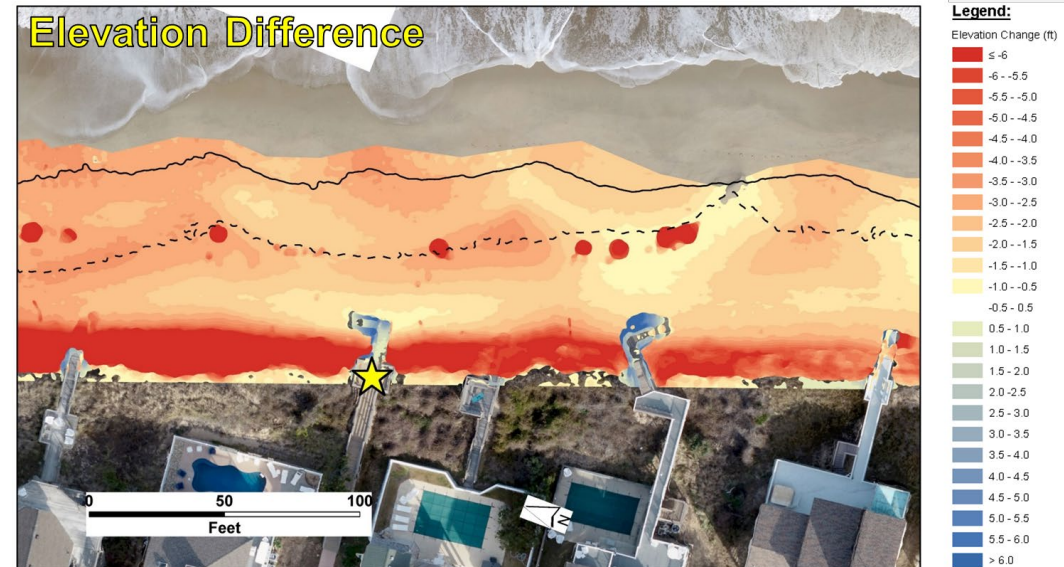
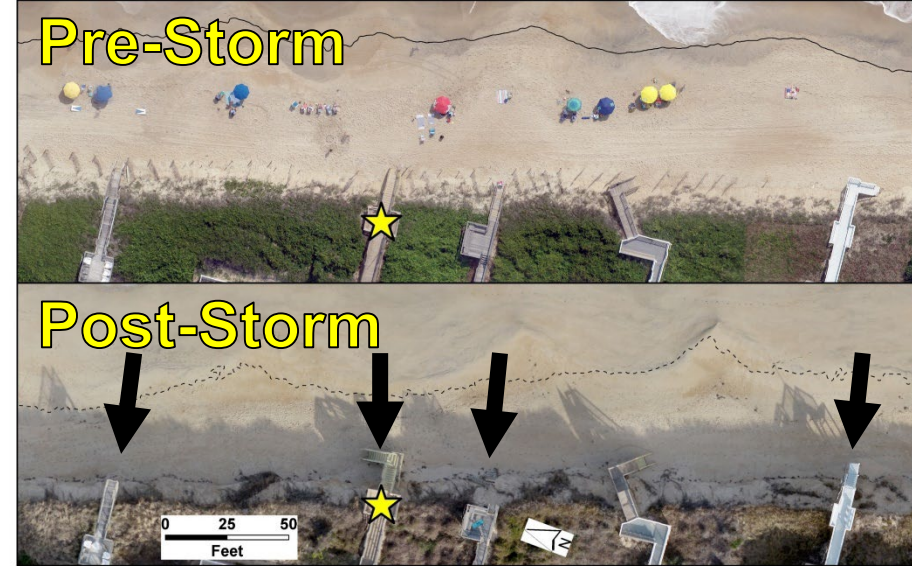
# CASE STUDIES

- Rapid Beach Assessment
- Construction Observation
- Cultural Resource Survey – Magnetometer
- Sub-Aquatic Vegetation (SAV) Survey
- Percent Vegetation Cover Analysis & Mapping
- Post-Helene & Milton Sand Stockpile Assessment



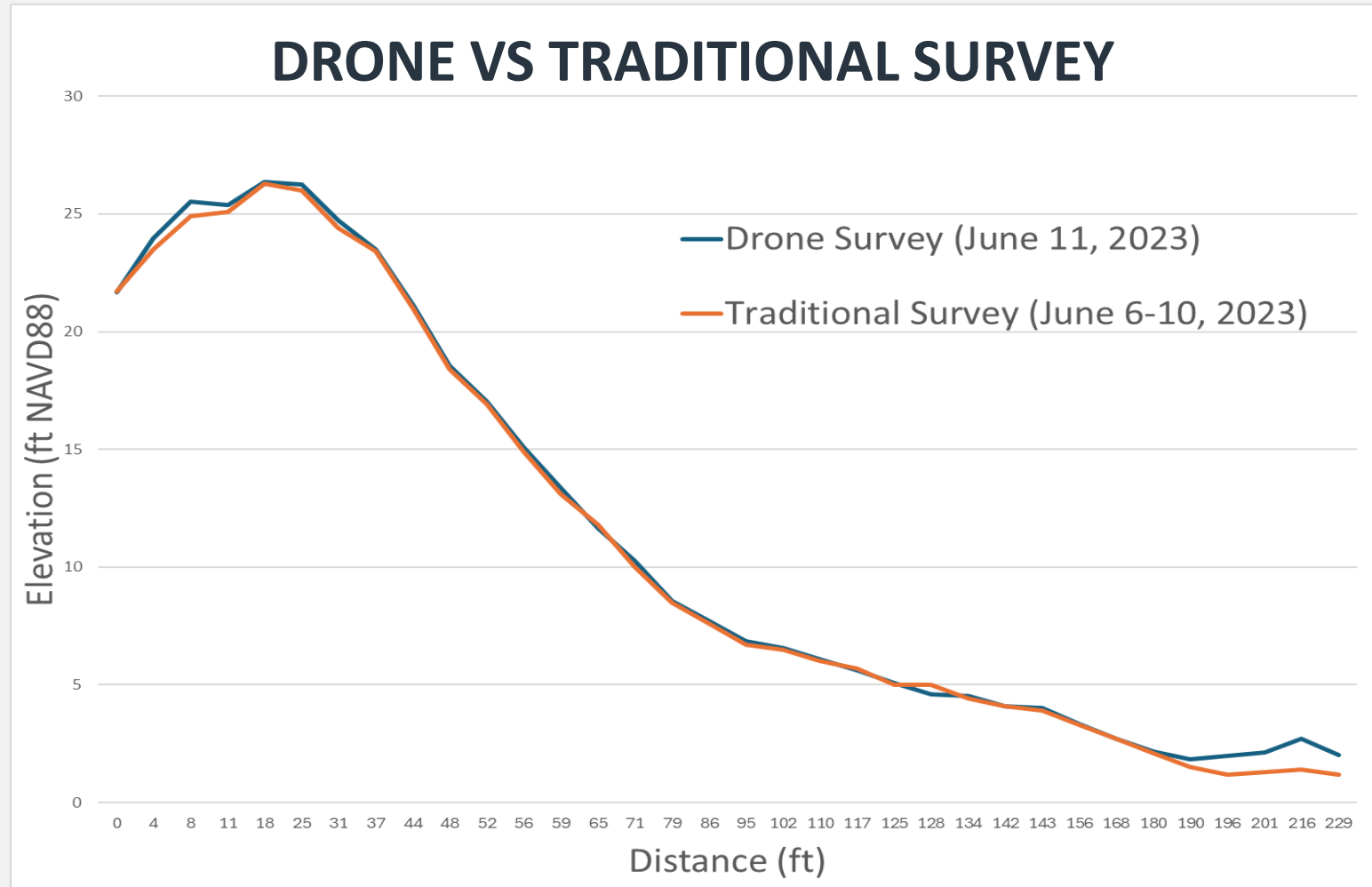
# RAPID BEACH ASSESSMENT – DUCK & PINE ISLAND, NC

- Pre- vs Post-Storm
- Pre- vs Post-Nourishment
- Track Contours
- Identify Storm Impacts
- Volumetric Analysis
- Elevation Difference Plots
- Quick Analysis (2D & 3D)



# RAPID BEACH ASSESSMENT – DUCK & PINE ISLAND, NC

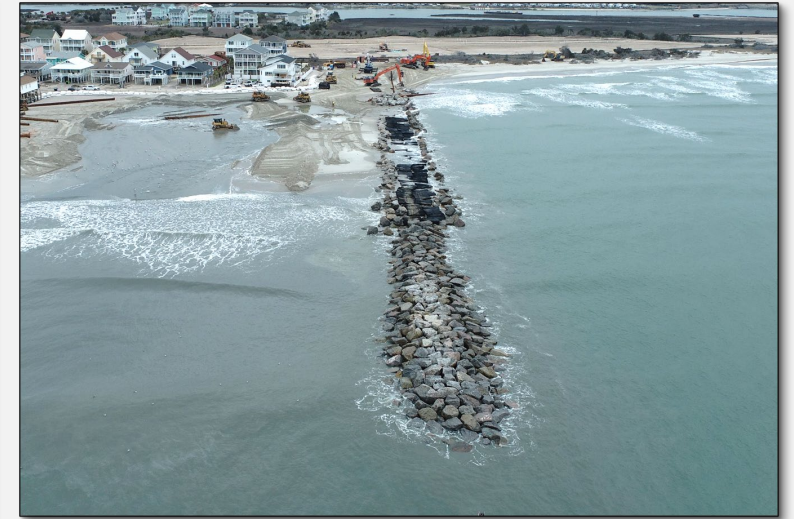
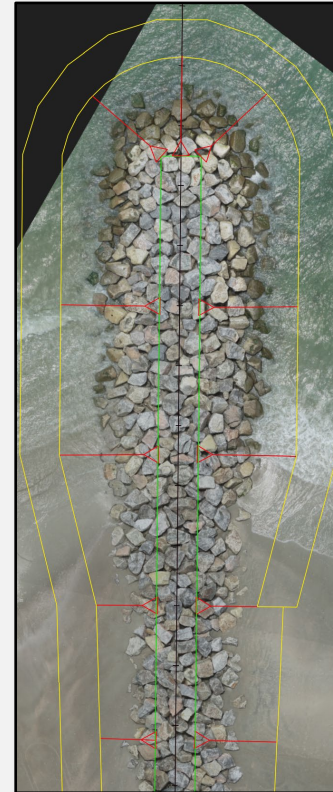
- Accurate Data Collection for Bare-Earth Areas
- Minimal Personnel & Equipment Needed
- Data Collection Decreased Time & Increased Coverage
- Challenges Vegetation, Water, Shadows





# CONSTRUCTION OBSERVATION - OCEAN ISLE BEACH TERMINAL GROIN

- Provides “Birds-eye” View
- Quick Deployment
- Overlay Construction Thresholds on Imagery
- Hi-Res Orthomosaic Imagery for Tracking Progress
- Identify Inspection Areas
- Physical Sampling





# CONSTRUCTION OBSERVATION - OCEAN ISLE BEACH TERMINAL GROIN

- Time-lapse of Construction Daily Progress
- “Way-point” Flight Plan
- Collect Photos/Videos Same Location



# CULTURAL RESOURCE SURVEY – UAS MAGNETOMETER SURVEY



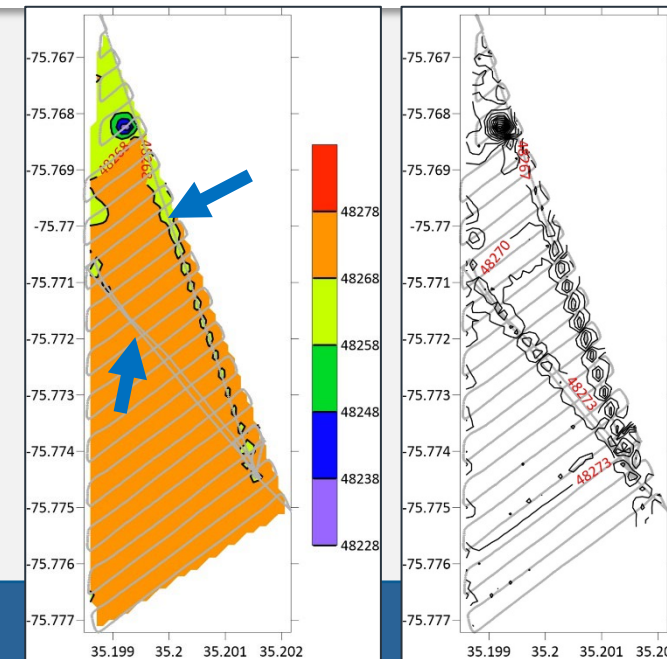
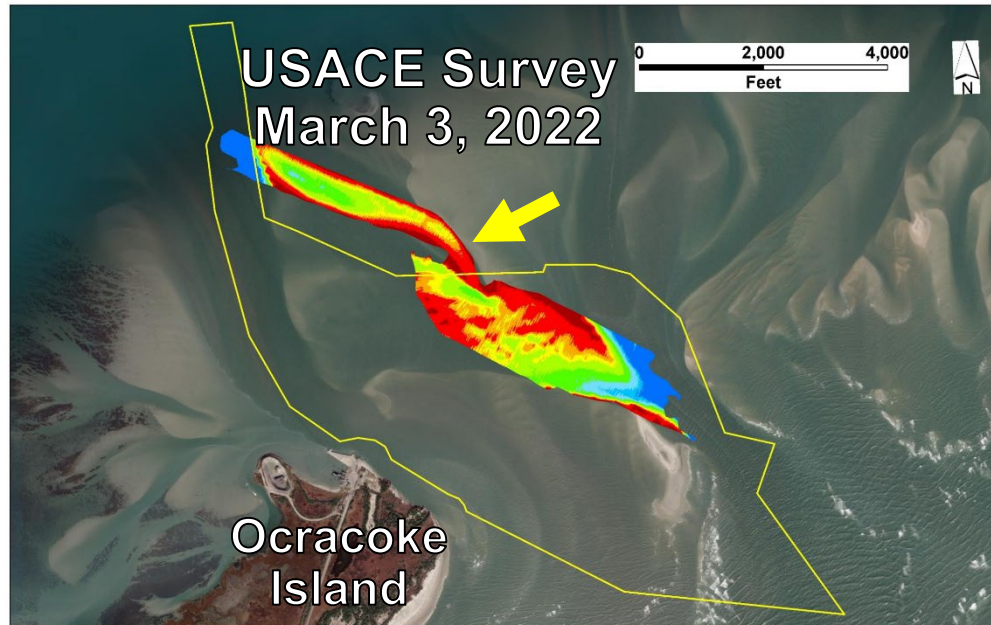
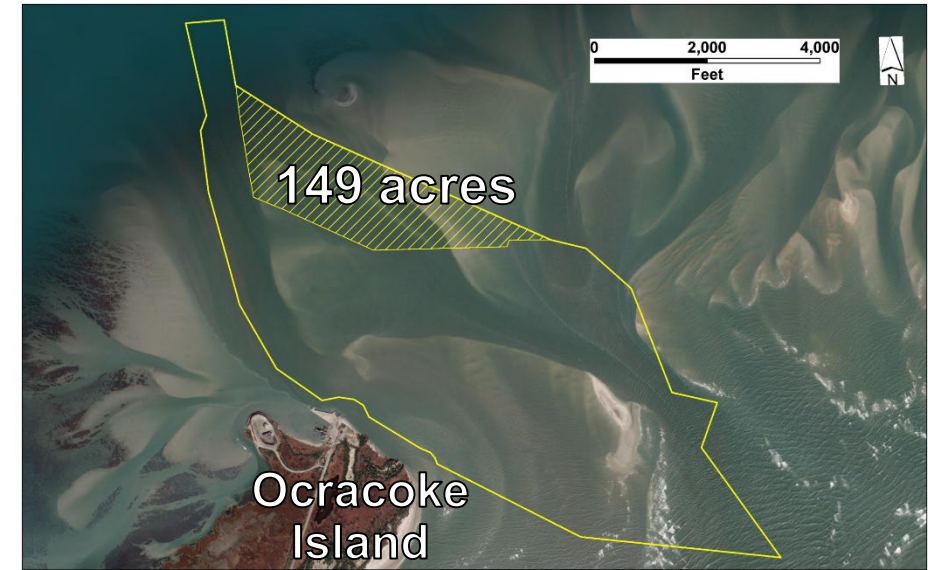
**DJI Matrice 600 Hexacopter  
Geomtics MagArrow UAV Magnetometer**



**CPE Pilot Launching From Shoal Within Hatteras Inlet**



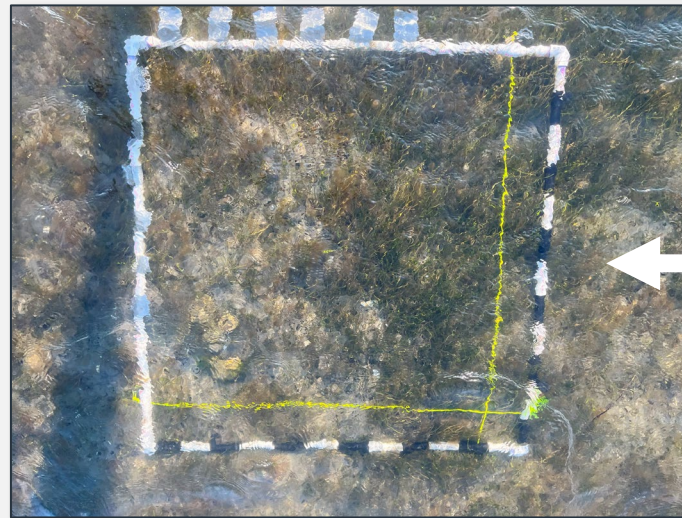
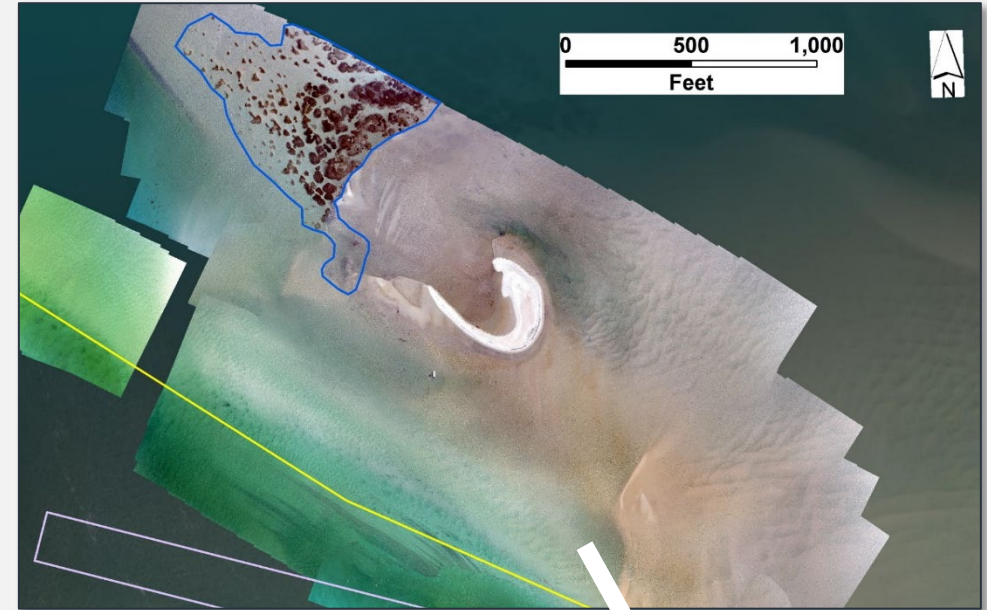
# CULTURAL RESOURCE SURVEY – UAS MAGNETOMETER SURVEY





# SUB-AQUATIC VEGETATION (SAV) SURVEY - HATTERAS INLET

- Assess Navigation Channels ahead of Maintenance Dredging
- SAV Habitat Delineation
- Hi-Res Over-Water Images
- Aid in Ground Truthing

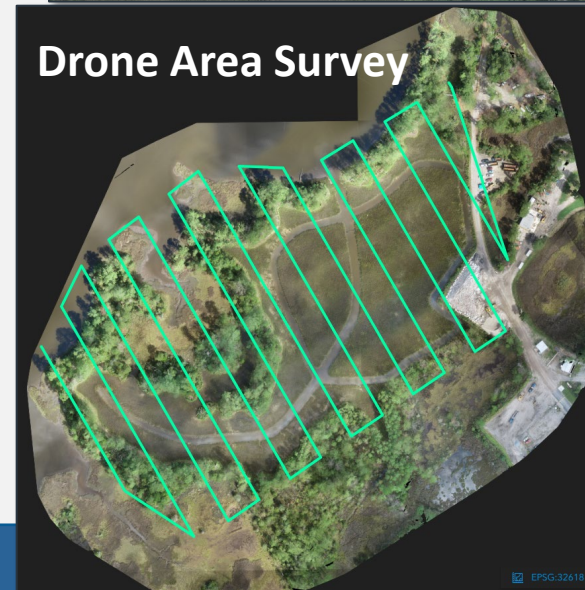




# % VEGETATIVE COVER ANALYSIS

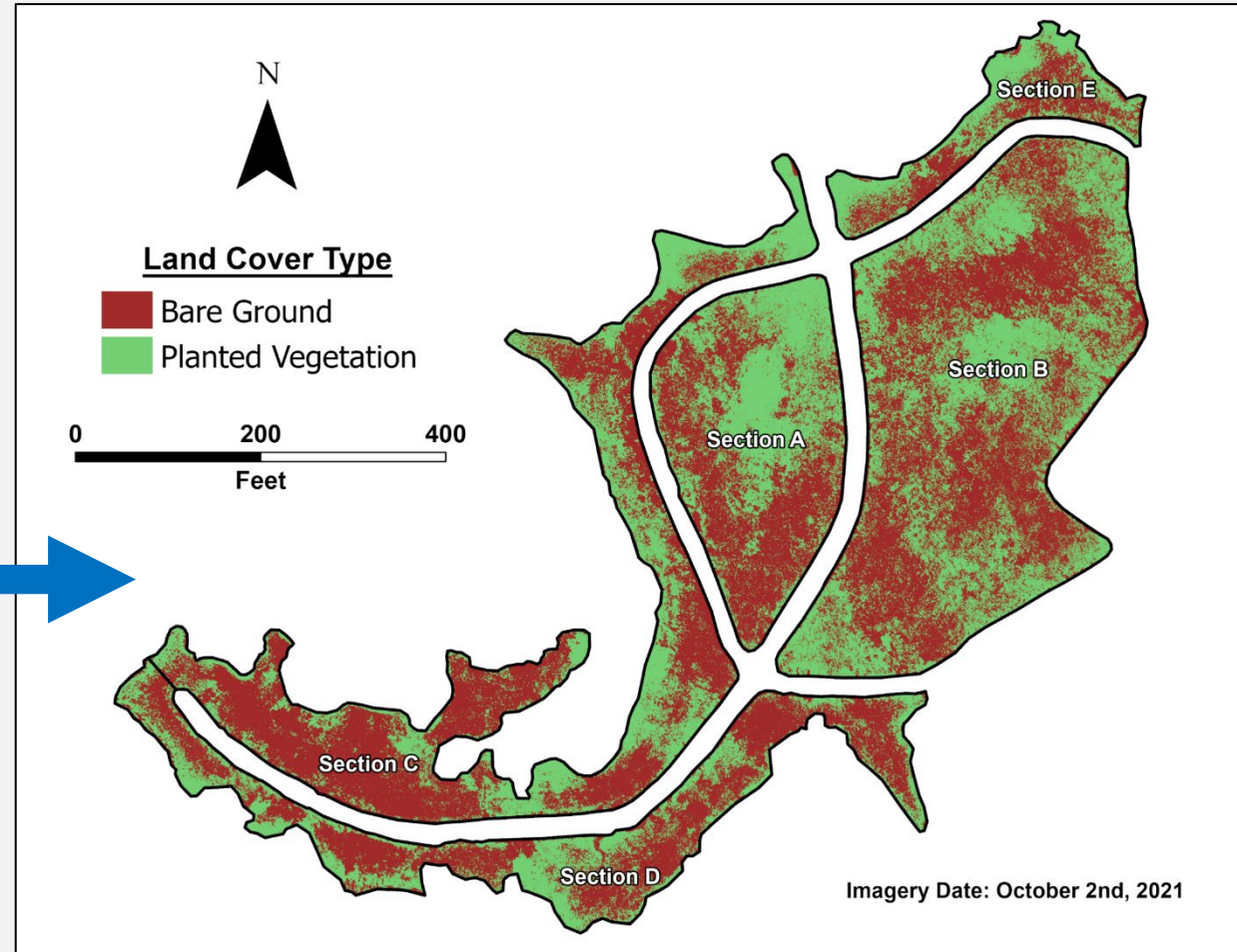
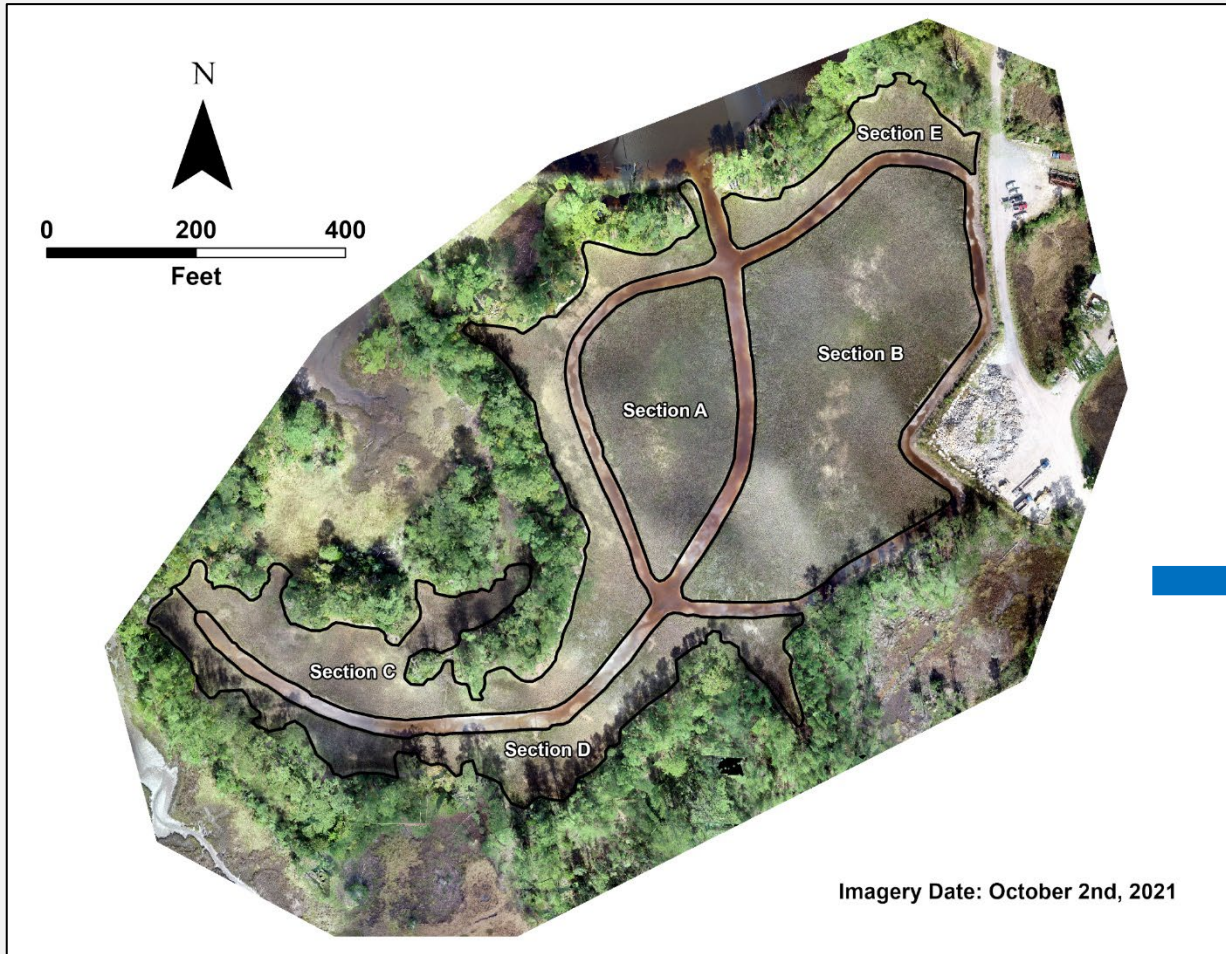
## NEW MILL CREEK WETLAND MITIGATION BANK

- Comparison of Traditional Quadrat Method vs Drone Method
- Increased Time and Labor Efficiency
- Increased Coverage Area
- Aid in Ground Truthing

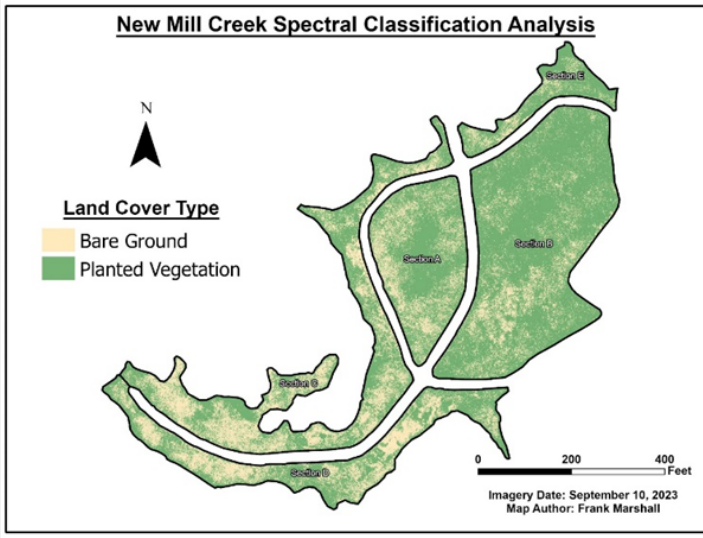
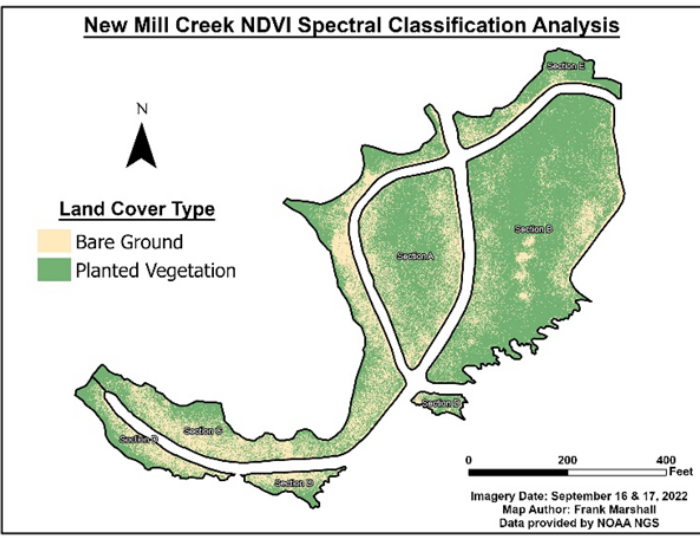
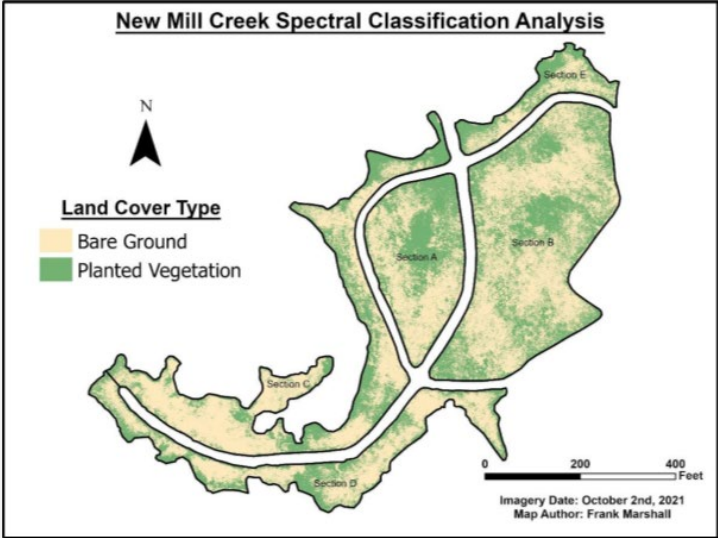




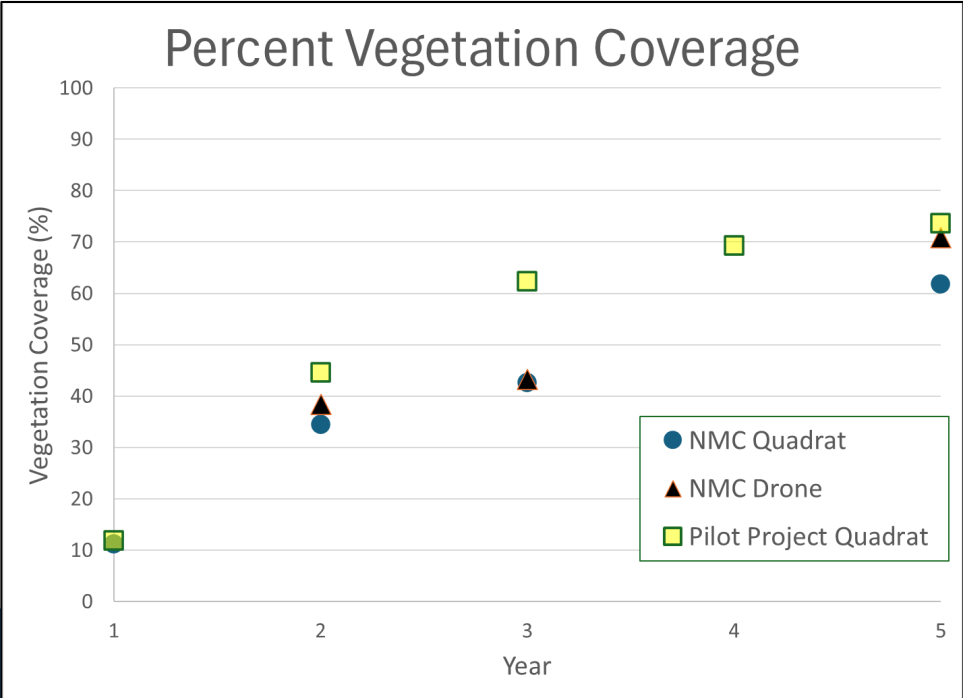
# GREEN CHROMATIC COORDINATE INDEX



# % VEGETATIVE COVER ANALYSIS – NEW MILL CREEK WETLAND MITIGATION BANK



Year	NMC Quadrat	NMC Drone	Pilot Project Quadrat
1	11.17	-	11.84
2	34.45	38.34	44.5
3	42.59	43.27	62.34
4	-	-	69.34
5	61.83	70.84	73.59





# POST-HELENE & MILTON SAND STOCKPILE ASSESSMENT - ANNA MARIA ISLAND, FL

Pre-Storm



Post-Storm



Pre-Storm



Post-Storm



Pre-Storm



Post-Storm



Pre-Storm

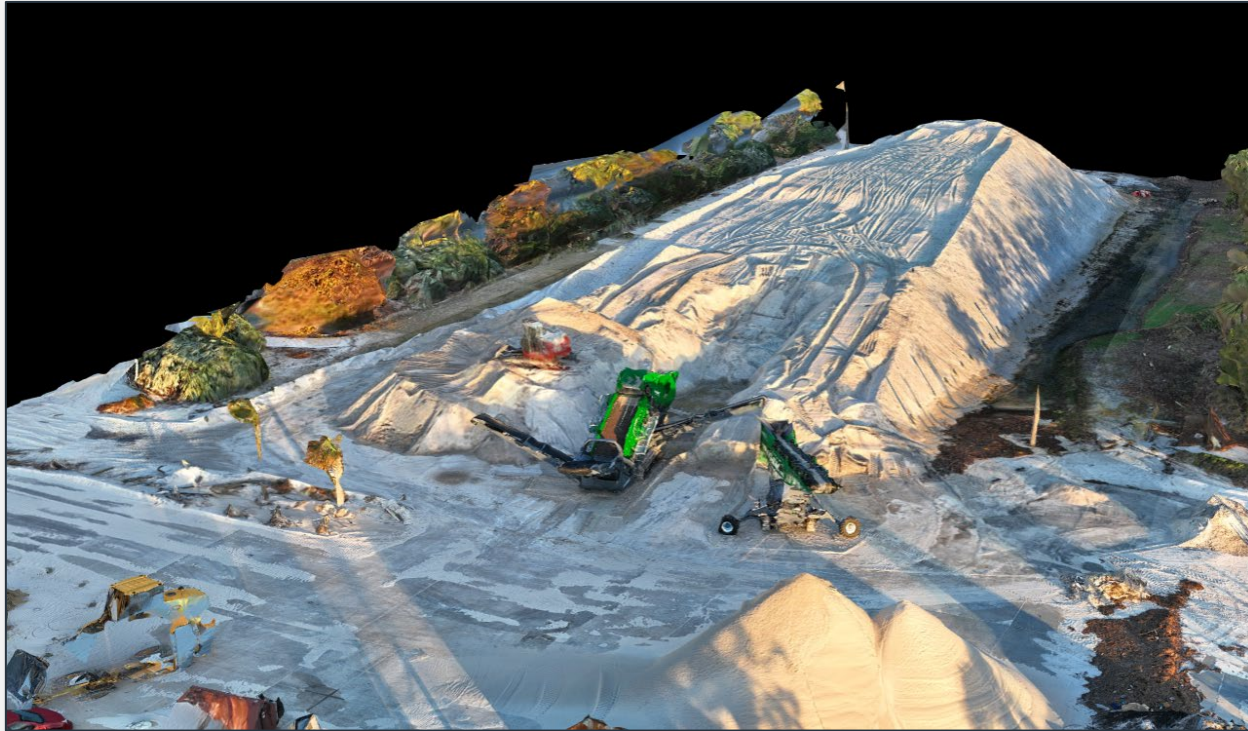


Post-Storm



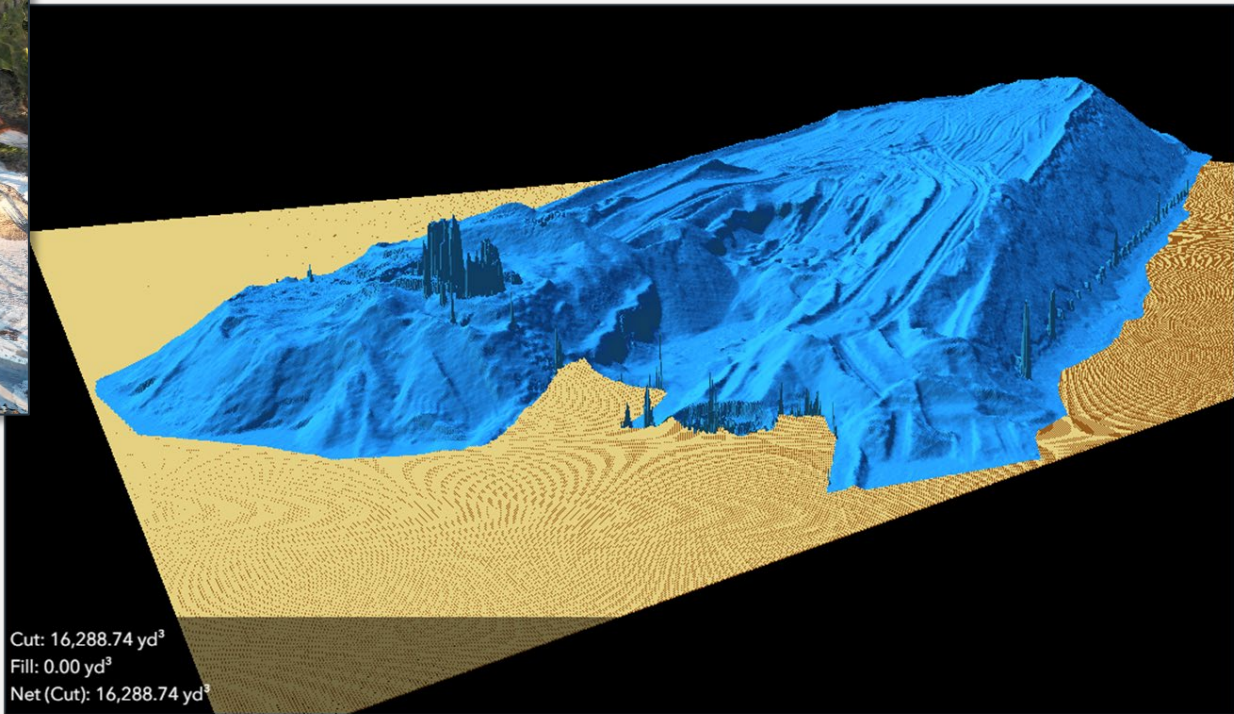


# POST-HELENE & MILTON SAND STOCKPILE ASSESSMENT



**3D Representation of Beach Sand Stockpile**

## Volumetric Analysis - Surface Comparison



# POST-HELENE & MILTON SAND STOCKPILE ASSESSMENT

Drone Estimate	Placed Volume
34,000 CY	34,560 CY





# THANK YOU!

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