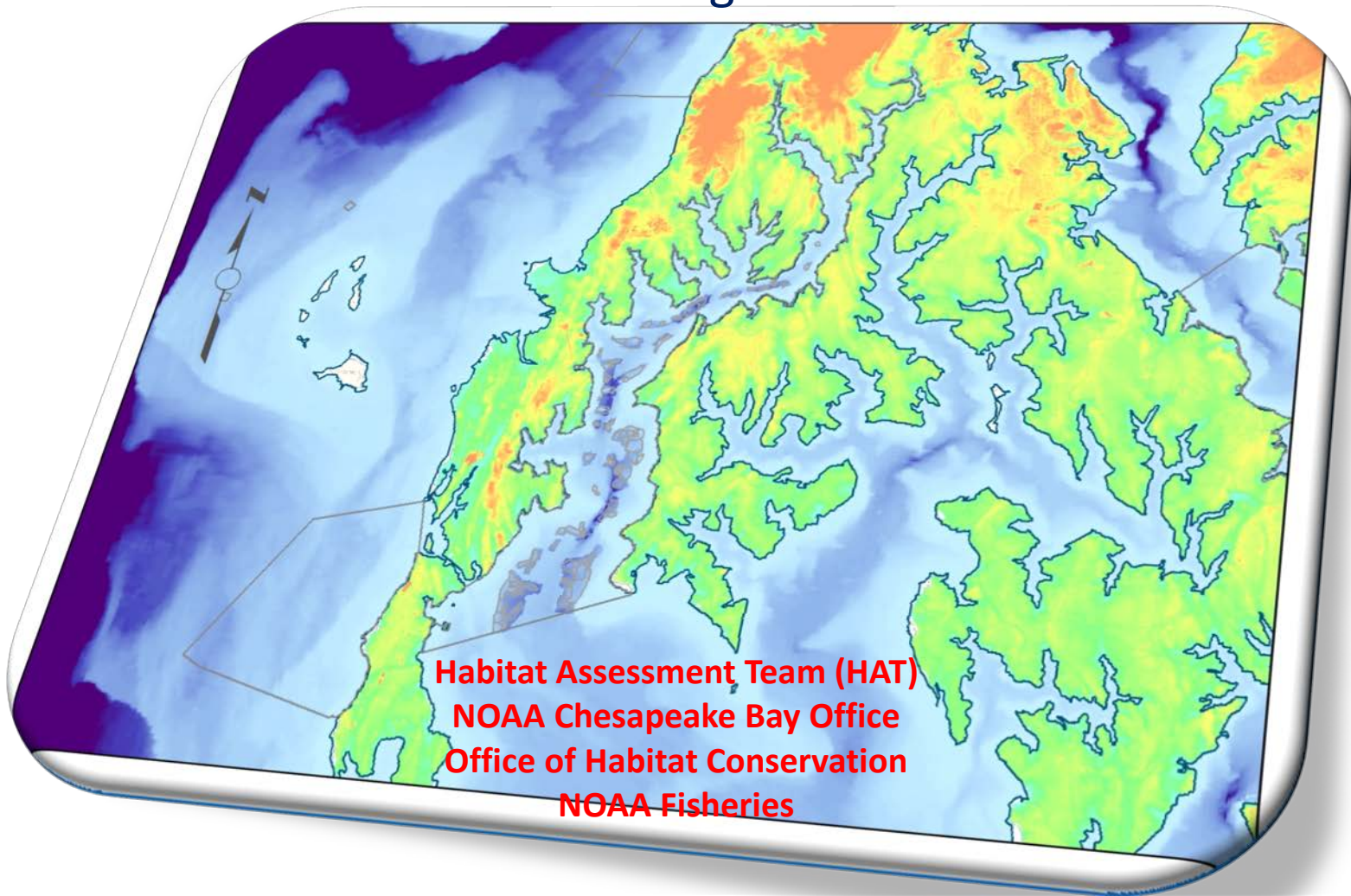


Location Matters

Habitat Mapping and GIS Tools Improve Oyster
Restoration Siting and Success



Survey Equipment



NCBO R/V Potawaugh

R2Sonics 2024 Sonar

- Multibeam Sonar
- Rigid mount deployment

Edgetech 4200

- Side Scan Sonar
- Towed configuration

Edgetech 3100

- Sub-Bottom Profiling Sonar
- Towed configuration

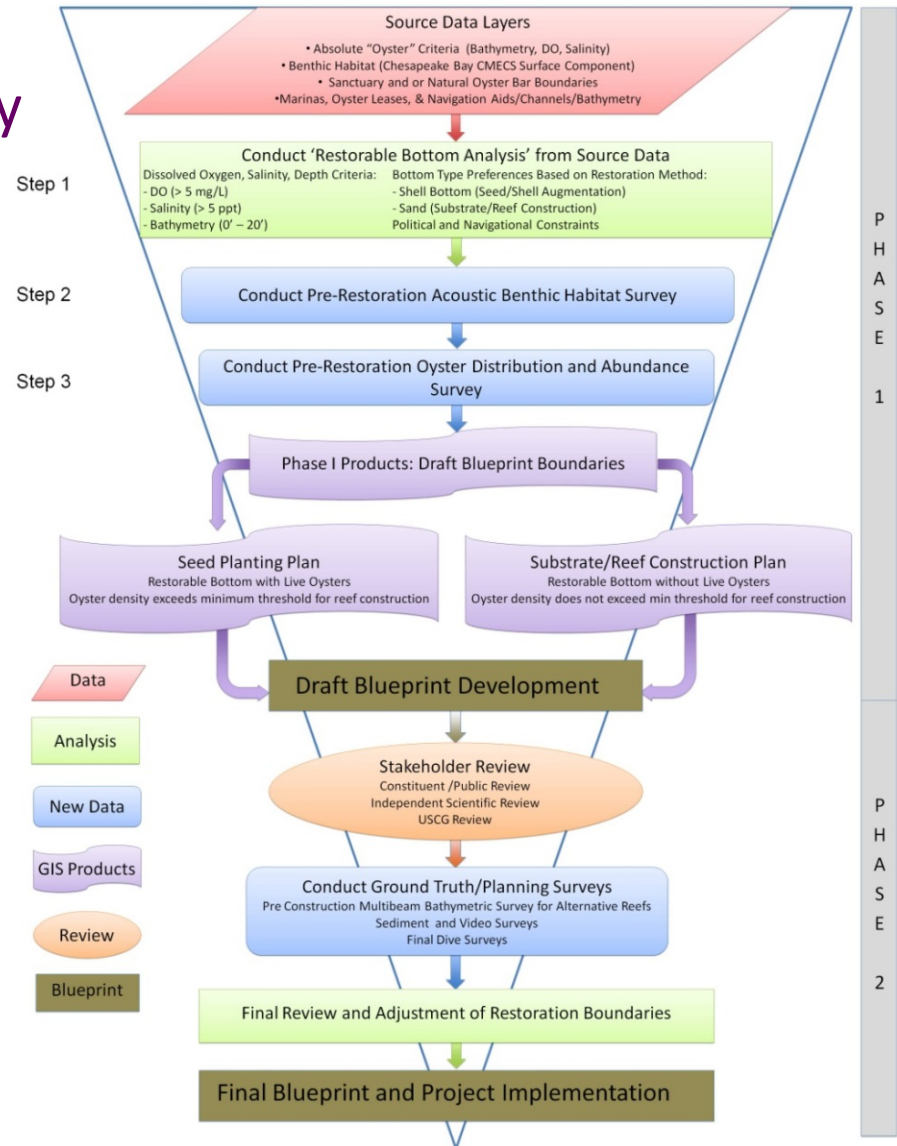
RoxAnn Singlebeam sonar

- Singlebeam sonar
- Rigid mount deployment

Habitat Assessment for Oyster Restoration in the Chesapeake Bay

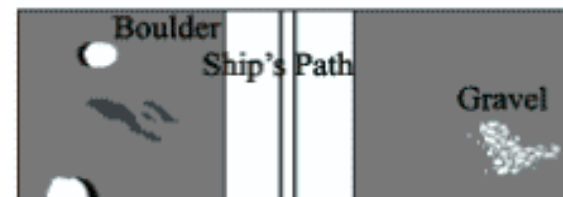
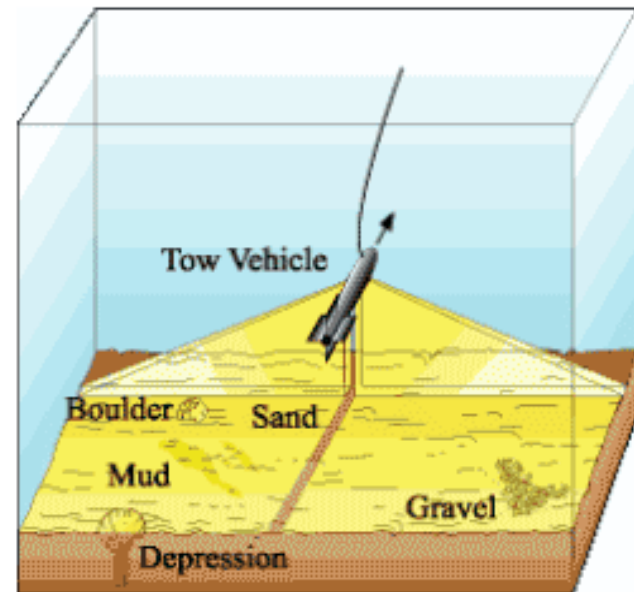
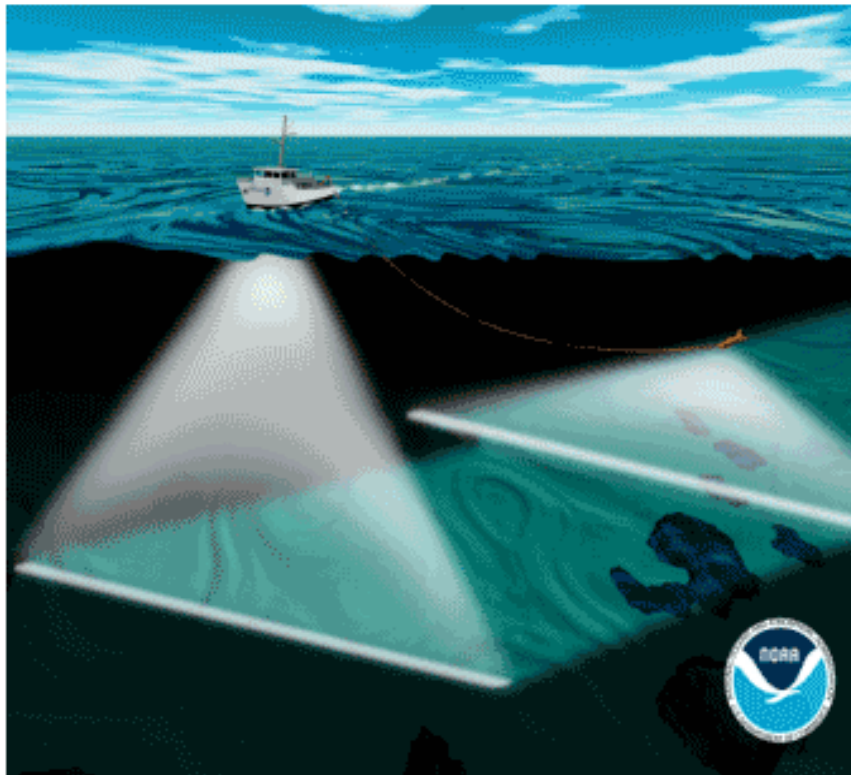
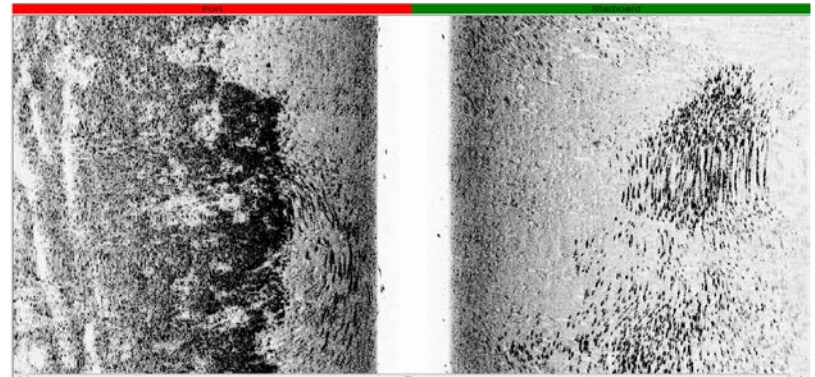
- Collect General Bathymetry and Substrate Data
- Produce Restorable Bottom Analysis
- Collect Population Data
- Produce Draft Blueprint Maps
- Collect More Detailed Bathymetry and Substrate Data
- Produce Final Blueprint Maps

Oyster Restoration Blueprint Flow Chart



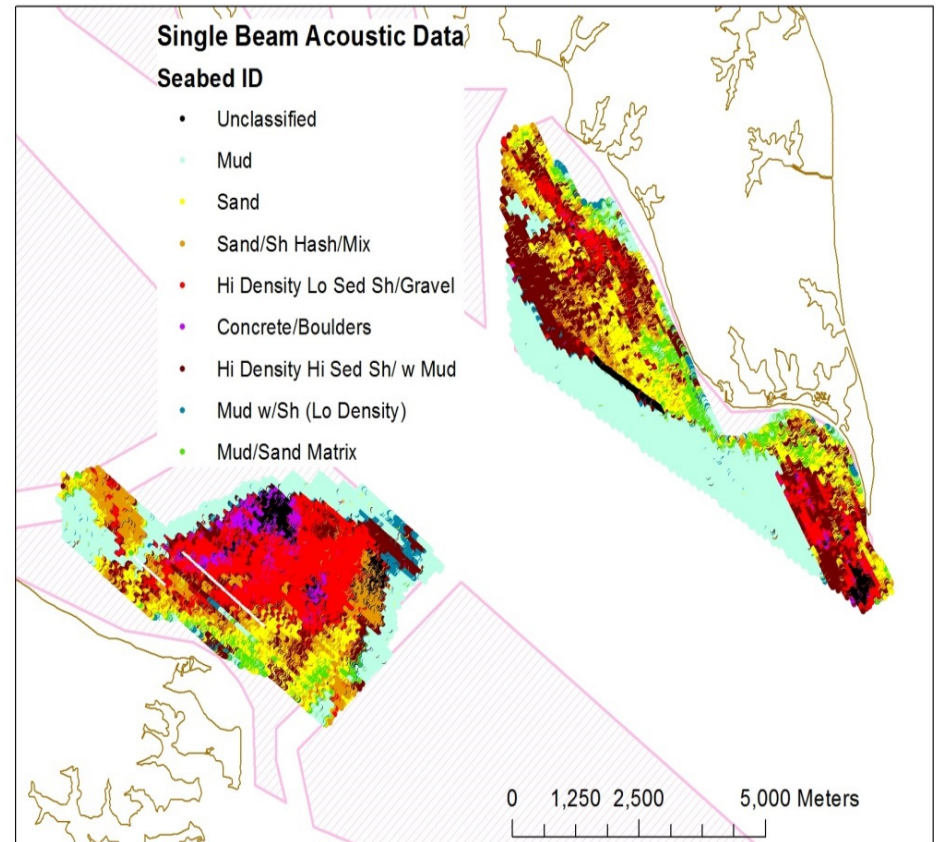
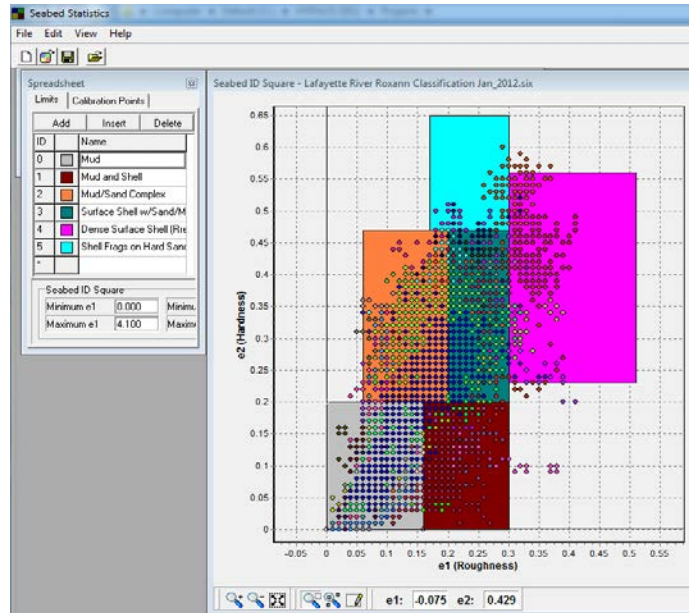
Sidescan Sonar

Side Scan Sonar creates a wide swath that measures the reflectivity of the acoustic signal, a proxy for texture and the composition of seabed material.



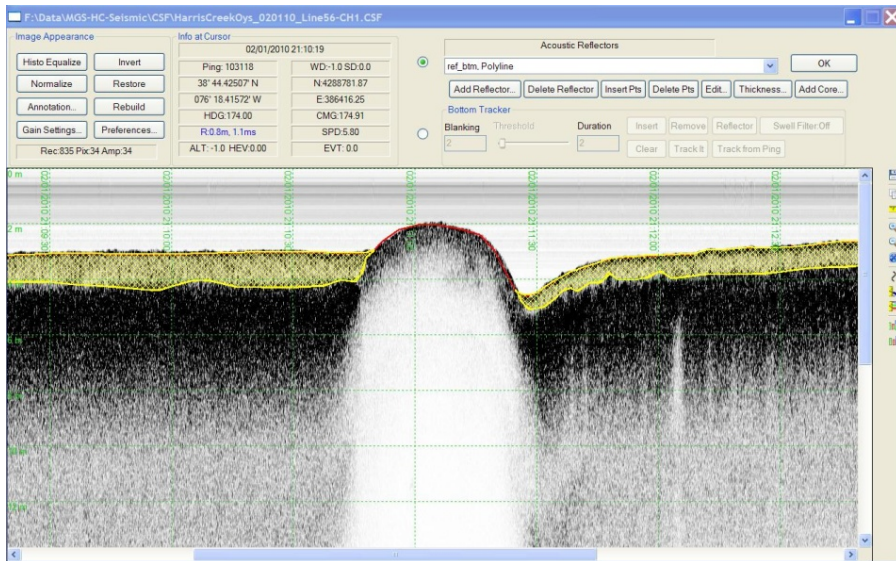
Singlebeam Sonar

- Single beam sonar through the use of special hardware allows up to determine a roughness (e1) and hardness (e2) factor. We plot these values over a matrix of known bottom type hardness and roughness characteristics to establish a seafloor classification.

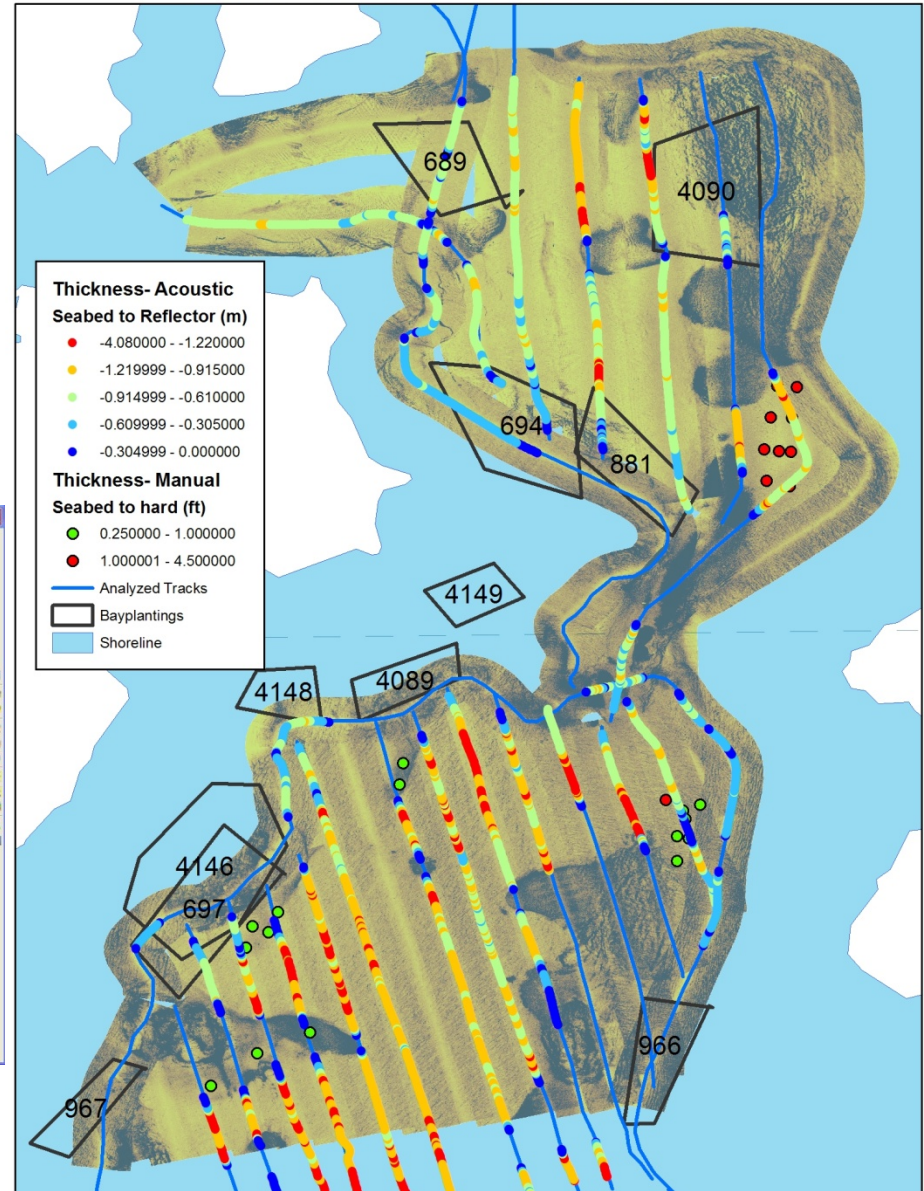


Sub Bottom Profiling

Sub Bottom Profiling allows you to determine sediment thickness above a hard reflector such as oyster bottom and is used to determine the suitability for substrate placement

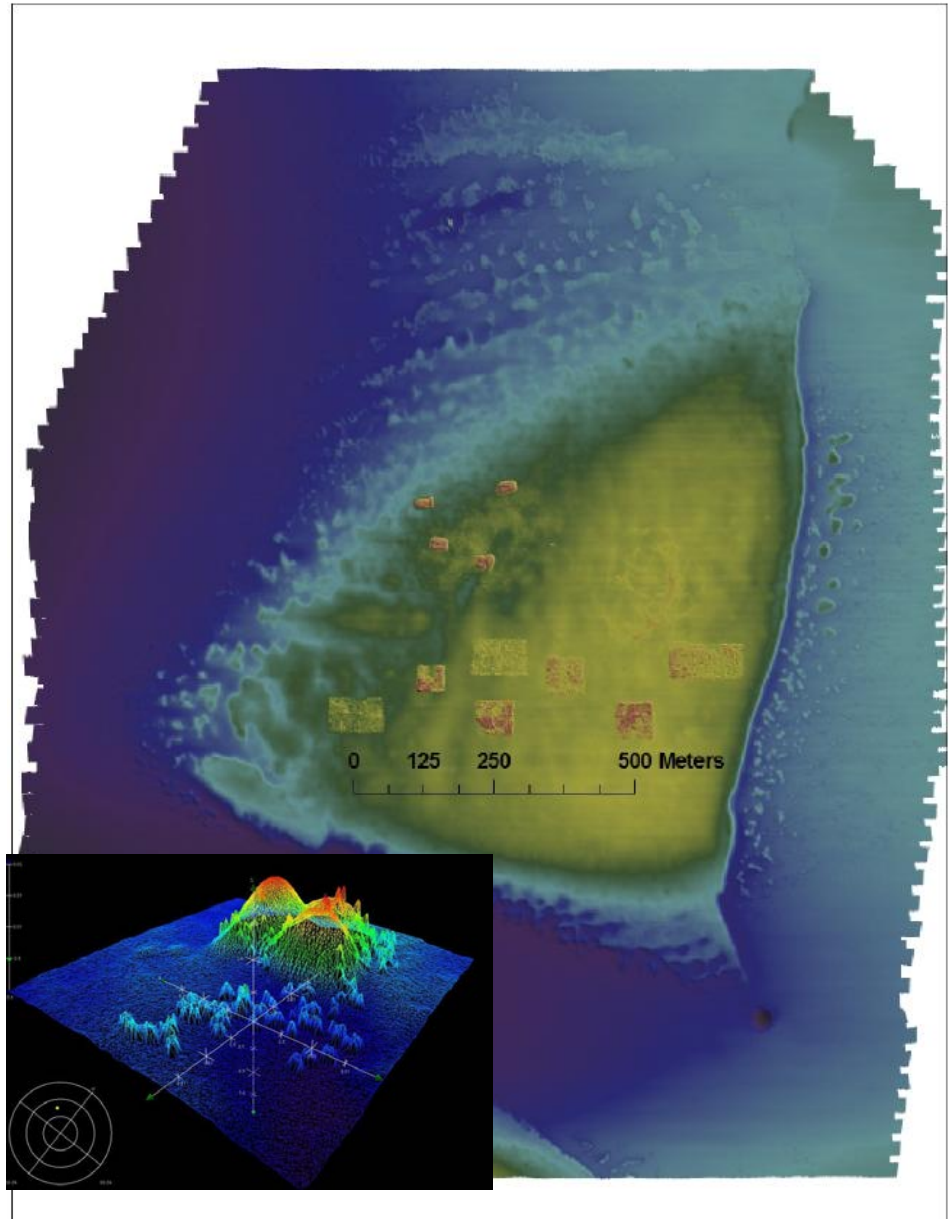
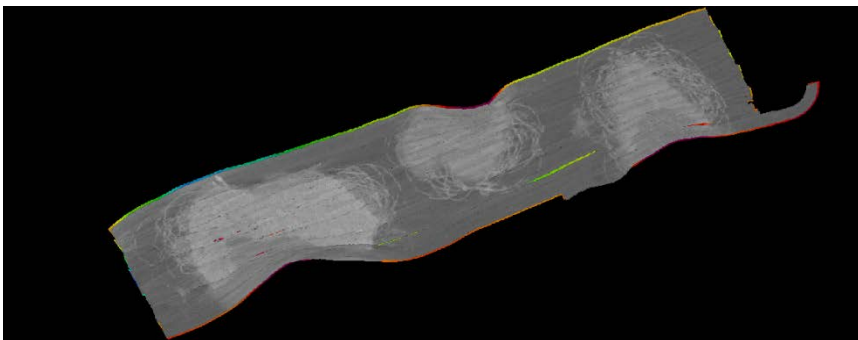
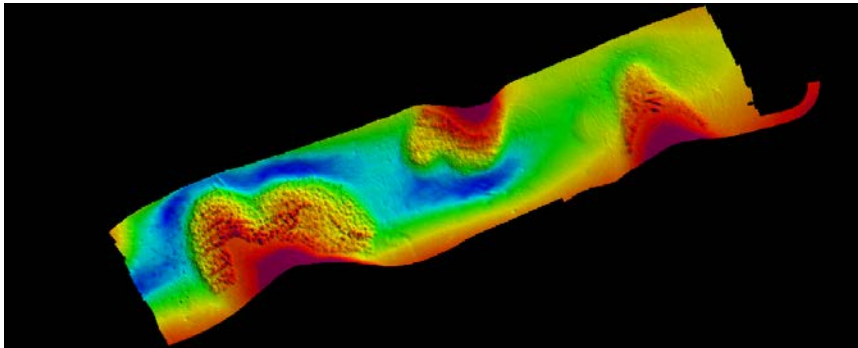


Harris Creek Sediment Thickness



Multibeam Bathymetry

Multibeam provides a high density of bathymetry and intensity sounding. Equiangular swath means survey coverage is a function of water depth

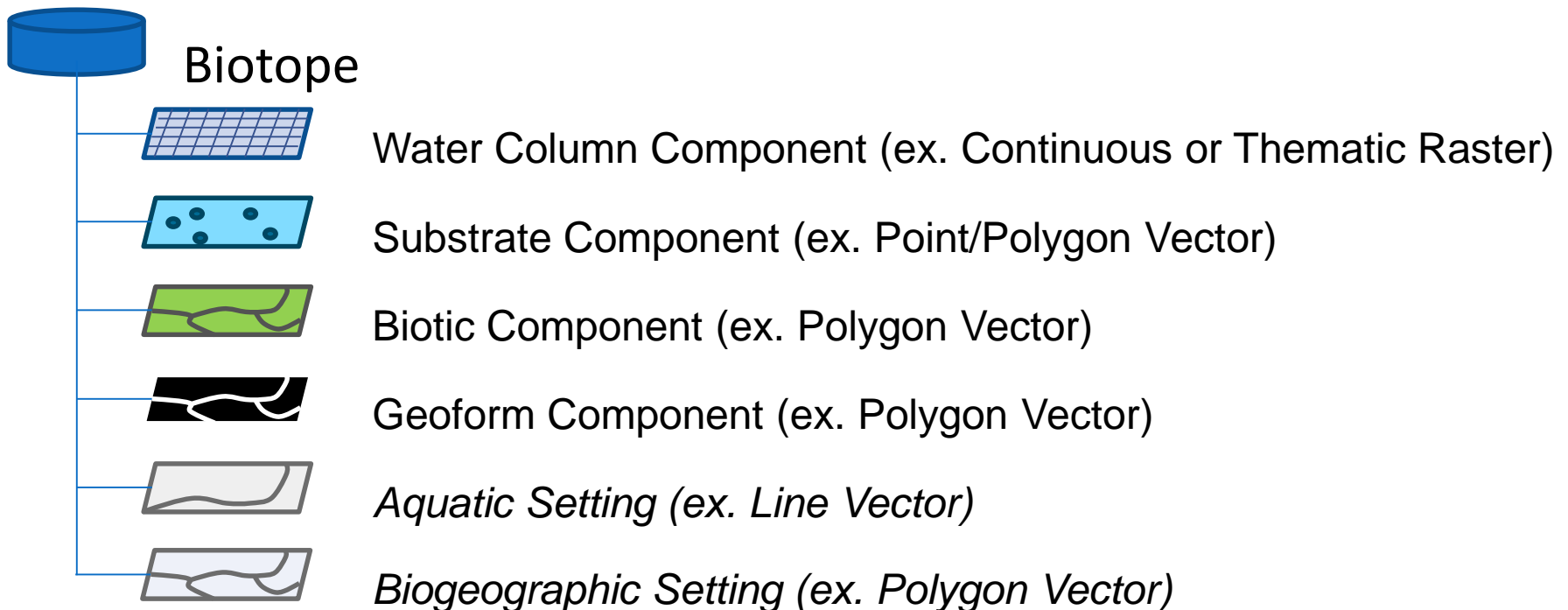


Summary of Mapping Products

- **Sidescan - Backscatter Mosaic surface (reflectivity)**
- **Multibeam – gridded surface/points (bathymetry, seabed morphology, slope, rugosity)**
- **Sub-bottom Profile - Lines (subsurface morphology)**
- **Singlebeam Classification - points (seabed material – remote sensing)**
- **Benthic Grab Sample - Points (seabed material - actual)**
- **Habitat Characterization Polygons (seabed surface material distribution)**

What is CMECS

- Federal Geographic Data Committee standard for Coastal and Marine Ecological Classification.
- Basis for the Chesapeake Bay Office compiled dataset of Benthic Substrates in Chesapeake Bay.
- Unifying set of Nomenclatures and Data Structure that Accommodates biological, geological, chemical, and physical data .

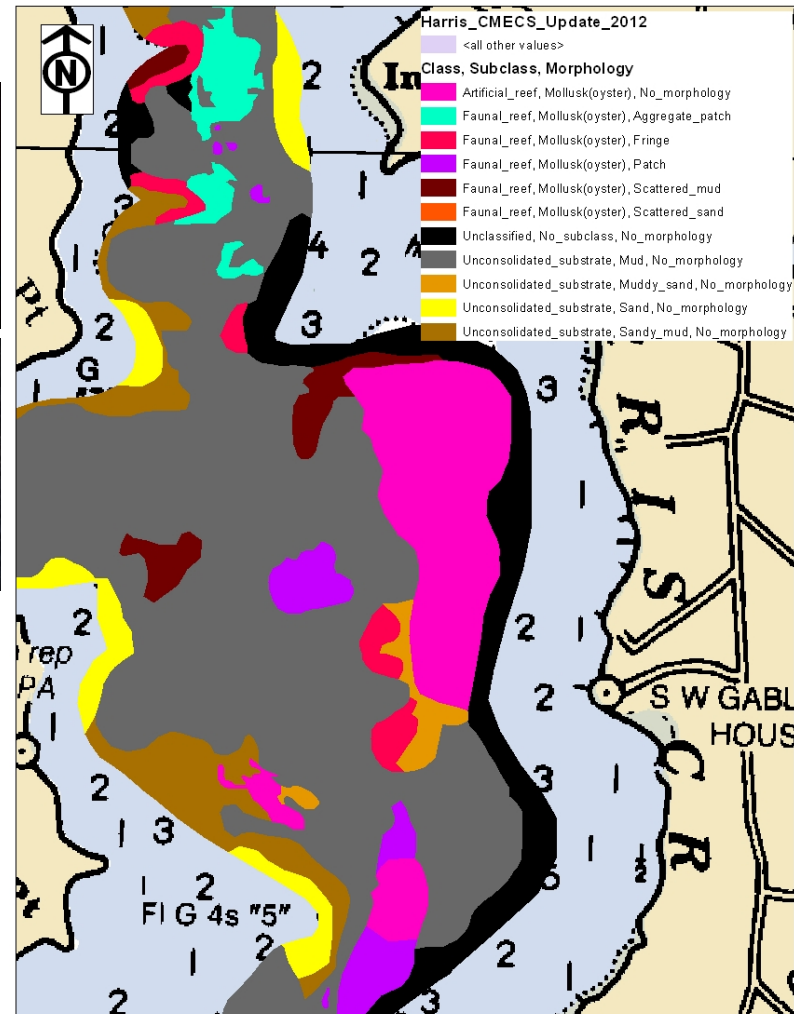


Composition and Distribution of Seabed Materials

Sidescan sonar, Singlebeam Classification, ground truthing



Habitat characterization with CB-CMECS
Surface Geology Component



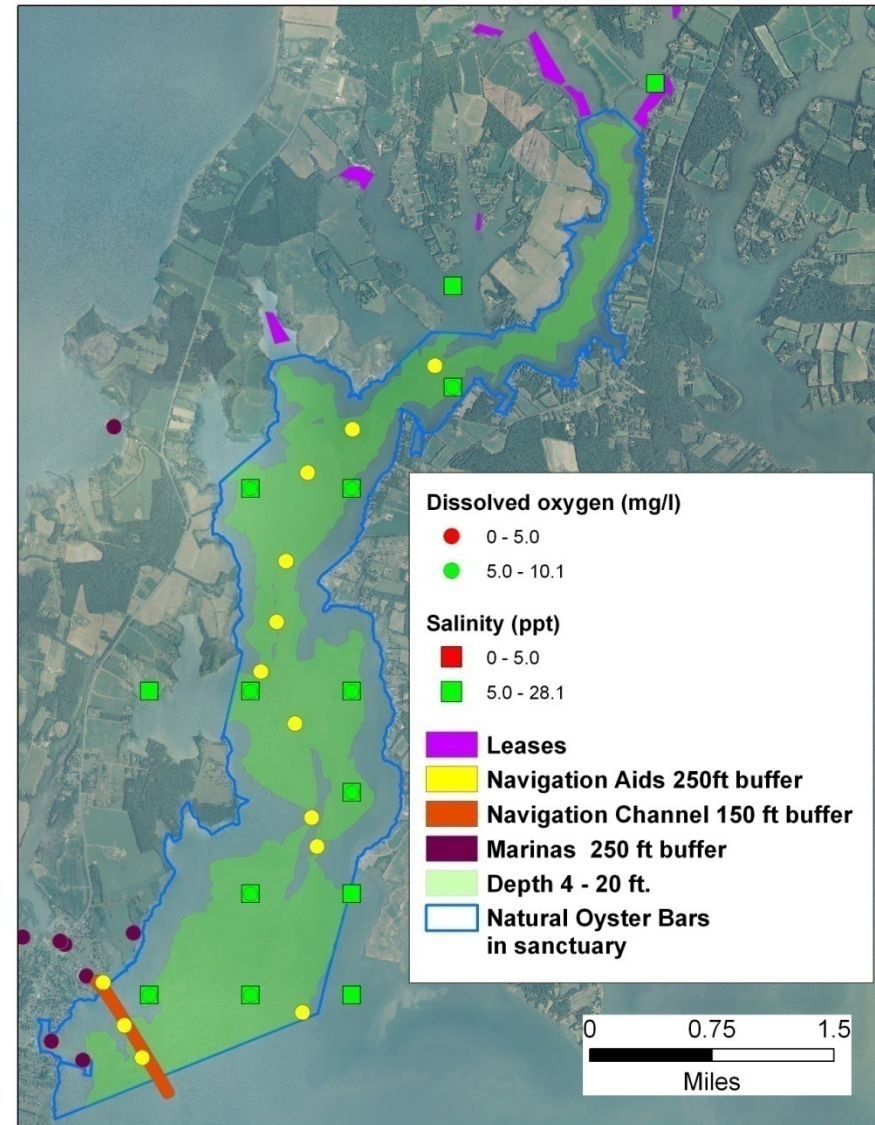
Restorable Bottom Assessment: General Criteria for Restoration Projects

Biologically Restorable

- Compatible substrates and structures
- Dissolved oxygen : ≥ 5 mg/l
- And/or Bathymetry zone 4-20 feet
- Salinity : ≥ 5 ppt.

Politically Restorable

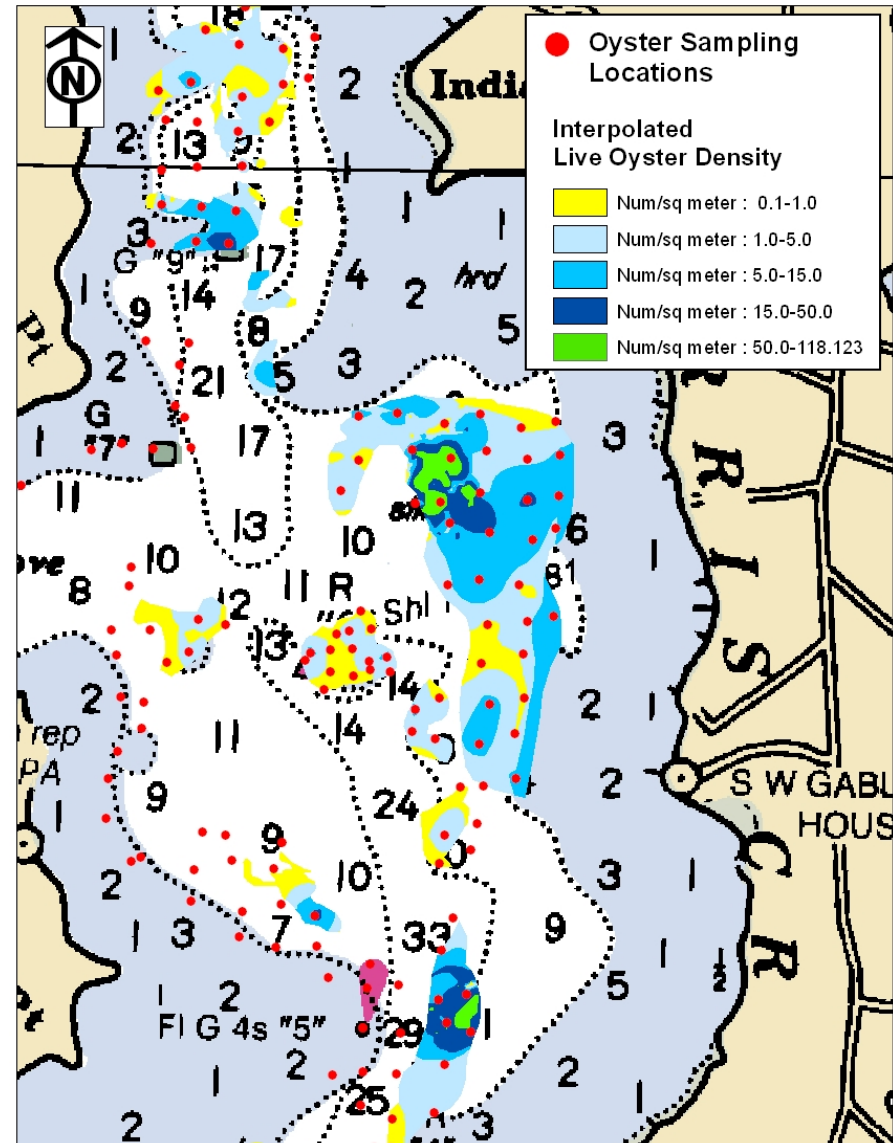
- Outside private lease areas
- Outside buffer zones around navigation aids and maintained channels
- Outside sanitary shellfish closure areas and marinas
- Inside MD Natural Oyster Bars (NOB)



Live Oyster Distribution and Abundance



Patent tong sample site selection
based on CMECS Substrate
Component polygons



Determining Restoration Method

Seed Only : hatchery spat planted directly on bottom

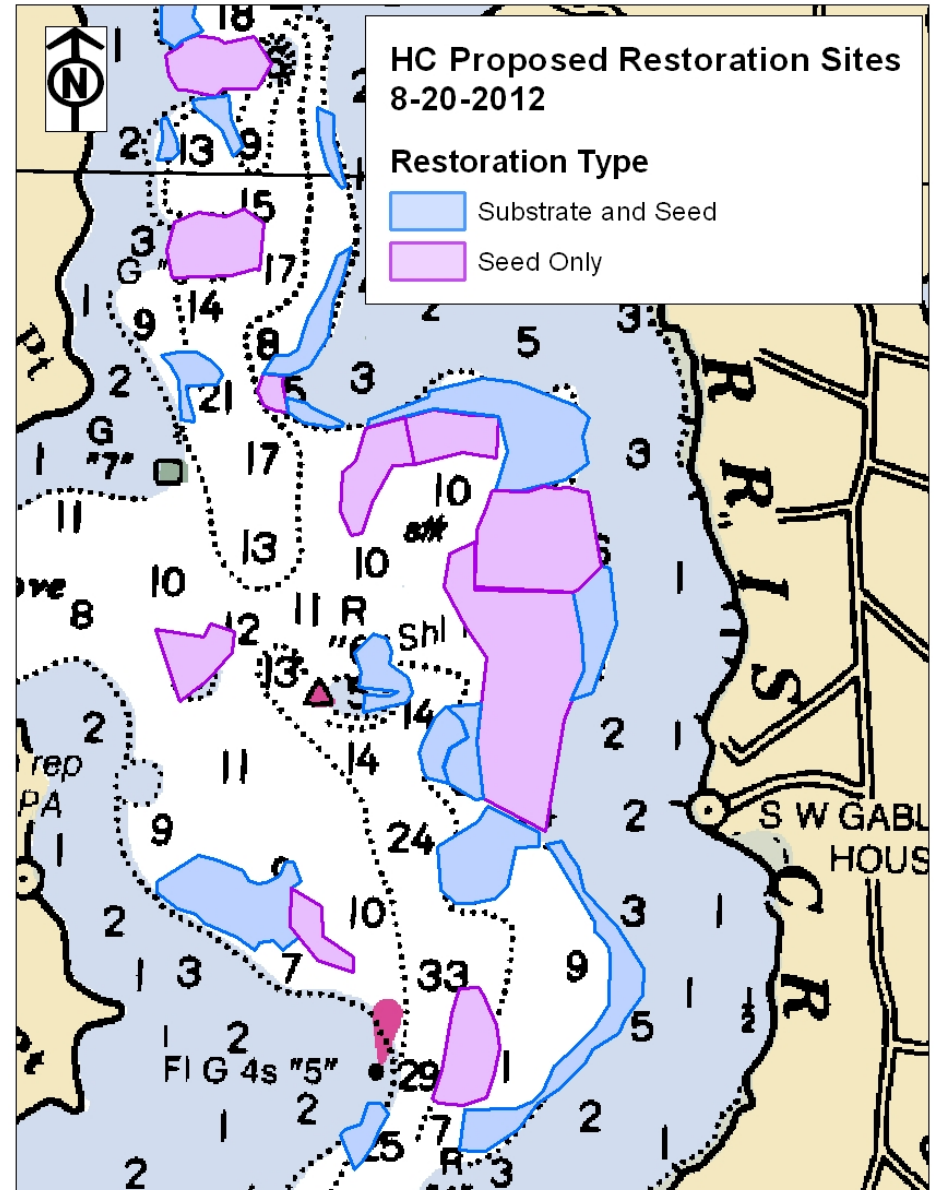
- On un-sedimented oyster shell-Populations greater than 5 oysters per square meter
- Existing oyster densities warrant augmentation with hatchery spat

Substrate and Seed : constructed reefs with hatchery spat

- Site devoid of functional oyster shell habitats and live oysters – Populations of less than 5 oysters per square meter.
- Sub-surface sediments can support reef construction
- Current seabed conditions suggest that site will not become sedimented
- Site depth and planned reef height are within permitted minimum depths

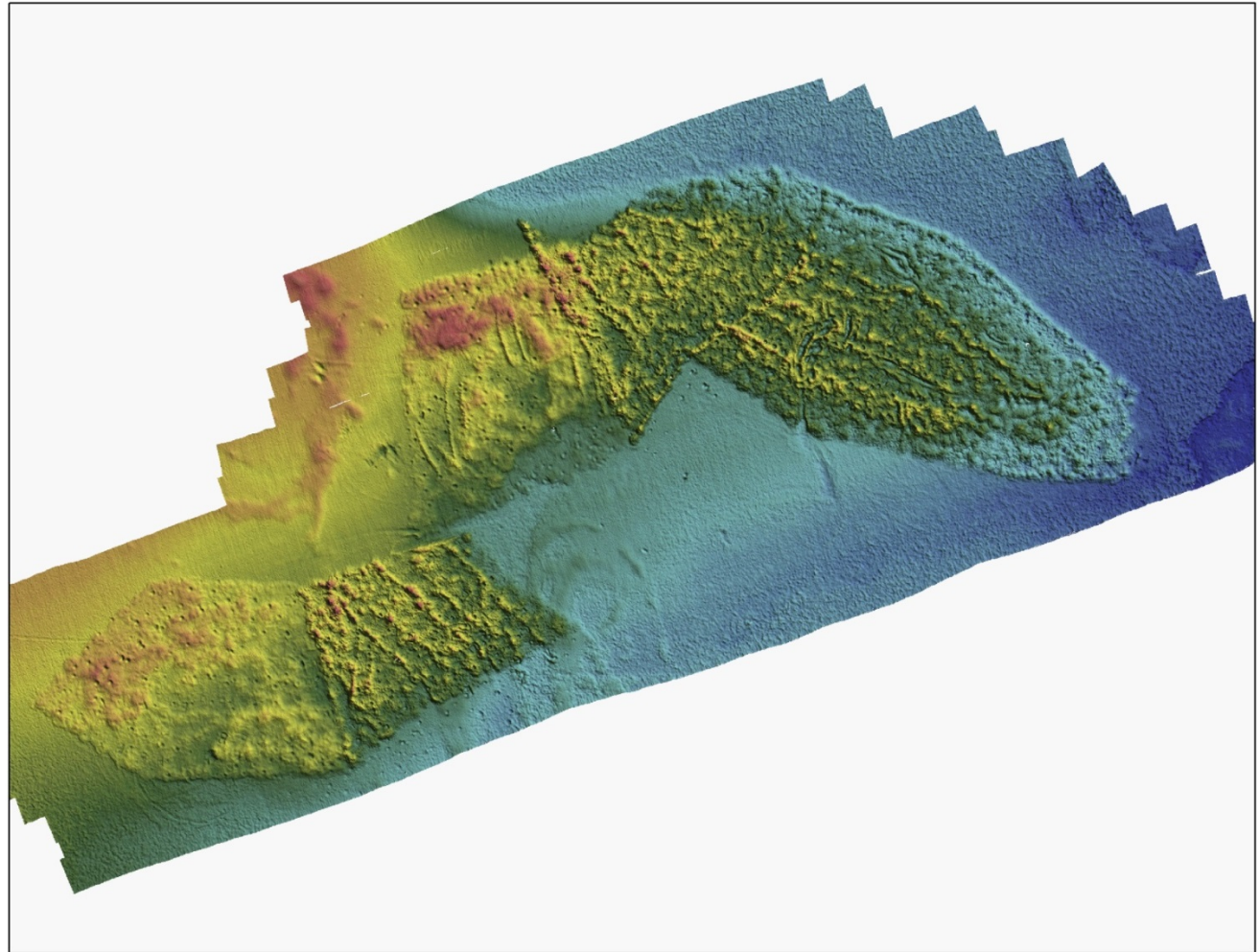
Restoration Blueprint

- Identify Restoration Site Boundaries Based on Restorable Bottom Assessment
- Determine Site Construction Timetable
- Diver ground truth transects to verify survey findings.

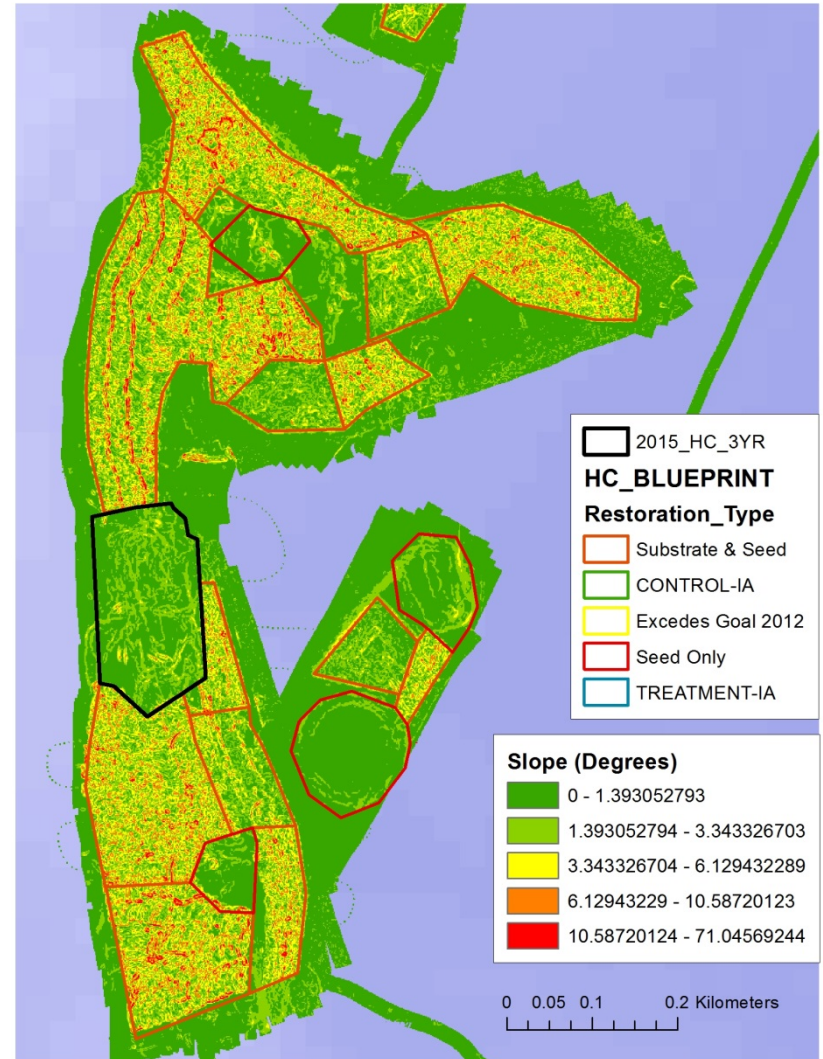
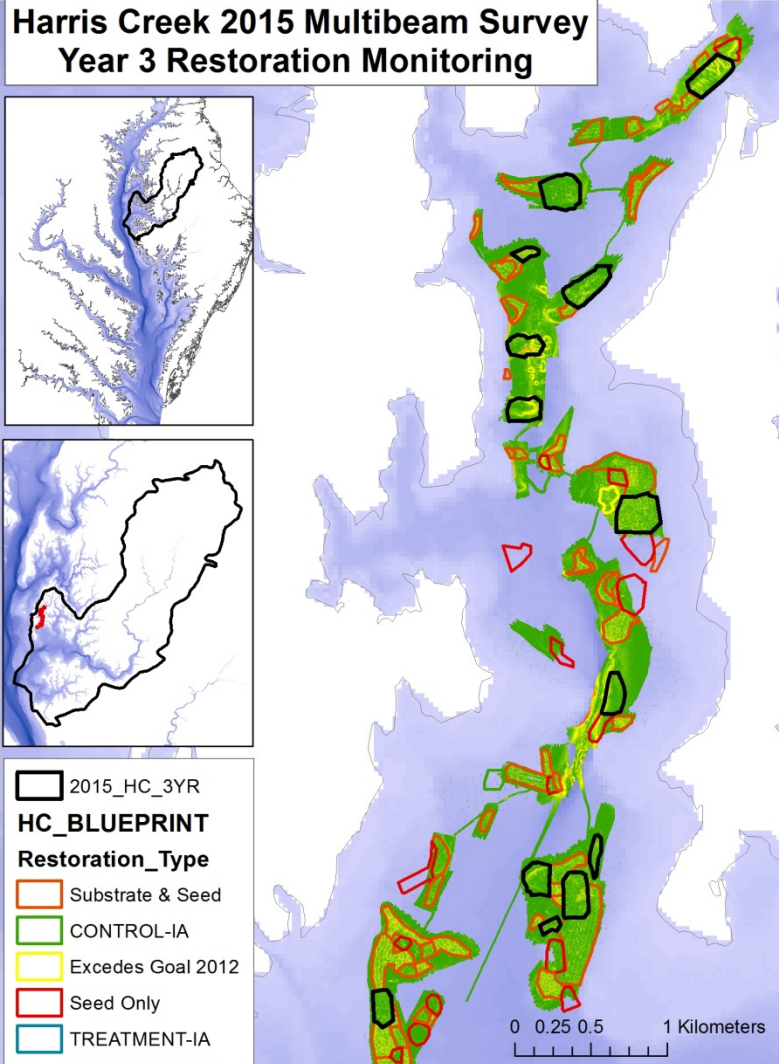


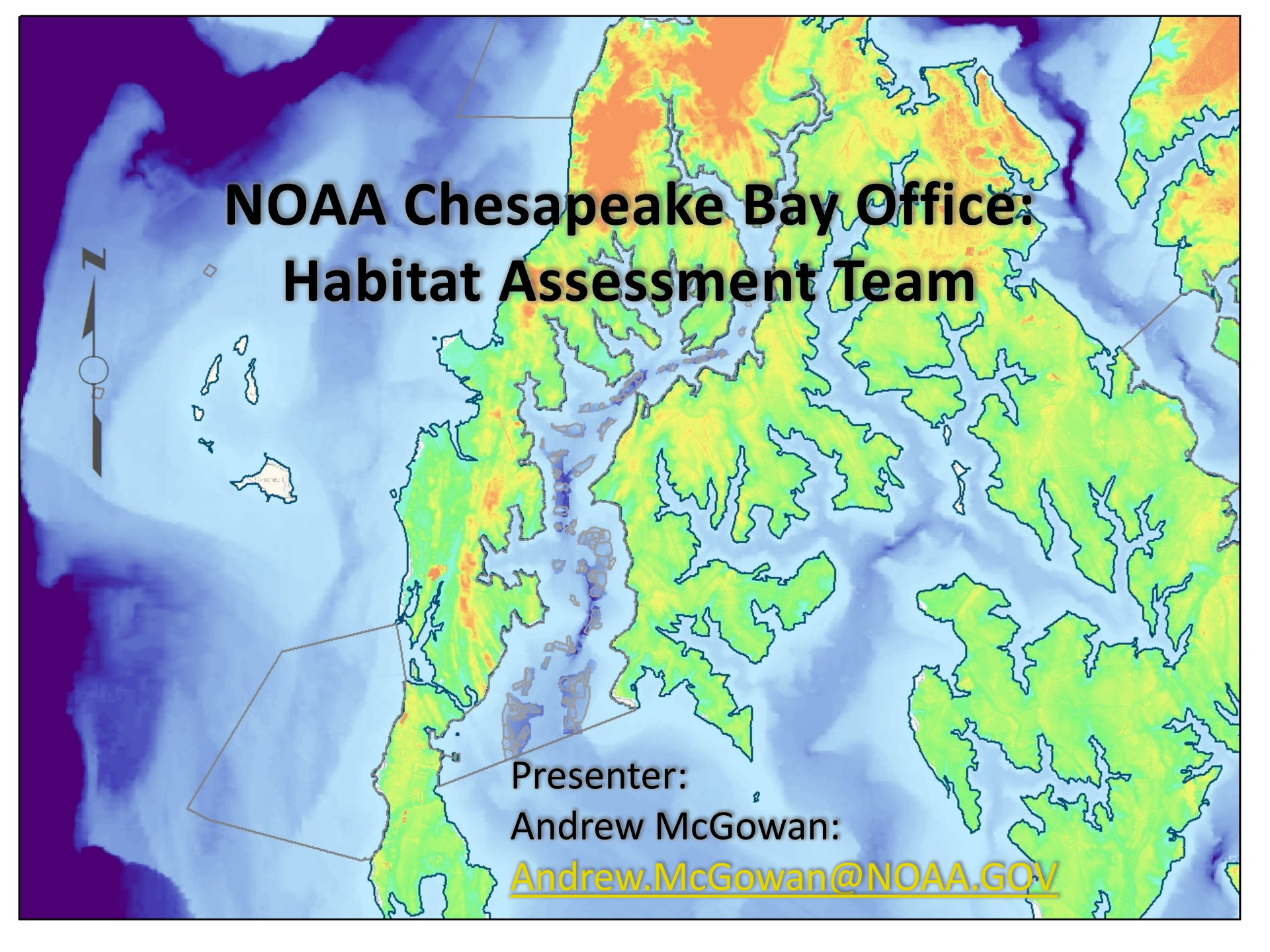
Post Construction Monitoring

Hi resolution full coverage multibeam surveys are conducted after the reefs are constructed and again three and six years after the reef was constructed.



Post Restoration Monitoring Analysis and Findings





NOAA Chesapeake Bay Office: Habitat Assessment Team

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