NCBO Science: Current and Future Efforts

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Background

- Focus, and a New Dialog
  - Toward a well-targeted scientific portfolio
  - Responsiveness to mandates by embracing innovation and the best of the scientific community
  - Emphasis on analysis through in-house and external capacities – get the results out there
  - Looking forward to a robust, two-way conversation with STAC to answer science and technical questions facing NCBO and its partners

Ecosystem Science at NCBO

- My background & the ecosystem science manager role
- Within the Ecosystem Science (ES) Branch:
  - Buoy observations, integrated observations
  - Habitat assessment, bottom characterization
  - Ecosystem modeling
  - Satellite remote sensing
  - SYNTHESIS, INTEGRATION
- ES strives to work in concert with Fisheries Science Research Program grants (~$1.5M)
- ES connects with Coastal and Living Marine Resources, Environmental Literacy Branches at NCBO to enhance science to application and broader impacts of the work

Vision

- NCBO believes that an inter-disciplinary approach at multiple scales is the best strategy for Bay issues
  - NOAA characteristics
    - Diverse capabilities (e.g., satellite observations)
    - Bay-wide, regional, shelf scale activities
  - Partners as collaborators, co-PIs

- Carrying this vision to 2012 projects

Current Efforts

- Pre- and Post-Restoration Habitat Assessment
  - Oyster focus
- Integrated Observations
  - Evolution of CBIBS
- Incident Response Success
  - Hurricane Irene, Tropical Storm Lee

Figure 1 The image shows a side scan sonar survey over a layer of bathymetry on Sandy Hill in the Choptank River by Maryland Geological Survey. I
n the side scan image, darker shades represent hard, coarse bottom (e.g., shell); lighter shades represent fine, soft bottom (e.g., silts). Data courtesy of Maryland Geological Survey.

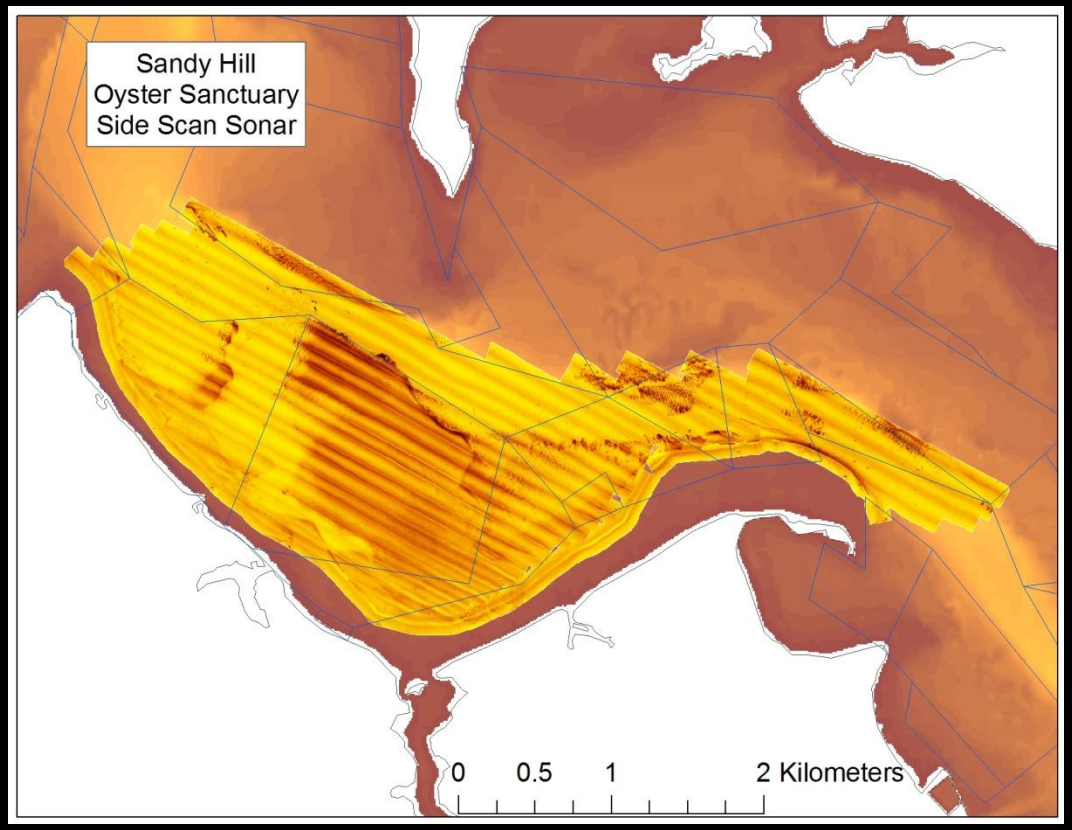


Figure 2. The image depicts a GIS polygon layer of oyster bottom surface type which is a product of the Broad Scale assessment. Data courtesy of Maryland Geological Survey.

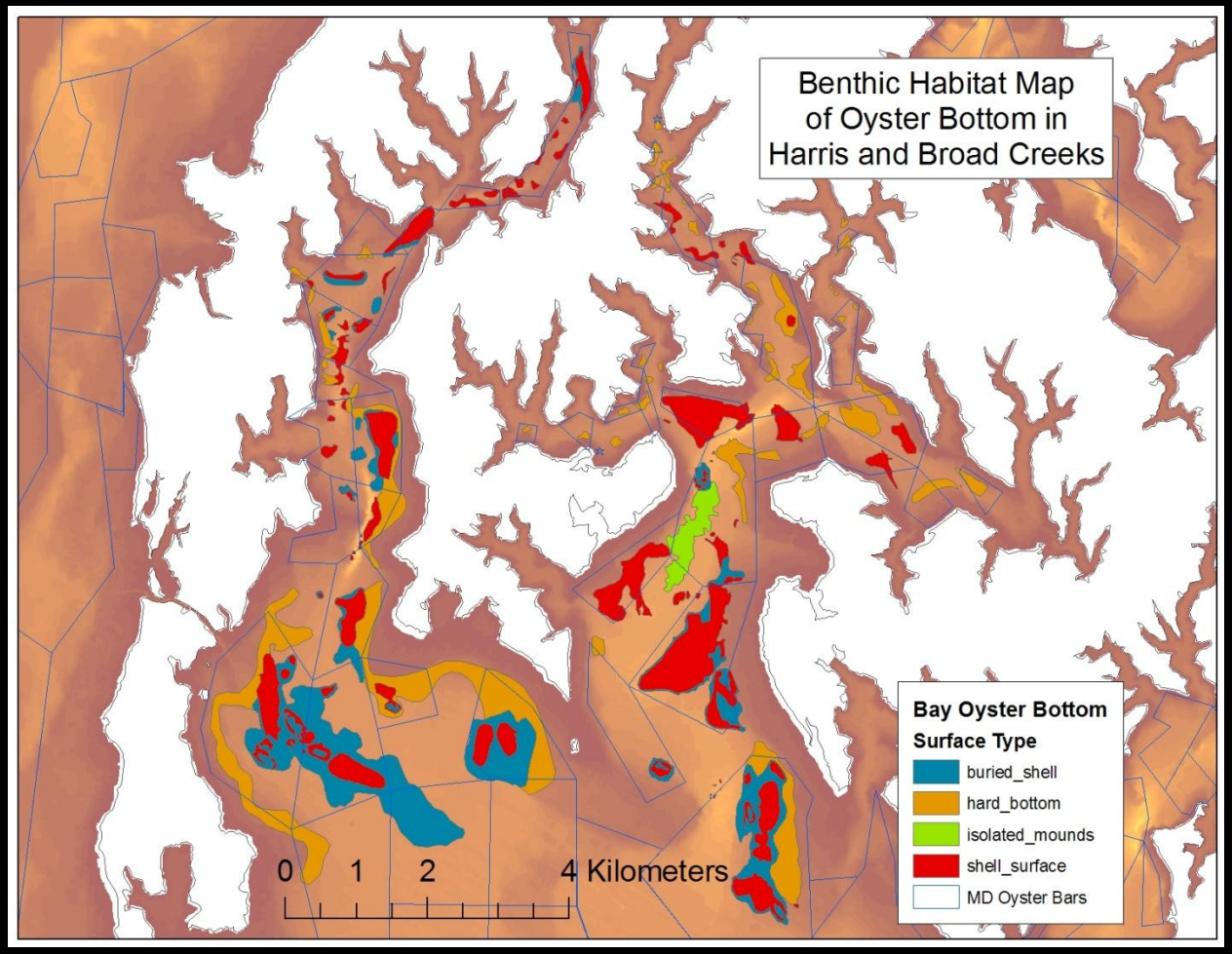


Figure 3 This image shows a multibeam bathymetric survey over a portion of the side scan sonar survey. The purple/blue represents deeper water (15m). T he gray/white represents the more shoal water (3m). Multibeam data courtesy of NCBO Habitat Assessment Team.

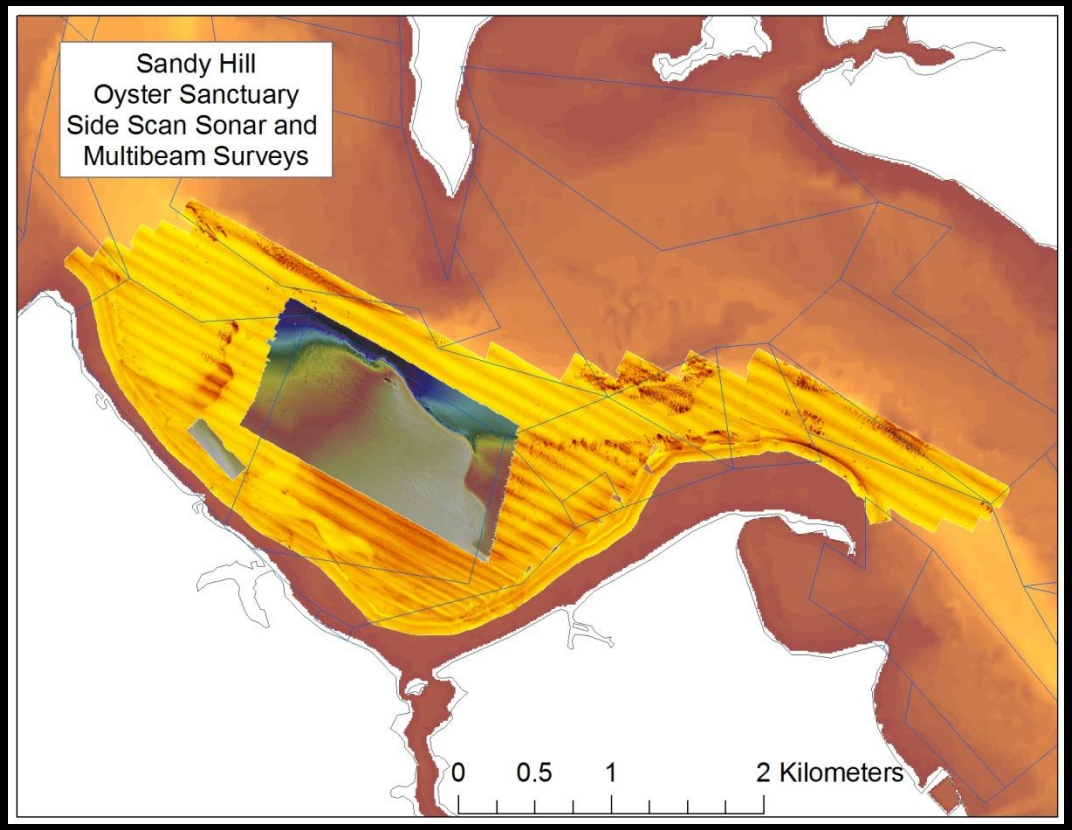
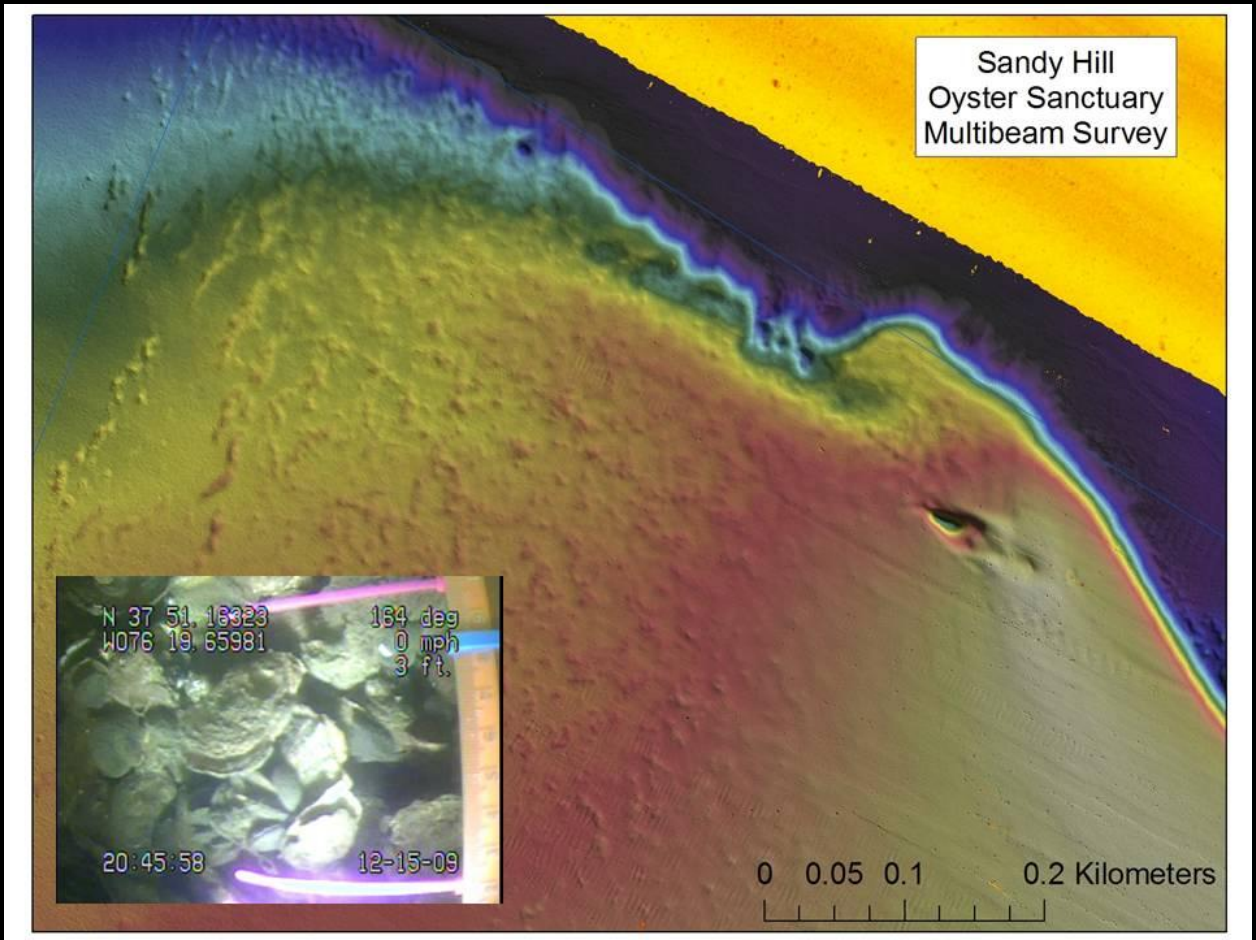
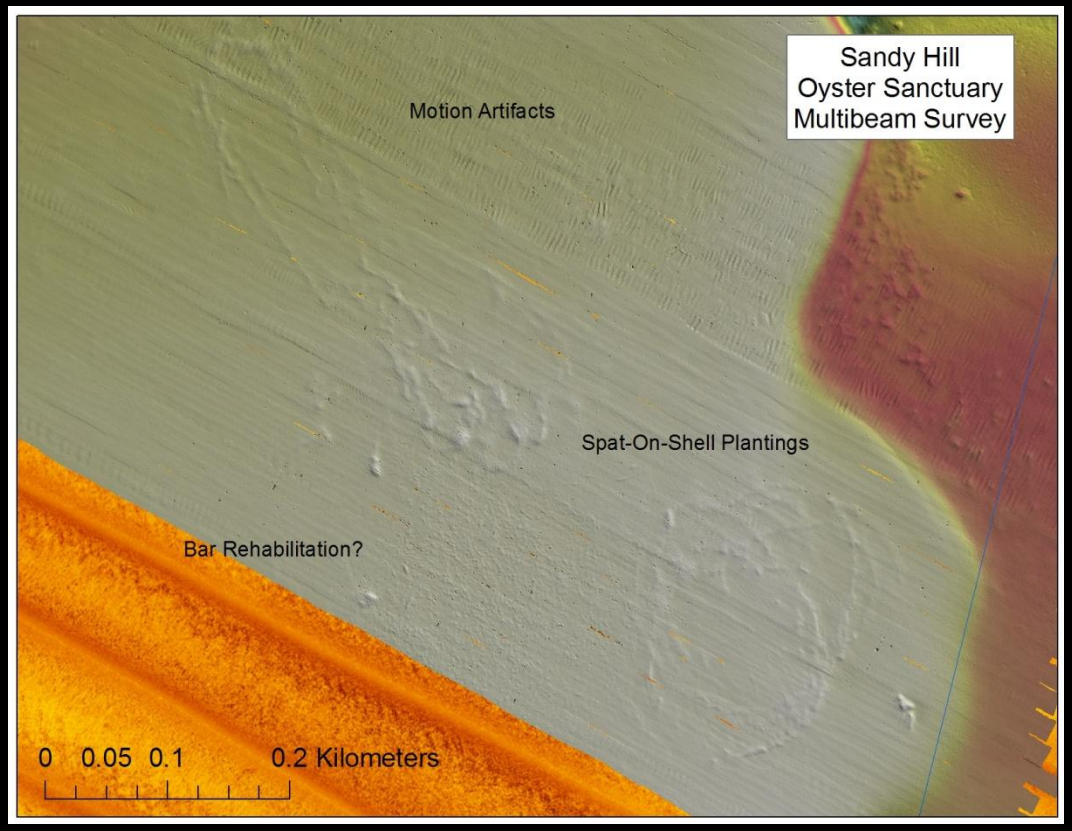
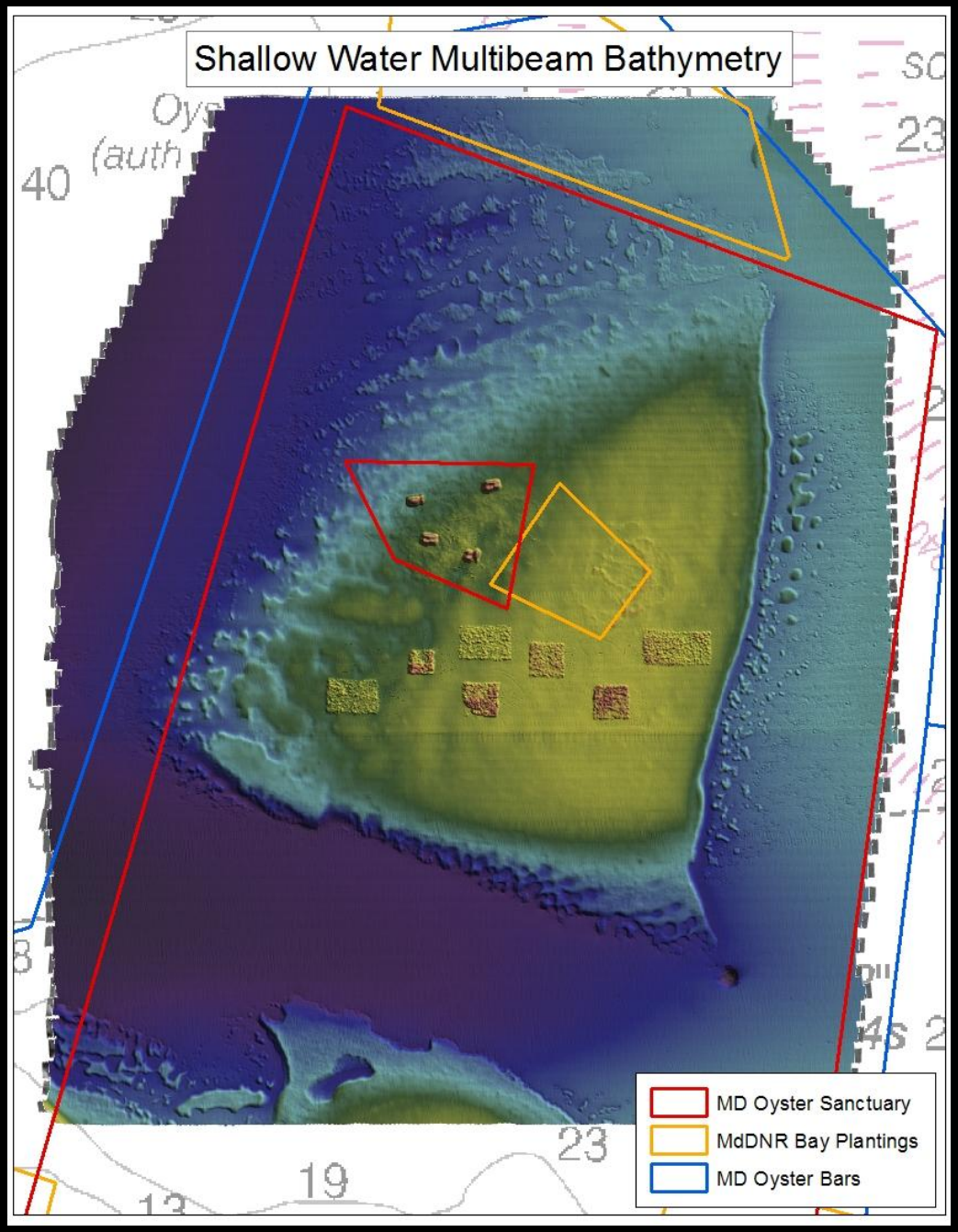


Figure 4 Multibeam surface of oyster habitat created with 0.5m grid of soundings with video groundtruth inset. Photo courtesy of NCBO Habitat Assessment Team.




Sandy Hill
Oyster Sanctuary
Multibeam Survey
Motion Artifacts
Spat-On-Shell Plantings
Bar Rehabilitation?
0 0.05 0.1 0.2 Kilometers


Shallow Water Multibeam Bathymetry
MD Oyster Sanctuary
MdDNR Bay Plantings
MD Oyster Bars

Integrated Habitat Assessment

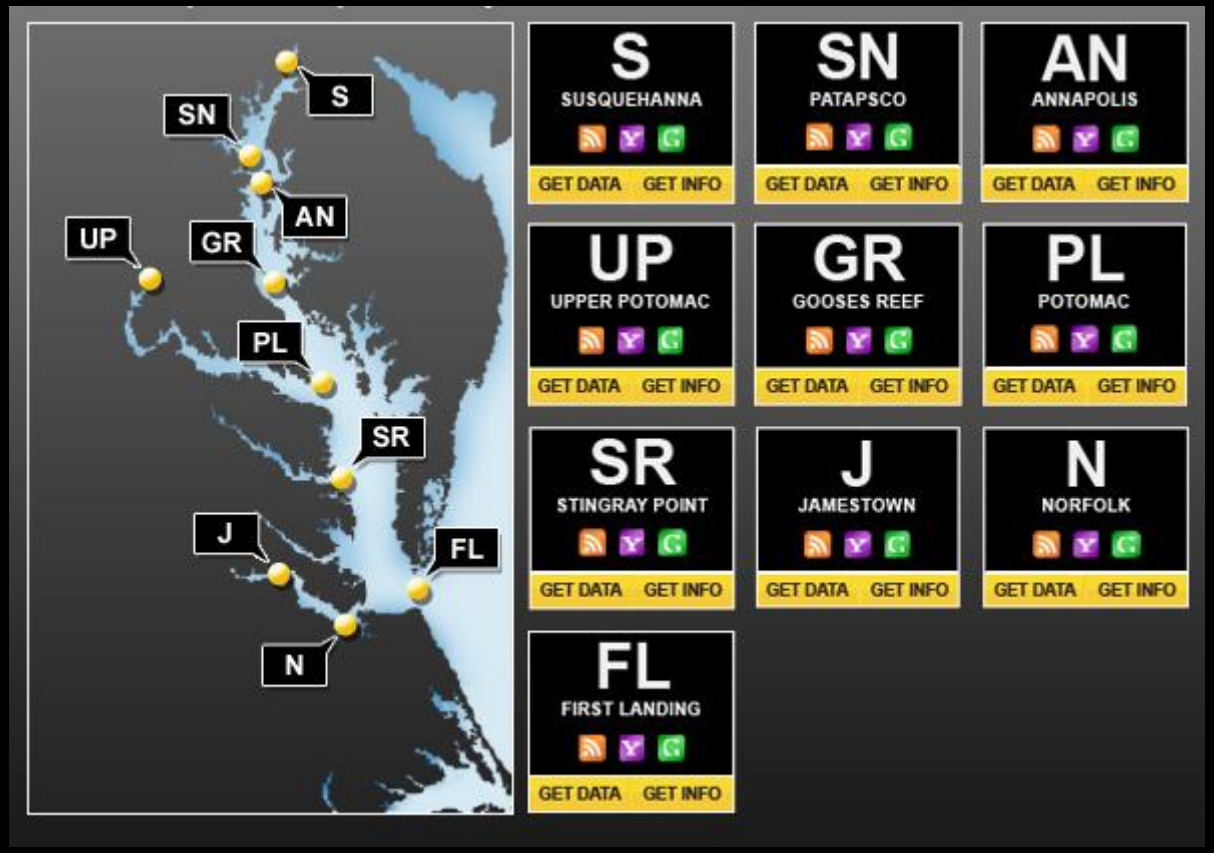
- Pre- and Post-Restoration Habitat Assessment
  - Guiding information for oyster restoration
  - Synchronized with states, agencies to provide side-scan (broad), multi-beam (fine), video, and direct population assessments (spatially-explicit demographics) to support oyster restoration
  - Following consistent process to characterize bottom habitat
  - Present application is for guiding oyster reef restoration

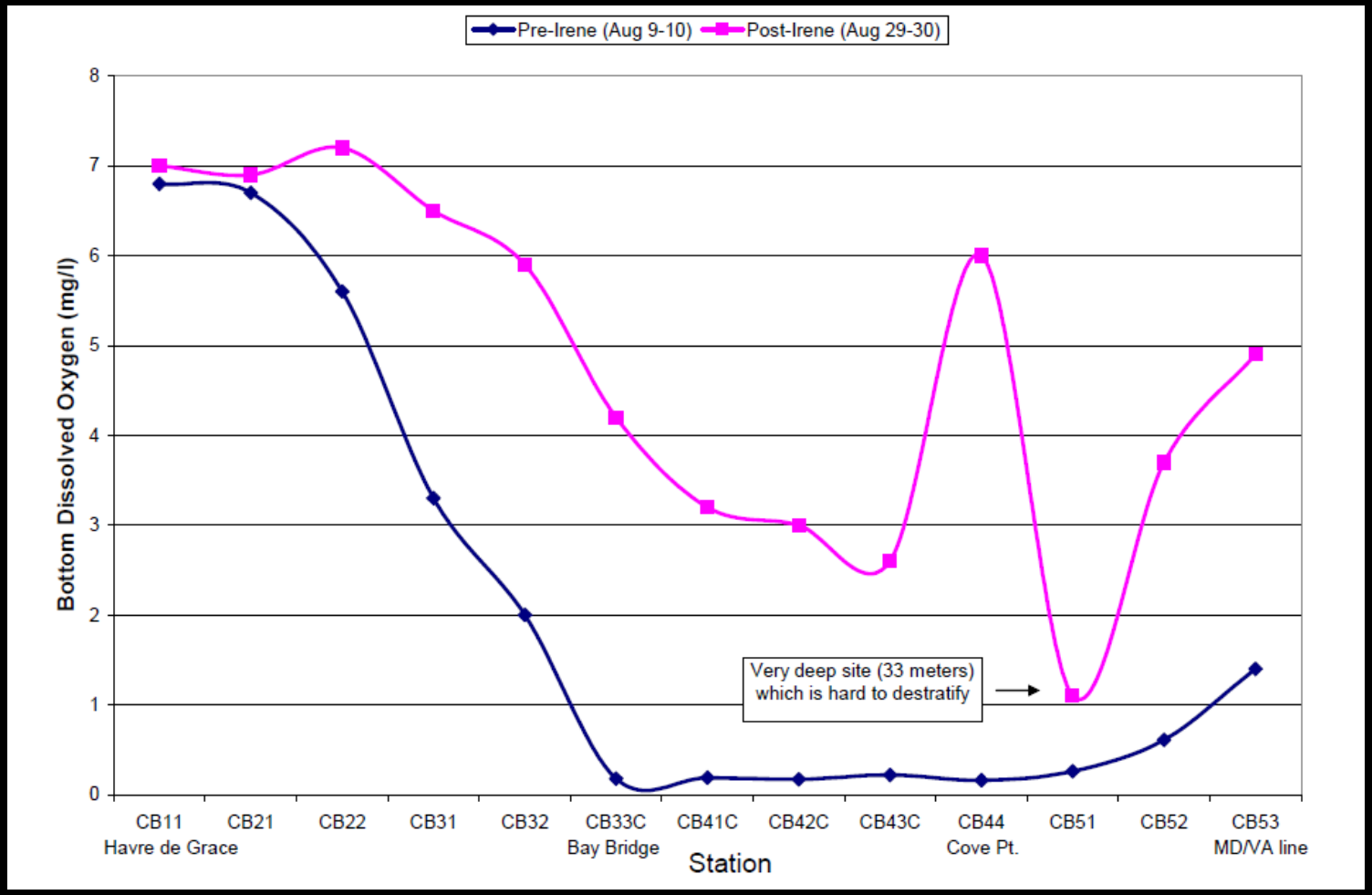
Design for Integrated Ocean Observations: Not too far from reality.

As we work,
We ask ourselves 'Are we making the best use of our observatories? '

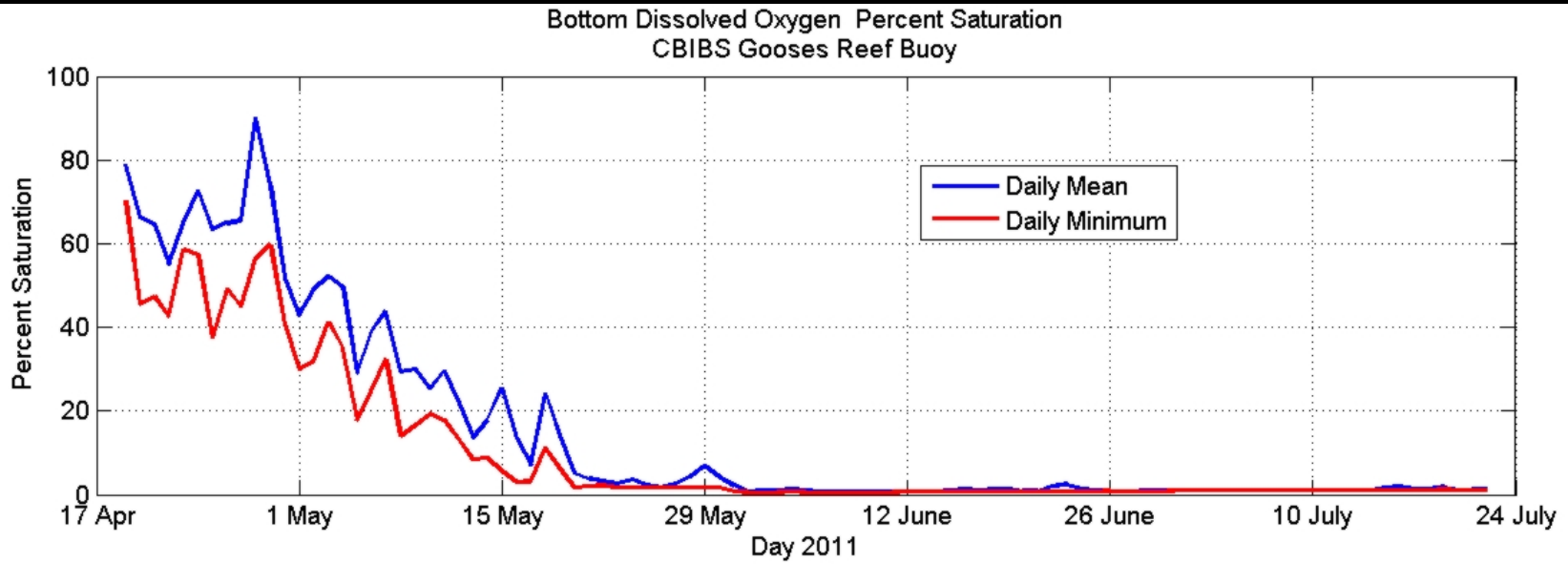
Launch of 10th and 'final' buoy in the array
Perhaps a shift from construction to
Synthesis and analysis.

Preparing methods to engage science community as well as public to use buoy datasets

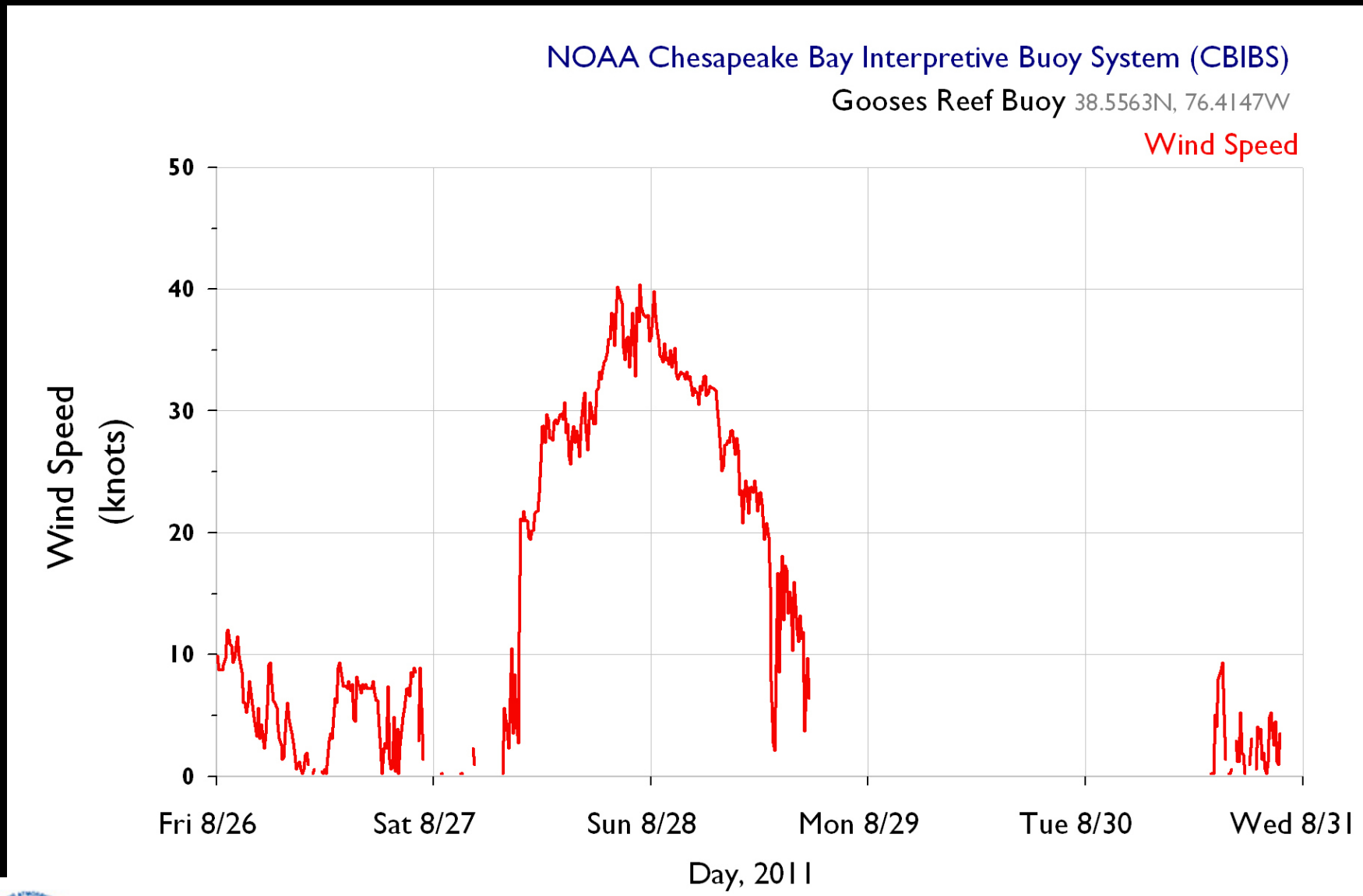




Example: DNR surveys are a consistent mainstay of observations invaluable to the community



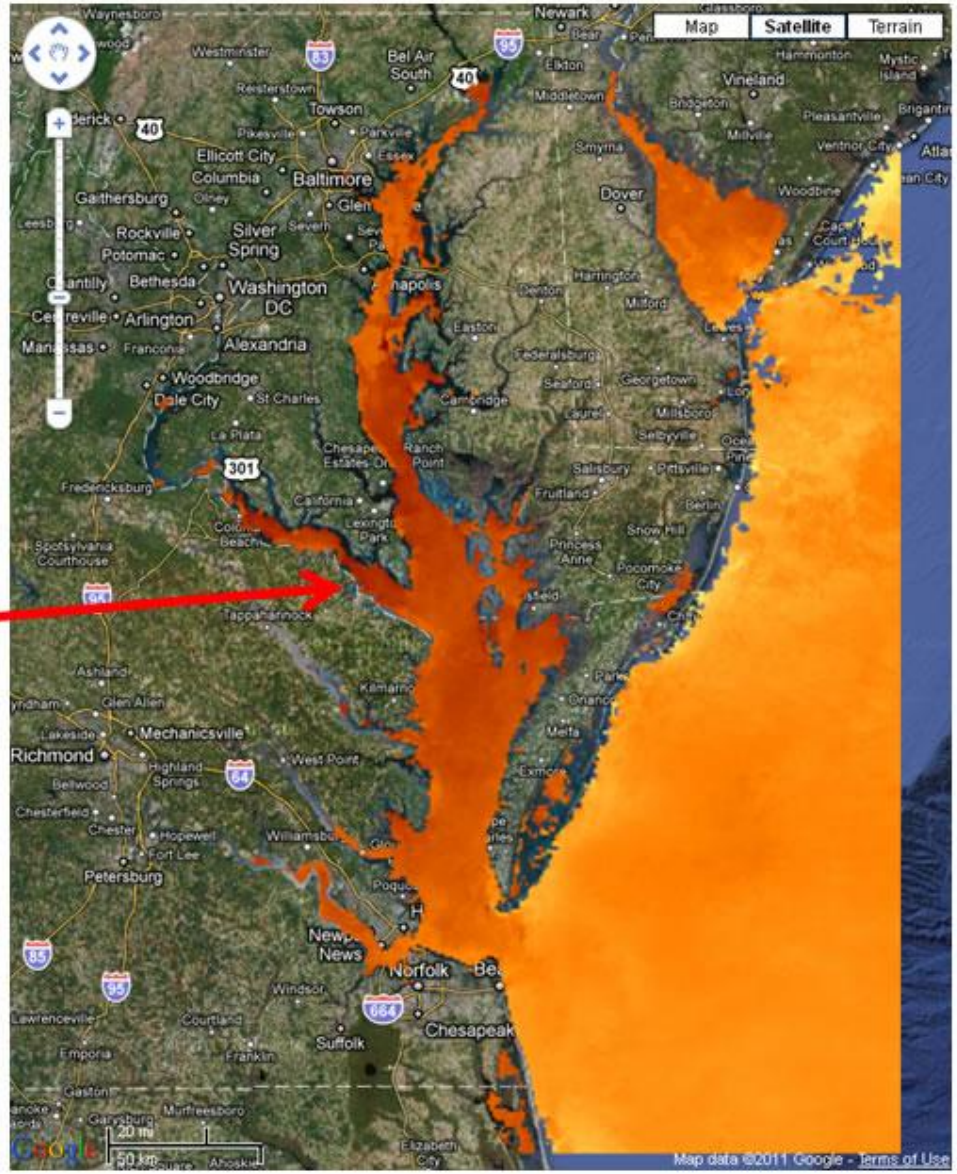
Starting to enjoy and utilize the benefits of continuous data streams for hypoxia (above) and other key parameters throughout the season

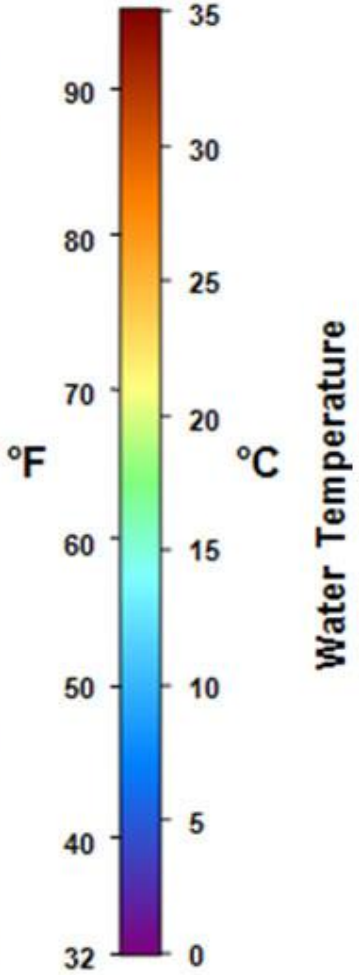

NOAA Chesapeake Bay Interpretive Buoy System (CBIBS)
Gooses Reef Buoy 38.5563N, 76.4147W
Wind Speed
Wind Speed (knots)
50
40
30
20
10
0
Fri 8/26
Sat 8/27
Sun 8/28
Mon 8/29
Tue 8/30
Wed 8/31
Day, 2011

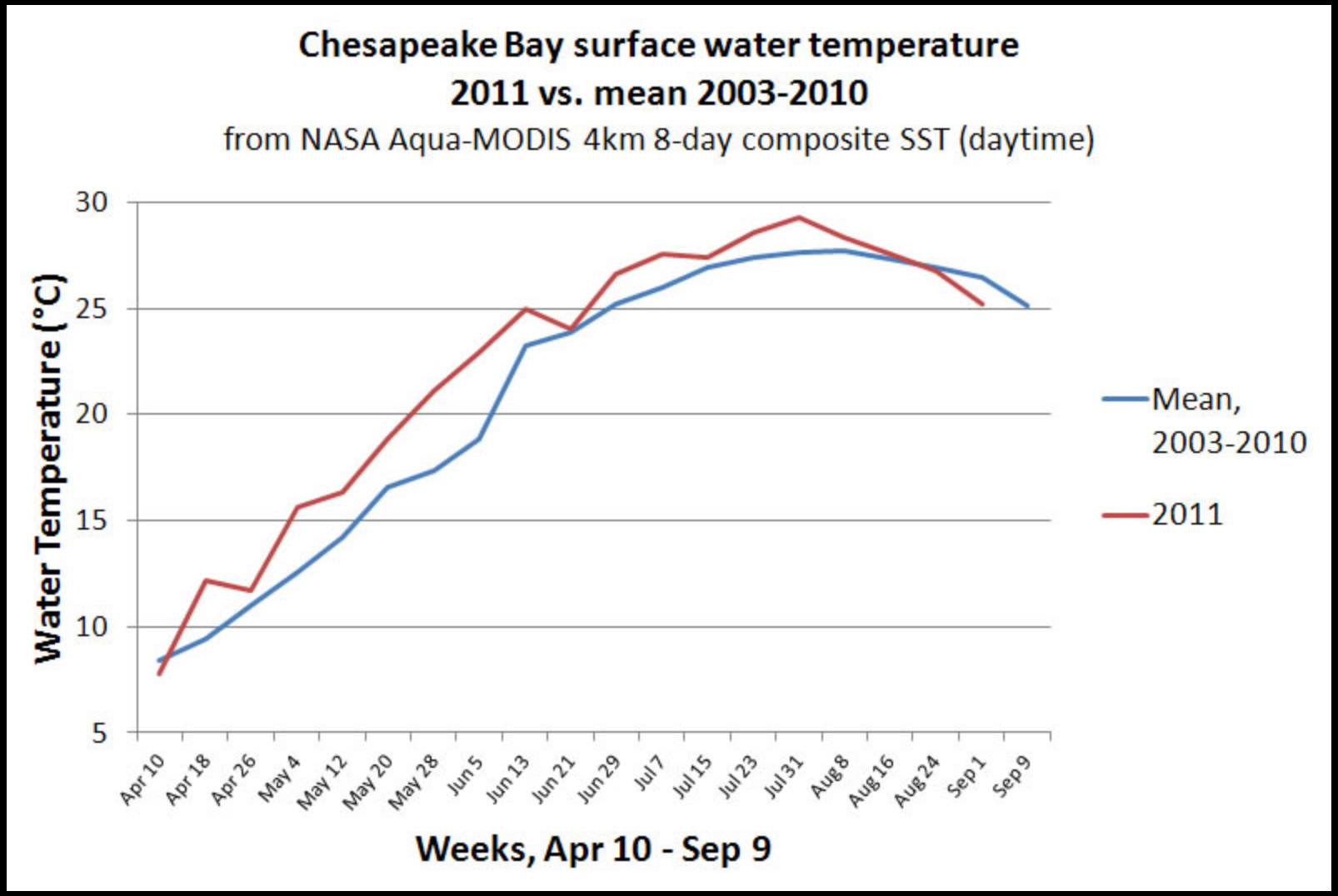
NOAA Satellite
Water Temperature
from AVHRR

July 23, 2011

Mid-Chesapeake Bay and Potomac River at 90+ °F (up to 34 °C)



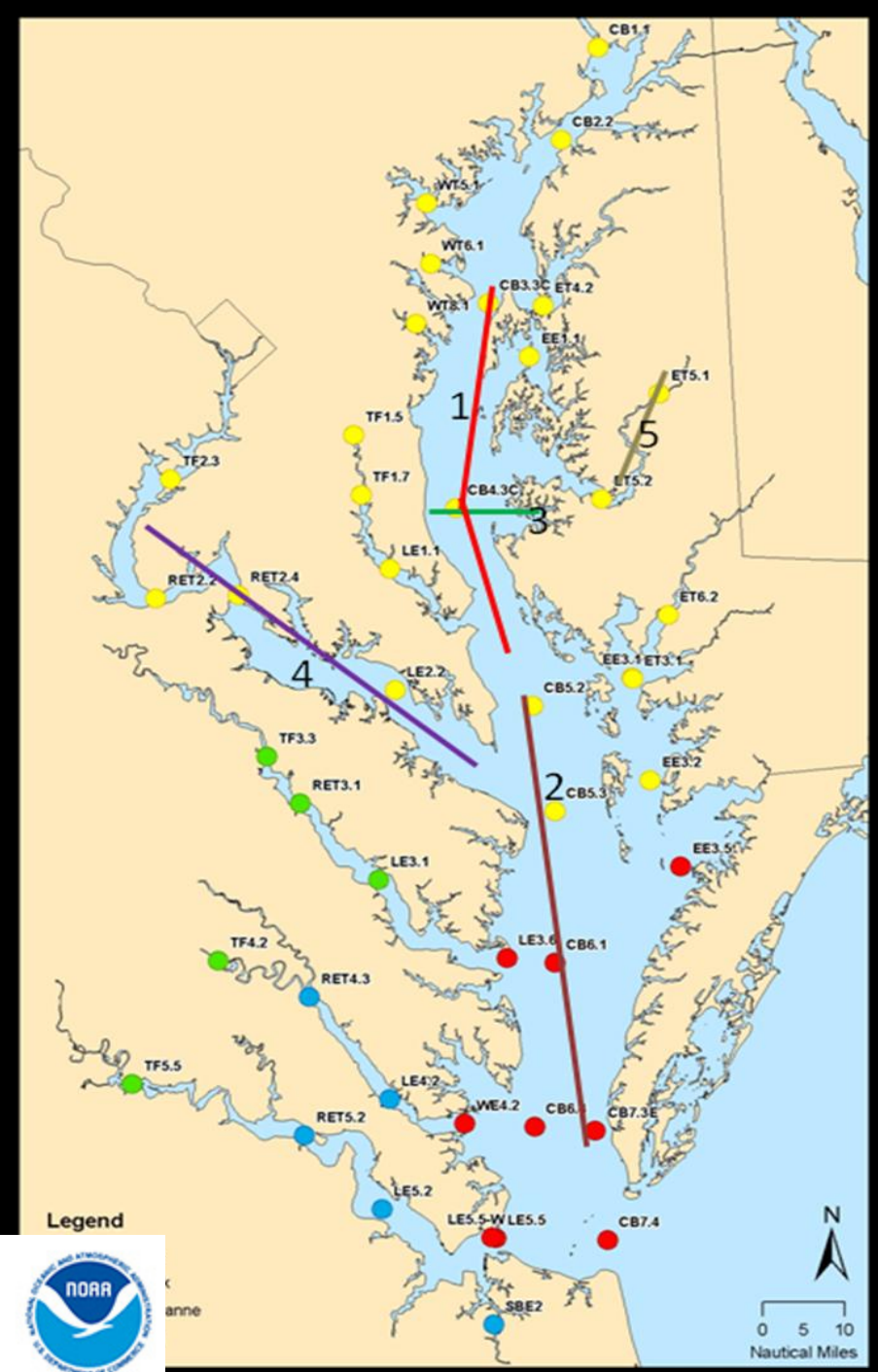




Moving toward expressing changes in Bay Conditions along with the best baseline to provide anomaly detection. Year after year, our story should become richer and richer.

Observations

- Evolution
  - With the 10th buoy launched, no new stations are planned – attention to perfecting O&M, data streams
  - Satellites, buoys, in situ work used to analyze Bay conditions and publish to web, etc. as the season progressed (salinity, sediment, chl a, oxygen)
  - Maintained and expanded connections with other parts of NOAA, NASA to improve performance of satellite image products, in situ sampling



Parameters to be measured at each station include:

Instrument-based

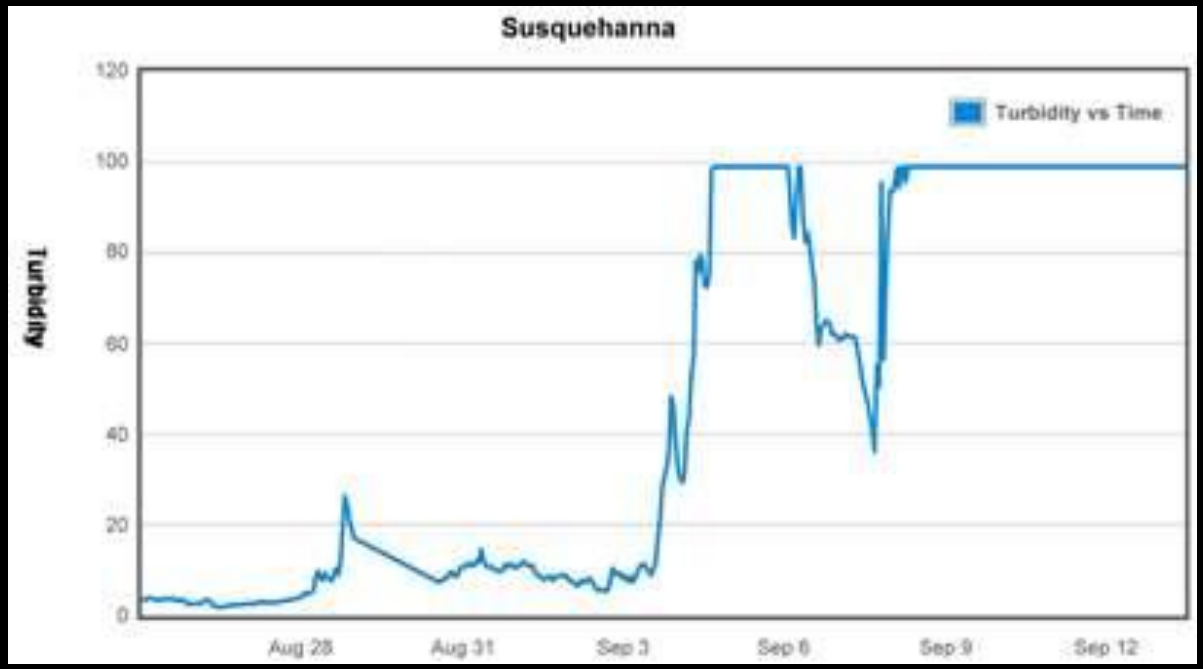
- CTD (yields temperature, salinity, depth), pH, chlorophyll, dissolved oxygen, and turbidity) – [NOAA and others]
- Light spectra over the whole water column - hyperspectral -[NASA]

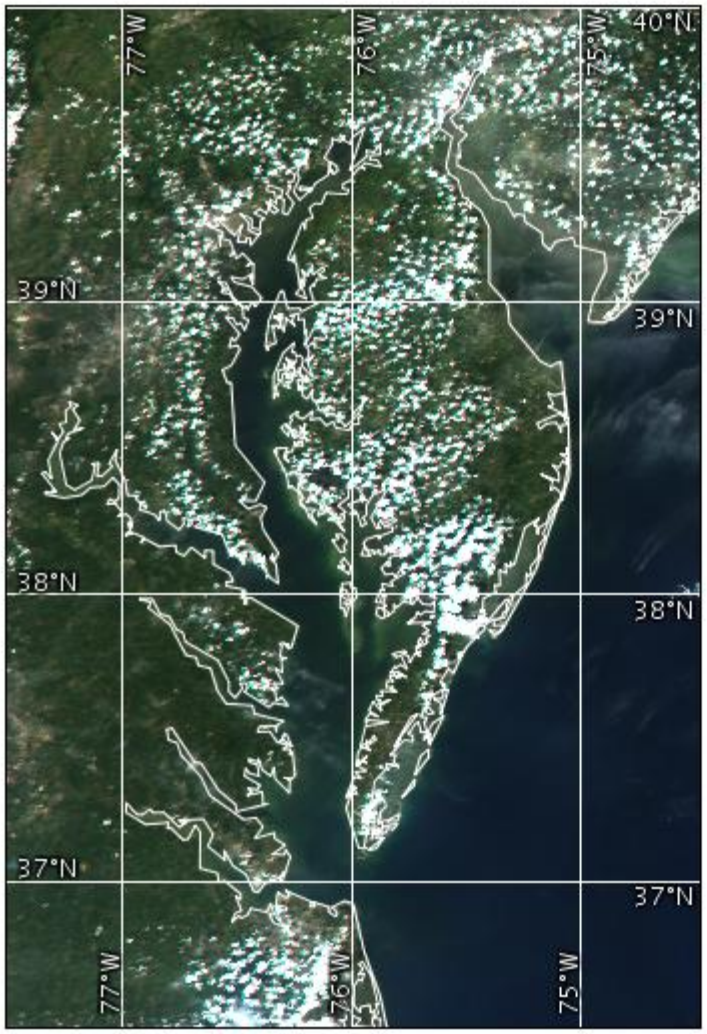
Water sample (bottle or pumped) -based

- Nutrients [UMD]
- Primary Production, Respiration [UMD]
- Phytoplankton (algal) pigments, dissolved organic, carbon, particulate organic carbon [UMD, NASA]
- Phytoplankton DNA, phytoplankton size spectra [UMD]
- Source tracking with fluorescence indicators and stable isotopes.
- Bacteria samples [UMD]

Net tow-based

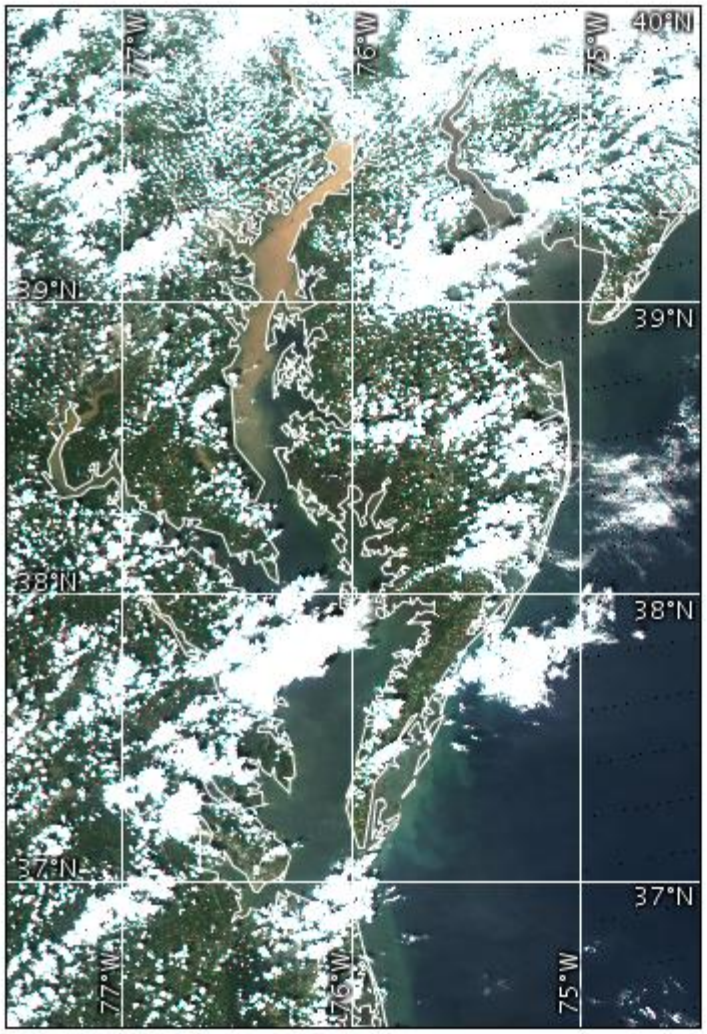
- Plankton collection with nets [UMD – HPL]


Susquehanna
Turbidity vs Time
Turbidity
120
100
80
60
40
20
0
Aug 28
Aug 31
Sep 3
Sep 6
Sep 9
Sep 12



Data courtesy of:
USDOC/NOAA/NESDIS
CoastWatch

Satellite:
AQUA
Sensor:
MODIS
Date:
2011/08/23 JD 235
Start time:
17:35:00 UTC
End time:
17:40:00 UTC
Projection type:
MAPPED
Map projection:
0.28 km/pixel
MERCATOR
Latitude bounds:
35 N -> 41 N
Longitude bounds:
79 W -> 73 W



Data courtesy of:
USDOC/NOAA/NESDIS
CoastWatch

Satellite:
AQUA
Sensor:
MODIS
Date:
2011/09/11 JD 254
Start time:
18:05:00 UTC
End time:
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Map projection:
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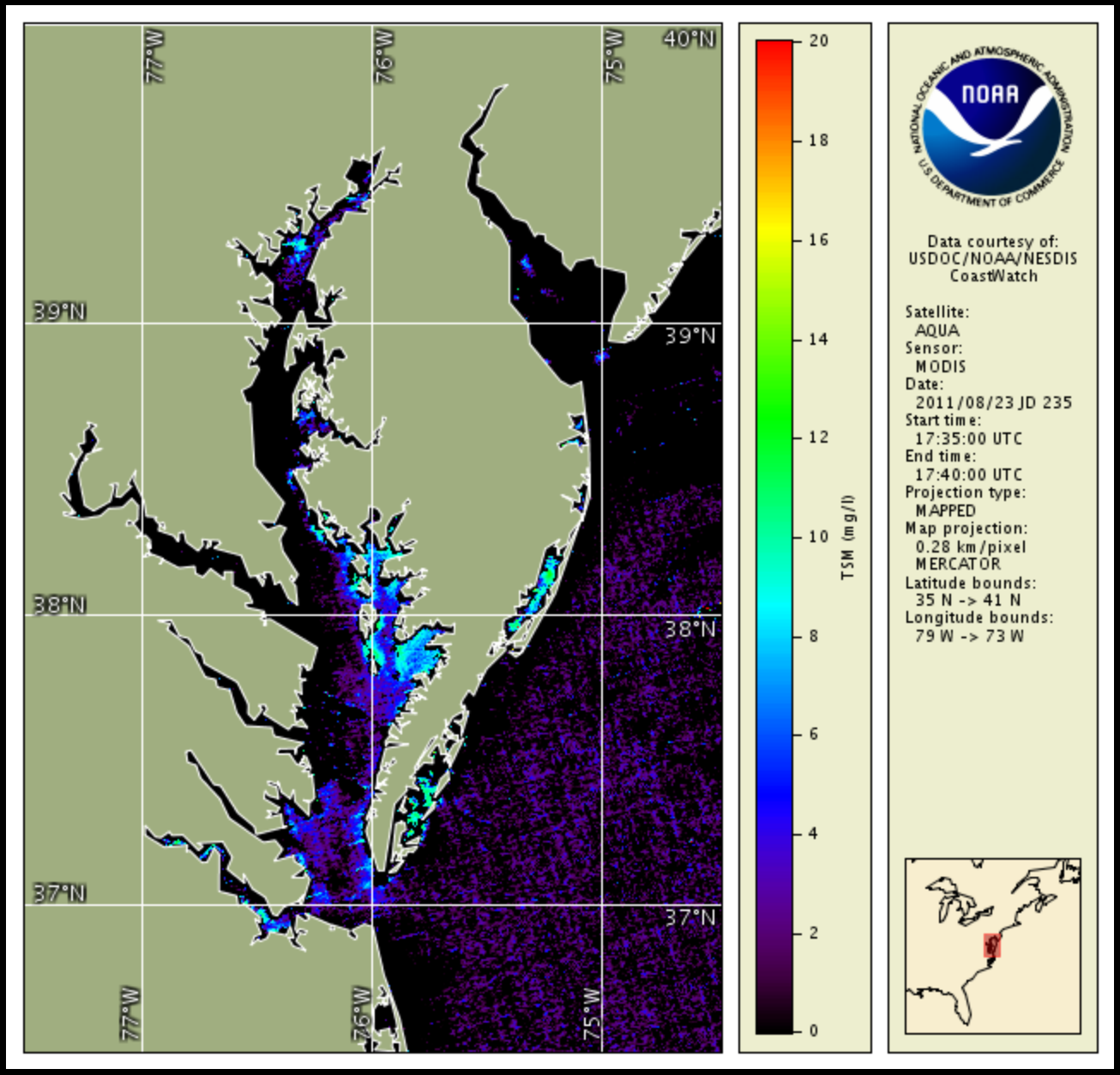
MERCATOR
Latitude bounds:
35 N -> 41 N
Longitude bounds:
79 W -> 73 W


77°W
76°W
75°W
40°N
39°N
38°N
37°N
TSM (mg/l)
0
2
4
6
8
10
12
14
16
18
20
Data courtesy of:
USDOC/NOAA/NESDIS
CoastWatch
Satellite:
AQUA
Sensor:
MODIS
Date:
2011/08/23 JD 235
Start time:
17:35:00 UTC
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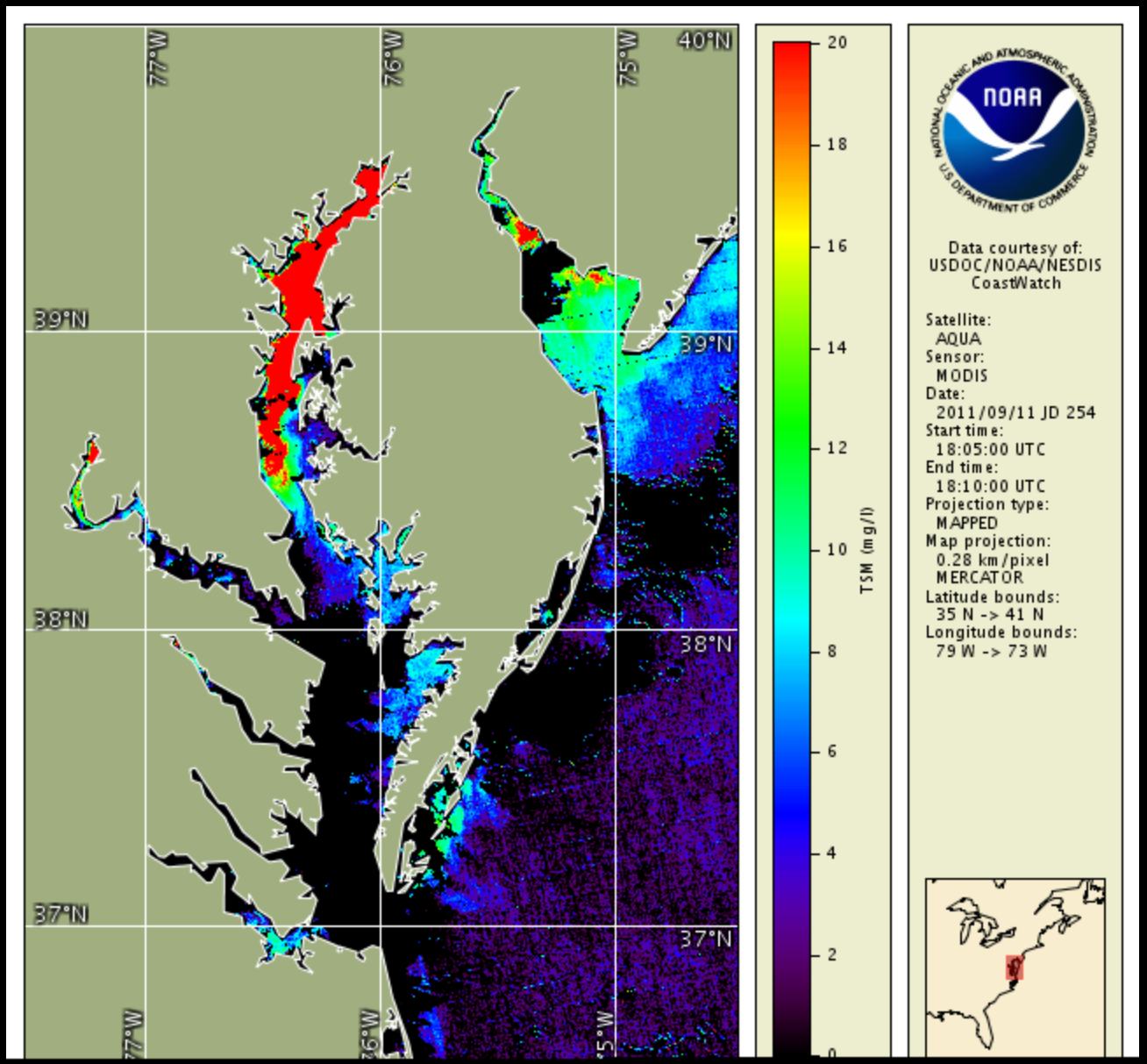
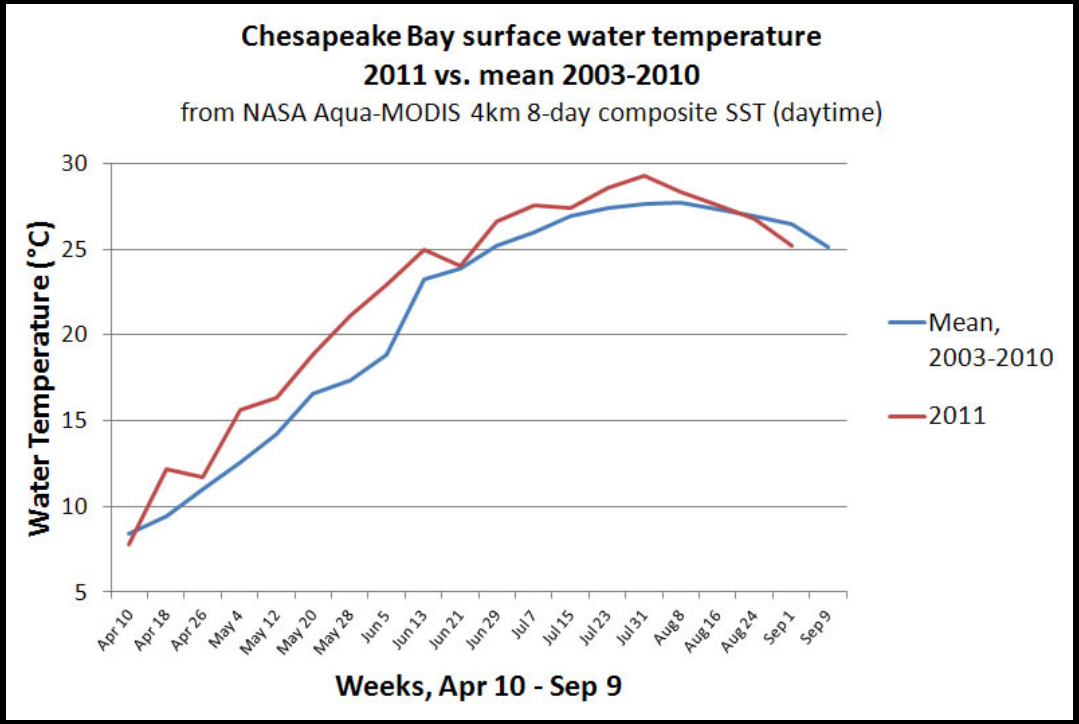

77°W
76°W
75°W
40°N
39°N
38°N
37°N
TSM (mg/l)
20
18
16
14
12
10
8
6
4
2
0
Data courtesy of:
USDOC/NOAA/NESDIS
CoastWatch
Satellite:
AQUA
Sensor:
MODIS
Date:
2011/09/11 JD 254
Start time:
18:05:00 UTC
End time:
18:10:00 UTC
Projection type:
MAPPED
Map projection:
0.28 km/pixel
MERCATOR
Latitude bounds:
35 N -> 41 N
Longitude bounds:
79 W -> 73 W

Future Efforts and Key Questions

Routine Updates to Bay Conditions

Future effort to synthesize information on a regular effort to describe changes in context.

- temperature
- salinity
- chlorophyll
- dissolved oxygen
- turbidity
- etc.



Shift to improve the 'dialog' with our stakeholders by adding a synthetic characterization of conditions – the most basic (and realistic) step toward ecological forecasting

Synchrony in DO

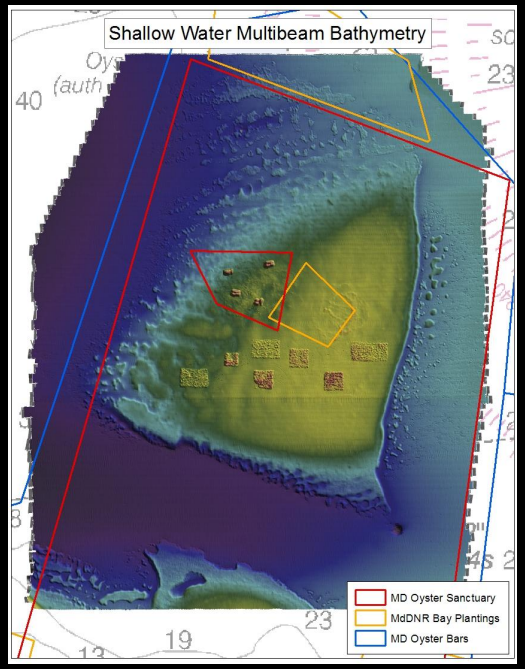
With EPA, USGS, and other partners NCBO looks to integrate continuous DO measurements into mainstream Bay indicators, calculations.

- linking non-tidal, tidal systems
- data integration under CBP enterprise
- Executive Order Goal 2012

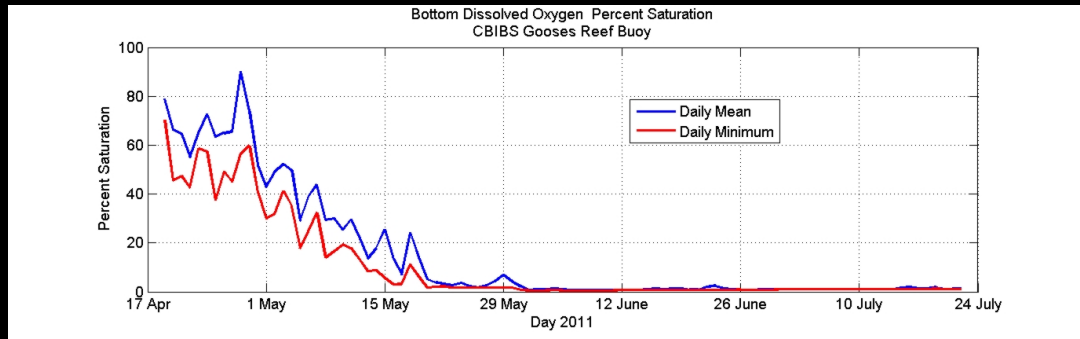
Starting with DO and quickly moving to ancillary measurements and beyond, this effort should be a step toward open interagency, cross-partner collaboration

Ecosystem-level thinking – oysters, etc.

Moving beyond simple pre-restoration mapping and into comparative studies/ analyses for oysters, etc.



- Restored versus 'un-restored'
- Ecosystem services – ecological (processes) & human interactions.
  - Scale
  - Relationship to fisheries
  - What works and why



The Gap – Chesapeake Bay Plankton

- Restart the plankton survey
  - Update information for ecological thinking, models, connecting the primary productivity to upper trophic levels.
  - Getting at the impacts of changes in coastal oceanography we can now see clearly
  - Smart cruises – more comprehensive sampling for all partners
    - Genomic, microbial, phytoplankton, optics, jellyfish, jellyfish, jellyfish

The Gap – Chesapeake Bay Plankton

Some key questions need attention:

- What is the management utility of a zooplankton survey throughout the Bay? – a clear articulation of the application to the management community - toward a business case.
- How will the community ensure separate sample processing labs are being comparable?
  - Regional plankton processing center established
- Survey design

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