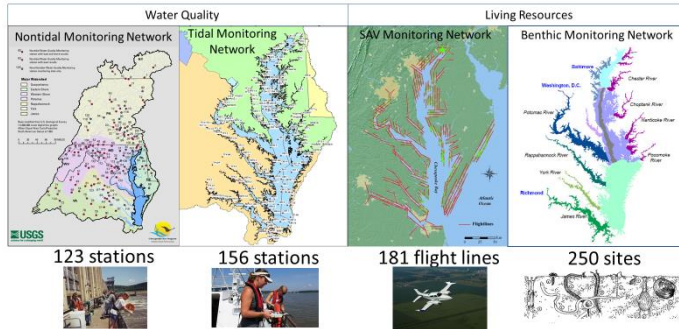# Potential data resources: Data beyond the CBP Data Hub

Peter Tango

USGS@CBPO

BORG meeting

6/10/2022
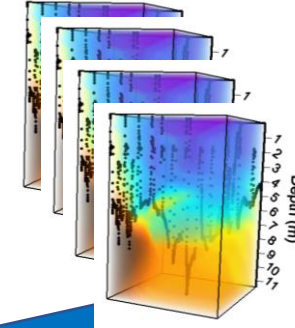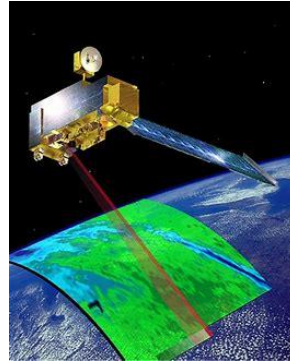
Setting: We need to leverage successful research, adopt and adapt to address capacity shortfalls

2. Adapt to baywide satellite-based data (SAV, Kd, CHLA)
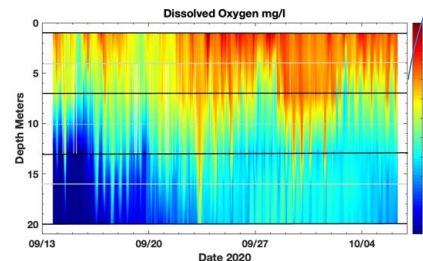
4. Improve assessment tools (4D water quality estimator)

Traditional networks

CBP Partnership Monitoring Networks: Annual Monitoring

Water Quality | Living Resources
Nontidal Monitoring Network | Tidal Monitoring Network | SAV Monitoring Network | Benthic Monitoring Network

123 stations   156 stations   181 flight lines   250 sites

Expanded capacity

Monitoring and assessment capacity building beyond traditional monitoring

Expanded capacity

1. Apply Citizen-based observations (MOU 2018)

CMC Chesapeake Monitoring Cooperative

Liz Chudoba, Alliance for the Chesapeake Bay
lchudoba@allianceforthebay.org

Dissolved Oxygen mg/l

3. Innovate and adopt new WQ and living resource monitoring at needed data scales (CBT 2020 work, Bever et al. sampling design insights)

Full Water Quality Standards Attainment Assessment for Chesapeake Bay + CrossGIT Benefits

There are millions more data points available each year than just what is in the CBP Data Hub
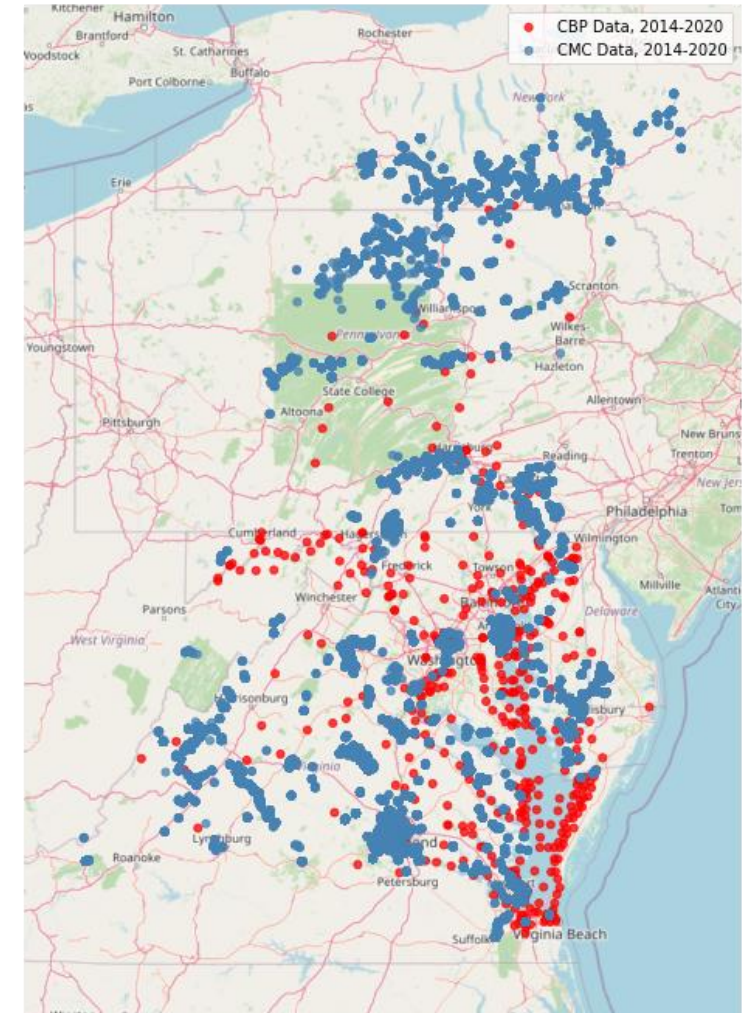
Community Science

Brave new world of high quality data collections

CMC
Chesapeake Monitoring Cooperative

Liz Chudoba, Alliance for the Chesapeake Bay
lchudoba@allianceforthebay.org
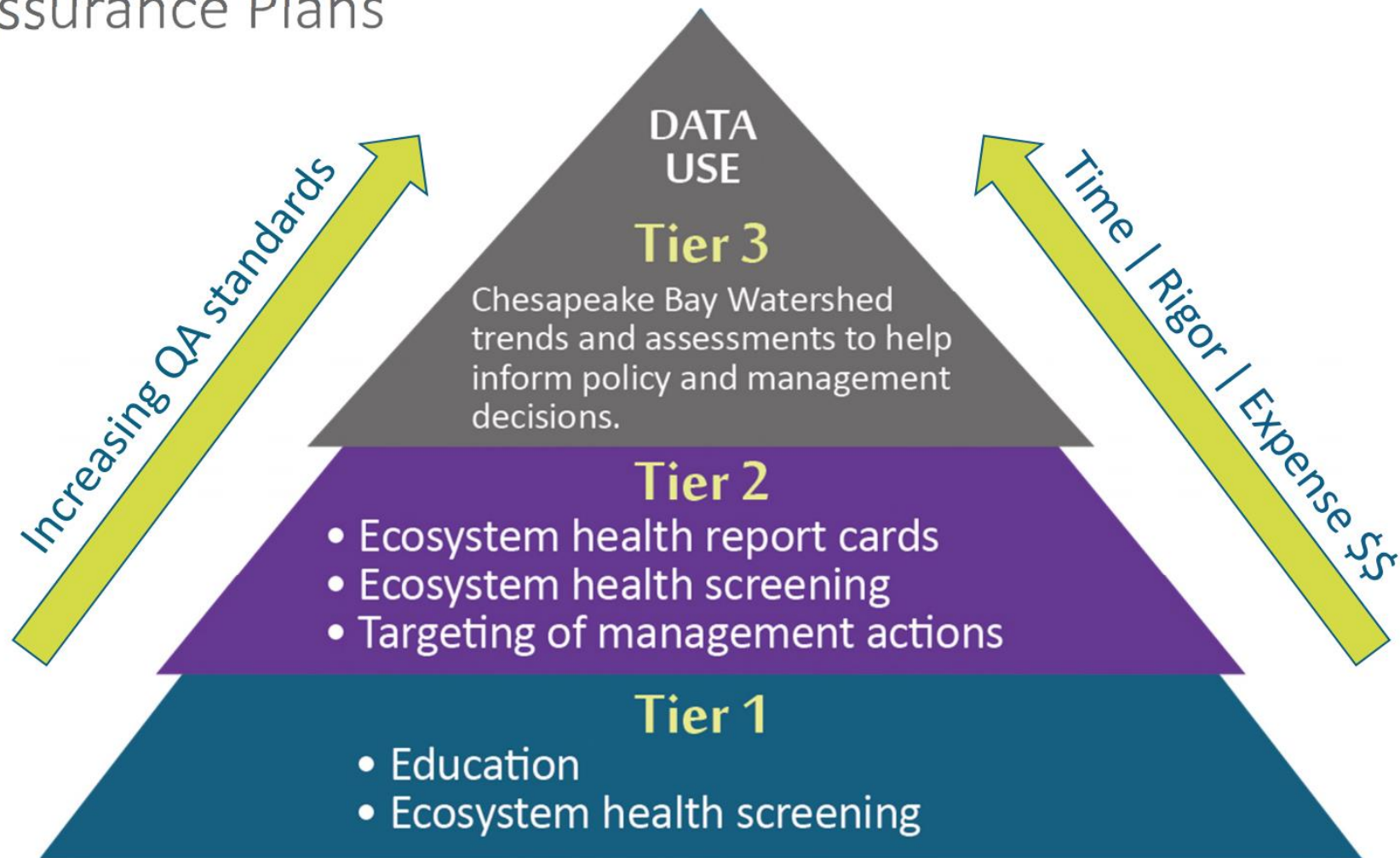
CMC Data: [Chesapeake Data Explorer](#) overview

Geospatial Density and Distribution

- The Chesapeake Bay watershed spans across Virginia, Maryland, Delaware, West Virginia, Pennsylvania, New York and Washington, DC.

- CMC's data has greater coverage in some states over others, and is largely dependent on the activity level and participation of monitoring groups in those states.

- As of June 2020, CMC's water quality database includes sample results from over 1,600 unique stations (compared to 466 unique stations in CBP's database).

- PT note: >500,000 data points in 2022

CMC: Guiding volunteers collecting data of known quality supported by Quality Assurance Plans


DATA USE

Tier 3
Chesapeake Bay Watershed trends and assessments to help inform policy and management decisions.

Tier 2
• Ecosystem health report cards
• Ecosystem health screening
• Targeting of management actions

Tier 1
• Education
• Ecosystem health screening

Increasing QA standards

Time | Rigor | Expense $$

Source: https://acwi.gov/monitoring/conference/2019/presentations/G6_Tango_Secure.pdf
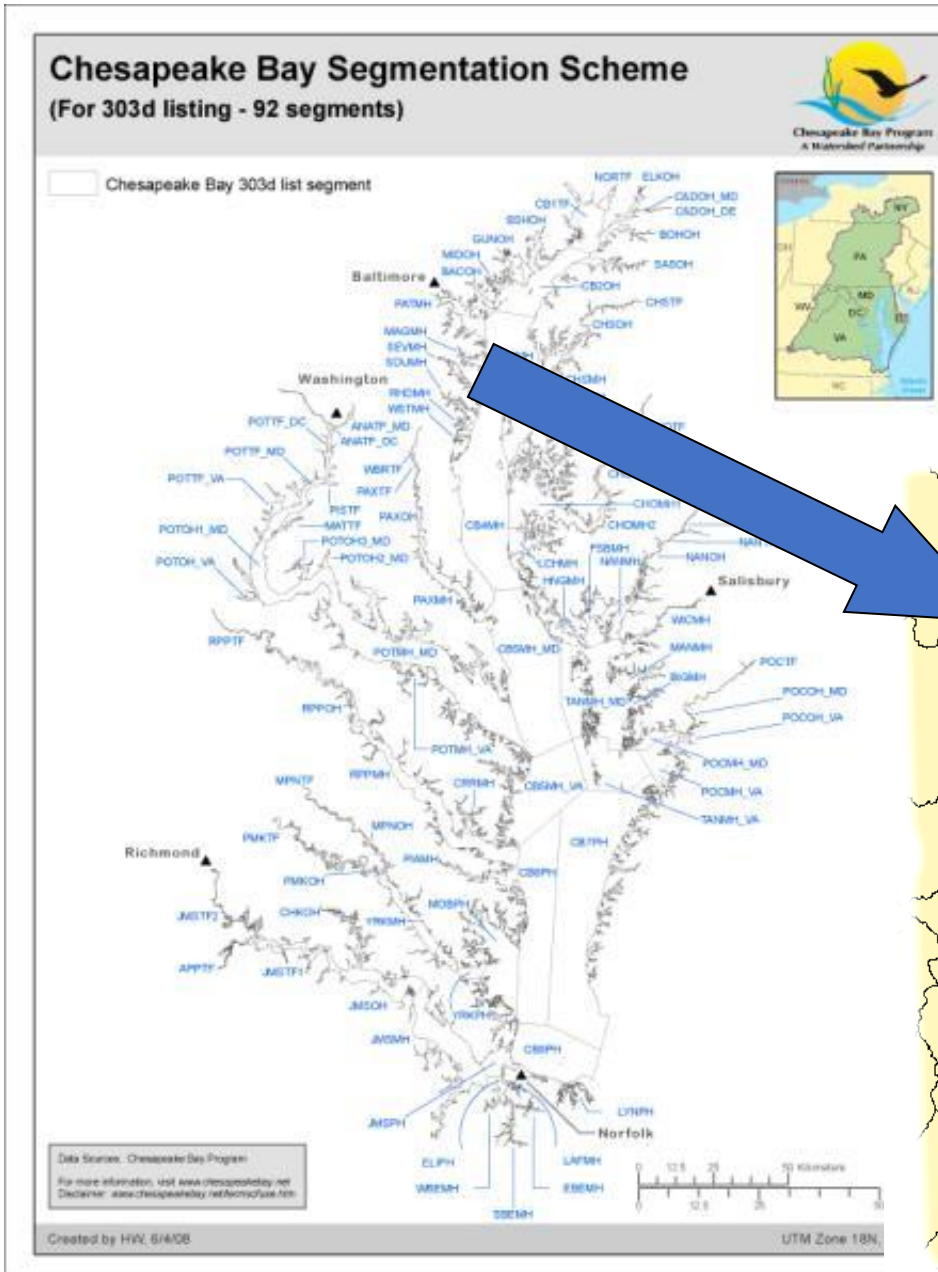
CMC Data overview

Temporal Density
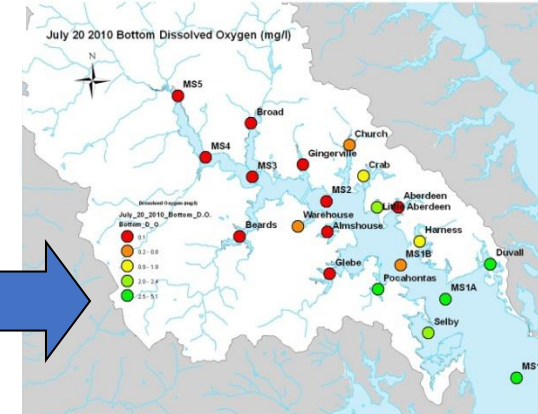
- CMC's water quality data goes back as far as 1992, with the majority of their data collected after 2017.
  - As of June 2020, CMC's database includes over 56,000 collection events, each one representing multiple water quality parameter measurements.

- Data upload focused on post-2017 data as the first step. Some of those datasets may have historical data available, just not uploaded to the Data Explorer.

Enhancing Monitoring for Management Effectiveness
Through Community Science
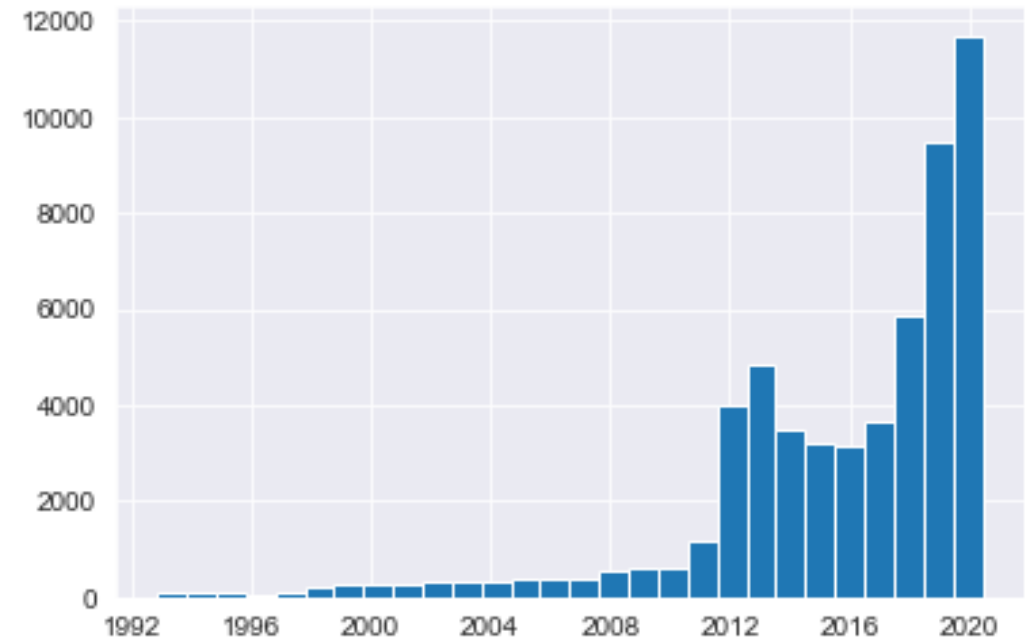
Chesapeake Bay Segmentation Scheme
(For 303d listing - 92 segments)

Chesapeake Bay 303d list segment

Photo
D. Muller. SRF

South River Federation

July 20 2010 Bottom Dissolved Oxygen (mg/l)

Increasing resolution
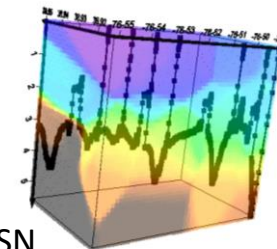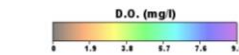
Weekly measures

Increased local resolution

D.O. (mg/l)

Reducing uncertainty

A Muller. USN

Bay – Hypoxia Collaborative

The Hypoxia Collaborative:
Issues of interest in growing out the sampling design

- Suggestions

Needed information

- Vertical resolution at locations

- Thus far – we have set up the first 2 mainstem bay arrays with 2m resolution.
  - Good for 7 arrays and 1 reference array with 1m resolution?
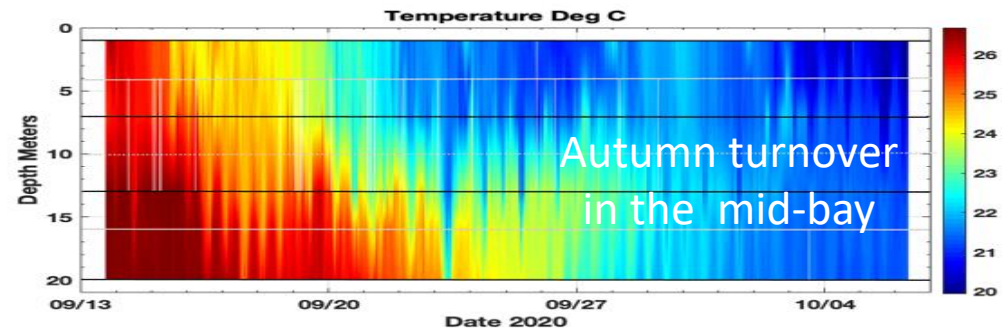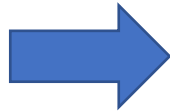 - Is there a basis to recommend more than 1 array with 1m resolution in sensors?

Polyurea encapsulated
closed-cell HDPE foam

← electrode

1 m
3 m
5 m
7 m
X-TP Sensors 10 m
Water is the current return 15 m
path (ground) for inductive
signal travelling through 20 m
wire rope
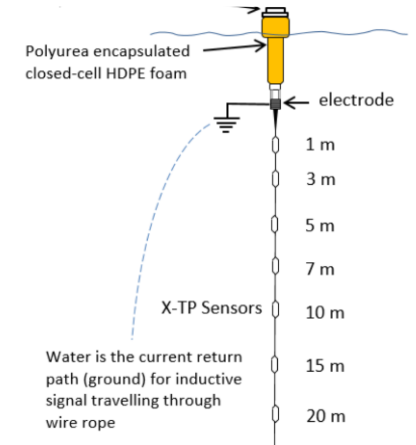
Addressing the data issues: 2019-20 GIT Funded Pilot Project
on robust, cost-effective high frequency water quality profiling data collection
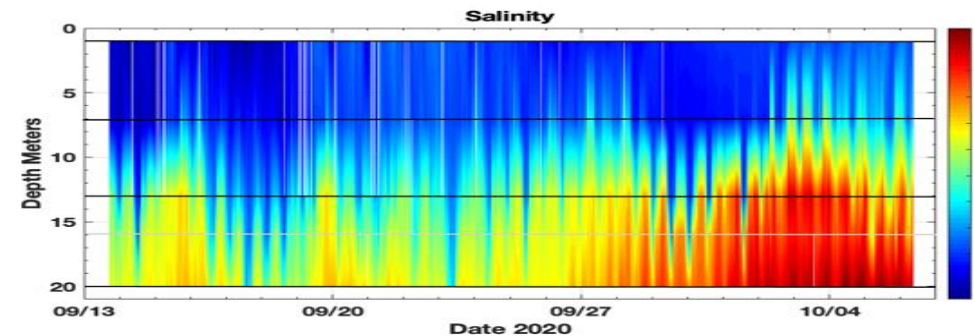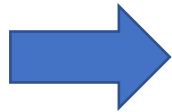
- **Dissolved oxygen**

- **Temperature**

- **Salinity**

Sept-Oct 2020 mid-Bay CB4.3

~ $50K instrument with high data return on investment

Autumn turnover in the mid-bay

D. Wilson 2020. 2019-2020 Chesapeake Bay Trust GIT-funded pilot project results

Recommendations on sampling design for the next phase of hypoxia monitoring network development

Expanding monitoring and assessment capacity 2021+: High frequency monitoring network

Existing

- NOAA supports 2 vertical sensor arrays
- 3 fully funded river input water quality continuous monitors (VADEQ/USGS)
- 2 river input water quality continuous monitoring sites with support ending, need funding (MD/USGS)

New – proposed and considered for investment

- 2021-22 PSC Monitoring Review proposal for capacity to support unassessed criteria assessment, improved fish habitat assessment, modeling calibration and verification:
  - 8 new tidal water vertical array sites
  - 5 new river input con-mons at tidal/nontidal boundary
  - New 4-D water quality interpolator tool development

Draft: Hypoxia Collaborative 2022

Network vision: D.O., Temp, Salinity

- 11 vertical arrays operating in main bay and tidal tributaries

- 10 boundary condition river input continuous monitoring stations

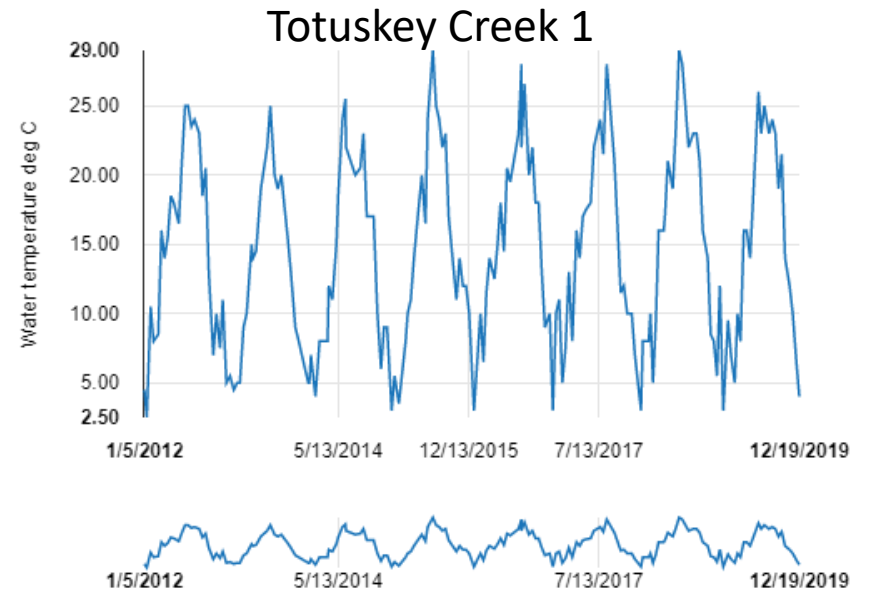- Sustain existing long-term and targeted shallow water monitoring

Totuskey Creek 1
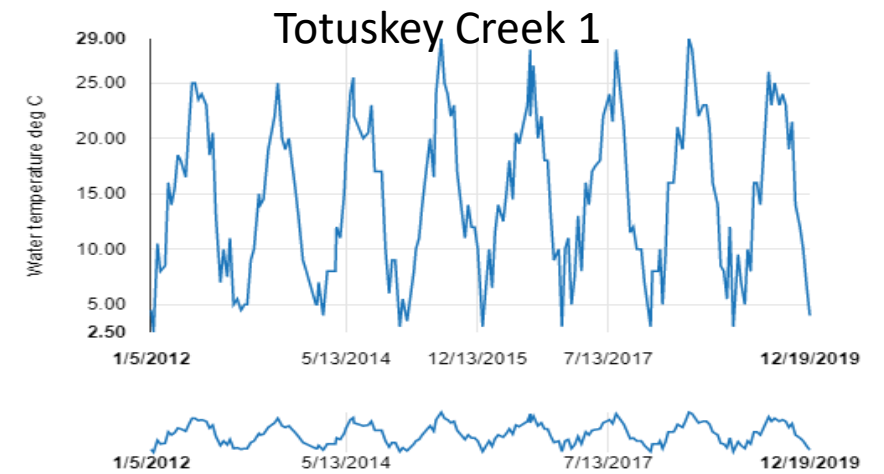
Continuous Water Quality Monitoring

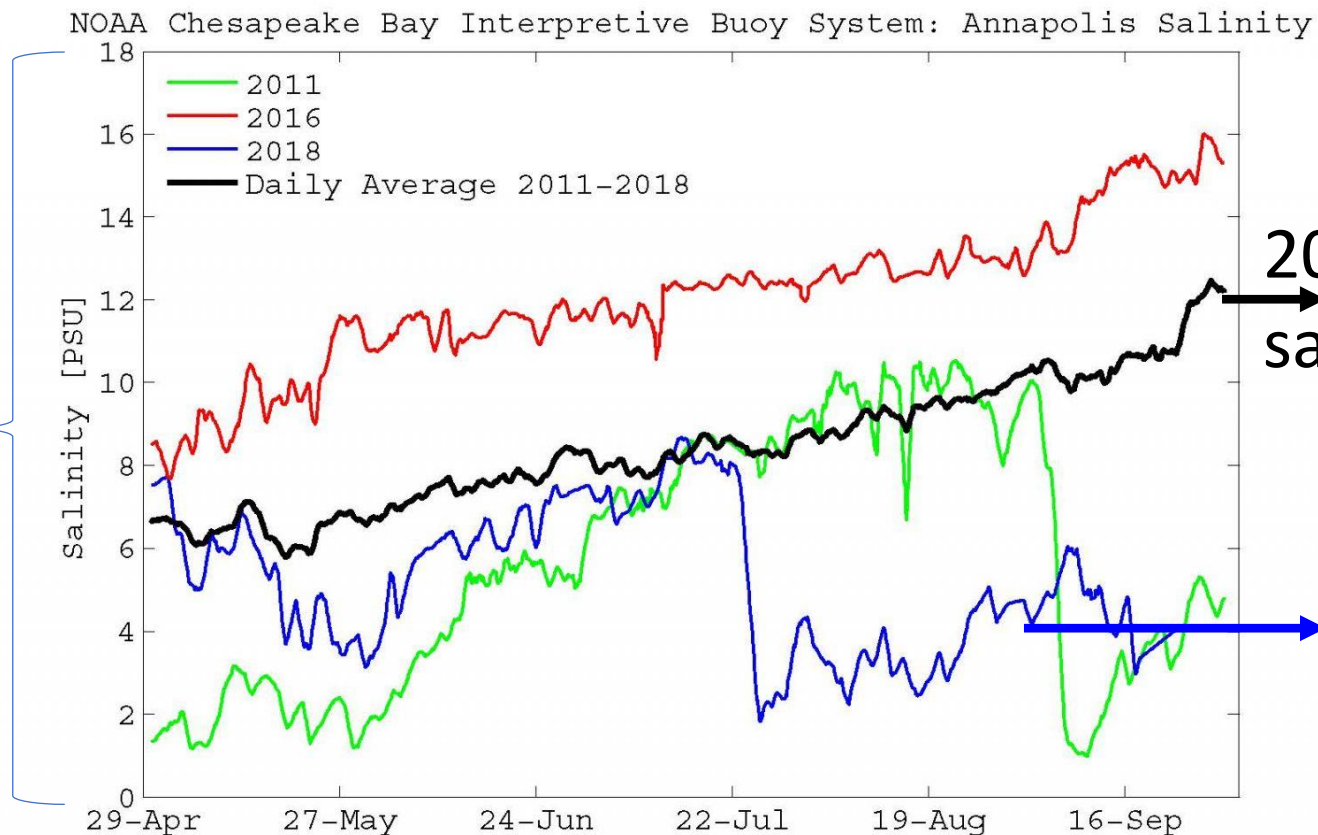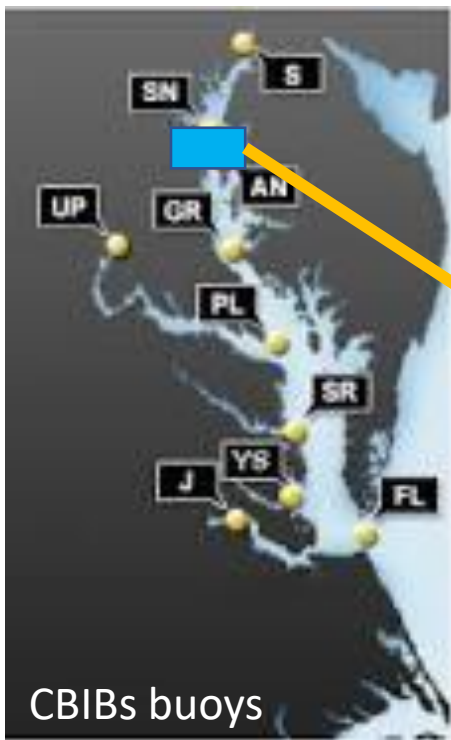Long history now of continuous water quality monitoring of the most basic water quality parameters

Small numbers of fixed site Continuous Monitoring data stations operating in real time now in the bay.
Many more historical data sets.
Varied record lengths
Shallow water context

Eyes on the Bay MD, VECOS VA

IMPACTS OF INCREASED FRESHWATER FLOWS TO THE BAY:

salinity zones shift south affecting habitat for living resources.
NOAA CBIBS buoy data

Annapolis, MD buoy site

CBIBs buoys

NOAA Chesapeake Bay Interpretive Buoy System: Annapolis Salinity

- 2011
- 2016
- 2018
- Daily Average 2011-2018

2011-2018 average salinity by day of year

Below average salinity about 99% of the time May-Sept 2018.

Reminder – **2011 was Tropical Storm Lee** for comparison, the second highest flows to the Bay since 1972 H. Agnes

Remote sensing
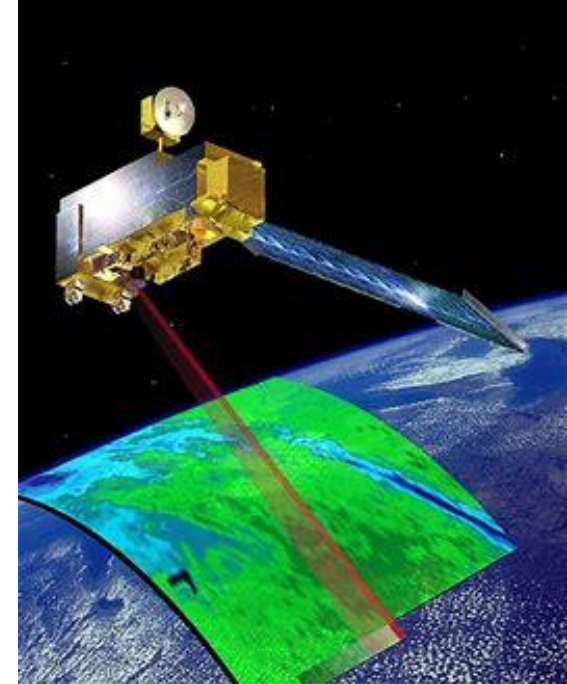
PlanetScope satellite constellation data sets are achieving sub-daily scale imaging and 1-4m sq resolutions

Remote sensing data sets – sea surface salinity, temperature and more.

Vogel. NOAA
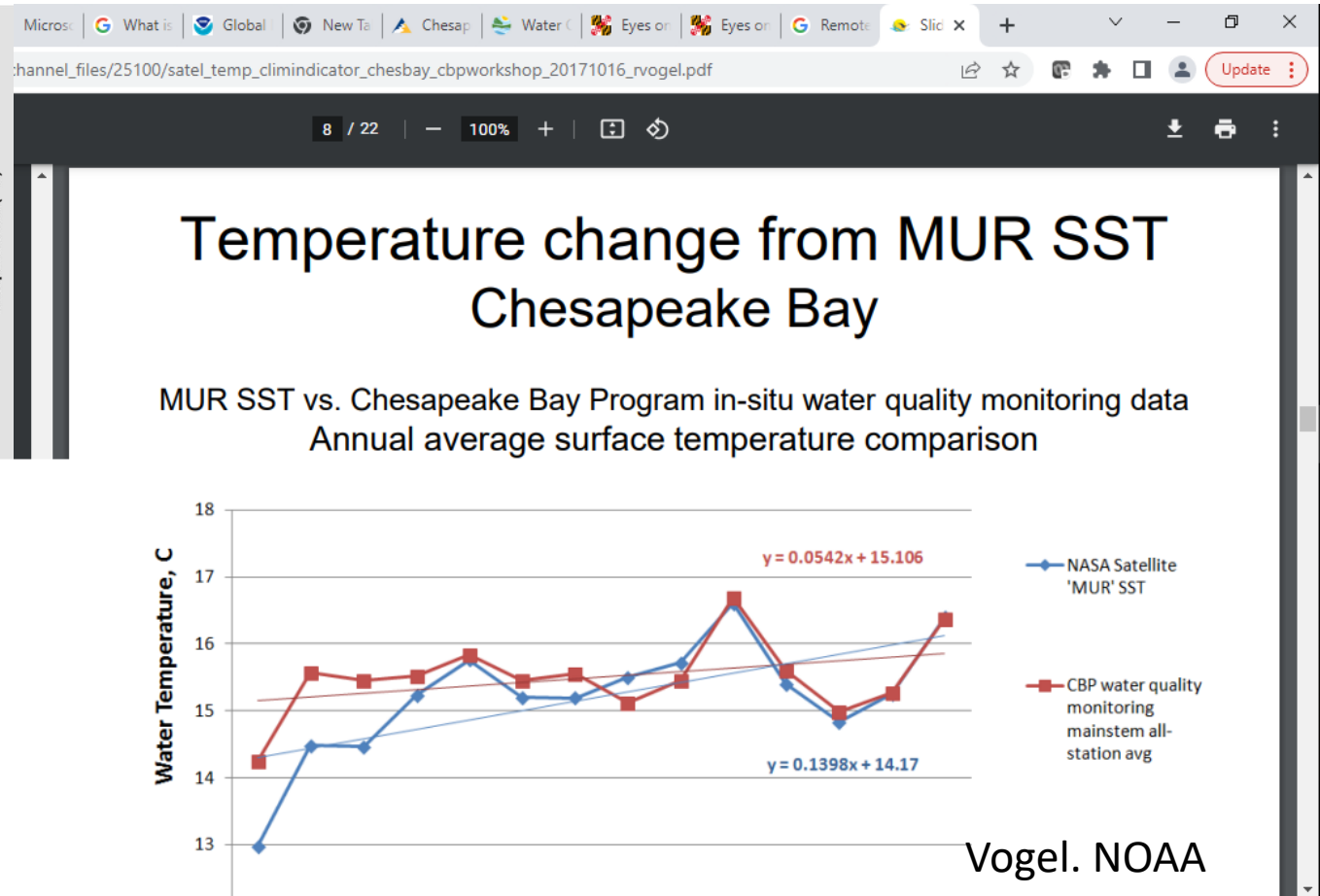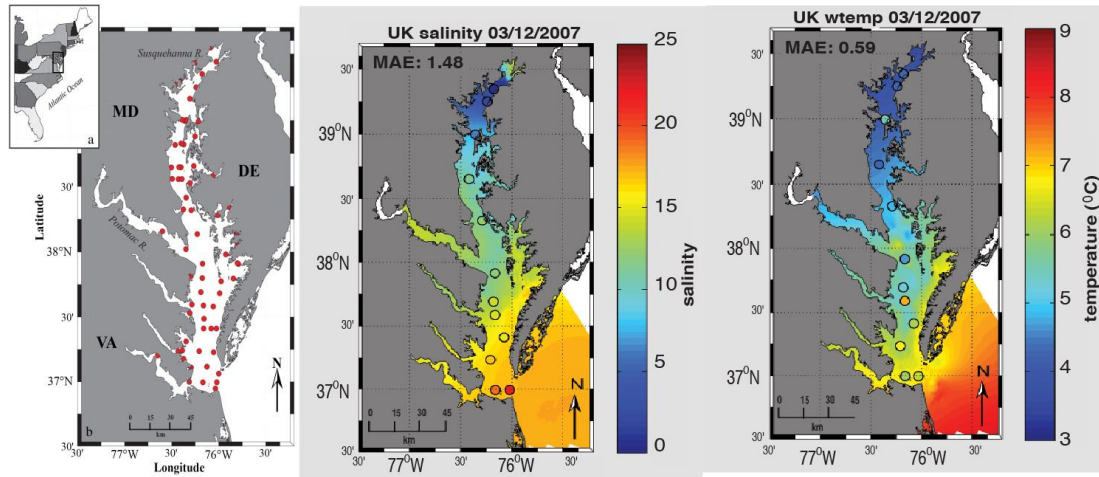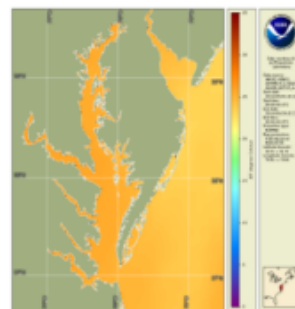
Web Display:

https://eastcoast.coastwatch.noaa.gov/time_series_sst_regions.php

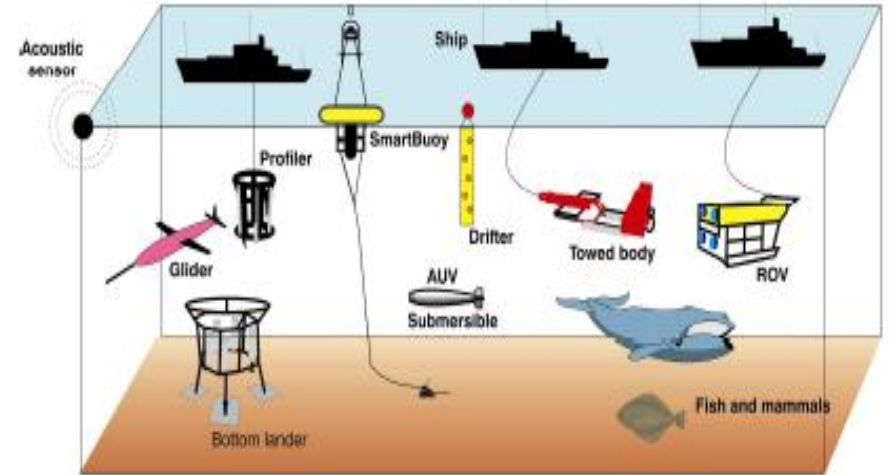Chesapeake Bay Temperature, September 2016 Monthly Average

September Average map, current year

September Average series

Other resources

But wait! There's MORE ☺

After a 2018 Fisheries Workshop – a data inventory was being produced with NOAA and USGS

Next Steps

A post-workshop project proposal was selected for Chesapeake Bay Program GIT funding. Funds will be used to secure a contractor for one year to continue building on the STAC workshop data inventory with biological data and analysis of the data for use in the pilot assessments, and potential regional assessment.

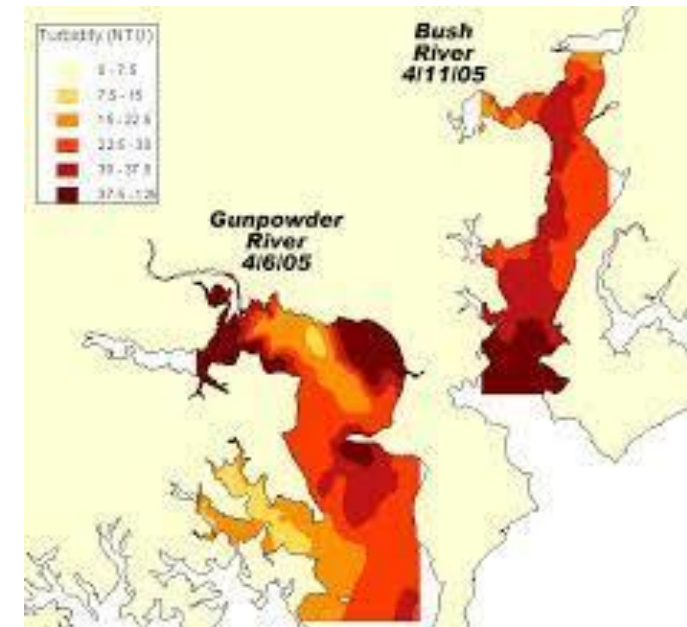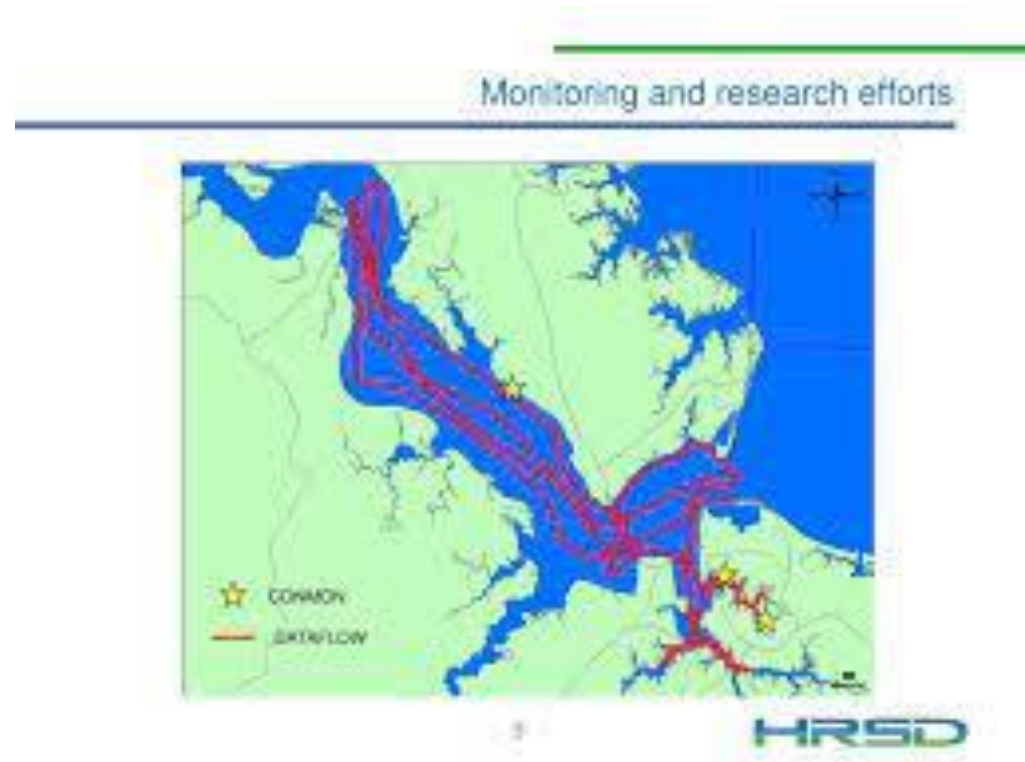Collaboration with NOAA and USGS partners will continue with this project.

DATAFLOW Water quality mapping

Consider the possibilities of access to millions more data points each year to support the 4D interpolator assessment of water quality