MTM team in the Choptank River

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Modeling Quarterly Review

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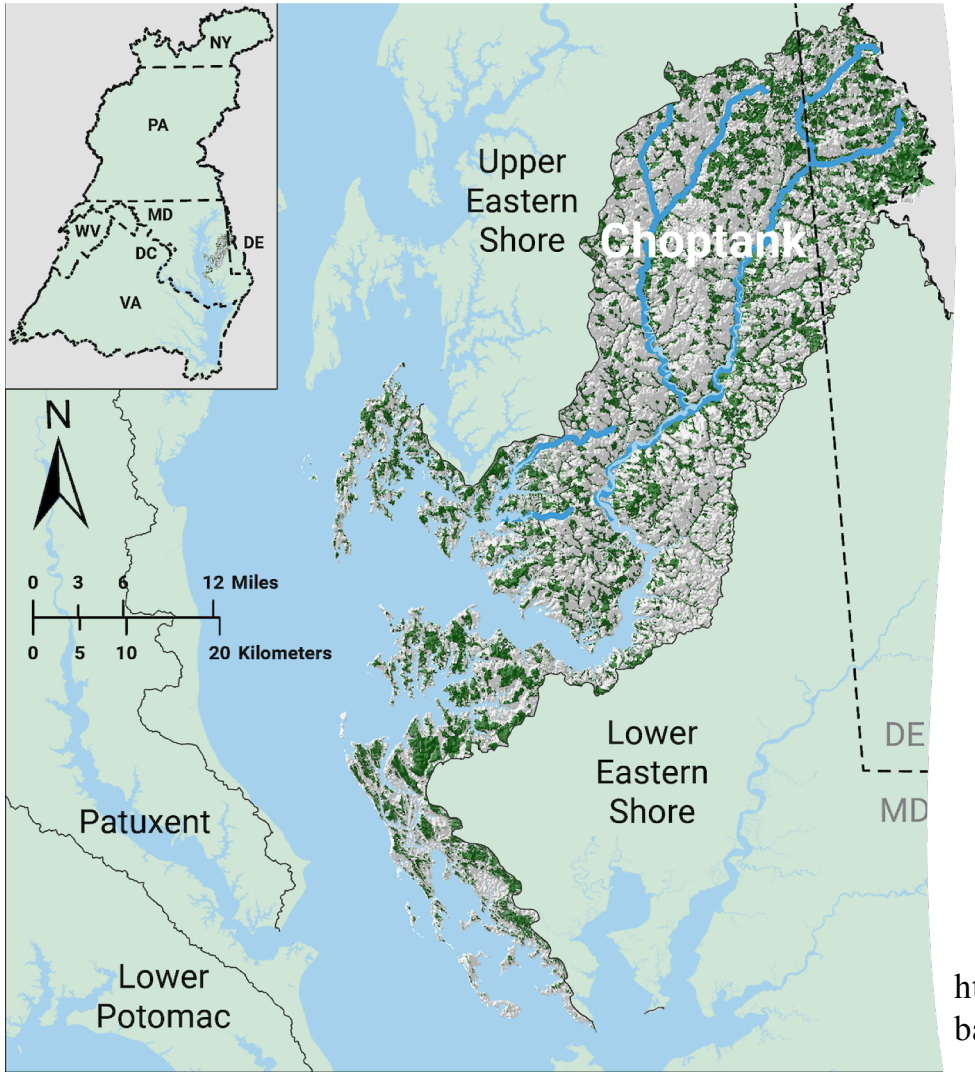
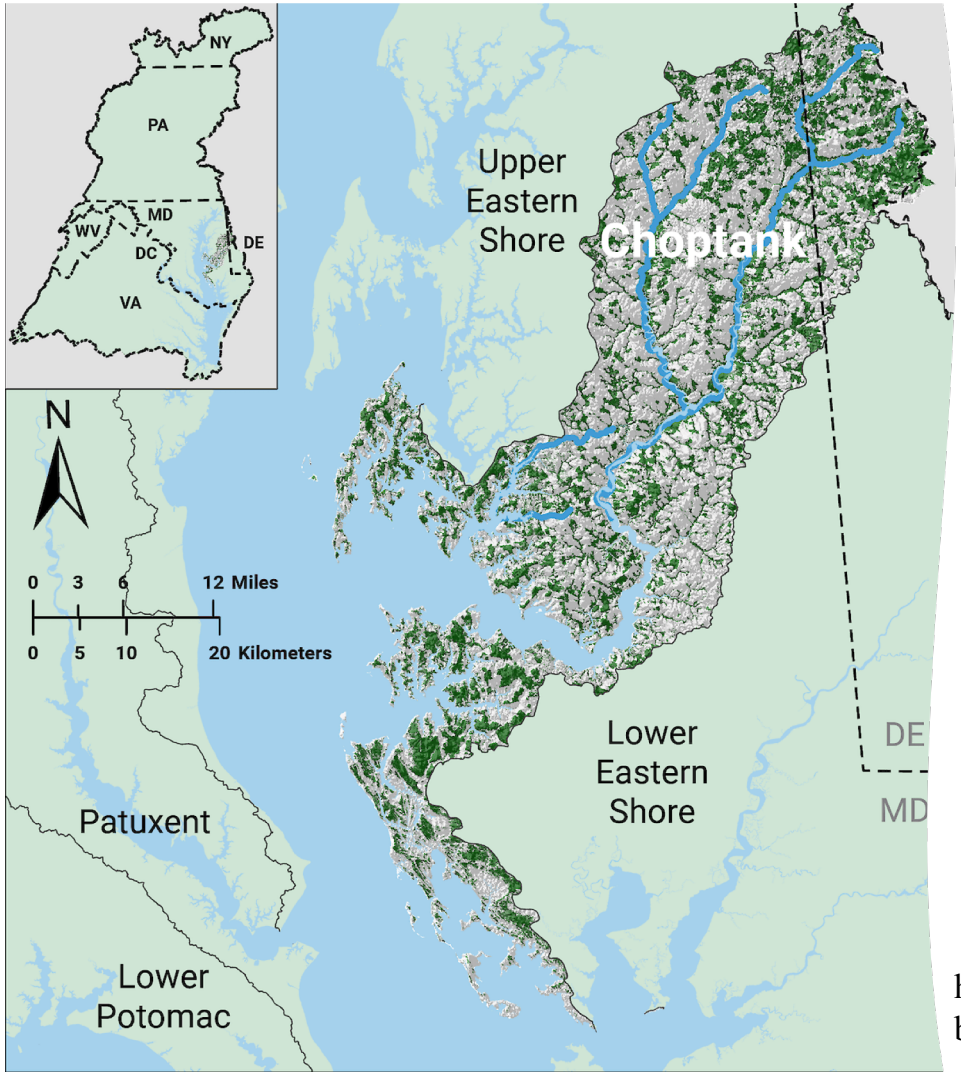


Choptank River

The Choptank River complex is located on Maryland's Eastern Shore and includes the Choptank River and its major tributaries (Little Choptank River and Honga River).

The largest of the Chesapeake's Eastern Shore river (about 68 miles).

https://ecoreportcard.org/report-cards/chesapeake-bay/watershed-regions/choptank/



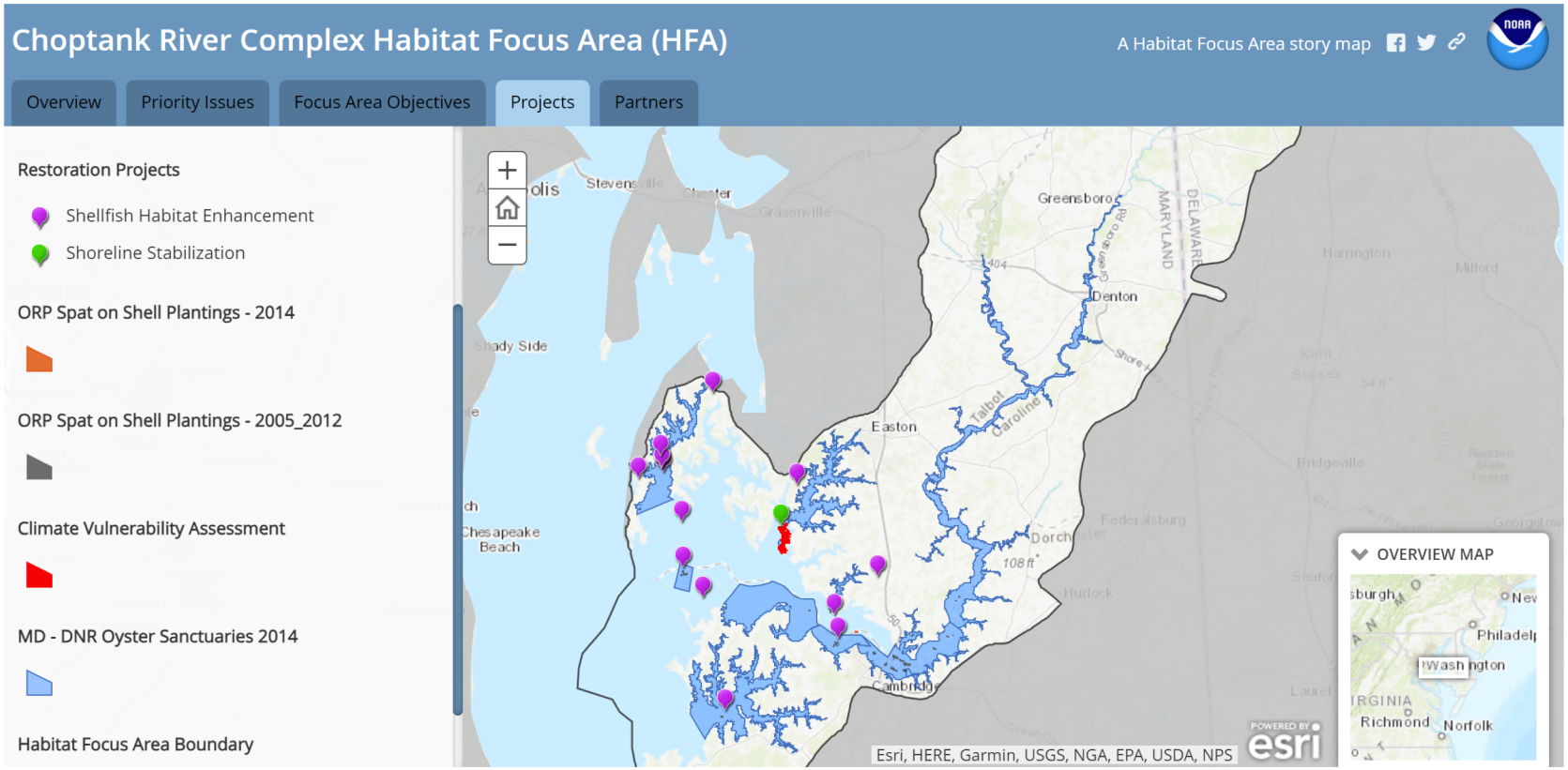
Choptank River

The Choptank is a treasured part of the Chesapeake Bay ecosystem, with critical habitat for spawning striped bass, river herring, blue crabs - the Chesapeake's most lucrative fishery as well as historically abundant oyster reefs.

In the upper portion of the Choptank watershed, over half of the land is used for agriculture, and this narrow portion of the river is susceptible to nutrient and sediment runoff.

https://ecoreportcard.org/report-cards/chesapeake-bay/watershed-regions/choptank/

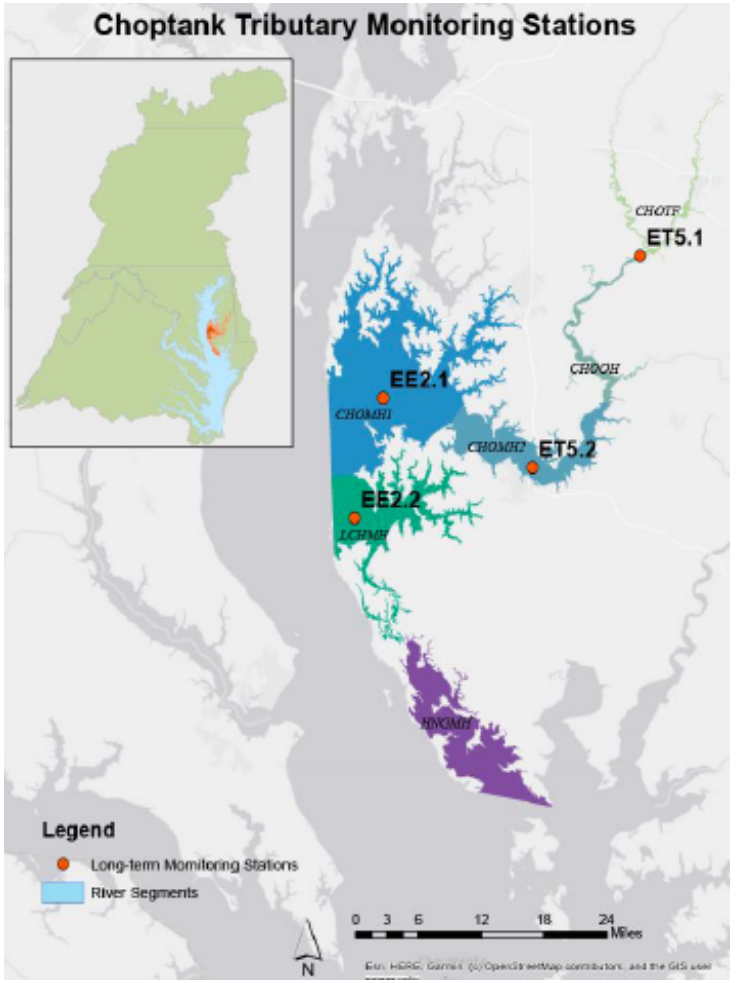
NOAA's interests in Choptank's major tributaries: the Little Choptank River, the Tred Avon River, and Harris Creek



https://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=8c59862bed7646f290875be579e531bc

Water Quality Assessment

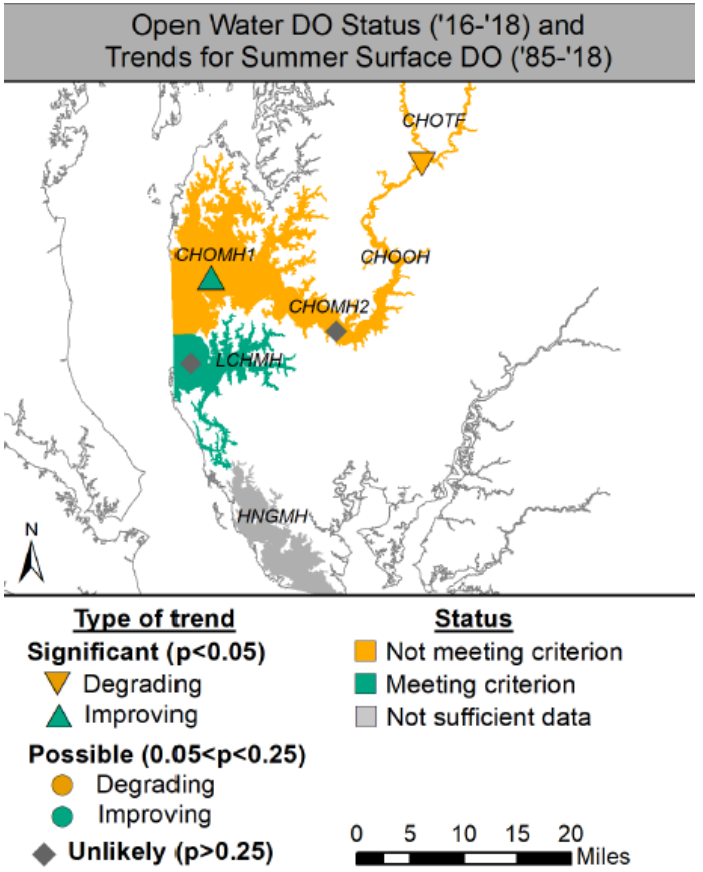
The tidal portions of the Choptank River and nearby tributaries are divided into multiple segments (U.S. Environmental Protection Agency, 2004): Tidal Fresh Choptank (CHOTF), Oligohaline Choptank (CHOOH), and Mesohaline Choptank, Little Choptank River and Honga River (CHOMH2, CHOMH1, LCHMH, and HNGMH) (CBP Choptank Tributary Summary, 2021).



Map of tidal Choptank River and nearby segments and long-term monitoring stations. Base map credit Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, World Geodetic System 1984. (CBP Choptank Tributary Summary, 2021)

Degraded water quality

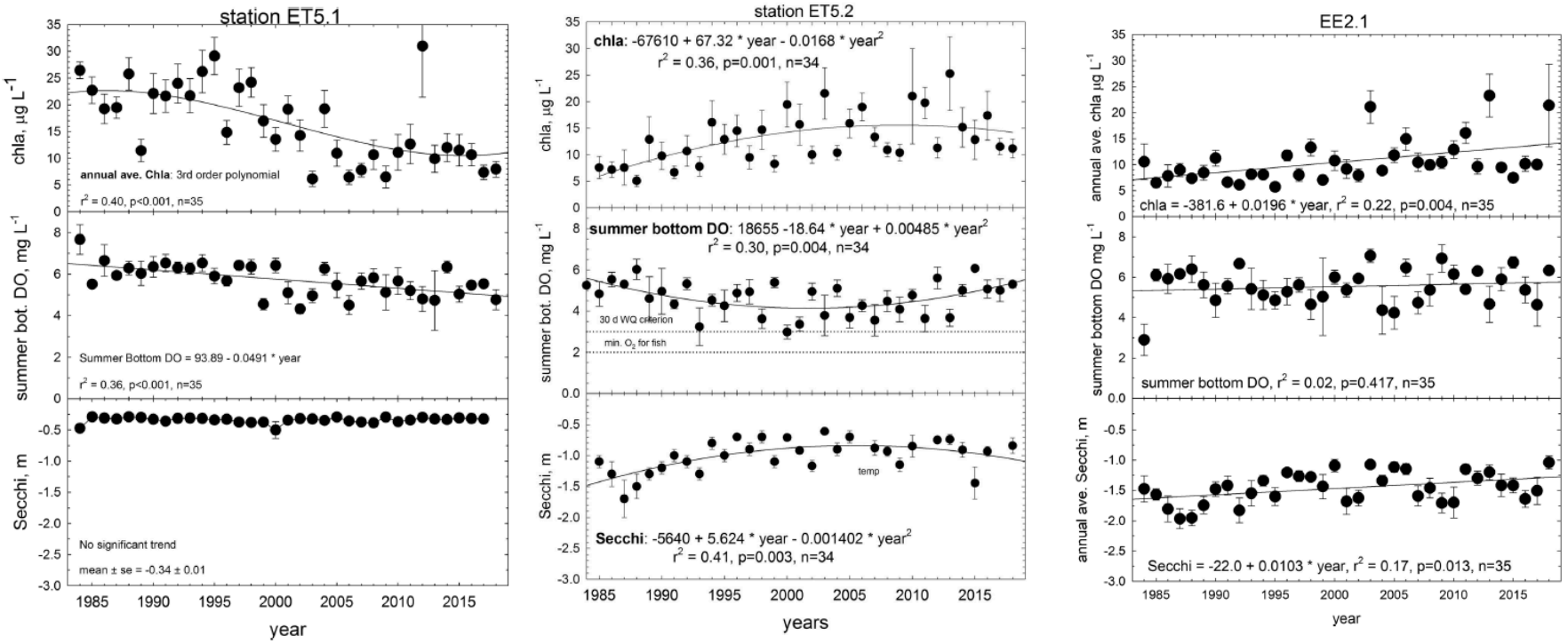
time period	CHOTF	CHOOH	CHOMH2	CHOMH1	LCHMH	HNGMH
1985-1987						ND
1986-1988						ND
1987-1989						ND
1988-1990						ND
1989-1991						ND
1990-1992						ND
1991-1993						ND
1992-1994						ND
1993-1995						ND
1994-1996						ND
1995-1997						ND
1996-1998						ND
1997-1999						ND
1998-2000						ND
1999-2001						ND
2000-2002						ND
2001-2003						ND
2002-2004						ND
2003-2005						ND
2004-2006						ND
2005-2007						ND
2006-2008						
2007-2009						
2008-2010						
2009-2011						
2010-2012						
2011-2013						ND
2012-2014						ND
2013-2015						ND
2014-2016						ND
2015-2017						ND
2016-2018						ND



Open Water summer DO criterion evaluation results (30-day mean June-September assessment period). Green indicates that the criterion was met. White indicates that the criterion was not met. "ND" indicates no data.

(CBP Choptank Tributary Summary, 2021).

Localized Water Quality Improvement in the Choptank Estuary



Trends in annually mean surface chlorophyll a, July–Sept bottom-dissolved oxygen and annual mean Secchi depth at stations ET5.1, ET5.2, EE2.1 in the Choptank estuary. (Fisher et al. 2021)

Tasks

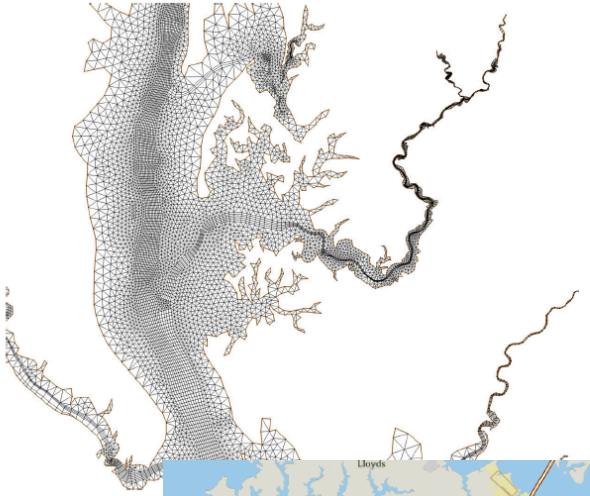
- Develop a tributary model for the Choptank River complex.
- Calibrate and validate the hydrodynamic and water quality variables and understand the physical-biogeochemical processes in the Choptank River.
- Work with the MBM and other MTMs to integrate our tributary model into the bay model.
- Assist in preparation and testing for the operational model.
- Evaluate the TMDL and other water quality assessments in the Choptank River.
- Assess and construct local projections in the Choptank River under a 2035 hydrology, climate, and sea level rise.

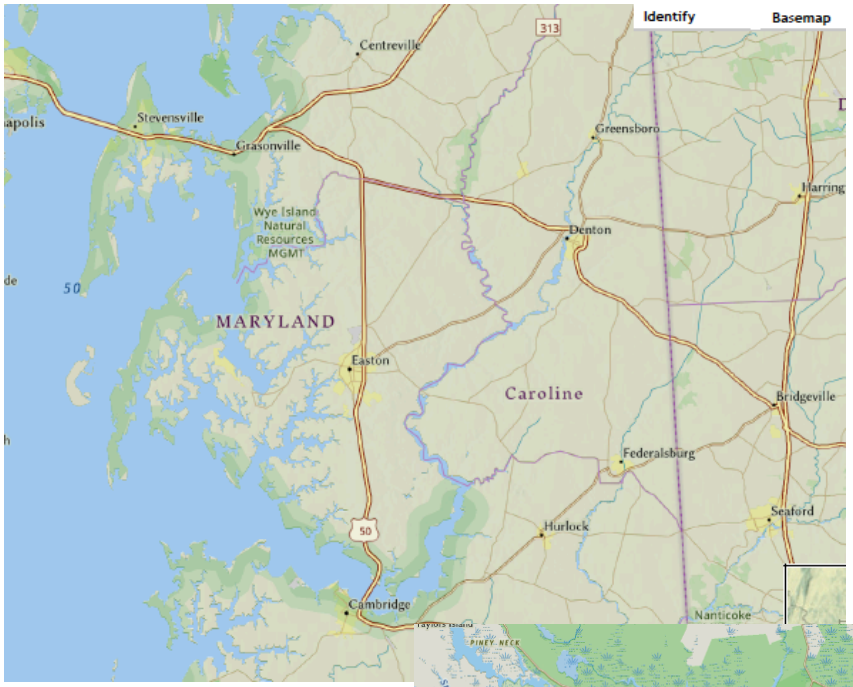
1) Phase I (2023 to mid-2026):

Fine-scale Choptank tributary model development, calibration, and application, aiming to better represent Bay tributaries and shallow-water processes under future climate change conditions.

2) Phase II: Year-long review of the Choptank tributary model in 2026 and application of scenarios and analysis to CBP management needs in 2027.

Grid in MBM



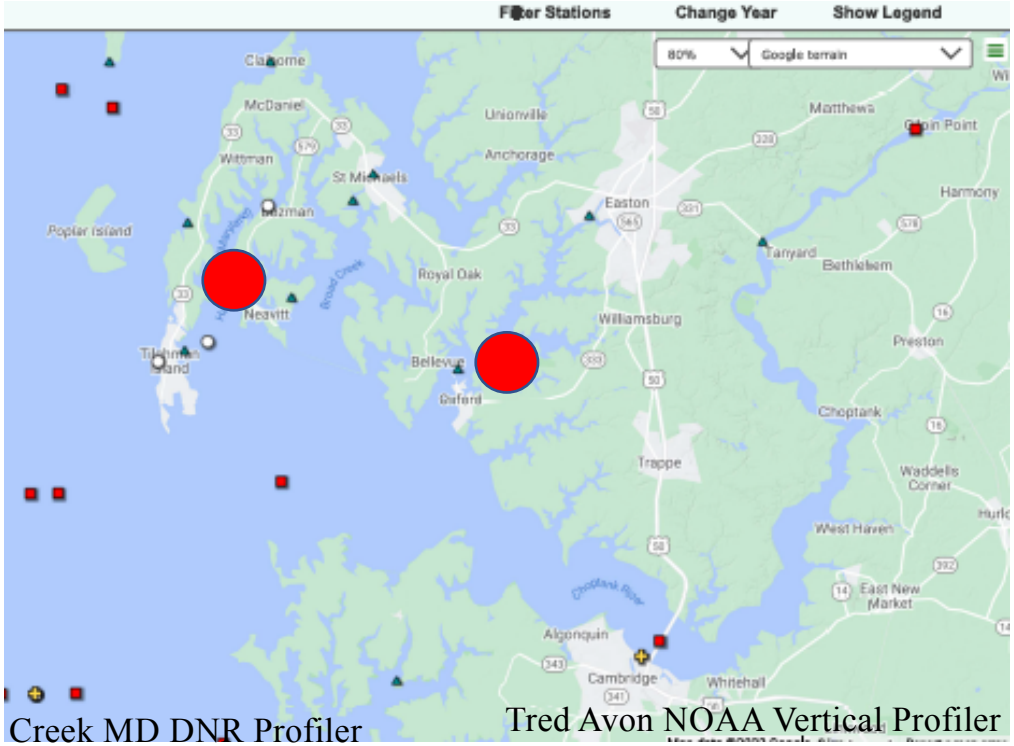


Little Choptank River

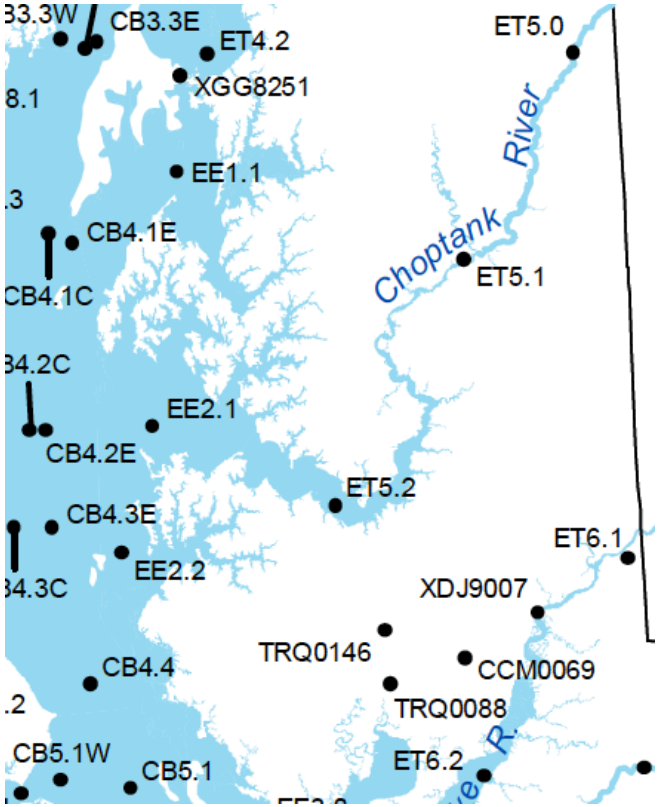
Blackwater National Wildlife Refuge

Honga River

Observations for Model Validations

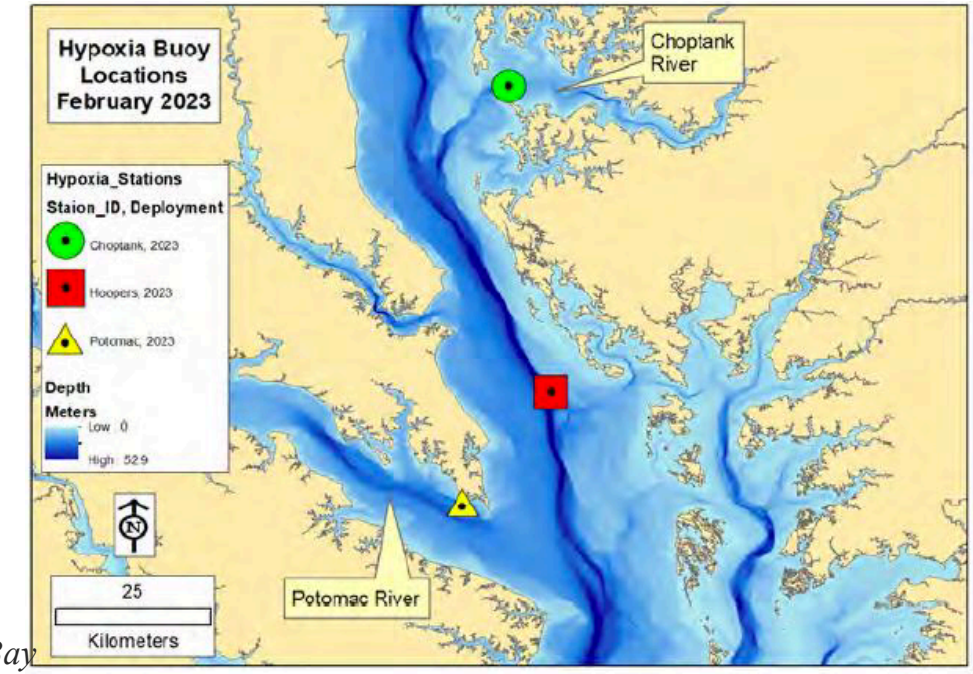


Harris Creek MD DNR Profiler
Years deployed: 2012-2019
Measurements at 0.5, 1.0, 1.5 & 2.0 m
Site water depth: ~3 meters



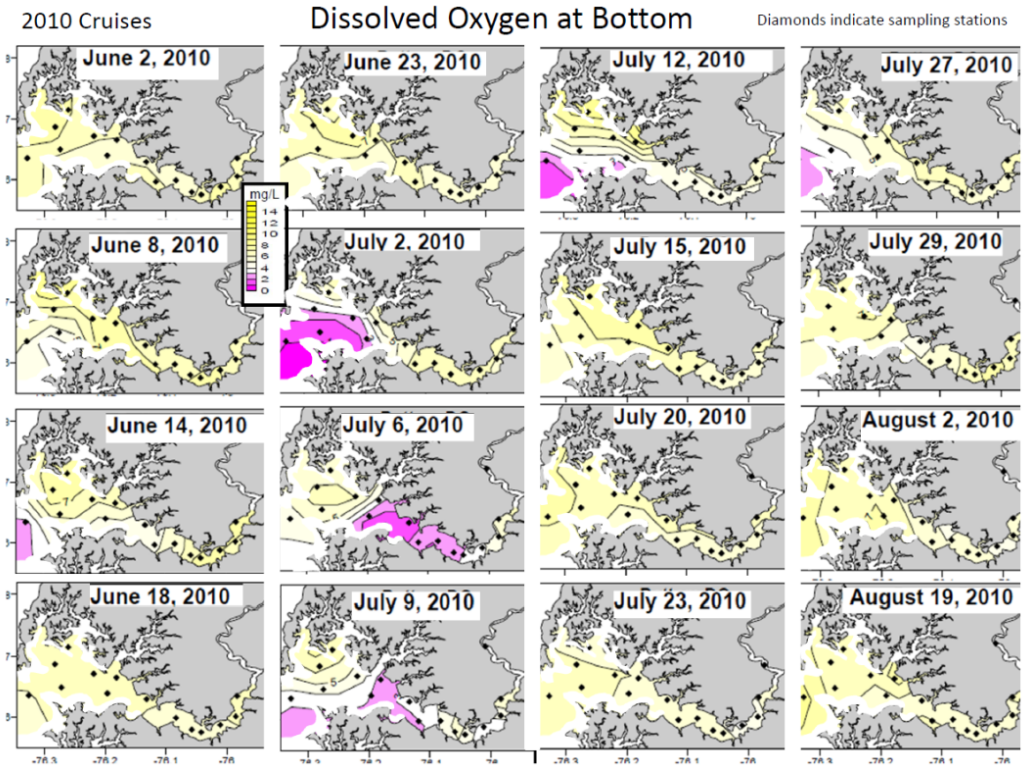
Tred Avon NOAA Vertical Profiler
Years deployed: 2014 - 2019
Measurements at 0.5, 1, 2, 3, 4 & 4.5 m
Site water depth: ~5 meters

Observations for Model Validations



The hypoxia buoy floats after being deployed from the R/V Bay Commitment at the mouth of the Choptank River near Dorchester County, Md., on April 23, 2023. (Photo by Kim Couranz/NOAA)
https://www.chesapeakebay.net/news/blog/thanks-to-federal-investment-the-chesapeake-bay-program-enters-a-new-phase-of-water-quality-monitoring

Observations for Model Validations



Near-bottom dissolved oxygen from CTD casts during the TRANSPORT Program research cruises during the summer of 2010. (Elizabeth North)

Thank You !

Summary of Inputs

Total estimated N and P inputs to the Choptank estuary increased between the two time periods (Table 3). During 1988–2000, atmospheric and terrestrial N inputs to the estuary were 2483 Mg N $year^{-1}$, 88% of which were contributed by agriculture. The N inputs increased to 3872 Mg N $year^{-1}$ in 2001–2017, a 53% increase, which was primarily due to increasing N from terrestrial diffuse sources (Table 1). Agriculture was responsible for 92% of the inputs calculated for reference year 2017, and the remaining inputs were < 5% each. Unfortunately, the decreases in atmospheric N deposition (−19% from the 1998 estimates) and wastewater N discharges (−76%) were overwhelmed by the increases in agricultural N.

P inputs to the Choptank estuary also increased by 20% from the earlier to later time period estimates (Table 3). In the earlier time period, P inputs were 58 Mg P $year^{-1}$, primarily from wastewater plants (28 Mg $year^{-1}$) and agriculture (23 Mg $year^{-1}$). However, during 2001–2018, there were 91% decreases in wastewater P inputs, making current wastewater P the smallest input for which data are available. There are currently no measurements that we are aware of for atmospheric P deposition in the Choptank, but it is likely that atmospheric P input to the estuary is much smaller than current wastewater inputs, given the values measured by Lee et al. (2001; Table 3). Agricultural inputs increased from 1988 to 2000 (23 Mg P $year^{-1}$) to 2001–2018 (53 Mg P $year^{-1}$). Overall, estimated P inputs to the estuary have increased from 58 to 69 Mg P $year^{-1}$ for the two time periods.

(Fisher et al. 2021)