Joint Coordinator/Staffer and
Scientific, Technical Assessment and Reporting (STAR) Meeting
Theme: Water Quality

Thursday, November 17, 2022
9:30 AM – 12:00 PM

Meeting Materials: Link
This meeting was recorded for internal use only to assure the accuracy of meeting notes.

ACTIONS

- ✓ ALL: Let Bill Dennison (dennison@umces.edu) know if you are interested in working on a focused set of studies on the Patuxent River with Jeremy Testa and graduate students in the University of Maryland Center for Environmental Science's Marine Estuarine Environmental Sciences (UMCES MEES) program.
- ✓ Breck Sullivan (USGS): Connect with Jeremy Testa and UMCES MEES students to discuss with integrated Trends and Analysis Team (ITAT) incorporating this work into the Patuxent tributary summary updates.
- ✓ Climate Resiliency Workgroup (CRWG): In 2023, meet with Rebecca Murphy to discuss utilizing the tidal trends for temperature and dissolved oxygen (DO).
- ✓ Breck Sullivan (USGS) will send the Tidal Trends to Marisa Baldine (CRC) and Marisa will add them to the Bay Brief newsletter.
- ✓ The Chesapeake Bay Program GIS Team will invite Shannon Smith (VIMS) to talk to the GIS team.

MINUTES

9:30 AM **Welcome, Introductions & Announcements – Bill Dennison** (UMCES) and **Scott Phillips** (USGS)-STAR co-chairs, **Breck Sullivan** (USGS) STAR Coordinator, **Peter Tango** (USGS) CBP Monitoring Coordinator

Announcements
Strategic Engagement Team Update - **Marisa Baldine (CRC)**
Funding Opportunity: Eastern Brook Trout Joint Venture RFP – Deadline January 30th, 2022

Scott Phillips (USGS) announced he will be retiring at the end of February 2023.

Bill Dennison (UMCES) discussed the transition in government in Maryland. He said Don Boesch convened a bunch of former secretaries in Governor's Chesapeake Bay cabinet and put together advice to the incoming administration. Bill said the two big challenges are the Total Maximum Daily Load (TMDL) 2025, and climate change 2030 initiatives. The advice said to start integrating these two efforts, dealing with climate and nutrient interventions in a more integrated way. He also said there are some projects coming up in the UMCES MEES graduate program. Jeremy Testa and other faculty at the Chesapeake Biological Laboratory (CBL) along

with the graduate students are doing a focused set of studies on the Patuxent River. There will be a white paper or scientific synthesis paper coming out of that effort. Last year one of these courses presented to STAR on an environmental justice indicator. Breck Sullivan (USGS) said she'd like to connect with Jeremy Testa and the students because ITAT is starting to update the tributary summaries and there is one on the Patuxent, and they would like to see how the product Jeremy produces is part of that.

Marisa Baldine (CRC) said the Strategic Engagement Team is meeting with the Climate Change and Resiliency Cohort after Thanksgiving. Marisa announced that Alex Gunnerson (CRC) wrote a blog on the very high-resolution land cover data and recommends everyone take a look at it. It was one of the lead articles. The hypoxia press release and hypoxia blog were added to the website yesterday. Marisa is doing the media clips on it today.

Upcoming Conferences, Meetings, Workshops and Webinars

- Coastal and Estuarine Summit – December 4-8, 2022, New Orleans, LA.
- A Community on Ecosystem Services - December 12-15, 2022, Washington, D.C. Metropolitan Area.
- Maryland Water Monitoring Council Annual Conference – December 15, 2022, Linthicum Heights, MD. Registration closes December 1, 2022.
- A workshop on applying novel techniques to assess and forecast harmful algal blooms (HABs) in Chesapeake Bay to protect fisheries, aquaculture, and human health – January 18-19, 2023, Virginia Institute of Marine Science, Gloucester, Virginia. BY INVITATION ONLY.
- National Water Quality Monitoring Council's 13th National Monitoring Conference - April 24-28, 2023, Virginia Beach, VA.
- Species on the Move – May 15-19, 2023, Everglades National Park, FL.
- Interagency Conference on Research in the Watersheds (ICRW8) – June 5-8, 2023, Corvallis, Oregon. Abstracts due December 15, 2022.
- CERF 2023 Conference: Resilience & Recovery – November 12-16, 2023, Portland, Oregon. Abstracts due May 10, 2023.
- Citizen Science Association conference, C*Sci 2023 - May 22-26, 2023, Arizona State University campus in Tempe/Phoenix, Arizona.

9:45 AM **2021 Tidal Trends Results** – *Rebecca Murphy (UMCES)*

Rebecca will present the draft 2021 baywide tidal water quality trends generated through a joint effort with the Integrated Trends and Analysis Team (ITAT), Maryland Department of Natural Resources (MD DNR), Virginia Department of Environmental Quality (VADEQ), Old Dominion University (ODU), Department of Energy and Environment (DOEE) and Metropolitan Washington Council of

Governments (MWCOG). Rebecca will examine any new patterns for this year and get feedback on presentation and dissemination of the results.

Discussion Questions:

- How can we better align tidal and nontidal trends?
- How can we engage the public and social science communication products to connect stakeholders with what is going on in their waters.
    - Currently have the baytrendsmap app and Water Quality Trends Summary.

Rebecca began with a reminder of what the tidal trends results entail and the announcement that new this year, Washington, D.C. tidal trends results have been included thanks to the work of Mukhtar Ibrahim and Karl Berger from MWCOG, Efeturi Oghenekaro, Blessing Edje and George Onyullo from DOEE, and Breck Sullivan, Alex Gunnerson, and Rebecca Murphy from the Chesapeake Bay Program (CBP). Rebecca also thanked Renee Karrh at MD DNR and Mike Lane at ODU for the Maryland and Virginia results. The new DC additions include 18 stations and are included on the 2021 maps where applicable. Parameters measured at these stations are: Annual Secchi depth, spring & summer surface Chlorophyll a, summer surface DO, Annual surface Total Suspended Solids (TSS) and phosphorous (PO4), and annual surface dissolved inorganic nitrogen (DIN) – for graphs only. Future work for the Washington, D.C. stations might include additional parameters, analysis of the results with the team, and the inclusion in Potomac Tributary Report during the next revision. Bill Dennison asked how many stations for the new DC additions were collected via boat vs collected on land? Rebecca didn't know those specifics but said there was a combination.

Rebecca explained that there is 1-2x monthly data collected from over 150 stations starting in the 1980s, throughout the water column for many parameters. In addition to the monitoring data, there is a longstanding coordinated effort to analyze the data for trends since the 1990s. The analysis approach was last revised around 5-6 years ago. Annually, analysts run BayTrends, an R package to apply Generalized Additive Models (GAMs). This is a statistical approach that captures both linear and nonlinear water quality changes. This process is run for every station and water quality parameters. Then, the results are submitted to the Chesapeake Bay Program, and Rebecca makes maps and other products. Results are then disseminated and published as part of interactive tools. Trends are computed for Total Nitrogen (TN), Dissolved Inorganic Nitrogen (DIN), Total Phosphorus (TP), Orthophosphate, Secchi Depth, Chlorophyll a, Dissolved Oxygen (D), Total Suspended Solids (TSS), Temperature, and Salinity. This is done for both surface and bottom layers of the water column, and it is computed both as observed, and with flow adjustments. Analysis is done over different time periods as well.

Bill Dennison commented that the habitat requirements calculated for Submerged Aquatic Vegetation (SAV) in the Bay are seasonal and they differ for freshwater vs marine. To connect it to habitat requirements it would be easy to crop that out and get March through October trends. Rebecca agreed and added that Secchi depth is currently analyzed for April-October, the

SAV season, specifically, as well as the annual trend. Seasonal trends could be pulled out for other parameters as well.

Rebecca then walked through some of the 2021 Tidal Trends, specifically TN, Secchi depth, DO, and Surface Water Temperature. Rebecca also demonstrated use of the Baytrendsmap app.

- For TN, the long-term trends can be summarized as decreasing at a majority of stations (bottom is similar) and the short-term trends are more mixed, but the largest group is improving.

Rebecca showed how to go into the Baytrendsmapp app to investigate what is happening in the Rappahannock and York Rivers with short term increases in nitrogen.

Bill asked if Rebecca would speak to what she thinks is going on with recent upswing of concentrations. Rebecca said she isn't totally sure. The teams from VA may have some ideas. She did recently pull some Chesapeake Assessment Scenario Tool (CAST) data from the county for the York between the Pamunkey and the Mattaponi but has not done the analysis. Rebecca added that in general the concentrations in those places are much lower in those tributaries than other places, and it's just the last couple of years when they have increased. It's something to keep an eye on but not a huge change yet.

- For Secchi depth, the summary says more than half of the long-term degradations have turned to "no change" for the last 10 years, and stations with long- and short-term improvements are fairly consistent.

Rebecca showed an example of what this looks like in the Anacostia, which has both long- and short-term improvements.

Bill said there was a study 10 years ago in the Corsica River and the tributary in the Chester, and it was pointed out because of the shallow nature of these places, a 10 cm improvement in Secchi could create a lighted bottom area that could grow SAV or benthic diatoms. This can be an ecological tipping point because once you have a lighted bottom, you have organisms that serve to trap and sequester nutrients, reduce resuspension and nutrients exiting from the sediments. Looking at the levels in the Anacostia, it looks like there is a potential tipping point. Rebecca agreed and said ITAT discussed how there have been many improvements in the long-term for the Anacostia due to Best Management Practices (BMPs) and stream restoration work, not just in DC but in MD. 80% of the watershed is in MD. They're hopeful to see even more improvements from the 2018 combined sewer overflow effort (the opening of the Anacostia River Tunnel system) in the future since that is recent. Rebecca added chlorophyll trends have improved as well with indications of less phytoplankton. Bill said if the large BMP effort can be linked to these results that would be fantastic. Rebecca emphasized that Secchi overall is leveling out.

- For Surface Water Temperature, the long-term trend and short-term trend can be summarized as increasing across nearly every station. Water temperature is important for many reasons.

Rebecca reviewed what is available for water temperature. There is surface and bottom temperature long- and short-term changes by stations. There are graphs of long-term patterns available for each station. There are maps of 2-year averages for each station, and mid-1980s average temperatures by station. In the mainstem of the Bay, the bottom water tend to be cooler than the surface, and the tributaries tend to be hotter than the mainstem. With just a few more steps, it would be easy to get this information for any season or month. While seasonal trends are not currently output for temperature, just for oxygen and chlorophyll, it can be done.

- For Summer Bottom Dissolved Oxygen, results vary greatly by station and therefore by depth. The lowest values are in the deepest waters. For long-term and short-term there is a mixture of trends. The Bay-wide takeaway is that most of the oxygen patterns have no long or short term trends, but there are some spatial patterns with more increases in the tributaries.

Bill commented he would argue that the tributary high oxygens are an artifact from time of sampling. It's shallow water in the middle of the day, there's a lot of productivity, so they'd be high, but if you are sampling at 5 in the morning that's when the oxygen problems come about. Sampling isn't done at 5 in the morning, though. When they've done continuous monitoring and done a deeper dive on shallow water (no pun intended) they get that super saturation of oxygen during the day. It's applicable for the deep water when it doesn't change day and night but for the tributaries, Bill didn't think that's very relevant. Peter commented in the chat that he can think of a graph by Elgin Perry showing the daytime bias compared to nighttime DO data distributions. Rebecca said there could be some of that, but this is bottom oxygen, 5 or 7 meters deep, this is NOT shallow water oxygen monitoring. Rebecca agreed in the surface time of day matters a lot, but not as much for deeper water. The Bay Oxygen Research Group (BORG) will build time of day into the new 4-D Interpolator as a factor. Time of day is not built into the long-term bottom oxygen trends. Bill said it would be nice to work towards that and there's a lot of continuous monitoring diel data to calibrate that model with.

Rebecca showed an example of bottom summer oxygen trends in deep Rappahannock compared to nearby mainstem. There is a slight decline in the average in the Rappahannock. However, in the mainstem, there is a slight increase. Oxygen improvements have been observed in this part of the day. Bill said this bears out with the nitrogen data showed earlier. There is some kind of degradation happening with the Rappahannock and the York.

- In summary, across the Bay, nutrient trends are mostly decreasing over the long-term and leveling out over the short term. Secchi depth and oxygen trends are mixed but have more stations that are no change and there is a drop in degradation in recent years. Finally, water temperature is increasing.

Results can be accessed via the ITAT webpage, Baytrendsmap, and the updated Chesapeake Bay Watershed Data Dashboard. Rebecca concluded the presentation with acknowledgements.

Discussion:

Bill commented that Andrew Elmore did a study using Landsat imagery over 30 years, and he found hotspots in the Baltimore and Washington, DC areas. He attributed that to hot asphalt and run off from the summer. Here, it doesn't look like that is the case. Rebecca responded that this is the trend, so it won't show that information. Bill also said it's a chance to get people engaged in thinking about land use change and large BMPs. Scott Phillips (USGS) commented these would feed into the tributary summaries. Breck said she just met with Laura Cattell Knoll and will work with the Local Leadership Workgroup to share tributary summaries. Bill said the tributary summaries are a chance to connect to the nontidal. Greg Allen commented in the chat that Mural would be a great platform to use to arrange multiple graphs to tell the story and show interrelations among the maps. Bill said Mural is by a subscription but UMCES has a subscription.

Breck said Katheryn Barnhart has been focusing on influencing factors for indicators at the Status and Trends meeting. She's not introducing anything new right now but once they can look at new indicators, it would be good to bring forward the ITAT parameters and see which of those could be an influencing factor for other outcomes.

Julie Reichert-Nguyen commented in the chat that the CRWG is interested in how they can utilize these trends (Bay temperature and DO). The Climate Outcomes are going through the Strategy Review System (SRS) right now, but once they get caught up, they would be interested in meeting with Rebecca. Rebecca said that sounds great. Julie added in the chat that the Rising Water Temperature Scientific and Technical Advisory Committee (STAC) report should be coming out by the end of this month, and it has recommendations to consider in connecting temperature and DO trends with living resources.

Renee Thompson (USGS) asked in the chat, where is E. coli? She saw E. coli on trend reports from the Anacostia riverkeeper. Breck responded that E. coli is not a parameter that is regularly collected through our tidal long-term monitoring network. The GAMs package is available for other data to produce trends through the baytrendsmap app. Garrett Stewart (CRC) added that Chesapeake Monitoring Cooperative's (CMC) Rivertrends program tracks E. Coli at a monthly interval through citizen science and that data can be viewed through their data explorer linked here.

10:30 AM **Chesapeake Bay Environmental Forecast System (CBEFS) 2022 Hypoxia Report** – *Aaron Bever (Anchor QEA)*

Aaron Bever will summarize summer 2022 hypoxia from the real-time CBEFS model and compare hypoxic conditions in the Bay to previous years.

MD DNR and Virginia Institute for Marine Science (VIMS) summary reports came out yesterday. The water quality modeling and monitoring show that hypoxia was fairly mild this year. The seasonal forecast done in the spring, based on freshwater and nutrient inputs in the spring, was 13% lower than the annual average. The spring forecast was that hypoxia would be less than average because the nutrient inputs were lower than average. But hypoxia is also influenced by

other environmental conditions and weather – windspeed and direction, storms, water temperatures. Even though the forecast was lower than average, they didn't know exactly what it will be.

Results are from real time modeling. This is based on a 3D hydrodynamic biogeochemical model. It performs 1-day Nowcast and 2-day forecast. The VIMS one is stakeholder tailored and mobile phone friendly. The MARACOOS oceans map website has more features and is more science-y. They get monitoring data from MD and VA throughout the summer and put that on the website, so they can compare the modeling to the monitoring. It's a little delayed though because it takes time to get the monitoring data.

The model has a built in complex biogeochemical model. It grabs real time meteorological data, and it gets USGS gauge data, and that gets scaled so it better matches what would be predicted from the Phase 6 Watershed model because while the USGS gauge data is available in real time it doesn't provide total freshwater inflow. The nutrients are based on climatology since they don't have real time nutrient data. The system grabs this information and provides a nowcast and forecast of all the environmental variables they put out. They're starting to include Harmful Algal Blooms (HABs) and pathogens as well. They take the DO from the model and calculate the volume of hypoxia. The motivation for the real time DO forecasts is for the recreational and commercial fisherman so they can use the forecast to plan their daily activity in the Bay. They show the depth in mg/L.

Aaron explained that they also track the severity of hypoxia in real time. At the end of the summer, they've already simulated the whole summer so they can put out summaries of the hypoxia along the same time periods as the monitoring data puts out their summaries.

In 2022, the model focused on 4 different metrics: Maximum daily hypoxic volume, duration of hypoxia, total annual hypoxic volume (an integration of how much hypoxia there was on each day of the summer in km cubed days), and summer average. They don't focus on the summer average though because it's based on a set time period not including May and October, but often there is hypoxia in May and October, which they don't want to miss.

Bill commented once there was a January heat wave and hypoxia in January. With climate change, it can happen year-round. Aaron said the model can capture that as well. When they start to look at these metrics, they compare to historical values and the recent past (last 5 years from the current year). To get the historical statistics, they use long hindcast biogeochemical simulations. This allows them to compare apples to apples. Throughout real time during the summer they post online how severe the predicted hypoxia is this year, and line plots of the recent past. At the end of the year, they have the full summer. They look at windspeed, air temperature, etc, to see what's happening. Compared to recent past, this year hypoxia started later and ended earlier. The maximum was about average.

In summary, in 2022, the maximum daily hypoxic volume was near average, less than 54% of historical years. The duration of hypoxia was less than most (95% of) historical years. The total

annual hypoxic volume was less than many (76% of) historical years. The duration of hypoxia was lower than the historically normal range. The maximum daily and total annual hypoxic volume were within normal ranges. The duration of hypoxia and total annual hypoxic volume was lower than expected normal range; the duration was much shorter than 2021, and the volume was slightly less than 2020, but much lower than 2019. A relatively windy and cool May delayed the onset of hypoxia in the Bay. The analysis demonstrates how a relatively late onset followed by a quick decline from near-average maximum summer hypoxic conditions can result in a relatively low amount of total hypoxia in the Bay. The water quality monitoring data showed the same findings.

There was no significant trend from 1985 to 2022. There is no decreasing or increasing trend, but one of the confounding factors is there is a lot of inter-annual variability in river inflows. That confounds any impacts that nutrient inputs may have in the end result of hypoxic volume. Luke Frankel did some work taking out the effect of inter-annual variability and river inflows. After these are removed, the nutrient reductions have improved hypoxia throughout the Bay, even if it's not seen in the long-term trends. With nutrient reductions, there is a decrease in the duration and southern extent of hypoxia. Another confounding factor is the warming of the Bay. From 1985-2019 the warming of the Bay has offset 6-34% of hypoxia improvements.

Discussion:

Greg Allen (EPA) commented in the chat if precipitation is overlayed onto Daily Hypoxic? He would be expecting some lag time. Marjy Friedrichs (VIMS) responded that yes, a delay is inherent in the modeling. Precipitation on the Bay itself does not significantly impact hypoxia, but precipitation on the watershed, causing runoff into the Bay is a major cause of hypoxia, and the delay is accounted for. Aaron said scientifically precipitation is still on the table for improving our understanding. However, they don't know exactly how it influences hypoxia. Is it a nutrient supply issue, stratification issue? Is it not important? Does it make hypoxia extend longer?

Bill said he appreciates the new data presentation styles as opposed to standard oxygen mapping and tracking.

Peter asked if duration is more sensitive over time in terms of the total volume. Aaron said not really. He did the basic statistics for all 4 metrics, and none were significant, so he just showed one. Bill said when you look at a graph, you can look at the extremes to see if there is a trend in extremes. Maybe there is indication the high hypoxia extremes are diminished a little.

Peter said 2018 and 2019 had record flows, yet they didn't see as much hypoxia. That may be an indication of an improving effect. Aaron emphasized how Luke Frankel's work says that hypoxia would be in a worse place without the nutrient reductions. Greg Allen agreed. He said hypoxic volume gets less sensitive to precipitation over time as more BMPs are built over time. Aaron agreed and said that's what Frankel's work says.

Marjy shared the published paper "Nitrogen reductions have decreased hypoxia in the Chesapeake Bay".

Breck commented that when the recommendations from the Rising Water Temperature STAC Workshop are carried through it will be important to keep that last point Aaron shared on how much the rising temperature has impacted the hypoxia.

11:00 AM **Evaluation of habitat quality for juvenile summer flounder in two seascapes** – *Shannon Smith (VIMS)*

We used a seascape approach to characterize the environmental and physical habitat in a sub-estuary of Chesapeake Bay and a coastal area of Virginia's Eastern Shore in order to better understand how habitat types (marsh, oyster, seagrass, unstructured soft-bottom) in these relatively shallow areas function for juvenile summer flounder. We examined metrics of juvenile fish abundance, body condition, and recent growth as indicators of habitat quality.

Shannon is a PhD candidate at the Virginia Institute of Marine Science working with Dr. Mary Fabrizio. Her research focuses on understanding fish - habitat relationships for juvenile fishes, with an emphasis on evaluating how habitat quality may affect fisheries productivity. After earning her M.S. from Eastern Illinois University in 2016, Shannon worked in the world of freshwater fisheries in South Dakota and Arkansas before transitioning to saltier waters in 2019 to pursue her PhD.

Habitats are integral for fisheries management. In this region, these key habitat types of marsh, oyster, soft bottom and seagrass are thought to promote nurseries for fish. Summer flounder is a special interest due to its economic importance. Although there's been a fluctuating trend in juvenile abundance, in the past decade there's been a steady below average trend. Shannon's research asked, are VA estuaries serving as essential summer habitat for juvenile summer flounder? The study sampled 4 areas, 12 sites, and 4 habitat types. Shannon evaluated relative abundance, recent growth, and body condition.

Mean summer flounder abundance was highest in marsh habitat, mostly in the Eastern shore compared to the Piankatank sub-estuary. There was no detectable signal in recent groups between areas or habitat types. There were no detectable differences in relative condition between areas or habitat types. Marsh is likely providing prey resources and protection from predation. A potential explanation for the lack of differences in recent growth are insufficient sample size, availability of prey resources, and use of seascape (using a larger area than what the researchers caught them in). Why was there no difference in body condition? A past study found body condition was higher on the Eastern Shore, although they sampled different sub-estuaries. Shannon thinks one difference was the sampling gear was different in this past survey from what their study did. This study targeted fish at much shallower depths. The 2019 study captured larger flounder than this study, as well. There may be an effect of depth and body size in body condition, underscoring the importance of doing comprehensive sampling. Additionally, the small fish may be putting their energy into areas other than fat storage and weight gain. Insufficient sample size and use of the seascape is also a possibility.

Seascapes can define how an area function. Seascape refers to environmental context, physical structures, and spatial relationships (how close is the marsh to a seagrass bed? How contiguous is the marsh?). Seascapes affect movement of fish and resources. Understanding this can help us understand how habitats function for multiple species.

Using landscapemetrics (in R) and GIS, they calculated various metrics based on input buffer difference. One caveat is this package was developed for terrestrial use. Metrics that are relevant for seascapes include: proximity, availability of structured habitat, connectivity of habitat, diversity of habitat, and bathymetry and environmental conditions. It's possible to input a user given buffer difference; this study put a 1 meter buffer difference which was drawn from literature on what represents their maximum movement distance.

Comparing the Piankatank River sub-estuary habitat and Eastern Shore habitat, the Piankatank River habitat is primarily soft bottom habitat (sandy mud/muddy sand) with patches of seagrass and oyster reef. In contrast, the Eastern shore seascape is mostly marsh vegetation, with numerous oyster reef patches, and big, connected patches of seagrass. These areas may not be functioning the same. They used a random forest classifier to quantify these differences. The classifier was 98% accurate. This also allows for looking at metrics of habitat diversity, seagrass pass connectivity and size, and softbottom area. Eastern shore sites had higher habitat diversity, larger seagrass connectivity and size, and less softbottom area. Salinity and tidal range were not calculated, but Shannon noted Eastern shore habitat is closer to the Atlantic Ocean with a higher salinity and larger tidal range. These tools allow for insight on why fish may have been higher on the Eastern Shore. Eastern Shore marsh site seascapes had more marsh area and larger patches, more complex marsh habitat, more seagrass area and larger patches, and a smaller soft-bottom area.

In summary, seascape metrics can be an important consideration when evaluating habitat and living resource connections. They're a holistic way of looking at habitat and taking into account all the different ways organisms might use the aquatic habitat. The higher abundance of juvenile summer flounder observed in the Eastern Shore marshes may relate to some of these seascape characteristics or all of them. Despite differences in seascapes, they did not observe any differences in body condition or recent growth in their shallow water fish. Next steps include looking at other species and other characteristics to provide insight on habitat quality for these other fishes.

Discussion:

Bill Dennison asked, how would climate change influence what's going on? Shannon said summer flounder is having a northward movement of spawning stock. It could be as that moves northward, where the flounder are advected to in ocean currents could change what estuaries they're exposed to. Being able to quantify the coastal and shallow water areas these fish are using could be helpful to work with estuaries farther north to make sure there is essential juvenile fish habitat farther north.

Justin Shapiro (CRC) asked, what are some species of interest to focus on next? Shannon said her research will focus on spot next. For a NOAA report, they looked at juvenile black sea bass as well but couldn't find any differences related to seascape metrics for juvenile black sea bass

It was probably an issue of insufficient sample size as well. Peter asked if Shannon would do research on prey resources/food resources. Shannon said yes. They accidentally collected invertebrates at one point but will hope to do so intentionally in the future. Another next step is to decouple interaction between proximity to Atlantic Ocean and Eastern Shore, and to look at an area that doesn't have as much seagrass.

Renee Thompson (USGS) said she was really interested in the R package and landscape metrics tool and asked if Shannon could come back and chat with the GIS team soon.

Breck said it sounds like you did sampling during the summer months this year? Shannon clarified they did 2 years ago, in 2020. Breck said it would have been interesting to see the abundance of the fish since the hypoxia squeeze would be lower. Shannon said VIMS samples monthly so they may be able to provide information on fish inhabiting deeper waters, but Shannon said she doesn't know of a comprehensive shallow water sampling that targets the areas she targeted. Julie Reichert-Nguyen (NOAA) asked did if she looked at environmental conditions across the two sites? Shannon said yes. It was a more limited suite of environmental conditions, but they looked at temperature, DO and salinity. It was all comparable (except salinity). DO was a little higher in the Piankatank (and DO measurements were only taken on net retrieval, in shallow water less than 2 meters). They did not capture any kind of diel cycling. Nothing below 3.5 mg/L was observed.

11:30 AM **Coordinator/Staffer Meeting**

Forest Buffer Strategy Review System Dry Run Presentation – Katie Brownson (USFS)

12:00 PM **Adjourn**

Next STAR Meeting: December 15th, 2022

Participants:
Aaron Bever (Anchor QEA), Alexander Gunnerson (CRC), Amy Goldfischer (CRC), Barbara McGuinness (USDA), Bill Dennison (UMCES), Breck Sullivan (USGS), Britt Slattery (NPS), Cara Johnson (CRC), Chris Moore (CBF), Chris Guy (USFWS), Douglas Austin (EPA), Garrett Stewart (CRC), Gary Shenk (USGS), Greg Allen (EPA), Greg Barranco (EPA), Jamileh Soueidan (CRC), Jennifer Starr (Alliance for the Chesapeake Bay), Jeremy Hanson (CRC), Jess Blackburn (Alliance for the Chesapeake Bay), John Wolf (EPA), Julie Reichert-Nguyen (NOAA), Justin Shapiro (CRC), Katheryn Barnhart (EPA), Katie Brownson (USDA), Katlyn Fuentes (CRC), Keith Bollt (EPA), Kristin Saunders (UMCES), Laura Cattell Noll (Alliance for the Chesapeake Bay), Marisa Baldine (CRC), Marjy Friedrichs (VIMS), Mary Fabrizio (VIMS), Matthew Kierce (Izaak Walton League of America), Meg Cole (CRC), Peter Tango (USGS), Qian Zhang (UMCES), Rebecca Murphy (UMCES), Renee Thompson (USGS), Shannon Smith (VIMS), Sophie Waterman (CRC), Briana Yancy (EPA)