**Joint Scientific, Technical Assessment and Reporting (STAR)**
**& Coordinator/Staffer Meeting**
**Theme: Next Generation Stewards Science Needs Meeting**

Thursday, June 23, 2022
10:00 AM – 12:00 PM
Meeting Materials: Link

*This meeting was recorded for internal use to assure the accuracy of meeting notes.*

**ACTION ITEMS**

- **Alex Gunnerson will send the feedback on the STAR webpage to the CBP Web Team and make the suggested edits that can be changed under the current webpage structure.**
- **Julie Reichert-Nguyen will send an email to Lew Linker, Gary Shenk, and Angie Wei about potentially adding climate projections to the 4D Visualization of living conditions for striped bass and blue crab.**
- **Shannon Sprague will let Breck Sullivan, Alex Gunnerson, and Amy Goldfischer know if they have any changes they want to make to their science needs before they are updated in the Science Needs Database – Due date has been extended to July 26th.**
- **John Wolf will follow up with Jeremy Hanson about the layout of Ecosystem Services Map Viewer to see if he is still having issues.**
- **John Wolf will list the Ecosystem Services Map Viewer under the Water Quality tab on the CBP Targeting page in addition to the Increased Benefits to People tab since it builds off water quality practices.**
- **Once the Ecosystem Services Report is complete, John Wolf will highlight the Ecosystem Services Map Viewer during his August presentation to the WQGIT. Vanessa Van Note will provide an update to John and Jeremy Hanson when the Ecosystem Services report is complete.**
- **Breck Sullivan, Alex Gunnerson, and Amy Goldfischer will work with Vanessa Van Note to input the future maintenance of Ecosystem Services Map Viewer into the Science Needs Database as a need.**
- **Angie Wei will double check the dissolved oxygen criteria for freshwater in the 4D Habitat Visualization and follow up with Peter Tango.**
- **Angie Wei will provide Peter Tango with the hypoxic volume days outputs.**
- **Angie Wei will consider producing demonstration videos on how to use the 3D Segment Explorer and 4D Visualization of living conditions for striped bass and blue crab.**
- **Justin Shapiro will follow-up with Angie Wei about presenting the 3D Segment Explorer and 4D Visualization of living conditions for striped bass and blue crab to the Fish GIT.**
- **John Wolf and Angie Wei will simplify the URL for the 3D Segment Explorer and 4D Visualization of living conditions for striped bass.**

- **STAR will consider hosting greater training for the partnership on the concept of single, double, and triple loop learning at a future STAR meeting.**

**MEETING MINUTES**

**10:00 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**

**Communications Update** – There was no communications update at this meeting.

Summary

Scott Phillips began with a brief overview of the agenda. Scott added that the Chesapeake Community Research Symposium on June 6-8th was a success and was well attended in person.

Breck Sullivan reminded attendees that session proposals for the National Water Quality Monitoring Council's 13th National Monitoring Conference were due on June 24th. The Non-Tidal Workgroup had discussed submitting an abstract on the Principal's Staff Committee (PSC) Monitoring Review completed recently and the last monitoring review from a decade ago.

Jeremy Hanson announced that the 2021 Progress scenarios are now available on CAST and ChesapeakeProgress has been updated with the reducing pollution indicator.

**Upcoming Conferences, Meetings, Workshops and Webinars**

- World Seagrass Conference and International Seagrass Biology Workshop - August 7-12, 2022, Annapolis, MD.
- Global HAB symposium on automated in situ observations of plankton - August 22-26, 2022. Kristineberg, Sweden.
- Increasing Coastal Resilience Webinar (Delaware Living Shorelines Committee) – September 14, 2022. Virtual.
- 2022 Potomac River Conference: A Conversation on PFAS – September 22, 2022. Virtual/in person hybrid.
- Chesapeake Watershed Forum - November 4-6, 2022. Shepherdstown, WV. Session proposals due June 3, 2022.
- 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.
- National Water Quality Monitoring Council's 13th National Monitoring Conference - April 24-28, 2023. Location TBD. **Session proposals due June 24, 2022.**
- Species on the Move – May 15-19, 2023. Everglades National Park, FL.

**10:10-10:20 Feedback on Website**

- The Web Team is updating group pages and would like feedback on some improvements. Requests must be applicable to all groups; they are not doing group specific changes.
    - What additional features would you like to see on the STAR web page?
    - Is there any additional functionality that you would like to see added or improved upon?
    - The current available sections are Upcoming Meetings, Scope and Purpose, Publications, Projects and Related Links. Is there another section/more information you would like to see added?
    - How could we make this page better?

Summary

Breck and Alex Gunnerson began with the context that the Chesapeake Bay Program (CBP) Web Team is preparing to make changes to the format of workgroup webpages. The CBP Web Team specifically asked for the workgroups to respond to the following questions: 1) what additional features would you like to see on the STAR page; 2) is there any additional functionality that you would like to see added or improved upon; 3is there another section/more information you would like to see added; 4) how could we make the STAR page better? Alex added that any suggestions must be applicable to all workgroups' webpages and that if suggested changes are made in the structure of the webpage, then Alex can go in and make those changes to the STAR webpage. Alex asked meeting participants to add their feedback to a Jamboard so their responses could be visualized before being compiled and sent to the CBP Web Team. The responses were as follows:

- Add drop boxes to show all categories and sections at the top of the page. This might look something like a navigation bar/pane or a webpage directory with quick links for that workgroup. This navigation section would add the functionality to jump to the different sections from the top of the page (e.g., tabs).
- Add subpages for workgroups, for the purpose of particular projects or content to make access to groups of files easier to navigate. Some examples of subpages for STAR might be the Strategic Science and Research Framework or the PSC Monitoring Report.
- Add the ability to embed an interactive map with adjustable layers and other visuals, like synopsis videos of certain topics, into the webpage directly. Make synopsis videos for critical topics.
    - Breck shared an example of a nicely done interactive page.
- Ensure that Scientific and Technical Advisory Committee (STAC) and other related meetings are on the CBP calendar.
- Move the publications section to be higher on the webpage so it is more prominent, since that is a major reason why some visit the workgroup pages.

- Instead of keeping all minutes and progressing tracking documents just on the calendar page, find a way to make it easier to access.
- Include recent meetings in the quick view of events on a group's page, not limiting this section to only upcoming events. Maybe include the 3 most recent and 3 next upcoming events.
- Renee Thompson suggested relating themes from the Logic and Action Plan & workplan to meetings (communicating who needs to be where for the general topics, longer term heads up). Provide an at a glance plan for the year on the workgroup webpage. Vanessa Van Note commented this is a good idea and she is trying to do more of this with the Watershed Technical Workgroup to make sure they are meeting the scope and purpose of the workgroup. Vanessa asked if Renee would be willing to share this format.
- Provide a relevant link to the subpages of ChesapeakeProgress and/or ChesapeakeDecisions for each outcome. Tom Parham suggested adding a footer on all pages that link to ChesapeakeProgress.
- Create a specific calendar for the workgroups within a Goal Implementation Team (GIT) or STAR where related workgroup meetings are linked.
- Include GIT organization charts or visuals on nearly all GIT/STAR pages and make them interactive so that they are hyperlinked to each workgroup's webpage.
- Create a separate section for the STAR newsletter. Include an archive with previous versions of the newsletter.
- The Science Needs database is buried. Bring this and other key resources up-top or make easier to find in some way.

Justin Shapiro suggested maybe listing the Hypoxia Workgroup under STAR's workgroups even though it is not technically a workgroup. Breck replied it is currently attached to the Integrated Monitoring Network (IMN) Workgroup webpage, but if a hyperlinked STAR organization chart is added it would help highlight this workgroup and where it lives. Alex Gunnerson added we have a skeleton page for Hypoxia, but as Breck mentioned it is under IMN WG so it can be hard to find. Alex agreed it would be easier to highlight the workgroup webpage with a visual.

**10:20-10:50** **Science Needs of the Next Generation Stewards Cohort** - *Shannon Sprague (NOAA)*

*Materials: Student Environmental Literacy, Environmental Literacy Planning, and Sustainable Schools Outcome science needs.*

In follow-up to the Management Board (MB) review, Shannon Sprague of the Next Generation Stewards Cohort Outcomes discussed their updated science needs. STAR provided input on potential opportunities to address science needs.

Summary

Shannon began with a broad overview of each outcome. Shannon summarized Environmental Literacy Planning as the effort to get school districts, local governments, and state governments to enhance environmental literacy, Student as an effort to develop meaningful watershed experiences for students, and Sustainable Schools as the programs in place to certify sustainability standards in school.

Shannon then presented a science need that has been completed, which was the need to quantify and support Best Management Practice (BMP) installation and restoration at schools to contribute directly to Bay restoration goals. Using Stroud as a contractor, this 2018 GIT Funded project examined how to connect CBP restoration projects to K-12 schools. The project produced a 100+ page document that outlined a plan for interaction, equity, and a few tools with GIS layers. While there was good work that came out of the project, such as interviews with school officials, the project was not fully successful because it struggled to connect with the restoration and protection priorities of the CBP. Breck asked if the Environmental Literacy workgroup has had success in distributing the workplan created by the GIT Funded project to schools or if that is a next step for this project. Shannon replied one gap is that the Sustainable Schools group is not very active within the workgroup, so it needs to be reinvigorated. The other limitation is that the Sustainable Schools group needs to tweak the tools developed by the GIT Funded project. Shannon said these actions will be included in the revised Logic and Action Plan and will get more support when the person from EPA replacing Erin Sullivan will be brought on. Breck commented she is interested in seeing what the potential of schools is for BMP implementation. Shannon replied that while there are thousands of acres of school owned and maintained acres that could be accessed, it is a drop in the bucket when it comes to helping states meet their 2025 Watershed Implementation Plan targets. Shannon emphasized there is still much value for implementing BMPs on school grounds as they can educate students by being models of how to incorporate sustainability and environmental stewardship into everyday life. Shannon said unfortunately the analysis was tailored to the former and not the ladder, so the GIT Funded project was less helpful than it could have been with hindsight being considered.

One overarching in progress science need is the Environmental Literacy Indicator Survey being administered by Sickler Consulting. The survey is being conducted from May through October and is running in 2022 instead of 2021 as scheduled due to the high demand placed on teachers and school administrators by COVID. Shannon is cautiously optimistic that the data collection will be sufficient, but since schools are still grappling with the learning loss inflicted by COVID and the indicator survey cannot wait much longer, the survey had to be administered this year. National Oceanic and Atmospheric Association (NOAA) secured the Office of Management and Budget (OMB) clearance for the survey, EPA secured the contract with Sickler Consulting, and the clearance allows for a few state-specific questions. The next steps for this science need are Sickler Consulting will synthesize the data and create findings documents, the data will be used to update indicators, and the CBP GIS team will create new layers and update the Diversity dashboard.

**10:20-10:30** **Environmental Literacy Planning** – *Shannon Sprague*

Summary

Shannon began with a recurring science need for this outcome, which is the Percentage of Local Education Agencies (LEAs) that are "Well Prepared" or "Somewhat Prepared" to implement environmental education program(s). This analysis/monitoring need selects questions from the Environmental Literacy Indicator Tool survey, such as "Does your school district have an environmental literacy curriculum in place?" which are then weighted to create a composite score to determine LEA (or school district) capacity to provide systemic environmental education. The survey is administered every two years and was shifted from 2021 to 2022 due to COVID. This need exists to support the indicator for Environmental Literacy Planning, as it is one of the most important indicators for this outcome. This need has full resources if EPA continues to fund the contract that supports Sickler Consulting.

Shannon then identified a high priority new science need: better articulation of the green career/workforce pathways. This was elevated to the Management Board at the Quarterly Progress Meeting and the workgroup suggested creating an action team to answer the following questions: what interventions can increase awareness of green jobs; which populations of students are underrepresented in green jobs; how can the CBP increase diversity and representation; which messengers can effectively convey the potential of green jobs; which skills and competencies are helpful for green jobs and CBP jobs. This science need has been identified because significant workforce opportunities in the environmental and climate fields are emerging and steps must be taken to ensure a strong and diverse candidate pool. Currently, the CBP Education Workgroup's purview stops at high school graduation, so there is a gap for supporting youth in this age range, which includes a focus on those going to vocational school or college. Some current efforts in this space are being led by National Park Service (NPS) and NOAA, with Colleen Norton and Bart Merrick respectively working to influence youth in this age range by providing guidance counselors and community colleges with information about green jobs. Shannon emphasized how the next step should be looking at this need through the lens of the CBP. While a member of the Chesapeake Conservation Corp will be working on this issue for a year starting this summer, higher level and more enduring support is required for this science need.

Breck asked if the potential resources for the new need should be expanded, or if they need to be distilled for the CBP. Shannon said right now the issue is capacity and that most likely they would need to hire a consultant to develop a framework for engaging with schools in specific interventions to support the expansion of a diverse green workforce.

Breck commented she likes the focus on jobs related to climate change since the need for different skills has varied over time and changes depending on which career stage one is at. Breck said perhaps some skills might be better taught before college to help skills and competencies develop further. Shannon agreed and suggested students complete projects for class that help develop key skills for green jobs and educate students about environmental career pathways. Shannon also highlighted the need to get students motivated and excited about these career opportunities, whether they are going to college or not. Vanessa Van Note commented teaching kids that there are rewarding and lucrative jobs/careers outside of going straight to college, especially with an environmental focus, is important. Vanessa expressed she is glad that is a focus area for this workgroup.

**10:30-10:40** **Student Environmental Literacy** – *Shannon Sprague*

Summary

Shannon began with a recurring science need: Percentage of LEAs that have "system-wide, "some" or "no Meaningful Watershed Educational Experiences (MWEE)" availability at the elementary, middle and high school level. This analysis/monitoring need selects questions from the Environmental Literacy Indicator Tool survey to determine student participation in Meaningful Watershed Educational Experiences at each grade level. The survey is administered every two years, and it was shifted from 2021 to 2022 due to COVID. This need exists to support the indicator for Student Environmental Literacy, as it is the indicator for this outcome. This need has full resources if EPA continues to fund the contract that supports Sickler Consulting.

Shannon then identified a high priority new science need focused on synthesis: determining evidence-based criteria to highlight how MWEEs are advancing K-12 student outcomes (with an emphasis on academic achievement and 21st century skills). Shannon noted there is increased scrutiny and focus on school curricula in Maryland (MD), Pennsylvania (PA), and Virginia (VA), which requires evidence-based criteria for what is taught in schools. Since the state departments of education are increasingly relying on evidence-based practices to support decision making, environmental literacy programs need to be able to demonstrate how they support goals for learning (student achievement, 21st century skills, social emotional learning, etc). Shannon said this makes evidence-based criteria critical for this outcome's success. The workgroup has partial resources for this need, which include NAAEE's benefits of EE for K-12 students literature review, NOAA's B-WET MWEE research list, and NOAA's B-WET evaluator. Breck asked if the criteria still needs to be determined. Shannon said their workgroup needs to talk with those who are not convinced of the importance of environmental literacy programs so they can understand the threshold for evidence. They can then put together a sufficient package of research for the evaluators. Shannon said it would be best for the outcome if they could leverage currently existing research as it would be expensive and time consuming to need to conduct new research.

Breck asked if the Environmental Literacy Workgroup has already compiled the research demonstrating the health and safety benefits of outdoor learning, if this is a synthesis need, or if new research needs to be generated. Shannon said since the Sustainable Schools representatives still need to be reinvigorated, this science need was left off the presentation because they are a prerequisite to defining the scope of this science need properly.

**10:40-10:50** **Sustainable Schools** – *Shannon Sprague*

Summary

Shannon began with a recurring science need: number and distribution of certified sustainable public and charter schools that have been recognized by the following programs: U.S. Green Ribbon Schools, National Wildlife Foundation Eco-Schools, MD Green Schools, PA Pathways to Green Schools and VA Naturally Schools. This analysis/monitoring need is to collect data every two years from the programs listed above and entered into a database maintained by the Chesapeake Bay Program. The data collection effort is supported by an EPA contractor. This need exists to support the indicator for Sustainable Schools, as it is the indicator for this

outcome.

Breck asked if a fact sheet or infographic might be helpful for informing stakeholders of the heightened attention and health benefits of outdoor learning based on the information they provided in the Management Board Quarterly Progress Meeting. Shannon said largely that information has already been compiled be a few existing groups, but that having some localized outreach materials on the workgroup webpage would be helpful. Shannon said one way to improve the attainability of this outcome is through improved communication of knowledge on the benefits of sustainable schools. Breck commented this might be a good project for an intern to take on.

Breck commented that if Shannon has any other science needs that come up, she can reach out to STAR to update the science needs database with the new needs at any time.

Amy Handen reflected on the recent presentation she gave to the Scientific and Technical Advisory Committee (STAC) on the Stewardship Cohort's science needs, saying that the data collected from these surveys can inform single, double, and triple loop learning. Amy asked if that is a direction the Next Generation Stewardship Cohort might be interested in going and asked Breck if that is a framework that will be used for science needs going forward. Breck replied she believes that will be a focus of when the science needs are presented to STAC, so there will be an opportunity for that thinking. Breck commented that maybe another way STAC could participate in the Strategic Science and Research Framework (SSRF) and Strategy Review System (SRS) is by incorporating STAC members in the lessons learned portion of the narrative analysis and Logic and Action Plan prior to the SRS Quarterly Progress Meeting at the Management Board. Breck added that perhaps after the science needs meetings STAC members can go to their institutions and see what capacity they or their students can provide in addressing these science needs. Meg Cole replied that STAC feels they might be most effective when contributing to double and tiple loop learning instead of single loop learning since STAC serves an advisory role. Scott Phillips suggested there be greater training throughout the partnership on the concept of single, double, and triple loop learning since it might be new to some individuals and could be better interwoven into the SSRF. Scott said in the meantime, STAR will focus on organizing and finding support for addressing these science needs. Shannon said for MWEEs, there will be a focus towards triple loop learning since school districts might be more interested in changing opinions and learning over time, as opposed to just increased knowledge of facts.

Bill Dennison commented that environmental literacy is crucial for developing strong environmental stewardship in a region.

**10:50-11:10 Presentation of Updates to the Science Needs Database site** - *Alex Gunnerson (CRC), Amy Goldfischer (CRC), and Breck Sullivan (USGS)*

<u>Summary</u>

Breck Sullivan began with an explanation that the Science Needs Database has been revised to make the interface more user friendly and to provide more information on its purpose and role within the SSRF. These updates were produced by STAR, the CBP Web Team, and the CBP Data Center team.

Alex Gunnerson then walked through some of the new additions to the Science Needs Database, such as the home page or landing page which provides information at a glance about what the database covers, why it exists, how the needs were identified, and who the intended audience is. Alex then reviewed the SSRF Guidance page, which addresses different audiences who might be using the Science Needs Database. For an outcome lead who might be starting to go through the SRS and SSRF processes, this page illustrates the different steps of the processes through a graphic and provides a template for the STAR Science Needs presentation. The template is designed to streamline the process and make the work of the outcome lead easier. The SSRF Guidance page also outlines how to update an outcome's science needs if it is not taking place during the SSRF process. For example, outcome leads can go to the Download tab to get an excel spreadsheet of all their needs, filter them by their outcome, make any desired changes using the "Track Changes" feature, and then send it to Alex Gunnerson (agunnerson@chesapeakebay.net), Amy Goldfischer (agoldfischer@chesapeakebay.net), and Breck Sullivan (bsullivan@chesapeakebay.net) for upload to the Science Needs Database.

For those who are researchers, students, or affiliated with an academic institution, a section will be added to the SSRF Guidance page that outlines how to get in contact and begin collaboration with a particular outcome on addressing their science need. Julie Reichert-Nguyen commented this is a great idea to include a way for partners to suggest projects they are working on that can support these science needs. Julie added she has been contacted by a few researchers looking to engage more with the CBP, so the Science Needs Database could be a good place to start collaborating. Breck clarified that right now only the STAR team can directly edit the Science Needs Database and that the SSRF Guidance page will direct researchers to email the point of contact for each need they are interested in collaborating on. Julie suggested allowing outside researchers to directly tag or identify needs in the database that they would like to work on. Breck said this is something STAR can consider further, as up until now the main emphasis was on getting everything working. Breck mentioned the Science Needs Database now has Climate and Diversity, Equity, Inclusion, and Justice (DEIJ) tags that should allow researchers to easily find related science needs.

Amy Goldfischer then highlighted the changes made to the Science Needs Database page itself. One new feature is that each individual science need can be shared in a new tab with others, making it easier to identify, share, and collaborate on addressing a science need. Amy added how another added feature is the deadline for when the finalized science needs in the SSRF process must be submitted to STAR, which is two weeks after the STAR Science Needs meeting. This deadline can be found on ChesapeakeDecisions.

Sophie Waterman asked if it would be possible to include completed/archived science needs on the database or on a PDF. Sophie suggested that highlighting needs completed needs can be a good reference to indicate the progress being made on addressing these needs. Breck replied

this a good suggestion and that currently the STAR team can see the completed needs. STAR will work to see which approach might best showcase the completed needs and the progress being made.

Tom Parham commented if one selects details in the far-left column about a goal, a pop-up window appears, but when the arrow down or page down control is used, the cursor scrolls up. The same issue occurs but in mirror image form when the arrow up or page up controls are used. Scott and Breck replied they will work with the Data Center and CBP Web Team to get this issue resolved.

**11:10-11:30 Ecosystem Services Maps and Data** - *John Wolf*

Summary

Scott Phillips began with some background on the ecosystem services project, explaining that it is housed under the EPA Office of Research and Development.

John Wolf provided some additional context, commenting how he is showing the visualization of one of the projects that Ryann Rossi and Bo Williams presented on at the February STAR meeting. John emphasized he did not complete the work, but just worked with Ryann Rossi to represent it geographically and present a quick overview of the metrics generated by the project. As part of this project, Ryann generated a number of ecosystem service category values at the county scale.

John then walked through the Ecosystem Services Map Viewer, showing some of the different layers available and how to manipulate the web map. The Ecosystem Services Map Viewer can be found on the CBP Targeting page, under the Increased Benefits to People tab. John then briefly overviewed the Beyond Environmental Benefits Database and Search Tool under the Prioritizing Other Benefits tab of the Watershed Data Dashboard. John said the Ecosystem Services Map Viewer will be added to the Prioritizing Other Benefits section Watershed Data Dashboard.

John commented the functionality of this project in Chesapeake Assessment Scenario Tool (CAST) will not be precalculated to the county level. Instead, it will be associated with specific projects or implementations that will be more user specific.

Jeremy Hanson asked why on his screen the map viewer is half obscured by the menu options and wondered if it was due to the browser he was using. John said it is hard for him to resolve this issue without seeing the screen but offered to follow up with Jeremy and help him.

Scott Phillips suggested bringing these tools and visualizations to the Water Quality GIT Meeting (WQGIT) and showing how they might be functional for members. Jeremy Hanson said John Wolf is already scheduled to be there for the August meeting, so perhaps that would be a good time to show these tools. John said he can make sure the ecosystem services tool is one of the tools highlighted during the presentation. Vanessa Van Note commented it might be beneficial to wait until the report is complete before taking this to the WQGIT. Vanessa said the Ecosystem Services team will have the report completed by July, and she will provide an update

when it is ready.

Breck asked John if the ecosystem services tool will be continually updated and if so, who the responsible party is. John said he is not sure, but since the data is connected to land use and land cover data, it will most likely need to be updated with the recently released land use/land cover dataset. Vanessa commented this was discussed, and although the methods are documented and Ryann can still be contacted, there is more work to be done to determine next steps since the main focus has been on publishing and incorporating the data into CAST. Scott agreed the main focus should continue to be publishing and connecting to CAST. Breck agreed, and just emphasized she does not want any future progression with this work to become lost. Breck suggested putting the future maintenance of this tool into the Science Needs Database as a need. Vanessa commented she thinks this a good idea and that once the partnership sees the results, they may decide it is something they want to fund further in the future.

Scott Phillips asked if John is alright with listing the Ecosystem Services Map Viewer under the Water Quality tab on the CBP Targeting page in addition to the Increased Benefits to People tab since it builds off water quality practices. John Wolf said this can be done and is not a big deal.

**11:30-12:00 Overview of 3D Segment Explorer and 4D Visualization of living conditions for striped bass and blue crab** - *Angie Wei*

> *Angie Wei discussed work done with the modeling team to visualize the living conditions of blue crab and striped bass in interpolator grids, and her work on a 3D Segment Explorer showing both the 2D and 3D view of individual segments and their basic statistics, monitoring stations, and TMDLs.*

Summary

Breck began with some context, explaining that the idea for this presentation came out of the February 2022 STAR meeting discussion on targeting and connecting other outcomes to water quality. The 4D visualization connects to living resources and the second part of the presentation is on the 3D segment viewer, which can help workgroup members understand the segments and stations in the Bay.

Angie first presented on the Web-Based 4-D visualization of Habitat Condition of Living Resources. Angie said this was developed with the modeling team and the major inputs for the visualization are from the Chesapeake Bay Interpolator and monitoring data. Angie explained how for the water quality data, the interpolator produced outputs using the ten years from 1991-2000 as a baseline condition, considered three parameters (Dissolved Oxygen, Salinity, and Temperature), and four scenarios (No Action, WIP 3, 1985 Progress, 2017 Progress) represented in this visualization. Angie connected the interpolated results to the habitat requirements for charismatic living resources associated with the Chesapeake Bay, like Striped Bass and Blue Crab (slide 4). The method for making this connection involves taking the three parameters and then masking the Bay with the relevant parameters for each species. In the case of Striped Bass, Dissolved Oxygen and Temperature are the most relevant while all three are relevant for Blue Crabs. Angie then presented both the Blue Crab and Striped Bass visualizations, showing how to toggle between different scenarios and compared a few

examples to illustrate their comparison value. Angie also showcased the ability of the visualization to look at habitat volume at different depths and from different angles, including zoom and search features. Users can also see the attributes of each cell in the interpolated grid.

Peter Tango suggested checking that dissolved oxygen criteria for freshwater (0-0.5ppt) has a threshold of 5.5mg/L in the USEPA 2003 documentation, not 5mg/L. Angie said she will double check this and follow up with Peter.

John Wolf commented the GIS Team will generate a more user-friendly URL for these applications.

Angie then presented on the 3D Chesapeake Bay Segment Explorer that she and John Wolf put together. The data in this tool comes from a refined version of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM), which is being used in the Phase 7 Development of the Main Bay Model. This SCHISM data uses a finer scale grid characterized by finite element/volume formulation and unstructured mixed triangular/quadrangular grid in the horizontal dimension. Finer scale grids are currently available for the Mainstem, James River, and York River. Angie then walked through the 3D Chesapeake Bay Segment Explorer and briefly highlighted how to select different segments and the metrics which are reported. Angie then shared some of the features of the segment explorer, such as: a 2D map shows boundaries of the segment, any tidal water quality monitoring stations found in the segment, and TMDL segment-sheds; the 3D scene depicts the extent of the segment in refined SCHISM grids, color-coded by bathymetric depth with 100x vertical exaggeration; both 2D and 3D scenes are synced and interactive. Angie said a potential next step for the tool is the integration of the segment explorer with water quality standards attainment information currently presented in the Watershed Data Dashboard.

John Wolf added that the 3D Chesapeake Bay Segment Explorer is currently focused on the physical properties of the segments, but as many have pointed out, the integration of water quality standards attainment from the Watershed Data Dashboard would indeed be a strong next step.

Peter Tango asked where the hypoxic volume days outputs reside, as this metric appears sensitive to responding to management actions over time, more so than a maximum hypoxia level each year. Peter said he is not aware of anyone else in the CBP using this metric and thinks it would be very helpful to incorporate. Angie said she has this data in some tables and can provide this to Peter.

Bill Dennison commented these visualizations are fantastic and he expects them to be quite helpful. Bill asked if Angie would consider putting together a short training module/demonstration on how to use the visualizations since users not in attendance today could benefit from a recorded demonstration. Angie said this is a good idea and expects she can do this. Angie said they can add a help button on the applications and link to the video there.

Peter Tango commented these are beautiful visualizations. Peter emphasized there is a chance here to look at these views for how pycnoclines and oxyclines behave to evaluate designated

use boundaries such as the considerations being given to change CB6 and CB7 boundaries. Tom Parham agreed and said there is much potential here.

Julie Reichert-Nguyen said it would be great if the climate change projections that the modeling workgroup generated could be applied to the 4D Habitat visualization tool. Comparing the 2035, 2045, and 2055 scenarios could be illuminating for the state of habitat. Angie said she is not looped into those conversations, so Julie will send an email to Lew Linker and Gary Shenk about this potential addition to this visualization.

Justin Shapiro said he would follow-up with Angie as he expects the Fish GIT will be interested in looking at these maps.

**12:00 Adjourn**

**Participants:** Alexandra Fries, Alexander Gunnerson, Amy Goldfischer, Amy Handen, Angie Wei, Bo Williams, Breck Sullivan, Bill Dennison, Bill Jenkins, Britt Slattery, Carin Bisland, Caroline Johnson, Doug Austin, Fred Irani, Garrett Stewart, Greg Barranco, Jackson Martingayle, Jamileh Soueidan, Jeremy Hanson, John Wolf, Julie Reichert-Nguyen, Justin Shapiro, Katheryn Barnhart, Mark Nardi, Meg Cole, Megan Thynge, Peter Tango, Renee Thompson, Sally Claggett, Scott Phillips, Shannon Sprague, Sophie Waterman, Tom Parham, Vanessa Van Note.