Integrated Trends Analysis Team (ITAT)
Meeting

Wednesday, January 26, 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 help with the coordination of materials for tributary summary updates and assist with the introductory text updates, table of contents, and formatting.**
- **Qian Zhang and Vanessa Van Note will return to ITAT in a few months to discuss the best ways of visualizing tidal water quality status and trends data in the tributary summaries.**
- **Mike Lane will complete the Rappahannock Tributary Summary update in February. Any last comments or feedback should be sent to him promptly.**
- **Vanessa Van Note will complete the rest of the presentation at the February ITAT meeting.**
- **Any additional comments on color schemes should be directed to Rebecca Murphy (rmurphy@chesapeakebay.net) and Elgin Perry (eperry@chesapeake.net).**
- **Breck Sullivan reaches out to the local engagement team (Kristin Saunders, Greg Barranco, and Rachel Felver) to determine how to best disseminate the tributary summaries.**

AGENDA

10:00 – 10:10 **Welcome – Vanessa Van Note** (EPA) and **Breck Sullivan** (USGS)

Announcements -

- Estuary Water Quality Trends document now complete and available on ITAT webpage here.
- Rebecca Murphy announced the publication of nutrient trends and links manuscript authored by herself, Jeni Keisman, Jon Harcum, Renee Karrh, Mike Lane, Elgin Perry, and Qian Zhang. The paper can be found at this link.

10:10 – 10:40 **Review of Rappahannock Tributary Summary Edits and Responses – Mike Lane (ODU)**
Mike shared the edits he has received on the Rappahannock Tributary Summary and a revised report he has drafted. Discussion included how to integrate the cluster analysis work Elgin contributed and how much of it to include in the report.

Summary

Mike began by explaining that he has incorporated most of the edits he has received from about half a dozen respondents (Cindy Johnson, Rebecca Murphy, Renee Karrh, Qian Zhang, Elgin Perry, Tish Robertson, Roberto Llanso,). Mike still has some comments to incorporate, but the main points he wanted to consider in the meeting involved how to integrate Elgin Perry's cluster analysis. Mike suggested potentially incorporating the cluster analyses in the water quality section, but wanted to hear more ideas. Mike said he expects the report to be done in February.

Breck asked if most of the comments are more specific to the Rappahannock or for all of the tributary summaries. Mike commented that most of the comments are specific to the report, but that it is worth considering if the new format used for the Rappahannock should be applied to all the summaries once more analysis has been completed. Mike said some of the aspects of the report, like loadings and land use information should be incorporated within each summary, but that their section depends on who is doing which section.

Elgin Perry commented that he has now completed cluster analyses on Dissolved Oxygen (DO), Total Nitrogen (TN), Total Phosphorus (TP), Secchi depth, and Chlorophyll-a for the Rappahannock. Claire Buchanan provided comments and Elgin expressed that he thinks it is difficult to incorporate cluster analyses into the tributary summaries because of how complex they are. He added that in a previous line of work for environmental impact analysis, the Ohio River Factbook was very similar to the value tributary summaries provide and could be a model to adopt portions from. Elgin emphasized the importance of including land use information given the context it can provide for understanding analyses.

Breck asked Olivia Devereux if the land use is included. Olivia responded yes, it is included and that it should be considered in understanding why the loads change. Olivia commented on how the tributary summaries on CAST followed the same format.

Mike asked about the intended audience of the tributary summaries. Olivia commented that they are for a general/policy audience like local governments, states, and the Metropolitan Council of Governments.

Mike suggested including a glossary and an appendix for the end of the tributary summaries, where the glossary could focus on relevant terms and the appendix includes analyses perhaps too technical for the general body of the text. This could be included for every tributary summary. Breck said this is something we can consider, and it is more feasible because they would not need to be updated each time. Rebecca Murphy expressed that she really likes the glossary idea.

Rebecca suggested utilizing the cluster analysis in the insights on change section for interpreting the trends and including a figure. Mike said he has not had a large amount of time to consider the cluster analysis question, but he thinks that would be a good section for it.

Elgin said one of his next steps for the cluster analysis is to try to relate the Chlorophyll clustering group with the nutrient clustering patterns. Elgin expressed he may not be the best person to do the interpretation of what the patterns mean for the report since as a statistician he is more suited for identifying patterns. Elgin said with an experienced scientific lens, the summarized relationships between the clusters could be a valuable piece of information in the tributary summary reports.

Breck asked if Elgin could utilize some of the cluster work he has done in the past and presented in September to ITAT. Elgin said he could, noting that the previous work was broader. Elgin said for the focused analysis on the Rappahannock, there would be more investment in connecting the parameters together and the data would be extended to 2020. Elgin added that it would be helpful to have some scientists collaborate to compliment his statistician work.

Mike will be done incorporating the Rappahannock tributary summary in February, but welcomes comments in the meantime.

10:40 – 11:15 Feedback for the Tributary Summaries – Breck Sullivan

Breck provided an overview of the feedback from the Modeling Workgroup Quarterly meeting, the Modeling *Ad Hoc* meeting, STAC, and Lee's expectations for the tributary summaries, which includes discussing the feasibility of incorporating climate change in the tributary summaries. Breck updated members on a pilot communication strategy for the summaries.

Summary

Breck began with the Modeling *Ad Hoc* team's feedback. The suggested expansions that will help the Modeling *Ad Hoc* team the most is the following: submerged aquatic vegetation (SAV) factsheets and working with the VIMS SAV team to provide SAV density graphs; including existing atmospheric deposition data; incorporating historical trends of rainfall duration and intensity; moving water temperature tidal trends from the appendix to the main body of the report.

Lew Linker commented on how there are critical trends to watch, such as the climate change data which the Modeling team will provide, which can help explain why nutrient reductions have not yielded expected results due to warmer temperatures. Elgin commented how there is readily available long term records of flow which may be insightful in terms of climate change. Lew asked if Elgin was referencing Karen Rice et al., as increasing precipitation volume and intensity is one component but so is the interpolation of evapotranspiration. Lew suggested flow be considered in terms of seasonality. Breck agreed with the inclusion of flow and said the communications team suggested flow as well. Breck used the example of the fisheries Goal Implementation Team (GIT) completing seasonal summaries as another potential source of analysis.

Breck discussed the feedback from the Modeling quarterly in January, emphasizing the question: what is the best way to use the data in the tributary summaries to validate the watershed and estuarine models, what other information do the estuary modelers need to validate the models, and how do we best present this information. Breck shared how Gary asked at the quarterly if running the General Additive Models (GAMs) on the model output would be helpful in comparing the results with actual data. Lew commented that it may be premature to begin discussing these topics ahead of the April meeting. Lew said that once the budget lines are developed and the Multiple Tributary Models (MTMs) have more certainty, they can start speaking with ITAT about connecting the tributary summaries. Lew said an estimated timeline for the MTMs might be 18 months to develop.

Elgin commented on Gary's point about GAMs and speculated that it may be connected to both their membership in group analyzing the 4-D estimation problem, where they are looking to replace estimation with interpolation and are considering using GAMs to fit the data. Elgin emphasized this is still early on in the research phase and would not be ready for the tributary summaries at this point. Lew agreed and expressed that as information becomes available, the modeling team will refine their work to the new information.

Breck then shared feedback from Lee McDonnell about how to build the summaries as a tool for decision-making. This involves updating the tributary summaries with 2020 tidal data because the most up-to-date data will improve decision making, the data is available, and it will help the ITAT coordinators develop the next steps for operationalizing updates. The other major component was outreach to local decision-makers, specifically to get it in the hands of local decision makers and local planners and meeting with the communications team to get the message out.

Olivia commented they are building mapping functionality into CAST that allows for interaction with the bay segments and shows the impacts a particular area has on other bay segments. Olivia said this information would be very helpful if included in the tributary summaries, so tidal data would be a good match. Olivia expressed the importance of including narrative information for the tributary summaries.

Breck asked how this interactive feature would be included in the tributary summary, and Olivia suggested including a link to that specific geography. Olivia said she will help with distribution to local users by including more information in the CAST newsletter and by hosting a webinar.

Breck shared feedback from the communications team on how to best get out the message on the tributary summaries and the Tidal Water Quality Change document. For the tributary summaries, they suggested writing articles for the Chesapeake Bay Program Blog (Tributary Tuesday – feature highlights from a tributary summary), which include two pilot approaches where one is done for the lower eastern shore and one if done for the Potomac which includes the insights on change and story map. They also suggested creating infographics to share on social media. Breck said anyone who is interested in providing input/writing for a blog, post, or article is more than happy to contribute. In the chat, Alex offered to help write a blog post for one of the tributary summaries.

For the Tidal Water Quality Change document, the communications team suggested the following ideas for Chesapeake Bay Program blogs and articles: summary of the biggest takeaways, long-term improved but the short-term did not so how to proceed, how does precipitation affect flow. Ideas for the social media posts include one describing each of the five parameters and some looking at the long-term trends.

Breck discussed ITAT priorities which are to update the tributary summaries with the 2020 tidal trends data, complete the Rappahannock Tributary Summary, work with Lew and Gopal to gather the historical precipitation data, and to introduce an insights on change section to the tributary reports for the James River, York River, Eastern Shore tributary, and Patapsco/Back River. Breck requested feedback on the priorities in terms of these questions: what is the feasibility of incorporating these suggestions, what do you see as a priority, and are there ways for you to support this work. Breck mentioned they have already presented to the Anacostia Watershed Steering Committee and Council of Governments.

Elgin commented on the insights on change section and the importance of also considering the current status of a tributary. Elgin provided the example of a recent Bay Journal article which focused on how the Patuxent has seen greater decreases in nutrient trends than the Pamunkey and Mattaponi Rivers. Elgin explained how the Pamunkey and Mattaponi Rivers are already doing relatively well compared to the Patuxent, so it would be logical that the trends will not improve as much compared to the Patuxent. Claire Buchanan agreed with this. Breck expressed that status will continue to be a focus of the tributary summaries and the updated 2020 data should help address this point.

Kristin Saunders said in the chat the local engagement team is available to help sort through how best to disseminate and to whom. Breck agreed this would be helpful because they have more connections. Breck asked Kristin who would be the best contact for the local engagement team. Kristin replied the local engagement team is organized by Greg Barranco, Rachel Felver, and myself. We meet every other week. Olivia shared she has been working with Laura Cattell Noll for all things local government/local planning.

Lew said he views the tributary summaries as being helpful for informing 2025 goals and evaluation. For example, the summary could provide an assessment for someone who wants to know what the status is of their nearby tributary. Breck agreed and said that this information could assist the communication team in their efforts as well. Breck said that while the Potomac tributary summary is the only one with an insights on change section and a story map, all the tributary summaries have been produced and are available on the CAST website. Olivia added the SAV reports are on that same page as well.

Breck concluded with feedback to consider for Tidal Water Quality Change document, specifically defining the goal and the audience. Rebecca Murphy explained the context behind the goal for this document, stating that the main focus was summarizing the tidal water quality trends for the year in

one document, similar to how the USGS does for non-tidal. There originally was not a specific audience for the Tidal Water Quality Change document. Breck reminded ITAT members to share any information they believe should be included in the document or any communication tips for distributing the information.

Elgin expressed his support and thanks for the work Breck and Vanessa have done to bring this information to other audiences and collaborate with other parts of the Chesapeake Bay Program.

11:15 – 12:00 **Steps Needed to Develop and Update the Tributary Summaries – Vanessa Van Note**

Vanessa requested feedback from ITAT members for necessary next steps and respective timelines for updating the Tributary Summary with 2020 tidal trends data and updated CAST data.

Summary

Vanessa explained the scope of the presentation was to understand what goes into the tributary summaries, what has been operationalized, and who was responsible for each section of the tributary summaries. The major needs from the discussion were to answer these questions: are we missing any steps, what are the time frames for each step, and what needs to be done to operationalize each step. Vanessa began with some general questions, the first being the timeline for updating CAST and annual progress. Vanessa said the ideal timeline for CAST updates is every two years, and for annual progress every one year. Vanessa suggested waiting until the 2021 progress data is incorporated into CAST before incorporating into the tributary summaries. Olivia agreed and explained that the data should be available before the end of February, plus it is automated and only takes about two hours to run all of the tributaries, so it is not a problem to wait. Olivia added that the tributary summaries have been updated with 2019 data, but not 2020 data. Vanessa said both annual progress and CAST updates can be included into the tributary summaries after March. Olivia and Vanessa said they need to wait for CAST 21 to be finalized since there are errors with CAST 19. The CAST 21 timeline is not solidified, but the goal is March.

The second question was about the long-term goals of the tributary summaries. Vanessa asked if the tributary summaries should be updated every time the tidal data is updated or if there should be staff in each tributary to update the tributary summary report. Rebecca proposed every two years and said while it does not take long to generate the new charts and graphs, the logistics of assembling and reformatting the new documents would not be worth the effort because usually there is little change between one year and the next. Qian Zhang agreed and said the USGS non-tidal network data is only updated every other year, so it might be best to align with their timeline since it is a limiting factor. Qian added that perhaps on the years when not updating the tributary summary with new data, effort should be focused on interpretation and explanation. Vanessa and Elgin agreed. Elgin commented that in the earlier days of the Bay Program, due to limited staffing capacity the timeline was two tributaries per state per year, which supports Qian and Rebecca's ideas. Vanessa asked if a rotating schedule is best. Rebecca suggested seeing how this first year goes, and then reassessing from there. Qian said it may be intimidating to do every two years, so maybe having every tributary updated every four years would be ideal to let the research development guide updates. Vanessa agreed and suggested using input and momentum (such as an eastern shore tributary) to help drive the decision when to make updates. No conclusive decision was made on the timeline, with things to consider being the prevalence of new research, time, and staff capacity.

Vanessa asked Rebecca about the delegation of tasks for updating the tributary summaries. Rebecca said it evolved over time, but what the process ended up being was a document on a shared Microsoft Teams Drive, where Rebecca, Qian, and Angie updated the text and graphics for each of their sections. A staffer was in charge of updating the table of contents, introduction, formatting, and making sure the documents were coming together. Alex volunteered to take on this role.

Carl Friedrichs suggested that VIMS could maintain updates for Virginia tributaries because it is part of their mission and would not require additional resources. If VIMS could be trained to use some of the tools in the Virginia tributaries, it could be a win-win scenario for both organizations. Maybe a similar program could be aligned with UMCES and MD DNR with the MD tributaries. Qian and Tish Robertson, and Vanessa agreed. Vanessa said after detailing the steps, knowing who is doing what will be helpful. Breck suggested transferring over the Microsoft Teams Drive from USGS to the Chesapeake Bay Program for greater accessibility.

Vanessa then went through each Tributary to determine exactly which components need to be updated. For the Potomac, purpose and scope would need only a small update which Alex can do and include a sentence or two about water temperature, describing the trends and graphs Rebecca will put in the tidal trends section. Location would only need Olivia to update the land use text and land use graph to include the CAST 2021 data, which is automated in R. Tidal Water Quality Status would need to be updated with the 2017-2019 data text and tables on criteria, update text and graphs of comparing criteria with water quality trends by Rebecca and Qian. Rebecca and Qian agreed it would not take a long amount of time and most of that would be for making the maps. It would probably take no longer than a week to complete. Qian said he can write a short memo on how to make the table and Rebecca can write a short memo on how to make the maps.

Breck asked if there are certain data limitation sharing with others and public. Qian responded this question applies to the loading information as well, but that ultimately it depends on the format of the data provided. Qian explained there are no limitations, but data needs to be provided in the same format every year internally (Qian, Rebecca, Gopal Bhatt) as it is not already published. Breck also asked about attainment deficit graphs and if they should be included. Lew and Qian said yes, they can and should be shown as a time series figure to show the improvement over time. Qian said they can keep the tables as well in the report. Vanessa said in the next few months they should discuss the different ways of displaying this information. Qian said this is a good platform to host the results since they don't have a different home.

For Tidal Water Quality Trends in the Potomac, the text needs to be updated as do the four planal plots and annual surface total nitrogen data and average predictions. Rebecca explained the plots are created from the deliverables from Virginia and Maryland and is not a large time commitment as it is already automated. Rebecca said once decisions are made for color schemes, the maps can be re-run. The temperature plots are already created and located in the appendix, but the text would need to be updated. Overall, Rebecca estimated it would take a month to complete section 4 - the graphs, maps, and text for this section (assuming an average work month where she must complete other tasks). Instruction materials are already completed.

Vanessa introduced a change to the color scheme for the trend graphics to be accessible to those who experience colorblindness and to improve the clarity of communication of the trends, as some commented the colors were too harsh. The proposed color scheme uses shades of blue for decreasing trends, shades of orange for increasing trends, and a light gray background for the bay. Rebecca confirmed that one individual with color blindness they spoke to said he was able to distinguish between trends with the proposed color scheme. Carl Friedrichs suggested using completely different shapes in addition to color, as sometimes individuals cannot discern between color, or a graphic is printed in black

or white. Carl added that certain colors carry specific connotations related to a particular field, such as red representing warmer temperatures and blue representing colder temperatures or green is associated with chlorophyll. Carl also suggested offering a color-blind accessible version via a link at the bottom of the page if a particular, non-accessible color scheme is desired for good reason. Breck suggested sticking with one version operationalizing the production of the graphics. Renee Karrh suggested using easily distinguishable colors that are consistent (i.e., red representing an undesirable outcome whether it is DO decreasing or nutrient loads increasing) and also clearly distinguish the locations that have no trends as they are important to note as well. Mike Lane agreed with Renee. Some suggestions include making the background lighter, giving a thicker/sharper edge and clear or white interior to the no trends locations, using different or rotated symbols, and giving certain symbols a halo effect.

In the chat, Kristin Saunders said Dave Yayac on the web team has good information about what color schemes work best for audiences with visual impairments. Roger Stewart and Tish Robertson both said they like the proposed orange and blue color scheme. Tish suggested potentially using the RColorBrewer package for selecting colors that pop.

Rebecca said she will examine what is possible in the software but will work to see what will make the symbols pop. Rebecca and Elgin said to send them any feedback on these topics. Breck and Vanessa thanked everyone for their participation and remarked that this presentation will be continued at the February meeting.

12:00 Adjourn

Participants: Alex Gunnerson, Breck Sullivan, Andrew Keppel, Cindy Johnson, Rebecca Murphy, Rikke Jepsen, Roger Stewart, Erik Leppo, Mike Lane, Efeturi Oghenekaro, Vanessa Van Note, Lew Linker, Carol Cain, Renee Karrh, Tom Parham, Qian Zhang, Elgin Perry, Tish Robertson, George Onyullo, Olivia Devereux, Roberto Llanso, Claire Buchanan, Carl Friedrichs, Kristin Saunders, Dave Parrish.

Next Meeting: Wednesday, February 23, 2022