Integrated Trends Analysis Team (ITAT)
Meeting

Wednesday, March 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

- **Breck Sullivan or Vanessa Van Note will reach out to Friends of the Rappahannock and Virginia Department of Environmental Quality about promoting the updated Rappahannock Tributary Summary.**
- **Lew Linker will provide text and the observed distribution figure on rainfall intensity to Breck. For rainfall volume, ITAT would prefer a spatially disaggregated visual that matches the scale of the Tributary Summary it is a part of. The modeling team will work on finding a scaled down visualization for each tributary.**
- **Qian Zhang will send Mike Lane the V3 figure for the Rappahannock from his attainment deficit presentation so Mike can add it to the Rappahannock Tributary Summary.**
- **Qian will send the updated V3 figures for attainment deficit with the suggested changes (open and closed circles, separation by designated use) to ITAT members for review.**
- **Breck will share the document with information on Watershed Factors – Effects of Physical Setting with Vanessa.**
- **Breck and Vanessa will ask Olivia how long she expects updating the figures and text for the expected effects of changing watershed conditions in the watershed factors section.**
- **Breck and Vanessa ask Rebecca Murphy how long she expects it to take for the insights on change section, based on her experience with the Potomac Tributary Summary.**
- **Breck and Vanessa ask Tom Butler to share his documentation and introduce them to the graphs he produced and how long it took to produce them (Patapsco Tributary Summary on page 36).**
- **Breck and Vanessa produce a timeline for updating tributary summaries based on the information gathered in these ITAT meetings.**

AGENDA

10:00 – 10:15 **Welcome – Vanessa Van Note** (EPA) and **Breck Sullivan** (USGS)

Announcements –

- Conferences of potential interest:
  - Joint Aquatic Sciences Meeting - May 14-22, 2022, Grand Rapids, MI.
- Chesapeake Community Research Symposium - June 6-8, 2022, Annapolis, MD. (Hybrid: virtual and in-person.) Abstract submissions due March 30, 2022.
- Rappahannock Tributary Summary Update - Mike Lane

Summary

Breck Sullivan highlighted the Chesapeake Community Research Symposium and how there are multiple members of ITAT interested in submitting abstracts. Qian Zhang shared that he, Rebecca Murphy, Isabella Bertani, and John Clune have a session for the Chesapeake Community Research Symposium which will focus on the water quality patterns and trends and the factors affecting them in the Chesapeake Bay and its tributaries. He commented this is a session that would be relevant for ITAT members and the deadline to submit an abstract is March 30th. If anyone has questions for Qian, they should contact him at qzhang@chesapeakebay.net. Breck also highlighted how the Modeling team has two sessions scheduled for the Chesapeake Community Research Symposium.

Breck and Mike Lane provided a brief update on the Rappahannock Tributary Summary. Breck explained that the action items from the last meeting are being addressed, and that once the summary is completed in about a month, the Communications Team will weigh in on how to best distribute it. The Communications Team plans to use it in their upcoming "Tributary Tuesday" feature. Mike said he has been working on some other projects so had to put the updates to the Rappahannock to the side for a moment, but that he will be ready to share updates at the next ITAT meeting. Lew Linker asked if there is a marketing plan for this tributary summary, suggesting bringing it to the Friends of the Rappahannock and Virginia Department of Environmental Quality to host on their website. Breck agreed this is a good idea, and said she will try to bring this to one of the Friends of the Rappahannock quarterly meetings.

10:15 – 10:35 **Updates to baytrendsmap – Erik Leppo** (Tetra Tech)

Erik will discuss recent updates and changes to the baytrendsmap R package. Erik will solicit feedback from members on these updates and general comments.

Summary and Discussion

Erik began with an overview of why the baytrendsmap shiny app was created, like making the Generalized Additive Modeling (GAMs) approach and providing a platform for users that do not have GIS experience to easily edit maps, layers, colors, and explore the data. Erik explained that for this update, they split the app into two categories: "advanced" for existing users and "basic" for new users. The audience was changed to focus on a wider technical audience, but one that would not have specific knowledge of baytrends. Erik then did a live demonstration of the baytrendsmap R Shiny app, showing some of its functionality, how to filter the data, and both the static and adaptive map.

Qian Zhang suggested that from a user's perspective, maybe it would be best to have the map layer autogenerate and be the initial data shown to a user. Erik said he does not know how easy that will be to have the map layer be shown first, but he can look into it. Qian replied that makes sense from a developer point of view because that might be how the data was provided. Qian said this suggestion is not a big deal, but could be helpful. Erik replied that for the interactive and static maps, the colors and scale should be consistent.

Breck asked if it was possible to have a pop-up box with some basic information about the Shiny app when a user first loads the tool, in addition to a tab with the general background information. Erik that it could be possible to have a pop up. Tish Robertson

said that would be helpful, and that perhaps the background window could pop up first and direct the user to the background information tab. Erik replied that he may not be able to make the changes people want, but they should voice them, so he knows what the user priorities are. Erik added that the data in the maps is coming from the datasets in the baytrends R package. Jon added that the CAST webpage also is an entry point to the baytrendsmap Shiny app, so maybe Olivia can weigh in about which information to add there.

In the chat, Carol Cain asked if it was possible to look at more than one parameter. Erik replied that it is not possible in the current state to look at more than one parameter at a time, but one can easily save each parameter in a side-by-side comparison.

Breck suggested the for future iterations, the Shiny app can incorporate change maps and the related respective bar graphs Rebecca Murphy developed.

Breck also suggested this tool should be presented to STAR in a focused themed meeting on targeting resources, specifically water quality practices and co-benefits in regard to nutrients and water temperatures.

10:35 – 11:05 **Incorporating Precipitation Intensity and Volume into the Tributary Summaries – Breck Sullivan**

Following feedback from discussions with the Modeling Team and ITAT about including climate change into the Tributary Summaries, Breck will lead a discussion on incorporating precipitation intensity and volume data. More information on the types of data can be found in Sections 2 and 3.1 in the Phase 6 Model Documentation.

Summary and Discussion

Breck began by sharing how the objective of these efforts is to incorporate climate change data into the Tributary Summaries to help explain tidal trends and that the data available comes from the Modeling Team at the county scale for rainfall trends (volume and intensity) based on the 1927-2014 Parameter elevation Regression on Independent Slopes Model (PRISM) dataset. Breck then posed some questions to ITAT about how to use the data (slide 3). Lew replied that it will be relatively easy for the Modeling Team to share this data, adding that the intensity is roughly watershed wide. For rainfall volume, the data are applied in the last 90 to 100 intensity decile. Lew then showed the observed distribution of rainfall volume from the literature. Lew said the Modeling Team can provide a figure and a paragraph of explanatory text to explain in the tributary summaries that intense periods of rainfall is expected. Breck and the group agreed that the observed distribution graph should be included. Elgin Perry asked if it would be possible to get access to non-aggregated data so that way it can be compared for each tributary with the respective water quality parameters. Elgin added this would allow for analysts to aggregate up to the segment level. Mike Lane and Carol Cain agreed, saying that aggregating the data to segments to correlate with water quality criteria would be very helpful, and if possible the monthly temporal scale would allow further aggregation by investigators using the data. Lew replied that intensity and volume by themselves might not be ideal, and instead maybe disaggregated change in stream flow would be best. Lew said using this change-delta method the noise is removed from the data. Elgin replied that he thought if intensity increased per volume of water the load delivery would change because of greater surface delivery. Lew and Elgin agreed to continue this

conversation offline. Lew expressed that the modeling team was going to be helpful and provide the data needed.

Breck then posed some questions on how to display the precipitation data, but suggested it might be best to first focus on accessing the data and seeing what is possible in connecting it to other water quality parameters. Lew said for the graph on slide 5, the Modeling Team could provide the trendline from PRISM or the precipitation data at the county scale. Lew then showed the expected change in precipitation from 1995-2025 for the entire watershed at the county scale, and a few other extrapolations for 2035, 2045, and 2055 using trends. Breck replied she is hesitant to use this data in the tributary summaries because typically they have only included observed data. Lew replied that these figures did not involve General Climate Models and are purely trend lines of observed data. Lew added they can disaggregate quite far temporally, but cannot disaggregate spatially. Lew and Breck agreed to discuss in the future the integration and boundary information in the tributary summaries between modeling and monitoring.

11:05 – 11:35 **Attainment Deficit – Vanessa Van Note** and **Qian Zhang** (UMCES)

At the January meeting, we discussed the inclusion of attainment deficit graphs into the tributary summaries. Qian mentioned that they could be shown as time series figures to show the improvement over time. In addition to figures, we can include tables in the report. Qian has drafted figures for the Rappahannock that he would like to bring forward to the group for comment.

Summary and Discussion

Vanessa began with a brief overview, highlighting that today's session is about getting feedback from ITAT members. Qian then showed three figures of attainment deficit for the Rappahannock segments. One such figure was a binary assessment in the form of multiple tables (V1), but it does not use space efficiently in the report. Another figure was a binary assessment also (V2), but it consolidates all the results into one figure. But a problem with V2 is that it does not show if the segment is close to attainment or far from it. The final figure (V3) showcased a time series for different segments based on its designated use and what percentage were in attainment in each time period. Qian added that these figures all take the same amount of time to generate.

Some initial reactions to the options were general agreement in the chat that V3 was best because it painted a fuller picture with information. Elgin and Lew agreed, and Lew recommended adding the attainment criteria value to each segment. Lew commented positively on how V3 conveys a lot of information in a compact format. Qian replied that he is considering separating segment by designated use. Tish Robertson recommended putting in the binary information in the case of an assessment report and in the case of the tributary summaries the percentage attainment deficit makes sense to explain the trends. Tish added she agreed with Qian's idea to separate segment by designated use and said both the binary assessment and attainment deficit should be included. Tish asked if it will be possible to showcase positive attainment. Qian said this is possible, but it will require more analysis so that can be considered.

Claire Buchanan and Efeturi Oghenekaro recommended removing the dashed line at zero for V3 as it interferes with interpreting the results for certain segments. Qian said this is fine to drop the dashed line and that in the past he has used closed circles for full

attainment and open circles for non-attainment. Claire said this is fine and she trusts Qian's judgement.

George Onyullo asked how V3 and attainment deficit can be tied to a management objective. Qian replied it can be helpful because the time series can provide greater flexibility in describing the magnitude of attainment deficit for each segment, whether only 1% is out of attainment or 99% is out of attainment. Qian added attainment deficit can help explain the trends for a segment over time as well. An example might be that while a segment has never been in attainment, it is trending towards attainment over time which can reveal insights. Lew replied to George that attainment is a regulatory question, so V3 is more informational for the managers.

Vanessa asked if the general tributary summary audience will understand the y-axis on the attainment deficit figure. Claire Buchanan said that is a good question and suggested speaking with the Communications team to find a test audience to answer this question. Vanessa and Qian agreed with this suggestion. Mike Lane said he thinks the negative axis in this case is intuitive since non-attainment is indicative of degrading water quality conditions.

Qian said that since it seems many want to include V3 into the report, he asked if the group thinks there should be some associated text included as well. Elgin suggested indicating the Mann-Kendall test results with the attainment deficit percentages in the graph. Jon asked about the power of the Mann-Kendall test on the deep water versus deep channel. He asked if the meaning and power of the test would be affected, and if it should be a concern because the value is close to zero. Qian said this is a good question, and he does not have a clear answer. Qian said from his experience segments mostly in attainment often do not have a statistically significant trend. Jon replied that while he has not looked at how this might impact the data, this consideration should be kept in mind when interpreting the results. Elgin said he cannot think of a test that would handle the tidal data any better. Elgin still thinks this is the best tool for the job. Qian said maybe a different test could be to run a time series with many zero values, but then that might introduce bias. Jon agreed that while maybe Mann-Kendall should continue to be run for the entire dataset, he is hesitant to agree to using the Mann-Kendall for the deep water segment and suggested maybe using a proportion type test.

Qian also asked if the group can make a decision on separating the segments by designated use. Elgin said this is a tough question because it might depend on the particular tributary. For the Rappahannock, Elgin suggests separating the segments by designated use. Elgin suggested including a key (colored lines) next to each of the three sections to include the designated use for each area so as to not confuse people who might think data is missing. Mike said we should include a definition for designated use in the glossary.

Breck commented in the chat that an item to consider with both topics of water quality attainment and climate change precipitation is that the tributary summaries can have a portion in text or in a visual that shows how large weather events have impacted attainment.

Breck said that since the tributary summaries are directed towards a management audience, we should focus on what information they most care about and make the decision about designated use or segment that way. Tish said she thinks they look at

segment basis first. Vanessa agreed and thought they will probably care more about segments based on the way the tributary summaries are being presented. Qian said he can generate these graphs and then send them to the group.

11:35 – 12:00 **Steps Needed to Develop and Update the Tributary Summaries – Vanessa Van Note**

Vanessa will continue from where we left off at the January meeting and request feedback from ITAT members for necessary next steps for updating the Tributary Summaries with 2020 tidal trends and CAST model data, respective timelines for each step, and available instructions for operationalizing each step. Vanessa will also bring up the consideration for using April meetings to build a timeline and get suggestions on operationalizing the tributary summary updates.

Summary and Discussion

Vanessa picked up on the section that ITAT left off on at the January meeting, which was Factors Affecting Trends (slide 8). Breck shared that for watershed factors: effects of physical setting, Jimmy Webber is currently on paternity leave, but can easily pick this information up when he returns and Breck can share the document of information with Vanessa. Qian added that the trends for Non-tidal Network stations for 2020 will be published by USGS in April so the newest information can be quickly updated in tables and text that Jimmy completed. This work is expected to take two weeks, and Breck and Vanessa will talk to Jimmy when he returns about operationalizing this information.

For the estimated nutrient and sediment loads in the watershed factors, Qian confirmed that information is correct. Qian said that once the data is available it takes only about a few days to complete these actions steps (slide 8, red text). Vanessa said she will budget about one week for these tasks.

For the expected effects of changing watershed conditions in the watershed factors, Breck confirmed that Olivia Devereux worked on this section as she provided information to Mike Lane on this for the Rappahannock Tributary Summary. Breck said it does not seem to not take too long as it is automated, and it included a little bit of text in addition to the graphs. Breck mentioned Olivia recommends waiting for the newest version of Chesapeake Assessment Scenario Tool (CAST) before updating, which in this case would be CAST-21. Vanessa commented that ITAT is having these discussions about timelines so that the tributary summaries can be released in a complementary manner to CAST. For the best management practices implementation subsection, Olivia has already provided this updated information using CAST-19 data. Vanessa recommended changing these sections once CAST-21 is released.

For the tidal factors and insights on changes sections in factors affecting trends, Qian said that figure 24 was from a published paper. Breck and Vanessa think that figure 25 (algal biomass and secchi depth acreage) was also produced in a research report, so ITAT does not need to worry about reproducing these graphs. Breck said the graphs Tom Butler created were for comparing the annual average expected nitrogen loads with volume and the annual average expected phosphorus loads with volume. Breck said that since Tom is back with the Chesapeake Bay Program in a different capacity, he can introduce ITAT to the work he did for these comparisons. Vanessa asked if there is currently documentation available and Breck said she does not know.

Vanessa said that in terms of prioritizing next steps, her understanding is that updating the tidal trends with the most recent data and incorporating climate change considerations is more pressing than adding an insights on change section. Breck agreed and said that Qian recommended updating the insights on change section in a staggered fashion. Vanessa said we need to ask Rebecca about the estimated time needed for the insights on change section, based on her experience with the Potomac Tributary Summary.

For the summary section, Breck recommended adding the glossary Mike Lane produced to all the tributary summaries.

Lew asked why there is a graph for comparing load to volume, as that is basically concentration (slide 10). Lew asked if anyone knows the value of this approach. Breck pulled up the figure of interest from the Patapsco Tributary Summary on page 36. Breck, Vanessa, and Lew looked it over, but were unable to conclude why this graph was produced. Mike Lane asked in the chat if those river volumes are correct as 0.1 km3 seems very small. They will follow up with Tom Buter on this matter.

12:00 **Adjourn**

Participants: Alex Gunnerson, Amanda Shaver, Amy Goldfischer, Blessing Edje, Breck Sullivan, Carol Cain, Carl Friedrichs, Cindy Johnson, Claire Buchanan, Dave Parrish, Efeturi Oghenekaro, Elgin Perry, Erik Leppo, George Onyullo, Helen Golimowski, John Clune, Jon Harcum, Lew Linker, Mike Lane, Qian Zhang, Renee Karrh, Rikke Jepsen, Tish Robertson, Roger Stewart, Vanessa Van Note.

Next Meeting: Wednesday, April 27, 2022