Integrated Trends Analysis Team (ITAT)
Meeting

Wednesday, August 23, 2023
10:00 AM – 12:00 PM

Meeting Materials: Link

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

ACTION ITEMS
- **Breck Sullivan will follow up with Adam Lynch to provide more information about the Chesapeake Bay Program's (CBP) targeting tools and 1-meter land cover land use change data for the new Piedmont region report card Friends of the Rappahannock is developing.**
- **Alex Gunnerson and Lew Linker will invite Adam Lynch and Friends of the Rappahannock to the Modeling Workgroup quarterly on days with the Multiple Tributary Model (MTM) for the Rappahannock will be discussed.**
  - **Completed.**
- **After Anoosh Tauqir concludes her internship, Alex Gunnerson will add the attainment deficit graph, figure, and text to the tributary summary story map template, before sending it in for USGS review.**

Meeting Minutes

10:00 – 10:05   Welcome – Kaylyn Gootman (EPA) and **Breck Sullivan** (USGS)
Announcements –
- Joint ITAT-Factors Team Retreat on October 25th at the USGS MD-DE-DC Water Science Center Office (5522 Research Park Dr, Catonsville, MD 21228) from 10am to 3pm. The theme of the meeting will be connecting the Chesapeake Bay watershed to the estuary.

Upcoming Conferences, Meetings, Workshops and Webinars

- Chesapeake Studies Conference – September 15-16, 2023, Salisbury University, Salisbury, MD.

- 2023 Potomac River Conference: One River's Perspective on a Changing Climate – September 21, 2023, Lorton, VA.

- Virginia Water Monitoring Conference – September 26, 2023, Henrico, VA.

- Chesapeake Watershed Forum – November 3-5, 2023, Shepherdstown, VA. Session proposals were due June 11. Poster proposals were due July 28. Registration is taking place the week of August 21, 2023.

- CERF 2023 Conference: Resilience & Recovery – November 12-16, 2023, Portland, Oregon. Abstracts were due May 10, 2023.

- [Environment Virginia Symposium](#) – April 9-11, 2024, Lexington, Virginia. [Presentation Proposals](#) are due August 31, 2023.

- [National Conference on Ecosystem Restoration](#) – April 14-19, 2024, Albuquerque, New Mexico. [Abstracts](#) are due September 1, 2023.

- Chesapeake Community Research Symposium – June 10-12, 2024, Annapolis, Maryland. Special session proposals are due October 2, 2023. Email allison@greenfinstudio.com with any questions.

  - The monitoring team and Science, Analysis, & Implementation Branch are coordinating the CBPO's session proposal submissions. If you have an idea for a session, please contact Breck (bsullivan@chesapeakebay.net) and Kaylyn (gootman.kaylyn@epa.gov).

10:05 – 10:35 [**Rappahannock River Roundtable Overview**](#) **– Adam Lynch** (Friends of the Rappahannock)

Adam provided an overview of [Friends of the Rappahannock](#) (FOR) and the work of the collaborative partnership of the Rappahannock River Roundtable. Adam shared the most recent Lower Rappahannock River Report card and explained the data and methods used to create this resource. Following the presentation, discussion included how ITAT can continue to collaborate and enhance partnerships with stakeholder groups like FOR.

Summary

Adam began with an overview of the Friends of the Rappahannock, including its mission and key activities. Adam then described the Lower Rappahannock River Report Card, including its mission, methodology, key indicators, and data sources ([slides 4-9](#)). The overall grade for the Lower Rappahannock is a C+, but results by watershed are available on [slide 11](#) and maps of results for the following metrics are available on [slides 12-15](#): fish consumption, open space conservation, forest canopy cover, and aquatic grasses.

Adam recommended anyone interested in learning more should attend the [Rappahannock River Symposium](#) on October 25th.

Discussion

Lew Linker asked Adam how the Friends of the Rappahannock can be best integrated into the high resolution Multiple Tributary Model effort for the Rappahannock. Lew said he will follow up over email to talk about this further. Adam said one challenge the report card faces is data limitation for small streams in the Rappahannock watershed, since much of the data produced by Virginia Department of Environmental Quality (DEQ) and EPA focuses on the mainstem. Adam emphasized that an improved understanding of shallow water streams without current monitoring and which sub-tributaries to focus on for data reporting would support FOR in their advocacy efforts. Lew said this is an appropriate use of the detailed modeling work. While observations are the gold standard of what to report, if communicated properly, modeled results could inform shallow water conditions and play an important supporting role.

Lew asked about the oyster scoring on slide 12, specifically how fecal coliform is being used in this metric. Adam said the scoring is based on which percentage of the oyster samples did not exceed the fecal coliform level.

Adam said the tributary summary document alone was very informative and helpful in understanding the trends documented in the report card.

Breck Sullivan asked how FOR geographically targets their restoration efforts. Adam said FOR takes all opportunities that are available for restoration, and they do not say no to people interested in planting trees. However, FOR tends to target their marketing and outreach effort by region to maximize restoration benefits. As an example, they target tree planting marketing in the piedmont region and litter campaigns in Fredericksburg, given that is where the restoration would be most effective. Breck offered to introduce FOR to the CBP's geographic targeting tools and discuss how they might be used to support FOR's work.

10:35 – 11:15   [Tributary Summary Story Map](#) – Anoosh Tauqir (C-StREAM, CRC)

Anoosh presented the work she completed during her time as an intern in the Chesapeake Student Recruitment, and Early Advisement, and Mentoring (C-StREAM) program this summer with ITAT. This included a story map template for the [tributary summaries](#), and an example of a story map created using this template for the Rappahannock.

Summary

Anoosh began by introducing herself and her interest in the C-StREAM program. Anoosh outlined the scope and purpose of the project which was to communicate the tributary summaries in a more interactive, easily replicable format that can be used by local organizations to communicate results to the public. Anoosh reviewed the methods and data input for the story maps.

One part of Anoosh's project was focused on engaging with local watershed groups to solicit feedback on how to improve the story maps. A common theme was confusion on symbology for water quality trends. Another suggestion was the inclusion of a community specific section, which can boost engagement with local watershed groups. Anoosh responded to these comments by improving the legibility of the water quality symbology and adding a "For the Community" section.

Anoosh then walked through the story map she created for the Rappahannock using the template she developed ([slides 14-29](#)). Next steps include making a few more edits on the attainment deficit figures and text before it will be submitted to USGS for review. Once that review is complete, it will be finalized and posted alongside the tributary summaries on the CAST webpage. The template will be utilized to produce story maps for all the tributary summaries as their static reports are updated.

Discussion

Adam Lynch said Anoosh's work was very impressive and the story map is an ideal resource for an elected official or decision maker since the interactive format is visually appealing and the scrolling feature makes it a seamless experience. Anoosh said that is great to hear and hopefully it can be used at community events, neighborhood

associations, and civic associations. Adam said much conservation work occurs at the local supervisors' level, so this product is critical. Adam Lynch commented this was an outstanding job taking a complex report and distilling it into an interesting and informative product.

Amanda Shaver said that Virginia DEQ is looking to develop a similar type of product for their integrated water quality report in 2024. Amanda asked if the ability to search by address within the embedded maps is an added functionality Anoosh developed or if it is within the ESRI product. Anoosh said she thinks it is part of the ESRI product, but she will double check to be sure and let Amanda know.

11:15 – 12:00   Joint Ecosystem Modeling (JEM) Everglades Vulnerability Analysis (EVA) – Laura D'Acunto (USGS)

Laura presented on the work of the JEM team, an overview of Bayesian network theory, and a demonstration of a Bayesian network (the Everglades Vulnerability Analysis, EVA).

Summary

Laura began with an overview of USGS's Wetland and Aquatic Research Center (WARC) and the types of models they produce. Laura introduced the Joint Ecosystem Modeling (JEM) effort as a collaborative approach to modeling and standards across the Everglades restoration community. Some commonly used JEM models include habitat suitability models (for species like alligators, kite nest, Everglades waders, and Everglades sparrows), population or density models (for species like Everglades snail and other small fish), and Bayesian network models like the Everglades Vulnerability Analysis (EVA). The EVA is designed to connect many different Everglades ecosystem indicators to provide a system-wide perspective on the Everglades.

Laura provided some legal context for these modeling efforts, such as the Comprehensive Everglades Restoration Plan (CERP). The main goal of CERP is to restore the water flow of the Everglades back to a more historical flow regime, which means directing more water south to the Everglades, then current conditions where water flows to the west and east of Lake Okeechobee.

The Everglades is well monitored and modeled for hydrologic conditions. JEM uses this data for use in Everglades restoration. One such model is EVA, the goal of which is to forecast areas where cumulative stressors may lead to a risk of irreversible ecological damage. EVA builds capacity to understand and consider uncertainty through its flexibility, connectivity, and easily updatable format.

Laura then explained Bayesian Networks (BN) which are models that graphically and probabilistically represent correlative and/or causal relationships among variables using the assumption of conditional independence. There are 4 major types of BNs: discrete, continuous, hybrid, and dynamic. The EVA is a discrete BN, meaning that continuous variables must be converted to categorical variables. BNs are defined by conditional probability tables (CPT), which contain the probability of observing an outcome as a result of all the possible combinations of the current nodes of parent variables. BNs have many advantages, such as being able to utilize data from multiple sources, update new information as it becomes available, address variable data availability, graphical

representation of the model, and facilitates the exploration of uncertainty and sensitivity in the model.

In EVA, the BN model development process followed these steps, which were co-created with partners and completed iteratively:

1. Define model objectives.
2. Create a conceptual model of the system.
3. Convert the conceptual model to an influence diagram.
4. Create model variables and assign their states.
5. Parameterize ('or learn') the model.
6. Evaluate model sensitivity and accuracy.
7. Apply the model to new scenarios.

EVA has network inputs of daily water depths, daily sensitivity, and landscape level predictors. Network outputs include indicators like vegetation type, sawgrass peat accretion, alligator nest presence, and size of wading bird colony at a 400 m scale annually. The outcomes and uncertainty are used to create a vulnerability layer which represents the distance from an 'ideal' target ecosystem state. Indicators have tailored hydrologic models and landscape metrics to inform probability outcomes for each indicator in the form of a module. Inter-module relationships were developed using Bayesian inference. These indicator modules influence each other and are used to create results for EVA.

Laura walked through the results of the vegetation, alligator nesting potential, wading bird nesting colony size, and sawgrass peat accumulation modules. Laura then explained how vulnerability was calculated as a distance from a target state defined by the user. If the user was less tolerant of uncertainty, larger portions of the map were likely to be identified as highly vulnerable. To learn more and see the maps of the results, one can read the publication, the data release, and R code used for the analysis.

Laura concluded with next steps for EVA, such as

- The vegetation module will be used to explore potential future impacts of the Biscayne Bay Southeastern Everglades Ecosystem Restoration project
- Building vegetation succession lags within the module and exploring ways to define vulnerability of vegetation
- Utilizing funding received for the FY24 development of an aquatic fauna module

Discussion

Breck asked how these results are used to inform management implications. Laura said the EVA team is working with partners to identify how to best communicate the implications of this work, whether they are interactive maps or individual metrics, like acreage changes.

Breck asked why alligators are featured so heavily in this model and if they are important to stakeholders. Laura said alligator nesting is considered an indicator of Everglades ecosystem health and is sensitive to changes in conditions, so monitoring this metric will inform the goal of the CERP to restore the landscape.

12:00   **Adjourn**

Participants: Adam Lynch, Alex Gunnerson, Amanda Shaver, Amy Handen, Andrew Keppel, Anoosh Tauqir, August Goldfischer, Breck Sullivan, Carl Friedrichs, Carol Cain, Chris Mason, Cindy Johnson, Efeturi Oghenekaro, George Onyullo, Helen Golimowski, James Webber, Kaylyn Gootman, Laura Cattell Noll, Laura D'Acunto, Lew Linker, Marisa Baldine, Mike Lane, Mukhtar Ibrahim, Qian Zhang, Rachel Felver, Renee Karrh, Tony Timpano, Roger Stewart.

Next Meeting: Wednesday, September 27, 2023