Scientific, Technical Assessment and Reporting Team (STAR) Meeting
Theme: Emerging Monitoring Technologies and Networks

Thursday, April 25, 2023
9:30AM – 11:30 AM
Meeting Materials: Link
This meeting was recorded for internal use only to assure the accuracy of meeting notes.

ACTION ITEMS

- **STAR will send the comments from today's discussion, along with GIT identified synthesis science needs, to STAC to partially inform their "state of the science" workshop RFP.**
    - **Anyone who has high level themes they would like sent to STAC on this topic, please send to Breck Sullivan (bsullivan@chesapeakebay.net) by Thursday, May 2nd. This would entail 1-2 sentences on a topic. Ultimately STAC will develop the RFP.**
        - **Done**

MEETING MINUTES

9:30 AM **Welcome, Introductions & Announcements – *Ken Hyer*** *(USGS) and* ***Kimberly Van Meter*** *(Penn State) - STAR chair and vice chair,* ***Breck Sullivan*** *(USGS) STAR Coordinator,* ***Peter Tango*** *(USGS) CBP Monitoring Coordinator*

Announcements

Breck highlighted the importance of the planning conferences for engaging with local decision makers and implementers. Local Government Advisory Committee (LGAC) coordinator Laura Cattell Noll has connected STAR and workgroups to the Mid-Atlantic Planning Commission and the National Planning Conference, where the CBP has presented on the tributary summaries and watershed data dashboard. More information on the two local planning chapter meetings in Maryland and Virginia can be found below.

Upcoming Conferences, Meetings, Workshops and Webinars

- Choose Clean Water Conference – May 20-22, 2024, Ellicott City, Maryland.
- Chesapeake Community Research Symposium – June 10-12, 2024, Annapolis, Maryland.
- American Planning Association (APA) Virginia 2024 Conference – July 21 – 24, 2024, Williamsburg, Virginia.

- American Planning Association (APA) Maryland 2024 Conference – October 22-24, 2024, Ellicott City, Maryland. Session Proposals are due May 31st.

9:40 AM **Stream Team – *Dr. Gregory Noe (USGS)***

Dr. Gregory Noe (USGS) shared the goals and approach of the USGS Stream Team, a study measuring stream ecosystem health responses to Best Management Practice (BMP) implementation and to land use in smaller nontidal watersheds around the Chesapeake.

Summary

Greg noted this is a highly interdisciplinary study funded by USGS that is focused on looking at the co-benefits of conservation practices, or BMPs, for the response of conditions in local streams. Critical unknowns the study aims to address include which conservation practices improve stream health more effectively and how conservation practices change water quality and the impacts of stressors on aquatic life. The interrelationship between land use induced stressors and conservation practices is another focus on this study. The holistic approach of this study will be guided by a focus on determining the spatial gradients across streams, as opposed to a temporally focused study.

Greg shared critical knowledge to be delivered to stakeholders includes:

- Effects of conservation practices on local water quality conditions.
- Degree that these same conservation practices also provide local stream ecosystem benefits.
- Deeper understanding of local stream ecosystems, including stressors and conservation practices, to guide the selection of efforts that enhance both water-quality and overall stream ecosystem health.

Greg reviewed the analytical and sampling approach of this study, which focused on measuring drivers and stressors and responses at carefully selected sites that are controlled for other influences. 30 smaller sized streams were monitored for a year long period in four Chesapeake landscapes (slide 8). These sites were selected along both land use and BMP-intensity gradients (slide 9) and collected measurements for the following metrics: water quality and contaminants, channel geomorphology and habitat, stage and temperature, macroinvertebrates, fish, and riparian. More information on these metrics can be found on slides 21-26.

Greg then outlined the challenges this study has faced, which fall into four major categories: obtaining landowner permissions for accessing multiple properties for 30 streams each year, extensive field and lab work, using BMP data is

inordinately complicated, and geospatial processing and analysis of all data (slides 11-15).

Greg provided an overview of the engagement efforts USGS will be conducting (slide 16) before concluding with a timeline for the project (slide 17), an early view of some Shenandoah data (slide 18), and an acknowledgement of all the parties who participated in this work.

Discussion

Olivia Devereux said the Chesapeake Bay Program (CBP) has a great quantification/relationship for BMP effects on water quality. Greg's team is doing a fantastic job looking at the practices for total ecosystem effects.

Jeremy Hanson said he appreciates seeing the "confidence" column on the expert elicitation spreadsheet. Love that the stream team is trying to account for that alongside the estimated effect.

Kristin Saunders said a major insight from the February CRC Roundtable on the results of the stream restoration Scientific and Technical Advisory Committee (STAC) workshop was that biological uplift has to be an intention from the start. Trying to connect the presentation from today to that message and the ecosystem services conversations at the CBP, how does the stream team presentation interface with these efforts? Greg replied that not only does a stream restoration project need intent for biological uplift, but they also need to know what the stressors are in the stream that you need to alleviate. Knowledge of both components are required to determine the appropriate restoration action. This work will shed a lot of information on the actual stressors in these stakeholder identified key watersheds. Greg said he hopes the statistical analysis in this work will fill the information need from the STAC stream restoration workshop. In terms of ecosystem services, if we find attributable effects of BMPs on ecosystem health at all, then we think we can have a quantitative linking tool between BMPs and ecosystem improvements. But the valuation of these ecosystem services is a whole other question. There have been attempts to do this in different projects (USGS flood mapper evaluation tool and USGS small mouth bass fishery population connection to BMPs project) but it is not within the scope of this project.

Jeremy Hanson asked does "close to publication" mean that the fact sheet of goals and approach is already in USGS peer review? Trying to calibrate expectations for days or weeks. Greg said this will be complete within two months at the latest. Jeremy said he will help distribute this information once it is available.

Bill Dennison said this was an impressive presentation and Greg is really getting at the crux of the issue of BMP effectiveness. Bill added the bubble diagram is hard to interpret, especially with the 'hidden' factor. Greg thanked Bill for the feedback on the bubble diagram. Greg was testing different ways to show the data, and now bubble diagrams are low on the list of visualizations to use.

Kristen Saacke-Blunk asked Greg to share more about how channel geomorphology is being measured in the field. Kristen said she is thinking about this in terms of Chesapeake Monitoring Cooperative (CMC) data and National Fish and Wildlife Federation (NFWF) invested sites because Stroud Water Research Center has been working to develop a protocol for collecting this data by community scientists. Would it be possible to work with CMC on the channel geomorphology monitoring? Greg replied that slide 24 highlights the channel geomorphology metrics being monitored, which reflect current methods being utilized in the field. This project will look at typical ways of conducting these measurements and potentially better ways of taking these measurements collectively in the future. The number of metrics is so broad because we want to discover interconnected relationships.

Katie Brownson said this is such an exciting project! Do you have a list of the BMPs you identified as being likely to benefit stream health? Greg said not yet to share, but as the data is analyzed we will explore which BMPs are effective and explanatory. Before we begin that effort, we are finishing up the summary of the expert elicitation effort on BMPs and expected responses, which include expert opinion on the effects of the BMPs on each stressor, the confidence for that assessment, and any clarifying comments. This will then be compared with the data collected in the four select watersheds. Greg added that "likely" benefiting stream health does seem aligned with our expert elicitation summary of expected effects. We couldn't rank all ~300 individual BMPs, so we restricted it to the most common cumulative 95% of practices actually implemented. Our plan is to publish the BMP expert elicitation in the next year, before most of the stream measurements (by landscape) get published.

Jeremy Hanson asked where the BMP data for developed areas is coming from and where it is being gathered. Greg said the data is provided by the states to the CBP through National Environmental Information Exchange Network (NEIEN), then brought into Chesapeake Assessment Scenario Tool (CAST). The stream team receives it as an output from CAST through Olivia Devereux.

Breck commented the Water Quality GIT Funding proposal on heater and cooler BMPs would inform the Stream Team project, but there is no guarantee it will be selected for funding. Breck will share an update with STAR once we know the results of the GIT Funding process.

Ken Hyer said hopefully those in attendance today see how this work is cross-cutting for outcomes and holistically integrated. This project also demonstrates the importance of working at finer scales and with local partners. Ken said those interested in learning more about the metrics being used can contact Greg Noe (gnoe@usgs.gov).

10:20 AM **Monitoring of HABs using hyperspectral remote sensing – *Dr. Natalie Hall (USGS)***

Dr. Natalie Hall, a Supervisory Geographer at USGS in the MD-DE-DC Water Science Center, presented some of her work on the Monitoring of Harmful Algal Blooms (HABs) using Hyperspectral Remote Sensing, including details of how the microscope-based hyperspectral system was validated through a NIST (National Institute of Standards and Technology) collaboration for collection of algal data. Data from this project forms the basis of a developing HABs spectral library and the project has expanded to validation of field hyperspectral sensors, as well as development of a field hyperspectral data collection protocol. These efforts seek to advance our ability to characterize potentially toxic HABs using hyperspectral imaging.

Summary

Dr. Natalie Hall began with a note that her research is interested in instrumentation and implications for informing the monitoring efforts of HABs. For the purposes of this presentation, HABs are being defined as an overabundance of algae or cyanobacteria. The primary study site for this project was in the relatively shallow Upper Klamath Lake in Oregon which experiences HABs most years.

Natalie said the focus of the project is on building a reference spectral library for specific taxa that contribute to HABs, such as toxigenic algae. While multi-spectral remotely sensed data (such as data from Sentinel-2 and Sentinel-3) can be helpful for monitoring HABs, this study is interested in genus specific taxa that multispectral instruments cannot resolve, so hyperspectral data is needed. For example, this means moving from 13-21 spectral bands on an instrument to over 200 spectral bands on an instrument. The very fine spectral resolution allows for distinguishing between taxa at the genus level to develop unique spectral profiles to facilitate the monitoring of HABs.

Natalie then described the data and methods used to monitor the HAB relevant taxa in this study. This included information on the innovative sensors used, system validation, and refinements in the method. USGS and NIST collaborated through an interagency agreement to pioneer these methods and instruments.

Natalie concluded with a snapshot of some preliminary results and next steps for this project.

These methods, instruments, and preliminary results are undergoing review, so these minutes have been generalized to ensure no information is prematurely distributed. Those interested in this work are encouraged to follow Natalie and her colleagues as they publish this work. Natalie's publications on her USGS staff profile can be found here.

Discussion

Chris Guy said Poplar Island has had ongoing HAB monitoring for more than 10 years. Chris suggested using that project as a Chesapeake monitoring site.

Kaylyn Gootman asked Natalie if she has connected with EPA Office of Research and Development (ORD) researcher Blake Schaeffer (schaeffer.blake@epa.gov) who uses remote sensing to focus on HABs. Natalie said she will contact him, as she sees part of her role as coordinating hyperspectral remote sensing data collection to ensure reproducibility and comparability. Peter Tango mentioned that Megan Coffer worked with Blake and is now at NOAA here in Maryland. Megan worked with satellite-based assessments, SAV and cyanobacteria. Kaylyn said she will follow up with additional EPA names once she hears back from another colleague. Kaylyn mentioned Brooke Landry and Maryland Department of Natural Resources (MD DNR) and Peter Tango mentioned Richard Stumpf (richard.stumpf@noaa.gov) at NOAA. Natalie said she works with Cathy Wazniak at MD DNR already and knows Richard and others Peter mentioned. Natalie said part of her role is to connect researchers working in this space with each other. Kaylyn asked if there is anyone at Old Dominion University or Viginia Institute of Marine Science that others can think of that works on HABs? Kathy Boomer said Margie Mulholland (mmulholl@odu.edu) and Tom Allen (tallen@odu.edu) would be top of her ODU contact list. Bill Dennison said Margie Mulholland at ODU works on HABs and Dick Zimmerman (rzimmerm@odu.edu) and Victoria Hill (vhill@odu.edu) work on remote sensing (mostly seagrass).

Peter said this information will help address narrative questions for tidal waters like how to characterize HABs in terms of duration and extent is key for developing a numerical target. Natalie said how to utilize all this hyperspectral data is a question the field is still wrestling with because the expansion of available data is relatively recent. NASA's recently launched PACE instrument is an exciting new data source. Breck noted she recently learned some scientists at University of Maryland Baltimore County helped contribute to PACE. Natalie mentioned she has been working with Bernard Hubbard and Ray Cokley to discuss data management and reproducible data utilization.

Kathy Boomer asked if Natalie is working with the global AquaWatch network. Natalie said no, she is not but would be interested. Kathy said in her work at Foundation for Food and Agriculture Research she has connected with folks in Australia, the Gulf of Mexico, and Chesapeake Bay. Connecting our HAB work to AquaWatch global network contact: kboomer@foundationfar.org. Natalie said she is somewhat connected with a CYRO in Australia because one of the major professors in that network will be reviewing these publications. Natalie said she is a large proponent of sharing science and would like to collaborate.

Ken Hyer asked if this is a water mission area funded project? Where in the organization does this project sit? Natalie said yes, the funding comes from HABs CMF and Tyler King's water quality project within the water mission area. These are three-year funding projects, so anyone interested in discussing funding is welcome to contact her (nhall@usgs.gov), especially regarding the collection of samples.

11:00 AM **CBP Synthesis Needs: Informing STAC Science Synthesis** - ***All***

STAC is beginning the process of determining the STAC Science Synthesis topics, and they asked for support from STAR to identify CBP priority synthesis needs that can inform the RFP request. While the specific topic is yet to be decided, as outlined in their grant, synthesis project(s) should revolve around either effectively managing in the face of climate change or addressing issues arising from under-served stakeholder groups, providing some flexibility depending on program priorities.

Topics deemed "ripe" for synthesis would have clear research and management goals and should generate science-based conclusions. Synthesis projects must also consider the applicability of relevant management questions as they seek to understand and summarize available science. STAC is seeking high level topics from STAR which will help frame the RFP being released June 2024.

- What are the big issues the CBP needs to tackle and would benefit from synthesis on the topic?
- What are high level themes that overlap multiple outcomes?
    - i.e. Rising Temperatures was a theme impacting multiple outcomes and resulted in synthesis effort to understand the state of the science and recommendations for moving forward.
- Based on the priority climate science needs already identified, are there major themes to share with STAC?

Discussion

Breck Sullivan and August Goldfischer walked through the science needs in the database that were identified by CBP workgroups as a synthesis need. There are a total of 38 synthesis science needs in the database right now, 17 of which address the program priorities outlined by STAC and are listed as in need of resources. The highlighted science needs were also identified by their respective outcome team as their priority climate science need as part of the workplan to address the Executive Council's (EC) climate change directive. Breck provided the caveat that this is the current representation of the science needs database, so if GITs' science needs have changed the database may not reflect any updates that have yet to be communicated to STAR. Any changes that should be made to the database should be directed to Breck (bsullivan@chesapeakebay.net), August (agoldfischer@chesapeakebay.net), and Alex (agunnerson@chesapeakebay.net).

Julie Reichert-Nguyen asked how this presentation differs from the EC climate directive component on science needs. Breck explained this presentation only shows science needs categorized as synthesis needs by the outcomes and are in need of resources. There are a few science needs that overlap with the EC climate directive priority climate science needs, which have been highlighted here. Julie replied that the climate resiliency monitoring and assessment science need on slide 5 has been completed and the Climate Resiliency Workgroup chairs would like to elevate a different science need for this effort. Breck said it is possible the science need may not be in the database, or it may simply be categorized differently. Breck urged Julie to reach out to her directly since STAC needs this input soon.

Katie Brownson said for some of these, the "synthesis" that would be done isn't super clear - seems like some fleshing out would be needed before putting into an RFP. Breck mentioned that the request from STAC is for broad, high level topics to begin conversations. Ken said we are trying to provide resources to STAC, and this first set has a climate or DEIJ component. Maybe the first question is: is something missing for this set? Larry commented the idea of these topics is to thoroughly review the state of the science and publish a document describing the findings. The funding comes allocated in a certain amount each year, and we have saved it up over years to use it in a meaningful synthesis effort. Larry said Ken's idea to provide broad ideas which STAC will then narrow down is correct.

Julie Reichert-Nguyen asked how much funding is available for the synthesis proposals? Meg Cole said the funds are split across our grant years and the total resources are $125,732. The subcommittee writing the RFP is leaning towards 1 large project, versus a handful of smaller projects. STAC is hoping to put out the

RFP in early June 2024. This would allow six months for teams to complete their proposals.

Kristin Saunders asked if we should look at this list with an eye toward the small group recommendations coming from Beyond 2025 and/or crosswalk with CESR? This may be helpful for sifting out themes. Accountability would also be an interesting theme to consider.

Chris Guy said for the wetlands synthesis need, the conversation surrounding the habitat tracker has evolved beyond what was originally listed in the science needs database. This discussion will be taking place at the Management Board next week. Chris Guy said given these moving parts, we may not want to include this need in what we send to STAC. Additionally, Chris stressed the importance of including the Wetlands Workgroup chairs and having a deeper conversation on this topic. Breck agreed with Chris and said Ken's point is that STAR would send this list of science needs to STAC, but any detailed conversations would take place with the GITs in consultation with STAC. Kristin said this conversation aligns with her suggestion for accountability because this issue is relevant for several outcomes.

Breck Sullivan said while it wasn't a synthesis STAC effort, a great example is the Rising Water Temperature effort. It was a theme that was needed across the outcomes and raised the need to do not only synthesis but also the STAC workshop. Julie stressed the importance of looking for overlap between the CESR report and STAC workshop report. Larry said yes, this is the kind of idea we are looking for. We are trying to inform an RFP, not award a project at this stage. Larry said we are interested in the interacting effects. For example when temperature increases, all types of rates change and how that interacts with stressors in shallow waters is unknown. The needs from STAR are simply examples of these interconnections. Ken said understanding stressors and shallow waters, with attention to DEIJ and climate change could be an interesting theme for the RFP to focus on.

Julie said one idea she has for the RFP is to focus on the nearshore environment and synthesize how climate change is affecting living resource response to inform resilience efforts. Julie said she will write out a couple of sentences to cover the nearshore-living resource response to multi-stressors.

Katie Brownson said one of the Healthy Watersheds science needs (on methods to characterize vulnerability to future high-level risks) seems like one that could be broadened out for a synthesis "theme"- synthesizing research on management approaches to improve resiliency of terrestrial ecosystems to climate change and the best methods/tools for evaluating relative vulnerability/resilience to climate change.

Jeremy Hanson said it comes up less often in the needs database in the "synthesis" category, but we know "social science" and "behavior change" are also cross-cutting items that pop up a lot in SRS documents, Beyond 2025, GIT-funding projects, etc. So perhaps STAC could consider a synthesis along those lines, synthesizing all the threads and work around the Program from last several years. Jeremy doesn't have specific angles or parameters, just the initial thought. Chris commented that the Habitat GIT is meeting next week and will have a large focus on social science. Chris suggested bringing some of those speakers to a future STAR meeting.

Kristin Saunders said she is not sure if this fits within the STAC synthesis paradigm but with CESR's finding that our non-point source programs are not as effective as they could be AND we have a nutrient mass balance issue, would a synthesis around dealing with these two related issues be palatable and appropriate? This forum might help us address this problem. Meg Cole noted Kristin's comments and said she is cross walking these suggestions and bringing them to the subcommittee designing the RFP.

Breck noted another recommendation from the Beyond 2025 Climate Small Group was for the CBP to focus on climate mitigation. This could be a potential topic for a STAC state of the science workshop.

11:30 AM Adjourn

Participants: Alex Gunnerson, Ann Foo, Ashley Hullinger, August Goldfischer, Bill Dennison, Breck Sullivan, Brenda Majedi, Carl Friedrichs, Chris Guy, Cindy Johnson, Doug Austin, Denice Heller Wardrop, Emily Young, Fred Irani, Gary Shenk, George Doumit, Greg Noe, Isabella Bertani, Jamileh Soueidan, Jeff Sweeney, Jeremy Hanson, John Wolf, Judy O'Neil, Julie Reichert-Nguyen, Kathy Boomer, Katie Brownson, Kaylyn Gootman, Kristen Saacke Blunk, Kristin Saunders, Larry Sanford, Marisa Baldine, Mark Nardi, Meg Cole, Melissa Fagan, Mike Mallonee, Natalie Hall, Olivia Devereux, Peter Tango, Sarah Brzezinski, Sophie Waterman, Tou Matthews.

Next meeting: May 23rd, 2024