Joint Scientific, Technical Assessment and Reporting (STAR) Meeting/
Coordinator & Staffer
Meeting

Thursday, November 19, 2020
9:30 AM – 12:30 PM

Join by Webinar
Meeting Number: 120 261 7522 Password: **PWwcUFPr339**
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Meeting Materials:
https://www.chesapeakebay.net/what/event/joint_c_s_star_november_2020_meeting

This meeting will be recorded for internal use to assure the accuracy of meeting notes.

Action Items

- ✓ Greg Noe is actively seeking ideas for how to use and communicate their measurements and predictions from the USGS Chesapeake and Delaware Floodplain Network project. Please reach out to him (gnoe@usgs.gov) with any suggestions.
- ✓ Reach out to Liz Chudoba (lchudoba@allianceforthebay.org) if a Chesapeake Bay Program (CBP) workgroup is interested in having a submission winner present at a meeting.
- ✓ Peter Tango will share insights from the Submerged Aquatic Vegetation STAC Workshop with Rebecca Hanmer.

AGENDA

9:30 **Welcome, Introductions & Announcements – Bill Dennison** (UMCES) and **Scott Phillips** (USGS)- STAR Co-Chairs, **Peter Tango** (USGS) and **Emily Trentacoste** (EPA), STAR Co- Coordinator

Upcoming Conferences, Meetings, Workshops, & Webinars-

- Maryland Water Monitoring Council Annual Conference, December 3 – 4, 2020. Virtual. Free registration by November 25th at noon or until they meet their capacity, whichever occurs first.
- Behavior, Energy and Climate Change Conference, December 7 - 10, 2020, Washington, D.C. Virtual.
- American Geophysical Union Fall Meeting, December 7 - 11, 2020. Virtual.

- Sustainable Agriculture Conference, February 3-6, 2021. Lancaster, PA. Virtual.
- CERF, November 7 – 11, 2021. Richmond, VA.
- A Community on Ecosystem Services (ACES), December 13 - 16, 2021. Bonita Springs, FL.

STAR leads the Water Quality Standards Attainment and Monitoring (WQSAM) Outcome. This outcome through the Strategic Review System (SRS) shares a Management Strategy with the 2025 Watershed Implementation Plan (WIP) Outcome and has its own Logic & Action Plan. These documents were updated and currently out for public review until December 1st on the Document Status page on (filter for Clean Water Cohort) ChesapeakeProgress. Here are PDF versions of the Joint Management Strategy and WQSAM Logic & Action Plan.

9:35 **CBP Communications Update – Jake Solyst** (Alliance for the Chesapeake Bay)

Jake commented they would like to write something on the updated WQSAM and WIP Outcome SRS documents. He also introduced the new Communications staffer Marisa Baldine.

9:40 **9:40-10:40 Floodplain and Channel Evaluation Tool (FACET)**
The USGS will present the FACET tool, and STAR will discuss potential applications to CBP outcomes. Peter Claggett will provide an introduction for several associated talks on the tool.

This tool is an open source tool that was started to be developed in 2014. It was made to automate stream cross sections. It can take half a day in the field to complete a stream cross section which is invaluable for hydrologic assessments and stream vulnerability assessments. With the advancement of Lidar, their team considered using it to enhance the tool and was able to put a team together to utilize it.

9:45 **Mapping stream and floodplain geomorphometry with the Floodplain and Channel Evaluation Tool (FACET) - Labeeb Ahmed** (EPA CBPO-Attain, LLC)
FACET is an open-source geomorphometry tool developed to automate processing of high-resolution digital elevation (DEMs) to generate regional-scale estimates of bank height, channel width, floodplain width and a suite of other fluvial geomorphic measurements that can be summarized at the stream reach or catchment-scale. The presentation will focus on the tool, its implementation and outputs and applications.

FACET is open-source written in Python and R. The only required input is a DEM (3 – meter or finer resolution). They ran FACET on 3 – m DEMs in 85% of the Chesapeake Bay watershed because Lidar was not available in the entire

watershed. They also ran it for 100% of the Delaware River Basin. For the calibration and validation process, bank and floodplain geomorphic measurements validated against field data at 67 reaches.

The general workflow for the team consisted of:

- Hydrologically conditioned the DEM and generated a synthetic stream network
    - They started with NHDPlus HR (1:24,000 scale) stream network's end nodes for channel initiation points.
    - They Hydro-conditioned the DEM to improve breaching through road and railroad embankments.
    - They generated D8 flow direction and flow accumulation to derive a stream network which aligns better with the DEM compared to the NHD network.
- Identified stream banks and calculated channel width, bank height, bank angle, channel shape and area
- Identified active floodplain extent and calculate floodplain width, elevation and depth along the floodplain

They used three methods to obtain geomorphic metrics. The first method is the cross-section method. They create an elevation profile at each cross section to detect change in slope and capture the bank heigh and channel width. The second method is the raster-based curvature analysis. It uses terrain segmentation to identify channel curvature through a moving window that goes along the path of the stream. Once a threshold is identified it is applied to find the pixel counts. Buffer window used to estimate channel width based on the pixel counts. The last method they use it the Height Above Nearest Area (HAND) analysis. It estimates the vertical height on the landscape from the nearest stream or the channel. They extract the HAND grid for each reach and recreate equally spaced 50 vertical slices. Then they use change in slope to identify the channel width.

The HAND grid is also used to identify floodplain width. They first went out into the field to identify the active floodplain extent. Next, they identified the HAND threshold aligning with the field measured floodplain extent at each site to then create a predictive linear model relating HAND heigh thresholds to drainage area and physiographic province. Here is a link to the floodplain mapper.

Peter Claggett posed a question on the application of the tool. They have already been talking with US EPA on stream stability and perhaps on identifying stream restoration. There is also the potential to delineate different flood interval floodplains.

Bill said he really liked the visual of the floodplains. He said it would be nice to see a visual of staggered different series of flood levels. He said it is a really great resource.
Greg Barranco said this could help prioritize forest buffers or wetlands with this information.
Denice Wardrop said there is work going on in PA that should incorporate this tool. It is the interest of the state to identify areas for stream restoration. They are trying to come up with a disturbance index. Bill said he liked that idea because one of the syndromes with development is the flashing runoff and stream incision levels. Peter said on the website users can see the bank points by bank height, and it gives some indication of where there are steep banks. Peter and Labeeb were thinking about adding width to depth ratio.

Kathy Boomer said it would be beneficial to reach out to Maryland Department of Nature Resources and Nature Conservancy because they have been using this kind of resolution to engage landowners and identify forest buffers. They can provide insight as the utility of this data for buffer restoration. Regarding stream channel heads, she asked if they started from NHD channel heads or are they mapping smaller artificial waterways. Peter said they are currently using end nodes of the 24k NHD so they are replicating NHD density but aligning it to the lidar. Kathy said to look at the finer resolution because zero water streams are really important to the transport of nutrient and sediments.

Bruce Vogt suggest checking with fish passage team on uses.

Bill commented that the examples were shown for the Piedmont but what happens on the eastern shore where there are no elevation changes. Peter said Greg will get more into it, but there are some challenges when the area is really flat and with tidal waters. Greg Noe commented FACET tends to underpredicted bank height in the Coastal Plain and overpredict bank height in the Valley and Ridge, Blue Ridge, and Appalachian Plateau. Currently it seems to work best in the Piedmont.

Scott commented multiple workgroups would be interested in this tool such as Stream Health, Fish Passage, and Brook Trout.

Bill Jenkins wholeheartedly agrees Scott and Bruce. He would also second the wetlands and buffers suggestion too.

10:00 **Erosional or depositional streams? Measurement and modeling of watershed material budgets in the Chesapeake** - **Greg Noe** (USGS)
The presentation will describe results from the USGS Chesapeake and Delaware Floodplain Network that is measuring and modeling streambank erosion, floodplain deposition, and streambed sediment. We measured long-term

erosion and deposition of sediment and associated N and P at a network of 68 sites that characterize the diverse mid-Atlantic landscape. This data was used to build Random Forest regression models to predict loads of sediment, N, and P due to streambank and floodplain change for each of the 64,000+ streams in the Chesapeake's NHDPlusV2 network. These loads are compared to upland erosion and downstream export models to create sediment, N, and P budgets for each and all streams in the Chesapeake, highlighting the importance of considering and managing streambanks and floodplains in changing downstream loading to the Bay.

Bill Dennison said there is a lot of sediment erosion and movement before it even makes it into the Bay so there is a lot of nutrient distribution in the landscape. He was wondering what was the implication of it. Greg Noe said the nutrient concentration they have measured on the floodplains and stream banks is low concentration. It is not nutrifying the local floodplains and wetlands, but it does build up as a large load so it is another form of lag time.

Denice Wardrop asked if is it correct to represent the estimates as representing "current" conditions (last 50 yrs). Greg Noe said yes, it is integrated over the 50 years for floodplains and 17 years for bank erosion. They do not have the specificity to look over the time course of that time period. They know big events matter for geomorphic process, but this is a long-term view. She also asked what the criteria was for eliminating channelized. Greg Noe said they did not have field sites in strongly channelized locations. They used the NHD category features that label each stream. It characterized channeled streams. They are not looking at just natural streams but they are not looking massively modified streams.

Greg Noe said they are actively seeking ideas for how to use and communicate their measurements and predictions. They're working closely with the Modeling Team, but they would like suggestions for other groups.

10:20 **Characterizing and Valuing Floodplain Ecosystem Services in the Chesapeake Bay Watershed - Emily Pindilli** (USGS)

The presentation will describe interdisciplinary efforts to apply an ecosystem services framework to value floodplains in the Chesapeake Bay watershed. The translation of the floodplain characteristics to the functions that benefit humans will be discussed. Details on how nutrient retention benefits are valued and flood mitigation services are quantified and valued will be provided.

The goal of this project was to work on a more localized scale for providing ecosystem service information on streams and floodplains to inform decision-making. They started at a pilot scale at Difficult Run in Virginia. They looked at sediment and nutrient retention and linked functions to services such as improved water quality. As a result, there is an opportunity for people to view

the environment and swim, wad, boat, and catch fish. In translating services to values, it is important to consider the willingness to pay for recreation. For example, the better the water quality, the more fish that might be available to catch and the more people want to go to that area.

The best approach for valuation is to estimate the consumer surplus associated with the water quality improvement. This is not something they were able to do for the study due to availability of primary data so the next best approach is replacement cost method. This approach could include evaluating 'built' alternative (Wastewater treatment plants) to replace the function of floodplains.

For the pilot project, they looked at a newly installed wastewater treatment plant so their costs to remove nitrogen are actually lower than some of the older facilities. Emily Pindilli than went into the cost of filtering out nitrogen per kilogram. The results suggest a value of $727,226 for nitrogen retention in the floodplains at Difficult Run.

Scaling up from the Difficult Run project to the region has been possible through Greg Noe's work and using boosted regression tree models. It is possible to look at wastewater treatment plants in different parts of the watershed, but it does not show true difference in value. It is more likely the underlying physical features of the floodplains and how much nutrients they can reduce are more important than what people are paying for wastewater treatment. It does not capture preferences would are beneficial in an economic study.

Another service they looked at is flood mitigation. The floodplains help store water during precipitation events which reduces peak flows resulting in less flooding. It was important to use FACET to look where the natural floodplain is located and the elevation. In their scenarios, they looked at a counterfactual of no floodplain so what would happen if the floodplain were paved over. There goal was to look at the damage cost incurred if the floodplain did not exist so they looked at houses inundated in a flood event and used FEMA's hazard model to develop statistical correlations between depth and damage. They then used local property values to come up with cost values. The results suggest an annual value of $73,412 for flood mitigation in Difficult Run.

Bill Dennison asked how it could be scaled across the watershed. Emily Pindilli said they are working on it, but they need to consider the least cost method. The nutrient retention is easier to scale up compared to the flooding method because it is very specific to the parcel.

Denice Wardrop suggested in the CBP report card to talk about the value of what has been done to date. She was wondering if the tool could be run on specific

sites and add up the value of all the actions taken. Emily said it could be done if they use the per kg value to look at load reduction.

10:40 **Chesapeake Monitoring Cooperative (CMC) Hackathon – Liz Chudoba** (CMC)
In celebration of the 50-year anniversary of Earth Day, Booz Allen Hamilton partnered with the CMC to host Hack the Bay, a virtual, month-long hackathon to explore data monitoring on the health of the watershed. Participants explored CMC's data to create solutions to address some of the core challenges. Liz will provide an overview of the event.

This was their first opportunity to look at the data in the system Chesapeake Bay wide and comparing it to the Chesapeake Bay Program data set. They wanted to see where there were still gaps and where CMC data could fill it. Other goals included exploring innovative approaches to problem solving with CMC data.

The Hackathon included 430 participants in 37 countries with a total of 20 team submissions. The CMC had 4 challenges to choose from for the participants. The challenges included:

- Challenge 1: Develop a Restoration Case Study
    - This challenge had three complete submissions. The winner was "Hack the Bay" by Joseph Geglia, Jacob Hassinger, and David Taboh. They analyzed three different parameters (temperature, pH, conductivity) for a 3 – 5 year time period, and they were able to find some trends and link it to local policies.
- Challenge 2: Identify Data Gaps
    - This challenge had two complete submissions. Both were the winners. "Dynamic Duo" looks at the prioritization report completed by the CMC in 2016 to identify the data gaps that existed when the cooperative started and compared it to the current CMC monitoring sites to see how well they met the goals in the report. They only looked at DC, but it could easily be replicated in the other jurisdictions. The second submission, "Mind the Gap," is more planning for the future by identifying areas where the CMC can target additional data collection.
- Challenge 3: Model Water Pollution
    - There was one submission for this challenge. A video of this project can be found here: https://www.youtube.com/watch?v=kAa5iWRKkNc&feature=emb_logo
- Challenge 4: Design a Water Quality Report Card
    - There were two submissions for this challenge, but they were not able to complete them. One is an interactive website where a user puts in their zip code and gets a suite of metrics for that area such as

water quality and ecosystem health. CMC is going to continue working with this team to build out the challenge.

- Gina Hunt said she would love the idea of imputing a zipcode to get a water quality report. She would love to see that tie into habitat quality data, and dream of dreams, include fish species in this habitat (what a person could expect to see.) Julie stated EPA has a "How's My Waterway" where the user can enter a zipcode and get water quality information of nearby waters: https://mywaterway.epa.gov/

If anyone is interested in one of the submissions, CMC is happy to connect the creators with CBP GITs so that they may present at a meeting. The CMC website has more videos on all of the Hackathon challenges: https://www.chesapeakemonitoringcoop.org/hackthebay/

Denice Wardrop stated the Chesapeake Research Consortium (CRC) is currently working with the science needs database to create projects for college courses, and they could coordinate efforts. Peter Tango commented in the times ahead they can certainly discuss items in the Strategic Science and Research Framework for gaining insights on particular gap needs with a crowdsourced community science approach. Liz said she would love to coordinate with CRC on those efforts!

11:10 **Water Temperature STAC Proposal – Rebecca Hanmer**

Rebecca will provide an update on the draft Scientific and Technical Advisory Committee (STAC) proposal to review water temperature increases in both non-tidal and tidal waters of the Chesapeake Bay watershed. This will be followed by a discussion with the GITs to provide feedback on the proposal.

The next step is for Rebecca to present a revised version at the Water Quality Goal Implementation Team Meeting.

Bruce Vogt suggested other experts to consider are Vince Saba at GFDL and Barbara Muhling.

Kathy Boomer suggested looking at how much human interaction with land and coastal management affecting these temperatures. She thinks the land to water connection is really important. Triplets could be a framework on where they have seen temperatures changes and what is going in the triplet catchments. It could be a way to manage the scale of the workshop. Bill Dennison said the shallow water near shore grasses are being cooked and it is an important indicator for the health of the Bay. Another suggestion Kathy had was what techniques are affecting temperatures such as changing the flow of water across the landscape. Kathy Boomer said she will help out with the proposal.

Rebecca Hanmer asked Bill Dennsion what she needed to do in preparation for the STAC meeting, and if he thought this information could be tackled in one workshop. Bill said yes, he thinks pre material before the workshop and a synthesis afterwards will help. He suggests making the format of it flexible so that it could be virtual and in person, a more hybrid approach. Scott Phillips said he has also seen proposals where the STAC workshops were in a series and then it had a synthesis at the end. Peter Tango said they actually saved money with small meetings that were stretched out for the Submerged Aquatic Vegetation STAC workshops. Rebecca Hanmer asked Peter Tango to help her restructure the proposal so that it could fit the format of multiple meetings. Peter Tango agreed to share with her some ideas on it.

11:40 Coordinator/Staffer Meeting

12:30 Adjourn

Next Meeting Dates: Joint STAR & C/S Meeting December 17th 9:30 – 12:30 (Combined meetings due to Christmas.)

Participants: Peter Claggett, Breck Sullivan, Peter Tango, Jacob Czawlytko, Labeeb Ahmed, Garrett Stewart, Denice Wardrop, Scott Phillips, Bill Dennison, Bill Jenkins, Greg Noe, Emily Pindilli, Jennifer Starr, Bruce Michael, John Wolf, Julianna Greenberg, Kathy Boomer, Krissy Hopkins, Liz Chudoba, Marisa Baldine, Megan Ossmann, Nora Jackson, Kurt Stephenson, John Young, Jeff Sweeney, Bruce Vogt, Mandy Bromilow, Michelle Guck, Jake Solyst, Carin Bisland, Gina Hunt, Greg Barranco, Gary Shenk, Johnathan Leiman, Justin Shapiro, Than Hitt, Jeremy Hanson, Amy Handen, Jeni Keismen, Sarah McDonald, Cindy Johnson