Scientific, Technical Assessment and Reporting (STAR)
Meeting
Theme: Healthy Watersheds Cohort Science Needs Meeting

Thursday, September 30 2021
10:00 AM – 12:30 PM

Meeting Materials:
https://www.chesapeakebay.net/what/event/scientific_technical_assessment_and_reporting_star_team_meeting_septem2

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

Action Items

- ✓ Breck Sullivan will work with new C-StREAM Coordinator and Denise Wardrop to determine how C-StREAM interns can be part of addressing science needs brought up in this meeting.
- ✓ STAR and Climate Resiliency Workgroup (CRWG) will go over the climate directive signed by the Chesapeake Executive Council at a future STAR meeting.
- ✓ Forest Workgroup (FWG), Protected Lands Workgroup (PLWG), and Climate Resiliency Workgroup (CRWG) will collaborate on understanding tradeoffs between forest carbon and blue carbon
- ✓ All workgroups will follow up with Peter Tango (ptango@chesapeakebay.net) regarding monitoring needs they would like included in the Principal Staff Committee Monitoring Review
- ✓ All workgroups will coordinate regarding their science needs around climate change and increased development

AGENDA

10:00 Welcome, Introductions & Announcements – Bill Dennison (UMCES) and **Scott Phillips** (USGS)-STAR co-chairs, **Peter Tango** (USGS) CBP Monitoring Coordinator, **Breck Sullivan** (USGS) STAR Coordinator

Announcements -

- New STAR Coordinator - Breck Sullivan
- New STAR Staffers - Alex Gunnerson & Amy Goldfischer
- New Chair for Status & Trends Workgroup - Caroline Donovan

It was also noted that Jennifer Keisman, who has been a STAR ecosystem analyst and chaired Integrated Trends Analysis Team (ITAT), is moving to USGS with a position examining water-based models and how they can benefit decision making. She'll still be interacting with STAR a bit. Breck will be co-coordinate ITAT with Vanessa Van Note.

The communications update was given by Marisa Baldine (Chesapeake Research Consortium). The blog post on monitoring was highlighted. The Chesapeake Executive Council meeting occurred 10/1/2021 and was focused on climate change, with Executive Council members signing the new Climate Directive.

Scott Phillips (USGS) shared that the updated trends and loads for the 9 river input stations are now public.

Bruce Vogt (NOAA) shared that the NOAA Chesapeake Bay Office (NCBO) is putting together seasonal summaries based on buoy and satellite data. These will be public next week. The data looks at temperature and salinity as key habitat parameters for fish, examines changes and long-term trends for the past 10 years, and synthesizing and interpreting what these mean for living resources. This will go into the state ecosystem report used by the Mid-Atlantic Fishery Management Council, who will change their estuarine risk assessment tool based on this information.

Scott Phillips noted that there is a new structure for STAR staffers, and they will be more integrated and help to oversee all 8 of the workgroups.

Upcoming Conferences, Meetings, Workshops, & Webinars-

- 2021 National Coastal Conference: "Geaux Resilient"; American Shore and Beach Preservation Association - September 28-October 1, 2021, New Orleans, LA.
- CERF - November 1-4 and 8-11, 2021, Virtual.
- Chesapeake Watershed Forum, November 1-5, 2021, Virtual.
- American Fisheries Society - November 6 - 10, 2021, Baltimore and Virtual.
- Behavior, Energy and Climate Change Conference - November 8-10, 2021, Virtual.
- CitiesAlive Conference - November 8-11, 2021, Virtual.
- Maryland Water Monitoring Council Annual Conference - December 2-3, 2021, Virtual.
- A Community on Ecosystem Services – December 13-16, 2021, Virtual.
- American Geophysical Union Fall Meeting - December 13 - 17, 2021, New Orleans, LA and Virtual.
- Sustainable Agriculture Conference - February 10-12, 2022, Lancaster, PA. (Virtual pre-conference in January).

10:15 - 12: 20 Science Needs of the Healthy Watersheds Cohort (5 Outcomes 25 minutes each)

Materials: Brook Trout Outcome, Fish Habitat Outcome, Healthy Watersheds Outcome, Protected Lands Outcome and Stream Health Outcome science needs.

In follow-up to the Management Board (MB) review, each of the leads for the

Healthy Watershed Outcomes will discuss their updated science needs. STAR will provide input on potential opportunities to address science needs.

Breck Sullivan briefly introduced the purpose of the science needs updates and how it fits into the Strategic Science and Research Framework (SSRF) framework. Breck noted that the Principals' Staff Committee (PSC) monitoring review is on-going and requested the Healthy Watersheds Cohort to note if any of the science needs pertain to monitoring and analysis needs and need to go before the PSC.

10:15 Brook Trout Outcome – Stephen Faulkner (USGS)

Stephen Faulkner presented on the Brook Trout Outcome. Their science needs can be found in an Excel spreadsheet here. Stephen noted they are currently in a transition period and were identified as one of the outcomes not being attained. The stressors on brook trout are overwhelming the resources available to combat those. The Scientific and Technical Advisory Committee (STAC) brook trout genetics workshop was held virtually September 28-29th, and outcomes will be reported soon. The STAC temperature workshop also has repercussions for brook trout.

Stephen Faulkner noted that the Brook Trout Outcome's first two science needs are needs for collaboration, and they are a high priority. They have identified staffing needs to the Management Board (MB). They have made some progress on this–working with the U.S. Environmental Protection Agency (EPA) and Chesapeake Bay IT teams to develop the monitoring tracking tool to accumulate and correlate all the conservation and restoration practices related to brook trout in the watershed. This will help with the data analysis side. They are submitting a Goal Implementation Team (GIT) funded project proposal for a contractor to facilitate collaborations, particularly with NGOs doing work on the landscape that is not currently captured by the workgroup.

Another science need is an eDNA line and there is a lot of work still left to do for this. They tried to get a GIT funded project proposal for this. One of the outcomes they heard from the STAC workshop this week is that many agencies and practitioners have not embraced eDNA because they are not sure how it's better than electrofishing, their standard practice, and how it would align with their QA/QC requirements. There is an opportunity for more standardized protocols and off the shelf technology that they could apply. They will work with stakeholders on this over next 2 years.

Another science need is a better understanding of where groundwater can mitigate rising stream temperatures–this will be critical to identify high quality temperature refugia and restoration opportunities in the watershed. This need is still a high priority given climate change. Much of the response to this will come out of the STAC workshop. They have started a new project with support from the United States Geological Survey (USGS) Chesapeake Bay science program to understand air/water dynamics in karst topography, with 50 sites

throughout karst watershed.

New science needs: The first new science need is to determine the genetic metrics needed by managers and decision makers to determine brook trout population health and resiliency. This was a focus of this week's STAC workshop. Adaptive potential, genetic rescue were topics. There is an opportunity for conserving quality habitat and expanding habitat with this.

Another new science need is determining how interactions between climate change and land use will impact brook trout. There are recent publications on this. Most recent Intergovernmental Panel on Climate Change (IPCC) report is very impactful with respect to the likelihood of temperature increase in the Chesapeake Bay area. This is high priority because interactions are multiplicative and complicated. This is a big need for scientists and managers to support their decision making on conservation and restoration of brook trout habitat.

Denice Wardrop (Penn State University/Chesapeake Research Consortium) stated that the Chesapeake Research Consortium (CRC) will be making presentations this winter to young academics about CBP science needs, and asked how can the science needs of the Brook Trout Outcome be made more specific to aid groups/people outside the CBP in helping to meet them? Renee Thompson (USGS) noted that St. Mary's College, which is part of the University of Maryland system, just started a marine biology program.

Stephen Faulkner responded that groups/people interested in helping meet these needs should get in touch with him, and they can meet with the scientists working on this. There are some current collaborations with National Fish and Wildlife Federation (NFWF) and Fish Unlimited going on to address these needs. NFWF has identified, through a Request for Proposals (RFP) process, areas of need. It is challenging to address a specific need because the Brook Trout GIT doesn't have the capacity to summarize the literature and determine gaps. This is one of the reasons why they had the brook trout genetics workshop. The temperature workshop will also help. The best thing to do is to get smaller groups together as all needs have to be addressed in their own context and it's a matter of bringing the right people together to specifically target gaps. One question to address is what would be needed in terms of better groundwater and air temperature data to reduce uncertainties?

Breck Sullivan noted the science needs database is a connection between those who have the outcomes and those who are interested, but agreed it's important to break down needs into manageable and actionable chunks. As the workgroup doesn't have the capacity to compile all of the research available, that itself could be a science need–a need for synthesis of the research on each topic to result in more actionable items for the science needs.

Stephen Faulkner noted overlap with the USGS Chesapeake Science Strategy to synthesize the science they've been doing by 2024 in time for 2025 outcome summary.

Scott Phillips noted that as needs are updated, need to add more information on each need.

Greg Allen (U.S. EPA) stated that forecasting populations at risk would be a powerful way to engage stakeholders. Stephen Faulkner responded there is work being done on this, a combination of empirical data and modeling, and a lot of this will come out of the stream temperature workshop. There will be information related to current science applied to forecasting and identifying populations at risk. A synthesis and identification of gaps is needed to help decision makers and move towards an outcome by 2025.

Peter Tango (USGS) said that he had heard eDNA is not ready for the community to embrace. Peter Tango also asked if the need for an indicator assessment to understand whether the resource is changing or not was mentioned? E.g., the monitoring of brook trout. A sampling design that is a consistent measurement and also affordable and reproducible, that can measure change in population over time, is needed.

Stephen Faulkner replied that this is part of the new effort working with the IT team to collate that information systematically and develop QA/QC for different data sources. An issue is that different groups record monitoring outcomes differently. They are hoping to get GIT funding to find a person to lead the efforts to standardize monitoring approach of stakeholders. Stephen shared some feedback from genetics workshop: A rapid eDNA kit would be very useful according to those working in the field as a quick diagnostic. If leading eDNA scientists were given $200,000 they could probably develop this in a year or two. This is an example of a specific need. NFWF has a very structured approach designed to provide grants and funding to practitioners on the ground and they're hoping to better engage with that. They met with Jake Rielly (NFWF) last week and Shawn Rummel (Trout Unlimited).

Stephen Faulkner concluded by saying they'll be developing their two-year work plan as part of the Strategic Review System (SRS) process. He said to reach out to him to talk about the science needs or SRS process, and Scott Phillips reminded everyone that common science needs across outcomes should be noted so they can be tackled together.

10:40 Fish Habitat Outcome – Bruce Vogt (NOAA)

Bruce Vogt presented on Fish Habitat Outcome science needs. Bruce reminded everyone that the general outcome is to improve the ability to assess fish habitat conditions across the entire watershed. They are not trying to meet a specific metric; the outcome is about filling in information gaps to guide restoration, habitat protection and fishery management within the Bay but also regionally. NOAA has invested at least $1 million to address these needs, USGS has also invested in this.

Bruce Vogt discussed current science needs that are being addressed. One science need is a regional fish habitat assessment within the Bay watershed, because the national one was too

broad. NOAA and USGS have been looking at what data would be needed to do this. NOAA has finished a tidal pilot project in the chop tank to test a statistical framework that might work for doing this assessment. This has concluded and they will share report from the workshop. NOAA is working with USGS to work on a habitat assessment linking tidal and non-tidal. Analysis on where this could be achieved found that the Patuxent is a good candidate. This will be a big focus for the next couple years and the upcoming workplan.

Another science need is maintaining an acoustic telemetry array. The Navy acoustic telemetry array, at the mouth of the Bay extending into the James and New York rivers, is being defunded. This was an important array for fishery managers. Having a gate at the mouth of the Bay allows them to capture any tagged fish coming in and out of the system. The Fisheries GIT decided to step in and maintain this monitoring source by working with researchers and fishery managers to identify where to place a mainstem backbone of telemetry receivers. One is located at the mouth of the Bay and one at the Bay Bridge; these two are now in place. Maryland Department of Natural Resources (MD DNR) maintains the northern one and Virginia Marine Resources Commission maintains the southern array. NCBO is also developing a mid-Bay array with Chesapeake Bay Laboratory (CBL) and working with new researcher at George Mason University (GMU) to get something into the Potomac. NCBO bought the receivers and works with partners to maintain them. All the data is going to the Mid-Atlantic telemetry observing system, a database accessible to researchers with tags and receivers. The next step is to determine how to best use the data from the arrays. NCBO funded a study with Chesapeake and Estuarine Research Federation (CERF) seeing how they can use the data to identify seasonal interannual shifts for key Chesapeake Bay fisheries, looking to see how climate might be impacting this fishery resource. NOAA hired a new fish biologist who will be working to develop a science plan for the arrays, identifying key questions and how they can be answered. They hope to put together summaries from what they receive and link environmental condition with pings captured by receivers to build a picture of habitat condition with fish.

Bill Dennison (UMCES) suggested that there is an opportunity to get the general public involved by tracking an individual animal and naming it. Bruce agreed and said they will also be working on public outreach.

Another science need addresses dissolved oxygen (DO). DO is very important for Total Maximum Daily Load (TMDL), criteria assessment and living resources. DO is one of the key stressors limiting habitat volume within the Bay especially in the summer. STAR set up the Hypoxia Collaborative. This group decided additional monitoring and profilers in Bay mainstem are needed. NCBO funded some work with Caribbean wind that tested a vertical water column profile system–this had promising results measuring volume and extent of DO. NCBO is planning to deploy two new profilers in fall 2021, and is working with fishery managers and Hypoxia Collaborative to define what products can be developed with the new data. Habitat GIT's interest is in better describing habitat condition in Bay, amount of habitat available for certain species, and link with fishery surveys.

Another science need is the shallow water monitoring proposal. Currently the mainstem is well monitored, but shallow waters not so much, so this is a gap. There is no Bay wide shallow water monitoring design, but there are a number of smaller efforts underway. Currently there is a striped bass nursery assessment underway (this covers mainstem and shallow water), also have similar projects underway for summer flounder and seabass. They are starting to sample at Poplar Island–this is being transferred to NCBO. They will do what core requires but also identify over the next year what other things can be added to sampling that have value to CBP outcome. Other studies that were funded this year looking at ecosystem services evaluation of habitats like oysters and Submerged Aquatic Vegetation (SAV) and other nearshore habitat types.

Their aspirational science needs: they heard from Brooke Landry (MD DNR) they are moving forward with SAV sentinel sites, and hope to have a conversation with the workgroup to see if there is a way to pair some fish sampling at those SAV sites.

Current science needs that are not being addressed: Exploring cost effective plankton monitoring. There are plans to address this in the PSC monitoring review but this needs more conversation to know where it is going. It will be difficult to use previous framework, and they need a new plan inspired by monitoring needs identified by management; there are many applications.

New science needs to explore: Synthesis and indicators to support ecosystem-based fisheries management at Bay and regional fishery management level. Incorporate habitat, climate and other factors driving productivity, mortality and more into how fisheries are managed as opposed to doing stock assessments. They want to develop indicators that pull together habitat indicators and suitability models that can drive management change at places like the Mid-Atlantic Fisheries Management Council where a number of species are managed regionally. Another need is for cross GIT mapping efforts and stakeholder outreach (this is less of a science need and more of a stakeholder engagement need); they hope to tie the data being collected to an end user so that the data is helping managers meet their goals.

Peter Tango commented it's important to consider the history of shallow water continuous monitoring and the opportunity to model DO dynamics (likelihood of good or bad DO conditions) related to shoreline characteristics, local hydrodynamics, spatial relationship to local watershed and the open Bay, and that it might be good to update this. Peter said that Boynton, Testa, Breck Sullivan have all worked on dimensions of this, and that the 4D work will be a good tie in over time. Bill Dennison commented that the Comprehensive Evaluation of System Response (CESR) report that STAC is working on will highlight how shallow water monitoring is important.

Peter Tango also commented the zooplankton monitoring program was defunded in 2004–at that time trends were going in a downward direction. Since that time, there have been two panel reviews but multiple attempts at revising the program could not get anything beyond

what was there before. Maybe they could focus on historical comparison of those sites until an affordable alternative to expand is available. Bruce agreed and stated that the more targeted or focused they can get will be helpful.

Stephen Faulkner mentioned the USGS nontidal assessment was complete and undergoing review before release. Some science needs will be identified from this.

Kathy Boomer (STAC) commented that related to the CESR they're working on in STAC there is a need to promote model-based monitoring. They should be strategic with research about how they're leveraging the models to think about how/when/where they're collecting data.

Peter Tango commented that this could be helpful when thinking about shoreline GIS layer. It is important because studies had shown impacts on fish/benthos/SAV. If they have this layer, there's an opportunity to target specific areas across that spectrum and learn from that using the model connection. That ties well with CESR recommendations.

Bruce Vogt commented that some of the work currently underway developing habitat suitability models sound in line with this, pulling in monitoring data and linking to fisheries surveys and linking to gaps. This will also help show them where more important areas are and additional monitoring is needed. Kathy Boomer commented that this may make it easier to connect back with stakeholders and their decisions on where to invest resources and show why the science is so critical to this decision.

Breck Sullivan commented about indicators, wondering if this is more in line with Status and Trends Workgroup (STWG) work or more like metrics for fishery management to use. Bruce Vogt replied that it would be good to work with STWG to develop indicators that meet both needs (within the Bay and region) linking habitat condition with living resources. This is also being requested by regional fisheries management council. They have not talked about where these indicators would sit yet as they are focusing on the process of prioritizing and developing indicators. They have done the research to develop potential indicators, and now need to make it operational. The process of that is to meet with the research community to determine what is possible, then develop indicator, then talk about how to make it more useful, make it public and update it. Breck noted STWG can talk with Bruce more about this.

Kristin Saunders (UMCES) asked if state fishery managers are of the same mindset in turning to ecosystem-based management? Bruce Vogt responded that the push for Ecosystem-Based Fisheries Management (EBFM) is at the regional council level and they're not moving towards developing an EBFM plan for blue crabs, for example.

Stephen Faulkner commented that habitat assessment is discussing habitat suitability with sea level rise in the mouth of the river systems and shallows, and that's very important. Scott Phillips noted that with the Executive Council climate directive signing this will be a critical piece.

11:05 Healthy Watersheds Outcome – Renee Thompson (USGS)

Renee Thompson gave an overview of the healthy watersheds outcome and vision. Renee noted that each state has their own methodology for identifying healthy watersheds, and noted there is a lot of overlap with Land Use Methods and Metrics Outcome. There are multiple tools used to inform assessment.

Science needs: Interim indicator development looking at impervious surface, protected lands and habitat suitability. John Wolf and Renee have been working hard on the interim indicators. There are examples of potential indicators that can be developed with datasets available. Lots of maps and storymaps are already made.

A monitoring needs list came out of the PSC request; these are different monitoring needs that states rely on to identify healthy watersheds. Renee showed the list that's used to inform Chesapeake Healthy Watershed Assessment–they rely on continued maintenance and update of this list.

Another science need is to coordinate and utilize land use metrics. Understanding thresholds from scientific literature is an important piece. They need to integrate knowledge on thresholds with management and decision making. There is great data on high resolution land cover and change over time, and there is a need to digest this data and translate it. A new factor is covid's impact on land cover and development, and what this means for natural resources.

Another science need is user experience and research–this need is going into their GIT funding project proposal. They're building support tools for informing decisions. There is a need to understand how to design tools that will be effective for managers, decision makers, local planners, watershed organizations, land trusts, watershed program managers. This need comes from the question as to whether investing in these resources is meeting the needs of stakeholders and emerging needs, not just outcomes and development of indicators. There's research coming out of Local Government Advisory Committee (LGAC) on this. States also did user research with regards to planners as part of their Watershed Implementation Plans (WIP) planning process.

Another science need is synthesis and communication–there is a lack of capacity for the translation of science aspect across the outcomes. Maybe they can give the fisheries biologists the resources they need to collectively share the GIT's information to key target audiences.

Another science need is to make information more localized and scalable based on a variety of required boundaries, down to the regional and even parcel scale. They want to allow users to scale to the finest resolution they need for decision making. It's their job as the creators of the tools to make sure end users are using the data in a way that is appropriate for the scale they're working in.

Some emerging priorities include to integrate Diversity, Equity, Inclusion and Justice (DEIJ) into the Healthy Watershed Outcome. They have resources to put into DEIJ layers and intersect them with watershed metrics to get a sense of where they want to target, e.g. areas with lack of access to high value habitat. Renee asked how do they make sure they're improving diversity and being inclusive of all voices within their decision making framework too–such as who's sitting on the action team, who is providing input.

Another science need is to improve the climate metrics they have in the Healthy Watersheds assessment–they are not customized for the Chesapeake Bay watershed. They need to adjust approved climate indicators or emerging data sets–this is an area for investigation, and they need help with this.

Julie Reichert-Nguyen (NOAA) commented to share an article about living with water and that water will go where it naturally has always gone. Julie stated it would be interesting to have a landscape layer that shows historically wetland locations and flooding occurrence. Denice Wardrop replied to Julie that historic wetland locations are available from a number of sources, including National Wetlands Inventory (NWI) Status and Trends; there are a number of groups identifying wetland restoration/creation sites utilizing this with flooding info.

Denice Wardrop asked how much interaction there is between the needs of Healthy Watersheds Outcome and some of the metrics and indicators that Bill's group has put into the report card, and the DEIJ dashboard. Denice wondered if these tools are transferrable and can be revised to suit the purposes of the Healthy Wetlands assessment. Renee Thompson replied they're working on making the Healthy Watersheds assessment similar but the difference between the report card and the Healthy Watershed Assessment is that in the assessment, the individual layers can be looked at separately. There is interaction at the goal team and outcome level but not so much with outside groups. Renee said that they do interact with NLCC for the habitat layer and investigating The Nature Conservancy (TNC) resilient lands for climate. There are some national level indices but they have better data on the Chesapeake so the question is whether it is worth the effort to customize this. Bill Dennison added that essentially the report card is a wish list, and the assessment is refining it and giving it quantifiable, mappable and measurable characteristics. The goal is to continue evolving the indicator framework to better capture DEIJ issues.

Renee Thompson demonstrated how to combine two healthy watershed metrics on the story map to view overlap. There are many ways to show this information, but they need to make sure it's actually useable and can meet the needs of users as well as our outcomes.

Kathy Boomer noted an interest in stream metrics because it brings this down to a scale that field managers can use for example, for designing stream restoration. However, what's missing is information about stream stressors. Those likely have a strong influence on whether the watershed is healthy and provide a direction for creating a healthier watershed. Renee

Thompson replied the question is how to filter the metrics needed and provide analysis and interpretation of results. Within the Healthy Watershed Assessment framework it's a lot about streambank stabilization, and they are using facet tools the GIS team is working on. An appropriate use of the healthy watershed assessment, for example, would be informing landscape metrics that affect stream health. Kathy Boomer asked whether waiting to identify the threshold first rather than bringing those concerns immediately is dangerous considering the implications of the adverse effects in streams and how they impact other outcomes and goal teams. There is evidence that hydroelectric alterations have cascading effects down to the mouth of the tributaries in the Chesapeake Bay. Kathy also brought up the prevalence of artificial drainage ways as something that could be a factor. Renee Thompson replied they are using high resolution hydrography to delineate riparian area, although it doesn't represent the engineered world–that's not included in the assessment.

11:30 Protected Lands Outcome - Jake Leizear (Chesapeake Conservancy) and Olivia Wisner (CRC)

Jake Leizear and Olivia Wisner presented on the Protected Lands Outcome, starting with an overview of the Protected Lands Outcome and the expected status/progress so far. They are expected to meet 2 million acre goal soon. During the Management Board meeting there was a conversation about adopting a new outcome to conserve 30% of lands by 2030. The Protected Lands Workgroup (PLWG) has achieved 79% of their forest subgoal and 30% of their wetland subgoal. Increased prevalence of high-resolution data in regards to landcover will help provide an up to date picture, especially in regards to wetlands delineation.

Two types of science needs were shared, starting with mapping science needs. Olivia Wisner noted they removed the need to develop comprehensive trail system mapping as it has been quite successful so far. One science need is to expand analysis and mapping of projected climate impacts and other pressures like development. Another science need is a review of forest definitions and high-resolution mapping products. High resolution products can assist in making the definition of forests consistent. Jake Leizear also noted that climate and equity are two major areas of importance. The availability of tools such as TNC's resiliency layer assists the PLWG in factoring this in. Another science need is for development of improved methodology for data collection of Chesapeake Bay Protected Lands indicator. Renee Thompson and Jake Leizear have been working on this. This was done manually every two years in the past. Now there's an opportunity to automate it and do this much more often. They can get more real time data, so they can improve quality of info now that they're not spending so much time on this. This ties into tracking, analysis and reporting especially within LandScope.

Two analysis needs were shared. One need was updating important datasets (important forest and farmland). There's been a need for a while to improve 1 meter resolution land cover and land use data in regards to their goal maps. There's support that's been identified for habitat mapping, but there is less understanding of the human health and heritage aspects. They want to focus on how to best utilize the 1 meter land cover and land use data.

Other science need: they've removed the need for Chesapeake Watershed intensive finance workshop. Another science need is to develop additional health criteria and document those values as key inputs to conservation planning and implementation. This is specific to things like drinking water, recreational corridors and equity and environmental justice. Another need is to fillthe cultural and scenic landscapes documentation gap. There is a synthesis need to improve understanding of indigenous cultural landscapes (ICLs). This will be in the PLWG's upcoming Logic and Action plan. Another analysis need is to conduct opportunity assessment for forest related carbon sequestration and co-benefits, and understand what quantifiable work carbon sequestration can do and how this relates to forest conservation.

Denise Wardrop asked what tools they are using for assessing wetland acreages as there are differences between estimates of National Wetlands Inventory (NWI) and the University of Vermont (UVM) method is orders of magnitude in Pennsylvania. Jake responded that they do utilize NWI and land use data they have in regards to wetlands.

New Science Needs: Synthesis of studies on human health and outside greenspace, and synthesis of science on conserving 50% of land by 2050.

Scott Phillips asked about science needs for 30% land conserved by 2030. Olivia Wisner said they wouldn't turn down any science for that. Jake explained 30/30 and 50/50 relates to E.O. Wilson's concept of half earth and that this is a global initiative. Jake commented it is important to understand how that looks in the Chesapeake and what the benefits of it are around biodiversity and specific benefits to the Chesapeake.

Katie Brownson (USGS) commented that the Forestry Workgroup is putting together a team to take a close look at what the new high-resolution data is telling us about forests and forest change (including timber harvest), and to let Katie know if you want to participate with that group once we get going. Renee responded that Andy Fitch made the first forest dataset, and it would be great to be consistent across CBP on the high resolution/high value forest dataset e.g. same data and process for land change model, healthy watersheds assessment, Chesapeake Conservation Partnership (CCP) high value forest and other applications.

Scott Phillips asked with Chesapeake Watersheds Investment for Landscape Defense (WILD) coming under CCP, heard there was a need to improve habitat data for restoration and conservation targeting. Would this be considered under this outcome's mapping needs? Jake replied that this would be under this outcome's mapping needs but it would be met with support to Chesapeake WILD and possible GIT funding opportunities we have submitted. It's a broader question. The CCP breaks it down into 5 goals. While habitat is part of this, it's not included as prevalently in this presentation because it's not as prominent a need from this group.

Katie Brownson commented an interest in hearing more about that opportunity assessment for forest carbon at some point--maybe there are opportunities for Forest Workgroup (FWG) members to engage with this? Katie will follow up after the call.

Julie Reichert-Nguyen mentioned that the CRWG has a small team that has been looking into blue carbon. It would be great to also include discussions around forests. To allow for blue carbon, you omit forests (allowing marshes to migrate into forest lands). It would be helpful to begin thinking how to strategically approach carbon sequestration with these different landscape uses. Julie commented are there areas that would be better to keep forests versus letting a marsh migrate and vice versa.

Katie Brownson commented that it would be interesting to think through what those trade-offs are between blue carbon and forest carbon.

Kathy Boomer raised a question on the need to look at carbon sequestration in agricultural soils, and how this relates to increasing farm resiliency. Jake replied they are looking into this and the best ways to engage around this.

Breck Sullivan asked a question on improved cultural landscape for indigenous projects. Previous projects in Virginia and Maryland were mentioned, and Breck asked if there already had been progress on this, or if this is a future need. Jake replied there has been work done in Virginia, Maryland and Pennsylvania around certain tribes, and the National Park Service (NPS) has taken this on with the CCP. This need suggests that there are distinct ICLs and they're looking to synthesize individual studies to build a comprehensive picture of the Chesapeake indigenous culture landscape, and landscape management practices.

Kristin Saunders commented that there is also a project happening to document and provide layers that relate to historical and cultural locations tied to 13 African American communities in the watershed. Jake responded yes there is, and the National Trust for Historic Conservation, and John Griffin are involved, but it's not as established as ICL projects. Kristin Saunders also commented that Indigenous cultural landscapes were a huge component of the Captain John Smith trail initiative.

Breck Sullivan asked Jake and Olivia if for the need of reviewing of forest definitions and mapping products they have considered requesting this project for a C-StREAM intern. They could compile all the different definitions and mapping products and then coordinate planning a meeting to have the needed participants at the table to come to agreement on it. Jake replied that sounds like a fantastic opportunity and can bring this idea back to the CCP team and see what they think. Denise Wardrop commented many of the needs presented today would be perfect for a C-StREAM Fellow's project. CRC will be soliciting internship project descriptions later this Fall. Breck stated hoping to work more with the new C-StREAM Coordinator and others on how we can support these needs through the program!

11:55 Stream Health Outcome – Alison Santoro (MD DNR)

Alison Santoro gave an overview of all updated science needs and new science needs from the Stream Health Outcome. Their science needs can be found in an Excel spreadsheet on this page. Alison stated that right now they are trying to narrow in on what is stream health and what good metrics and management strategies are. They don't have their current progress goals because it's on a 5 year cycle. They're working on our progress data.

A high priority science need is support for reporting Chessie-BIBI progress. They are looking for partners to do data analysis because the current partner's funding is running out.

Another science need is more benthic data collection. There is only measured data across 50% of the watershed, and they are trying to model the other 50% based on Chessie-BIBI, tracking both miles and watershed area.

The Chessie-BIBI metric analysis protocol document has been completed.

Another science need is support for a STAC workshop. They had a request by partners to submit for a STAC workshop on the state of the streams. This workshop would bring science professionals together to produce report on current state of the science of stream health. This is still in idea phase and they're trying to figure out how to merge management actions with stream health metrics.

Another science need is to support long term monitoring efforts and coordination. There is a lack of pre-restoration or control data. They have a 3 phase plan that they are currently in phase 2 of (phase 1 was USGS identifying stressors throughout the major watershed, phase 2 is currently under GIT funding to link stressors to management actions). They are pulling together resources to understand how BMPs influence stressors, and found that in some areas there are too many reports to delve into, and in other areas there are gaps. They are hoping to identify gaps and fill in long term monitoring data.

Another science need is determining the effects of climate change on stream processes, and they need help in fleshing out the details.

Another science need is clarifying the definition of stream health and what is meant by watershed health vs stream health. For this they will look at different ecoregions such as urban vs agriculture. Alison noted that the standard benthic survey is based on rocky bottom streams, but coastal plains have sandy bottom streams. They are trying to figure out in detail what those differences are in communities.

Alison noted that Phase 3 of their cycle involves linking management practices and stressors to metrics and developing additional metrics to support the Chessie-BIBI, and maybe going from

the current 5 year cycle to a 2 year cycle so management actions can be more focused.

Another science need is to separate impacts of climate change from management actions on stream health. This was compared to the Red Queen Hypothesis–things are getting worse so as projects are implemented, outcomes may be staying constant rather than improving.

Scott Phillips stated the Stream Health Outcome should work with Peter Tango, who is compiling enhanced monitoring needs. Scott also asked if there is an approved STAC workshop or proposal to be submitted on the state of the streams.

Breck Sullivan asked if the Stream Health Outcome already had resources for the climate change need or if they needed help coordinating it. Alison responded she will be speaking with colleagues, and does need help fleshing out the direction of the science. Stephen Faulkner mentioned there is a lot in this publication around disentangling the potential effects of land-use and climate change on stream conditions. Scott Phillips commented that there are different thresholds they need to consider on how climate change will effect stream conditions: thresholds for stream health, fish habitat, cold water fishery for brook trout, and asked whether one forecasting effort applied to different results was needed. Katie Brownson suggested that when they look at the effect of climate change on streams they may also want to look at how riparian vegetation communities are changing and potential implications for stream ecosystems, and Alison responded that a coordinated effort will be an important resource on the climate piece.

Renee Thompson commented there is a lot of opportunity with the Phase 3 stage to coordinate with Healthy Watersheds and figure out what they're already doing across the Bay program, where they have the data and where there are gaps. They all also have the local engagement and communication piece; how do they do this in a way that's complementary across outcomes and tailored to stakeholders. There is an obligation for them to collectively figure this out, and maybe a shared approach is best once they get past our data collection and have some ideas about the problems.

Breck Sullivan concluded the meeting by noting that coordination is needed particularly across climate change and increased development. Breck noted that people should go back to workgroups and structure science needs more based on this feedback from today, and they're welcome to reach out to STAR for help. There will be a future meeting with STAC to go over the updated science needs and then put them in the database.

12:20 Adjourn

Next Meeting Dates: October 28th, 2021, Aquatic Life Cohort Dry Runs

Participants: Alexander Gunnerson, Amy Goldfischer, Breck Sullivan, Alison Santoro, Amy Handen, Britt Slattery, Bruce Vogt, Marisa Baldine, Caroline Donovan, Caroline Johnson, Chris Guy, D Austin, Denice Wardrop, Greg Allen, Jake Leizear, Justin Shapiro, Julie Reichert-Nguyen, Fred Irani, Katheryn Barnhart, Kathy Boomer, Katie Brownson, Katlyn Fuentes, Ken Hyer, Laura Cattell Noll, Lee McDonnell, Mandy Bromilow, Megan Ossmann, Megan Thynge, Melissa Fagan, Olivia Wisner, Patrick Thompson, Peter Tango, Renee Thompson, Scott Phillips, Stephen Faulkner, Tom Parham, Bill Dennison, Emily Bialowas, Kristin Saunders, Mark Nardi