Modeling Workgroup Quarterly Review
October 6, 2020

10:00 Announcements and Amendments to the Agenda – Mark Bennett, USGS and Dave Montali, Tetra Tech

10:05 Optimization of Phase 6 CAST – Kalyanmoy Deb, Pouyan, Nejadhashemi, Gregorio Toscano, and Sebastian, Hernandez-Suarez, Michigan State University (MSU)
Substantial progress over the last wo quarters has been made in the development of an optimization for CAST Phase 6 applications. The work will be presented by the Michigan State University (MSU) Team. In addition, principles and methods of optimization, as applied to the CAST System with the CBP objectives of least cost or greatest nutrient reduction, will be discussed with the Modeling Workgroup.

Discussion:
- Lewis Linker gave three points to keep in mind for the Modeling Workgroup:
  o This is a long-term project building on past success.
  o The Optimization team will give updates at the Quarterly reviews so that decision makers know how to use it and members can give their direction and guidance to the team.
  o For 2022 – 2023 milestones, this is a product that should be used in it. For 2024 - 2025 milestones, it will evolve and used again.
- Dave Montali stated that Danny Kaufman started this optimization effort with efficiencies of BMPs and how to deal with BMPs that were not easy to quantify. They had concerns about cost for some BMPs because some said zero cost. If they want some utility out of this by 2022 – 2023 milestones, when do they need to start working on the inputs that might become a problem?
  o Olivia Devereux stated they did an update on all costs for all BMPs, now in 2018 dollars. They were all reevaluated by the latest science. The problem with zero costs arises from new BMPs and the expert panel didn't include any information about cost. There are not many new BMPs being evaluated right now, but they have a contractor to look at this information when it is brought into the model.

- o Dave Montali said so in the short-term they won't have BMPs that have zero cost. Oliva Devereux said this is correct, and if they do, it is because the science says it will be zero cost to the user.
- Dave Montali asked another question if they needed to do anything to improve the inputs to the optimization for CAST.
  - o Deb stated before they do optimization, they need to download all the cost and geographic information, and then they apply their methods to it. As updates are loaded, they can revise and repeat their work. As long as the same objective functions are consistent, it will not be affected too much. It is something that can be done in parallel. As the model evolves, the optimization will evolve and change with it.
- Lew Linker asked if co-benefits could be incorporated once the optimization is more mature. Deb said yes.
- James Martin suggested the Optimization Team provide a schedule for delivery of any interim tools. He would encourage release/training in fall of odd years for potential use in Milestones development.
- Dave Montali stated the Optimization Team will come present again at the January Quarterly Meeting.

11:00 Fine-Scale Chesapeake Regional Hydrology Model (CRHM) Development – Gary Shenk (USGS-CBPO), Gopal Bhatt (Penn State), Isabella Bertani, UMCES
A progress update on the development of a fine-scale distributed hydrology model of the Chesapeake Bay watershed at an NHDplus catchment scale will be reviewed.

Discussion:
- James Martin asked what is the ultimate use of the work Gopal described? CAST uses land to stream and stream to river factors to represent the NHD+ catchments. Are the end results updated factors?
  - o Gary responded there are several purposes to the work. Some of the CBP development partners are interested in water supply and ecological flows at a finer scale. They also need to be able to model changes in the behavior of these catchments due to climate change. The stream to river factors will also be updated.
  - o Gopal stated in his opinion it would have multiple utility, but at its core, it will provide the ability to validate a fine-scale model against monitoring data and inputs for the estuarine model. However, a fine-scale model will have the advantage of new high-resolution data and new science (e.g., the current presentation) and ability to quantify loads at smaller geographic areas.
- Peter Claggett commented some of the NHD catchments will be omitted from the watershed model because they are 100% tidal emergent wetlands which are processed directly by the Water Quality Model. However, this means some catchments may have less than 1-acre of upland area and over time, sea level rise will inundate these areas. How will the new CHRM account for these cases?
  - o Gopal responded that they can model portions of a catchment as a no-load area (or land use) that can change over time if they had information on the

time-variable inundation. Or, account for the atmospheric deposition loads for the inundated area if that wasn't accounted for in the estuarine WQ model.

11:20 Comparison of Modeled and Monitored Nutrient Trends – Gary Shenk, USGS-CBPO; Isabella Bertani, UMCES; and Scott Ator, USGS
Progress on the comparison and analysis of WRTDS and the Phase 6 Dynamic Watershed Model trends will be presented.

Discussion:
- Based on Isabella's presentation, Guido Yactayo asked if drought indexes are available by river-seg?
  - Isabella responded that so far she has looked at two indexes (PDSI and SPEI) and both of them are at a much coarser resolution than river-seg unfortunately. Not sure if anything else is available at a river-seg scale.
- Based on Isabella's presentation, James Martin asked if the increase in phosphorous (P) concentration during drought could be associated with point source (PS) discharges? Would PS discharges explain some of the variable strength of the negative relationship in other Basins. Would Basins with more PS discharge be more negative?
  - Isabella responded they haven`t looked at PS in a systematic way, but they do plan to look at which factors may explain the difference in the strength of the relationship across the watershed, and the relative contribution of PS is something to consider.
- Based on Isabella's presentation, Bhanu Paudel asked if there is any reason for the "hump" in P concentration during drought period? May it be sediment release?
  - Isabella responded that there are different hypotheses as to why dry conditions may result in higher P concentrations, one of them (brought up by Bob Hirsch) being higher availability of P due to lack of high-flow events that would otherwise transport it away. However, this is very preliminary, and she certainly doesn't have a definitive answer as to what may be causing these patterns.
- Based on Isabella's presentation, Greg Noe asked if the concurrent trend in suspended sediment had been compared to the total phosphorous (TP) hump? One of the mechanisms you highlighted for the TP hump could be tested by comparing the SSC trend, or even better, a trend analysis on TP/SSC.
  - Isabella responded that they haven`t done that yet, but it`s a very good idea and will certainly look into it.
  - Greg said he thinks it is worth looking at TP vs suspended fraction relationship. He has seen high correlation between TP and suspended fraction especially during drought in Texas bays and rivers.
- After all the presentations, Gary said in general they are looking at CAST for empirical and database methods to see where they match up. They are starting to look at the four different factors and seeing if they can get exact comparisons. They are making progress to understand why WRTDS flow normalized loads are not strictly anthropogenic effect but partially due to drought. They are also able to

numerically put lag times into their models. From Andrew's presentation, he showed how lag times has an effect on the ability to detect changes to BMPs. They will continue to bring updates to the workgroup at quarterly meetings.

12:00 Overview of ORD Project -- Jason Bernagros, Tom Johnson, Tanya Spero, and Anna Jalowska– EPA ORD

An overview of on-going ORD intensity duration frequency (IDF) curve and extreme weather research projects applicable to urban stormwater management will be presented. Applications include updates to the National Stormwater Calculator as well as climate data for EPA's Stormwater Management Model (SWMM).

Discussion:
- Lewis Linker commented there is a Joint Climate Resiliency, Modeling, and Urban Stormwater Meeting on December 9th where they hope to have a deeper discussion on this topic. He also commented their current focus is county level IDF. He was not sure if extreme weather really plays a part in a standard BMP design.
    - Jason Bernagros thinks looking at extreme storm event data is used for urban stormwater BMP designs that are looking specifically at flood management. They have seen communities using it when designing flood mitigation and implementing green infrastructure.
    - Tanya Spero added that some of their work is exploring if the definition of 100 year storms are changing. If designing to something that is 25 years, the design is probably not going to be good enough.
    - Norm Goulet said local government has an interest in the extreme storm information. They are not thinking along the lines if the reservoir has enough space. They are more concerned if the pipes under the streets has enough space. In a number of areas, the answer is no. They are going to need to look at this information not only for the design of the future BMPs but also how and if they are going to handle the large events.
    - Jon Butcher commented water quality BMP designs are often based on 90th or 95th percentile 24-hr annual event. These can be analyzed by a similar approach to IDF using Peaks-over-threshold analysis. Lower recurrence events are of particular importance for things like culvert design. He also stated overall increases in rainfall intensity lead to greater bypass and less contact time in water quality BMPs and thus a decline in overall pollutant removal efficiency.
    - David Wood commented he is working a lot on these issues to lay out the issue of current design standards and what they are seeing in projections for storms. They are going to send their last memo out on the vulnerability and types of risks BMPs are considering so then they get at the questions of data concerns.

12:40 Break

The following three presentations are "lightening presentation updates" in anticipation of more in depth discussions at a joint meeting of the Urban Stormwater Workgroup, Modeling Workgroup and the Climate Resiliency Workgroup on December 9, 2020.

12:50   Lightning Update: IDF Curve Development for the Chesapeake Watershed – Arthur DeGaetano, Cornell U.

Art will present progress on IDF development for current and future time periods at the county scale for all Chesapeake watershed counties.

1:00   Lightning Update: CSN on IDF curve Development and Application in the Chesapeake stormwater community– David Wood, Chesapeake Stormwater Network (CSN)

David will provide an update of CSN's activities in organizing the Chesapeake stormwater community in the application of IDFs updated to presents and future conditions in order to maintain resiliency of stormwater and restoration practices under climate change.

Discussion:
- Jason Bernagors asked if David Wood will be looking at the use of real time controls with the upcoming vulnerability assessment memo?
    - David Wood answered yes, they are going to be on the table as one of the potential adaptations. They are already approved as a Chesapeake Bay BMP, and there is some data on their potential for improving water quality performance of older ponds.
    - Jason Bernagors responded great. He thinks there is more data becoming available about how RTCs are able to accommodate increased precipitation volumes.
    - David Wood responded yes, from what he's found so far there are fewer studies on their effectiveness for mitigating the larger storm events. Most work has been on water quality and channel protection.

1:10   Lightning Update: BMP Design under a Changing Climate- Jon Butcher, Tetra Tech

Jon will provide an update in the development of IDFs based on present and future conditions for Maryland metropolitan regions.

Discussion for all Lightning Talks:
- Lewis Linker stated that with Arthur and Jon's presentation they showed two different approaches. He wondered if it would be more satisfying to practitioners if they had a look back, look forward approach within the methodology. He is not stating this is what needs to be done.
    - Arthur thinks it is a great idea. There needs to be the capability to look at how projections are doing as time goes on.
- As a follow up from Jon's discussion, ATLAS 14 used AMS. The analysis done by Arthur's colleagues at Carnegie Melon is using AMS so hopefully they can look at

the sensitivity of that choice in their analyses. Studies have noticed that while using AMS, large precipitation events are missed.

- o Jon agrees with Arthur and states that their scope was to reproduce the ATLAS 14 method as closely as they could do it.
- Lewis Linker asked if insurance companies are paying attention to the IDF work. Will society see a withdraw of insurers to properties that are within expanded future flood plains? If so, will this be changing land use the CBP is tracking for 2050 and future years w/ an increase in urban open space from this source?
  - o Kristin Saunders responded there may be a unique opportunity as they begin to assign ecosystem service values to certain practices and place a value on them, they may be able to encourage insurers as a stakeholder to invest in finance strategies that put practices on the ground that both create habitat and climate adaptation/flood reduction. This is one reason she is trying to keep a close link between living resources/water quality and co-benefits of green infrastructure BMPs in an attempt to keep them from withdrawing and being part of financing the solution.
  - o Jason Bernagros stated there has been some research that the First Street Foundation has done on how increased chances of flooding may affect risks for typical home mortgage time periods: https://firststreet.org/press/2020-first-street-foundation-flood-model-launch/
    - ▪ This data is available nationwide.

1:20   Sediment dynamics and Implications for CBP Management – Greg Noe, USGS
A synthesis of the current knowledge of sediment dynamics will be presented. Long-term research in the watershed was done with the intent of providing improved information for environmental management in the restoration of the estuary and its watershed. The watershed's sediment sources, transport, delivery, and impacts will be discussed with consideration of the implications for effectively implementing best management practices (BMPs) to mitigate sediment issues.

Discussion:
- Lewis Linker mentioned on November 5th the Modeling Workgroup will host a meeting with more presentations on this material and more on the next generation modeling. The next meeting will be about the application.
- Gary Shenk asked when Greg Noe was talking about the modification curve, is the hop and rest the major thing drawing that curve out or is it more there is a single stream and when you aggregate over the landscape there are different development times.
  - o Greg stated it is a little bit of both those drivers. The major reason is the erosion of uplands as a result of earth moving and development. It creates a massive pulse. What is really causing the extended peak after earth development is the down streams eroding as a result of greater storm water runoff from the development. It is two phases that has mobilized different stored sediment.
- Gary Shenk said the CBP question is what is the effect of management actions over the long term. In nitrogen it means water lag and with phosphorous that means 25

years of soil erosion. When talking about sediment, they have always taken credit in the CBP model for the eventual upstream practices on the stream, and they need to think about what we mean by that. Do they immediately take credit for what will be done for many years or take the approach more like P where there is a timeframe. Gary knows no one can really answer this right now, but he looks forward to the discussion on it.

- Dave Montali asked what is happening with reactivity and is it a consideration. If they do more over time, is the reactivity going to be less?
  - Greg Noe asked for clarification. Dave said reactivity for impacts to dissolved oxygen.
  - Greg Noe said at least for the Piedmont the sediment that gets eroded is very fresh mineral stuff. for the most part it would take a fare amount of time to be loaded up with N and P matter that once exported would cause DO depletion downstream. Agriculture watersheds would be the opposite because it is coming off the fields and the ditches a little hotter in respect to reactivity, so it depends on the landscape.
- Lewis Linker said in terms of trying to maintain equilibrium of sediment, he asked if the work is also considering the drivers of sediment in the watershed.
  - Greg Noe said yes, they spend time on the historical perspective. The issue is that there is just not good enough historical data to measure how it has changed so instead they are using space for time substitutions to understand how sediment transport processes different from one place to another. He does note there is no equilibrium for sediment and streams.
- Dave Montali stated an observation that BMPs have reduced the level of sediment to the Bay by 23%, but that is counter to how they are not seeing these reductions.
  - Greg Noe said they need a better understanding of the stored time and how it varies through space. Then they can set the expectations of how long that expected 23% reduction of sediment from BMPs will take because of downstream load. Dave said he misunderstood so he now understands that the 23% is what is done if they look in the future based on the implemented BMPs.
- Greg Noe also stated there is an accompanying journal paper published and free to download: Noe, G.B., M. Cashman, K. Skalak, A. Gellis, K. Hopkins, D. Moyer, J. Webber, A. Benthem, K. Maloney, J. Brakebill, A. Sekellick, M. Langland, Q. Zhang, G. Shenk, J. Keisman, and C. Hupp. 2020. Sediment dynamics and implications for management: state of the science from long-term research in the Chesapeake Bay watershed, USA. Wiley Interdisciplinary Reviews: Water 7:e1454. https://doi.org/10.1002/wat2.1454

2:00   Adjourn

Participants: Breck Sullivan, Lewis Linker, Mark Bennett, Dave Montali, Gary Shenk, Gopal Bhatt, Richard Tian, Isabella Bertani, Kalyanmoy Deb, Pouyan Nejadhashemi, Gregorio Toscano, Sebastian Hernandez- Suarez, Scott Ator, Jason Bernagros, Tom Johnson, Tanya Spero, Anna Jalowska, Arthur DeGaetano, David Wood, Jon Butcher,

Greg Noe, Andrew Sekellick, Anna Jalowska, Arianna Johns, Bhanu Paudel, Carl Friedrichs, Clint Gill, George Onyullo, Guido Yactayo, J. Sebastian Hernandez, Lisa Beatty, Jesse Bash, Jon Butcher, Karl Berger, James Martin, Karl Blankenship, Ken Hyer, Kristin Saunders, Mukhtar Ibrahim, Norm Goulet, Sam Merrill, Scott Phillips, Steve Schreiner, Tanya Spero, Carlkington Wallace, Cassandra Davis, KC Filippino, Steve Bieber, Bruce Michael, Peter Claggett, George Onyullo, Sam Merrill, Jim George, Qian Zhang

Modeling Workgroup Quarterly Review
October 7, 2020

Event webpage:
https://www.chesapeakebay.net/what/event/october_2020_modeling_workgroup_quarterly_review

Join by Webinar: **Meeting Number**: 120 867 4785
Password: MODEL
Webinar*: https://umces.webex.com/umces/j.php?MTID=m50bb802b27f830b4957c096219e5b8da

Or join by phone: **Conference Line**: +1-408-418-9388 **Access code**: 120 867 4785

10:00 Announcements and Amendments to the Agenda – Mark Bennett, USGS and Dave Montali, Tetra Tech

10:05 Nitrogen in the Chesapeake Bay Watershed: A Century of Change, 1950 to 2050 – John Clune, Paul Capel, Matt Miller, and Andy Sekellick, USGS
The presentation will provide an overview of an upcoming report that aims to provide an understanding of how human activities and environmental change in the watershed in the past, present, and future influence the export of nitrogen to the Chesapeake Bay. The spatial and temporal aspects of the interconnected and changing physical factors, source inputs, and management actions that control current status and future trends of nitrogen will be discussed.

Discussion:
- James Martin commented oyster relationship in the graphic implies a direct cause:effect when oyster disease was the biggest driver of oyster decline and land use/population was the biggest driver of Nitrogen (N) increase. He also asked if the atmospheric deposition line in the N sources graphic includes all atmospheric deposition (to land and water) or just deposition to water as in the models?
    - Gopal Bhatt answered the atmospheric deposition in the report has the N-inputs to the watershed (all load sources or land uses including surface water features), but N-depositions to the tidal open water of the estuary is not included.
    - Andrew Sekellick also answered it is all atmospheric deposition (to land and water). The circular also has data for wet and dry deposition.
    - John Clune commented that James point about the oysters is addressed in the text. They can modify the text or graphic to point out that as human population increases aquatic life impairments have increased as well and largely the result of land use. John welcomes feedback on how to modify this information.
- Bhanu Paudel asked if there is no NOx-N dry deposition after ~2015 or just using data until then?
    - Gopal stated NOx-N dry deposition is included in the data for the entire 1950 to 2050 period.

- Lewis Linker shared a point of clarification. He does not think the presentation/report includes direct deposition of TN to tidal waters of the Bay.
- Lewis Linker stated the scientific community will probably ask if the input and output data is available and how ready is the model for the input data.
  - Andrew stated there is going to be a data release prior to the circular. He said the data is ready to use.
- James Martin commented on the slide that showed land use change. He thinks it misses an important piece on back filling of agriculture land through conversion of forest back to agriculture. He is seeing this in VA, and Peter Claggett is seeing these trends too in his work.
  - John Clune commented that it is probably included in the narrative. There was a lot of images they were not able to show. He will get back to James Martin to make sure they capture this in the narrative.
- James Martin also commented on the climate change slides especially for the one on increased rainfall volume. A challenge they have seen looking at recent trends in rainfall compared to downscale global climate models is that while overall every place in the Bay gets wetter, the climate model shows the south is going to be more wet than the north as the presentation shows. However, more recent trends show the north will be wetter than the south. This trend is still uncertain.
  - John Clune said this is an interesting topic that he will reach out to James Martin to better clarify in the report.
- George Omyullo had a comment that John Clune should emphasize flow from wastewater treatment plants because generally most of the wastewater treatment plants have their flow going up because of better collection but that could be superimposed with the expectation that runoff will increase. George would like to work with John Clune on this topic for the narrative part of the report.
  - John Clune asked Paul Capel if they captured that in the report. Paul said he does not think so and asked for clarification if it was on combine sewer overflows.
  - Lewis Linker said George is talking about infiltration with wetter climate and not stormwater.
  - Paul Capel does not think it is captured in the story of the Blue Plains. It could be added to the side bar. John Clune will send it to George Omyullo so that he can add a few sentences.
  - Karl Berger suggested sending the Blue Plains sidebar to Matt Ries of DC Water, chair of the WWTWG.
- Dave Montali asked if there is a story on per capital sewage flow changing over time about how wastewater flow is influenced by precipitation through collection systems.
  - Paul Capel said that story has not been told because the report is on a high level, but if Dave Montali thinks it is important to be added, they can add it to the text.
  - John Clune said he would follow up with Dave Montali on this topic.

**10:55 STAC Climate Change Technical Synthesis Shallow Tidal Water DO Dynamics –
Jeremy Testa, UMCES**
An update will be presented on the STAC synthesis of shallow tidal waters that includes
a statistical analysis of the shallow water data in concert with numerical model
simulations and linkages to local physical conditions and watershed features. The
synthesis will generate an improved understanding of how local eutrophication and the
effects of future climate will impact oxygen criteria and dynamics in shallow waters.

Discussion:
- Lewis Linker said the connection between temperature and precipitation is key
  because it will help them know what to represent in shallow waters with future
  temperatures. He thinks Jeremy Testa and his team has identified the key issues
  the modeling team is tackling.
   o Jeremy Testa would like to look station by station how frequently the
     temperature is above a certain threshold and see if the stations vulnerable
     to high temperatures are also vulnerable to low oxygen. If they have an
     idea of that, they will have an idea of the temperature that splits oxygen in
     CART. It will tell them where the vulnerability is in the shallow waters.
- Lewis Linker said that Jeremy had an unstructured grid model that the modeling
  team may be able to work on with them like they did in the Chester River.
- Dave Montali is struggling with the idea of which depth to model shallow water.
  He said the measurement could be bad at one depth but going a little further can
  have a better measurement.
   o Jeremy said the high-resolution models might be able to capture it, and it
     was also a short event so maybe these events are something that always
     happen, and the organisms can handle it.
- Gary said this presentation points to the important factors and how it varies across
  areas. When the modeling team updates the model, they need to use this
  information. They could use CART to spread the information available to where
  information is not available. Gary also commented that some of the variables they
  used to predict DO are more easily predicted than DO by a model. Gary wondered
  if there was another CART that could be used that included predictor variables
  that were end predictions of a water quality model that was sensitive to
  management actions. He also wondered if they could use an interpolator to
  evaluate the success of scenarios. If they find in the next version of the estuary
  model it is easier to use the predictor variables, then those variables are a way to
  get to DO.
   o Jeremy said this is something to think about because they could steer away
     from the more detailed work to something that is more useful to the
     modeling team.

**11:30 Analysis of Tidal Bay Tributary Nutrient Limitation – Qian Zhang and Richard
Tian, UMCES**
An analysis that presents insights into nutrient limitation in the Chesapeake tidal
tributaries will be presented. Changes in Chesapeake nutrient limitation have broad
implications to CBP policies such as the development of effective Watershed

Implementation Plans (WIPs), as well as to next generation Bay Model calibration and performance.

Discussion:
- Lewis Linker stated in Tom Fisher's work on bioassays no reaction was often connected with light limitation. Does this continue with this work?
  - Qian said for their bioassays it is titled No Response to Added Nutrients (NOR). That category is used as is, so their interpretation is the same used in Qian's work.

12:10   BREAK

12:30   SAV Nutrient Dynamics and DO Impacts – Carl Cerco, Attain and Richard Tian, UMCES

An update on the 2017 WQSTM estimated nutrient flux by submerged aquatic vegetation will be presented. Examination of net nutrient flux is anticipated to simulate net import to SAV in the growing season, augmented by simulated enhanced settling of particles in SAV beds. However, after the SAV growing season a nutrient flux out of the SAV beds, mostly as organics, is anticipated.

Discussion:
- Lewis Linker looked at the flux out from the three SAV groups and it looked like 180 kilos per day for Organic N and 80 kilos for Dissolved Inorganic N (DIN). He asked is that only for the entire year or only for the growing season.
  - Carl Cerco stated it is the average over an entire year and an average over all vegetated cells in that segment.
- Lewis Linker stated as Carl goes further it would be helpful to have G1, G2, and G3 included.

1:15   Drivers of Patuxent Chlorophyll Trends – Jon Harcum and Diane Allen, Tetra Tech, Inc.

An investigation of potential stressor-response models associated with increasing chlorophyll-a concentrations in the Patuxent River, 1994-2018 will be presented.

Discussion:
- Lewis Linker stated Jian Shen (VIMs) has found in terms of mechanisms in the tidal fresh there is a period of high chlorophyll when there are low flows. He suggested looking at his work.
- Qian would like to follow up offline about the results from this presentation and his presentation.
- Elgin Perry said with GAMs they use to see a strong negative relationship between flow and chlorophyll in the tidal fresh. They interpreted this as when flow goes up, the chlorophyll gets flushed out.
- Bhanu Paudel commented in his study in Texas using drought period data, he has seen negative relationship between TN and Chlorophyll, (which was hypothesized due to sediment release effect). He did some sediment release exploration after

running SEM model which did coincide with their sediment hypothesis. His second comment was on the use of highly correlated data in SEM model. He has found out that sometimes use of data such as secchi, tss and chl in the SEM model gives overfit (as in this case it does not look like a overfit model). He hopes they have taken care of that as well.

1:45   Baytrendsmap: Creation of Concentration and Change Maps Using General Additive Model (GAM) Results from Baytrends – Jon Harcum and Erik Leppo, Tetra Tech, Inc. and Jeni Keisman, USGS

Yearly, state stakeholders analyze and submit long-term trend evaluations of water quality parameters associated with the Chesapeake Bay Program's tidal monitoring network using a Generalized Additive Modeling (GAM) approach. The evaluations include station and parameter-specific development of nonlinear seasonally-varying changes over time, incorporation of hydrologic variability via river flow or salinity, method or laboratory changes, and censored data as developed through the R package Baytrends (https://CRAN.R-project.org/package=baytrends). With the release of Baytrendsmap, these results are now available to program managers, researchers, and the general public via an R Shiny dashboard on the Chesapeake Bay Program website (https://baytrends.chesapeakebay.net/maps).

Discussion:
- Lewis Linker asked who are the users of baytrendsmap.
    - Jeni Keisman said this is question they want to find out. They want to get the message out that it is available. She recognizes that it is going to be a more technical community, but she wants to take it to other groups to show them the tool including STAC and the Rivers Keeper Association. She wants to show it not only to those who will use it but to those that would be interested in the results on all the parameters. She is open to any suggestions on who they target for their messaging.
    - Lewis Linker asked if Jeni had a contact for the River Keepers because they have an annual meeting coming up. Jeni said she did not so Lewis will share a contact with her.
- Lewis Linker asked if this was used in Jeni's Tributary reports. Jeni said yes, it is in those reports.
- George Omyullo is really interested in this tool and thinks it can help him in his work.
- Dave Montali suggested presenting this tool at a WQGIT meeting.

General Announcement
Another Modeling Workgroup meeting will be held on November 5th.
There will be a Modeling/Climate Resiliency/Urban Stormwater Workgroup Meeting December 9th.

2:00   ADJOURN

Participants: Andrew Sekellick, Anna Jalowska, Arianna Johns, Bhanu Paudel, Carl Cerco, Carl Friedrichs, Cassandra Davis, Clint Gill, Dave Montali, George Onyullo, Gopal Bhatt, Norm Goulet, Greg Noe, Gregorio Toscano, Gary Shenk, Isabella Bertani, Jesse Bash, Jessica Hopple, John Clune, Karl Berger, KC Filippino, Kristin Sunders, Ted from PA, Larry Sanford, Lewis Linker, Luke Frankel, Mark Bennett, Mukhtar Ibrahim, Paul Capel, Qian Zhang, Raleigh Hood, Rebecca Murphy, Richard Tian, Scott Phillips, Tammy Zimmerman, Karl Berger, Paul Capel, Jessica Hopple, James Martin, Alex Kua, Jennifer Keisman, Jeremy Testa, Kyle Hinson, Mukhtar Ibrahim, J. Sebastian Hernandez, Diane Allen, Elgin Perry