CPB Climate Resiliency Workgroup Meeting

Monday, May 23, 2016
10:00AM – 3:30 PM

Conference Line: (866)299-3188 Code: 267-5715
Adobe Connect: https://epawebconferencing.acms.com/ccw (enter as a guest)
Meeting Website: http://www.chesapeakebay.net/calendar/event/23786
Location: Maryland Dept. of Natural Resources, C1 Conference room

MINUTES

Announcements (Zoë Johnson, CBP Climate Change Coordinator)

- The Climate Resiliency Workgroup (CRWG) is still looking for feedback from workgroup members regarding the issues and tasks that are being addressed, and in how the group is doing completing those tasks. The CRWG is trying to tackle more substantive issues for in-person meetings, and save more of the process centered activities in conference calls.
- In regards to updates in goal team funding, $80,000 was awarded by the EPA for the CRWG to work with Protected Lands and Wetlands Workgroups and this was contracted to TetraTech.
- An updated compendium of current efforts was also sent out to the entirety of the workgroup for member review and comments.
- Schedule updates include the next CRWG conference call, which is scheduled for June 20, and a breakout session devoted to the formulation of STAC workshops that the CRWG was awarded at the June 7 STAC meeting.

Chesapeake Bay TMDL and the 2017 Midpoint Assessment: Decision Making Process and Timelines (Lucinda Power, U.S. EPA Chesapeake Bay Program)
Attachment A

- Lucinda provided an overview of the Midpoint Assessment, the priorities associated with the goals set at this point, and outlined the challenges facing the modification and implementation of Watershed Implementation Plans (WIPs).
- The Water Quality GIT is looking to the CRWG to determine what the climate considerations should be, and options for incorporating them in the Midpoint Assessment process.
- Rich pointed out that this climate information is important to bring to state level secretaries as soon as possible to ensure that they know what is on track for the MPA and by 2025.
    - It may also be helpful to tee up information recommendations in incremental stages and, as a workgroup, it may also be helpful to look at what's beyond the 2025 timeline.

2017 Midpoint Assessment Modeling Needs: Simulating Sea Level Rise, Tidal Marsh Loss and Changes in Watershed Loads (Carl Cerco – U.S. CoE ERDC, Ping Wang – VIMS, Gopal Bhatt – Penn State, and Lewis Linker – U.S. EPA Chesapeake Bay Program)
Attachment B.1, *Attachment B.2*

- Lewis outlined the motivation for quantifying the effects of climate change on watershed loads and future conditions within the modeling efforts of the Chesapeake Bay Program. Lewis also presented initial comparisons and modeled impacts of warming temperatures and sea level rise.
- The state of the modeling team's understanding of wetlands with the models existent today was also presented, highlighting the nutrients that are expected to be captured by wetlands. A conservative estimate of sea level rise was also used in an initial scenario to outline expected changes in dissolved oxygen.
- A recent STAC workshop has also recommended that the modeling team use a longer record of changes in precipitation and an ensemble of global models, in addition to previous efforts that focused on the CBP's 30 year record of precipitation.
- As previously stated by Lucinda, 2017 is the year of decision and the partnership needs to ask whether or not to consider climate change in the third refinement of Watershed Implementation Plans (WIPs).
- Lastly Lewis reiterated that what has been presented for a 2050 estimate is essentially a scoping scenario. When the TMDL was established in 2010 it used an average hydrology from 1991 to 2000. For the purposes of the TMDL, the hydrology is always an average of these 10 years which assures that stationarity is kept constant for these scenarios. The use of climate projections out to 2050 therefore also follows a 50 year projection forward from the TMDL baseline.
- Carl explained some of the methodologies and motivations behind assessing the effects of wetland loss on Bay water quality as both a source of organic matter and suspended solids to the water column and in terms of its retention of upland nutrients.
- To accomplish this sort of projection Carl stated that there are three informational needs:
    1. Information on current wetland area and the nature of these wetlands.
    2. Projections of future wetlands area and type.
    3. Information on wetland functions, including what functions are being lost and the composition of eroded materials from the wetlands.
- Carl has a good start on the informational needs outlined in 1 and 3, but needs assistance on the second need from the CRWG.
    - The needs of item 2 can be further divided into three points that are necessary: a base case (the current wetland area), an agreed upon climate change scenario and timeframe, and projected wetland loss resolved to the basin scale. It is important to know where the wetland loss will occur as it is not enough to simply say that there will be a 25% loss of wetlands in the Bay.
- In regards to SLAMM (Sea-Level Rise Affecting Marsh Migration) model runs, Carl has been working with Lora Harris (UMCES) about CB wide projections with this model.
- Kathy Boomer asked a question about the role of coastal wetlands, particularly the process of enhanced phosphorus release as saltwater reaches the wetland. A related concern that Kathy cautioned about was recognizing that every unit area of wetland is not necessarily providing the same function. That is very hard to capture in a coastal estuarine model and it should be a key uncertainty that can be tracked.
    - The idea of enhanced phosphorus release is new to Carl but he is willing to address it and said that he would follow up with Kathy after the meeting. Wetlands hydrology is difficult, there is still not consensus among the sources from which he summarized the information. Aside from spatial considerations, the other points may be beyond the current scope but could be evaluated in the future. It is important to work with the Wetlands WG to further hammer down wetlands connectivity and processes.
- Tom Ihde noted that in brackish portions, even if we may not be ready to model them, there are different functionalities between Spartina and Phragmites. It may be helpful to simply add placeholders for items that can be further addressed in the future. Erik also added that topography and land use information need to be employed as well to fully realize potential paths of marsh

migration. There are limitations of all of these models and while it is important to note that NWI is our best piece of information for now, it is also sorely out of date for most of the Bay.

Sea Level Rise Trends and Projections for the Chesapeake Bay (Capt. Emil Petruncio – USN, PhD, Chair, Oceanography Department, US Naval Academy)
Attachment C

- Emil shared what was currently known to his research team about the vulnerabilities and extent of anticipated sea level rise for 2025 and 2050 in Maryland.
- There is no single definitive answer, and it makes most sense to consider a range of expected scenarios in order to manage this uncertainty.
- Contributions from land ice to SLR is expected to increase in the latter half of the century, the rates to this point have been resultant from ice loss and thermal expansion.
- The globally averaged rate of sea level rise is exceeded in the Mid-Atlantic region, furthered by local land subsidence from glacial isostatic adjustment as well as dynamic sea level changes resultant from changes to the Gulf Stream and ice loss rates which are not uniform globally.
- One of the major sources of uncertainty lies in what is occurring in the Amundsen Sea and the West Antarctic ice shelves.
- Emil also presented some of the findings from the DoD led Coastal Assessment Regional Scenario Working Group's (CARSWG) report. This is a scenario driven report which came up with a range of scenarios as opposed to probabilistic projections. Trying to determine which scenario is most likely too difficult at this point.
- Lewis Linker and Kristin Saunders both noted that the cost and risk outline to an approach shown by Emil aligns well with the Bay Program point of view. The same kind of utility of a range could be used by the Bay Program for both water quality standards as well as in conjunction with applications to living resources efforts. In terms of modeling it may be best to split the difference and use a midpoint with this current best estimate with an understanding that this will not necessarily be the last word on the matter.

Probabilistic Sea Level Rise Projections for the Chesapeake Bay Region (Robert E. Kopp, Ph.D. – Rutgers University)
Attachment D

- The bottom line outlined by Bob immediately is that there is no deterministic answer, but there are probabilistic scenarios. Bob then also reviewed uncertainty and potential rates of SLR in three different RCP (representative concentration pathway) scenarios.
    - The knowledge surrounding these estimates is still evolving, especially with regards to the contribution of Antarctic ice sheets.
- Variability in Chesapeake Bay region SLR is primarily due to groundwater withdrawals.
    - It is fairly safe to employ a single value for the entire region, which (as noted by Emil previously) will also be higher than the global average due to influences of glacial isostatic rebound and influences of the Gulf Stream.
    - Uncertainty in Greenland melting is also not as important to this local region, rather thermal expansion, ocean dynamics, and Antarctic melting provide much more cause for concern.
- Bob also recommended that the CRWG take into account high emission SLR local scenarios for 2050 in order to complete a comprehensive risk analysis, which would study what may occur at 95th percentile, not just the likely scenario.

    - None of the projections include interannual variabilities, which need to be added in and accounted for in the SLR projections.
- The interannual variability at points within the Chesapeake Bay are fairly uniform, about 0.1 m.
- The tables provided that show relative SLR by definition also accounts for vertical land motion.
- Zoe asked, on behalf of the modeling team, if the CRWG could provide a range of SLR inputs or guidance that could be used within the models.
    - Lewis responded by asking whether it was worth the time to invest for these immediate SLR scenarios and produce them for the 2017 MPA.
    - Rich noted that it is actually not the Bay Program's call, and it should be kicked up to the PSC by the CRWG. The tendency is that the modeling team could be running hundreds of scenarios, but we also must ask what the partnership wants to see in terms of a lower or upper range or other options.
- Bob emphasized that there is a large range of numbers, and the CRWG should ask what exactly the goal is. Is your goal to determine the most likely event or is it to assess the best way to be resilient in the worst-case possible scenario? Often, if runs are limited, people choose both a likely scenario and a worst-case scenario.
- Philippe Hensel advocated that in modeling, it is important to understand how the end goals are reached and does not just simulate the end result after 20 or 50 years of SLR. Modeling every step in between can help practitioners to understand how the wetlands can keep pace which can make a big difference when making the projections based on hysteresis effects and the ability of, for example, marsh migration to keep pace with SLR.
    - Lewis emphasized that the Bay Program models are not sophisticated enough to do this step change simulation, instead they will focus on impacts of dissolved oxygen based on the capacity for wetlands to trap nutrients.
- Zoe asked whether it would be wisest to take a very conservative approach, knowing that SLR will probably increase at an even more rapid rate moving onwards past 2050 to the end of the century. Erik Meyers agreed, noting his reluctance to operate with the lowest possible SLR scenario.
- Rich advocated for putting both 2025 and 2050 estimates out for the partnership to better evaluate options in both the short term for the TMDL timeline and longer time spans.
- Lewis explained the TMDL approaches that can contain the potential for being implicitly or explicitly conservative. In this instance, a conservative approach denotes the higher end of anticipated SLR.
    - For a conservative approach of TMDL hydrology, the 3 year period chosen was from 1993-1995 because there were high flows that were not extreme high flows.
    - Zoe pointed out that there have been other TMDLs that have accounted for estimates of changes with climate change by adding in an additional margin of safety factor by being more conservative initially.
- Zoe also returned back to the expected changes presented by Bob and Emil that range from 8-11" up to 31". The model runs thus far have only accounted for about .5 meters (about 20")
- Zoe asked what the partnership may be risking if the estimated SLR is too low for the timeframes of 2025 or 2050.
    - Rich said that there is the potential of over-reducing nutrient inputs, but this hasn't happened yet in the history of the partnership.
    - This decision also needs to be assessed by the management board and PSC to see how much risk can be absorbed by choosing specific SLR scenarios?
- Fredrika Moser emphasized that managers should also understand that on top of the ranges outlined in the presentations, there is also a factor of interannual variability which should be addressed.

- The CRWG leadership asked whether, without getting down to specific numbers, workgroup members were comfortable with choosing a medium and high estimate of SLR.
    - Workgroup members agreed with the proposed approach of taking data and advice provided by Emil and Bob and continuing to move forward with these probabilistic estimates that help to also incorporate risk management and bring these ranges to management in the partnership.

Overview of the Chesapeake Bay Sea Level Sentinel Site Cooperative (Sarah Wilkins, CBSSC Coordinator)
Attachment E

- Sarah explained the function of the CBSSC, a regional collaborative network to improve planning and management decisions regarding sea level rise and associated ecological changes. Sarah also provided context for the sentinel site program in different areas across the country. Furthermore, the sentinel site model was explained.
- Priorities were also outlined regarding a better understanding of applications of collected data.
- Lewis asked how well we could potentially generalize from the surface elevation tables. Are a set of measurements representative of tidal wetlands in upper bay from lower bay?
    - This question was answered by Philippe. It is a very small footprint, which is a big limitation of these surface elevation tables. For monitoring, the application can be very limited.
    - Pat Megonigal added that there is some possibility to generalize sets of data, because the small footprint is a footprint in a context based on the soil, plant types, etc.

Assessing Loss of Tidal Marshes to Sea Level Rise in the Chesapeake Bay (Molly Mitchell – VIMS, Pat Megonigal – Smithsonian Environmental Research Center)
Attachment F.1, *Attachment F.2*

- Molly first reiterated that the primary mechanism for marsh loss is erosion, and the primary mechanism for marsh gain is retreat. Different climate drivers are also the predominant forces in tidal wetlands, while precipitation and runoff are the larger drivers in non-tidal wetlands.
- There are also considerations that must be factored in regarding retreat, particularly the local development and hardening of shorelines near wetlands.
- Lewis asked about the possibility of projecting forward in marsh gain and loss? 41:00
    - Projecting forward would necessitate a model format, in which the current analysis does not exist. We would need to better incorporate the human components and include projected patterns of development. Molly doesn't think that these can necessarily be used to project the models forward, but they can be used to validate the observed patterns.
    - This would be a highly spatially resolved model, which could help to tell what the gain or loss would be in specific portions of modeled rivers.
    - With regards to MD data, Molly has heard that similar data exist when discussing with Maryland contacts, but has yet to see the data. If that historical analysis was made available to her, then that type of analysis could be extended further up the Bay.
- Lewis asked whether we should think about, in terms of parking lot questions, using a multiple model or assessment approach combining SLAMM and the VIMS work presented by Molly.
    - Molly explained that while SLAMM performs well in looking at marsh erosion/accretion, it does not do a great job showing development pressures. However, that sort of data layer could be possibly overlaid with the SLAMM model outputs.

- Zoe came back to Molly's original point about the large impact of marsh erosion and asked whether in the short term with the VIMS work presented, a catalogued and mapped historic trawling dataset could also be used to estimate marsh loss.
    - Molly agreed that Zoe's suggestion would be a very useful piece of information in studying large scale patterns. Many marshes are eroding at two feet per year and need a great deal of low lying land behind the marsh for retreat to be able to occur
- Pat Megonigal then began his presentation, emphasizing that the work done at SERC is more related to forecasting in trying to understand processes.
- The rate of elevation change in wetlands under study was controlled by root growth, and plant productivity is also controlling decomposition.
- SLR can essentially turn off the effects of altered, increased N and CO_2 that help marshes to accrete sediment and gain elevation.
- Peter Tango asked whether reductions in N deposition resultant from regulations put in place by the Clean Air Act were detectable in the study.
    - Pat reiterated that elevated levels of N were used for these experiments, but long term data did not show any detectable trend in export in the Rhode River itself although this may be different on a Bay-wide scale.
- Current work is also focused on determining where growth and accretion curves can be drawn for different marsh plants.
- Philippe stressed the importance of gathering more accurate datums for water elevation levels to correct outdated relative marsh elevations.

Wrap-Up Discussion (Zoe Johnson – NCBO, Sarah Wilkins – Chesapeake Bay Sea Level Sentinel Site Cooperative)

- Tom Ihde posed a question for Lewis regarding methods to refine estimates or the timeframe during which the modeling team will be able to make modifications.
    - Lew said that with the decision making cycles we have at the Bay Program and adaptive management, the issue can be revisited as we also track progress to 2025. There is a period where the tracking framework is frozen and the next phase of the Bay model will be undertaken.
- Zoe asked about Carl's discussion of changes to SLAMM that were completed by Lora Harris?
- Carl discussed some of the changes to SLAMM that were completed by Lora Harris, and Zoe asked what the improvements were that were made for the NWF run.
    - The modifications that were made for the Bay and Chincoteague Bay included the isolation of Chesapeake Bay out of the SLAMM results and bringing the projected changes down to a county level. Lora would still be a better resource to ask about this question.
- Pat said that in earlier generations of SLAMM the feedbacks that could help wetlands keep pace with SLR were unable to be implemented.
- Mark asked whether, in running the model for 2025 vs 2050, uncertainties were so large regarding sedimentation and accretion dynamics that it would even make sense to run it for 2050.
    - Pat said that there may as well be runs as part of the adaptive management process.
- Tom asked if the group was also talking about a modified SLAMM model like that which Molly suggested. Currently shoreline development and hardening is ignored, but it can be added to the model although it would be an extensive process.
    - Currently they may overestimate the amount of marsh that will be existent
    - A conference call was set up for June 20 to further discuss SLAMM modeling efforts, and it would be beneficial to have Peter Claggett at the meeting as well.

- Zoe offered to work with both Lewis and Emil on a slide to better focus the projections of SLR estimates that can be shown to management members within the partnership as well.
- Fredrika said that more wetlands experts are needed in the room to discuss these issues. At this meeting there has primarily been a discussion of uncertainties, a path forward also needs to be outlined.
    - Zoe noted that the CRWG also already has other projects working with the Wetlands WG in the CRWG work plan, specifically the structured decision-making process that has been contracted out to TetraTech.

Participants			
Batiuk	Rich	batiuk.richard@epa.gov	EPA/CBPO
Baxter	Sharon	sharon.baxter@deq.virginia.gov	VADEQ
Becraft	Chris	christopher.becraft@maryland.gov	MDNR
Bennett	Mark	mrbennet@usgs.gov	USGS
Bennett	Rick	rick_bennett@fws.gov	USFWS
Boomer	Kathy	kboomer@tnc.org	TNC
Carlozo	Nicole	nicole.carlozo@maryland.gov	MDNR
Cerco	Carl	carl.f.cerco@erdc.usace.army.mil	USACE
Claggett	Sally	sclaggett@fs.fed.us	USFS/CBPO
Dell	Curt	curtis.dell@ars.usda.gov	USDA
DeMooy	Jennifer	jennifer.demooy@state.de.us	DE DNREC
Hensel	Philippe	philippe.hensel@noaa.gov	NOAA
Hernandez	Kim	kimberly.hernandez@maryland.gov	MDNR
Hinson	Kyle	khinson@chesapeakebay.net	CRC/CBPO/CCWG Staffer
Ihde	Tom	tom.ihde@noaa.gov	NOAA/CBPO
Jacobs	Amy	ajacobs@tnc.org	TNC
Johnson	Cindy	cindy.johnson@deq.virginia.gov	VADEQ
Johnson	Zoe	zoe.johnson@noaa.gov	NOAA
Julius	Susan	julius.susan@epa.gov	EPA
Kopp	Robert	robert.kopp@rutgers.edu	Rutgers University
Land	Sasha	sasha.land@maryland.gov	MDNR
Linker	Lewis	llinker@chesapeakebay.net	EPA/CBPO
McFarlane	Ben	bmcfarlane@hrpdcva.gov	HRPDC
McLaughlin	Erin	emclaughlin@maryland.gov	MDNR
Megonigal	Pat	megonigalp@si.edu	SERC
Merritt	Melissa	mmerritt@chesapeakebay.net	CRC/CBPO/CCWG Staffer
Meyers	Erik	emeyers@conservationfund.org	The Conservation Fund
Mitchell	Molly	molly@vims.edu	VIMS
Mohr	Lori	laumohr@pa.gov	PADEP
Moser	Fredrika	moser@mdsg.umd.edu	MD Sea Grant
Norris	Marian	marian_norris@nps.gov	NPS
Petruncio	Emil	petrunci@usna.edu	USNA
Phelps	Amanda	amanda.phelps@noaa.gov	NOAA

Phillips	Scott	swphilli@usgs.gov	USGS/CBPO
Poeske	Regina	poeske.regina@epa.gov	EPA
Powell	Emily	emily_powell@fws.gov	USFWS
Power	Lucinda	power.lucinda@epa.gov	EPA/CBPO
Raulin	Jenn	jennifer.raulin@maryland.gov	CBNERR
Robbins	Dave	david.w.robbins@usace.army.mil	USACE
Saunders	Kristin	ksaunders@ca.umces.edu	UMCES/CBPO
Schrass	Karl	schrassk@nwf.org	NWF
Subramanian	Bhaskar	bhaskar.subramanian@maryland.gov	MDNR
Tango	Peter	ptango@chesapeakebay.net	USGS/CBPO
Volk	Jenn	jennvolk@udel.edu	UD Cooperative Extension
Wilkins	Sarah	sarah.wilkins@maryland.gov	CBSSC/MD Sea Grant