Chesapeake Bay Program
Science. Restoration. Partnership.

Current Climate Change Research and Resiliency Efforts

Compilation of Efforts, Resources, and Gaps noted by the participants of the Climate Change Workgroup Kick-off Meeting and Survey Participants

December 2014

Workgroup Membership Survey Results

Beyond the Chesapeake Projects/Assessments/Monitoring/Modeling

1) NOAA National Climate Assessment efforts (Brady Phillips)
2) NSF Coastal SEES project, based at VIMS (Tom Ihde - NOAA)
3) USFS regional climate change team (Sally Claggett)
4) Coastal blue carbon (Kurt Johnson)
5) American Bar Association on a national level. (Lara Fowler)
6) Research (3yr EPA project) to evaluate vulnerability of headwater systems that form a nexus with downstream navigable tidal waters to climate change. (Donna Bilkovic)
7) NOAA – Regional Climate Trends and Scenarios for U.S. National Climate Assessment – Reports designed to provide input that can be used in the development of the National Climate Assessment

Chesapeake Region Projects/Assessments/Monitoring/Modeling

1) Colleagues in NOAA are engaged in and support research that dovetail with the resiliency goal, e.g. project to assess the influence of Shoreline Changes on Chesapeake and Delmarva Bay Ecosystems. (Suzanne Skelley)
2) Joint EPA-NOAA report on incorporating climate change considerations into stormwater planning efforts
3) Impacts of climate change on coastal areas – including the Chesapeake. Current efforts are focused on how circulation, tides, salinity, etc., may be altered by climate change. This research could inform the monitoring and assessment outcome. (Ray Najaar)
4) Current NSF Coastal SEES project that is examining the dynamics of the coupled human-natural system in the Chesapeake in response to climate change adaptation strategies (Donna Bilkovic)
5) Current and future research projects (VIMS) involving studying the effects of climate change on Chesapeake Bay. (Marjy Friedrichs)
6) NOAA – Chesapeake Atlantis Model – An approach for conducting formal management strategy evaluation – a simulation that accounts for tradeoffs in performance across a range of management objectives.
7) USGS Report: Stream temperature rising throughout the Chesapeake Bay region
8) Potential climate-change impacts on the Chesapeake Bay, Najjar et al.

Targeted Projects/Assessments/Monitoring/Modeling & Case Studies

1) Chesapeake Bay Sentinel Site (ODU) - Human Built Workgroup (Michelle Covi)
2) Hampton Roads Intergovernmental Pilot Project (Michelle Covi)
3) Cooperative Oxford Lab conducts research that may inform climate resiliency planning efforts in the region. (Suzanne Skelley)
4) ODU Pilot Project (Michelle Hamor)
5) Secure Commonwealth Panel (Michelle Hamor)
6) Virginia Piedmont vulnerability (Kurt Johnson)
7) Patuxent River Robust Decision Making analysis of climate and land use change effects on attaining nitrogen, phosphorous and sediment targets (Susan Julius)
8) Urban resilience to climate change indicators and case study for Washington, DC (Susan Julius)
9) Working on climate change issues at Penn State (Lara Fowler)
10) Climate change issues within Chesapeake Bay NEER (Jenny Allen)
11) MDNR data sets including water quality, elevation change, vegetation, groundwater (Jenny Allen)
12) VA Chesapeake Bay Sentinel Site Program (Willy Reay)
13) VA National Estuarine Research Reserve Program (Willy Reay)
14) DE climate change assessment: Delaware Climate Change Impact Assessment (March 2014) planning: Delaware Executive Order 41 implementation (Jennifer DeMooy)
15) Mallows Bay National Marine Sanctuary nomination. Discussion to use sanctuary as sentinel site to monitor climate change and test adaptation options (Kimberly Hernandez)
16) Co-PI, NSF Water, Sustainability and Climate (WSC)-Category 1 Collaborative Proposal: Coupled Multi-scale Economic, Hydrologic, and Estuarine Modeling to Assess Impacts of Climate Change on Water Quality Management Easton, Z., Sample, D., Bosch, D., Najjar, R., and Li, M.
17) A Storm Surge and Inundation Model of the Back River Watershed at NASA Langley Research Center, Jon Derek Loftis and Harry V. Wang, VIMS

Sea Level Rise/Flooding

1) Recurrent Flooding Subpanel and Joint Legisalative Committee for Recurrent Flooding (Michelle Hamor)
2) Hampton Roads Planning District Commission Special Commission on Sea Level Rise (Michelle Hamor)
3) Major project involves identification of a green-infrastructure based coastal resiliency regional plan in central MD addressing both freshwater river/stream corridors and also coastal areas to address reduction of flood and coastal storm damage driven in frequency/intensity by climate change. (Eric Myers)
4) COME HIGH WATER: Sea level Rise and Chesapeake Bay – A special report by Chesapeake Quarterly and Bay Journal

Local Engagement

1) NOAA Education efforts related to climate (Bart Merrick)
2) Communication efforts in sea level rise, supporting climate research, extension agents are engaged with communities discussing climate resiliency (Fredricka Moser)
3) Climate Communication Consortium of Maryland (Patricia Harcourt)

4) Advancing greater involvement of water advocacy organizations in climate resiliency. (Claudia Friedetzky)
5) Development of a Citizen's Academy to train residents how to use existing land use decision tools to control shoreline development/enhance resiliency. (Skip Stiles)
6) COG has the ability to serve as a conduit between Climate Change group and local governments and local groups to hear the questions of implementers. (Tanya Spano)
7) Graying Green: Climate Communication for an Aging World (Mick Smyer)

Key Species Monitoring/Modeling

1) Eastern Brook Trout (Kurt Johnson)
2) SAV, leading Technical Synthesis 3 effort which includes chapters on both Climate Change explicitly and also impacts of extreme events of varying intensity, duration and seasonal timing on SAV. (Lee Karrh)
3) NOAA – Chesapeake Bay Fisheries Ecosystem Model – An exploratory tool that helps scientists and others understand the Chesapeake Bay Ecosystem.
4) NOAA – Ecosystem Modeling – Develop and hones tools to support ecosystem-based management of the Chesapeake Bay's natural resource, including fisheries.

Adaptation Planning

1) Climate change and stormwater design guide (Susan Julius)
2) Ongoing research on the use of living shorelines as a form of erosion protection and their role as estuarine habitat conservation Strategies (Donna Bilkovic)
3) CBC has many initiatives to promote land conservation, enable improved local government capacity, re-establish and protect wetlands and oyster reefs and promote sound growth, all of which dovetail with resiliency efforts. (Ann Swanson)
4) D.C.'s Climate Adaptation Plan (Kate Johnson)
5) Principal Investigator for project that will be undertaking salt marsh resiliency practices at Blackwater NWR and vicinity (thin-layer marsh elevation, nature-based tidal exchange design for transitioning upland, phragmites mapping and eradication, nutria eradication, crop substitution in transitioning fields, and edge forest adaptive management for changing habitat needs) (Eric Myers)
6) Mapping, adaptation actions including conservation protection priorities and SW management measures and best practices for governance at local/regional level are among output goals. (Eric Myers)
7) SAGE Initiative (Systems Approach to Geomorphic Engineering) to integrate green, gray (built) and non-structural approaches for improved coastal protection from storms and sea level rise. Involved with leadership team in developing pilot projects, creative financing recommendations, and other measures to advance applied engineering and practice of SAGE. (Eric Myers)
8) Va Sea Grant -funded adaptation design effort in Norfolk, to increase ecosystem services while protecting against flooding. (Skip Stiles)
9) Development of a flooding phone app to crowdsource flooding/sea level rise information and assist inundation model development, (Skip Stiles)
10) Development of NFIP manual to show localities how to protect ecosystems from sea level rise and get flood insurance credits. Similar work with MS4/WIP BMP's to show how shoreline restoration/open space/conservation landscaping gets storm water pollution credits - "cobenefits"(Skip Stiles)
11) Maryland Coastal Resiliency Assessment (not yet kicked off) (Nicole Carlozo)

12) Coastal Development Planning – MDNR (Kate Charbonneau)
13) NWF's Climate Change Adaptation Reports

Climate Change Kick-Off Meeting Break-Out Sessions

Adaptation

Adaptation Planning/ Assessments

1) NSF Project
    a. Just getting underway is a project headed by P.I. Zachary Easton (VT) examining climate change effects across the landscape, particularly with respect to agriculture BMPs and urban BMPs.
2) Necessity of reliance on models to help simulate conditions not seen in observed data to date
    a. Ecopath with Ecosim (EwE), Chesapeake Atlantis model
    b. Most modeling efforts examine habitat loss, focus on marsh, some SAV, oyster reef populations, differing circulation patterns, storm surge
3) Data resource being developed by D.C. for a Climate Adaptation plan
    c. Downscale climate data that is D.C. specific
    d. Need for more data on extreme precipitation events
    e. Philadelphia just did a very similar analysis
4) NWF has done substantial work on climate adaptation (Lea has link)

Using Key Species

1) SAV Technical Synthesis Document
    a. Chapter on SAV resiliency to extreme events, chapter on response to climate change in general. This is to be completed in December 2015.
2) NWF did vulnerability assessment for a number of species in the Patuxent
3) SERC examining effects of increasing CO_2 and temperature on the growth and stability of phragmites

Sea Level Rise/Flooding

1) Erik Meyers – Conservation Fund
    a. Working with Audubon, USFWS, and DNR examining impacts of sea level rise on salt marsh on the Eastern Shore: Beyond the assessment document there are a set of integrated strategies from restoration strategies to slow down the rate of loss, to transition strategies for addressing upland areas which will become marsh, other strategies which help to identify key migration corridors for the future as sea level rises.
    b. Further work with USGS on Green infrastructure, to be executed under the Greater Baltimore Wilderness Coalition
        i. Nothing specific has yet been written, there has been some examination of Baltimore reservoirs

Targeted Efforts/ Case Studies

1) RDM (Robust Decision Making) approach around the Patuxent
    a. Uncertainties concerning BMP effectiveness, Land Use, Population Growth. Work done may be similar to that being addressed in the climate change workgroup
2) DE also did downscaling
    a. Developed temperature and precipitation indicators, completed by Katharine Hayhoe (also tasked with D.C.'s downscaling)
    b. Projections may be applicable to much of the Delmarva peninsula
3) UMD Project concerning impacts of climate change on rivers in western MD, research design was occurring a year ago

4) N. Atlantic Landscape Conservation Cooperative works with a number of potentially relevant data layers related to climate and resilience. Project about science delivery of those data layers, entitled "Envisioning the Susquehanna", is funded by the Chesapeake Conservancy. May be related and tied into work done by Mid-Atlantic Regional Ocean Agreement Climate Change Workgroup

Local Engagement/ Public Involvement

1) On DEAL island area there have been several projects funded by EPA and NWF examining socioeconomic issues and marsh environments that are being submerged
2) Discussion suggested concerning a targeted workshop with local representatives and state legislators pertaining science and policy making

Misc.

5) NOAA Project Ecoforecasting of Pathogens link
    a. Model is published, although the tool is not openly available the status could be sped up
    b. Could help to find the most suitable habitat for pathogens

Monitoring & Assessment

Beyond the Chesapeake

1) Mid-Atlantic tidal wetland rapid assessment method, Trust Fund has a WQ Monitoring strategy. (Nicole Carlozo)
2) NOAA Buoy system which is part of a sentinel site cooperative, an observing system associated with MARACOOS detecting: water level, individual studies on impacts, weather service with radars to detect temperature change (Peyton Roberts)
3) Data sets of hydrological modeling of stream flow across the US with all the Army Corps of Engineers climate models. (Britta Bierwagen)
4) Army Corps of Engineers has climate change response work underway, efforts to inventory elevations of different projects looking at vulnerability of projects due to inundation/flooding/climate change.
5) Army Corps of Engineers did a North-Atlantic coast comprehensive study.

Chesapeake Region

1) ACTION: Put together a document on the suite of climate modeling efforts at the Bay Program and make connections with NOAA colleagues for fisheries modeling. Also with an awareness of what monitoring is going on in the area with the sentinel sites and more (contact: Peter Tango), connection to modeling (Lew Linker) and keep the connection to the WQ GIT (Rich Batiuk)
2) EPA Report – Regional monitoring networks: a streams effort, to help states that do a lot of stream monitoring for other purposes besides climate change, to supplement what they're doing for a better special and temporal view to better understand climate effects. (Britta Bierwagen)
3) The WQ monitoring the infrastructure is there in the Bay, the question is what we are after to monitoring climate resiliency (i.e. new technologies, new parameters, and/or resolution).
4) COG has handout from NASA with latest basic temperature, precipitation, and downscale data for Chesapeake.

Targeted Efforts/Case Studies

1) DNR co-op evaluating habitat restoration on the Patuxent River, planning for habitat restoration using climate resiliency measures, shoreline types and impacts, satellite information detecting sea surface temperature (Peyton Roberts)
2) COG also has monitoring data for pre & post BMP implementation mostly of stream restoration and urban BMP's.
3) On the nontidal side – EPA is working on a way to more easily visualize and understand the outputs from different climate change models/tools/scenarios in different areas. (Britta Bierwagen)
4) Wetlands Vulnerability Assessments (with Denice Wardrop) using Patuxent as one of its case studies. (Britta Bierwagen)
5) NCOS working on a project with NEERS in the Bay working on place based/local data collection.
6) VIMS sentinel site cooperative USGS hosts the databases.
7) Recent Patuxent climate study. (Army Corps of Engineers?)
8) MD Localized data: Chesapeake Bay Reserve there is plenty data to share from MDNR (i.e. elevation, water quality, ground water) (Jenny Allen)

Sea Level Rise/Flooding

1) NOAA Nuisance flooding report
2) COG has programs dealing with nuisance flooding – working with FEMA, DC water work with massive tunnels detecting the impacts of changing frequency of major precipitation on tunnels.
3) USGS Report on subsidence. Groundwater withdrawal rates are a good measure of sea level rise.
4) WASHCOG has trend data on groundwater wells. Good parameter for the measure of sea level rise (Tanya Spano)

Local Engagement/ Public Involvement

1) National center for coastal ocean sciences has a team looking at Socio-economic impacts & aspects of coastal management systems (NOAA colleague)

2) WASHCOG is addressing drinking water, stormwater, wastewater, and water quality issues. Climate work with NASA and NOAA. Translating climate information to local governments and local groups. (Tanya Spano)
3) South River Federation looks at impacts on the local scale. Experience of on-the-ground stream restoration with federal and state money, therefore having an understanding of resiliency to storms can prevent occurrences of blown out restoration projects resulting in negative impacts and wasted money. (Diana Muller)

Key Species

1) For Fisheries – MDNR has a good database on fish species but not set up to detect climate impacts, however, temperature and salinity for fish behavior is monitored, and there is a record of trade-off of species due to changing temperatures. (Nancy Butowski)
2) NOAA has been working on a climate change vulnerability assessments tool for key fish species, template to apply to fish species in the Chesapeake Bay.

Other Climate Change Groups

1) Woods Hole climate team has a suite of models, Earl is willing to play the liaison between the Climate Change Workgroup and the Woods Hole team. (Earl Meredith)

CBPO Goal Team Needs from the Climate Change Workgroup

1) ACTION: Peyton and Rich will create a cross-matrix to thinking of the needs/priorities of the other goal teams and climate challenges.

Monitoring & Assessment/ Member Involvement Gaps

1) Hydrology and precipitation modeling from the shoreline enhancement perspective. (Nicole Gabazo)
2) Learned from the VIMS sentinel site that there is a need for more local data because that's where the decisions are being made. Place based information into the forecasting models (i.e. emerging wetlands and SAV) monitoring can be pushed out to the greater Bay.
3) A desire for more USGS and NASA colleagues to get involved in the climate resiliency conversations. As well as, groundwater resources groups.
4) Non-traditional partner data.
5) Need for the conversations in the Climate Change Workgroup to be clearly explained to the local groups planning and implementing the restoration projects to explain suggestions to reduce the occurrence of storm-ruined restoration projects.
6) Missing partners – coal and fracking industry or private businesses such as BP and Exelon who have a lot of data on climate change.
7) Emissions data. Looking at implementation of GHG on management actions.