Climate Resiliency Management Strategy
Biennial Work Plan
(2016-2017)

DRAFT 10/19/15

Monitoring & Assessment Outcome: Continually monitor and assess the trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystem, including the effectiveness of restoration and protection policies, programs and projects.

Management Approach #1 - #3: Define Goals and Establish Baselines; Develop Conceptual Monitoring, Modeling and Assessment Model; and Prioritize Climate Impacts

Key Actions

1. Develop and implement a methodology to establish climate related goals and baselines for individual Chesapeake Bay Agreement Management Strategies.
    a. Select two Management Strategies to conduct thorough documentation and evaluation.
    b. Complete a Literature Review of existing ecosystem-based climate resiliency approaches, aids (e.g., tables, matrices) and processes or decision making products.
    c. Compile existing climate change vulnerability research and data, including available assessment products and tools, specific to protected lands and wetlands within the Chesapeake Bay region.
    d. Design a Climate Resiliency Analysis and Decision-Making Matrix for Protected Lands and Wetlands. The matrix is intended to be used to conduct a structured decision-making process to : 1) review management goals and outcomes and establish baselines; 2) identify data, research, monitoring and assessment needs; 3) evaluate the effectiveness of existing BMP's; and 4) consider appropriate adjustments, revisions or modifications to proposed management actions or best management practices.

Facilitate in-person workshops with select Work Groups to: 1) complete Matrix Analysis process and revise, modify, prioritize and select management actions for integration into Management Strategies; and 2) to develop recommendations for augmenting existing Manage **Approaches Targeted to Local Participation**

    e. ment Strategies through the "Adaptive Management" framework.
    f. Refine matrix and recommend implementation process for applying matrix analysis and decision-making process to other Management Strategies.

Management Approach # 4: Design monitoring and modeling plan

Key Actions

1. Identify and evaluate the continuity of existing monitoring data and models available within federal agencies, state partners, and academic partners, to explain the relationship of the future impact of climate to specific outcomes.
    a. Work with individual GIT's and work groups to determine current and future monitoring needs by geography, habitat type, and BMP.
2. Identify and evaluate the continuity of existing monitoring data and models within federal agencies, state partners, and academic partners, to explain climate factors of interest to the Bay Program Partnership (i.e., sea level rise, precipitation, temp) at the watershed scale.
    a. Work with its regional offices, states, tribes, river basin commissions and other entities to establish Regional Monitoring Networks (RMNs) for freshwater wadeable streams (U.S. EPA).
    b. Monitor a number of sites in the Susquehanna River watershed for thermal changes. (Susquehanna River Basin Commission)
    c. Incorporate RMN sites into the existing Water Quality Network (WQN). The WQN is a long-term monitoring program with approximately eleven long term continuous monitoring sites operated by USGS on large river systems. These sites will be useful in future climate analysis. (PA DEP)
3. Catalogue monitoring and modeling gaps.
    a. Outline gaps at work group or GIT level.
    b. Outline gaps for watershed scale monitoring effort.
        i. Explore need for consistent bay-wide wetland monitoring in freshwater tidal and non-tidal wetlands (already have marsh monitoring in sentinel sites but not comparable effort for non-marsh sites). (EPA Region 3)
        ii. Identify gaps related to monitoring of non-climate stressors that will exacerbate climate impacts to Chesapeake Bay habitat or BMPs.
4. Identify gap-filling solutions by expanding the Partnership to include identified ongoing or planned monitoring efforts of climate factors.
    a. Examine current and future monitoring needs by geography, habitat type, etc. (Chesapeake Bay Sentinel Site Cooperative (CBSSC))
    b. Explore the use of citizen-based monitoring networks.
    c. Identify and examine groups using new technology and assessment methods for tracking climate factors.
    d. Participate in regional climate forums for networking and identifying new partnership opportunities.
5. Develop a plan to fill identified gaps.
    a. Identify costs associated with closing those gaps.
    b. Identify agencies/organizations through which commitments could be sought to fund or participate in closing those gaps.

c. Identify geographical overlap in monitoring efforts to explore opportunities for cost saving efficiencies and integration of priorities to include climate factors.

<u>Management Approach # 5</u>: Assess past and future trends in sea level, precipitation patterns, temperature, and ecosystem response and conduct assessments.

<u>Key Actions</u>

1. Establish guidance on the application of climate change scenarios, projections and realizations for CBP assessments.
    a. Evaluate applicability of international, national, regional and state climate scenarios, projections, forecasts and assessments for use in CBP assessments.
        i. U.S. Global Change Research Program (USGCRP) and the National Ocean Council (NOC) effort to launch in 2016 - U.S. Global Change Research Program (USGCRP) and the National Ocean Council (NOC) to develop, for the first time ever, a set of sea-level rise scenarios out to 2100 that combine national coverage with regional specificity, and that address not just sea-level rise itself, but also the associated coastal flood hazards that create risks for communities. This effort will launch in 2016. (EPA Region 3)
    b. Facilitate a workshop to develop process for establishing a recommended set of climate projections for use in Chesapeake Bay Program assessments. (STAC)
2. Conduct a literature review and synthesis of latest scientific research on past and future climate change impacts on the Chesapeake Bay, as was done in the 2008 STAC report.
    a. Compile and assess international, national, regional and state-level climate change assessments.
        i. Report on PA Climate Impacts and Assessment, a report that is required to be updated every 3 year. PSU researchers have been contracted to provide an assessment report to PA DEP. The most current report was updated in August 2015 (still draft and accepting comments through November 2015). (PA DEP)
    b. Synthesize latest scientific research on bay acidification and potential impact on Chesapeake Bay waters.
        i. Review findings and recommendations of MD's Bay Acidification Task Force Report. The group presented recommendations for monitoring and addressing acidification and its effects on Maryland's commercial fishery and aquaculture industry in January, 2015. (MD DNR)
    c. Synthesize latest scientific research on sea level and water level trends.
        i. Partner with the Chesapeake Bay Sentinel Site Cooperative to provide information to Chesapeake Bay communities and managers who need to

address challenges such as storm flooding, long term, local sea level rise, barrier island movement, degraded water quality, and wetland loss.

ii. Compile a report on local water trends, subsidence, ocean dynamics, projections from national and state assessments and current and planned projects. A draft report should be completed by the end of 2015. (Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project's Science Advisory Committee)

d. Synthesize latest scientific research on precipitation and evapotranspiration.
e. Synthesize latest scientific research on temperature change in both air and water.
f. Synthesize latest scientific research on ecosystem response.

<u>Management Approach # 6</u>: Develop a research agenda to improve understanding of climate impacts or fill critical data or research gaps.

<u>Key Actions</u>

1. Examine individual management strategies and biennial work plans and outline list of research needs.
    a. Conduct a cursory review and analysis of 29 individual management strategies to identify initial climate-related research needs.
    b. Conduct a more thorough assessment of research needs to support future policy dialog related to the integration of climate change considerations into the Water Quality Management Strategy.
    c. Conduct a more thorough assessment of research needs to support integration of climate change considerations into the Protected Lands and Wetlands Management Strategy.
    d. Compile a research agenda to improve understanding of climate impacts or fill critical data or research gaps.
2. Work with regional partners, academic institutions and other stakeholders to collaboratively define climate related science and research needs at the broader watershed-scale or within a defined geographic area.
    a. Schedule meetings with NE and Appalachian Landscape Conservation Cooperatives and NE USDA Climate Hubs.
3. Undertake targeted research to improve understanding of climate impacts or fill critical data or research gaps.
    a. Implement the Coastal SEES: Chesapeake Bay Sustainability: Implications of Changing Climate and Shifting Management Objectives. The project aims to develop an advanced modeling framework that integrates the physical, biogeochemical, and human components needed to simulate and select climate change adaptation strategies that will support a sustainable system. (VIMS)

b. Conduct the "Chesapeake Bay Climate Sensitivity Assessment using weather, water, biological, and climate data from a variety of sources and a state of the art biophysical model (the Chesapeake Bay Ecological Prediction System). (NOAA)
c. Undertake the Phase II Choptank Watershed Vulnerability Assessment (NOAA/NCCOS)

<u>Management Approach (Adaptation) # 1</u>: Compile and assess current adaptation efforts and lessons-learned

<u>Key Actions</u>

1. Compile and synthesize available data, tools and resources that can be used to support CB region vulnerability assessments.
    a. Explore USFWS training to CSWG and other interested parties on the NE Vulnerability Assessment (USFWS) Climate Change Vulnerability Index (CCVI). This tool enables a rapid, scientifically defensible assessment of species' vulnerability to climate change.
    b. Develop a vulnerability assessment guidance document for NER parks based on lessons learned from completed and ongoing NER vulnerability assessments and the broader existing literature and resources applicable to coastal parks. (NPS Northeast Region collaborators at the University of Rhode Island)
    c. Undertake a follow up vulnerability assessment building on that guidance for Colonial National Historical Park beginning in 2016. (NPS)
    d. Conduct an evaluation of existing water level and sea level rise data, research, studies, tools, and models. (Chesapeake Bay Sentinel Site Cooperative (CBSSC))
2. Compile and assess lessons learned from past and ongoing adaptation planning and programmatic efforts within the Chesapeake Bay Watershed.
    a. Develop need and format for information to be gathered and a methodology for updating list and synthesis on a continual basis.
    b. Informed by Step 2. a. above, work from Appendix B to compile an expanded list of current planning and programmatic efforts that support key elements of the Management Strategy.
    c. Document lessons learned through the implementation of its statewide Delaware Wetland Management Plan, which incorporates climate change impacts to wetland resource management strategies. (Delaware)
    d. Assess status of proposed federal actions identified in the 2010 “Strategy for Protecting and Restoring the Chesapeake Bay Watershed” (Federal Leadership Committee for the Chesapeake Bay)

e. Track local government and water agency climate adaptation efforts in the MWCOG region and will develop recommendations for how to replicate effort in other geographic areas. (MWCOG)
f. Explore the development of a spatially explicit adaptation project/plan database for the Mid-Atlantic Region after EPA Region 2 effort. (EPA Region 3)

Management Approach # 7: Review progress and reassess implementation priorities

Key Actions

1. Review progress on a biennial basis.
    a. Create process to evaluate progress toward the closing of gaps in baseline monitoring and gaps in assessment tools and scientific research.

Approaches Targeted to Local Participation

Approach #1: Undertake Public, Stakeholder and Local Engagement

Key Actions

1. Increase availability and access to monitoring and assessment data.
    a. CBP to explore need, utility and format for a climate data and information portal and/or identify another form for dissemination.
    b. Share and disseminate recently published a set of projections in temperature and precipitation for the DC metro area: http://green.dc.gov/publication/climate-projections-scenario-development. (District of Columbia)
    c. Launch climate data portal to provide access to climate projections data (temperature and precipitation) based on downscaling analysis conducted in 2013. (Delaware)
    d. Develop the Virginia Coastal Adaptation Data Portal, which Virginia is supporting and that is being developed by William and Mary's Virginia Institute of Marine Science. (Commonwealth of Virginia)
    e. Disseminate information to metro Washington local government staff and stakeholders through existing committees or website posts and will share lessons learned with other metro regions. (MWCOG)

Adaptation Outcome: Continually pursue, design and construct restoration and protection projects to enhance the resiliency of the Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms and sea level rise.

Management Approach # 3: Review and revise conservation, restoration and protection goals and objectives.

Key Actions

1. Develop process to revise or reconsider Watershed Agreement Management Strategies to accommodate anticipated climate-related changes or impacts.
    a. Create a Climate Resiliency Analysis and Decision Making Matrix to enable the assessment of climate impacts on existing management goals and outcomes and the effect of climate change on the performance of specific management practices (BMPs).
    b. Facilitate in-person workshops with Wetlands and Protected Lands Work to complete Matrix Analysis process and revise, modify, prioritize and select management actions for integration into Management Strategies; and 2) to develop recommendations for augmenting existing Management Strategies through the "Adaptive Management" framework.
    c. Develop recommendations for refinement of matrix and a proposed implementation process to engage one-on-one with GITS and work groups to identify, assess, evaluate and revise (as necessary) all individual CB Agreement Management Strategies.

Management Approach # 5: Increase the institutional capacity of the Chesapeake Bay Program to prepare for and respond to climate change.

Key Actions

1. Work with partners to host a "Chesapeake Bay Climate Adaptation Workshop" or offer adaptation related trainings at appropriate regional forums and conferences.
    a. Participate in the Maryland Sea Grant: Climate Change Research Forum (December 9, 2015)
    b. Participate in the NE Climate Preparedness Conference – Baltimore (April 4-5, 2015)
    c. Participate in the National Adaptation Forum (2017)
    d. Conduct outreach and offer trainings to state, local, and other partners interested in applying the Coastal Resiliency Assessment. (Maryland)
2. Increase opportunities for formal and informal communication and the exchange of ideas among the Chesapeake Bay watershed's existing "adaptation planning network."

a. Develop a framework and list of organizations within the "Chesapeake Bay Adaptation Network."
b. Explore formation of a community of practice on climate change communication. (DC-CUSP)
c. Explore creation of a wetland community of practice (EPA Region 3, POESKE)
d. Explore creation of a new CoP around using "Green Infrastructure" for climate resiliency. (The Conservation Fund)

3. Facilitate climate adaptation planning and project implementation guidance.
    a. Develop a "Flood Avoidance and Design Guidance" document for Delaware state agencies, under Executive Order 41, to use in the development of state projects. (State of Delaware)
    b. Maryland to conduct a Coastal Resiliency Assessment to identify conservation and restoration priorities along the shoreline based on shoreline and community exposure to flooding, storm surge, sea level rise, and wave action. (State of Maryland)
    c. Apply EPA's wetlands vulnerability framework to several areas within the Chesapeake Bay to understand how to apply climate change science to assess wetland vulnerability and the key factors that affect tidal and nontidal wetlands vulnerability to inform climate adaptation. (EPA Region 3)
    d. Implement Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project. The mission of the Pilot Project is to develop a regional "whole of government" and "whole of community" approach to sea level rise preparedness and resilience planning in Hampton Roads. The Pilot Project consists of a Steering Committee, Legal Working Group, Infrastructure Planning Working Group, Private Infrastructure Advisory Committee, Public Health Working Group, Land Use Planning Work Group, Citizen Engagement Working Group, Senior Advisory Committee, Economics Impacts Advisory Committee and a Science Advisory Committee. (Hampton Roads)
4. Explore mechanisms to encourage the integration of climate change considerations in the design and implementation of on-the ground "protection" and "restoration" efforts.
    a. Identify opportunities to expand EPA Climate Change and Stormwater Design Guide for Chesapeake Bay specific practices, soils, and climate changes, drawing on information from across EPA and other Agencies. (EPA)
    b. Undertake planning project on use of green infrastructure to increase regional resiliency to coastal storms and climate change project supported by NFWF in central MD (parts of 7 counties + major cities) to be completed in third quarter 2016. (The Conservation Fund, APA, USGS MD-DE-DC Water Science Center, Chesapeake Conservancy).
    c. Track Department of Interior Metrics Expert Group (MEG) recommendations for measuring effects of ecological resilience projects to protect key features/ systems

and some forms of grey infrastructure against effects of coastal storms and climate change effects (e.g., sea level rise, storm surge).

d. Concentrate federal resources within the Choptank Habitat Focus area to improve the decision-making and resilience of coastal communities by improving the delivery of NOAA's habitat and climate science. (NCBO)

5. Identify funding availability, needs and mechanisms.
    a. Review, update, and prioritize the recommendations of VA's 2008 Climate Change Action Plan and identify sources of revenue to fund the implementation. One recommendation in from the Commission is a green infrastructure bank of resilience projects and clean energy investments. (VA Climate Change and Resiliency Update Commission)
    b. Integrate consideration of resiliency into the state's Working Waterfronts Program. DNR to offer Working Waterfronts Enhancement Grants to local governments to support revitalization of working waterfront communities and economies. Maryland will seek projects that consider natural resource conservation and/or restoration, potential flooding, storm surge impacts, and MD's Climate Change and Coast Smart Construction Infrastructure Siting and Design Guidelines. (State of Maryland)
6. Identify and assess institutional barriers.
    a. Work with the Protected Lands and Wetland work groups to develop list of policy, programmatic and regulatory enhancements that will increase capacity
    b. Explore opportunities to form new partnerships with entities such as the Sea Grant Law Clinic, the William and Mary's Coastal Law and Policy Center or Georgetown's Climate Center, to support projects to conduct targeted policy and regulatory analyses. (Maryland Sea Grant)

Management Approach # 6: Implement priority adaptation actions

Key Actions

1. Plan and implement targeted restoration and protection efforts that build community and ecosystem resilience within the Bay watershed.
    a. Implement the Urban and Community Forestry Initiative. The draft plan seeks to utilize the planting and maintenance of trees in urban and community settings to increase carbon storage and to reduce residential, commercial, and institutional energy use for heating and cooling purposes. (PA)
    b. Identify additional projects proposed or planned by CB partners, likely to be implemented within the next two years.
    c. Assess opportunities to modify planned project designs to accommodate for climate considerations, develop metrics for and/or monitor a specific projects performance over time.

2. Pursue implementation of "pilot projects" to test new and emerging design principles and implementation methodologies.
    a. Participate in the SAGE Chesapeake Bay Pilot to develop "living" models of green/gray infrastructure for coastal community protection and improved resilience of natural resources; evaluate alternative SAGE project financing approaches; share information across federal, state, and local agencies, NGOs, academic institutions, and multiple business sectors (e.g., engineering, finance).

Management Approach #7: Track adaptation action effectiveness and ecological response

Key Actions

1. Assess progress towards the full integration of climate resilience considerations into the Chesapeake Bay Program.
    a. Develop a questionnaire or matrix to document programmatic baselines and monitor the status and progress towards incorporating climate factors into individual management strategies.
2. Develop a suite of climate resilience indicators to assess adaptation action effectiveness and ecological response.
    a. Review other climate indicator frameworks (USGRCP and US EPA Climate Change Indicators (http://www3.epa.gov/climatechange/science/indicators/) to assess suitability for application to CBP related activities.
    b. Work with UMCES, IAN to identify lessons learned through the development process for the Climate Resilience Index (2015).
    c. Work with STAR and STAC to recommend and establish performance metrics and/or indicators to assess Climate Resiliency Goal and Outcome implementation effectiveness, as well as ecological response.

Approaches Targeted to Local Participation

Management Approach #1, #2, #5: Undertake Local, Public and Stakeholder Engagement & Conduct Targeted Education and Outreach

Key Actions

1. Share current efforts, including policy, tools, products, and scientific understanding with interested parties.
    a. Work with CBP Communications Work Group to release a periodic newsletter to disseminate adaptation-related information.

b. Conduct 14 listening sessions across PA to hear comments from citizens regarding the development of Pennsylvania's plan to comply with the Federal Clean Power Plan. DEP plans to submit a draft plan to EPA by September 2016. (PA)

2. Test and develop new communication tools that are audience specific so that climate information is accessible and understandable across multiple audiences and communities.
    a. Provide educational opportunities and training related to effects of climate change on human and estuarine systems to increase public awareness and foster behavior change. (Chesapeake Bay NERRS)

<u>Approach #3:</u> Foster a larger discussion on the linkage between climate impacts and diversity

<u>Key Actions</u>

1. Work with the Diversity Action Team to identify and pursue opportunities to create a strong linkage between the Climate Resiliency and Diversity Management Strategy.
    a. Identify a Climate Resiliency Work Group member to serve on the Diversity Action Team.
2. Undertake targeted efforts to engage diverse stakeholders.
    a. Add a "diversity climate change" filter to BMP targeting efforts. (State of Maryland)
    b. Include “social vulnerability” in the statewide coastal resiliency assessment to initiate discussions about equity and diversity. (State of Maryland)
    c. Identify opportunities to use/ increase coastal green infrastructure for resiliency has an equity–related objective to increase benefits of projects to underserved communities. (Greater Baltimore Wilderness Coalition)
    d. Add an interpretive component to climate change vulnerability assessments being conducted for each park. (NPS)
    e. Connect local policymakers and public advisory committees with this information on diversity and climate change (MWCOG)
    f. Launch a Resilience AmeriCorps Pilot Program (2-year pilot program) to assist vulnerable communities that lack the capacity to address climate-resilience planning and implementation. (Norfolk)
    g. Establish new Equity work group (2015). (Greater Baltimore Wilderness Coalition)