Beyond 2025 Climate Small Group Recommendations

Recommendation: Develop and Implement a Framework for a Climate Adaptive Bay and Watershed of the Future.

Rationale: Climate change is rapidly and significantly altering the Chesapeake Bay and its watershed. As detailed in the CESR report, it is infeasible to return the Bay to its pre-colonial state. Therefore, the Chesapeake Bay Program (CBP) must work with partners and communities to envision a Bay of the future and enact climate adaptive measures to support a healthy system given anticipated changes. To tackle this wider range of climate challenges the CBP needs to embrace an overall climate framework and the capacity to support it.

Strategies:

- **Align Chesapeake Bay Agreement goals with climate change:** Evaluate existing and proposed Bay Agreement goals for alignment with climate change projections and multiple benefits. Develop new goals that are compatible with anticipated future conditions and that support a healthy, equitable, and resilient Bay. The role of climate factors (e.g., sea level rise, inland flooding, warmer Bay and watershed temperatures, increases in precipitation) and indirect effects of climate on the ecosystem (e.g., shifting species and habitat ranges, competition from non-native species) in influencing outcome attainability can be more explicitly addressed for all outcome management efforts moving forward.
- **Establish a more holistic climate adaptation goal(s) and set numerical outcomes**: In addition to updating Bay Agreement goals to account for climate change, the CBP needs to set broader adaptation goa. Once climate adaptation goals are established, corresponding numeric outcomes/indicators should be developed (e.g., acres of land/water benefiting from climate adaptive management; acres of nature-based solutions that are increasing the climate resilience of habitats and communities). **Numeric outcomes/indicators are** essential to assessing meaningful progress toward a healthy Bay given projected climate impacts and ensuring investment in climate adaptive strategies.
- **Invest in climate adaptation initiatives:** Identify and support strategies essential to adapting Bay conditions to anticipated climate change impacts. Given limited resources, prioritize climate adaptation investments that address key vulnerabilities and advance broader management objectives, developing systems of evaluation need to plan and prioritize, think strategically about investments.
    - **Climate adaptation science:** Enhance science to support understanding of anticipated changes and then support our built and natural environments in adjusting to those changes.
    - **Integrate climate projections into strategies:** Update current practices, such as land use planning and restoration, to account for anticipated climate change impacts (e.g., increasing the capacity of stormwater BMPs to handle larger storm flows, protecting future marsh migration space, increasing access to green space in Environmental Justice communities to address increasing temperatures). Steering adaptive management to support preservation/resilience. Prioritizing and incentivizing strategies that consider multiple benefits.

- **Adapt partnership structure and increase capacity to effectively advance integration of climate considerations:** The CBP should evaluate how to adapt its structure to prioritize climate change and build capacity to integrate climate considerations across the partnership. Currently, the Climate Resiliency Goal is compartmentalized under the Scientific, Technical, Assessment, and Reporting (STAR) team of the Chesapeake Bay Program. While this structure facilitates scientific and technical advancement, it limits the cross-work needed to accelerate ecosystem resilience at the program and policy-level. Examples of changes could include establishing a Climate Resiliency Goal Implementation Team/Structural Unit and a science support team focused on improving CBP knowledge and capacity to apply scientific capabilities to respond to climate vulnerabilities. Education across CBP in greenhouse gases, water quality, and air emissions co-pollutants and public health indicators should be included in training materials.
- **Apply structured decision making (SDM) and other decision science tools at all levels of the CBP decision-making process (not just for climate):** There is an urgent need to align diverse perspectives in advancing our collective goals and tackle underlying uncertainties that limit our capacity to make efficacious management decisions under changing climate change conditions, but this cannot stymie the CBP's actions to move forward. The application of decision science strategies will enable the CBP to bring diverse stakeholders together, support management decisions using the best available science, and facilitate "learning while doing" research that is essential to resolving uncertainty and improving management outcomes over time. Also, as described in the *Lessons Learned from Strategy Review System 3rd Cycle* document, SDM will allow for a more holistic management in identifying the tradeoffs and evaluating where the partnership might pivot its focus based on emerging scientific findings.

<u>Recommendation</u>: Improve Resilience of Communities to Key Regional Climate Vulnerabilities

<u>Rationale</u>: This approach would help mitigate impacts to the Chesapeake Bay Watershed exacerbated by climate change by helping communities protect water quality and habitat while adapting to climate change impacts such as sea level rise and changing rainfall patterns. Climate change does not act in isolation. The 5th National Climate Assessment shares how compounding climate hazards are occurring simultaneously or consecutively, increasing the impacts especially to historically marginalized communities. This exacerbates existing vulnerabilities like limited infrastructure, reduced access to resources, and increased health risks. By prioritizing adaption strategies, this approach aims to reduce these compounded risks, building resilience in communities already disproportionately burdened by the impacts of climate change.

<u>Strategies</u>:

- Prioritize efforts and resources to communities most vulnerable to ever-increasing risks or with highest cumulative risk.
    - Identify ways to better incentivize these priority practices through our crediting and accountability framework with an emphasis on practices with multiple benefits (water quality, flood protection, habitat, etc.).
    - Prioritize CBP funding for projects that directly support community adaptation efforts.
- Cultivate climate-resilient communities by building community capacity to adapt to climate change (i.e., increasing adaptive capacity).
- Promote nature-based solutions to improve infrastructure to withstand the effects of climate change and incorporate into community plans and policies.
    - Advance modeling and monitoring of flood impacts for communities, including both coastal and inland flooding.

    - Support research into long-term monitoring of BMPs and other adaptation measures to evaluate real-world performance for resilience metrics in addition to Bay Program goals.
- Support efforts to develop effective and equitable policies for relocation that account for cultural, economic, and social constraints at the individual and community level.
- Improve involvement and outreach by directly engaging communities and supporting efforts to build networks of practice at different scales throughout the watershed.
    - Develop meaningful community engagement with climate-vulnerable and climate justice communities.
    - Support development of downscaled climate projections that help communities understand the future impacts of climate change across multiple indicators (rainfall, SLR, habitat loss/change, land cover, etc.).
- Broaden CBP scope of climate justice to include public health and other aspects that matter to stakeholders.
    - Establish metrics related to community climate vulnerability/community resilience.

Recommendation: Promote Carbon Stewardship as a Holistic Approach to Climate Mitigation

Rationale: Climate change poses a major threat to the sustainability of communities and ecosystems within the Chesapeake Bay watershed. While actions to help communities and ecosystems adapt and become more resilient to climate impacts are essential, *the latest IPCC report* emphasizes the urgent need to reduce emissions worldwide in order to mitigate the most catastrophic effects of climate change. Carbon stewardship is a holistic approach to climate mitigation, encompassing actions that increase carbon uptake and storage as well as actions that stabilize existing carbon stocks through land management. According to the latest National Climate Assessment, protecting and enhancing terrestrial carbon sinks like forests and decreasing land use emissions from agriculture are key strategies for reducing land-related emissions. Practices like forest conservation, forest management, agroforestry, and reforestation also support the Bay Program's water quality objectives by ensuring forested ecosystems maintain the health, function, and resiliency needed to continue delivering water quality benefits. Reflecting a need to balance carbon objectives with other goals to maintain ecosystem integrity and resilience, carbon stewardship can provide a framework for the Bay Program to integrate climate mitigation throughout the partnership's restoration, conservation, and scientific efforts.

Strategies:

- **Advance understanding of carbon stewardship science**
    - Adopt methods for quantifying the carbon storage and sequestration currently being provided by ecosystems in the Chesapeake Bay watershed to better target existing carbon sinks for conservation and management.
    - Adopt methods for quantifying the carbon storage and sequestration impacts of common water quality BMPs, as well as the emissions that may be associated with their implementation.
    - Develop projections that predict how landscape change, both in response to climate change and land use, will impact carbon storage across the watershed.
    - Use existing and emerging technologies for agricultural carbon/soil health accounting to improve understanding of the carbon storage and sequestration implications of different agricultural practices
    - Develop educational materials that translate carbon stewardship science into formats that will enable partners to better use information to reach regional and state goals
- **Improve consideration of carbon in land use planning and decision-making.**

    - Prioritize conservation and management of forests and other ecosystems that provide high carbon value across the watershed. This should include approaches for improving the resilience of carbon sinks to the direct and indirect effects of climate change.
    - Prioritize best management practices that also provide carbon storage and sequestration benefits, including climate-smart agriculture, and forestry, and wetlands restoration. This may require looking beyond the partnership's current suite of BMPs to include additional practices that generate carbon and water quality benefits.
    - Develop frameworks for considering tradeoffs between carbon storage and sequestration, habitat, and water quality objectives associated with projected landscape changes. Where appropriate, use structured decision making to inform management practices to better understand and minimize tradeoffs between potentially competing objectives. Frameworks for minimizing tradeoffs are likely to become increasingly important in the context of rapidly expanding solar development in the watershed. Although solar power is an essential strategy for transitioning to clean sources of energy, the large amount of land required to meet growing energy demands will place increasing pressure on forests and other natural ecosystems that serve as carbon sinks and deliver valuable water quality benefits.
    - Identify opportunities to better incentivize carbon stewardship through policies, incentives, and crediting. Recent analyses of the high-resolution land use change for the watershed showed that over 103,000 acres of tree cover were lost to development between 2013/14-2017/18, so additional strategies are need to ensure the protection of trees and forested areas that provide critical carbon storage and sequestration benefits. At the same time, there may be opportunities to leverage funding from carbon markets to credit and further incentivize practices generate additional carbon sequestration benefits. However, given relatively small project and property sizes in the watershed, in some cases the costs of participating in carbon markets and demonstrating additionality will exceed the financial benefits. Additional feasibility analyses across multiple sectors could help the Bay Program determine if there are opportunities to better utilize carbon crediting and markets to provide additional financial support for carbon stewardship.
- **Improve regional coordination around carbon stewardship using natural climate solutions**
    - Expand the role of the Bay Program to convene state and local partners working on climate mitigation using natural climate solutions
    - Improve connections between existing national and regional carbon stewardship initiatives (I.e. RGGI) and state and local initiatives
    - Promote alternative approaches and behavior change in the agricultural sector such as agricultural production and food systems via enhancing the science, policy incentives, and increased collaboration with entities that share common goals

Recommendation: Promote Strategies for Healthy and Productive Ecosystems Under Changing Climate Conditions

Rationale: Climate change is a universal stressor that affects everyone and every ecosystem in the Chesapeake Bay watershed. This recommendation and its corresponding strategies were developed based on information from CBP Management Board and Partnership-vetted efforts, including the Rising Water Temperature STAC Workshop Report, the Climate Resiliency Workgroup's Strategic Review System Logic and Action Table and Management Strategy, and the Comprehensive Evaluation of System

Response (CESR) STAC Report. National efforts were also used to inform these strategies, including the White House Opportunities to Accelerate Nature-Based Solutions Roadmap and the Intergovernmental Panel on Climate Change (IPCC) Climate Change 2023 Synthesis Report. Ecosystem change in the watershed and Bay is occurring and will continue into the future from the changing climate conditions (e.g., rising water temperatures, shifting precipitation patterns, and sea level rise). Given this knowledge, the Chesapeake Bay Program should institutionalize the concept that the Bay of the future will not be the Bay of the past and aim to protect and conserve healthy ecosystems while promoting positive ecosystem change. For instance, a warmer Chesapeake Bay affects optimal habitat thresholds for species that have historically been present in the Chesapeake Bay and its watershed resulting in species community and distribution shifts. Resilience strategies should be done in such a way that maximizes the services and benefits of our ecosystems. To approach climate resilience work from an ecosystem-level, we need a structure that allows for cross-work between habitat types and the living resources supported by them (e.g., forests, streams, wetlands, Bay, fish, birds, submerged aquatic vegetation, etc.).

Strategies:

- **Enhance the confidence and use of nature-based solutions** through improved science on the performance and design under changing climate conditions that will promote multiple ecosystem services benefits while minimizing vulnerabilities to changing climate conditions. Nature-based solutions, such as forests, streams, urban tree canopy, wetlands, living shorelines, oyster reefs, and seagrass beds, serve as an integral piece of the required response for climate action. They provide opportunities for decreasing atmospheric concentrations of greenhouse gases by capturing/storing carbon, providing habitat for birds and fish, and decreasing vulnerabilities to climate change hazards from flooding, sea level rise, drought, and more frequent intense storm events and heatwaves. However, nature-based solutions are in themselves vulnerable to climate change impacts (e.g., loss in wetlands and forests from sea level rise, tree disease from warming, erosion from storm surge). Improved knowledge on how to best design and implement nature-based solutions under various climate change scenarios at the landscape and land-water interface will allow for more effective use of these strategies through time. Advancements and support in long-term monitoring and assessment of designs, ecosystem health, and resilience benefits after implementation are needed to allow for adaptive management of these strategies.
- Advance a vision to restore the natural flow regimes of our aquatic systems by increasing terrestrial water storage and restoring river corridors throughout the Bay watershed so as to reduce storm flows, restore base flows, cool water temperatures, and promote carbon storage while also providing water quality benefits.
- Within each workgroup/GIT or structural Unit of the Post 2025 Chesapeake Bay Program Agreement there should be space given to include strategies to sustain ecological function, reduce the impact of biological stressors and disturbances, create thermal refugia, and promote habitat connectivity under changing climate conditions.
- More focus on the development and application of indicators that will allow for better understanding and tracking of ecosystem health status and change (e.g., shifts in species community structure and distributions, landscape transitions from forests to marsh), assessing climate risk and uncertainties on ecosystems and how it will affect meeting our management objectives, and informing strategies to adapt to changing climate conditions.
- There needs to be an emphasis on better defining and evaluating multiple stressors on ecosystem health with emerging challenges from future climate, population growth, land use, and landscape changes. This knowledge should be used to assess and develop strategies on how

to adapt our restoration to allow for healthy ecosystem function with change while protecting ecosystem services in support of diversity, equity, inclusion and justice goals.

- More support of efforts to integrate emerging science, monitoring, and use of climate change projections to understand how changing watershed and Bay conditions will influence implementation of restoration and conservation practices and Total Maximum Daily Load (TMDL) water quality goals and the effects on living resources and ecosystems. Additional research is needed to estimate the future conditions of the Bay and its watershed ecosystems under different scenarios of management.
- Pursue the development of a CBP soil health outcome and ways to support and incentivize achievement. Soil health is the basis for overall healthy ecosystems that will enhance resiliency for living resources and biodiversity.
- Include alternative approaches to affect systemic change via research, policy incentives and support, funding support, policy and enforcement authority (to include incorporating new indicators of success for milestone evaluations), and increased collaboration with entities that share common goals.
- Need support for social science, communication strategies, and venues for partnership discussion on future Chesapeake Bay warming and landscape change scenarios to allow for a more proactive approach in preparing for ecosystem change to inform natural resource management decisions (e.g., fisheries, wetland protection and restoration, SAV restoration, stream restoration, and forest management).

Recommendation: Promote Regenerative Agricultural Production and Regionally Based Food Systems in the Chesapeake Bay Watershed

Rationale: This approach would decrease agricultural emissions sources, increase carbon sinks, and improve health and resiliency for all cross-cutting concepts including climate change, people, clean water, shallow water habitats, and healthy watersheds.

Strategies:

- **Transform Agricultural production**: **a shift to regenerative agriculture** is one of the most-effective solutions to achieve multiple environmental and societal benefits. Compared to conventional systems, agroecological or regenerative production systems conserve water, improve soil, air, water quality, biodiversity, increase carbon sequestration and farm economic and climate resilience. Regenerative systems also reduce chemical fertilizer, pesticide, feed inputs, and emissions. Regenerative agriculture is a holistic, systems approach to farming focused on building healthy soil — the foundation of all farm productivity- **this would include the development of a CBP soil health outcome and ways to support and incentivize achievement. Soil Health** is the continued and expanded capacity of soil to function as a vital living ecosystem that sequesters and stores carbon and sustains plants, animals, and humans. (Soil Health Institute and MDA). This definition speaks to creating a management system that is sustainable and considers the soil microbes as a key component of the system that drives soil functions necessary for food, fuel and fiber production. **Soil functions necessary** for a sustainable and regenerative system are nutrient cycling, water regulation (infiltration, holding capacity/ availability), filtering and buffering pollutants/toxic contaminants, physical stability that creates and supports habitat for soil organisms beneficial to agricultural production. All of these functions are impacted or mediated by soil microbes. **Healthy soil can be achieved by**

following the six principles of soil health: 1) consider context (place, geomorphology, climate, topography, etc.); 2) keep the soil covered: 3) keep living roots in the soil; 4) do not disturb the soil; 5) integrate animals/plants; and 6) enhance biodiversity. (NRCS priority practices such as nutrient management, no till, crop rotations, diverse cover crops, rotational grazing, animal/crop integration, increased use of agroforestry/perennial cropping)

- **Support scientific advances in accounting for agricultural carbon/soil health and the impacts of BMPs and other climate-smart agricultural practices on soil health**
  - **Consider existing and emerging technologies** for agricultural carbon/soil health accounting and how they might be used to incentivize soil health practices- include field scale economic/agronomic/environmental practice-based modeling tools and field scale soil health indicators testing methods that can be economically/efficiently scaled watershed wide.
  - **Use BMP Co-Benefit approach to** - research, promote, and credit BMPs that provide results for multiple Bay outcomes in multiple ways- nutrient/sediment/toxics/carbon reductions and on farm economic benefits. For example, agroforestry BMPs build food security, clean air/water/soil, sequester and store carbon, increase biodiversity & habitat, diversify farm operations and income, build soil health, improve livestock conditions
- **Identify strategies within the CBP framework to further incentivize policies and practices that benefit soil health**
  - **Research and workshops**- for example, ecosystem service markets and ways to integrate their use into the CBP structural framework, policy incentives and support, funding support, Agricultural Advisory Committee input, EPA policy and enforcement authority-to include incorporating new indicators of success for milestone evaluations, and workgroup initiatives, for example, local government outreach- planning for local food procurement or waste reduction
- **Evaluate how the current CBP structure could be modified to promote the long-term, systemic change needed to move towards regenerative regional food systems:** This shift requires investment and support to enable systemic transition: educational, structural, physical, psychological, emotional, and economic. The current CBP governance structure may not allow us to take steps needed to support wholesale agricultural and food systems transformation. The CBP partnership should consider what organizational changes are needed in the current structure in order to effectively address these issues. For example, how can we build in the ability to consider the current economic and market forces that prevent the achievement of these and other Bay Outcomes- and then develop mechanisms of change needed to move forward.
  - Education and behavioral science implementation to ensure that farmers understand the role that soils play in healthy and profitable agricultural production systems and consumers understand the value of soil health, reduced meat consumption, waste reduction, regenerative food and local sourcing for healthy communities
  - Consider ways to phase the transition over an extended time frame to ensure that it is manageable

- **Transform Food Systems**- **Regionally based food systems support local/regional production, sourcing and processing, regenerative and organic nutrient dense food, reduced meat consumption, reduced food waste, improved land access and healthy food access for vulnerable communities**. **Historically** we have worked toward achievement of the Chesapeake Bay watershed agricultural nutrient reductions needed solely through BMP implementation- but this approach ignores the reality of our watershed nutrient mass imbalance and continually intensifying animal and crop production systems that supply commodities both in and outside of the watershed. That production system is undermining farmers' considerable and continued efforts to reduce nutrient pollution through BMP implementation. Movement towards regionally based food systems combined with the other initiatives above would address this problem as well as our climate mitigation needs in multiple ways. Examples of these benefits include 1) **Demand for locally produced** regenerative and organic food provides economic support and consistent markets farmers need to transition and diversify their production systems, 2) **Local/regional aggregation**, processing and supply networks not only support local economies, but can ensure greater supply chain flexibility and farmer share of market prices, 3) **Producing livestock regeneratively** (rotational grazing) to supply local needs, combined with reduction in meat consumption reduces nutrient inputs and losses, greenhouse gas emissions, and sequesters carbon, 4) **Reduction in food mile**s traveled reduces emissions directly and also reduces food waste, providing additional reductions, 5) **Combining local food waste and manure** using varied approaches such as medium and small-scale waste to energy, composting and biochar production reduces greenhouse gas emissions and can help build soil health, and, 6) Addresses other CBP outcomes, such as environmental justice issues and healthy communities.
    - **Identify strategies within the CBP framework to further incentivize policies and practices that promote regenerative regional food systems**
        - **Consider other ways to mitigate agricultural climate and water quality impacts**, such as improved tracking, modeling, implementation of manure transport, as well as modeling of waste to energy, manure treatment, perennial biofuel feedstocks, soil amendments, Agri-solar production, land conversion and conservation scenarios for best outcomes
        - Incorporating emphasis on consumption of l**ocally sourced, sustainably produced seafood**, such as oyster aquaculture, as well as invasive species like blue catfish and snakehead, to include facilitating market support for these products, should be part of regional food system efforts. It has cross-cutting beneficial effects for the healthy watersheds, people, and fisheries management outcomes as well.
    - **Expand and increase collaboration with other entities that share common goals around regenerative and regional-based food systems**: farmers, states/counties, corporations, agencies, academia, non-profits, and business entities. Assess needs/gaps/barriers, resources, areas of overlap, collaborative potential
        - **Federal Agencies**: Existing Climate Action Plans, systemic resilience
            - **EPA**: food & animal waste reduction, waste to energy strategies
            - **Dept. of Defense** (DOE): supply chain resilience

    - **USDA: Climate Smart Agricultural Initiative:** focus on more resilient local and regional food production, ensuring access to healthy and nutritious food in all communities, building new markets and streams of income for farmers and producers using climate-smart food and forestry practices, includes National Agroforestry Center, regional Food Centers and Climate Hubs, Climate Smart Commodities Initiatives in all USDA agencies- US Forest Service (USFS), Natural Resource Conservation Service (NRCS), National Institute of Food and Agriculture (NIFA), Agricultural Research Service (ARS), Farm Services Agency (FSA), Sustainable Ag Research and Education (SARE)
- **States and Counties**: Climate Action Plans, Local Food and Soil Health Initiatives, governments and county conservation districts.
- **Corporations:** ESG (Environmental, Social, Governance) reporting requirements for GHG emissions, investment risk reporting, divesting initiatives
- **Business entities**: agricultural and food systems resiliency, service and marketing opportunities- ecosystem services, technical service providers-public and private, Farm Bureau, agricultural cooperatives, growers' associations.
- **Academia and Extension**: agricultural and food systems resiliency, Johns Hopkins Center for Livable Future, Harry Hughes Center, UMD-PSU Collaboration- Thriving Ag, all land grant universities.
- **Non-profits/NGOs**, Tribes- agricultural and food systems resiliency, Grazing Alliances, 4R Alliances, CBF, Rodale Institute, PASA, Soil Health Coalition, American Farmland Trust, Church organizations, and Native American tribes in the Chesapeake Bay watershed.