



Chesapeake Bay Program
SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE

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Climate Change and the Chesapeake Bay

Impacts and Implications for Watershed Protection and Restoration

Background

The Scientific and Technical Advisory Committee (STAC) provides independent advice and guidance to the Chesapeake Bay Program. In 2007, the Bay Program asked STAC to investigate the current understanding of climate change impacts on the Bay. Over the following year, STAC responded with an interdisciplinary review of climate change research, impacts, and adaptive opportunities. STAC members have continued to work on climate change issues, and they have regularly communicated with Bay Program leadership and the public about this importance of climate change.

The scope of the Bay Program's request required a collaborative approach, so STAC assembled a team of leading researchers from the across the region. The editors and contributors to the report represented thirteen institutions, each providing a complementary perspective on this far-reaching issue. The team compiled an initial report which was vetted through multiple rounds of internal and external peer review. The resulting final report reflects an assessment of the state-of-understanding with respect to connections between climate change and the Chesapeake Bay.

STAC Recommendations

The STAC report focused on the implications of climate change for four areas: (1) physical and biogeochemical processes, (2) monitoring systems, (3) restoration strategies, and (4) adaptive responses. STAC concluded that climate change is likely to have significant implications for efforts to protect and restore water quality and living resources in Chesapeake Bay. **Climate change will touch all facets of the Chesapeake Bay Program** including:

- Conditions that control the flow of pollutants into the Bay and their implications for water quality and living resources;
- Performance of environmental monitoring programs intended to measure success and guide regulatory processes;
- Design of regulatory programs, such as the Bay-wide Total Maximum Daily Load (TMDL);
- Effectiveness of restoration strategies, such as those in Watershed Implementation Plans.

Given the Bay Program's mandates, **we recommended that the Bay Program partners embed climate change considerations into its decision making processes.** We believe that the Bay Program has a fundamental requirement to consider these issues and ensure the success of protection and restoration efforts under changing climatic conditions. Addressing these impacts will require a strategic and durable response. Actions to address climate change fall into two categories:

- Mitigation of greenhouse gas emissions -- the primary anthropogenic driver of climate change;
- Preparation for and adaptation to changing conditions.

The Bay Program can have an important role in greenhouse gas mitigation, such as considering the implications of land use patterns and biofuel production. However, full consideration for greenhouse mitigation opportunities in the Bay was beyond the scope of our study. Our focus was on the assessment of impacts and adaptive responses with direct and immediate implications for the mission and current activities of the Chesapeake Bay Program.

The Bay Program can understand the impacts of climate change and prepare for changing climatic conditions by:

- Creating and empowering a well-qualified **climate change champion** charged with identifying opportunities to address climate change within existing authorities and available resources;
- Developing and deploying **new strategies** to accelerate consideration of climate change in public and private sector decision making;
- Incorporating climate change into **critical resource management decisions**, such as the Bay-wide TMDL and Watershed Implementation Plans.

These steps will require the Bay Program to (1) make changes in its internal organization, (2) consider climate change in regulatory decision making, (3) support the evaluation of individual restoration strategies, and (4) provide resources and leadership to advance research and development.

It is important to establish clear benchmarks and tangible outcomes associated with these actions. These metrics will help stakeholders monitor the Bay Program's process on this issue, provide feedback, and, when necessary, motivation. On the short term, **progress can be measured by specific changes in practice**, including:

- Hiring and empowering an internal climate change leader;
- Demonstrating the consideration for climate change in decision making;
- Support the evaluation of the implications of climate change for restoration strategies;
- Providing direct and indirect support for targeted research and development.

These are critical intermediate outputs that are consistent with recent guidance, such as the US EPA Office of **National Water Program Climate Change Strategy: Key Action Update** (August 2010) and The White House Council on Environmental Quality **Progress Report on the Interagency Climate Change Adaptation Task Force: Recommended Actions to Support a National Climate Change Adaptation Strategy** (October 5, 2010) .

Ultimately, the Bay Program will need to demonstrate that they lead to outcomes, including:

- Tangible changes in decision making that result in the systematic consideration for climate change in regulatory and restoration activities;
- Most importantly, success in meeting and exceeding protection and restoration goals under changing climatic conditions.

Despite these efforts, the Bay Program has yet to demonstrate leadership or even substantial engagement in recognizing the implications of climate change or explicitly considering climate change in critical decision making. Continued failure to consider climate change places the goals of the Bay Program at risk and neglects important aspects of existing regulatory mandates and responsibilities.

Possible Immediate CBP Actions

Work on climate change has continued since the release of STAC's 2008 report. Today, we understand that climate change may have significant implications for both the Bay's "pollution diet" and the importance and

efficacy of Watershed Implementation Plans. The broad contours of these implications are understood, and more detailed study is needed to guide specific regulatory and management actions.

The US EPA Office of Research and Development has actively supported climate change research in the watershed. It has downscale climate scenarios and created meteorological files compatible with the Phase 4.3 watershed model for use in watershed-scale case studies for the Patuxent and Monocacy watersheds. Results from the Monocacy made available to the CBP modeling staff suggests that plausible changes in climate over the next century can increase overall pollutant loads to the watershed by over 10% with significant variation in loading from different land use and land management types. **This underscores the fundamental sensitivity of load allocation calculations to climatic conditions and the differential relative response of management units.** This implies that the failure to consider changing climatic conditions may substantially alter load allocation and restoration priorities.

In an attempt to inform the possible revisions (revised urban/suburban efficiencies, new agriculture practices) to the Phase 5.3 watershed model now contemplated for January, 2011, on-going collaborative work by USGS and Pennsylvania State University is evaluating climate change impacts on flows and loads in the Susquehanna River. This work will provide climate change-induced altered flows and loads relevant to important decisions on implementation of the best management practices likely to be effective in mitigating future conditions in the basin. These results will help inform the design of on-the-ground implementation projects so that they can accommodate the full range of plausible conditions throughout their anticipated performance lifetimes. Preliminary results will be provided to the CBP modeling staff in early winter to aid in revising the TMDL allocations to best reflect not only the urban/suburban and agriculture modifications proposed but possible impacts of a changing climate on load reductions requested of each Bay jurisdiction.

STAC looks forward to a much stronger CBP commitment to incorporating climate change into its programs, decisions, and requirements. We believe that these recommendations are also in line with the Council on Environmental Quality's guidance that recommends that Federal agencies consider climate change in their decision making processes. **Without this attention, the CBP is requesting its partners to address likely higher flows and loads with practices relevant to conditions from the past 30 years and not the next century.** We must plan for future conditions and not implement for the past.

Summary

STAC has provided critical recommendations for Bay-wide adoption of climate change into all decisions and planning and with the immediate concern for implementation of the Bay-wide TMDL, it is now even more critical for bay partner considerations of climate change impacts as all jurisdictions prepare WIPs to meet current projections of flows and loads. STAC is extremely worried that using the current watershed model for estimating TMDLs will result in jurisdictions managing for past conditions and not future river discharges and nutrient and sediment contributions that will most likely accompany the century's climate changes.