Climate monitoring workshop for the blue crab outcomes

The goal of the workshop is to generate **specific recommendations for monitoring climate parameters in the Chesapeake Bay that are critically important to achieving the outcomes identified in the Blue Crab Management Strategy**. The list is to be focused on the actions being undertaken by the Bay Program and its partners (the states, DC, and federal agencies). So it is important that you come with an understanding of what is identified in the "Blue Crab Abundance and Management" management strategy and work plan (which can be found at: http://www.chesapeakebay.net/managementstrategies).

The climate monitoring recommendation we seek to develop should include:

- **Specific climate parameters** (e.g. temperature, precipitation, winds)
- **Specific spatial and temporal resolutions** for each parameter (e.g. daily wind and surface temperature conditions at the mouth of the bay in April and May, bottom temperatures in the Bay crab sanctuary in January, maximum monthly summer water column temperatures in Susquehanna flats)
- The **essential data syntheses** to support Bay Program actions identified in the management strategy and work plan (e.g. decadal trends, annual ranges, trends in timing of threshold events)
- the **priorities** among parameters and analyses to guide monitoring when resources are limited
- identification of **potential data sources** or data collection methods for each recommended parameter

We wish to have this list developed by the end of the workshop. You should think in terms of a one-page final product that is suitable to pass to the Bay Program Scientific, Technical Assessment and Reporting team (STAR) as guidance for development of a monitoring and analysis program. We are not interested in developing a white paper, state of the science report, or a technical rationale for future funding. This is to be practical guidance that can be combined with input from other groups working on other goals to develop an integrated monitoring effort.

One of the challenges you will confront in this effort is the essential focus on what the Bay Program is planning to do to achieve the stated outcomes. In the case of the Blue Crab strategy and work plan there are 6 major activities:

1. Plan and conduct stock assessments
2. Analyze winter dredge surveys to provide management advice
3. Work with the Bay Commission to identify legislative, budgetary and policy needs
4. Improve harvest accountability within each management jurisdiction
5. Assess the feasibility of implementing a Baywide Total Allowable Catch of blue crabs
6. Explore the feasibility of allocating a percentage of Baywide TAC to jurisdictions

Information about climate conditions is clearly not essential for some of these. For the others the question is which climate parameters should be monitored. We are not trying to identify parameters important to blue crabs that are affected by climate (e.g. food, predators, habitat structure). We are trying to identify the climate parameters that cause those conditions.

If you are interested, what follows is a brief description of the Bay Program's Decision Framework, the logic model that is supporting adaptive management of all the various Goal Implementation Team efforts. ***Climate generally shows up as an unmanaged factor influencing outcome achievement.*** *As such, "climate" represents a set of explicit or implicit assumptions about conditions that will exist affecting the efficacy of other planned management actions. This workshop is one of many that will be attempting to identify those assumptions for each of the Bay Program outcomes, and then recommend monitoring to evaluate the assumptions.*

In the Chesapeake Bay Program **Decision Framework**:

1. Outcomes should be dependent on **factors** that have been identified in the natural and human systems of the Bay watershed.
2. Important factors should be directly addressed in a management strategy, and should wherever possible be linked to specific **actions** that will manage them.
    a. Workplans should be comprised of actions for which the Bay Program is uniquely situated to provide some service or benefit. Examples include inventorying and tracking related activities, advancing related science, coordinating monitoring plans, and working with the public to raise understanding and support for restoration and conservation work.
    b. Planned actions should be linked to **indicator(s)** that track performance and system response. These indicators of actions provide diagnostic information that enables us to adaptively manage. While we still need those indicators that track performance toward an overall Outcome, these indicators provide us additional information in determining whether we have taken an action and whether this action had the intended effect.
    c. Ideally, the set of planned actions outlined in a workplan is fairly limited, and monitoring progress toward these actions is fairly simple.
3. Actions should be linked to **expectations** that outline how they will help achieve an Outcome. This will allow us to **learn** where our understanding is correct and identify any need to **adapt**.

factor → action → indicator → expectation → learn → adapt

Generic Example of strategy/workplan implementation

Factor	Action	Who's Responsible?	Indicator	Expected Response	Learning	Adaptation
A	1	CBP	**O&P**	ΔA	ΔA=oA?	Action 1+
B				ΔB	ΔB=oB?	
C	2	Other	O&P	ΔC	ΔC=oC?	
D	3	CBP	**O&P**	ΔD	ΔD=oD?	New factor J
E				ΔE	ΔE=oE?	New factor K
F				ΔF	ΔF=oF?	
G	4	CBP	**O&P**	ΔG	ΔG=oG?	New action
H	5	Other	O&P	ΔH	ΔH=oH?	CBP action

In this example, there are eight factors (A-H) that have been identified as key to attainment of the targeted outcome. Five of these factors have actions (1-5) in the associated workplan and three of these (1, 3, and 4) are things the CBP will be responsible for implementing. Actions 2 and 5 are being implemented by other collaborating entities. Output and performance indicators (o & p) are identified for each of the planned actions. Three of these (in bold) will be priority monitoring efforts because they are critical to assessment of CBP efforts. Monitoring is also planned for the three factors that will not have targeted management actions. These could include things like climate where the workgroup assumes that most climate parameters will change only marginally, but precipitation will come in much more intense events. Monitoring is planned to track whether these assumptions hold true – information that may become critical in assessing reasons if other interventions fail to produce expected results. The expected change over the planned management period is identified for each factor (ΔA – ΔH). AT the appropriate assessment interval, learning will occur when the observed outcome (oA) is compared with the expected change (ΔA). Adaptations resulting from this learning can include:

1. refinement of an existing action (e.g. "action 1+")
2. identification of a new factor influencing current management actions
3. identification of a new factor arising from assumptions that were not met
4. the need for an entirely new action to address previously identified factors
5. a need for the CBP to take on additional responsibilities