

This is a synoptic review of the draft Chesapeake Bay Watershed Agreement goals and outcomes. The intent is to identify (where possible) the monitoring that would be necessary to support effective adaptive management of efforts to attain these goals and outcomes. The commentary is in *red text*.

Monitoring needs are identified as:

- **Outcome:** this is the information necessary to evaluate progress toward the desired condition – is the management effort working? (for example: in Bay water quality management this would be the actual levels of DO in Bay segments)
- **Intervention:** this is the information necessary to determine if the management strategy is being implemented – are the planned actions being undertaken? (for example: in Bay water quality management this would be the evidence that BMPs identified in Watershed Improvement Plans are actually installed)
- **Assumptions:** this is the information necessary to confirm that the management strategy addressed all the significant system drivers – if the desired outcome is not being achieved are there factors not managed in the strategy that could be having an impact? (for example: in the original SAV goal for the Bay this would be monitoring for water temperature which is unmanaged but ultimately proved to be a significant factor in attaining the goal; in Bay water quality management this would include monitoring of specific BMP performance which is assumed and a major factor in goal attainment)

The first two monitoring categories are essential for accountability in the program. The third is critical if the program is actually going to reduce management uncertainty and iteratively improve restoration results. Absent information on the accuracy of assumptions inherent in management strategies, the program's capacity to learn while doing is severely compromised.

In conducting this first assessment of the draft goals and outcomes, numerous issues were identified with the clarity and character of some of the statements. We have noted some of these issues in the *Comments* with the intent of informing continuing efforts to craft statements that are explicit and actionable.

**Sustainable Fisheries Goal:** Restore, enhance, and protect the finfish, shellfish and other living resources, their habitats and ecological relationships to sustain all fisheries and provide for a balanced ecosystem in the watershed and bay.

- **Blue Crab Outcome:** Maintain sustainable blue crab population based on the current 2012 target of 215 million adult females (1+ years old) and continue to refine population targets between 2013 through 2025 based on best available science.

*Monitoring needs:*

- *Outcome:*
  - *blue crab population size and composition (females age 1+)*
- *Intervention:*
  - *implementation of fishing pressure restrictions*
- *Assumptions:*
  - *climate impacts on recruitment (meteorological impacts at Bay mouth)*
  - *predation will have no impact on outcome.*
  - *unregulated fishing pressure (recreational harvest, soft shell fishery) has no impact on outcome*
  - *shifts in essential habitat (quantity, distribution, quality) will not affect outcome*

*Comments:*

- **Oyster Outcome:** Restore native oyster habitat and populations in \_\_\_ tributaries by 2025.

*Monitoring needs:*

- *Outcome:*
  - *“restored” habitat areas and populations*
- *Interventions:*
  - *water quality management efforts (sediment)*
  - *habitat (reef) creation*
  - *fishing pressure management*
- *Assumptions:*
  - *water quality (wq management efforts are effective)*
  - *disease prevalence will have no impact on outcome.*
  - *predation will have no impact on outcome.*
  - *climate/acidification will have no impact on outcome.*
  - *aquaculture activities will not affect outcome.*

*Comments:*

- *need to define “restore” in measurable terms*
- *persistence will be a critical concern*
- *basis for selecting number of tributaries is unclear*

**Vital Habitats Goal:** Restore, enhance, and protect a network of land and water habitats to support priority species and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed.

- **Wetlands Outcome:** Restore a total of 75,000 acres of tidal and non-tidal wetlands, primarily on resource and agricultural lands, and enhance function of an additional 150,000 acres of degraded wetlands.

- **Black Duck:** Restore wetland habitats to support a wintering black duck population in the watershed of 100,000 birds by 2025.

*Monitoring needs:*

- **Outcome:**
  - acreage of “restored” wetlands
  - acreage of “enhanced function” wetlands
  - # of wintering black ducks
- **Intervention:**
  - verification of “restoration” and “enhancement” actions
- **Assumptions:**
  - climate impacts will not affect functions
  - development pressures will not affect functions
  - black ducks are good surrogate for other species
  - black duck population size, migration routes, hunting pressures, habitat conditions elsewhere in range are all constant or will not affect outcome

*Comments:*

- the overarching wetlands goal would seem to require identification of the wetland function(s) being targeted since restored wetlands are not typically broadly effective
  - need to define “restore” and “enhance function” in measurable terms
  - need to define black duck wetland habitat requirements
  - selection of black duck metric focuses on tidal wetlands and primarily on large tidal wetlands which are neither the most valuable for water quality functions nor the most prevalent in the Bay system
  - the rationale for the acreage goal, particularly in the absence of any spatial targeting, is unclear
- **Stream Health Outcome:** Restore stream health and function by 10% above the 2008 level\* throughout the watershed by 2025.  
\*Note: baseline will be re-assessed.
  - **Brook Trout:** Restore naturally reproducing brook trout populations with an 8% increase in total cumulative brook trout patch area by 2025 in Chesapeake headwater streams.

*Monitoring needs:*

- **Outcome:**
  - brook trout populations’ condition and distribution
  - stream health (IBIs?)
- **Intervention:**
  - stream restoration activities (need to identify acceptable practices)
- **Assumptions:**
  - climate impacts will have no effect on stream health and brook trout
  - watershed development impacts, fishing/stocking will not impact outcome
  - stream restoration practices actually restore persistent target conditions
  - adequate trophic conditions to support brook trout populations will result from restoration activities

*Comments:*

- **Fish Passage Outcome:** During the period 2011-2025, restore historical fish migratory routes by opening 1,000 additional stream miles, with restoration success indicated by the presence of river herring, American shad, Hickory shad, Brook Trout and/or American eel.

*Monitoring needs:*

- *Outcome:*
  - *presence of anadromous/catadromous species*
- *Intervention:*
  - *passage restoration efforts*
- *Assumptions:*
  - *water quality condition has no effect on outcome*
  - *upstream habitat conditions have no effect on outcome*
  - *in-stream fishing pressure will not affect outcome*
  - *downstream/offshore by-catch mortality does not affect outcome.*
  - *in-stream predation (blue catfish) does not affect outcome*
  - *climate impacts on migration patterns, spawning, and nursery conditions will not affect outcome*
  - *harvest and stocking management will not affect outcome*
  - *water allocation will not affect outcome*

*Comments:*

- *restoration success is effectively being defined as opportunity for fish to access currently blocked areas, there is an implicit assumption that presence indicates an adequate population to sustain use*
- **Submerged Aquatic Vegetation Outcome:** Achieve and sustain the ultimate outcome of 185,000 acres of SAV Bay-wide. This will be demonstrated by having \_\_\_% of Bay segments achieving and sustaining their segment acreage targets for SAV by 2025

*Monitoring needs:*

- *Outcome:*
  - *SAV distribution and persistence*
- *Intervention:*
  - *water quality management*
  - *freshwater SAV restoration efforts*
- *Assumptions:*
  - *climate impacts will not affect outcome*
  - *herbivory does not affect outcome*
  - *development pressure will not affect outcome*
  - *competition and disease will not affect outcome*

*Comments:*

- *rationale for acreage goal is unclear given emergent understanding of potential for restoration of historical distribution*

- **Forestry Outcome:** 1) Restore 900 miles per year of riparian forest buffer and conserve buffers until at least 70% of riparian areas are forested, and 2) Expand urban tree canopy by 1,000 acres per year in a total of 120 communities by 2025.

*Monitoring needs:*

- **Outcome:**
  - *need to identify the desired outcomes i.e. to increase wq for delisting impaired streams*
- **Intervention:**
  - *restoration and conservation actions*
- **Assumptions:**
  - *persistence*
  - *restoration is as good as conservation*

*Comments:*

- *these are not outcome statements, they are outputs, leaving the questions of why are we interested in restoring these conditions, this information is necessary to assess whether the activities are achieving a beneficial outcome and therefore worth the investment*
- *basis for the quantitative targets is unclear*

**Water Quality Goal:** Reduce pollutants to achieve the water quality necessary to support the aquatic living resources of the bay and its tributaries **and** protecting human health.

- **2017 Watershed Implementation Plans (WIP) Outcome:** Have practices and controls in place by 2017 that are expected to achieve 60% of the load reductions necessary to achieve applicable water quality standards compared to 2009 levels.
- **2025 WIP Outcome:** Have all practices and controls installed by 2025 to achieve the Bay's DO, water clarity/SAV, and chlorophyll a standards.

*Monitoring needs:*

- **Outcome:**
  - *reduction in impairments*
- **Intervention:**
  - *BMP implementation verification*
- **Assumptions:**
  - *BMPs are as effective as modeled*

*Comments:*

**Healthy Watersheds Goal:** Protect state-identified healthy waters and watersheds, recognized for their exceptional quality and high ecological value.

- **Healthy Waters Outcome:** By 2025 100% of state-identified currently healthy watersheds remain healthy.

*Monitoring needs:*

- *Outcome:*
  - *condition of state-identified healthy watersheds*
- *Intervention:*
  - *verification of conservation actions*
- *Assumptions:*

*Comments:*

- *need definitions of “healthy” and “watershed” (size)*
- *limitation to “state-identified” would seem to make this a relatively useless goal for the Bay program in so far as standards and therefore value in achieving other Bay Program objectives are not set*
- *limitation to existing “exceptional quality and high ecological value” watersheds may be a useful (if nebulous) conservation goal, but does nothing to address essential and attainable improvement in the vast majority of the Bay watershed*

**Land Conservation Goal:** Conserve landscapes treasured by citizens to maintain water quality and habitat; sustain working forests, farms and maritime communities; and conserve lands of cultural, indigenous and community value

- **Protected Lands Outcome:** Protect an additional two million acres of lands from the 2010 baseline year, throughout the watershed currently identified as high conservation priorities at the federal, state or local level by 2025, including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality.

*Monitoring needs:*

- *Outcome:*
  - *water quality and habitat services of “treasured” landscapes*
  - *persistence of working forests, farms and maritime communities*
  - *??? persistence of cultural, indigenous and community valued lands*
- *Intervention:*
  - *verification of conservation, sustainment, and/or protection efforts*
- *Assumptions:*
  - *no other system drivers impact desired outcomes when protection is in place*

*Comments:*

- *the “protected lands outcome” is basically an output not an outcome in so far as it specifies acreage targets but not a condition that should result from the protection efforts*
- *assuming the overarching land conservation goal statement identifies the desired outcomes it would be necessary to develop operational definitions of “conserve” and “sustain” as well as “working forests”, “farms” and “maritime communities” to enable any outcome monitoring*
- *need operational definitions of “protect”, “high conservation priorities”, and “highest value for maintaining water quality” for the “protected lands outcome”*

**Public Access Goal:** Expand public access to the Bay and its tributaries through existing and new local, state and federal parks, refuges, reserves, trails and partner sites.

- **Public Access Site Development Outcome:** Increase public access by adding 300 new public access sites by 2025 (from the 2010 baseline).

*Monitoring needs:*

- *Outcome:*
  - *???* (i.e increased public support for restoration effort?)
- *Intervention:*
  - *verification of access development*
- *Assumptions:*
  - *???* (expansion of public access generate unique benefits that are not created by other interventions)

*Comments:*

- *both the overarching goal and the site development outcome are outputs not outcomes, leaving the question why would we do this? What conditions in the system or the stakeholders should result from creating additional public access that would justify the investment?*
- *need to define “access”*