Chesapeake Bay Program Goals and Outcomes (Proposed, 010213)

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.
- ***Oyster Outcome***: Restore native oyster habitat and populations in 20 tributaries by 2025.
- ***Fisheries Outcome***: Improve fisheries health and production by connecting land use decision making with ecosystem science and policy and creating a precautionary management approach to ensure the sustainability of Chesapeake bay fisheries resources across tidal jurisdictions.

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 30,000 acres of tidal and non-tidal wetlands and enhance function of an additional 150,000 acres of degraded wetlands, and protect an additional 225,000 acres of wetlands by 2025.
  - *Black Duck objective*: Restore wetland habitats to support wintering black duck population in the watershed of 100,000 birds by 2025.
- ~~***Stream Restoration Outcome***: Restore stream health and function so that 70% of sampled stream sites throughout the watershed rate fair, good or excellent as measured by the Index of Biotic Integrity by 2025.~~
  - *Brook Trout objective*: Increase naturally reproducing brook trout populations in headwater streams by increasing occupied patch area by 8% by 2025. (**Currently under revision to finer scale 'patch' metric** Currently under revision by STAR. TBD Dec 2012.)
- ~~*Fish Passage objective*: During the period of 2011-2025, restore historical fish migratory routes by opening 1,000 additional stream miles. Measure success by monitoring for the presence of river herring, American shad, Hickory shad, Brook Trout and/or American eel in 50% of the restored rivers and streams.~~ Evaluate the success of projects by documenting the presence or absence of target fish species in reopened stream reaches *or by documenting changes to physical habitat and overall diversity of fish and macro-invertebrate assemblages.*
- ***Submerged Aquatic Vegetation Outcome***: Achieve and maintain 185,000 acres of SAV in the Chesapeake Bay to meet water quality standards.
- ***Forests Outcome***: Riparian Forest Buffers: ~63% of all streams buffered by 2025.

Water Quality Goal: Restore water quality to achieve standards for DO, clarity/SAV, and chlorophyll-a in the Bay and its tidal waters as articulated in the Chesapeake Bay Total Maximum Daily Load (TMDL).

- ***2025 Watershed Implementation Plans (WIP) Outcome***: Have all controls installed by 2025 to achieve the Bay's DO, water clarity/SAV, and chlorophyll a criteria.

~~***2017 WIP Outcome:*** Have practices in place by 2017 that will achieve 60 percent of the reductions necessary to achieve applicable water quality standards compared to 2009 levels.~~

Comment [BP1]: PADEP does not support dedicating land use staff to support Fishery GIT activities. OK if tidal states want to pursue this.

Comment [BP2]: See comment at end of document.

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Comment [BP3]: The PFBC generally supports the 1,000 mile bench mark. However, to label a dam removal project/fish passage project successful only if river herring, American shad, or American eel are present is not acceptable from Pennsylvania's perspective.

January 3, 2011 email from Jennifer Greiner, US Fish & Wildlife Service to Pat Buckley:

The workgroup has a stated objective to "Evaluate the success of projects by documenting the presence or absence of target fish species in reopened stream reaches *or by documenting changes to physical habitat and overall diversity of fish and macro-invertebrate assemblages*."

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Comment [BP4]: The Chesapeake Executive Council did create the commitment to implement 100% of pollution reduction actions for nitrogen, phosphorus and sediment no later than 2025. States did not, however, have a meaningful opportunity to give input on the water quality outcome of having 60% of the segments attaining standards by 2025. Given the variability of groundwater flow time lag, there is no scientific certainly that if all pollution reduction actions are implemented, that 60% of the segments will attain standards by 2025. DEP recommends that the outcome be limited to the measure of pollution reduction actions.

The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017.

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Comment [BP5]: Executive Summary, page 1, Chesapeake bay TMDL

Healthy Watersheds Goal: Maintain local watersheds at optimal health across a range of landscape contexts.

- ***Healthy Waters Outcome***: State identified healthy waters remain healthy

Stewardship Goal: Promote stewardship and assist citizens, communities and local governments in undertaking initiatives to achieve restoration and conservation in the Chesapeake region.

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 2 million acres of lands throughout the watershed currently identified as high conservation priorities at the federal, state, or local level by 2025.

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.

Environmental Literacy Goal: Ensure that students in Chesapeake Bay Watershed states graduate environmentally literate with the tools they need to make informed choices to protect and restore the Chesapeake Bay.

- ***Xxx Outcome***: TBD

~~**Partnering and Leadership Goal:** Continually improve governance and management to ensure Program effectiveness, efficiency, accountability and partner participation.~~

- ~~***Xxx Outcome***: TBD~~

~~**Identified Gaps:** Toxic Contaminants, Social/Environmental Indicators~~

PA DEP COMMENT on Stream Restoration Outcome:

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Rodney Kime | Division Chief, Water Quality Standards
Department of Environmental Protection

Summary Comment: We have continually expressed our concerns to the group that developed the "CBP indicator that measures stream quality using an index of biotic integrity which scores benthic macroinvertebrate communities". Simply put, the measure is out of necessity simplistic because it must be applicable to several states encompassing different physiographic regions using different collection methods and the macroinvertebrates are only identified to Family. The indicator is acceptable for use in some contexts but we have reservations using it as such an important environmental measure. The measure is not robust and is not sensitive enough.

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Secondly, macroinvertebrates are good indicators of reductions in sediment but they are not necessarily the best indicators to measure reductions in nutrients. The problem is compounded by the fact the CBP indicator as it is

now calculated is not a sensitive measure of the macroinvertbrate community. The indicator would miss smaller shifts in the biology.

The CBP indicator is not specifically designed to measure the effects of nutrients. If the habitat is poor, the CBP indicator will always be low no matter how much the nutrients are reduced.

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Detailed Comment: The below comments articulates our concerns with using the macroinvertebrate IBI when nutrients are the stressors of most concern. Our concerns are twofold.

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1. A macroinvertebrate IBI by itself is not a good choice when nutrients are the stressors of concern.
2. Measurable biological impacts due to nutrients occur only under specific conditions. Not all sites will exhibit the impacts.

The CBP restoration document makes the following statements.

- Assuming that the reductions of the N, P, and sediment loads to the Bay will improve the streams, and that the streams will be the first to see this improvement, a target of 70% of streams rating a 3, 4, or 5 was chosen. The current condition is 45% of the streams are rating 3, 4, or 5.

- .....using an existing CBP indicator that measures stream quality using an index of biotic integrity which scores benthic macroinvertebrate communities on a scale of poor to excellent (see attached backgrounder).

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Nutrients are not toxic to macroinvertebrates and absent low dissolved oxygen induced by excess plant respiration the macroinvertebrates often do not measurably respond to changes over a wide range of nutrient levels, especially using a Family level IBI. Recent to be published experiments using various doses of phosphorous in artificial streams showed no major changes in EPT taxa in doses ranging from 20 to 50 ug/l as long as aeration was adequate. Often, macroinvertebrate samples are collected in riffles where re-aeration occurs.

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The problem of relating nutrient concentrations to macroinvertebrates is known, and has been a point of contention in an ongoing nutrient TMDL lawsuit. As a result of the litigation, a Scientific Advisory Board (SAB) reviewed EPA's draft guidance titled "Empirical Approaches for Nutrient Criteria Development". The guidance is specific to nutrient criteria development but a number of the SAB's concerns are relevant in the context of relating macroinvertebrate communities to nutrient concentrations. A few examples from the document highlight some of the SAB's concerns.

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1. "The functionality of aquatic food chains is not solely dependent on one type of biota, sediment type, or single nutrient concentration. There are multiple stressors affecting receptors in a number of ways, over the landscape and watershed in question. Confounding variables are not sufficiently addressed in the Guidance. As previously discussed, approaches that address multiple factors, such as a stratified (or hierarchical) approach that considers other attributes known to be important (e. g. canopy, habitat, multiple nutrients) should be considered."

2. "The Committee emphasizes the importance of choosing the biological endpoints. We note the response of benthic indices can be related to many types of stress. We question why periphyton would not be a better indicator."

3. "Measurements of actual biological responses would be appropriate, emphasizing variables that respond most directly to changes in nutrient concentrations. These are typically measures of primary productivity or primary producers, or water chemistry changes such as DO and pH."

4. Moreover, response variables can be at multiple levels - primary response variables (e.g., plants), secondary response variables (e.g., dissolved oxygen [DO], pH), and tertiary response variables (e.g., fish, macroinvertebrates). A change in a response variable is unlikely to be satisfactorily described by changes in a single "causal" variable (e.g., total nitrogen [TN] or total phosphorus [TP]).

5. Some response variables described in the Guidance are clearly related to designated uses (e.g., DO) but the linkage of other responses to designated uses is less obvious or not as well supported scientifically (e.g., macroinvertebrate species richness).

As suggested in #1 above a hierarchical approach is required to assess nutrient impacts because the biological affects are not observable everywhere in a stream. Nutrients will flow through canopied riffles and small pools with little affect on the biota. Observable affects occur only in slow moving water with the proper substrate and lack of shading. Even here, as noted by the SAB, the macroinvertebrates are not the best indicators but rather periphyton and diurnal DO fluctuations are the better indicators. It is easy to understand how using macroinvertebrates and all sites as suggested in the CBP restoration plan could lead to misleading results when nutrient reduction is the goal.

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One could use a stratified probabilistic design that only includes susceptible sites. This might be practical in some areas where low gradient streams and lack of shading predominates but it is problematic in the large areas of Pennsylvania's ridge and valleys and mountains. It would be easier to select sites (control points) that are currently experiencing or are susceptible to nutrient problems and obtain a baseline of periphyton and DO. Later sampling could then be compared to the baseline.

PA DEP COMMENT:

Kenn Pattison, P.G. | Hydrogeologist
DEP Water Planning Office

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The assumption that 60% of Bay segments in attainment correlates to about 70% of non-tidal streams meeting the IBI category of fair, good or excellent is questionable. The assumption is based on the premise that improvement in IBI scores as result of nutrient and sediment reductions within the non-tidal watersheds is directly proportional to projections of improvement in Bay water quality as a result of the same nutrient and sediment reductions. The efficacy of this assumption is questionable.

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First, the large majority of watershed impairments in Pa are the result of acidic mine drainage and sedimentation. The nutrient reductions needed to reach the Chesapeake Bay TMDLs will not result in improvement within those watersheds impacted by acidic mine drainage. As a result, reaching the 70% improved in non-tidal streams would not be reasonable, assuming only nutrient and sediment reductions.

Second, free-flowing freshwater streams are mostly phosphorous limited in Pa. The Bay is a saltwater/brackish water estuarine environment. Once you get beyond the influence of the non-tidal inflows, principally within the middle and lower Bay, the Bay is mostly nitrogen limited. It is unlikely that nutrient and sediment reductions would generate directly proportional water quality improvements within the two completely different ecosystems.

Third, the nutrient and sediment "pollution diet" for the Bay is based on habitat restoration specific to the Bay. Freshwater benthic invertebrates respond to impairments and stressors specific to the freshwater environment. It is unlikely that identical impairments of dissolve oxygen, chlorophyll-a and water clarity standards within the Bay exist in free flowing freshwater streams and that the identical solution of nutrient and sediment reductions would serve to improve the impaired portions of the fresh water streams.