

DRAFT UPDATE FOR WQ GIT MEETING
MIDPOINT ASSESSMENT PRIORITY WORK PLAN:
MEASURE AND EXPLAIN WATER-QUALITY CHANGES
LEAD: SCIENTIFIC, TECHNICAL ANALYSIS, AND REPORT (STAR) TEAM
2014 EXPECTATIONS

Full Title of Priority: Enhanced Analysis and Explanation of Water-Quality Data for the TMDL Mid-Point Assessment

Short Description of Priority: The Chesapeake Bay Program (CBP) will enhance the analysis and explanation of monitoring information as part of the Mid-Point Assessment for the *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment* (Bay TMDL). The CBP partners have endorsed (PSC, May 2012) an integrated approach that includes three primary pieces of information to measure progress toward water-quality standards:

- Reporting of water-quality management practices.
- Analyzing trends of nitrogen, phosphorus and sediment in the watershed.
- Attainment of dissolved oxygen, chlorophyll, and water clarity/SAV standards.

The activities described in this work plan will provide an integrated assessment and explanation of changes in watershed and estuary water-quality monitoring information. The four major work elements are:

- Analyze water-quality trends in the Bay and its watershed.
- Explain the factors affecting water-quality trends in Bay and its watershed.
- Enhance CBP models using the improved understanding of trends.
- Inform management strategies to improve water quality.

The results will be used by CBP WQ GIT and other partners, through an adaptive management approach, to:

- Help prepare Phase III watershed implementation plans.
- Inform implementing practices to carry out the WIPs.
- Evaluate progress toward improving water quality.

Partners: The effort will be coordinated through STAR with leadership from USGS, CBPO Office (Modeling and Monitoring Teams), and UMCES. Many activities require coordination among the STAR Workgroups), which includes members from all Bay States and DC, USGS, SRBC, ICPRB, and academic institutions.

Study Approach, Necessary Datasets, Analyses, or Decisions: The integrated approach to quantify and explain water-quality trends in the Bay and its watershed relies on monitoring information, enhanced BMP implementation data, and use of several analytical tools (including statistical tools, CBP

WSM and estuary models, USGS SPARROW model, and GW models). The following activities will be coordinated through the CBP STAR team and interaction with the WQGIT:

- Analyze water-quality trends in the Bay and its watershed.
- Explain the factors affecting water-quality trends in Bay and its watershed.
- Enhance CBP models using the improved understanding of trends.
- Inform management strategies to improve water quality.

Below is a brief description for each major work element.

Element 1: Analyzing water quality trends in the Bay and its watershed.

This element consists of two primary items:

- Assess changes in nutrients and sediment in the Bay watershed.
- Analyze water-quality trends in the estuary and tidal tributaries.

Each is presented below.

Analyze trends of nitrogen, phosphorus and sediment in the watershed. The USGS will work with the NTWG to provide an annual update of trends in nitrogen, phosphorus and sediment concentrations for two time periods: 1985 to present, and the most recent 10 year period. The USGS will work with the STAR and CBP Office on approaches to compare and communicate the newly reported trend in flow-normalized loads (from WRTDS) with watershed model results and Bay TMDL allocations/targets loads.

Expectations for 2014: The focus in 2014 is assessing approaches for a new indicator based on trends in flow-normalized loads (from WRTDS). The new indicator will be finalized in 2015. Reporting on trends in concentration and loads for 2014 is based on the nine river-input monitoring (RIM) stations. The reporting for the remainder of the nontidal stations would occur in 2015 when the number of nontidal monitoring stations, when the number of stations with 5-year load and ten-year trends will increase significantly.

Analyze trends of water quality in the estuary and tidal tributaries.

Work to enhance approaches to examining temporal trends in water quality in tidal waters. One promising approach is the application of General Additive Models (GAMs). GAMs would supplement existing statistical approaches (i.e. Seasonal Kendall tests) by increasing information on changes in water quality parameters over time.

Expectations for 2014: Further develop and evaluate new statistical approach (GAMs) and explore ways to compare it to watershed trends (see Element 1 above).

Element 2: Explain water-quality trends in Bay and its watershed. An integrated approach to explain water-quality trends in the Bay and its watershed will be developed. The effort will include both geographically-specific and watershed-wide approaches to explain trends in the nontidal and estuarine areas. In addition to the watershed-wide analysis, the geographic areas that have tentatively been selected include: (1) Eastern shore, (2) Potomac River, (3) Lower VA rivers (Rappahannock, York, James), and (4) Susquehanna and upper Bay. The team will work to integrate findings to explain the relationship between the watershed and estuarine areas. The team will investigate approaches for explaining trends in relation to both anthropogenic factors (including implementation of water-quality management practices and land-use changes) and natural factors (such as residence times of nutrients and sediment). The team will also focus on explaining changes in distinct “source sectors,” including wastewater treatment plants, agriculture, and urban/suburban areas.

Trends in nutrients and sediment will be investigated for the major basins listed above, and in selected sites within those basins. The teams will examine water-quality changes at selected CBP monitoring stations (with an emphasis on the River-Input Monitoring (RIM) sites) using the new WRDTS approach. The factors to be examined at each site include: (1) inputs of nutrient (such as fertilizer, manure, air deposition) and sediment sources, (2) land-use change, (3) implementation of practices to reduce nutrients and sediment, and (4) influence of watershed properties. Several tools (e.g. USGS SPARROW model, ground-water models, and the CBP WSM) will be used to help examine regional processes affecting trends. Results from small watershed studies being conducted by USGS and academic institutions will also be used to help understand processes affecting water-quality change. The teams will interface with academic partners to focus on different topics.

Results from the watershed efforts described above will be used to help explain estuary trends. The effort will focus on explaining trends in DO, clarity/SAV and chlorophyll and associated parameters in the tidal waters of the Bay in the context of trends occurring in the watershed. The factors to be examined include: (1) inputs of nutrient and sediment loads from the watershed, (2) implementation of practices to reduce nutrients and sediment, and (3) influence of estuarine properties and processes. The effort will include STAR, the CBP monitoring team and the new USGS-CBP analyst.

Expectations for 2014:

- Finalize and release the “New Insights” report based on case studies in the Bay watershed addressing observed water-quality responses to BMP implementation (UMCES, USGS, CBP).
- Release Eastern Shore Trends report (USGS) and continue analysis of Potomac Basin and selected basin-scale analyses.
- Convene a STAC responsive workshop (“Management Effects on Water Quality Trends” workshop) to discuss promising technical approaches and associated data

needs to explain water-quality trends in the Bay and its watershed; release workshop report.

Element 3: Enhance CBP Models using improved understanding of monitoring data and load delivery. The CBP modeling team will use the increasing amount and understanding of monitoring data to enhance the WSM and estuary models. The planned enhancements are explained in additional work plans that were prepared for the Mid-point Assessment of the TMDL. The USGS SPARROW and Explaining Trends teams will work with the CBP modeling team to use an improved understanding of the significance of selected variables to inform the CBP WSM. The USGS SPARROW team will also be enhancing their models to provide partners with a finer resolution of geographic information that can be used by partners to help focus implementation of practices for the TMDL.

Expectations for 2014: The CBP modeling team will work with USGS and partners to:

- Evaluate modeled expectations of long-term trends in comparison to observed trends in load at key locations across the Chesapeake watershed.
- Continue efforts to identify changes in BMP implementation and expected changes in water quality since 1985.
- Explain changes using the watershed modeling tools.

Element 4: Inform management strategies to improve water quality. Results of the efforts described above will be used by the CBP WQGIT and other partners, through an adaptive management approach, to:

- Help prepare Phase III Watershed Implementation Plans
- Inform implementation of practices to carry out the WIPs
- Assess Evaluate progress toward improving water quality

The primary audiences and associated products for communicating the efforts described above include:

- Science Audience/WQGIT workgroups: Technical Reports/Journal articles.
- Water-Quality Goal Team and Federal and State managers on Management Board: Science Fact Sheets/tailored PowerPoint presentations/briefings.
- Implementers: local governments/conservation districts/watershed organizations: less complex and more geographically specific explanations and clear statements of implications for ongoing implementation programs and efforts.

The project team will provide key results to these groups using different communication products so they can better apply the CBP adaptive management framework to focus and potentially refine their efforts to achieve the TMDL and associated water-quality standards. Additionally, the information will be available for inclusion into decision-support tools (such as

ChesapeakeStat) and other WWW applications. This effort will require interaction between STAR and CBP Communications Office.

Expectation for 2014: UMCES and CBP STAR team will release a stand-alone Executive Summary of the “New Insights” report.

Interim Deliverables, Including Leads and Deadlines:

Products released in 2013:

- USGS report on flow-normalized trends in nutrient and sediment loads to tidal waters.
- Annual update of water-quality trends in the watershed and Bay (Bay Barometer and supporting indicators).

Products released in 2014:

- “New Insights on BMP implementation and water-quality improvements” report and associated executive summary (UMCES, USGS, CBP).
- Synthesis of factors affecting nutrient trends in nontidal waters on the Eastern Shore (USGS)
- STAC workshop report describing promising technical approaches and associated data needs for explaining water-quality trends in the Bay and its watershed.

Potential longer-term products:

Below is a listing of potential products for the MPA and beyond. The relevant collaborating teams will work with partners to prioritize items for the MPA.

- Synthesis of factors affecting nutrient and sediment trends in nontidal waters of the Potomac River basin.
- Synthesis of factors affecting nutrient and sediment trends in nontidal waters in selected VA river basins.
- Response of tidal water quality parameters to trends in nutrient and sediment loads in selected tributaries.
- Summary of factors affecting water-quality trends in the Bay and its watershed.
- Other reports and products on selected source sectors.

Level of Effort for Lead and Supporting Partners, Including (as relevant) CBPO Modeling

Team: High level of effort for CBP monitoring team, USGS, NTWG, TMAW, CAP, moderate effort for CBPO modeling team. USGS and the CBPO have created a new shared position to help coordinate and conduct analysis for the effort.

Potential Conflicts with Other Priorities: CBP modeling team may not be able to provide effort needed to help explain trends given other commitments.

Issues Requiring Input from Full WQGIT: Indicator development, verification protocols, review of key findings.

Issues Requiring Input from Management Board and/or Principals' Staff Committee:
Approach for measuring progress has already approved by MB and PSC.