Water Quality Standards Attainment and Monitoring Outcome

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Chair - Criteria Assessment Protocol WG
STAR Coordinator
Goal: Reduce pollutants to achieve the water quality necessary to support the aquatic living resources of the Bay and its tributaries and protect human health.

Outcome: Continually improve the capacity to monitoring and assess the effects of management actions being understood to implement the TMDL and improve water quality. Use the monitoring results to report annually to the public on progress made in attaining established water quality standards and trends in reducing nutrients and sediment in the watershed.
What We Want

1. Monitoring Capacity building with your support.

A vision for next steps in a successful path forward:

• **Summer 2018.** Management Board accepts Citizen Science and Nontraditional Partner MOU.

• **Summer 2018.** Management Board promotes MOU to PSC.

• **Next PSC meeting 2018.** PSC signs MOU.

• **2019 forward.** Management Board ensures partnership use of citizen science and nontraditional partner data as applicable to assessing progress towards meeting outcomes.

Results comparison shows better conditions with 21 sites than 1 site.

South River Federation
N=21 sites
4x/month

South River
Chesapeake
Bay Long-term Site

N=1 site
1x/Month

Increasing resolution
Reducing uncertainty

A Muller. USN
Which dinosaur picture has less uncertainty and more accuracy?

Marginal information

Adequate to full information
1. Monitoring Capacity building with your support.

Improved capacity leads to:

- **improved accuracy** of WQS attainment assessments,

- **reduced uncertainty** about status and progress

- **earlier detection of change** in response to management actions

- **better management targeting** of limited resources.
What We Want

2. Use the monitoring results to report annually to the public on progress made in attaining established Bay water quality standards, and trends in reducing nutrients and sediment in the watershed.

Charge STAR with further analyses that support greater understanding of patterns in water quality attainment in the bay, and between monitoring and model results for N,P, and S reductions in the watershed.
2. Use the monitoring results to report annually to the public on progress.

Enhanced data use and analyses leads to:

- **improved accuracy** of WQS attainment assessments
- **reduced uncertainty** about progress
- **earlier detection of change** in response to management actions
- **better management targeting** of limited resources
- **combat inflation** with cross GIT utcome support
Setting the Stage:

What are our assumptions?
Factors
• Delivering necessary financial capacity to implement practices and programs
• Improving the identification of sources and their contributions to N, P, Sed, pollutant loads

Current Efforts and Gaps
• Continue/expand monitoring and analysis efforts to coincide outputs with two-year milestones and annual progress runs needs.

Management Approaches
• Adapt the existing monitoring program
• Cit Sci/new partner support in assessments
• Continue to incorporate new land use data.
• Refine factors affecting source and loads changes.
• Better predict future pop growth and climate change impacts

Following the Decision Framework:

Logic Behind Our Outcome
Chesapeake Bay Program Partnership Monitoring Program: Networks and Analysis

- Analysis and synthesis are used to tell the stories that address stakeholder interests
- Applying adaptive monitoring is supporting Adaptive Management

Sustaining Core Networks and Conducting Peer-reviews, Planning, Coordination and Implementation

Evolving Policy

Leveraging & Growing Partnerships

Managing Uncertainty

Assessing and Communicating Ecosystem Status and Change Effectively
Progress: Are we doing what we said we would do?
What is our progress?

Our capacity to Monitor Watershed loads and trends: Adequate

Bay Water Quality Standards Attainment: Marginal

*Both programs show we are experiencing support thresholds experiencing erosion and decline.*

Capacity to Monitor (USEPA 2003 scale): 
1. Recommended
2. Adequate
3. Marginal
What is our progress?

(-) Inflation impacts with level funding

(-) Aging out of the infrastructure

(-) Lost monitoring partnerships

Creative Program Management for Sustaining and Growing Capacity To Fill Gaps

(+): Use of Citizen-based and nontraditional partner data.

(+): Updated assessment protocols (USEPA 2017)

(+): Partnership adapting of existing monitoring resources
Are we on track? The Bay

- 2014-16 assessment was the best index score on record.
- Long-term and short-term trends are improving.

Estimated Achievement of Chesapeake Bay Water Quality Standards 1985-2016

Monitoring – Bay network

Assessing progress
Are we on track? The Watershed RIM

- N trends mostly improving. P and S trends more frequently show no change or degrading.


[Improving or degrading trends classified as likelihood estimates greater than or equal to 67 percent]

<table>
<thead>
<tr>
<th>Monitoring station</th>
<th>Total nitrogen load</th>
<th>Total phosphorus load</th>
<th>Suspended-sediment load</th>
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<tbody>
<tr>
<td></td>
<td>Long term</td>
<td>Short term</td>
<td>Long term</td>
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<td>SUNQUEHANNA RIVER AT CONOWINGO, MD</td>
<td>Improving</td>
<td>Degradating</td>
<td>Improving</td>
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<td>POTOMAC RIVER AT WASHINGTON, DC</td>
<td>Improving</td>
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<td>JAMES RIVER AT CARTERVILLE, VA</td>
<td>Improving</td>
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<td>RAPPANANSECK RIVER BR. FREDERICKSBURG, VA</td>
<td>Improving</td>
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<td>Degradating</td>
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<td>APPOMATTOX RIVER AT MATOACA, VA</td>
<td>No Trend</td>
<td>Degradating</td>
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<td>PANUNEY RIVER NEAR HANOVER, VA</td>
<td>No trend</td>
<td>Degradating</td>
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<td>MATTAPONI RIVER NEAR BURLINGTON, VA</td>
<td>Improving</td>
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<td>PATUXENT RIVER NEAR HOWIE, MD</td>
<td>Improving</td>
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<td>CHOPTANK RIVER NEAR GREENSBORO, MD</td>
<td>Degradating</td>
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Challenges:
Are our actions having the expected effect?
Challenges

Maintain Monitoring Capacity
- In spite of our biggest investments in monitoring in the history of the CBP, program erosion is occurring.
  - Inflation, retiring aging infrastructure, partner loss and lack of monitoring-specific State match availability are eroding our program to the threshold of limiting monitoring program maintenance under a level funding status in the next 3 years.

Water Quality Standards Attainment
- Low spatial density of stations and low temporal resolution often require big ecosystem changes in order to detect changes in status.
Challenges

Monitoring and Analysis

- Analysis need: Understanding the relationship between monitoring load trends with model projections for N, P and Sediment

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<thead>
<tr>
<th>Model</th>
<th>Monitoring</th>
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<td>N</td>
<td>improving mixed</td>
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<td>improving degrading</td>
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<td>improving degrade/NT</td>
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</table>
Challenges: Trends and Synthesis

- (+) There are significant analysis developments, extensive new syntheses and a roll out of publications in progress on trends and linkages.
- (+) Support for analysis on our teams (Emily, Qian)
- (-) There have been some reductions in statistical support due to inflationary pressures
- (+/-) Diverse synthesis support funding
Adaptations: How should we adapt?
Based on what we’ve learned, we plan to...

- Improve capacity with your help by accepting and promoting the Citizen science and nontraditional partner MOU through PSC signing and data use by all partners.
Integration of Citizen Science complements work of the Stewardship GIT and Diversity Outcome by engaging groups and creating new leadership across the watershed plus the Habitat GIT and Stream Health Outcome assessment.

Maintaining the networks supports ‘factors’ data supporting proposed priority climate impacts and resilience indicators.

Improved accuracy and reduced uncertainty in water quality standards attainment assessments directly relate to Fish Habitat Outcome information needs.

Trends in the watershed water quality support the Healthy Watersheds Outcome information needs.
1. Accept and promote the Citizen science and nontraditional partner MOU that support enhanced data assessments.

2. Charge STAR with further analyses for understanding comparisons of observed and expected trends in water quality in the bay and watershed.
Discussion
Activity: Dinosaur fossil hunting…what did we find?
Activity: Dinosaur fossil hunting…what did we find?

A few bones of some dinosaur. What does it look like?
What does it look like?

It’s about a 10 ft dinosaur, standing about 6 feet tall, small front limbs, strong hind limbs, it has about a 4 foot tail and a head as large as my chest is across.

We can paint our estimate of a full picture of it from just a few bones.
**INDICATOR of Water Quality Standards Attainment Assessment**

<table>
<thead>
<tr>
<th>Bay Attainment</th>
<th>Segments¹</th>
<th>Designated Uses²</th>
<th>Criteria</th>
<th>Season</th>
<th>Thresholds</th>
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**1. Segment**
- **Migratory**
  - **DO**
  - **TF up** = 10
  - **TF lo** = 15
  - **OH** = 15
  - **MH** = 12
  - **PH** = 12

**2. Segment**
- **Open Water**
  - **DO**
  - **TF up** = 15
  - **TF lo** = 23
  - **OH** = 22
  - **MH** = 10
  - **PH** = 10

**3. Segment**
- **Deep Water**
  - **DO**
  - **TF up** = 30
  - **TF lo** = 30
  - **OH** = 30
  - **PH** = 30

**4. Segment**
- **Deep Channel**
  - **DO**
  - **TF up** = 30
  - **TF lo** = 30
  - **OH** = 30
  - **PH** = 30

**5. Segment**
- **Shallow Water**
  - **Bay grasses**
  - **DO**
  - **Water Clarity/SAV**
  - **SAV season**

BLACK is measured, known. **BLUE** is NOT MEASURED BY THE MONITORING PROGRAM. The Indicator **Estimates Attainment** at this time.
Which dinosaur picture has less uncertainty and more accuracy?

Marginal information

Adequate to full information
Which dinosaur picture has less uncertainty and more accuracy?

Marginal information

This is our Water Quality Standards Attainment Assessment right now

Adequate to full information
Which dinosaur picture is has less uncertainty and more accuracy?

Marginal information

This is our Water Quality Standards Attainment Assessment right now

Adequate to full information

With new data plus USEPA 2017 we are getting closer to this.
Agreement Goals and Outcomes

**Sustainable Fisheries**
- Blue Crab Abundance
- Blue Crab Management
- Oyster
- Forage Fish
- Fish Habitat

**Vital Habitats Goal**
- Wetlands
- Black Duck
- Stream Health
- Brook Trout
- Fish Passage
- Submerged Aquatic Vegetation (SAV)
- Forest Buffer
- Tree Canopy

**Water Quality Goal**
- 2017 Watershed Implementation Plans (WIP)
- 2025 WIP
- Water Quality Standards
  Attainment and Monitoring

**Toxic Contaminants Goal**
- Toxic Contaminants Research
- Toxic Contaminants Policy and Prevention

**Healthy Watersheds Goal**
- Healthy Waters

**Stewardship Goal**
- Citizen Stewardship
- Local Leadership
- Diversity

**Land Conservation Goal**
- Protected Lands
- Land Use Methods and Metrics Development
  Land Use Options Evaluation

**Public Access Goal**
- Public Access Site Development

**Environmental Literacy Goal**
- Student
- Sustainable Schools
- Environmental Literacy Planning

**Climate Resiliency Goal**
- Monitoring and Assessment
- Adaptation Outcome
Our Water Quality Monitoring Funding Support has grown and is the greatest it has ever been in the history of the program.

▪ 2008: ~3.08M EPA funding the monitoring programs.

▪ 2010: ~$4.3 Million EPA funds. Not including state match, partner funds.

▪ 2018:~$5.0M + SAV + State match efforts (not all monitoring match) + Citizen Science.
EPA funding and partnerships have grown the monitoring program throughout its history to its greatest level of support ever.

Managing budgets to address annual inflation are critical to sustaining the existing core monitoring for water quality standards.

Incorporating newly published protocols will improve the accuracy of our index.

Adding Citizen Science support to the monitoring program portfolio will expand our monitoring resolution in the bay.

Adjusting the priorities of shallow water monitoring funding to targeted monitoring will improve segment assessments.

CAP WG opportunity to introduce satellite image assessment of baywide water clarity could further improve attainment assessments.

SAV monitoring program funding is being shored up.

There are opportunities for State match/additional partners to fill gaps.
## FULL Water Quality Standards Attainment Assessment for Chesapeake Bay Dissolved Oxygen, Water Clarity and Chlorophyll a

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1. Bay Attainment
2. Designated Uses
3. Criteria
4. Season
5. Thresholds

### Bay Attainment

- **Bay Attainment**
- **Segments**
- **Designated Uses**
- **Criteria**
- **Season**
- **Thresholds**

### Segments

- **1** Segment
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- **92** Segment

### Criteria

- **Chla**
- **DO**
- **TF**
- **OH**
- **PH**
- **SAV**

### Season

- **Feb-May**
- **June-July**
- **Aug-Nov**
- **Dec-Jan**
- **Yearround**

### Thresholds

- **7-day mean Instantaneous minimum**
- **TF**
- **OH-Ph**
- **30 day mean**
- **1-day mean Instantaneous minimum**
- **30 day mean Instantaneous minimum**
- **Dependent upon Open Water attainment assessment**

### Segment-specific water clarity/bay grasses acreage goals.