# RESULTS OF QUANTIFICATION OF BMP IMPACTS ON CBP MANAGEMENT STRATEGIES

## Mark Sievers, Tetra Tech

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# Goal

To quantify the effect the Bay Model's best management practices (BMPs) have on each management strategy to better enable jurisdictions, localities, and others to assess the impact of their watershed implementation plans on all management strategies or additional goals.

# Result

- A matrix that assigns each BMP (or BMP group) an impact score (-5 to 5) for each management strategy or goal
- Matrix evaluates a wide range of BMP impacts, and can show where mutual benefits can be achieved depending on priorities

| BMP/BMP Group | Management Strategy A | Management Strategy B | Management Strategy C | Etc. |
|---|---|---|---|---|
| BMP 1 | -X to +X | -X to +X | -X to +X | -X to +X |
| BMP 2 | -X to +X | -X to +X | -X to +X | -X to +X |
| BMP 3 | -X to +X | -X to +X | -X to +X | -X to +X |
| Etc. | -X to +X | -X to +X | -X to +X | -X to +X |

# Management Strategies & Additional Goals

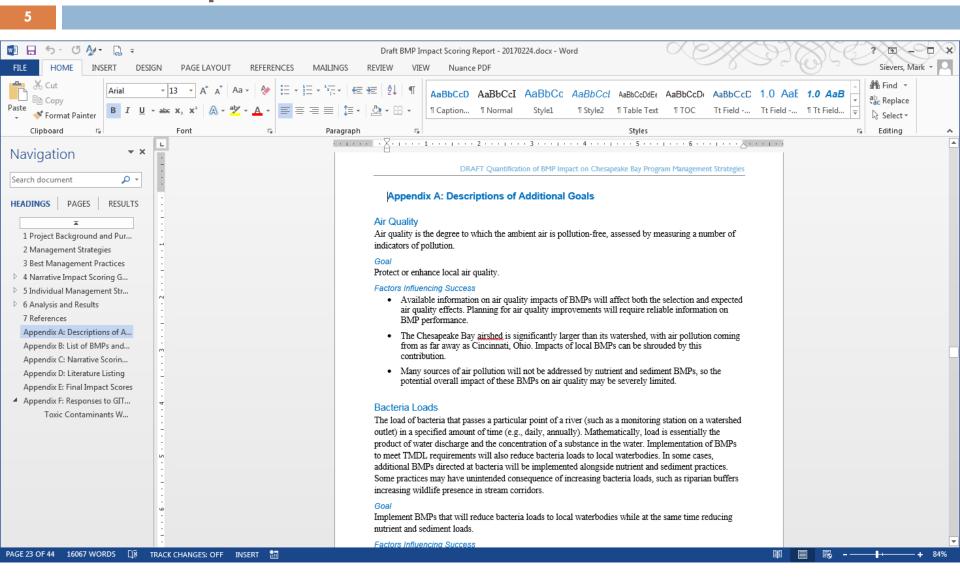| Management Strategy | Management Strategy | Additional Goals |
|---|---|---|
| Blue Crab Abundance | Forest Buffers | Community Development/Jobs |
| Oysters | Tree Canopy | Flood Control/Mitigation |
| Fish Habitat | Toxic Contaminants Policy and Prevention | Bacteria Loads |
| Forage Fish | Healthy Watersheds | Property Values |
| Wetlands | Citizen Stewardship | Groundwater Recharge/Infiltration |
| Black Ducks | Protected Lands | Drinking Water Protection/Security |
| Stream Health | Land Use Methods and Metric Development | Biodiversity and Habitat |
| Brook Trout | Public Access Site Development | Air Quality |
| Fish Passage | Climate Adaptation | Recreation |
| Submerged Aquatic Vegetation | | Energy Efficiency |

# Management Strategies/Additional Goals – Descriptions



DRAFT Quantification of BMP Impact on Chesapeake Bay Program Management Strategies

## Appendix A: Descriptions of Additional Goals

### Air Quality
Air quality is the degree to which the ambient air is pollution-free, assessed by measuring a number of indicators of pollution.

*Goal*
Protect or enhance local air quality.

*Factors Influencing Success*
- Available information on air quality impacts of BMPs will affect both the selection and expected air quality effects. Planning for air quality improvements will require reliable information on BMP performance.
- The Chesapeake Bay airshed is significantly larger than its watershed, with air pollution coming from as far away as Cincinnati, Ohio. Impacts of local BMPs can be shrouded by this contribution.
- Many sources of air pollution will not be addressed by nutrient and sediment BMPs, so the potential overall impact of these BMPs on air quality may be severely limited.

### Bacteria Loads
The load of bacteria that passes a particular point of a river (such as a monitoring station on a watershed outlet) in a specified amount of time (e.g., daily, annually). Mathematically, load is essentially the product of water discharge and the concentration of a substance in the water. Implementation of BMPs to meet TMDL requirements will also reduce bacteria loads to local waterbodies. In some cases, additional BMPs directed at bacteria will be implemented alongside nutrient and sediment practices. Some practices may have unintended consequence of increasing bacteria loads, such as riparian buffers increasing wildlife presence in stream corridors.

*Goal*
Implement BMPs that will reduce bacteria loads to local waterbodies while at the same time reducing nutrient and sediment loads.

*Factors Influencing Success*

# Example Impact Score Guidelines

| Value | Score | Score Narrative for Groundwater Recharge/Infiltration | Score Narrative for Healthy Watersheds |
|---|---|---|---|
| 5 | Substantial Improvement | Practice maximizes infiltration at a hardened site (e.g., replaces impervious surface area with pervious surface or captures and infiltrates runoff from urban or hardened sites). | Practice directly restores or conserves non-urban lands |
| 4 | Moderate to Substantial Improvement | Somewhere between 3 and 5 → BPJ | Somewhere between 3 and 5 → BPJ |
| 3 | Moderate Improvement | Practice increases infiltration at a hardened site (e.g., replaces impervious surfaces with semi-pervious surfaces). | Practice protects or improves stream flow regimes or channel stability |
| 2 | Slight to Moderate Improvement | Somewhere between 1 and 3 → BPJ | Somewhere between 1 and 3 → BPJ |
| 1 | Slight Improvement | Practice reduces runoff and increases infiltration at an unhardened site (e.g., change in tillage that increases infiltration). | Practice improves water quality or reduces impervious surfaces |
| 0 | No Effect | Practice has no impact on groundwater recharge/infiltration than without the practice. | Practice has no impact on healthy watersheds |
| -1 | Slight Worsening | Practice increases runoff and decreases infiltration at an unhardened site (e.g., change in tillage that decreases infiltration). | Practice worsens water quality or increases impervious surfaces |
| -2 | Slight to Moderate Worsening | Somewhere between -1 and -3 → BPJ | Somewhere between -1 and -3 → BPJ |
| -3 | Moderate Worsening | Practice directly decreases infiltration at a = hardened site (e.g., replaces pervious surfaces with semi-pervious surfaces). | Practice worsens stream flow regimes or channel stability |
| -4 | Moderate to Substantial Worsening | Somewhere between -3 and -5 → BPJ | Somewhere between -3 and -5 → BPJ |
| -5 | Substantial Worsening | Practice prevents infiltration at a hardened site (e.g., adds impervious surface area without runoff capture and infiltration) or uses/removes groundwater. | Practice directly increases urbanization |

** Do not consider location or scale of BMP, unless noted.**

# Scoring – Sources

- Tt reviewed expert panel reports and performed additional literature search

- GITs and workgroups contributed to scoring
    - Some GITs scored their management strategies
    - Some WQGIT workgroups scored their BMP types

- Toxic Workgroup scored all BMPs for toxics
    - Identified the toxics of concern for each sector
        - Septics: pharmaceuticals, household and personal care products, flame retardants, biogenic hormones

- Agriculture: Tt scores derived largely from USDA-NRCS conservation practice physical effects (CPPE) data

# Scoring – Processing

- Tt-scored practices were quality checked
- Goal was at least one score for each BMP/management strategy combination
  - Tt reviewed scores that disagreed > 2 points
    - Found differences in interpretation, understanding, and considerations.
    - Kept all scores for analysis
  - Averaged/weighted multiple scores
    - Based on understanding of the management strategies and BMP functionality
    - Rounded to nearest 0.5
    - Results: Matrix contains *relative* scores for BMPs versus each management strategy or goal rather than absolute scores that correspond directly to the scoring guidelines

# Interpreting Averaged Scores

- Scores for agricultural BMPs are single scores; all others are average scores
  - A *single* score of 3 corresponds directly to the score narrative (blue text)
  - An *average* score of 3 does *not* correspond directly to score narrative (blue text)
    - A BMP with an average score of 3 is *better* than a BMP with an average score of 2 or less.

| Value | Score | Score Narrative for Groundwater Recharge/Infiltration |
|---|---|---|
| 3 | Moderate Improvement | Practice increases infiltration at a hardened site (e.g., replaces impervious surfaces with semi-pervious surfaces). |

# Preliminary Scores

| BMP Group | Air quality | Bacteria loads | Biodiversity and habitat | Blue Crab Abundance | Energy efficiency | Flood control/ mitigation | Ground-water recharge/ infiltration | Property values | Tree Canopy | Wetlands |
|---|---|---|---|---|---|---|---|---|---|---|
| Constructed Wetland, Gravity Dispersal | -1.0 | 3.5 | 1.0 | 1.5 | -1.5 | -1.0 | 0.5 | 0.0 | 1.0 | 3.5 |
| Constructed Wetland, Pumped Dispersal | -1.0 | 4.5 | 1.0 | 2.0 | -3.0 | -1.0 | 0.5 | 0.0 | 0.5 | 3.5 |
| IFAS, Gravity Dispersal | -1.0 | 2.5 | 0.0 | 2.0 | -3.5 | 0.0 | 0.5 | 1.5 | 1.0 | 0.5 |
| IFAS, Pump Dispersal | -1.0 | 3.0 | 0.0 | 3.0 | -4.5 | 0.0 | 0.5 | 1.5 | 0.5 | 0.5 |
| Intermittent Media Filter, Gravity Dispersal | -1.0 | 3.0 | 0.0 | 1.5 | -1.5 | 0.0 | 0.5 | 1.5 | 1.0 | 0.5 |
| Intermittent Media Filter, Pump Dispersal | -1.0 | 3.5 | 0.0 | 2.0 | -3.0 | 0.0 | 0.5 | 1.5 | 0.5 | 0.5 |
| Pumped Dispersal | -1.0 | 3.0 | 0.0 | 2.0 | -3.5 | 0.0 | 0.5 | 1.5 | -0.5 | 0.5 |
| Recirculating Media Filter, Gravity Dispersal | -1.0 | 3.5 | 0.0 | 2.0 | -3.0 | 0.0 | 0.5 | 1.5 | 0.5 | 0.5 |
| Recirculating Media Filter, Pump Dispersal | -1.0 | 4.5 | 0.0 | 3.0 | -3.5 | 0.0 | 0.5 | 1.5 | 1.0 | 0.5 |
| Septic Connections | 0.5 | 5.0 | 0.0 | 2.0 | -3.0 | -2.0 | -3.0 | 3.0 | -1.5 | 0.5 |
| Septic Tank Pumpout | -1.0 | 0.5 | 0.0 | 1.0 | -1.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.5 |
| Unspecified Advanced Treatment | -1.0 | 3.0 | 0.0 | 2.5 | -3.5 | 0.0 | 0.5 | 1.5 | 1.0 | 0.5 |

# Applications

- To characterize the additional benefits (+/-) of BMP strategy *beyond* nutrient and sediment reductions to inform
  - Selection of priority BMPs to using management strategy priorities
  - Assessment of overall benefits of a BMP strategy
- Eventual plan is to incorporate in CAST
  - Internal discussions with CBP Technical Lead on potential intermediate way to process results in VBA-Excel file

# Applications - Adjustments

- Adjusting for BMP location and scale
  - Buffer adjacent to an SAV restoration area would be expected to have a greater impact on SAVs than the same buffer placed 2 miles upstream on a tributary
  - Some location/scale adjustments are intrinsic to scoring guidelines: e.g., Oyster Restoration Management Strategy
- Adjusting scores based on Management Strategy priorities
  - End-user decision

# Communications & Comments

- Please send a combined set of comments
- Send additional questions and comments to Mark Sievers, Tetra Tech
  - mark.e.sievers@tetratech.com
  - 703.385.2605