RESULTS OF QUANTIFICATION OF BMP IMPACTS ON CBP MANAGEMENT STRATEGIES

Mark Sievers, Tetra Tech

March 8, 2017 – TCWG Monthly Meeting

Outline

- Overview of Project
- Management Strategies and Additional Goals
- Impact Scoring Guidelines
- Impact Scoring
  - Sources
  - Processing
  - Interpreting
- Preliminary Example Scores
- Application of Scores

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 ***above and beyond*** **nutrient and sediment reductions** 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

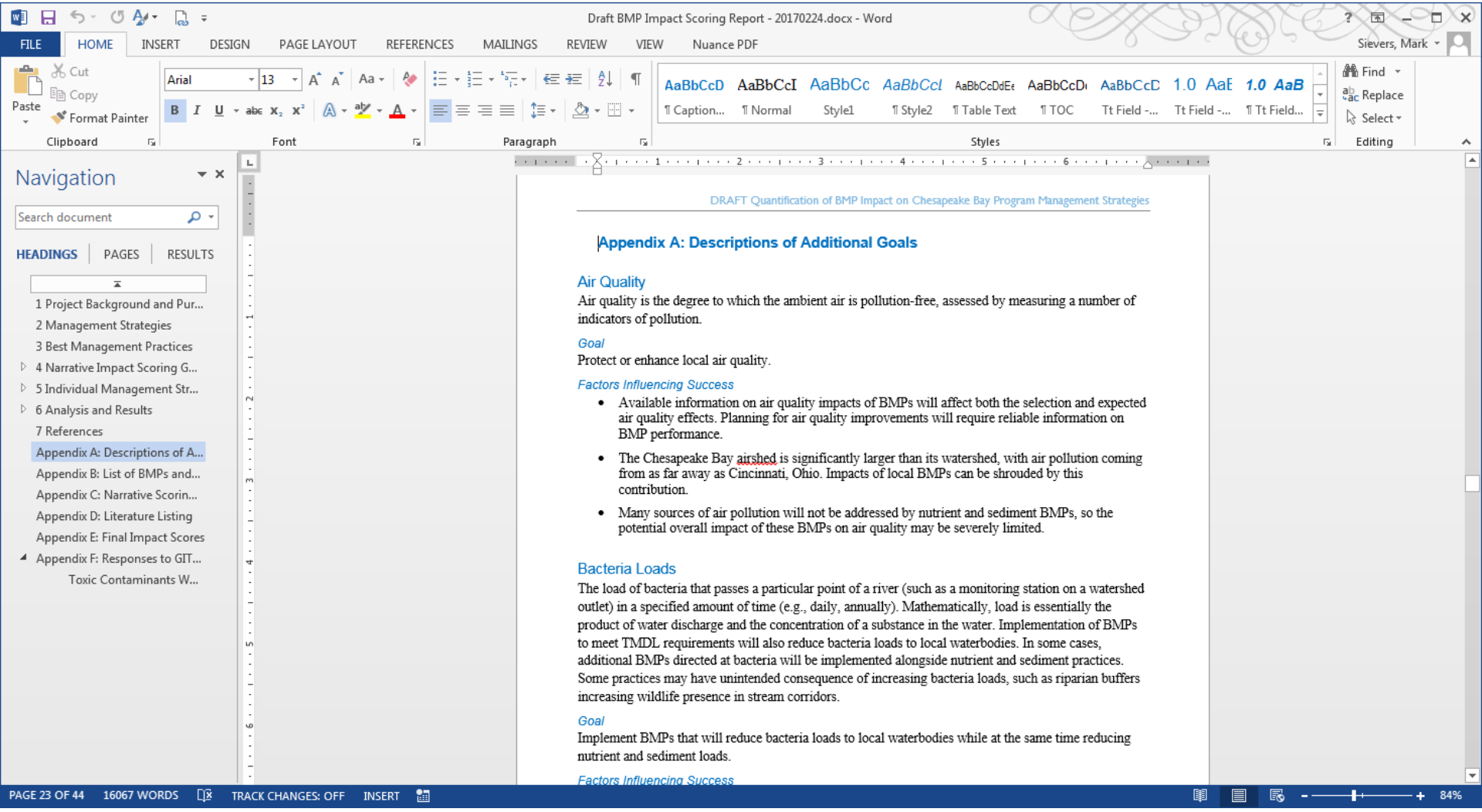
Management Strategies & Additional Goals

Management Strategy
Blue Crab Abundance
Oysters
Fish Habitat
Forage Fish
Wetlands
Black Ducks
Stream Health
Brook Trout
Fish Passage
Submerged Aquatic Vegetation

Management Strategy
Forest Buffers
Tree Canopy
Toxic Contaminants Policy and Prevention
Healthy Watersheds
Citizen Stewardship
Protected Lands
Land Use Methods and Metric Development
Public Access Site Development
Climate Adaptation

Additional Goals
Community Development/Jobs
Flood Control/Mitigation
Bacteria Loads
Property Values
Groundwater Recharge/Infiltration
Drinking Water Protection/Security
Biodiversity and Habitat
Air Quality
Recreation
Energy Efficiency

Management Strategies/Additional Goals – Descriptions



Example Impact Score Guidelines

Value	Score	Score Narrative for Toxic Contaminants Policy and Prevention
5	Substantial Improvement	Practice has potential to substantially decrease the delivery of toxic contaminants to waterbodies.
4	Moderate to Substantial Improvement	Somewhere between 3 and 5 → BPJ
3	Moderate Improvement	Practice has potential to moderately decrease the delivery of toxic contaminants to waterbodies.
2	Slight to Moderate Improvement	Somewhere between 1 and 3 → BPJ
1	Slight Improvement	Practice has potential to slightly decrease the delivery of toxic contaminants to waterbodies.
0	No Effect	Practice has no impact on toxic contaminants policy and prevention.
-1	Slight Worsening	Practice has potential to slightly increase the delivery of toxic contaminants to waterbodies.
-2	Slight to Moderate Worsening	Somewhere between -1 and -3 → BPJ
-3	Moderate Worsening	Practice has the potential to moderately increase the delivery of toxic contaminants to waterbodies.
-4	Moderate to Substantial Worsening	Somewhere between -3 and -5 → BPJ
-5	Substantial Worsening	Practice has the potential to significantly increase the delivery of toxic contaminants to waterbodies.

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

Scoring – Sources

- GITs and workgroups contributed to scoring
  - Some GITs scored their management strategies
  - Some WQGIT workgroups scored their BMP type
- Tt reviewed expert panel reports and performed additional literature search
- Special Cases
  - 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

Toxics Contaminant Classes

Contaminant Group	Sector	Extent, Severity, and Sources
Polychlorinated biphenyls (PCBs)	Urban	Widespread extent and severity. The severity was based on risk to human health through consumption of contaminated fish with impairments identified in all of the watershed jurisdictions. Some primary sources are contaminated soils, leaks from transformers, and atmospheric deposition.
Mercury	Atmo-spheric	Widespread extent and severity. The severity was based on risk to human health through consumption of contaminated fish. The primary source is air emissions from coal-fired power plants.
Polycyclic aromatic hydrocarbons (PAHs)	Urban	Widespread extent throughout the Bay watershed. The severity was localized based on impairments for risk to aquatic organisms in a limited number of areas in the watershed. The primary sources are contaminated soils, road sealants, atmospheric deposition, and combustion.
Pesticides	Ag, Urban	Widespread extent of selected herbicides (primarily atrazine, simazine, metolachlor, and their degradation products) and localized extent for some chlorinated insecticides (aldrin, chlordane, dieldrin, DDT/DDE, heptachlor epoxide, mirex). The chlorinated insecticides have localized severity based on risk to aquatic organisms. For many pesticides that had widespread occurrence, water quality standards were not available to determine impairments. Research shows sublethal effects for some compounds at environmentally relevant concentrations. Primary sources are applications on agricultural and urban lands and legacy residue in soils.
Petroleum hydrocarbons	Urban	Localized extent and severity (to aquatic organisms) in a limited number of areas in the watershed.
Dioxins and furans	Industrial	Localized extent and severity (to aquatic organisms) in a limited number of areas in the watershed. The primary sources are spills, contaminated soils, and atmospheric deposition.
Metals and metalloids	Urban	Localized extent and severity (to aquatic organisms) of some metals (aluminum, chromium, iron, lead, manganese, zinc) in a limited number of areas in the watershed. The primary sources are spills, industrial processes, and atmospheric deposition.
Pharmaceuticals, household and personal care products, flame retardants, biogenic hormones	Urban, Waste-water, Ag Septics	Information was not adequate to determine extent or severity. Their use in the watershed, however, suggests widespread extent is possible. Severity was not accessed but research shows sublethal effects to selected aquatic organisms for some compounds at environmentally relevant concentrations. Range of sources from wastewater treatment and septic tanks to animal feeding operations. Biogenic hormones assessment was focused on naturally occurring compounds from humans or animals.

Scoring – Processing

- Goal was at least one score for each BMP/management strategy combination
  - Some scores blank if did not fully understand a BMP
- Tt-scored practices were quality checked
  - Tt reviewed scores that disagreed > 2 points
    - Found differences in interpretation, understanding, and considerations.
    - Kept all scores for analysis – All considered valid
  - Averaged multiple scores
    - Weighting 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

Preliminary Scores

Sector	BMP Group	TC	Sector	BMP Group	TC	Sector	BMP Group	TC
Agriculture	Ag Forest Buffer	4.0	Agriculture	Narrow Grass Buffer	3.0	Septics	Pumped Dispersal	2.0
Agriculture	Ag Stream Restoration	1.0	Agriculture	Phase 6 Conservation Tillage	1.0	Septics	Septic Connections	4.0
Agriculture	Ag Tree Planting	2.0	Agriculture	Phase 6 High Residue Tillage	1.0	Septics	Septic Tank Pumpout	2.0
Agriculture	Agricultural Ditch BMPs	1.0	Agriculture	Phase 6 Nutrient Management-N	1.0	Urban	Bioretention	1.5
Agriculture	Barnyard Runoff Controls	3.0	Agriculture	Phase 6 Nutrient Management-P	1.0	Urban	Dry Ponds	2.0
Agriculture	Biofilters	0.0	Agriculture	Poultry Litter Treatment (e.g., alum)	0.0	Urban	Erosion and Sediment	1.5
Agriculture	Continuous High Residue Till	1.0	Agriculture	Poultry Phytase	1.0	Urban	Filtering Practices	2.0
Agriculture	Conversion to Hayland (RI)	0.0	Agriculture	Stream Access Control with Fencing	2.0	Urban	Grass Buffers	1.0
Agriculture	Conversion to Pasture (RI)	0.0	Agriculture	Streamside Forest Buffers	3.0	Urban	Impervious Surface Reduction	2.0
Agriculture	Cropland Irrigation Management	0.0	Agriculture	Streamside Grass Buffers	3.0	Urban	Infiltration Practices	2.0
Agriculture	Dry Waste Storage Structure (RI)	3.0	Agriculture	Swine Phytase	1.0	Urban	Nutrient Management Plan	1.0
Agriculture	Grass Buffer on Watercourse (RI)	3.0	Forestry	Dirt/Gravel Roads	0.0	Urban	Permeable Pavement	2.0
Agriculture	Grass Buffers	3.0	Forestry	Forest Conservation	2.0	Urban	Runoff Reduction	2.5
Agriculture	Horse Pasture Management	0.0	Forestry	Forest Harvesting Practices	0.5	Urban	Street Sweeping	2.0
Agriculture	Irrigation Water Capture Reuse	0.0	Forestry/Urban	Dirt/Gravel Roads	0.5	Urban	Urban Forest Buffers	2.5
Agriculture	Lagoon Covers	0.0	Septics	Constructed Wetland, Gravity	1.0	Urban	Urban Growth Reduction	1.5
Agriculture	Land Retirement to Pasture (HEL)	0.0	Septics	Constructed Wetland, Pumped	1.5	Urban	Urban Shoreline Management	0.5
Agriculture	Loafing Lot Management	0.0	Septics	IFAS, Gravity Dispersal	2.0	Urban	Urban Stream Restoration	2.0
Agriculture	Manure Technology: Composting	3.0	Septics	IFAS, Pump Dispersal	2.5	Urban	Urban Tree Planting	1.5
Agriculture	Narrow Forest Buffer	3.0	Septics	Intermittent Media Filter, Pump	2.5	Urban	Wet Ponds	2.5

Applications

- To characterize the additional impacts (+/-) of BMP strategy *beyond* nutrient and sediment reductions to inform
  - Selection of priority BMPs using management strategy priorities
  - Assessment of overall benefits of a BMP strategy
- Not intended as part of overall evaluation or effectiveness. Main use is for planning.
- 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
  - e.g., 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

- Send additional questions and comments to Mark Sievers, Tetra Tech
  - mark.e.sievers@tetratech.com
  - 703.385.2605

- Please send a combined set of comments per GIT/Workgroup