The Baltimore Watershed Agreement Cooperative Monitoring Efforts

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Why Cooperative Monitoring

- Shared Watersheds, Shared Environmental Problems
- NPDES – MS4 Permits
- TMDLs
- NGO's
- State of Our Watersheds Biennial Conference

Regulatory Framework Terminology

- **N**ational **P**ollutant **D**ischarge **E**limination Program – NPDES
- **M**unicipal **S**eparate **S**torm **S**ewer **S**ystem – MS4
- **T**otal **M**aximum **D**aily **L**oad – TMDL
- **W**atershed **I**mplementation **P**lan - WIP

Regulatory Requirements

- The NPDES – MS4 Permit provides the regulatory requirements for environmental restoration.
  - Requires the county to meet the Bay TMDL nutrient and sediment reduction requirements.
  - Requires the county to develop TMDL Implementation Plans for local water body impairments

Total Maximum Daily Loads & The Chesapeake Bay Program

- Determined by how much of a pollutant a water body can absorb and still maintain water quality standards
- A TMDL is both a reduction of a pollutant and a cap on the amount of pollutant that can be delivered to a water body
- Chesapeake Bay Program has developed a TMDL for tidal water nutrients and sediments
- MDE has developed a Phase I Watershed Implementation Plan for the reduction of nutrients and sediments.
- Baltimore County and the other local jurisdictions a currently developing a Phase II Watershed Implementation Plan.

Chemical Monitoring

- Required by NPDES – MS4 Permits
- Needed to assess progress in meeting TMDLs
- Provides information that is useful to NGOs.

Chemical Monitoring

- Both jurisdictions have baseflow and storm event monitoring programs.
- The programs are comparable, but field techniques for baseflow sampling vary
- Baseflow monitoring
  - County grab samples, with two rinses of stream water before taking sample.
  - City bucket from bridge

Chemical Monitoring

Storm event
both use
automated sampling

Chemical Monitoring - Lab

- City uses up to five labs, while county has a single lab.
- Split sampling has been attempted to verify replication of results from the various labs.
- To date, this has not been successful, as one or another lab will not have analyzed the samples.
- Will continue to attempt to get laboratory comparability results.

Biological Monitoring

- Provides an integrated measure of stream health.

Biological Monitoring

- City/County programs are comparable, but not the same.
  - Both use MBSS techniques
  - City sites initially randomly selected, then monitored annually
  - County sites selected randomly on an annual basis.

Illicit Connection Monitoring

- Requirement of the NPDES – MS4 Permits
- Exchange of information on field detection and follow-up investigation techniques

Illicit Connection Monitoring

- City and County have participated in a study to refine illicit connection detection techniques – resulted in county adding ammonia to the outfall testing protocols
- Differences noted in the prevalence of illicit connection between city and county.

Bacteria Monitoring

- Development of bacteria TMDLs is the driver for a bacteria monitoring program
  - Trends over time
  - Source locations

Bacteria Monitoring

- City has had a bacteria monitoring program for a decade.
- The county developed its monitoring program based on the expertise developed by the city.
- Joint monitoring for bacteria trends time
  - –City and County collect samples on the same day each month
  - –County analyses all samples for E. coli

Trash Monitoring

- Driven by the impairment listing of Baltimore Harbor for trash
- City/County trash monitoring is comparable, but not the same.

Trash Monitoring

- City
  - Streams
  - Trash Nets
- County
  - Streams
  - Stormwater Management Facilities
- Objective: develop a database that can be used to in the trash TMDL analysis

BMP Effectiveness Monitoring

- The city and county have participated in one BMP effectiveness monitoring program in conjunction with UMBC and CWP on street sweeping and storm drain cleaning.

State of Our Watersheds Biennial Conference

Monitoring Results

Individual Indicator Scores

Watershed	Impairments	Impervious Cover	Forest Cover	Presence of High Value Aquatic Communities	Nutrients	Percentage of Degraded Stream Miles	Amount of Impervious Cover Addressed by Water Quality Improvement Efforts*	Overall Watershed Health	
Little Gunpowder Falls	5	5	3	3.5	3.0	5	2	82%	Very Good
Deer Creek	5	5	3	4.0	1.5	5	1	78%	Good
Gunpowder River	5	4	5	1.0	ND	ND	3	75%	Good
Prettyboy Reservoir	3	5	4	2.5	2.5	5	1	73%	Good
Liberty Reservoir	1	5	5	3.5	2.5	4	1	70%	Good
Loch Raven Reservoir	1	4	4	4.5	3.0	4	4	68%	Good
Lower Gunpowder Falls	4	4	3	2.0	2.5	3	5	62%	Fair
Middle River	5	2	3	1.0	ND	ND	3	55%	Fair
Jones Falls	1	2	3	3.0	2.5	4	4	52%	Fair
Bird River	5	2	3	1.0	3.0	1	5	50%	Fair
Patapsco River	1	3	3	1.0	3.0	2	4	43%	Poor
Gwynns Falls	2	1	2	3.0	2.5	2	4	42%	Poor
Baltimore/Direct Harbor	4	1	2	1.0	2.0	2	2	40%	Poor
Back River	3	1	3	1.0	2.5	1	4	38%	Poor

*This indicator was not included in the overall watershed health composite indicator because it was not considered a representative indicator for all watersheds.
ND=No Data

Nutrient Load Rating

← *High Nutrient Load* —— *Low Nutrient Load* →

1	1.5	2	2.5	3	3.5	4	4.5	5

Nutrients

What is Nutrient Loading?

Nitrogen (N) and phosphorus (P) are nutrients that are essential to all living organisms and are naturally found in streamwater. However, development within a watershed can increase nutrients in streams. Sources of N to streams include application of fertilizers, sewage and septic leaks, pet waste, and atmospheric deposition of N released through combustion of fossil fuels. Application of fertilizers can also increase P in streams. P tends to stick to sediment, so any process that increases erosion and the delivery of sediments to streams will also increase P levels. Agricultural activities can also increase the amount of nutrients in streams through the use of fertilizers, planting of N-fixing crops, and livestock waste.

Why were nutrients used as an indicator?

High levels of nutrients within a watershed indicate that there may be substantial impacts on receiving water bodies, such as eutrophication within the Chesapeake Bay. Eutrophication leads to low levels of dissolved oxygen in the receiving water body, impacting aquatic life.

How this map was created

N and P data for Baltimore County were collected as baseflow samples every other year about eight times per year for each sampling site, between January 2003 and June 2009. N and P data for Baltimore City were collected as baseflow samples about 12 times per year for each sampling site, between January 2009 and January 2010. N and P data for each watershed were scored individually. Then the scores for N and P were averaged for each watershed to obtain one nutrients score.

Points :	1	2	3	4	5
Total Nitrogen (mg/L)	≥4.0	3.0 to <4.0	2.0 to <3.0	1.0 to <2.0	<1.0

Points :	1	2	3	4	5
Total Phosphorus (mg/L)	≥0.040	0.030 to <0.040	0.020 to <0.030	0.010 to <0.020	<0.010

Rationale for Scoring Categories

The nutrients indicator consisted of two components—N and P. Scoring categories for both N and P were based on Baltimore County's nutrient scoring system. N levels below 1.0 mg/L and P levels below 0.010 mg/L were considered healthiest and scored a 5. Scores for N and P were averaged together to obtain the nutrient load rating.

Photo courtesy of Baltimore County

Photo courtesy of Baltimore County

Watershed Health Rating

← *Poor* — *Very Good* →

POOR	FAIR	GOOD	VERY GOOD

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