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Bacteria Total Maximum Daily Loads

Observations from Maryland

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Local TMDL

EPA published regulations in 1992 establishing TMDL procedures

Local TMDLs

- Vehicle for implementing State Water Quality Standards
- State is responsible for developing TMDL for all waters identified impaired in Section 303 (d) list
- Needs to be approved by EPA
- Requires public participation in development of TMDL
- Deadlines to meet TMDL vary by State

Typical Pollutants of Concern for Local TMDL

- Nutrients and sediment
- Bacteria
- Chlorides
- Polychlorinated biphenyls
- Chlordane
- Heavy metals
- Mercury
- Trash
- Carbonaceous biochemical oxygen demand
- Calcium carbonate

Source: Google Images

https://mdewin64.mde.state.md.us/WSA/IR-TMDL/index.html?webmap=059dfe859bf846faa3c9c465ed04530b

TMDL Comparison

Chesapeake Bay TMDL

- Thee pollutants of concern (sediment, nitrogen, and phosphorus)
- Developed by EPA, administered by MDE's sediment and stormwater program
- 2025 deadline
- Regulated at the local level through NPDES permit since 2010
- Applies to all MS4s and industrial permit holders
- Pollutant load reductions (in pounds)
- Met through urban BMPS treatment of impervious areas

Local TMDL

- Numerous pollutants (bacteria, PCBs, etc.)
- Developed by MDE Sciences Services Administration, approved by EPA
- Iterative process until goals achieved
- Regulated at the local level through the NPDES permit since 2014
- Applies to Phase 1 MS4s municipalities only
- Percent reductions
- Focus on treating human sources through behavior change, septics, etc.

Regulatory Requirement

Fourth Generation MDE Phase I MS4 communities' NPDES permits require restoration plans for local TMDLs within one year of permit issuance

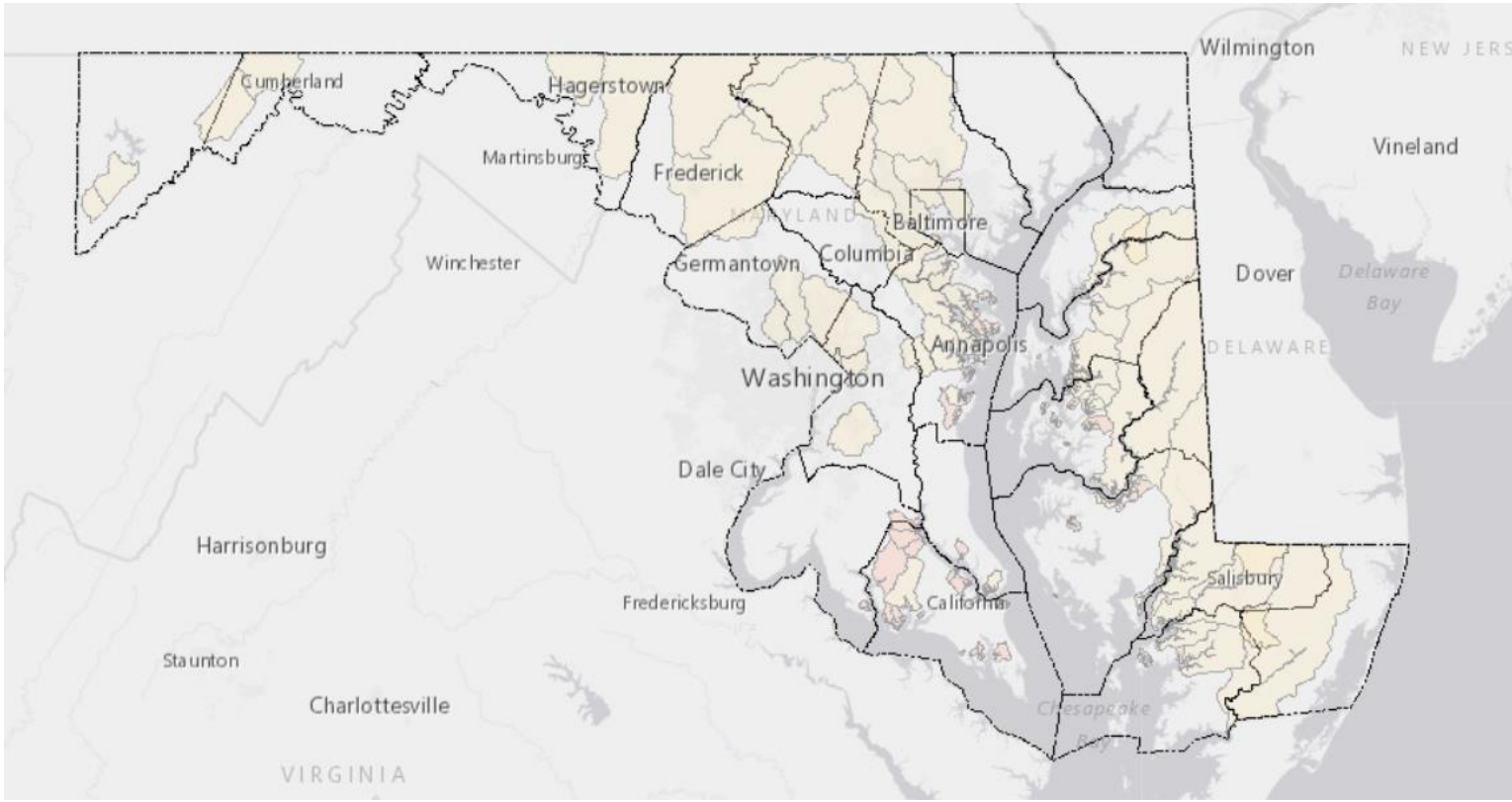
"… Within one year… shall submit to MDE for approval a restoration plan for each stormwater WLA approved by EPA prior to the effective date of this permit…"

Components of a TMDL Restoration Plan

- **Restoration projects identified to meet the TMDLs**
  - Cost estimate
  - Implementation plan
- **Schedule for meeting TMDLs**
- **Public review and comment**
- **Continuous evaluation of the Restoration Plan**
  - Monitoring
  - Modeling
- **Re-evaluate restoration strategies annually based on progress**

Bacteria TMDLs in Maryland

Fecal Coliform	E.coli	Enterococci



Source: MDE

Common Sources of Bacteria Impairment

Human

- Illicit discharges
- Sanitary sewer overflows
- Onsite sewage disposal system

Pet waste

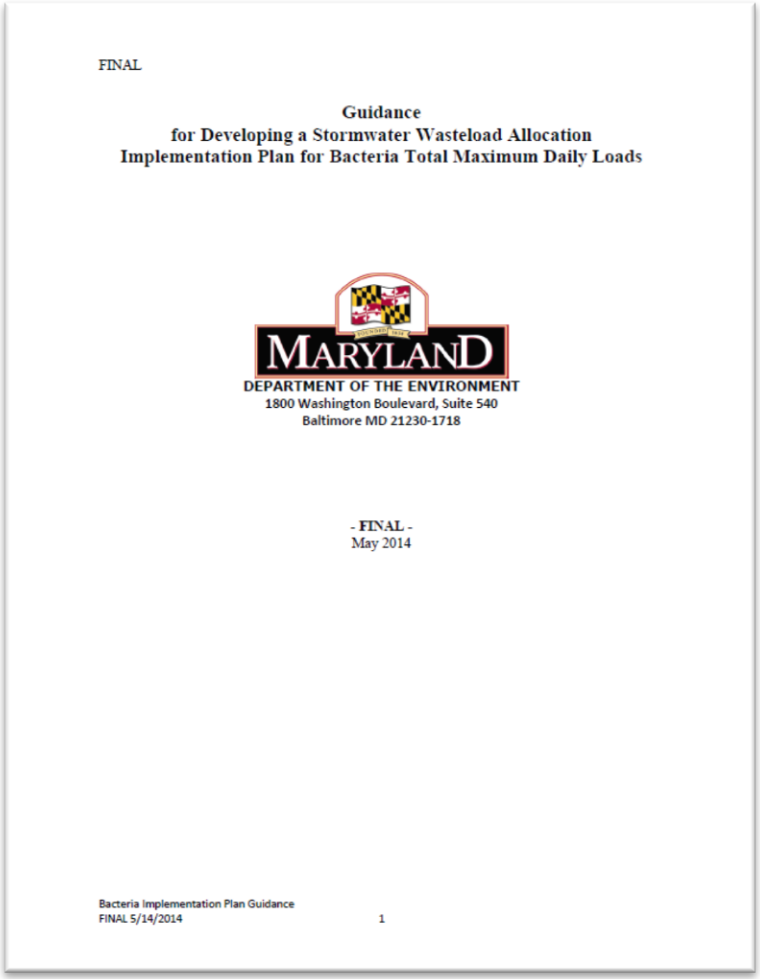
Wildlife

Marinas

Agricultural / domestic

MDE Guidance

- **Source identification and estimation of bacteria loads**
  - Bacteria source tracking
  - Modeling
  - Local monitoring
  - Hot spot investigation
- **Load reduction**
  - **Prioritize human source elimination**
  - Domestic pet source elimination
  - Wildlife source elimination
  - Stormwater source elimination
- **Develop evaluation plans**
  - Modeling
  - Monitoring



FINAL

Guidance
for Developing a Stormwater Wasteload Allocation
Implementation Plan for Bacteria Total Maximum Daily Loads

MARYLAND
DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard, Suite 540
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- FINAL -
May 2014

Bacteria Implementation Plan Guidance
FINAL 5/14/2014 1

Strategies to Meet Bacteria TMDLs

- **Human sources – Highest Priority**
  - Elimination of illicit discharges
  - Elimination of sanitary sewer overflows
  - Retirement of failing septic systems
  - Outreach to marinas
  - Outreach to homeless population
- **Stormwater source**
  - BMPs with bacteria removal efficiency
- **Pet sources**
  - Pet waste education and outreach
  - Incentives or enforcing proper pet waste disposal
- **Wildlife sources**
  - Vector control
  - Deer and geese management
  - Wildlife sources

Challenges Associated with Meeting Local Bacteria TMDL Goals

- **Aggressive schedule to meet Chesapeake Bay TMDL**
- **Lack of available best management practices (BMPs) performance data for bacteria**
- **Effective ways to track progress**
  - Modeling or monitoring
- **Interaction between sewer and stormwater departments**
- **Interaction with consent decree or other initiatives**
  - Baltimore City
  - Prince George's County
  - Washington Suburban Sanitary Commission

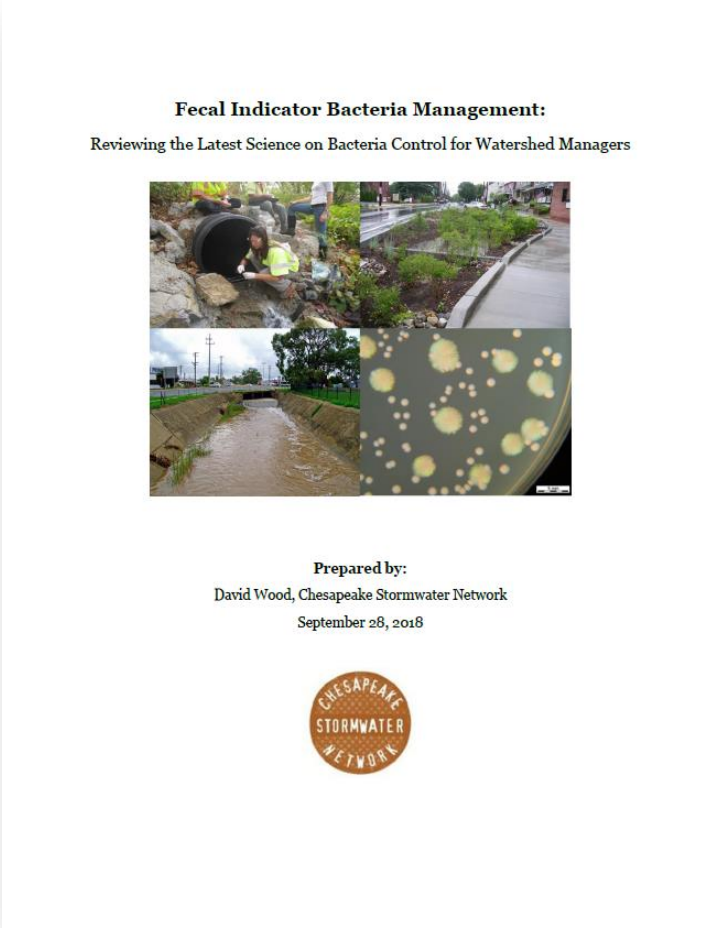
Varying Bacteria Removal Efficiencies for BMPs

BMP Type	Bacteria Pollutant Removal Efficiency (%)
Bioretention	70[2]
Detention Structure Dry (Dry Pond)	88[1]
Disconnection of Non-Rooftop Runoff	0[10]
Disconnection of Rooftop Runoff	0[10]
Dry Swale	0[6]
Dry Wells	96[3]
Extended Detention Structure, Dry	88[1]
Extended Detention Structure, Wet	70[1]
Forestation on Pervious Areas	42[5]
Grass Swale	0[6]
Green Roof	0[11]
Impervious Surface Elimination	0[10]
Infiltration Basin	96[3]
Infiltration Berms	96[3]
Infiltration Trench	96[3]
Landscape Infiltration	96[3]
Level Spreader	0[9]
Micropool Extended Detention Pond	70[1]
Oil-Grit Separator	0[7]
Other	0[7]
Permeable Pavements	37[1]
Rain Gardens	70[2]
Rain Water Harvesting	0[10]
Retention Pond	70[1]
Sand Filter	37[1]
Shallow Marsh	78[1]
Sheetflow to Conservation Areas	42[5]
Step Pool Conveyance System	70[4]
Stream Restoration	0[10]
Submerged Gravel Wetland	78[1]

BMP Type	Fecal Coliform Bacteria
Runoff reduction practices	
Green roofs	90%
Porous pavement	90%
Nonstructural practices[1]	NA
Rainwater harvesting	NA
Submerged gravel wetlands	75%
Landscape infiltration	90%
Infiltration berms	90%
Dry well	90%
Micro-bioretention	90%
Rain gardens	75%
Swales, dry	35%
Enhanced filters	90%
Infiltration basin & trench	90%
Bioretention filters	90%

Resources

- **Bacteria land use loading rates**
  - Insufficient data to tie bacteria loads to land use
  - Residential land biggest contributor
- **Bacteria source analysis techniques**
  - Microbial source tracking methods
  - Modified IDDE and SSO monitoring to improve bacteria management
- **Stormwater BMP performance**
  - BMP efficiency data is variable
  - Wetlands and filtering practices highly effective
  - Dry ponds and swales least effective



Moving Forward

- **Prioritize elimination of human sources**
- **Programmatic approaches**
  - Pet waste management
  - Reduction in SSOs/OSDS upgrades
  - Marina outreach
- **Long-term monitoring**
  - Leverage current MDE and local monitoring data
  - Trends in loads
  - Effectiveness of restoration strategies
- **Adaptive management strategies**
- **Monitor effectiveness of BMPs in reducing bacteria concentrations**
- **Selection of BMPs that help with Chesapeake Bay and local TMDL goals**

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Questions

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