



**Department of the Environment**

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# Overview of Changes to the Anacostia River Fecal Bacteria TMDL

**Scott Macomber and Dinorah Dalmasy**

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# Overview

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- Review of process to date
- Summary of changes to non-tidal TMDL
- Explanation of tidal TMDL analysis
- Results of updated analysis





# Process to Date

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- July 2005 – Initial stakeholder meeting regarding non-tidal bacteria TMDL
- September 2005 – End of public comment period for draft TMDL
- October 2005 – Stakeholder meeting to discuss comments and inform of delay in submittal to EPA due to comments
- March/April 2006 – Revised TMDL sent for public comment – meeting with stakeholders to discuss document





# Summary of Changes

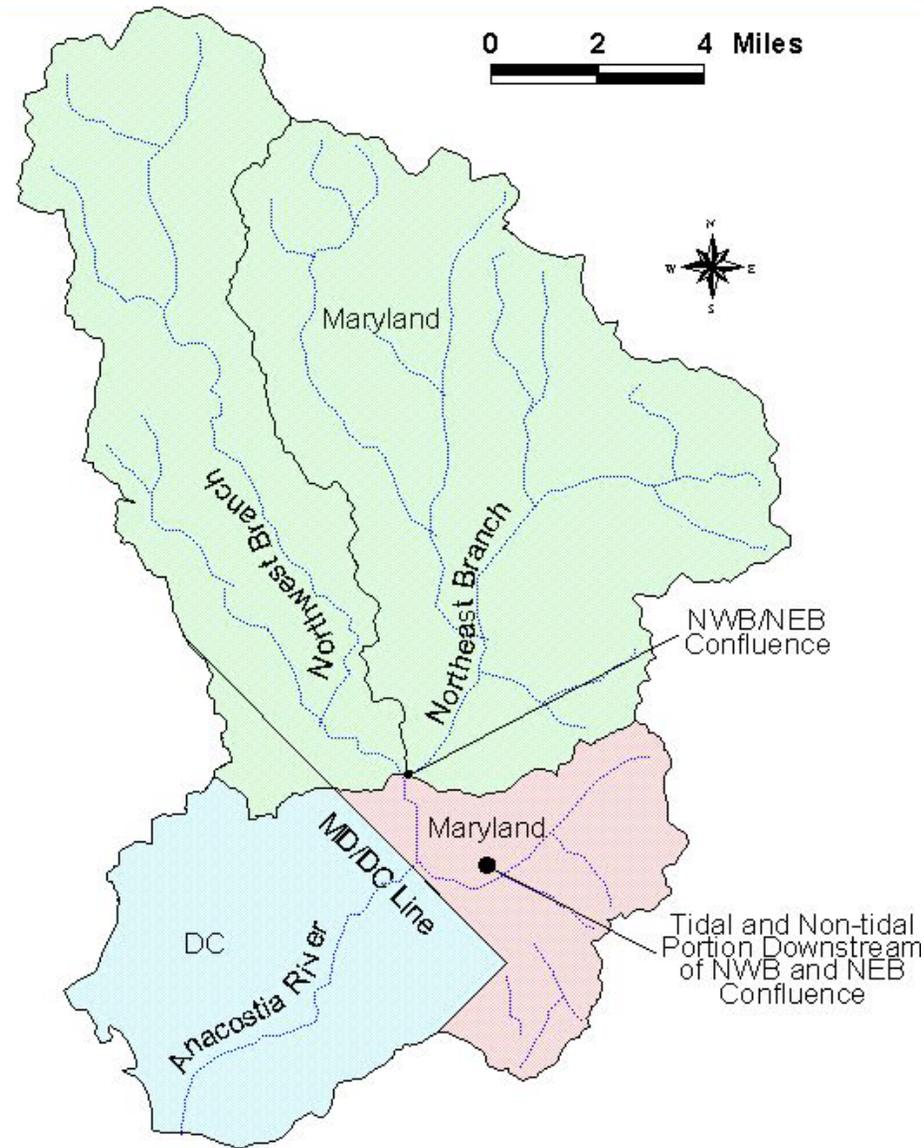
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- The non-tidal (above the confluence of NWB and NEB) TMDL was adjusted to incorporate critical conditions and seasonality
- The revised TMDL includes a new analysis to estimate a tidal TMDL (downstream of the NWB and NEB Confluence)





# Anacostia River Fecal Bacteria TMDL





# Initial Conditions: Non-tidal TMDL

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- The TMDL analysis based on a flow duration curve approach: using flow strata estimated from USGS daily flow monitoring data, fecal bacteria monitoring and bacteria source tracking (BST) data
- Sources of fecal bacteria were estimated at six stations where samples were collected for a one-year duration
- BST: antibiotic resistance analysis (ARA) methodology used to determine proportion of source categories: domestic; human; livestock; and wildlife
- Baseline load is estimated using a long-term geometric mean and weighting factors from the flow duration curve.





# Changes to Non-tidal TMDL Analysis

- TMDL established after considering six different hydrological conditions:
  - High and low flow annual conditions;
  - High and low flow seasonal conditions (the period between May 1<sup>st</sup> and September 30<sup>th</sup> when water contact recreation is more prevalent);
  - 30-day high and 30-day low flow conditions to be protective of DC waters designated uses





# Changes to Non-tidal TMDL Analysis

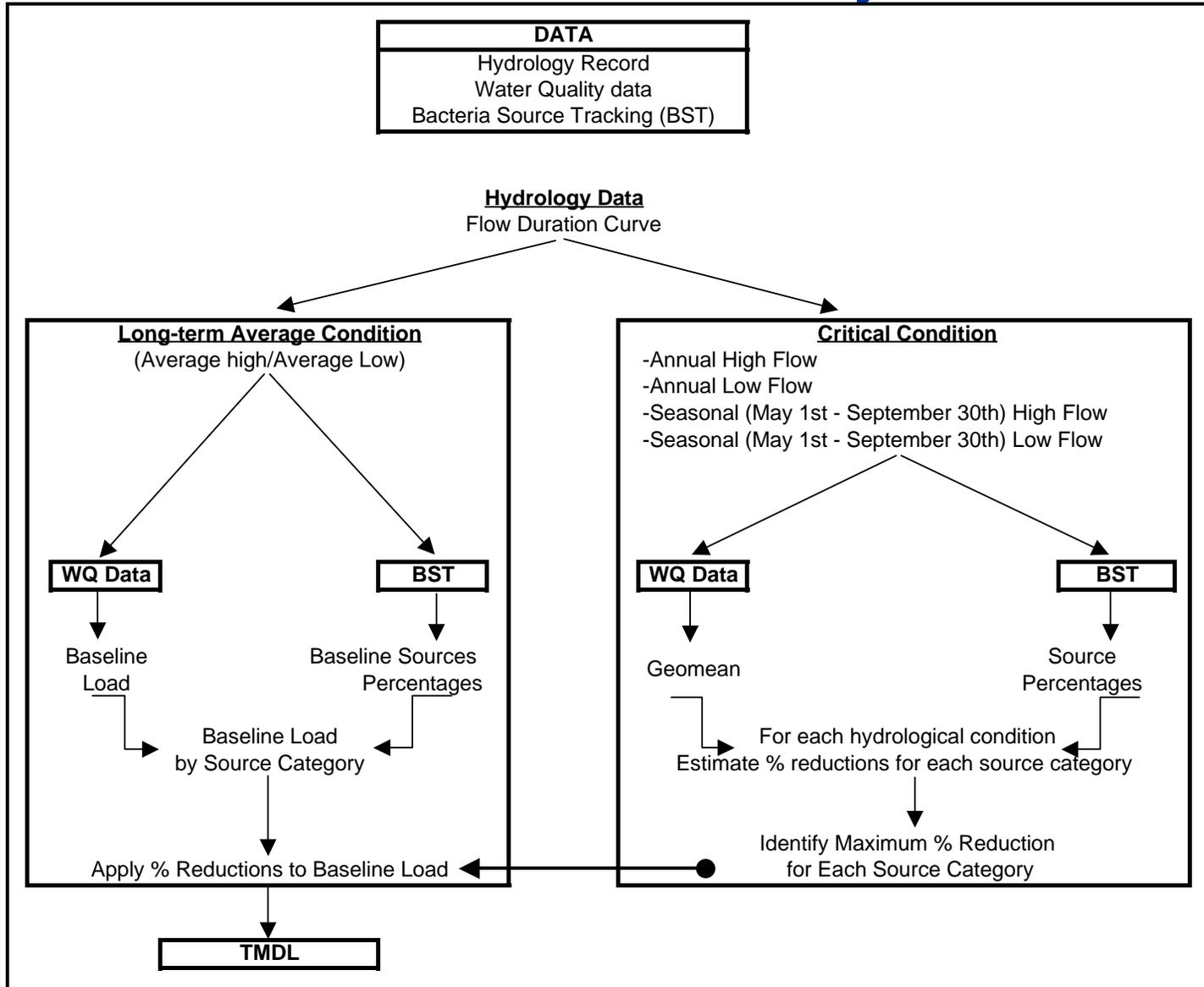
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- Two scenarios were developed:
- The first assessed if current water quality standards could be attained with maximum practicable reductions (MPRs)
- The second assessed if current water quality standards could be attained with reductions greater than MPR
- In the non-tidal subwatersheds, water quality standards could not be attained with the MPRs. (The TMDL was developed with reductions greater than MPR)





# Non-tidal TMDL Analysis Framework





# Tidal TMDL Baseline Conditions

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- DC's TMDL allocation to MD is a total load for both the tidal and non-tidal segments of MD's Anacostia watershed
- Bacteria sources were obtained from DC's bacteria source tracking study
- The MD TMDL for the tidal segment of the Anacostia is estimated by subtracting the non-tidal segment allowable load from the total allowable load derived from DC's TMDL

$$\text{MD tidal} = \text{DC Total} - \text{MD non-tidal}$$





# Bacteria Correlation Analysis

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- Analysis conducted to relate indicator organisms used by each jurisdiction
- Different pathogen indicator organisms\*:
  - DC's TMDL: fecal coliform
  - Maryland's TMDL: enterococci

\*Both based on EPA's recommendations in "Quality Criteria for Water" of an accepted illness rate of 8 illnesses/1,000 swimmers





# Bacteria Correlation Analysis

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- Correlation analysis between fecal coliform and enterococci used data collected from designated use I sites in Maryland during late May-Sept, 1999 and 2000
- These data were originally collected to compare fecal coliform and enterococci in Maryland's waters





# Correlation Data Results

- Analysis:

- Water samples tested for both organisms and paired fecal coliform and enterococci results were obtained.
- Thirty-day running geometric means were calculated for each site and indicator organism.
- The resulting 173 paired thirty-day running geometric means were based on 5 or more samples.
- With the paired geometric means, ratios of enterococci to fecal coliform were then calculated.
- Statistics were run for these ratios and the results are as follows:

- Analysis Results

- **Median** 0.30
- **Mean** 0.25
- **Geomean** **0.34**
- **Maximum** 12.53
- **Minimum** 0.03
- **St Dev** 1.19
- **Count** 173





# Coliform Correlation and Loading Rates Analysis Results

	<b>TMDL Load</b>	<b>Ratio Ent/FC</b>	<b>TMDL Load (Billion MPN Fecal Coliform/year)</b>	<b>Area Covered by TMDL (acres)</b>	<b>TMDL Loading Rate (billion MPN FC/Ac/yr)</b>
<b>DC TMDL Allocation to MD</b>	348,000 Billion MPN FC/year	N/A	348,000 Billion MPN FC/year	94,387	<b>3.7</b>
<b>MD TMDL for Non-tidal Anacostia</b>	99,687 Billion MPN Ent/year	÷ 0.34 =	296,688 Billion MPN FC/year	80,661	<b>3.7</b>





# Tidal Anacostia Allocation Calculation

<b>MD</b>		<b>DC TMDL</b>	-	<b>MD</b>
<b>Tidal Watershed TMDL*</b>	=	<b>Allocation to MD*</b>		<b>Non-Tidal Watershed TMDL*</b>
51,312	=	348,000	-	296,688

\*In billion MPN fecal coliform/year

<b>Fecal Coliform</b>					<b>Enterococci</b>	
<b>MD</b>		<b>X</b>	<b>Ratio Ent/FC</b>	<b>=</b>	<b>MD Tidal Watershed TMDL*</b>	
<b>Tidal Watershed TMDL*</b>						
51,312	(or 141 Billion				47.2	
Billion MPN Fecal Coliform/Year	MPN fecal coliform/day)	<b>X</b>	0.34	<b>=</b>	Billion MPN Ent/Day	





# Anacostia River TMDL Allocations

<b>Subwatershed</b>	<b>TMDL</b>	<b>LA</b>	<b>WLA-MS4</b>	<b>WLA-WWTP</b>
	<b>Billion MPN Enterococci/day</b>			
<b>Non-Tidal Watershed</b>	310	130	179	1
<b>Tidal Watershed*</b>	47	16	31	0
<b>TOTAL</b>	357	146	210	1





# TMDL Reductions in Non-tidal Anacostia

<b>Station</b>	<b>% Domestic</b>	<b>% Human</b>	<b>% Livestock</b>	<b>% Wildlife</b>	<b>% Target Reduction</b>
BED0001	98%	98%	98%	81%	91%
INC0030	98%	98%	98%	66%	88%
PNT0001	98%	98%	98%	72%	87%
NEB0002sub	98%	95%	98%	49%	79%
NWA0135	98%	98%	98%	14%	88%
NWA0002sub	98%	98%	98%	53%	78%





# TMDL Reductions in Tidal Anacostia

<b>Watershed</b>	<b>% Domestic</b>	<b>% Human</b>	<b>% Livestock</b>	<b>% Wildlife</b>	<b>% Target Reduction</b>
<b>Tidal</b>	99.9%	99.9%	99.9%	88.3%	93.3%





# CONCLUSION

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- Critical conditions and seasonality were addressed
- Tidal portion of MD watershed was addressed
- MD's proposed TMDLs will meet both MD and DC water quality standards,
  - It will be protective of downstream designated uses under all hydrological conditions.
- MDE cannot provide reasonable assurance that the TMDL allocations can be met given the magnitude of the MS-4 allocation and known efficiencies for relevant urban Best Management Practices
- Progress will be made through the iterative implementation process and will be reevaluated in the future

