

Addressing the Bacteria Impairment at Fairview Beach: Analysis of Monitoring Data and Assessment of Sources

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Interstate Commission on the Potomac River Basin

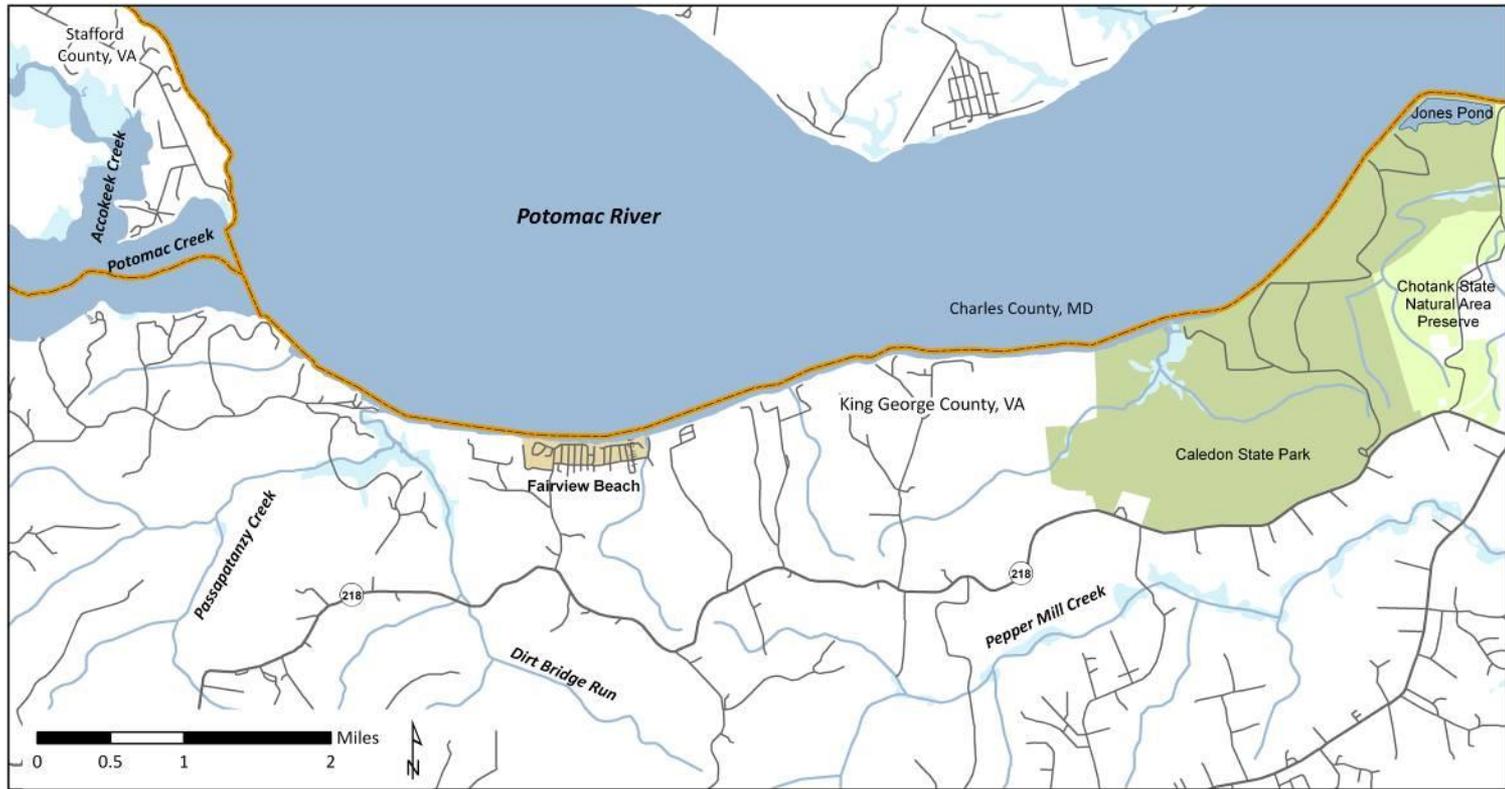
September 25, 2013



Topics

- Bacteria Impairment at Fairview Beach
 - Advisories
 - Water Quality Standards and Criteria
- Monitoring Results
 - VA Department of Health (VDH), Virginia Tech (VT), Fairview Beach Resident's Association (FBRA)
- Sources and Transport Paths
- Recommendations for Additional Monitoring
- Actions Already Taken to Address Impairment

Location of Fairview Beach



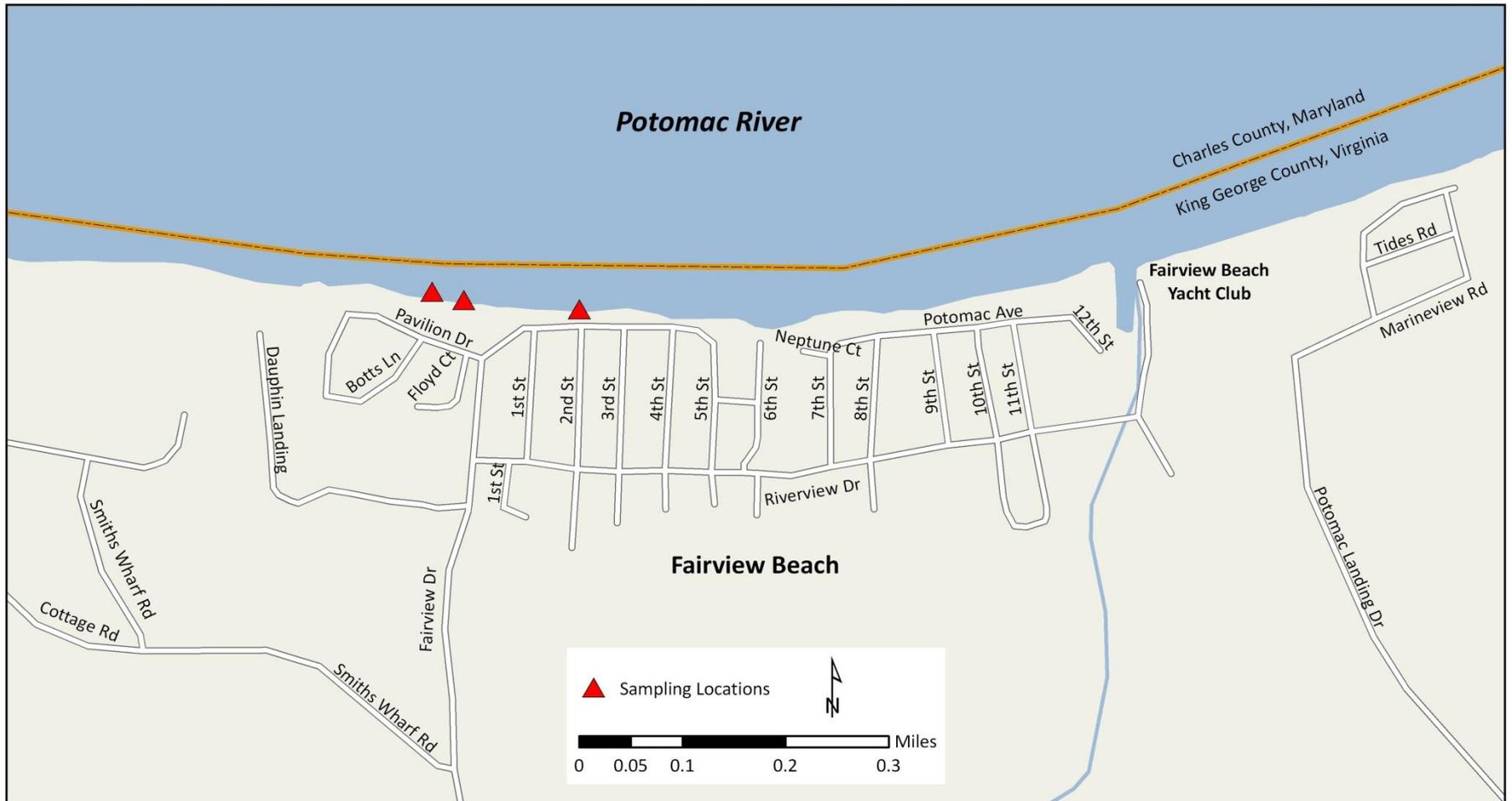
Water Quality Standards

- Virginia Water Quality Standards:
 - *all state waters are designated for recreational uses (e.g., swimming and boating) (9 VAC 25-260-10)*
- Bacteria Criteria:
 - *Enterococci bacteria shall not exceed a **monthly geometric mean of 35 CFU/100 ml** in transition and saltwater ...Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples... If there are insufficient data to calculate monthly geometric means in transition and saltwater, **no more than 10% of the total samples in the assessment period shall exceed 104 CFU/100 ml.**" (9 VAC 25-260-170 A)*

Virginia Department of Health Monitoring

- Sample weekly May (Memorial Day) through September since 2004
- Four sites (2004-2005); three sites thereafter
- Swimming advisory issued if the arithmetic average *Enterococci* count exceeds the assessment threshold of 104 cfu/100 ml

VDH Monitoring Stations (2006-2011)



Swimming Advisories at Fairview Beach

Year	Number of Advisories	Days Under Advisory
2004	4	13
2005	2	8
2006	3	33
2007	6	32
2008	5	24
2009	5	16
2010	4	18
2011	4	22
2012	5	10
Average	4.1	20.9

Monthly Geometric Mean Concentrations (based on VDH samples)

Year	June	July	August	September
2004	46	6	17	112
2005		84	64	
2006	149	27	7	
2007	136	43	69	52
2008	60	80	24	216
2009	84	31	39	88
2010	28	32	42	
2011	177	15	75	
2012	44	56	31	

Impairment Listing

Name	Cause Group Code	Description	Size	Initial Listing
Fairview Beach (Potomac River)	A29E-02-BAC	Includes all of Fairview Beach on the Potomac River	0.012 mi. ²	2006

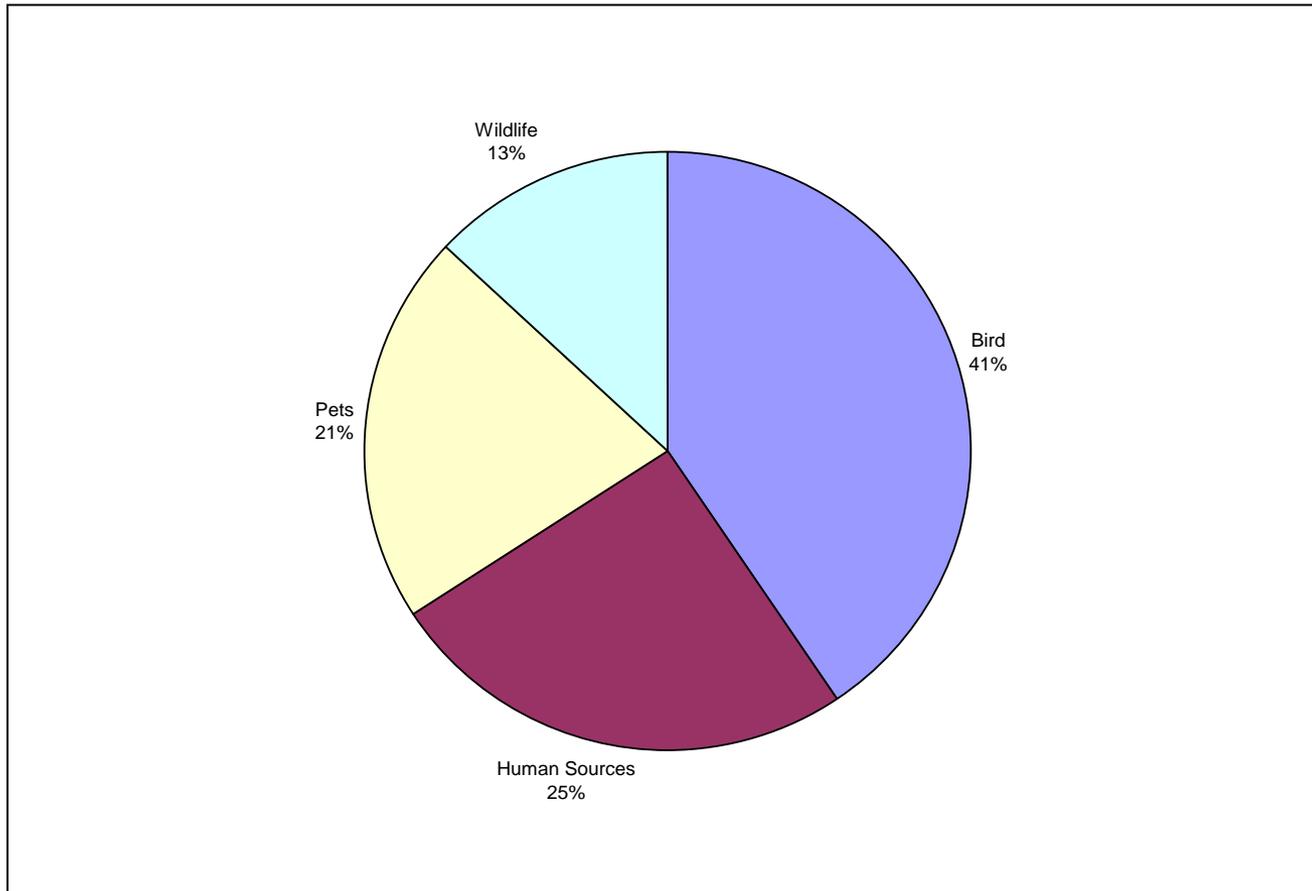
- 2010 305(b)/303(d) Water Quality Assessment Integrated Report

[http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/
WaterQualityAssessments/2010305b303dIntegratedReport.aspx](http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2010305b303dIntegratedReport.aspx)

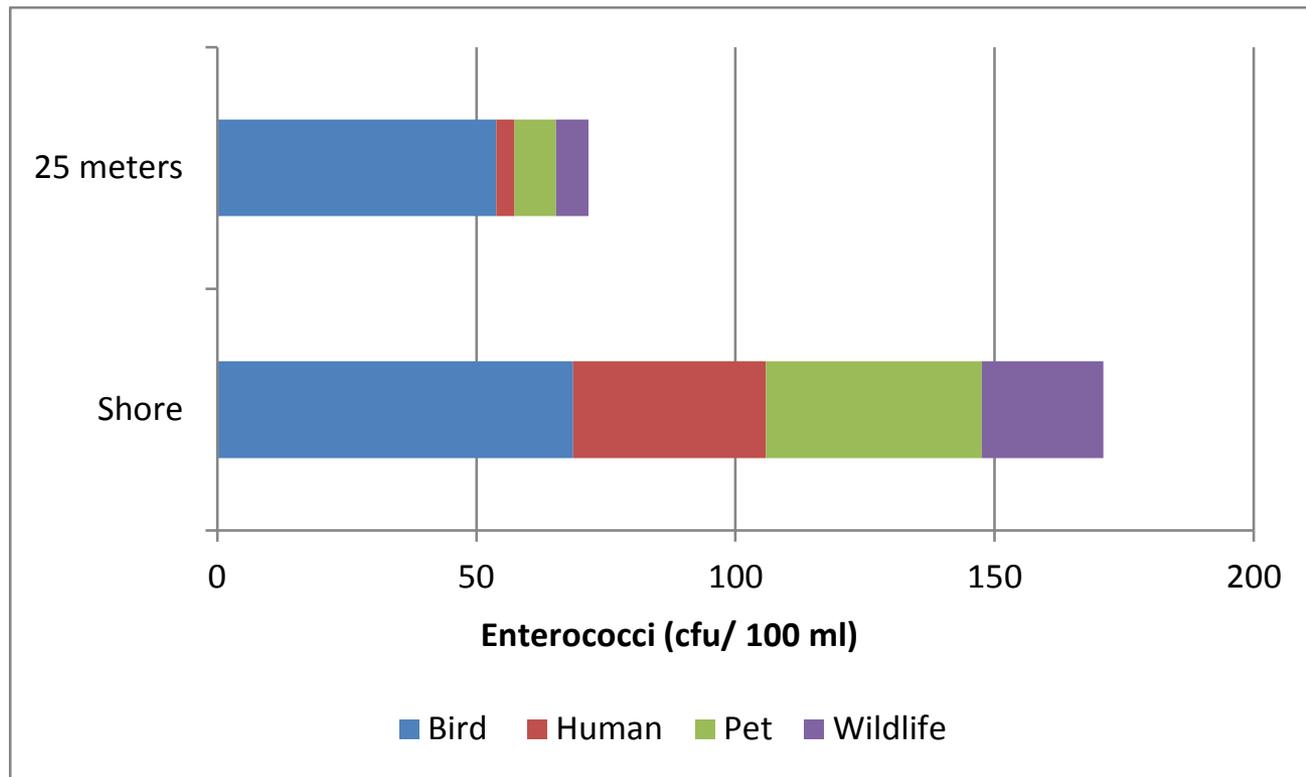
VT Monitoring Program (2004 -2008)

- Microbial Source Tracking
- Optical Brighteners
- Targeted bacteria monitoring to identify sources
 - “hot spots”
 - Potomac River
 - boating events and marina
 - Caledon State Park

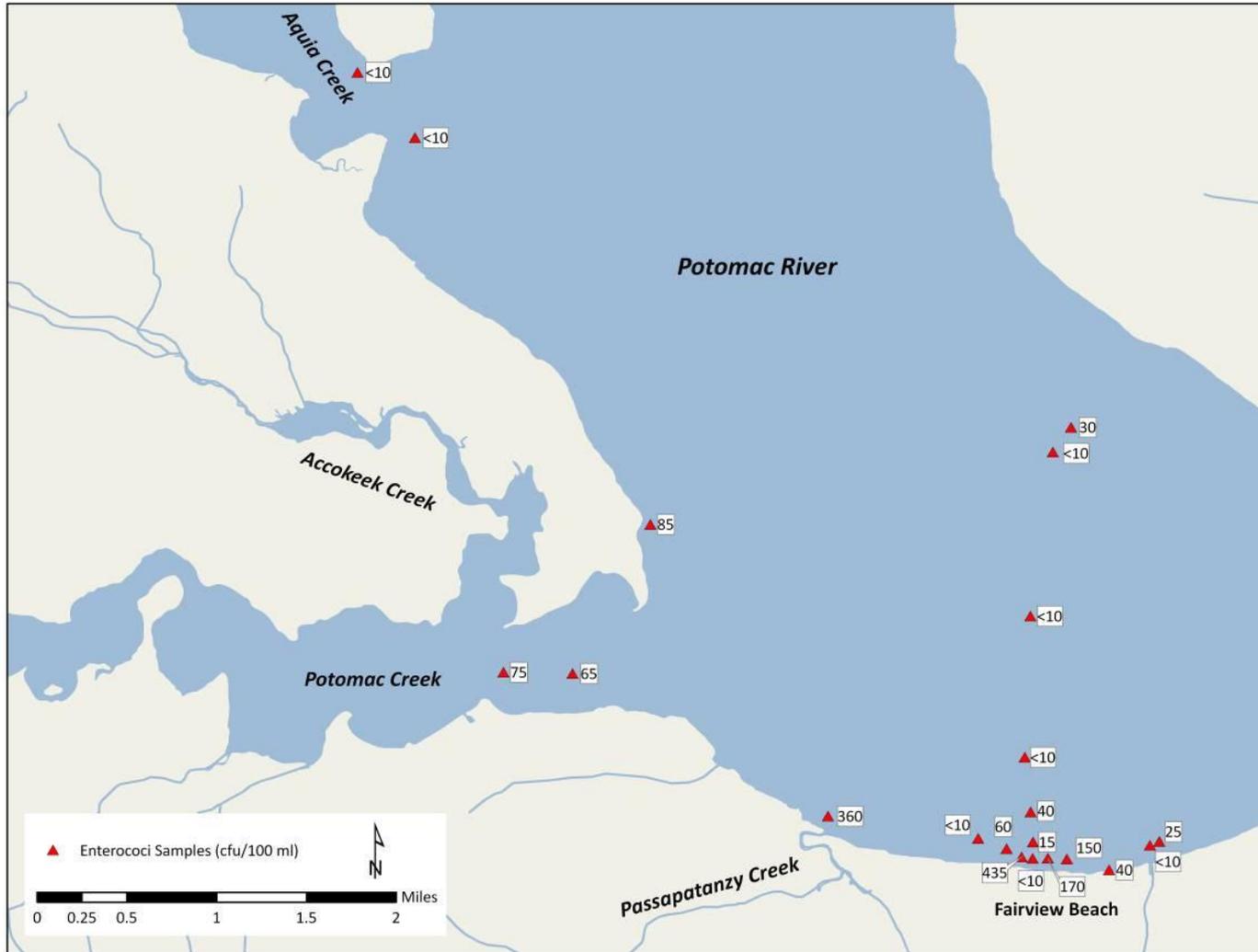
Observed Bacteria Attributable to Sources at VDH Stations, 2004-2007



Average Bacteria Concentrations (cfu/100 ml) at VDH Stations (2006-2007), Shore vs. 25 meters

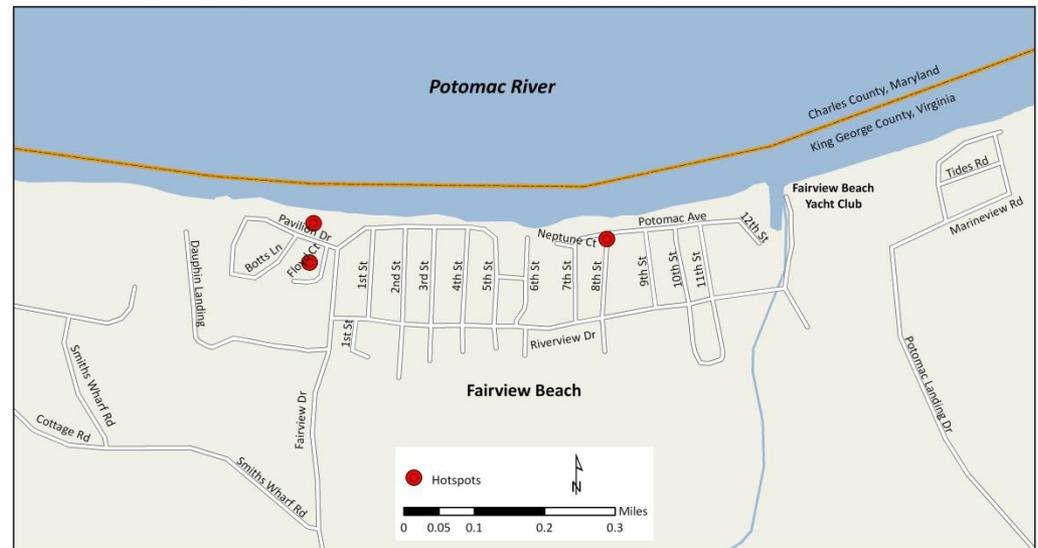


VT 2007 Potomac River Sampling



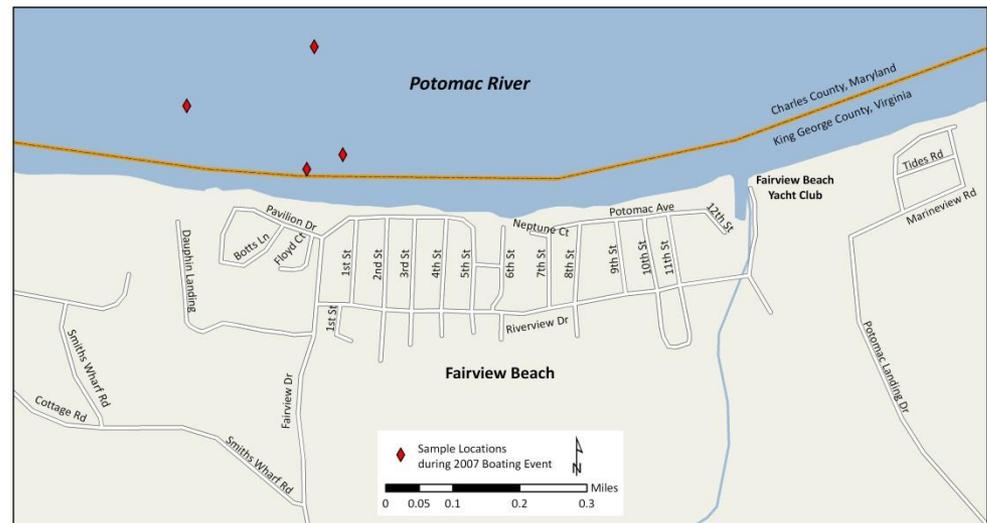
Hot Spots: Human Sources Detected

- 8th Street Sinkhole (2004)
- Pavilion Drive Drainpipe (2006,2007)
- Creek above Pavilion Drive Drainpipe (2006)



Enterococci Concentrations Generally Below 104 cfu/100 ml

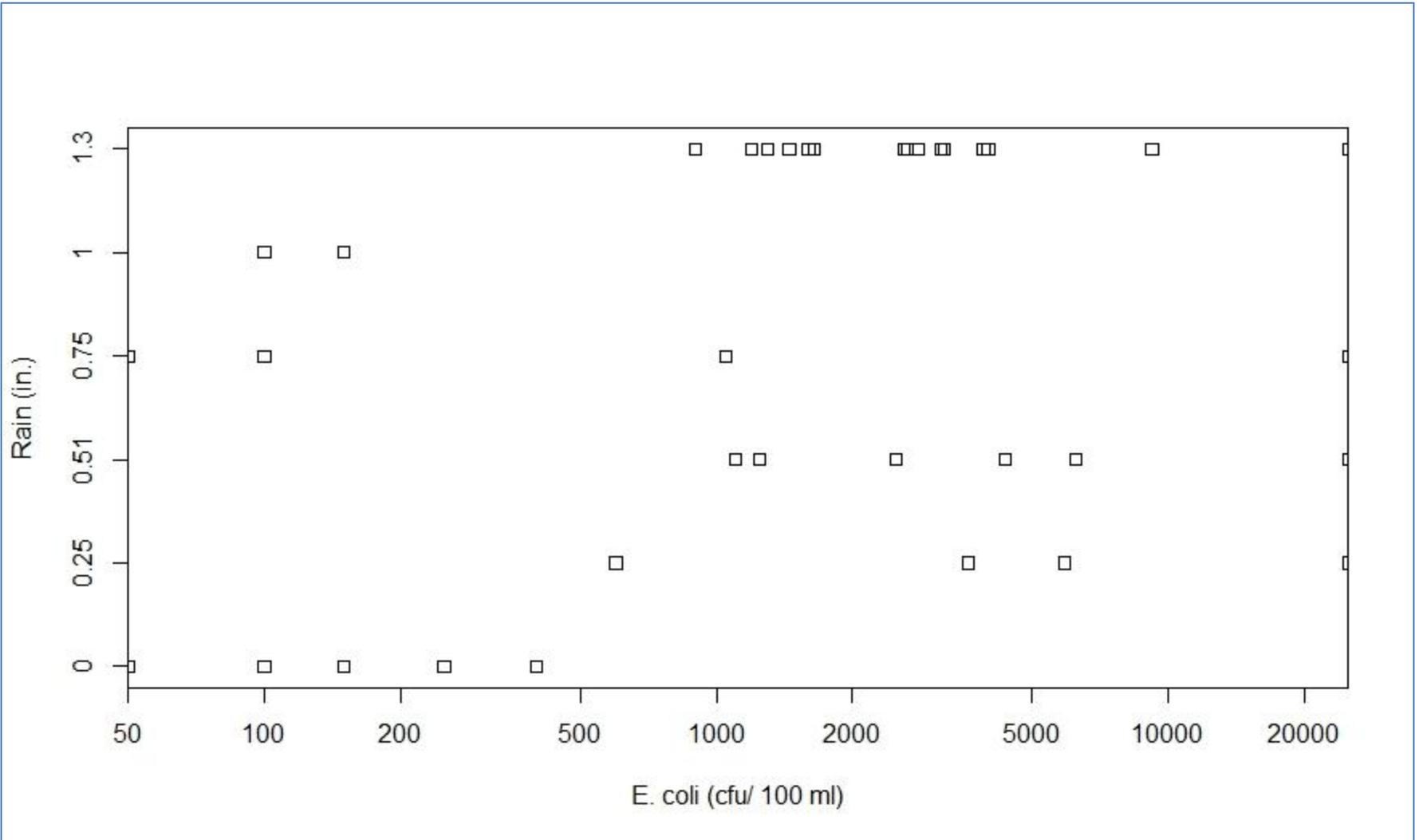
- Marina (2004)
- Large Boating Events (2007, 2008)
- Caledon State Park (2007, 2008)



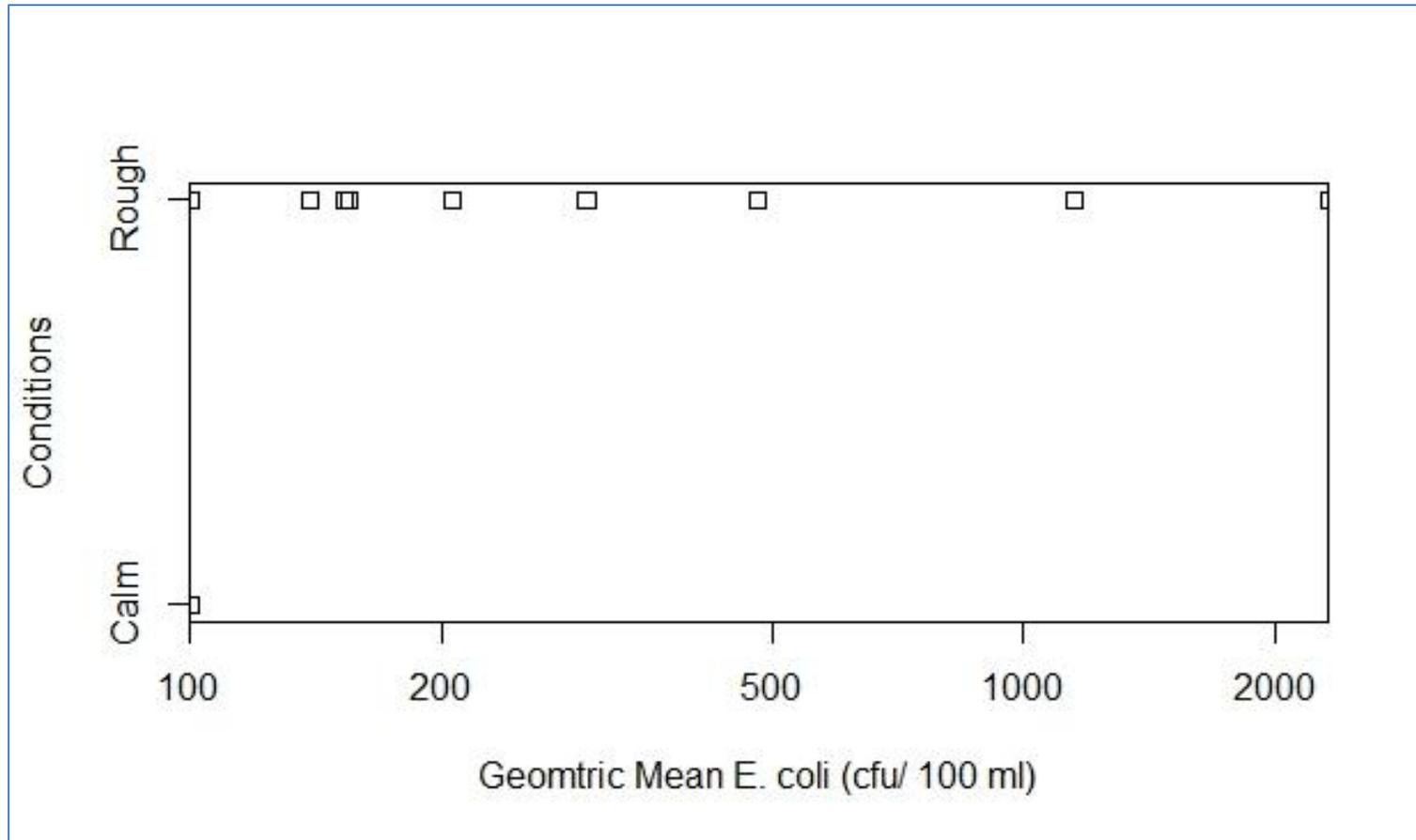
Fairview Beach Resident's Association Monitoring (2011-2012)

- Coliscan kits to measure *E. coli* bacteria
 - Inexpensive and easy to use
 - Cannot be used quantitatively to assess waters due to variations in quality assurance
 - 235 cfu/100 ml *E. coli* \approx 104 cfu/100 ml *Enterococci* (*E.coli* die off more rapidly in salt water)
- Sampling targeted
 - Stormwater
 - Rough conditions
 - Drain pipes near Pavilion Drive

Dry vs. Wet Weather Samples



Calm vs. Rough Conditions



Potential Sources and Transport Paths

- Sources
 - Septic systems and faulty sewer connections
 - Dogs
 - Birds and wildlife
- Potomac River
- Transport Paths
 - Stormwater
 - Groundwater
 - Beach sand and resuspension

Potential Sources

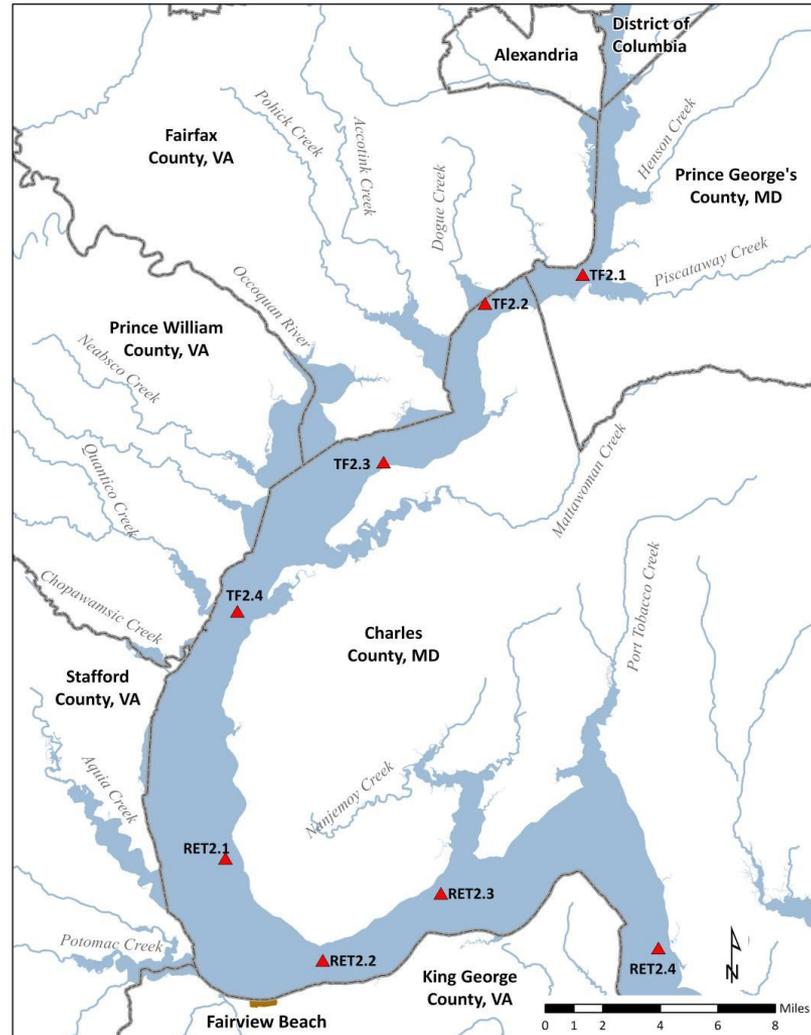
Sources	Evidence For	Evidence Against
Septic Systems Sewers	<ol style="list-style-type: none">1. MST2. History of Problems3. Poor soils for septic systems	None
Dogs Other pets	<ol style="list-style-type: none">1. MST2. VT reports of waste on beach	None
Birds Wildlife	<ol style="list-style-type: none">1. MST2. Large numbers of geese, swans 1 mi. from beach	<ol style="list-style-type: none">1. No large populations in vicinity of beach2. Bacteria concentrations 1 mi. away are likely to be diluted

Potomac River

Evidence For	Evidence Against
<ol style="list-style-type: none"><li data-bbox="98 429 962 529">1. Existence of <u>C</u>ombined <u>S</u>ewer <u>S</u>ystems in DC and City of Alexandria<li data-bbox="98 544 962 701">2. Upstream water impaired by stormwater, sanitary sewer overflows, and other urban sources	<ol style="list-style-type: none"><li data-bbox="969 429 1831 586">1. VT generally observed low bacteria concentrations in mainstem Potomac River<li data-bbox="969 601 1831 701">2. Bacteria concentrations are lower farther from shore<li data-bbox="969 715 1831 929">3. Historical MD DNR sampling suggests elevated bacteria concentrations more frequent at Fairview Beach than mainstem Potomac River<li data-bbox="969 943 1831 1100">4. DC Bacteria Model predicts upstream urban sources have little impact on Fairview Beach

Fecal Coliform Bacteria , Potomac River, 1986-1999 (MD DNR)

Station	Geometrical Mean (cfu/100 ml)	> 400 cfu/100 ml
TF2.1	93	28%
TF2.2	56	21%
TF2.3	38	12%
TF2.4	18	8%
RET2.1	9	4%
RET2.2	7	3%
RET2.3	5	0%
RET2.4	4	1%



Potential Transport Paths

Path	Evidence For	Evidence Against
Stormwater	<ol style="list-style-type: none"> 1. FBRA sampling 2. Scientific literature 	
Groundwater	Scientific literature	<ol style="list-style-type: none"> 1. High subsurface concentrations found only in hot spots. 2. Filling sinkhole decreased concentrations.
Resuspended Sediment	<ol style="list-style-type: none"> 1. Scientific literature 2. High concentrations under rough conditions 	FBRA sampling?
Beach Sand	<ol style="list-style-type: none"> 1. Scientific literature 2. High concentrations under rough conditions 	High subsurface concentrations found only in hot spots

Likely Sources and Causes of Bacteria Impairment

- Controllable sources:
 - Failing septic systems and faulty sewer connections
 - Dogs
- Primary transport paths:
 - Stormwater runoff
 - Resuspended sediment and beach sand
- Condition of beach and stormwater infrastructure:
 - Protection of beach from storms and wave action
 - Management of stormwater runoff

Recommendations for Additional Monitoring

- MST analysis of bacteria in stormwater
- Survey of septic systems and sewer connections
- Measurement of bacteria concentrations in beach sand and sediment

Actions Already Taken to Address Impairment

- Identification and repair of failing septic systems and faulty sewer connections in trailer park
- Pet waste stations
- Repairing bulkheads and groins
 - Reduce wave energy and erosion