Across tributaries, citizen scientists report on frequency, and abundance, of potentially harmful bacteria

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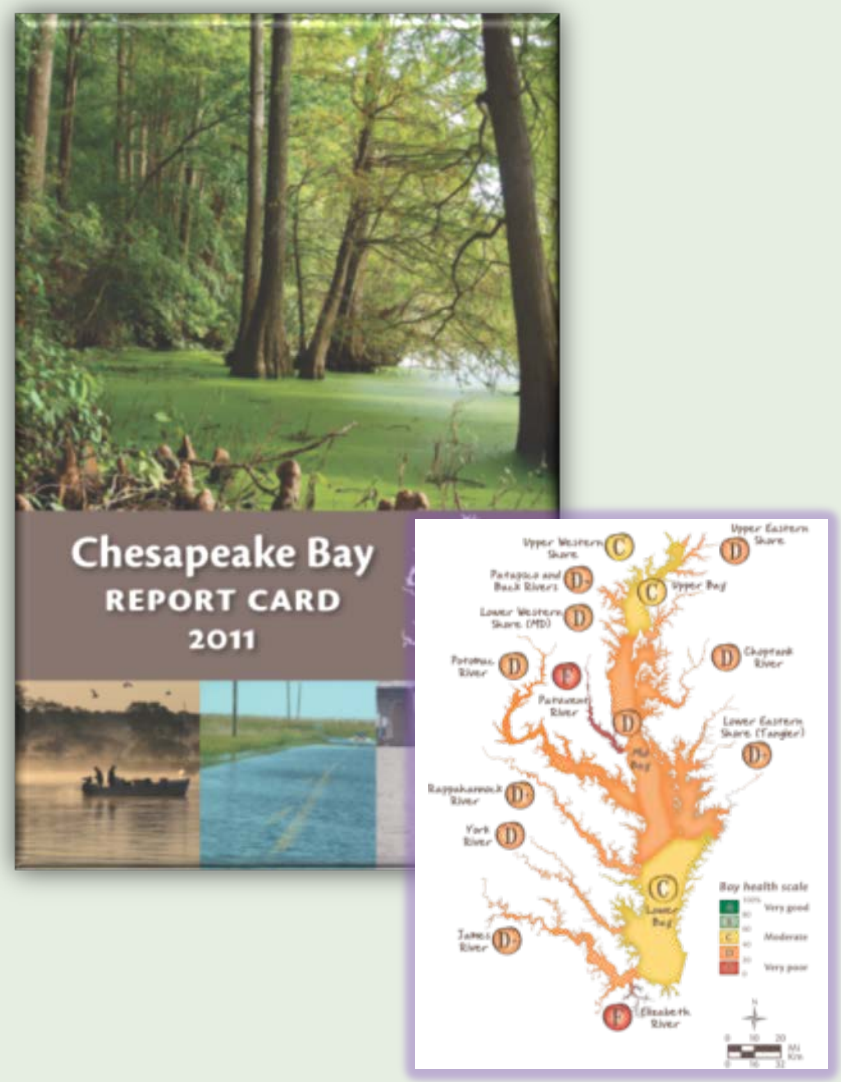
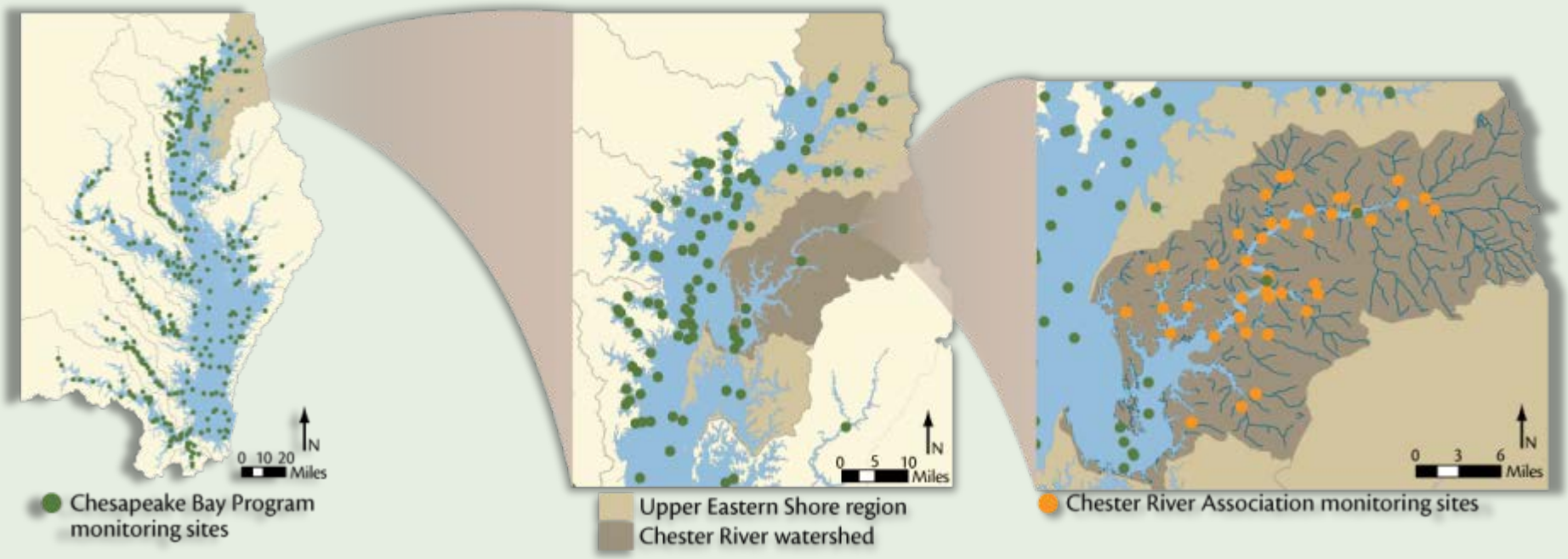
Monitoring results are communicated using report cards

- Broad-level assessments of health in a region or system
- Effectively communicate complex information
- Engage communities
- Based on real data: transparent and defendable
- Provides accountability to stakeholders and policy makers



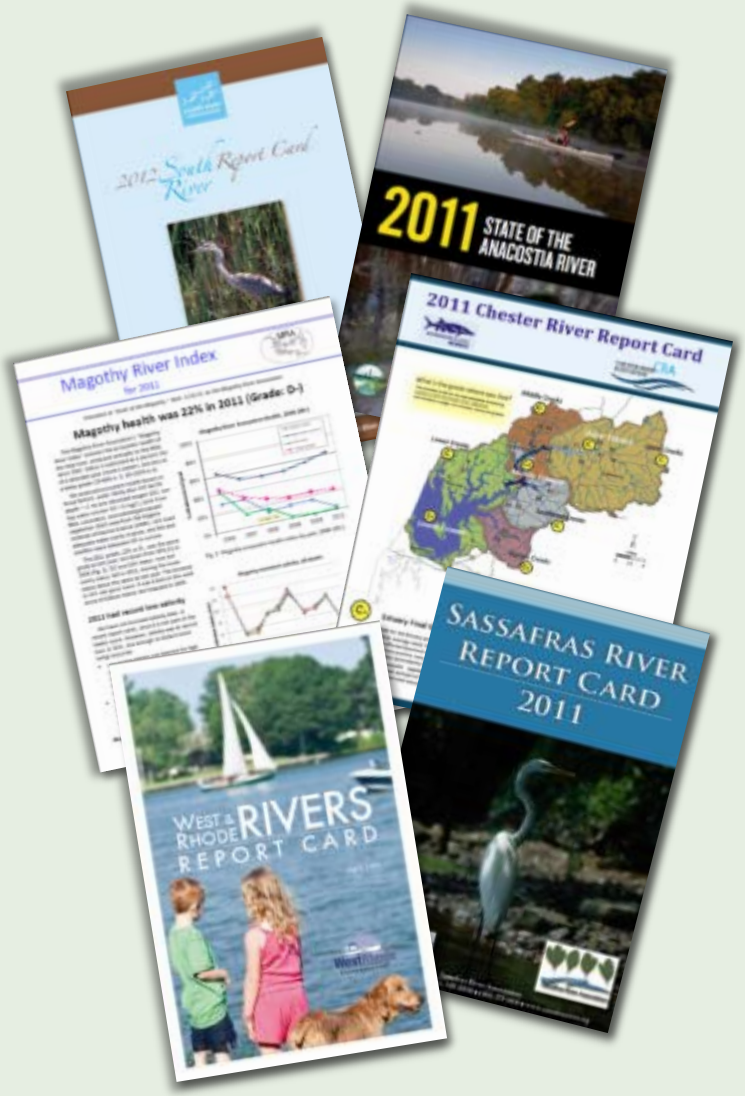
Differences in scale matter

- What about my local river? Tendency for communities to draw comparisons
- Citizen science monitoring programs provide higher spatial resolution data

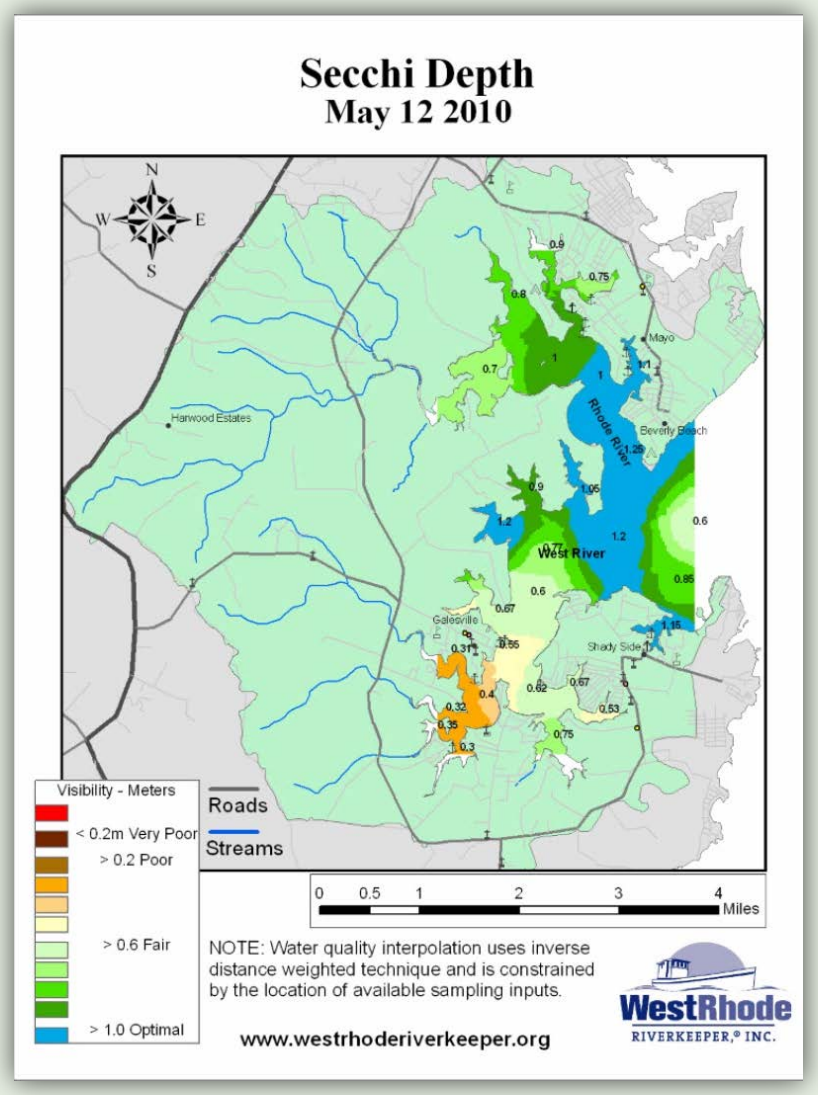


Bringing citizen groups together: Mid-Atlantic Tributary Assessment Coalition (MTAC)

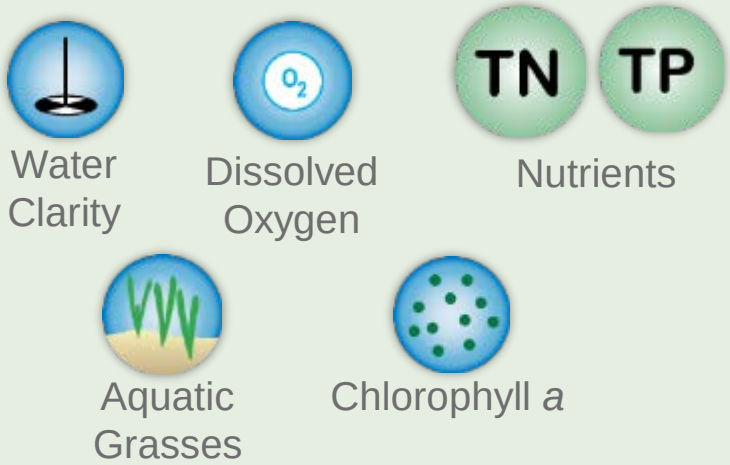
- Fosters collaboration across watersheds
- Standardize sampling methods through a common protocol
  - Enhance data quality
  - Data more comparable
  - Easier for public to interpret
- Provide guidelines for report cards



Integrating across indicators



- Five ecological indicators



- One human health indicator

  - Primary difference is in method of communication
- Suggested optimal and minimum sampling

Why use bacteria as an indicator?

- Public interest
  - Is it safe to swim in your local waters?
- Indicator of:
  - Leaking septic fields
  - Broken sewer lines
  - Excess pet waste
- MTAC monitoring supplemental to state monitoring at swimming beaches

Bacteria measurement protocol

- MTAC protocol based on EPA protocols
  - (Bi)Weekly sampling by watershed organizations (extra sampling after heavy rainfall)
  - Bacterial counts by state certified labs, data analysis by watershed organization

- In seawater, enterococci used as an indicator for harmful fecal coliforms
  - Pass/Fail Threshold: 104 MPN 100 mL^{-1}
  - Sources from both warm blooded animals and decaying material

West and Rhode River
Enterococci cfu/100 ml - Summer 2012

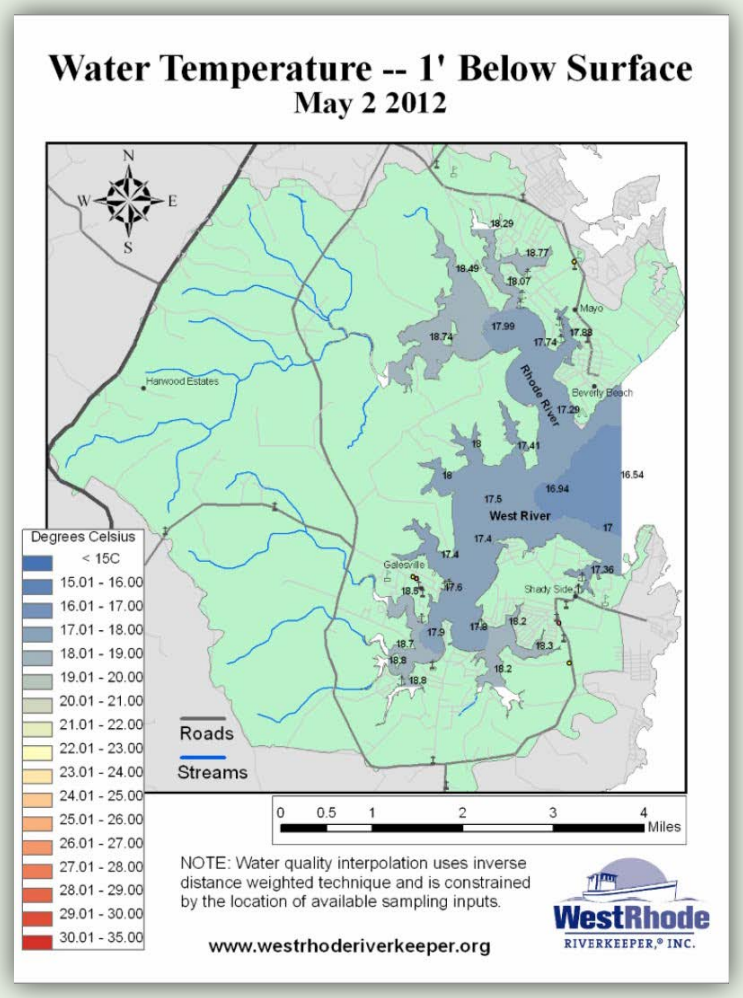
Is it Safe to go into the water?

Here is our explanation of what this testing means to you.

Date	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15
5/23/2012	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1
5/30/2012	6	50	1	26	2	406	88	4	56	116	66	12	44	4	102
6/6/2012	22	1	30	20	42	260	142	1	22	12	2	4	28	1	100
6/13/2012	14	23	16	70	102	1756	126	4	18	30	108	28	34	2	28
6/20/2012	1	4	8	2	134	186	6	4	8	12	1	1	2	1	26
6/27/2012	1	4	6	4	8	18	24	6	1	1	6	1	52	1	20
7/2/2012	10	36	10	18	28	106	82	6	1	46	12	14	2	1	6
7/11/2012	1	1	2	10	56	238	32	1	8	8	2	14	16	1	20
7/18/2012	354	2	124	12	16	114	52	1	4	118	2	46	12	1	12
7/25/2012	12	6	8	8	18	34	4	16	2	2	32	2	6	4	14
8/1/2012	128	8	10	14	78	1510	24	18	8	60	18	20	36	6	12
8/8/2012	108	1	2	6	14	130	48	1	2	42	26	1	1	1	118
8/15/2012	8	2	20	12	22	80	22	1	1	2	12	1	4	1	2
8/22/2012	192	2	12	26	6	82	10	2	1	10	4	4	6	2	1
8/29/2012	14	4	6	16	6	26	72	2	20	6	30	2	6	2	26
Notes:	-- = no sample taken.														
Notes:	The EPA recommended cut off is 104														

Communicating weekly results

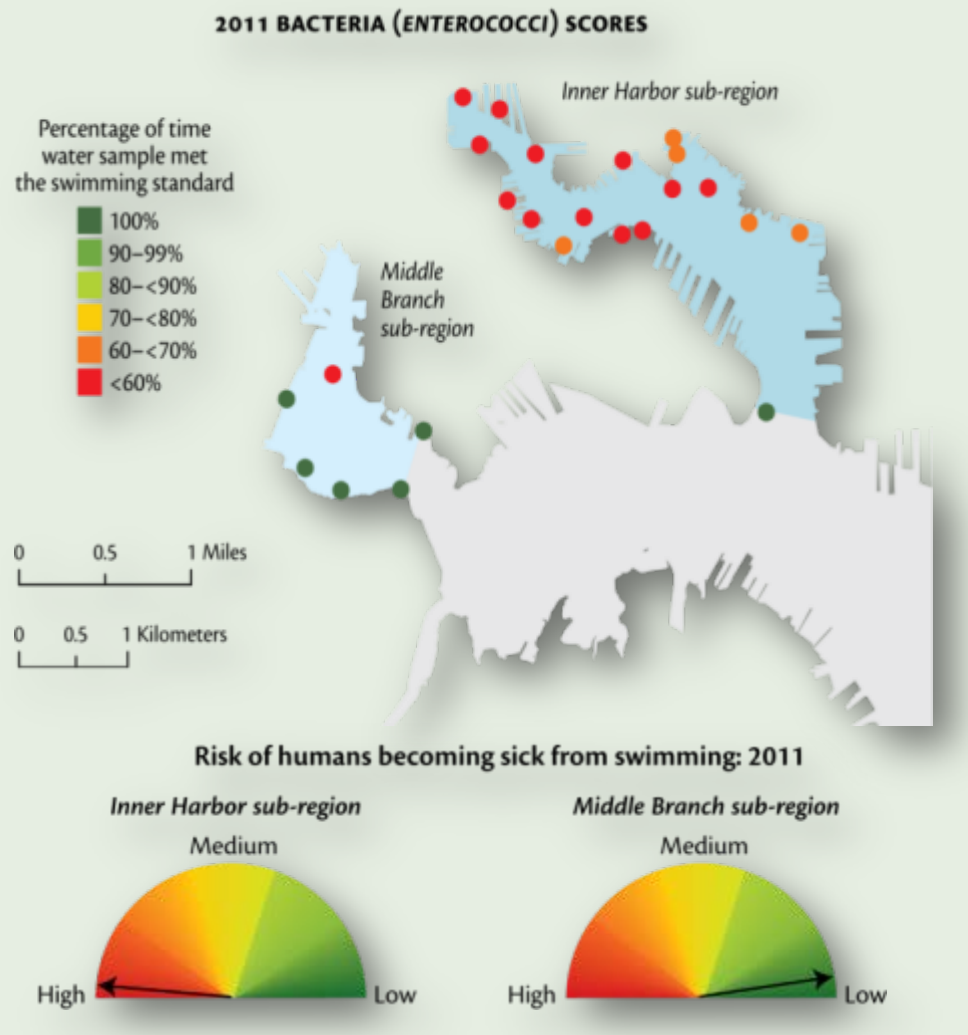
- Most recent data posted to organization website
- Lacking recent data, rule of thumb from the West Rhode Riverkeeper
  - Don't swim in waters warmer than 80 °F (red shades)
  - Common in this tributary from May 30-September 5 in 2011



Communicating annual results

- Not spatially interpolated
- Uses a different grading scale than most other indicators

Score	Narrative
100	Excellent
90 < 100	Good
80 < 90	Moderate
70 < 80	Moderately Poor
60 < 70	Poor
< 60	Very Poor



Comparing other sites around the Bay

Baltimore Harbor

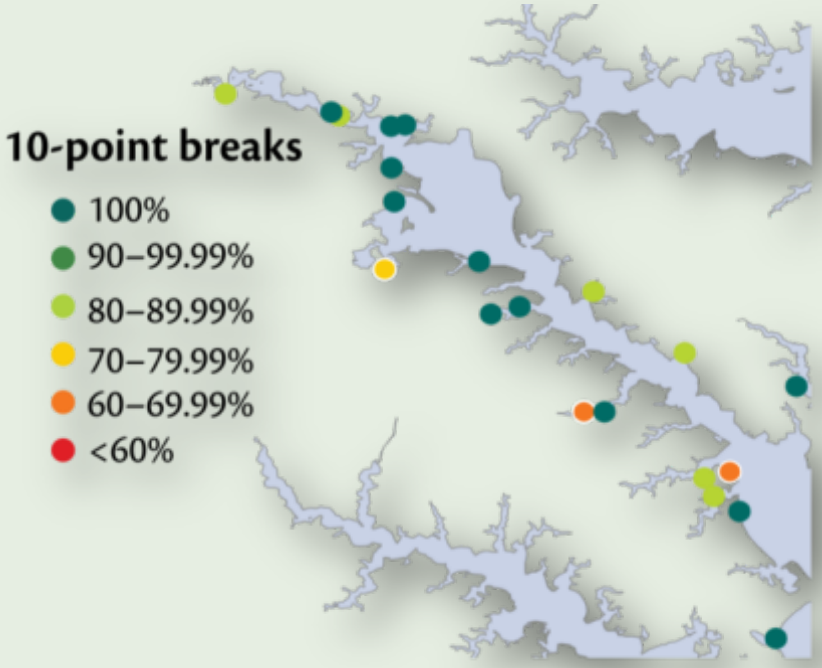
Severn River

West & Rhode Rivers

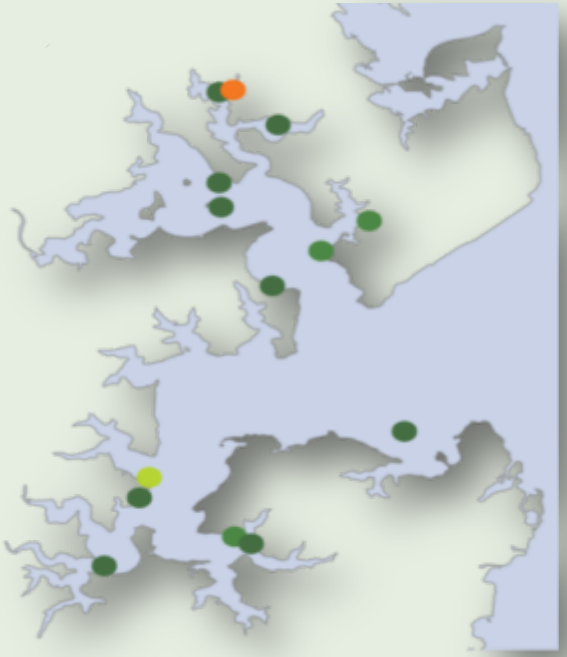
Nanticoke River

Comparing western shore tributaries

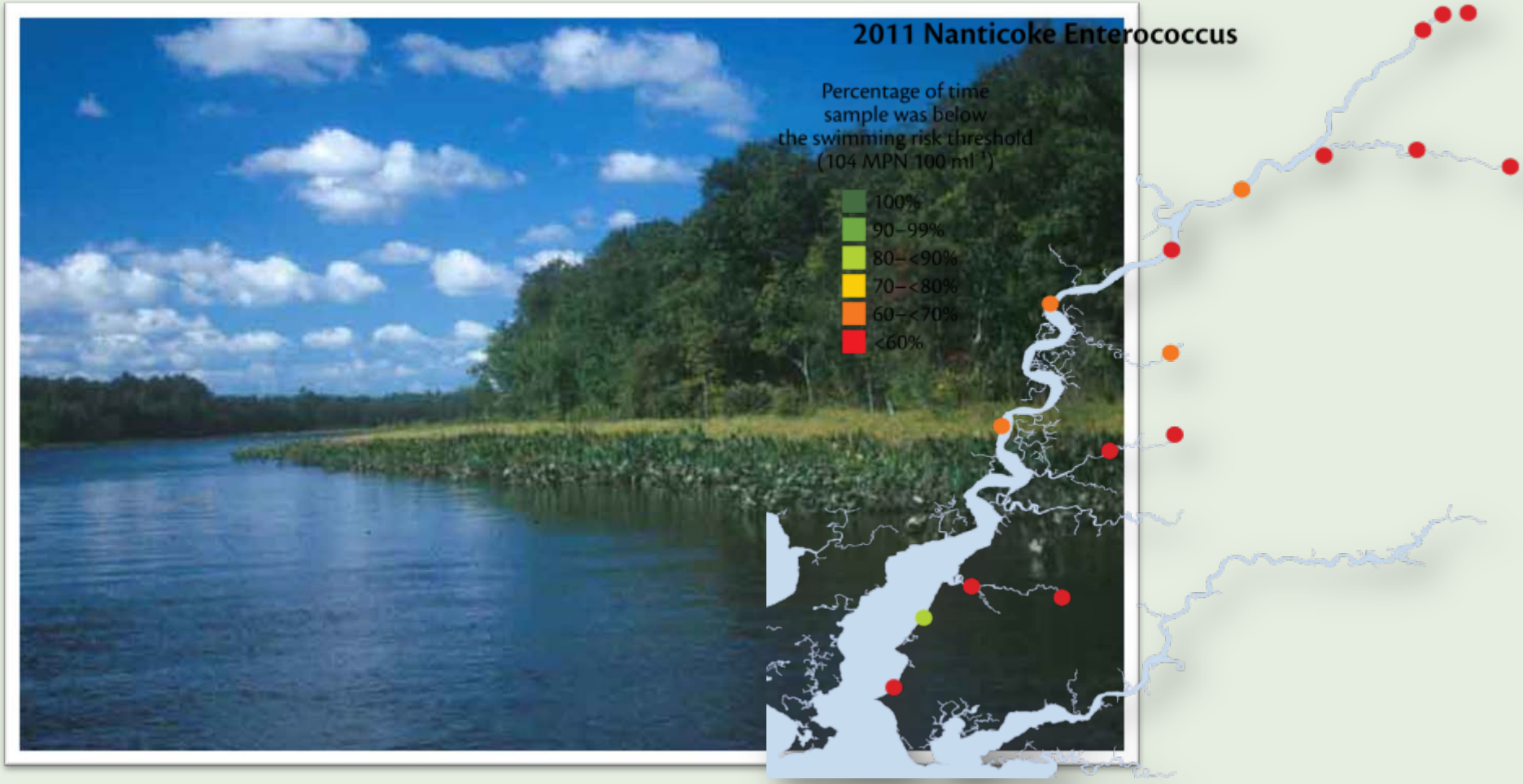
Severn River



West & Rhode Rivers

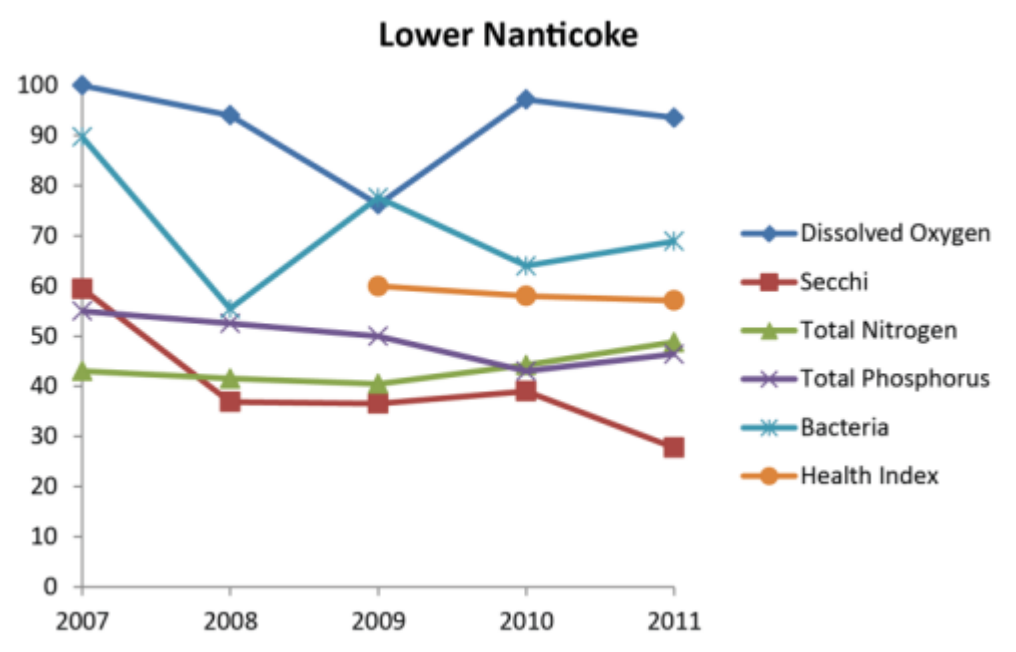


Eastern shore tributary: Nanticoke



The Nanticoke through the years

- Bacteria scores generally lower than expected
  - Some inter-annual variability
- Possible explanation:
  - Much of Nanticoke lined by marsh, wetlands, and degrading material
  - Enterococci from naturally degrading material or abundant wildlife?
  - 40-50% may be plant derived in natural samples (Moore et al. 2007)



MTAC organizations shed light on Bay bacteria

- Most DNR bacteria sampling sites are swimming beaches concentrated on the western shore
- MTAC organizations sample at swimming beaches and other shoreline sites
  - Additional sampling each year
- Organizations within the community are effective at communicating beach closures
- Low bacteria scores are indicative of many human causes (likely in Baltimore Harbor)
- Low bacteria scores may be indicative of natural processes (likely in Nanticoke)
- Need to identify enterococci species to verify

Additional watershed organizations

Octoraro River
Gunpowder River
Sassafrass River
Baltimore Harbor
Chester River
Magothy River
Severn River
South River
West & Rhode Rivers
Anacostia River
Choptank River
Nanticoke River
Potomac River

To name a few and more each new year…

Acknowledgements

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Link to protocol document (PDF):

http://ian.umces.edu/pdfs/ian_report_349.pdf