Update on Stream Health Indicators for the Chesapeake Bay Watershed

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www.potomacriver.org

Scientific, Technical Assessment & Reporting (STAR)
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2000 Chesapeake Bay Agreement

States agreed to:

- Decide on a common method to measure and evaluate stream health
- Provide stream monitoring data
- Establish a goal

for the purpose of tracking **Stream Health** in the Chesapeake Bay watershed.

What to Measured?

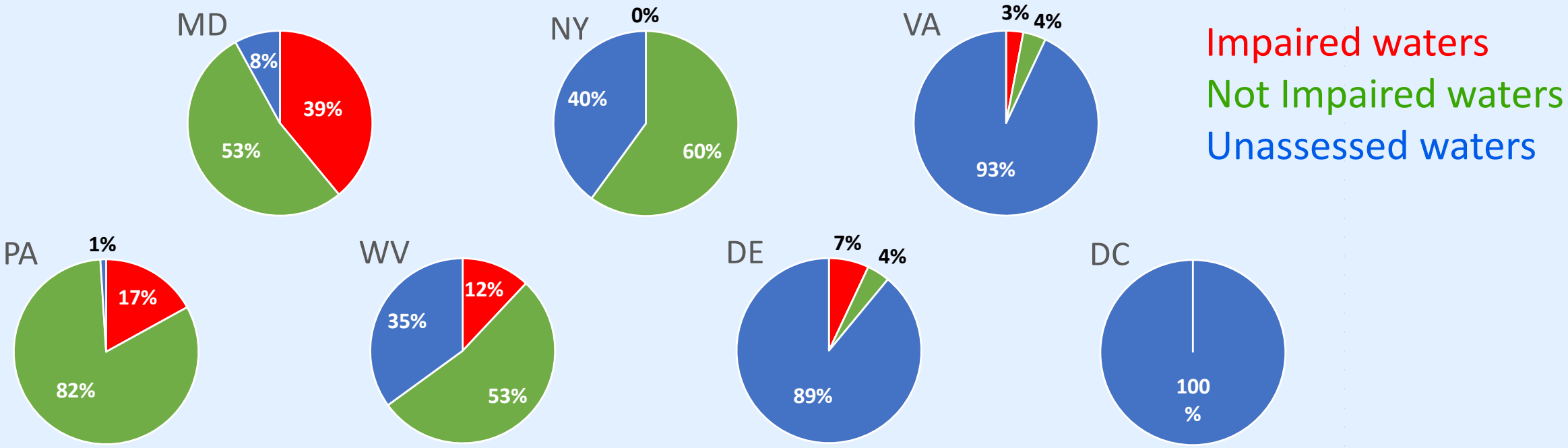
Biology is the definitive measure of ecological health

casmenvironmental.com

Russianriverkeeper.com

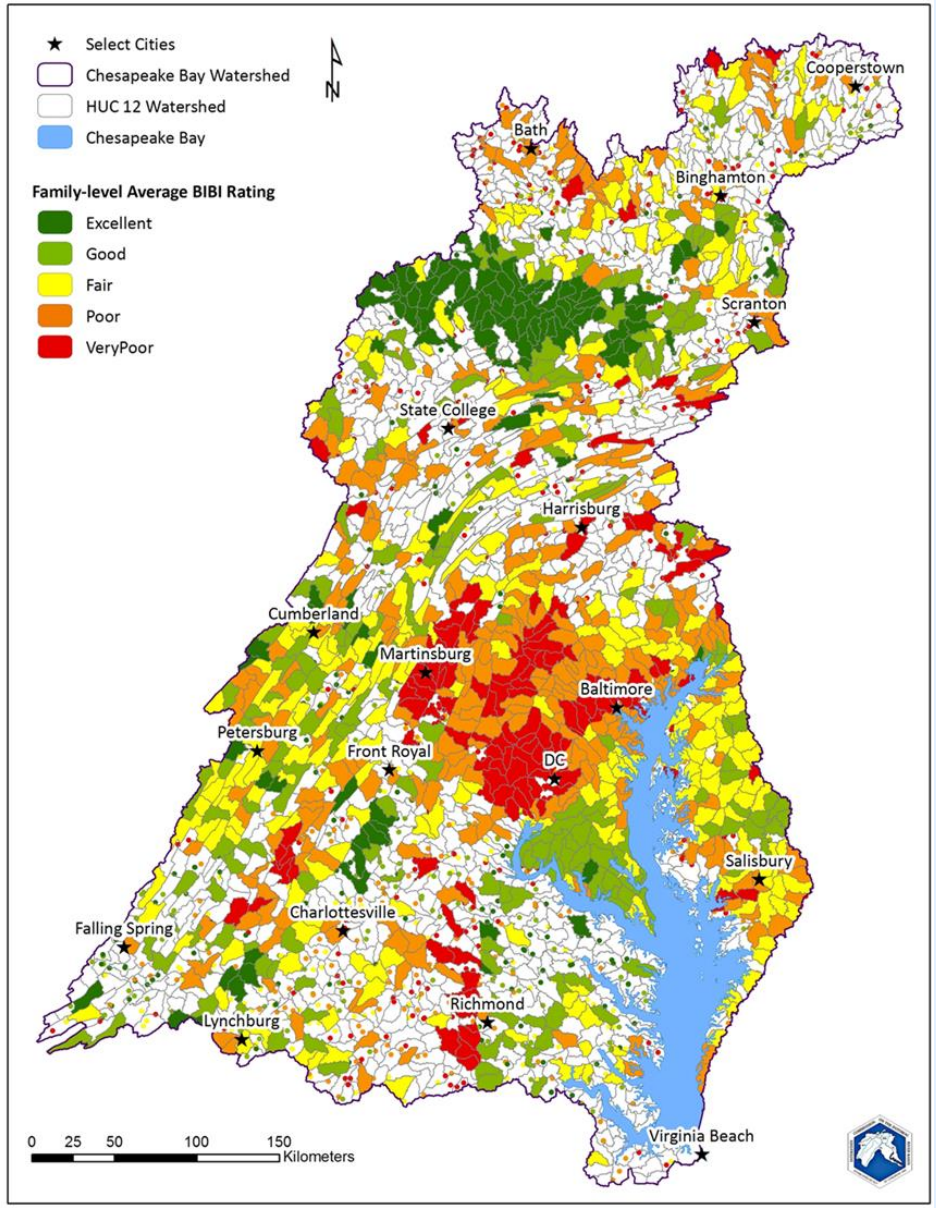
Macroinvertebrates are monitored by all jurisdictions with similar field and laboratory methods

State 303d Listings for 2006
Based on State-Specific Macroinvertebrate IBI's



Differences were too large for States to accept

Chesapeake Basin-wide Index of Biotic Integrity (Chessie BIBI)



2008 – Prototype

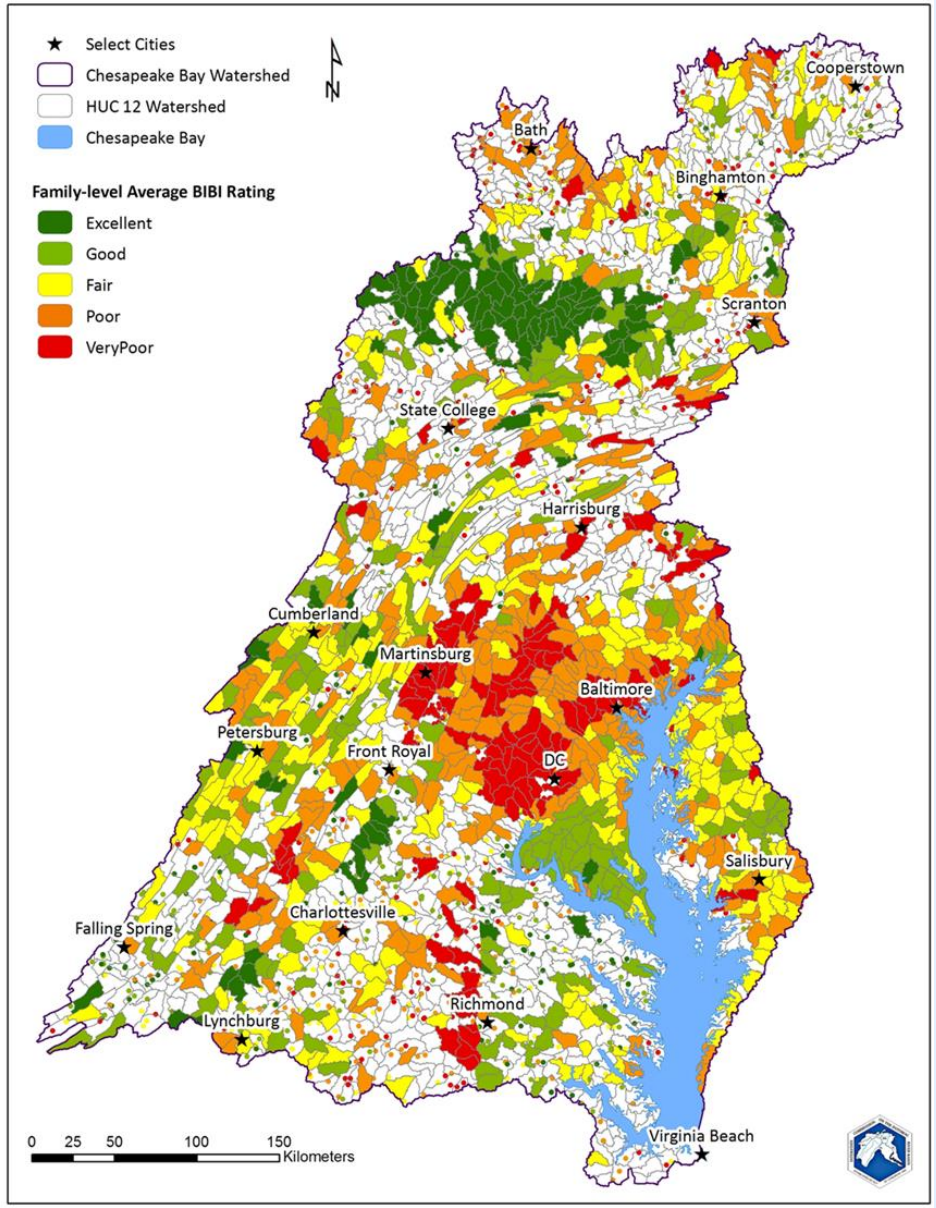
2011 – Proof of Concept

2015 – Selected as CBP Indicator by Stream Health Workgroup

2017 – Index Update and Refinement

2019 – Computer Program

Chesapeake Basin-wide Index of Biotic Integrity (Chessie BIBI)



Built from ground up by ICPRB with States & CBP

Contains more than 25,000 sample events from federal, state, county, and citizen monitoring programs

Based on large pool of reference sites

Sensitive to disturbance, poor WQ, high nutrient concentrations, flow alteration

Currently used in various research projects

Goal 1.0

2010 Chesapeake Executive Order Strategy

"Improve the health of streams so that 70 percent of sampled streams throughout the Chesapeake watershed rate fair, good or excellent, as measured by the Index of Biotic Integrity, by 2025."

Goal 2.0

2014 Chesapeake Bay Agreement

"Stream Health Outcome"

"Continually improve stream health and function throughout the watershed. Improve health and function of ten percent of stream miles above the 2008 baseline for the Chesapeake Bay watershed."

Decisions Needed

"… Improve -> *Does a change of Very Poor to Poor count?*

health and function -> *What indicator*? taxonomic resolution?*

of ten percent of stream miles -> *What stream GIS layer resolution?*

above the 2008 baseline for -> *What is the baseline period?*

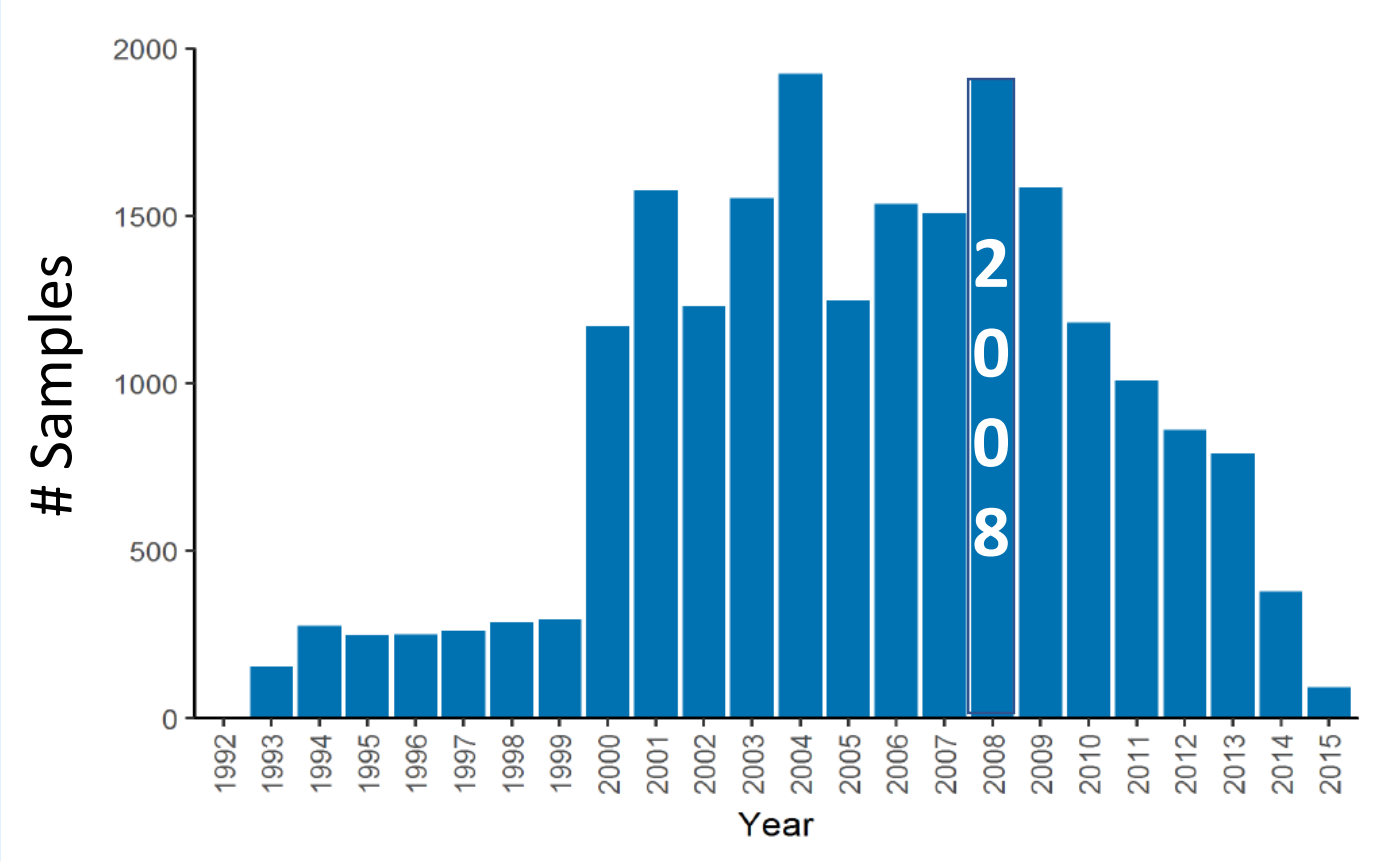
the Chesapeake Bay watershed." -> *What method to resolve sampling bias and data gaps?*

* Chessie BIBI identified as indicator in 2015 Stream Health Management Strategy

2018 Workshop

Recommendation #1

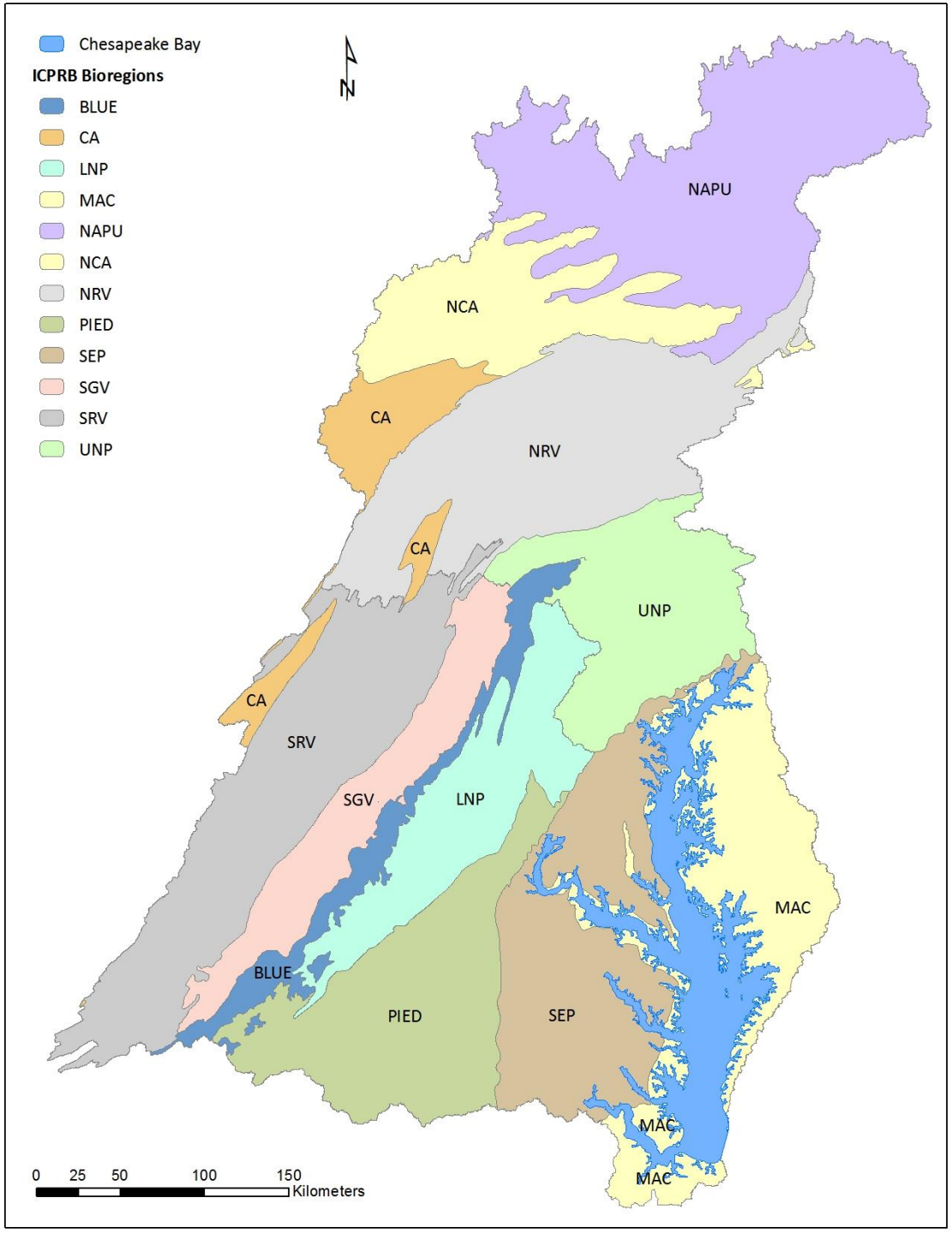
2006 – 2011 is the "2008 baseline"



Database as of July 2016 (n = 25,067)

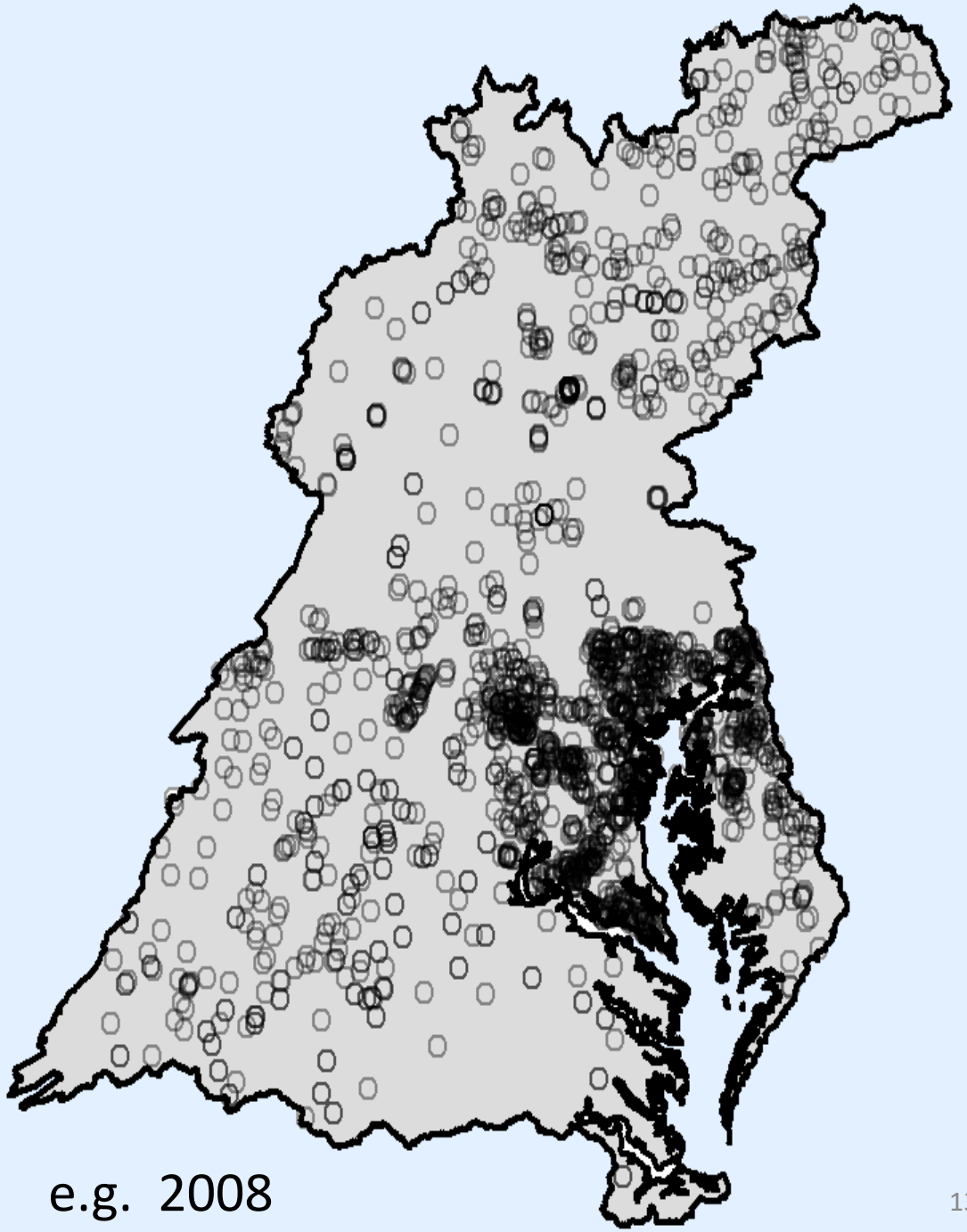
Recommendation #2

Measure status and trends with **family-level, bioregion-specific** Chessie BIBI sub-indices



Recommendation #3

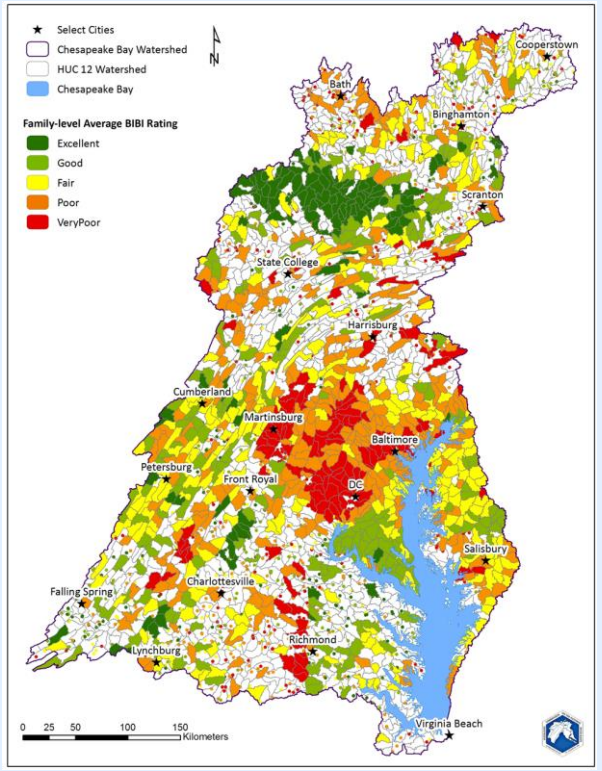
Use Proportional Watershed Rating method to **avoid spatial bias** caused by more intense sampling in some urban areas



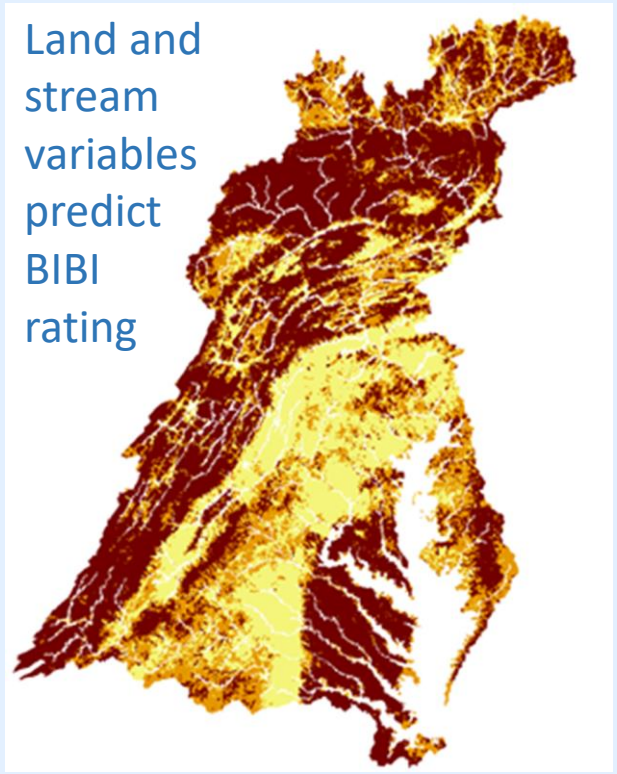
e.g. 2008

Recommendation #4

Fill in data gaps with predictive model results



Proportional Watershed Rating



Predictive (Random Forest) Model
Maloney et al. 2018

% Excellent, Good

% Fair

% Poor & Very Poor

Preliminary 2008 Baseline (2006 – 2011)

Excellent/Good	43%
Fair	17%
Poor/Very Poor	40%

60%

70%

Goal in 2010 Exec. Order Strategy

Recommendation #7

Improve index in poorer performing bioregions

- Currently revisiting **Coastal Plain index**

Recommendation #10

Use standard data formats (Chesapeake Environ. Data Repository)

- Data Center developing **non-tidal database & QA protocols**
- ICPRB competed **Chessie BIBI package**

  R-scripts, shape files, reference tables, documentation, 60 metrics, all Chessie BIBI scores and ratings

  https://archive.chesapeakebay.net/LR/Chessie BIBI/

Recommendations (cont.)

- Develop a **suite of basinwide indicators** of stream condition, e.g., in-stream habitat, water quality, riparian corridor, landscape
- Build **consensus** on what qualifies as 10% improvement (SHWG)
- Establish more **sentinel sites** for trend analysis (Monitoring programs)
- Verify **site type** as probabilistic vs targeted (Monitoring programs/ICPRB)
- Perform **power analysis** (TBD)
- Implement a **communication strategy** (CBP)

Source: ChooseCleanWater.org

"Continually improve stream health and function …."

2008 Baseline:	2006 - 2011
First Post-Baseline:	2012 – 2017
Second Post-Baseline:	2018 – 2023
Third Post-Baseline:	2024 – 2029

www.potomacriver.org/focus-areas/aquatic-life/chessie-bibi-stream-health-indicator/

https://archive.chesapeakebay.net/LR/Chessie BIBI/

Acknowledgments

EPA Chesapeake Bay Program

1. Anne Arundel County Maryland - Department of Public Works
2. City of Baltimore - Department of Public Works
3. Baltimore County Department of Environmental Protection
4. District of Columbia Department of Energy and Environment
5. Delaware Department of Natural Resources and Environmental Control
6. Frederick County Department of Public Works
7. Fairfax County Department of Public Works and Environmental Services
8. Howard County Department of Public Works
9. Loudoun County Department of Building and Development
10. Montgomery County Department of Environmental Protection

USGS Leetown Science Center

11. Maryland Department of Natural Resources
12. New York Department of Environmental Conservation
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20. Virginia Commonwealth University
21. West Virginia Department of Environmental Protection

Extra Slides

Stream Functions Pyramid