Partnering with watershed organizations to produce tributary-specific report cards

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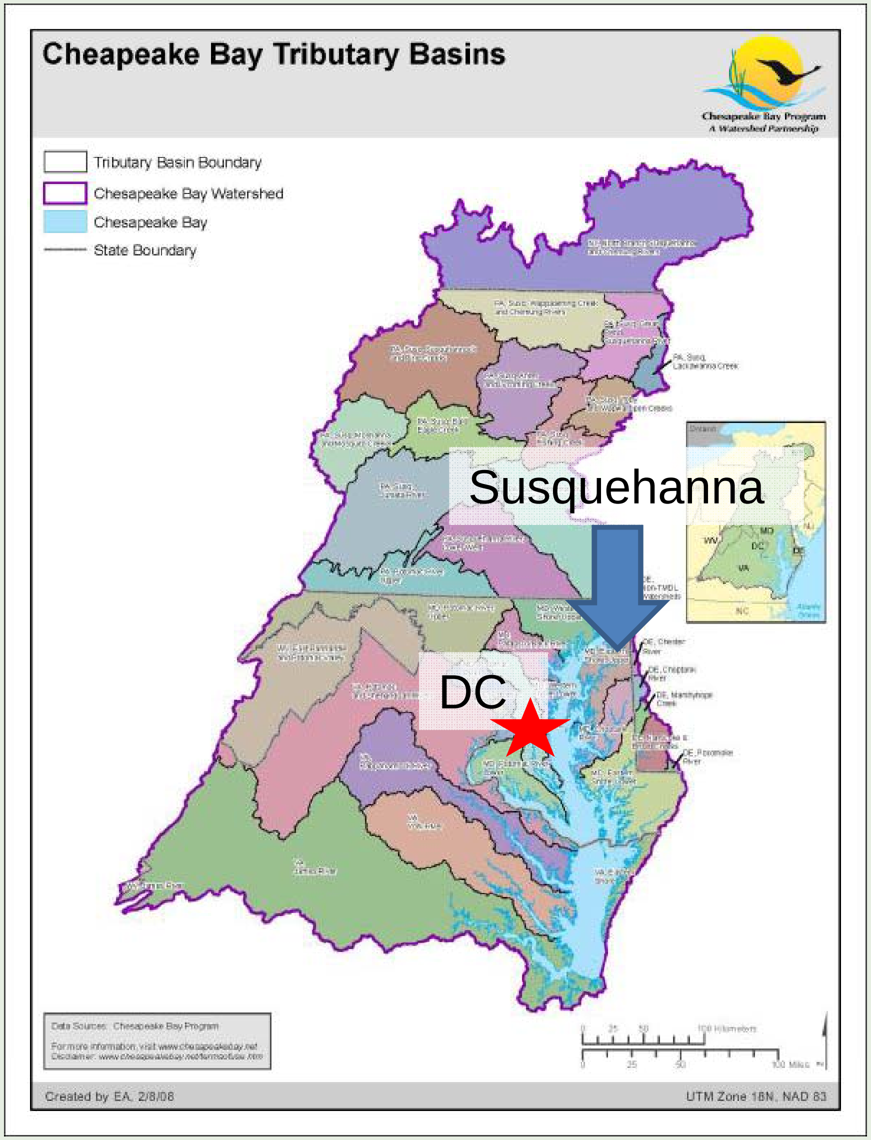
ecocheck
A partnership between
UMCES

MTAC
Mid-Atlantic
Tributary
Assessment
Coalition

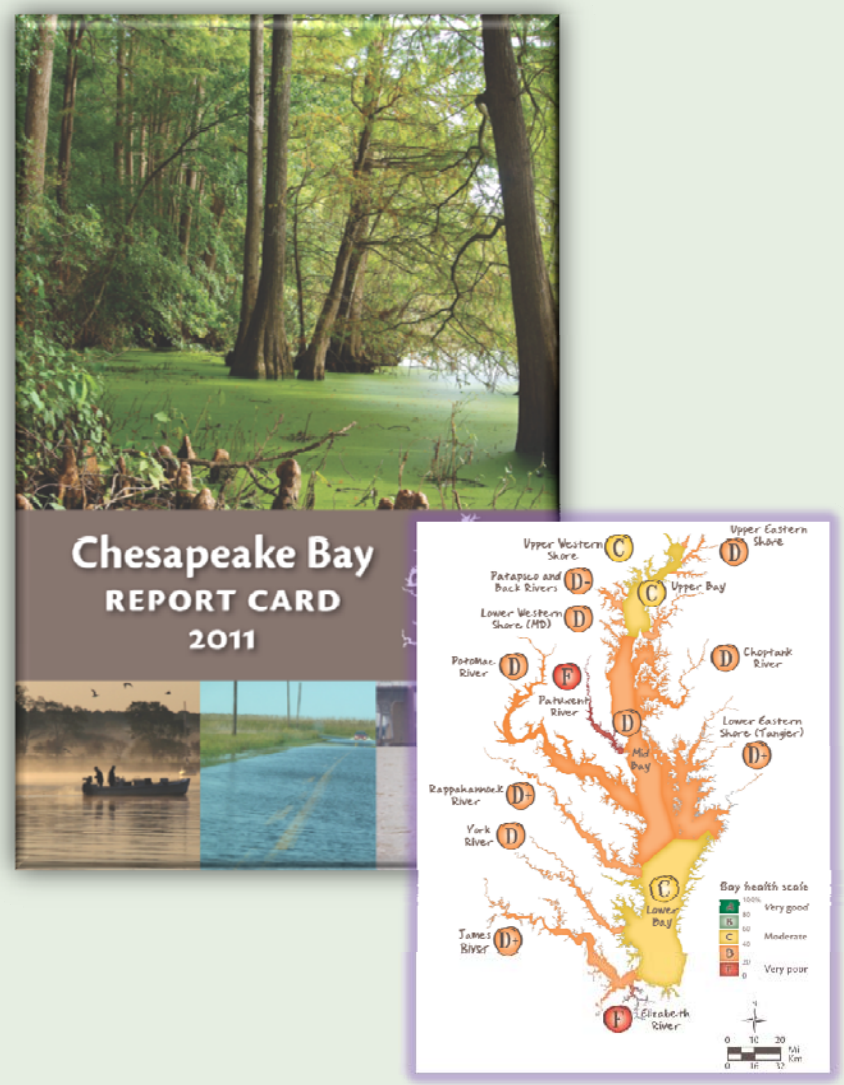
Monitoring Chesapeake Bay health

- Largest estuary in US
  - Surface area: ~12,000 km^2
  - Average depth: 14 m
  - Watershed size: ~167,000 km^2
  - Largest tributary: Susquehanna (~50% of fresh water supply)
- Whole Bay monitoring
  - Chesapeake Bay Program (EPA) maintained database
  - Monthly water quality sampling of 152 stations
  - Annual aquatic grass survey
  - Annual Benthic Index Biotic Integrity
  - Other monitoring: fin fish, shellfish, etc.



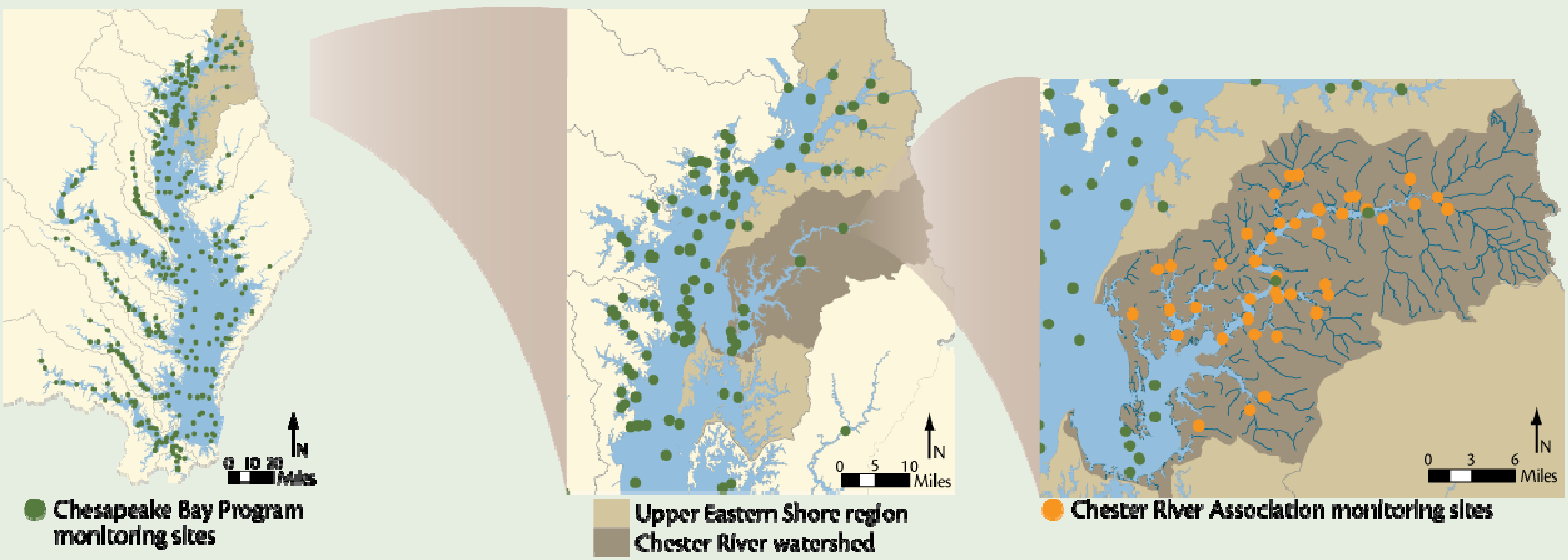
Monitoring results are communicated using report cards

- 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



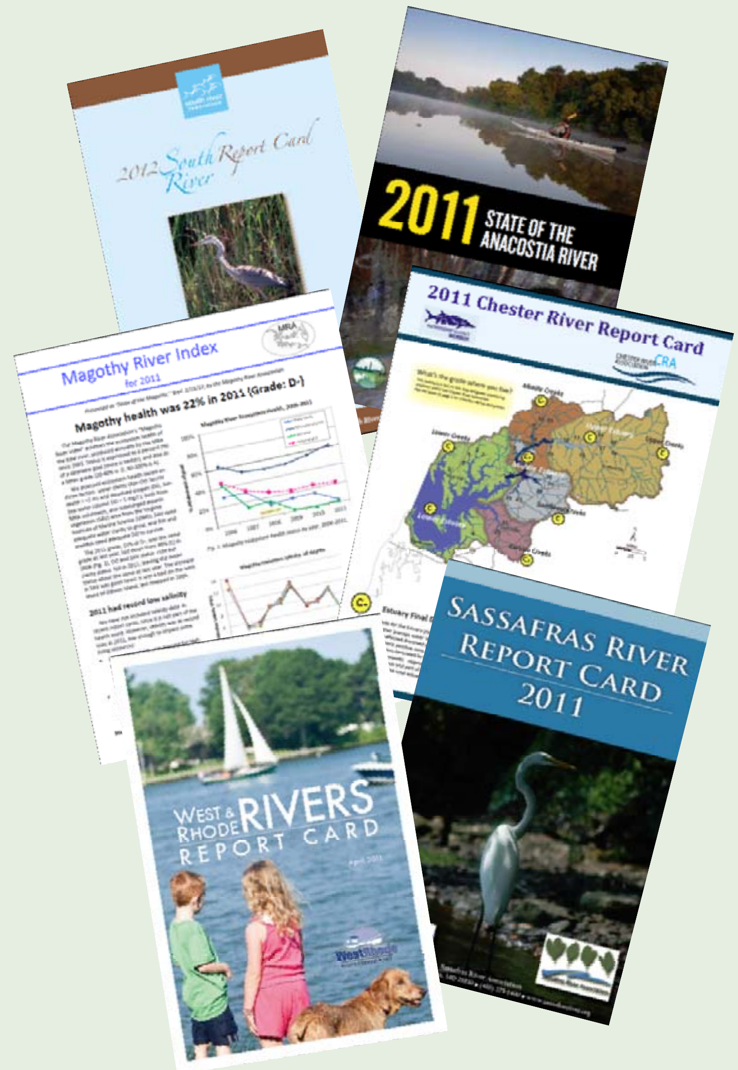
Differences in scale matter

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



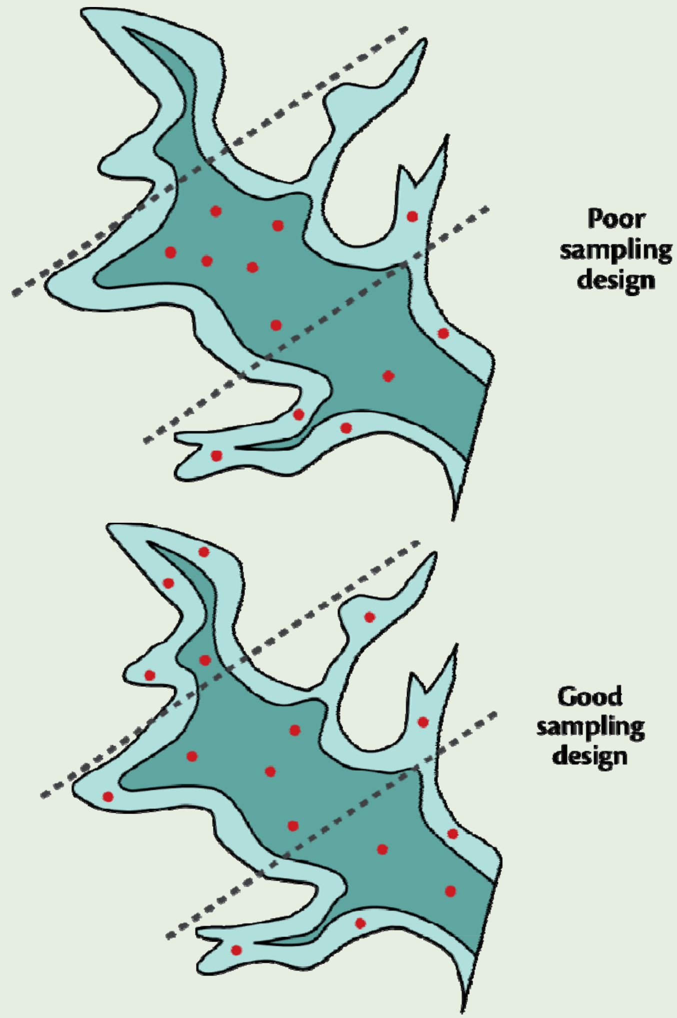
Bringing citizen groups together:
Mid-Atlantic Tributary Assessment Coalition (MTAC)

- 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



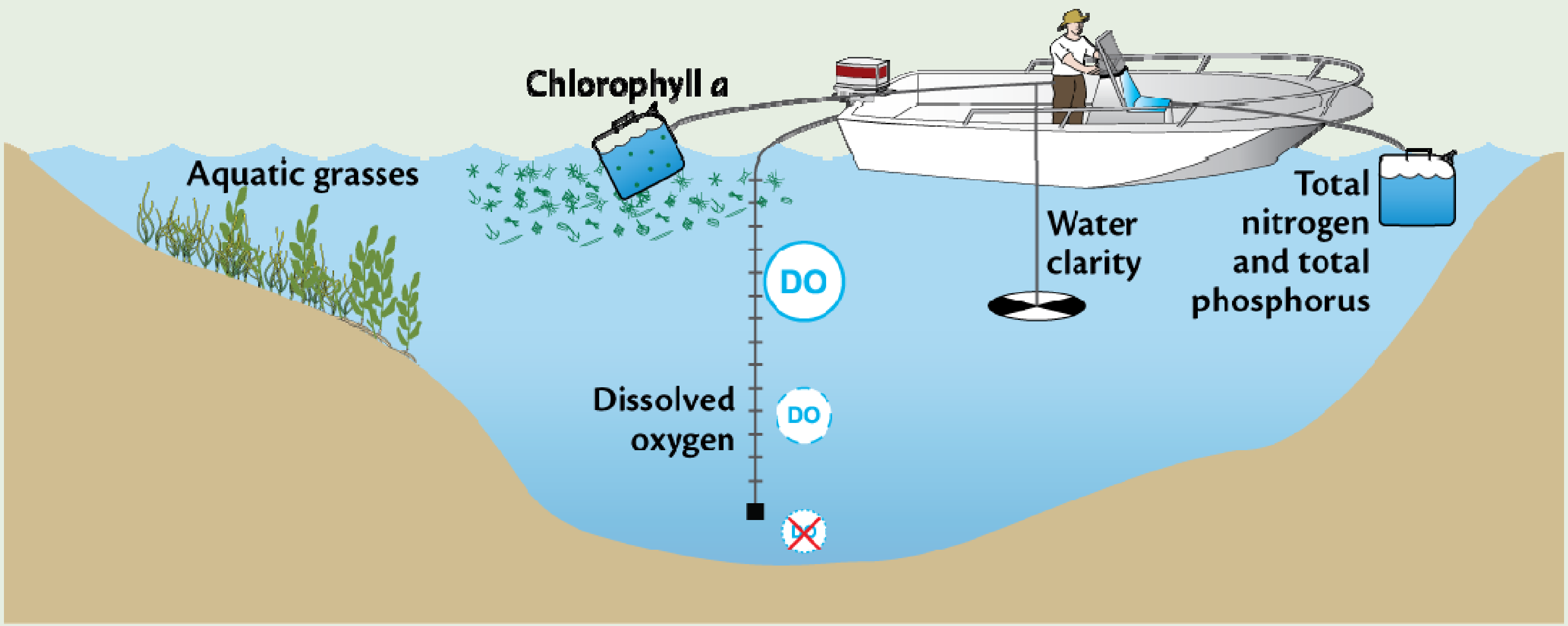
Developing a protocol: Where should samples be taken?

- Many citizen science programs around Chesapeake Bay are new to conducting field research
- Need for consensus on sampling design
  - Stratified random
  - Location of sampling sites
  - Sub-region delineation



What should be sampled?

- Selected six "core" indicators
  - Collected by organization: Chlorophyll *a*, dissolved oxygen, water clarity, total nitrogen, total phosphorus
  - Collected by state monitors: Aquatic grass growth



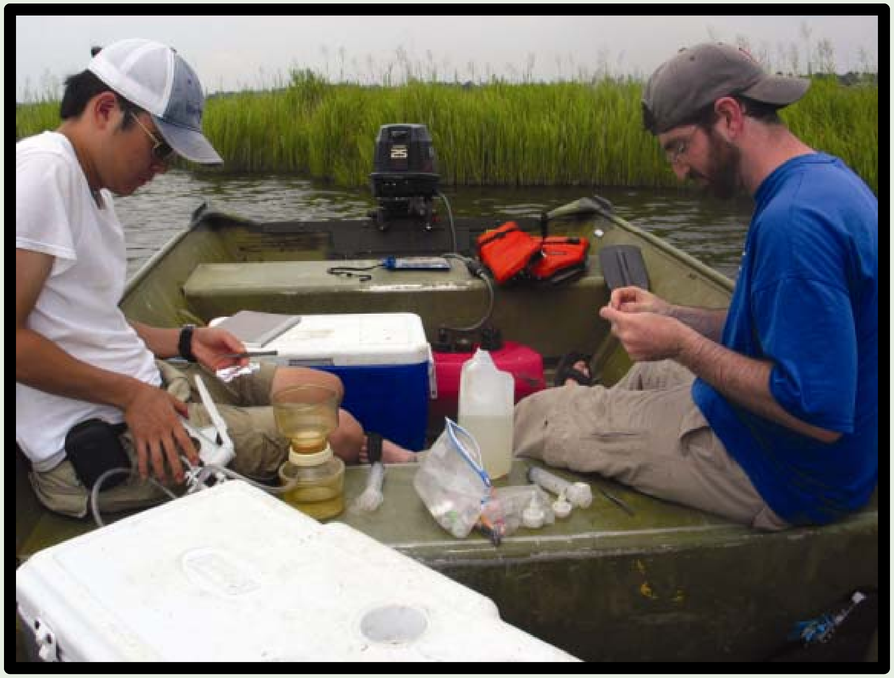
When should sampling occur?

- Period of interest identified to minimize costs
- Consensus on sampling period and frequency
- Minimum vs. preferred temporal resolution

Indicator	Preferred sampling period	Preferred sampling resolution	Minimum sampling period (needed for data analysis)	Minimum sampling resolution	Salinity regime (needed for data analysis)
Dissolved oxygen	April–October	Weekly	June–September	Twice monthly	No
Chlorophyll *a*	March–October	Weekly	March–May; July–September	Twice monthly	Yes
Water clarity	March–November	Weekly	April–October; March–November for polyhaline	Twice monthly	Yes
Total nitrogen	March–October	Weekly	April–October	Twice monthly	Yes
Total phosphorus	March–October	Weekly	April–October	Twice monthly	Yes

How should samples be collected and analyzed?

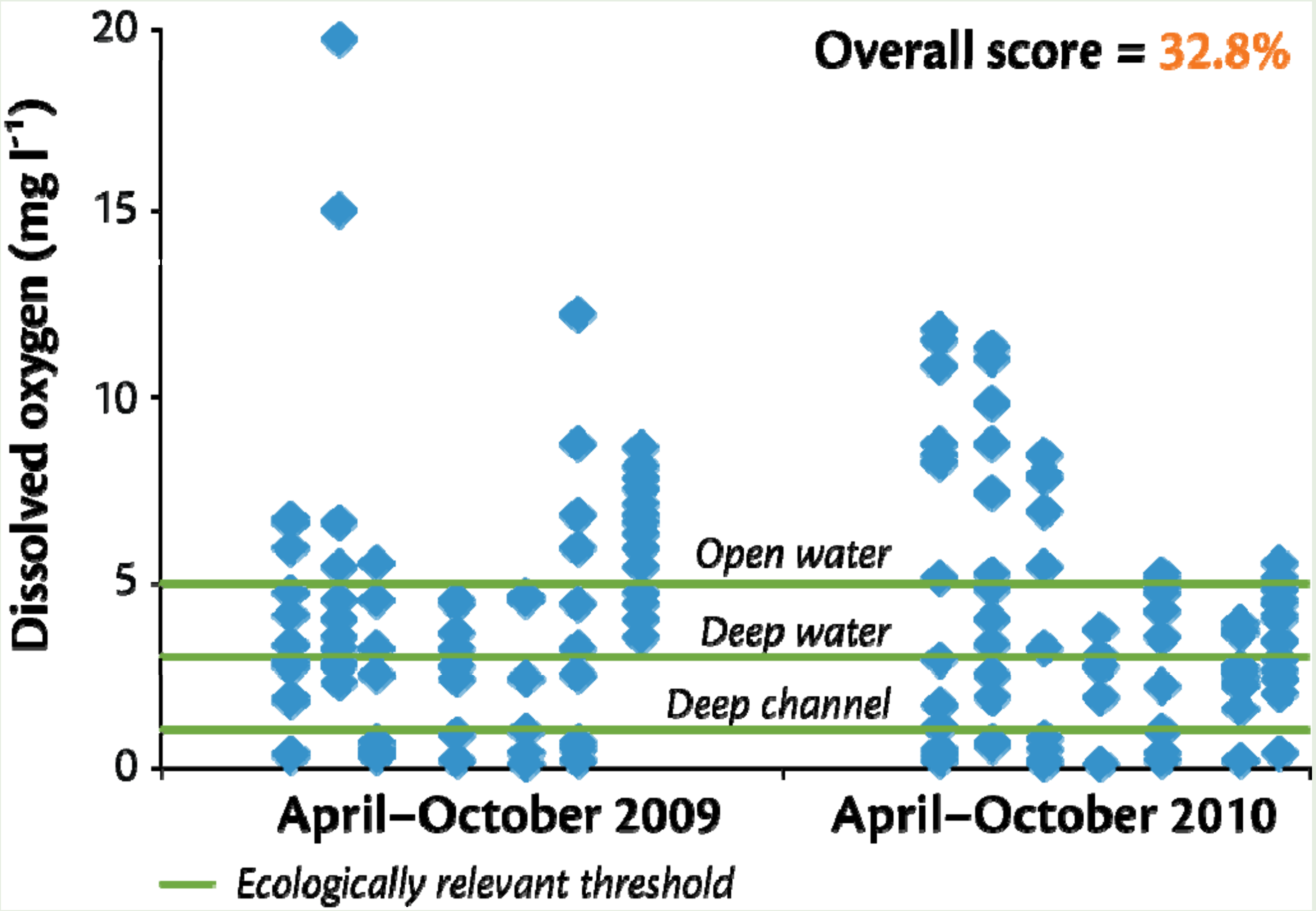
- For each indicator, reach consensus on:
  - Field sampling procedures
  - Laboratory or instrument based methods
  - Data analysis methods
    - Threshold criteria
    - Thresholds vary by salinity regime and time of year



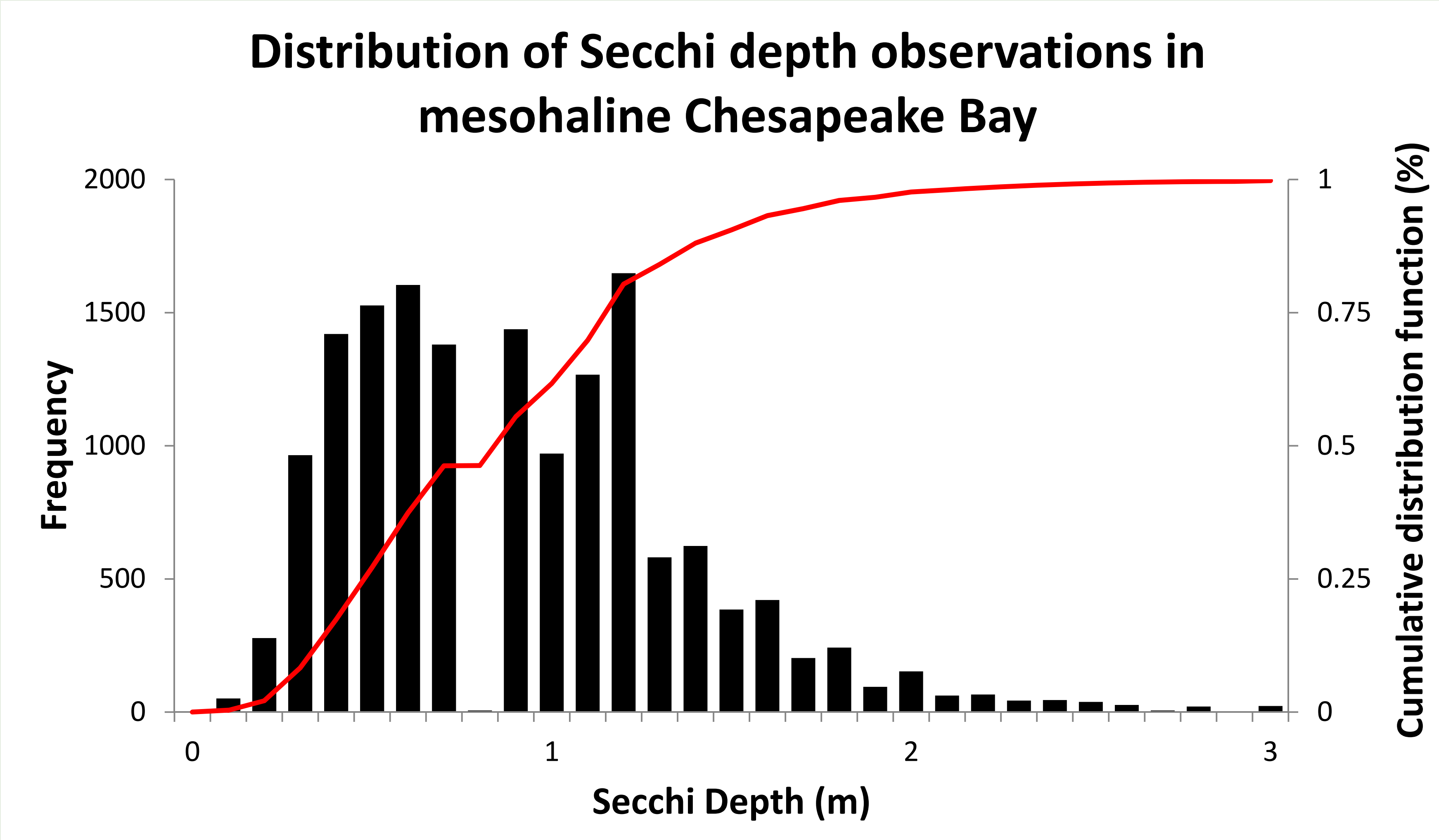
Use existing thresholds when possible

- When possible, use established ecologically relevant thresholds (US EPA 2003)

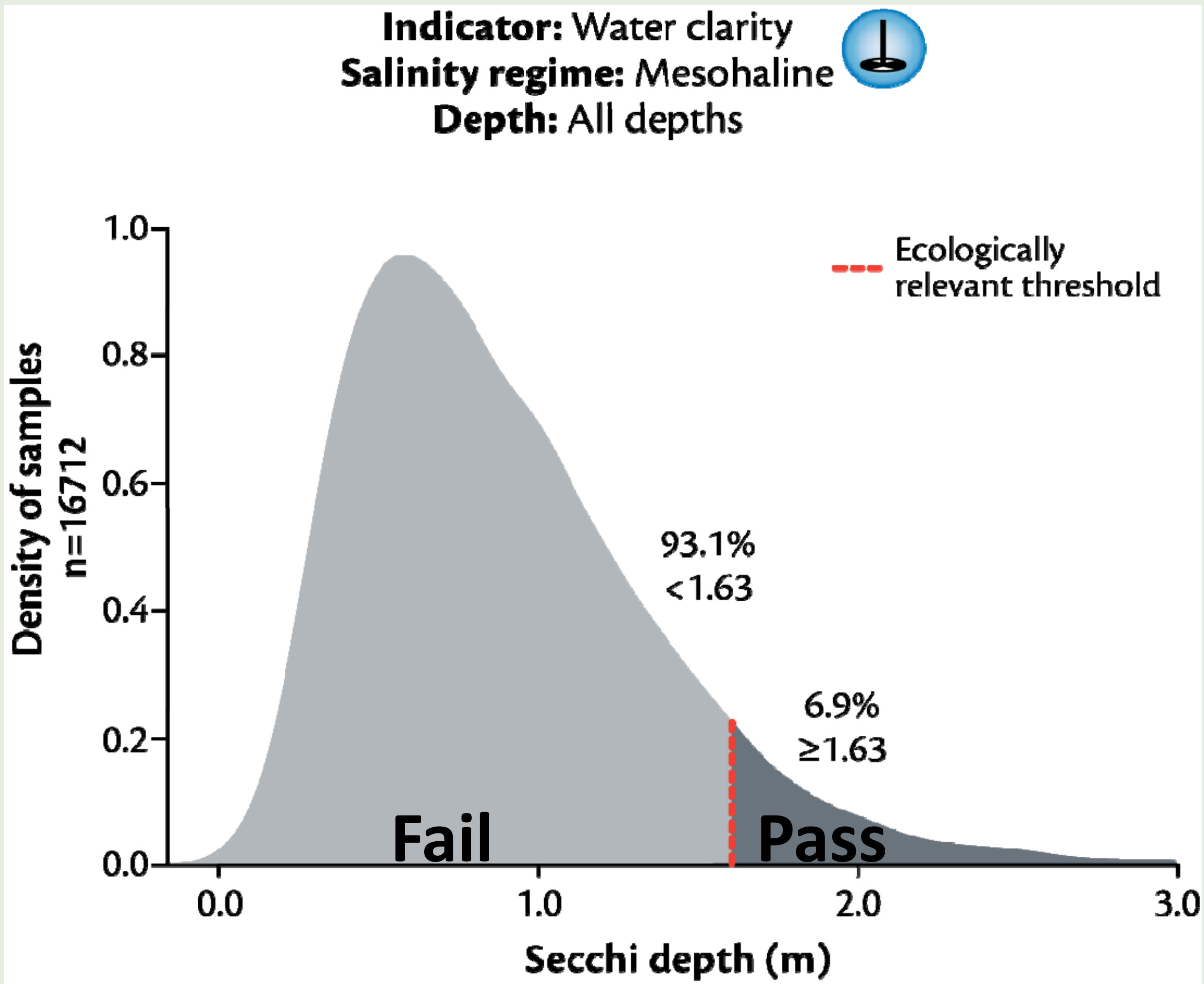
Baltimore Harbor dissolved oxygen



Determine a meaningful threshold: Evaluate existing observations

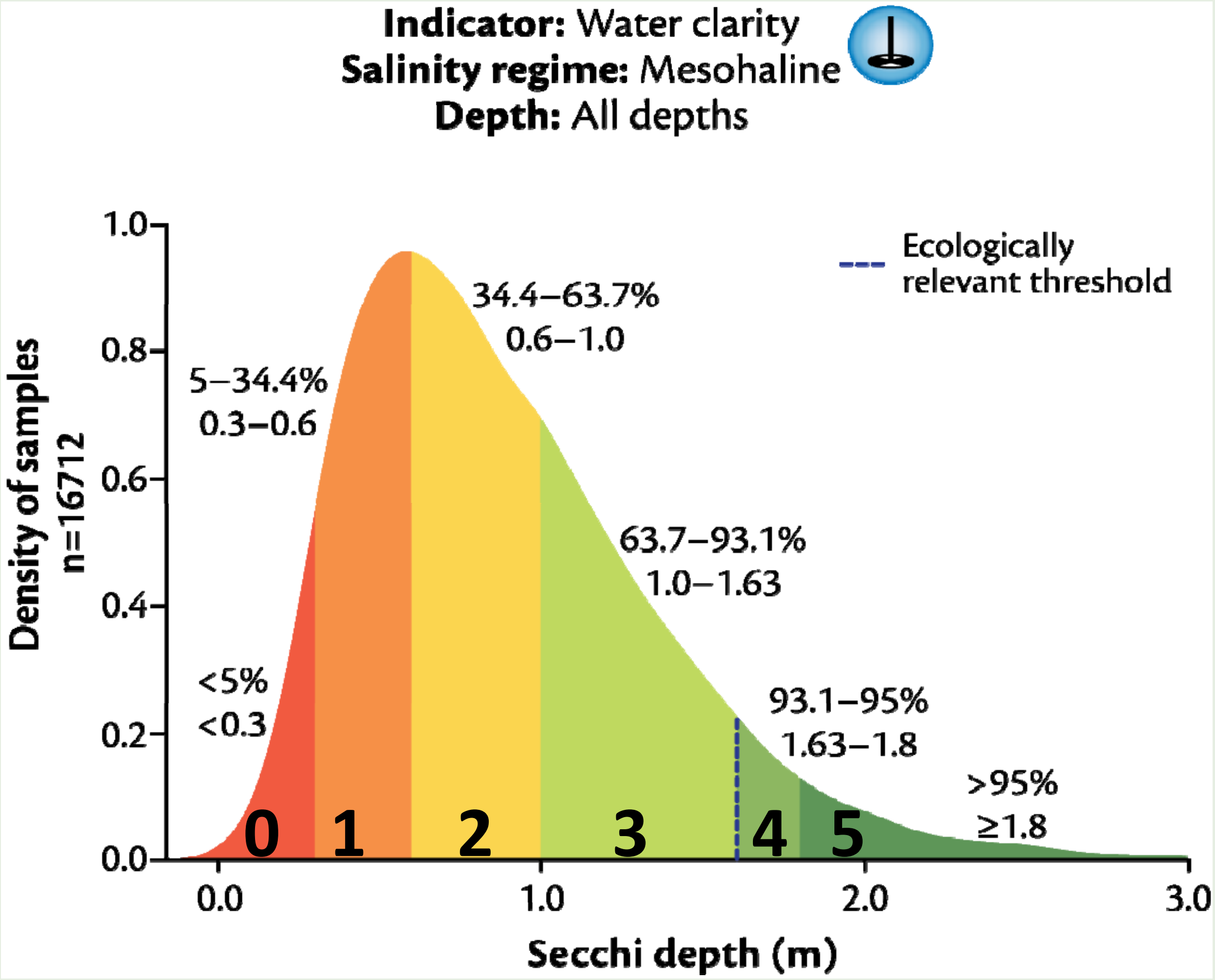


Determine a meaningful threshold: Pass/Fail



Note: Model based on tributary mesohaline data only

Determine a meaningful threshold: multiple thresholds



Note: Model based on tributary mesohaline data only

Example – Secchi scoring

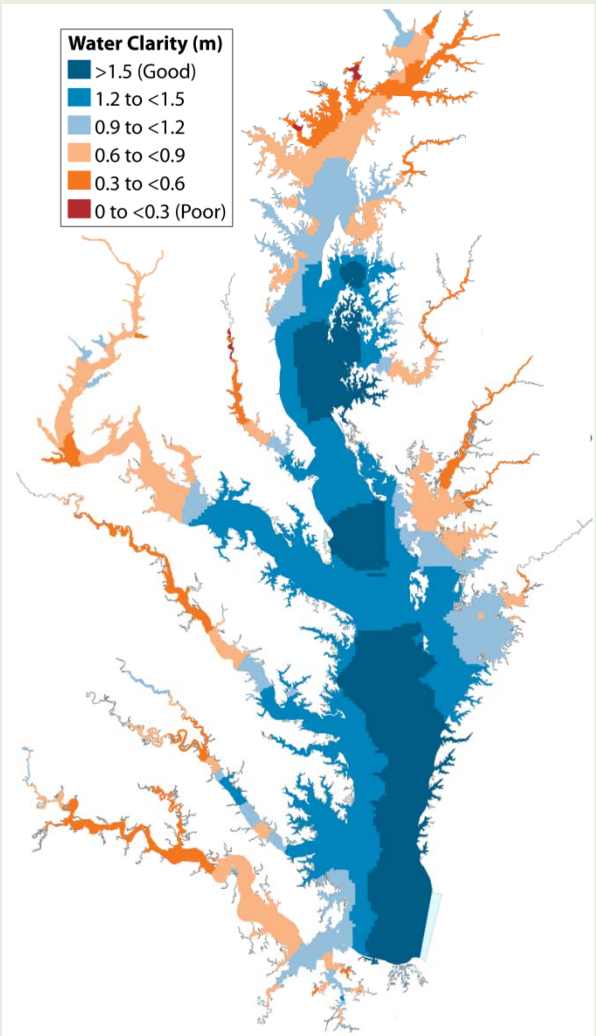
- Step by step scoring process
  - Station scores → Sub-region scores → Area weighted to Bay-wide score

Table 7.1. Multiple thresholds based on salinity regime for water clarity calculations.

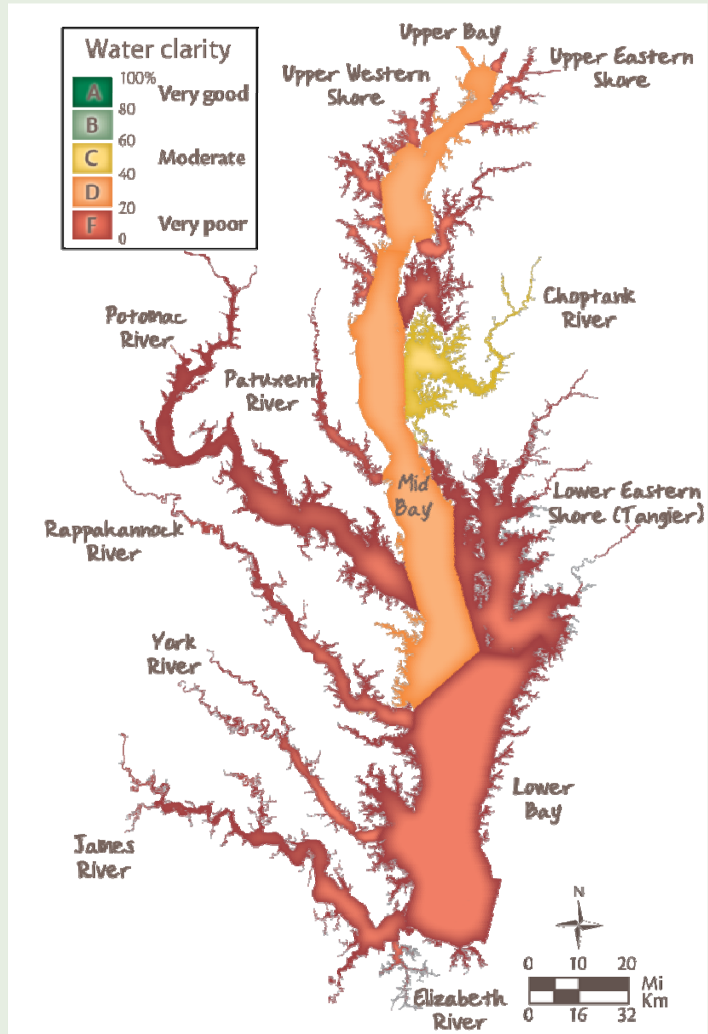
Score	Tidal Fresh	Oligohaline	Mesohaline	Polyhaline
5	≥1.3	≥0.9	≥1.8	≥2.1
4	≥0.9−<1.3	≥0.7−<0.9	≥1.6−<1.8	≥2.0−<2.1
3	≥0.6−<0.9	≥0.5−<0.7	≥1.0−<1.6	≥1.1−<2.0
2	≥0.4−<0.6	≥0.3−<0.5	≥0.6−<1.0	≥0.8−<1.1
1	≥0.2−<0.4	≥0.2−<0.3	≥0.3−<0.6	≥0.5−<0.8
0	<0.2	<0.2	<0.3	<0.5

Calculating a Bay-wide Secchi score

Bay-wide interpolated data

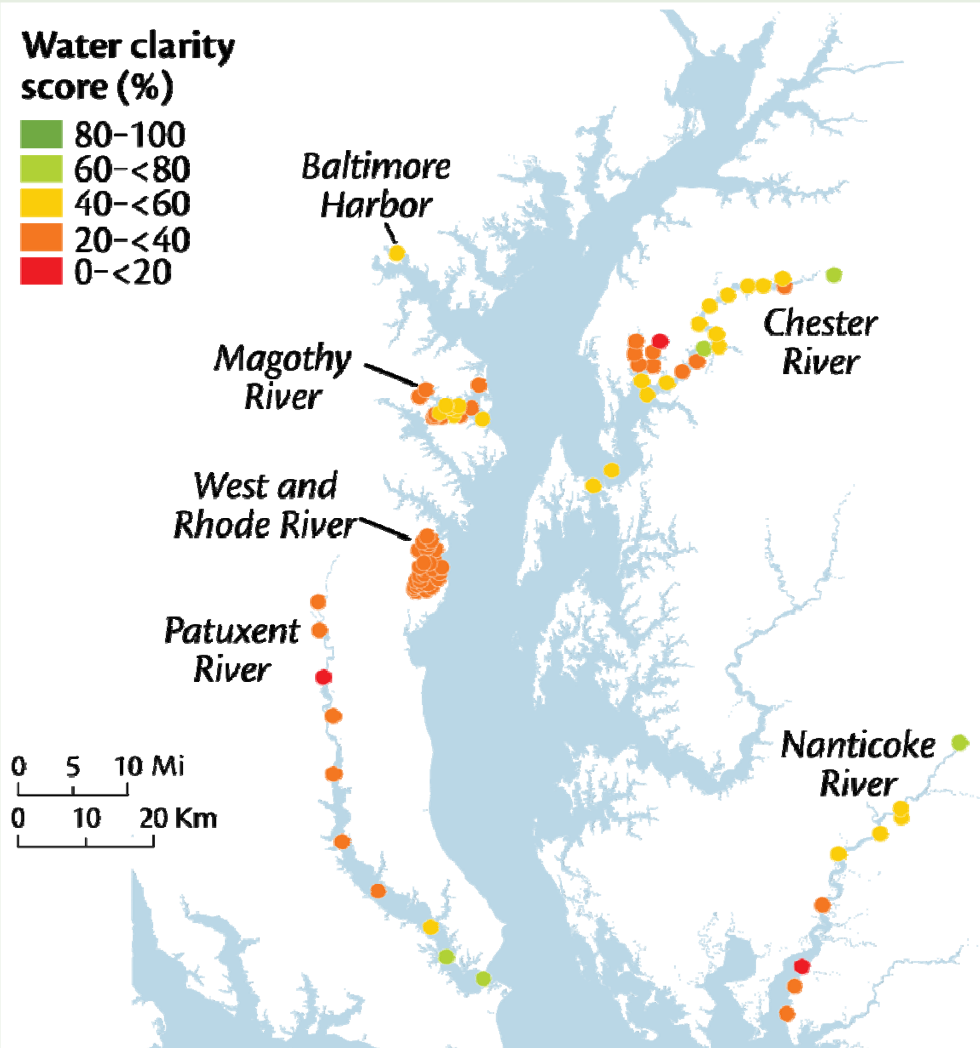


Scored & area-weighted average



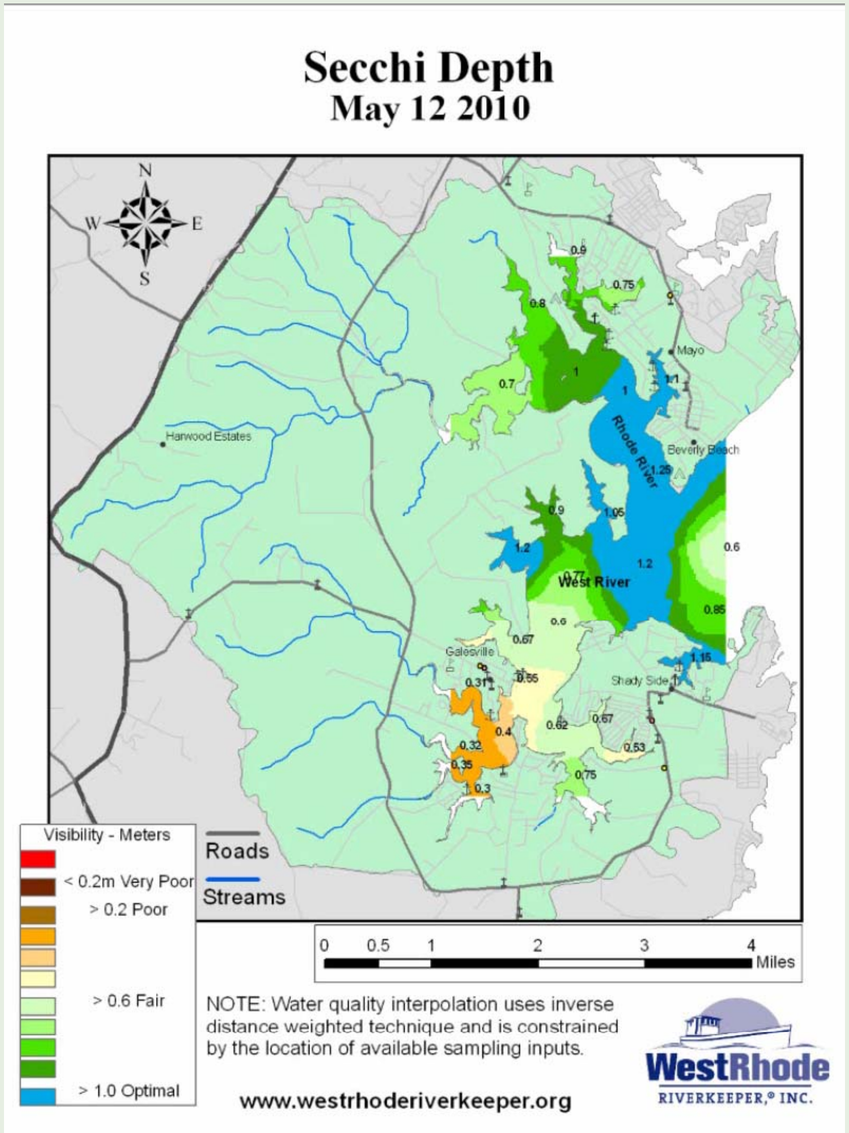
Bay-wide water clarity grade
(area-weighted average)

MTAC observations are comparable



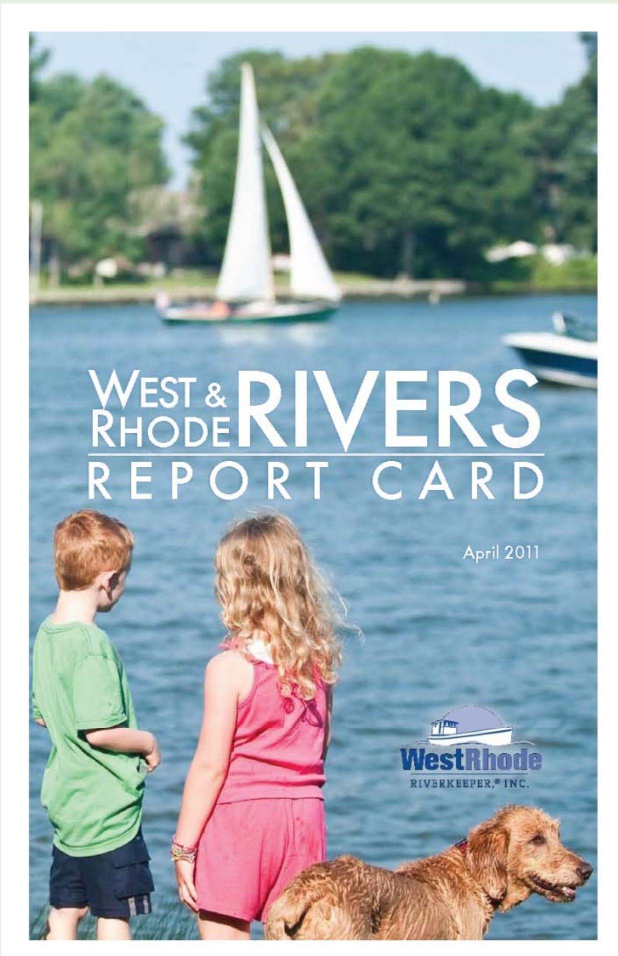
- Gathering data from multiple MTAC organizations reveals fine spatial scale trends
  - Spatial scale not practical for larger efforts
  - Can identify point sources
- Data among MTAC groups are comparable
  - Goal is to improve data quality across all indicators to Bay Program standards

Integrating across indicators



- Five ecological indicators
  - Water Clarity
  - Dissolved Oxygen
  - Nutrients (TN, TP)
  - Aquatic Grasses
  - Chlorophyll *a*
- One human health indicator
  - Fecal Bacteria
  - Primary difference is in method of communication
- Suggested optimal and minimum sampling

Pulling it together into an overall grade



- Average primary indicators into overall grade of Bay/tributary health
- Generate a report card for distribution
  - Released in spring, before summer sampling (optimally)

Indicator	West River	Rhode River	Grade	Notes
Water Clarity	26%	28%	D	Same grade as 2010. Clarity not good enough to support underwater grasses.
Dissolved Oxygen	70%	83%	B	Slightly worse than 2010, but generally adequate. No major fish kills.
Nutrients	40%	34%	D+	More nutrient pollution this year, possibly due to runoff from heavy spring rains.
Chlorophyll (algae)	27%	26%	D	Higher levels of algae than 2010. Too much nutrient pollution fueled algal blooms.
Underwater Grasses	0%	0%	F	Once again, no robust grass beds were mapped in annual flyover study. Bay-wide grasses down 20%.
Average Scores	**33%**	**34%**	**D**	**Worse than 2010. Wet spring and hot summer combined to create poor conditions.**

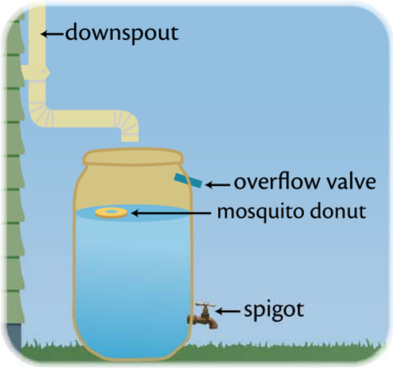
courtesy: West Rhode RIVERKEEPER

Encouraging public engagement

Improve water clarity—Live Bay friendly!

Water clarity was at an all-time low (5%) in 2011 in Chesapeake Bay. We can improve water clarity, which helps aquatic grasses grow, promotes the right balance of phytoplankton (algae) in the water column, and influences benthic communities (clams and worms living in the sediment) in the following ways:

Around your home



Stop sediment and nutrients from running off your property into storm drains. Divert rainwater into rain barrels, rain gardens, and natural areas. Reduce fertilizer use and re-use materials by composting.

In your community

Support local initiatives that convert hard surfaces like parking lots into green spaces like rain gardens. Report turbid water running off from public sites, such as construction areas, to your local government.

Through your lifestyle

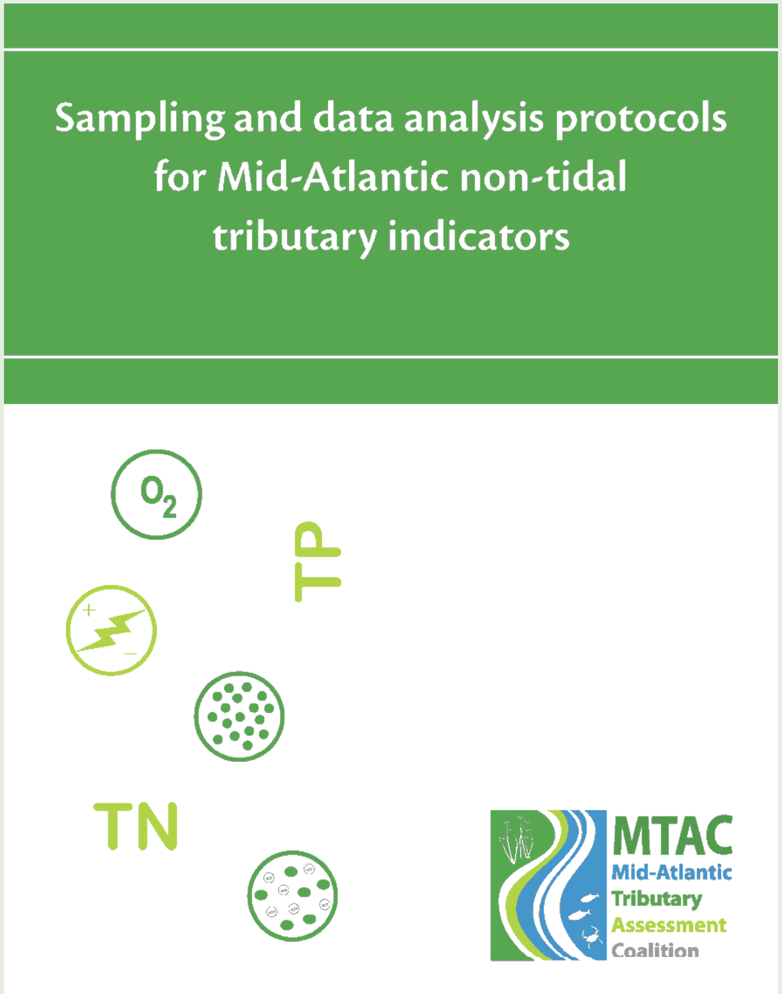
Use public and alternative transportation where possible to decrease the particulates from exhaust that enter waterways. Support state and federal initiatives for low-impact and environmentally friendly development.

Final protocol!

- Currently in use by ~15 watershed monitoring organizations and counting…
- Available as a free PDF download (along with tributary report cards and other documents) at: www.ian.umces.edu/ecocheck/

Direct link to PDF:
http://ian.umces.edu/pdfs/ecocheck_report_313.pdf

Next steps and upcoming products



- Guidelines for non-tidal indicators
  - Available Spring 2013
- Expand membership
- Develop integrated tributary report card

Acknowledgements

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Thank you's:

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Link to protocol document (PDF):

http://ian.umces.edu/pdfs/ecocheck_report_313.pdf