

Probabilistic Monitoring in Virginia: Experiences From the First Five Years

National Conference on Planning a Survey of the Nation's Lakes

April 25, 2006



Acknowledgements

- **VDEQ Monitoring Staff**

Warren Smigo, Roger Stewart, Don Smith, George Devlin, Tony Silva, Bill Shanabruch, Billy Van Wart, Mike Shaver, Eddy Cumbow, Greg Brown, Larry Willis, Drew Miller, Mary Dail, Mike Scanlan, Chip Sparks, Ted Turner

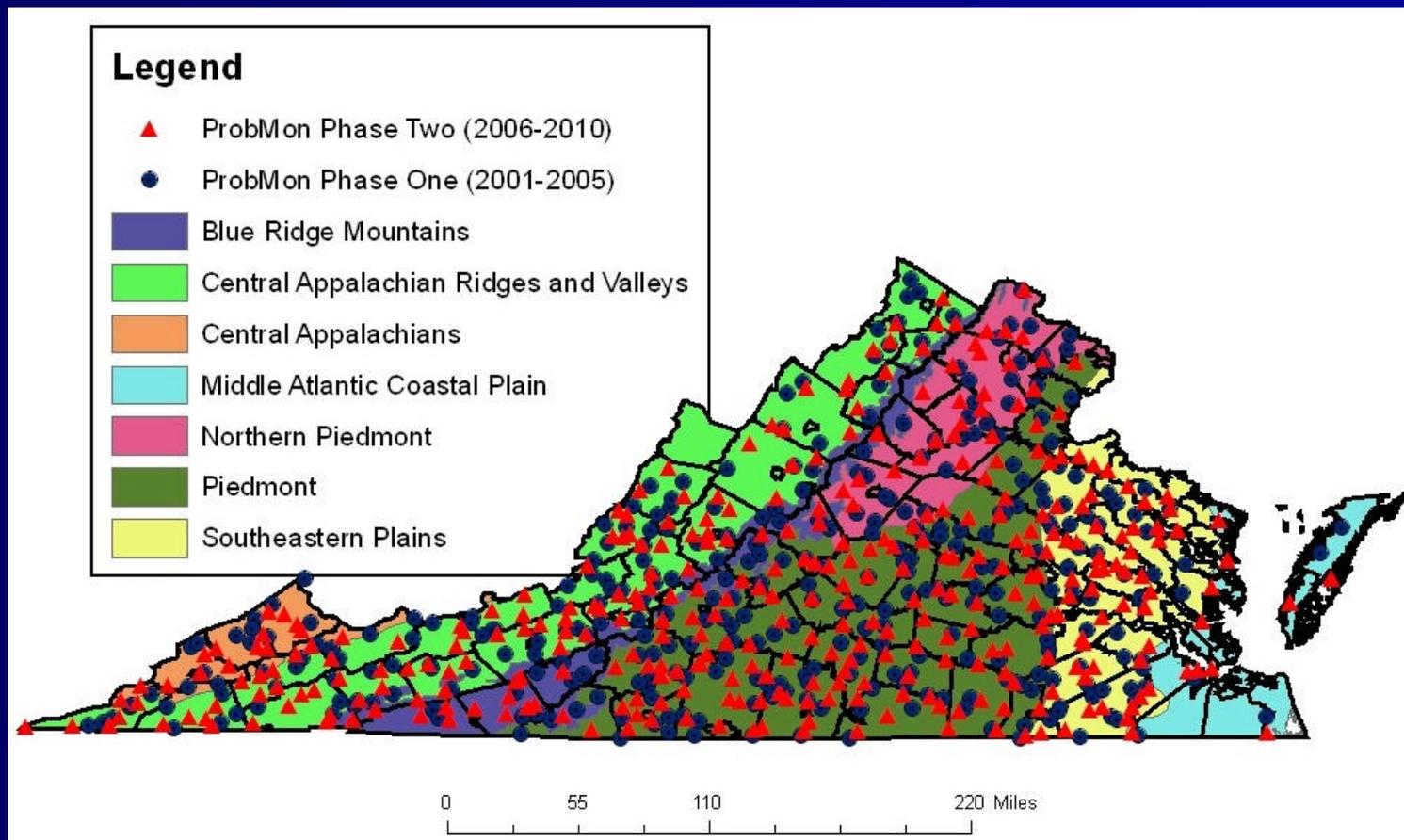
- **USEPA**

Greg Pond, Maggie Passmore, Karen Blocksom, Tony Olsen

Background

- 1997 - Water Quality Monitoring, Improvement, and Restoration Act (WQMIRA)
- 1999 – VDEQ monitoring taskforce revamps monitoring programs
- 2001- Probabilistic monitoring (ProbMon) begins

Sample Locations



Sample Reconnaissance

- Biologist contacts the landowner
- Sample spring and fall (different parameters)
- Four years of potential sampling (n=280)
 - 234 target and sampled (code 1)
 - 13 permission denied (code 2)
 - 9 other target (code 2)
 - 24 non-target (estuarine – code 3)

Case Studies

- Biomonitoring validation study
- Report condition of 100% stream miles
- Support Total Maximum Daily Load studies
- Track watershed management decisions
- Support water quality standards development
- Innovative monitoring strategies

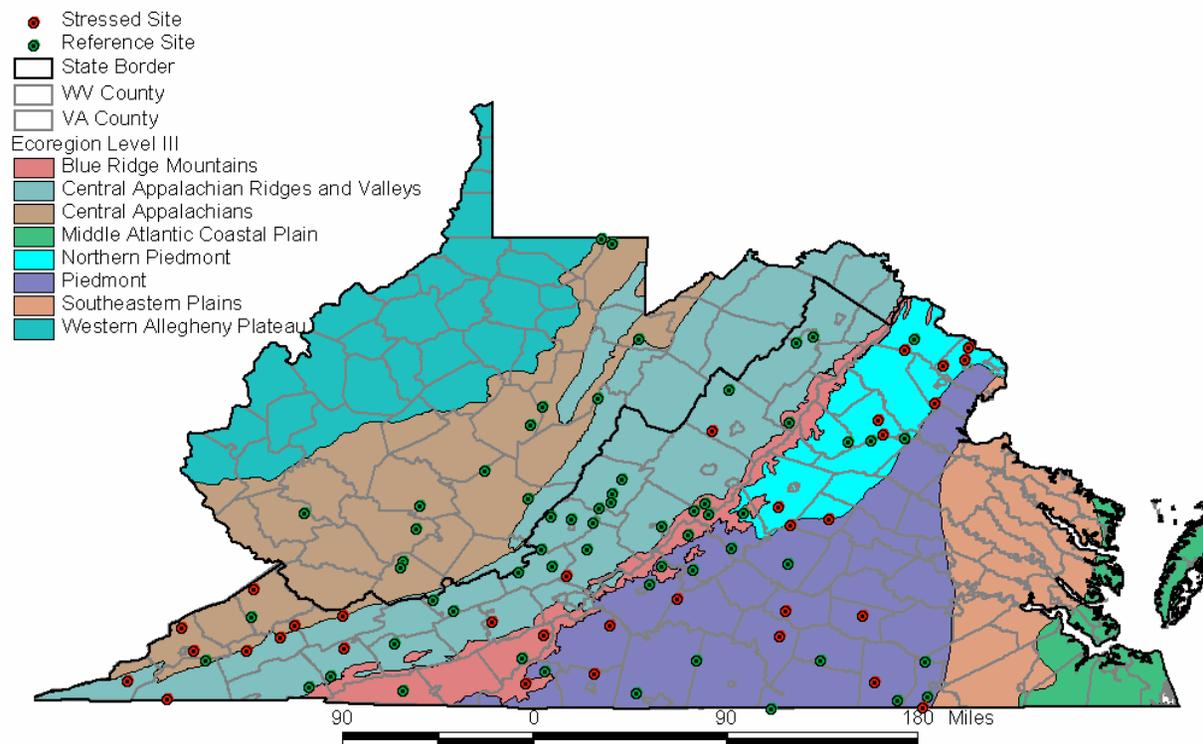
Biomonitoring Validation



- 2001 biological index development for non-coastal Virginia begins (8 core metrics)
- Final report submitted in September 2003
- VDEQ concerned with data used to develop the Virginia Stream Condition Index (VSCI)
 - Lack of watershed size diversity
 - Bias toward mountainous ecoregions
 - Multiple samples at the same location

Biomonitoring Validation

New reference stations (n=104 total samples)



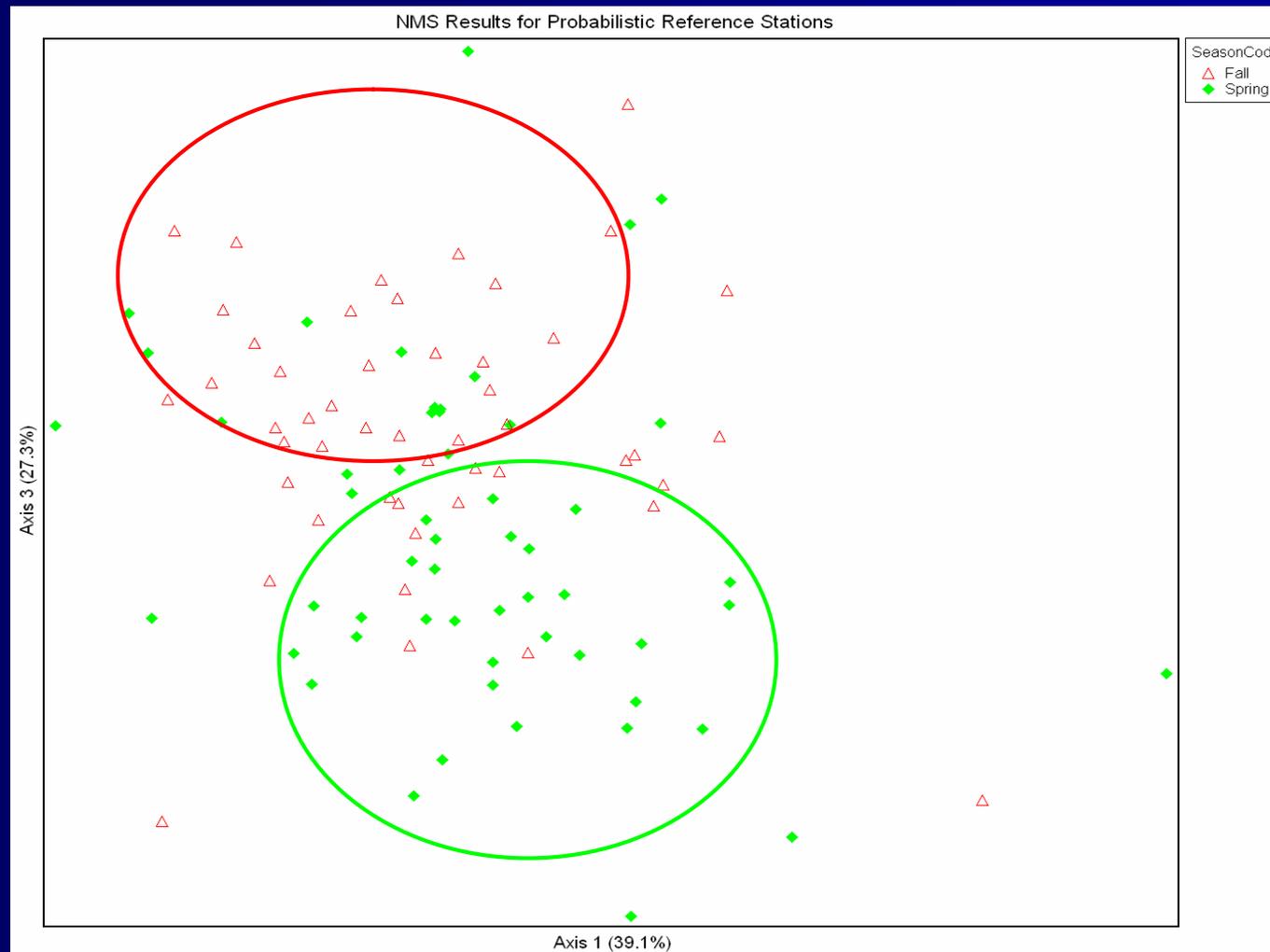
Mountain (n=71), Piedmont (n=33)

Biomonitoring Validation

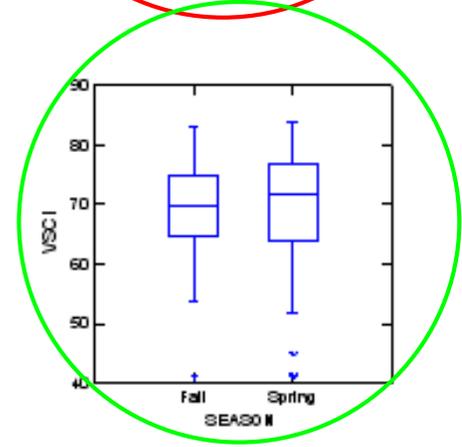
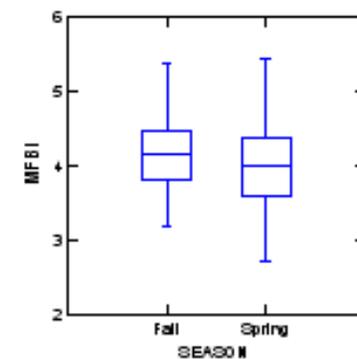
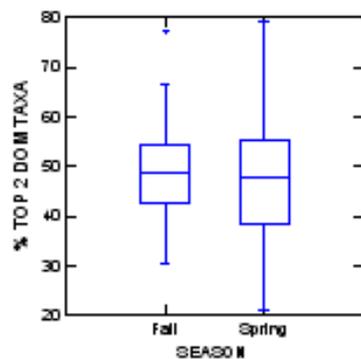
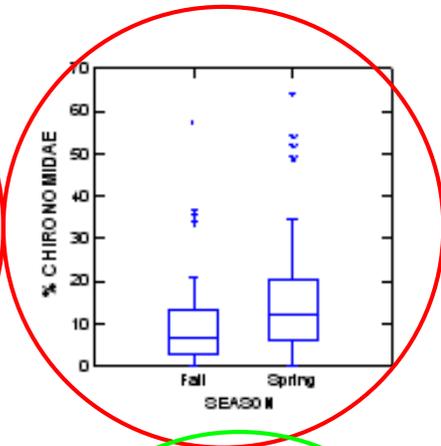
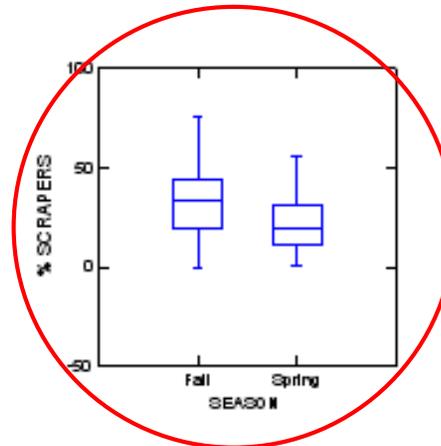
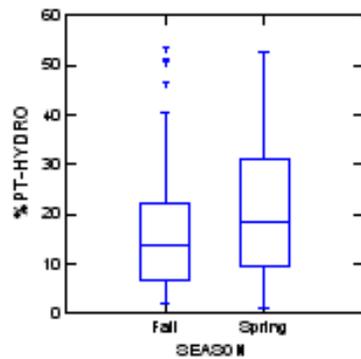
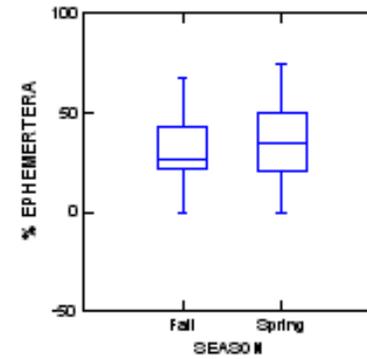
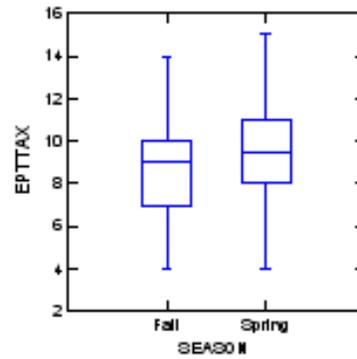
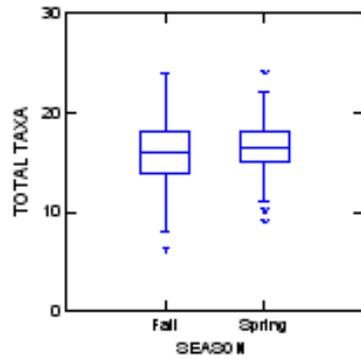
Categories: season, basin size, ecoregion, bioregion, basin size, VDEQ region, river basin

- Test for patterns in reference taxa
- Test for statistical significance
- Test for environmental significance
- Best standard value calibration

Biomonitoring Validation

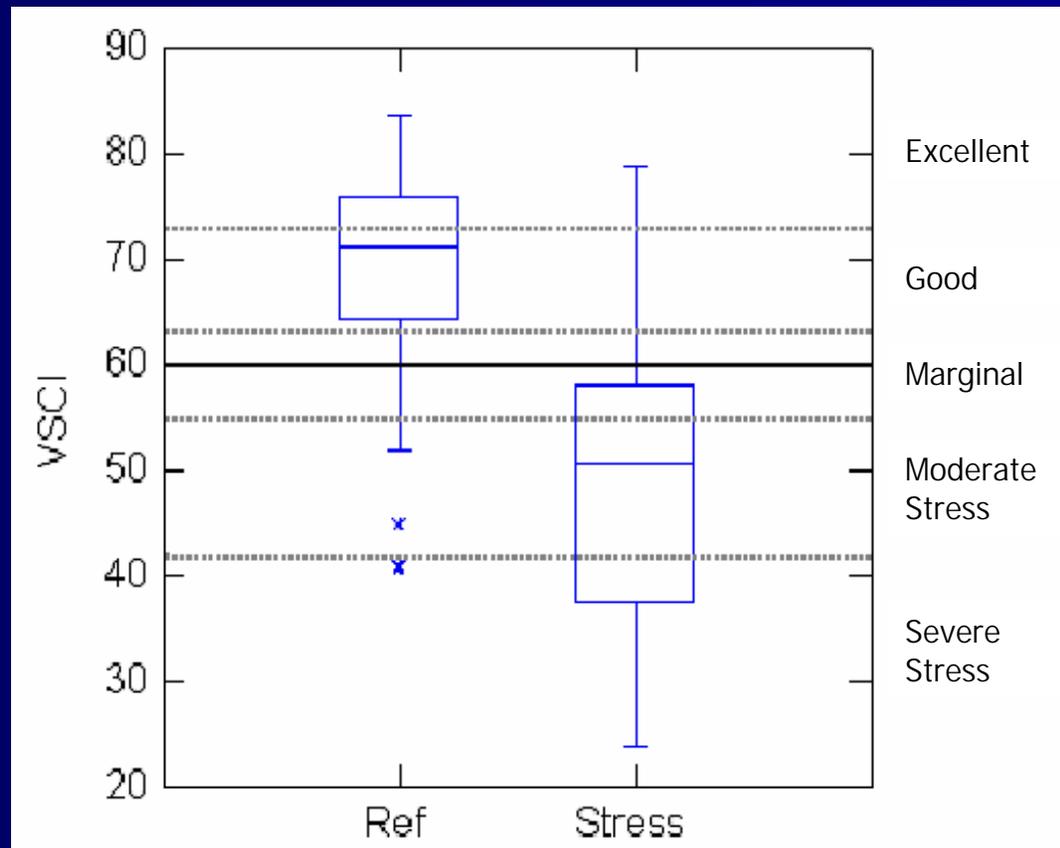


Environmental Significance? Season?



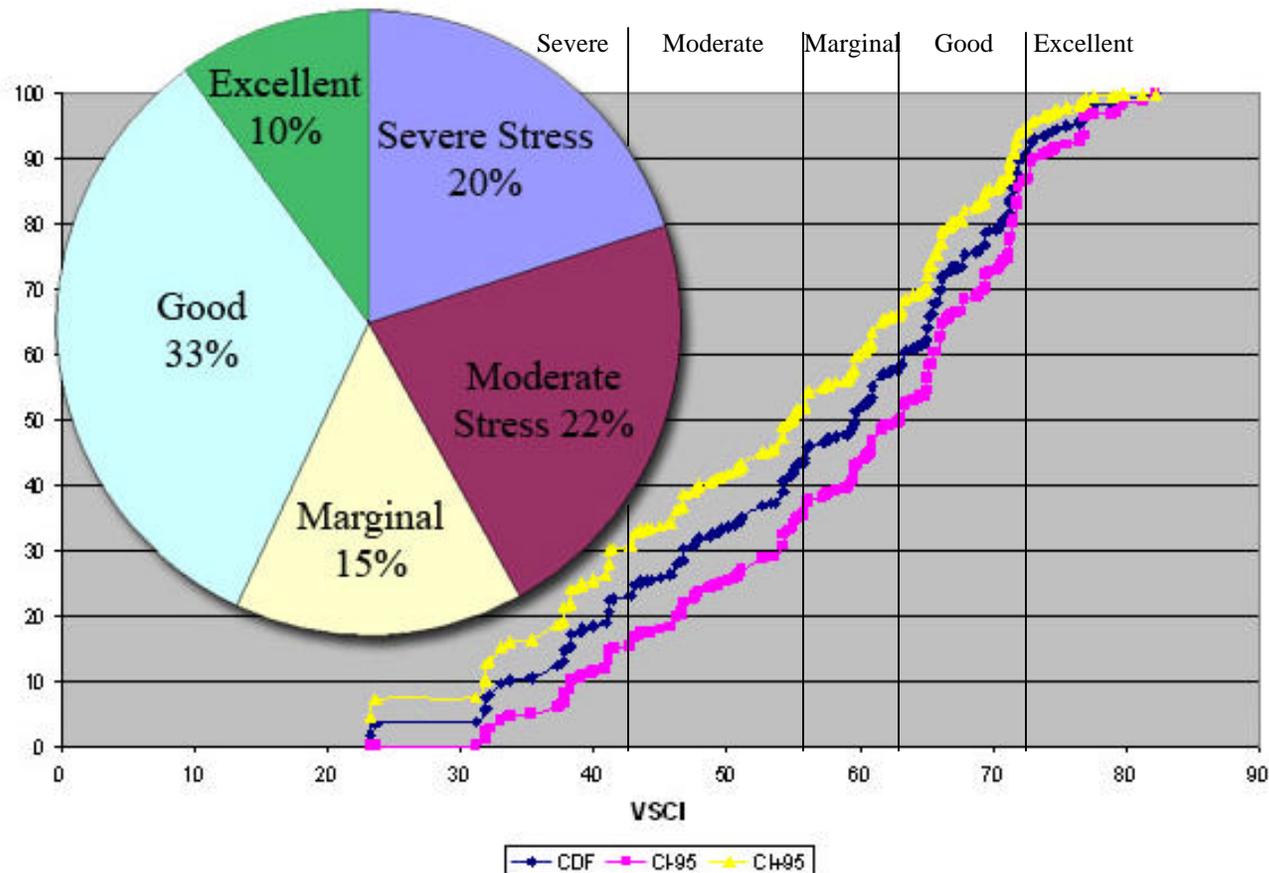
Biomonitoring Validation

- VSCI works!
- <http://www.deq.virginia.gov/probmon/pdf/scival.pdf>



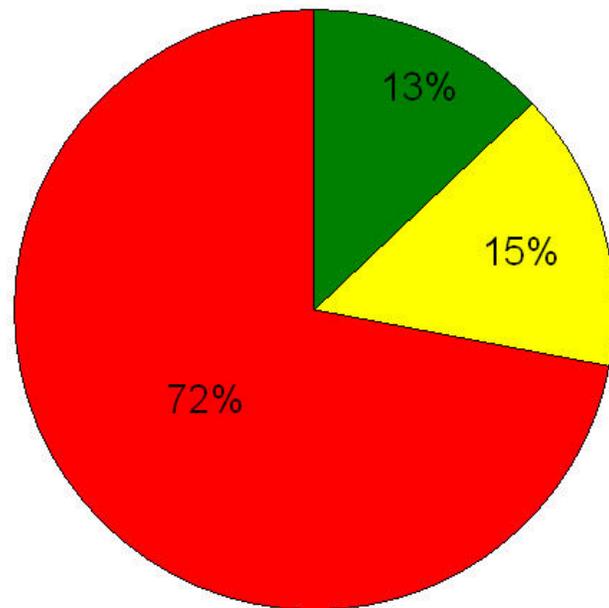
Report 100% Stream miles

Non-Coastal Virginia Stream Condition Index



Report 100% Stream miles

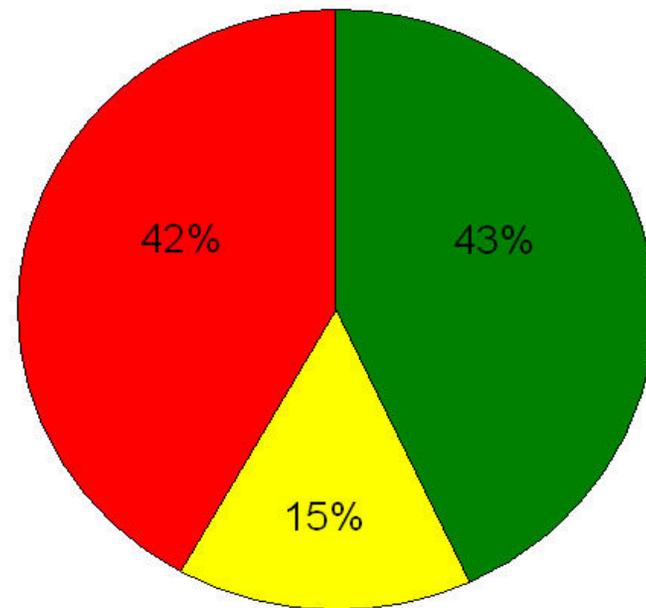
Mid-Atlantic Coastal Plain (MACP) Streams



Virginia Coast +/- 17%



Virginia Stream Condition Index

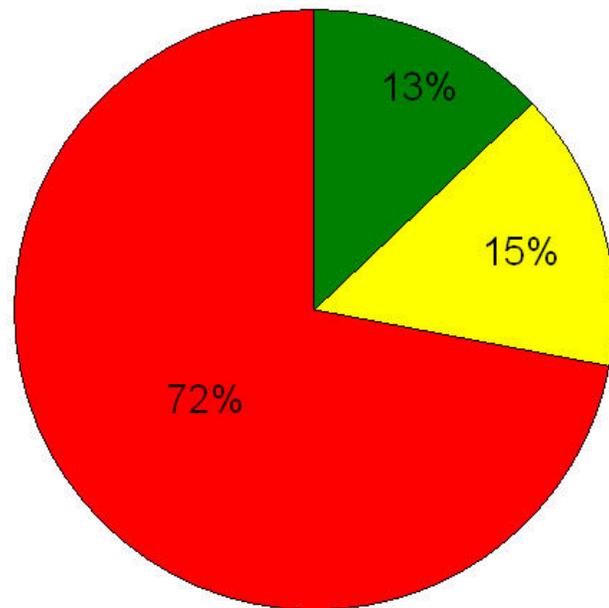


Virginia Non-Coast +/- 4%



Report 100% Stream miles

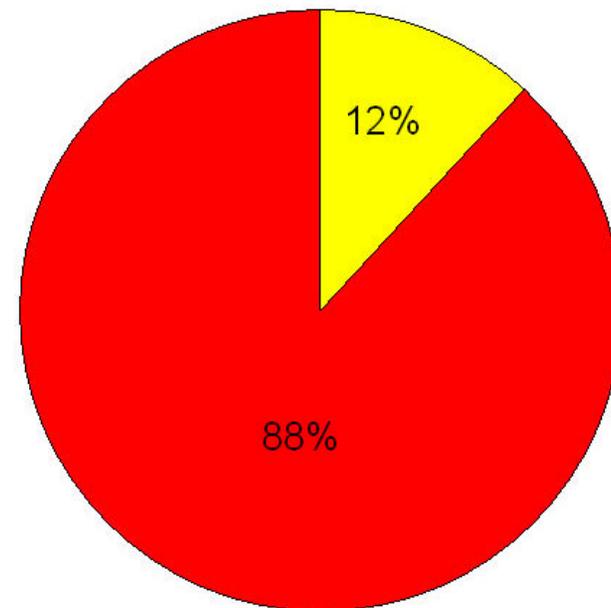
Mid-Atlantic Coastal Plain (MACP) Streams



Virginia ProbMon +/- 17%

■ Good ■ Fair ■ Poor

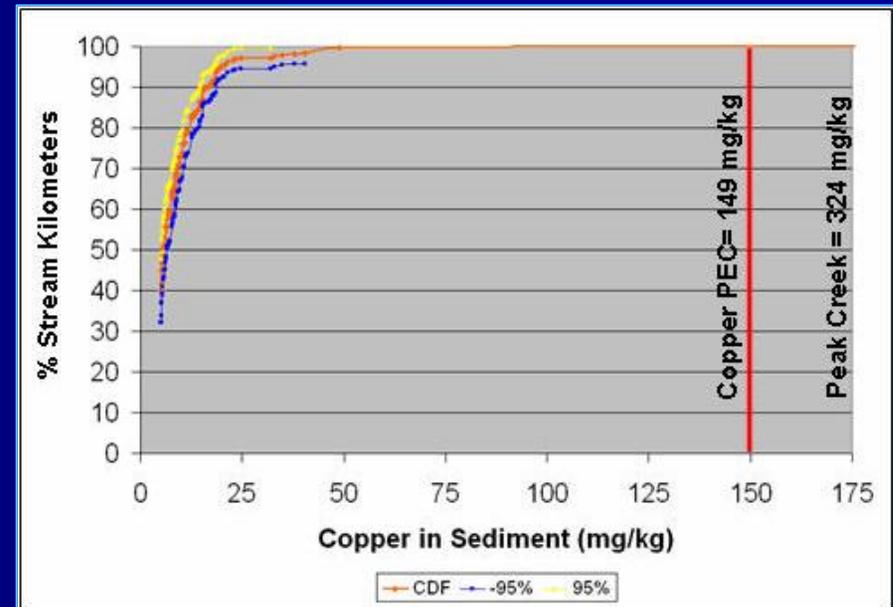
Mid-Atlantic Integrated Assessment (MAIA)



Regional EPA Survey +/- 23%

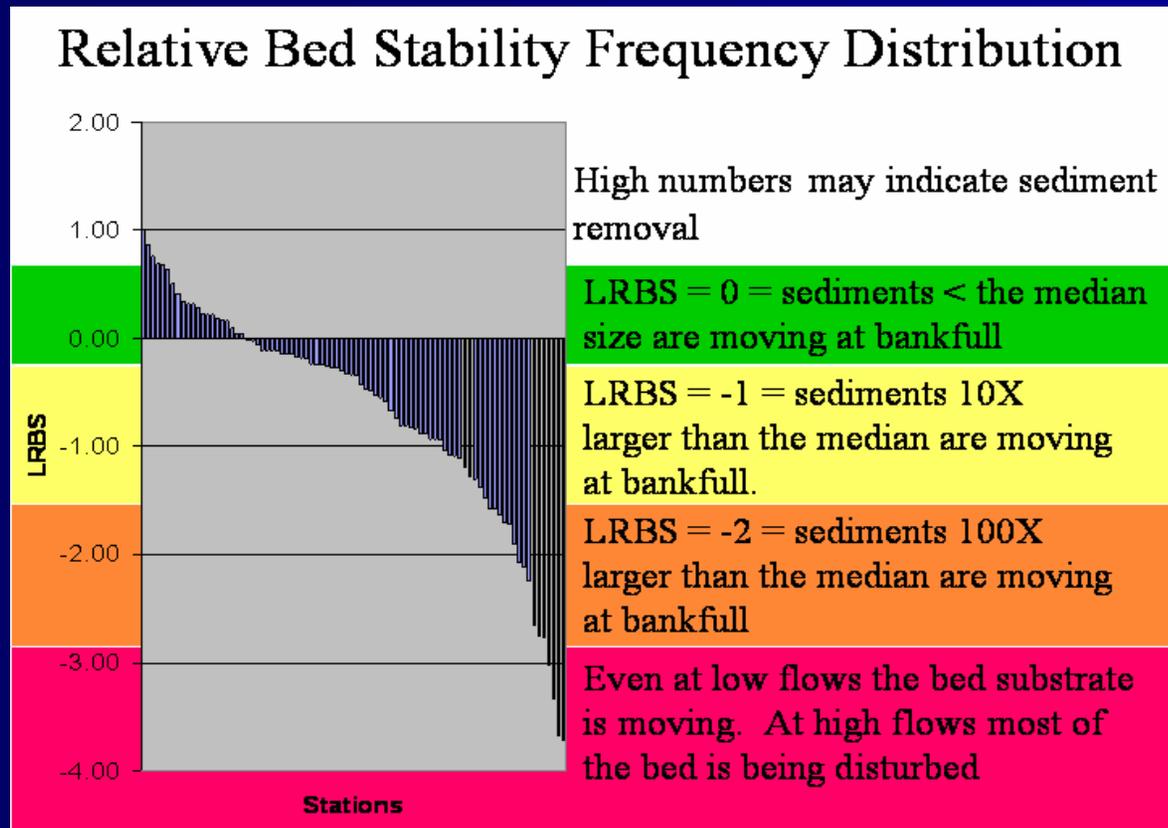
■ Good ■ Fair ■ Poor

Support TMDL Development



- Peak Creek (Metal TMDL)
- UT Chickahominy (Nutrient TMDL)
- Straight Creek (Ionic Strength TMDL)

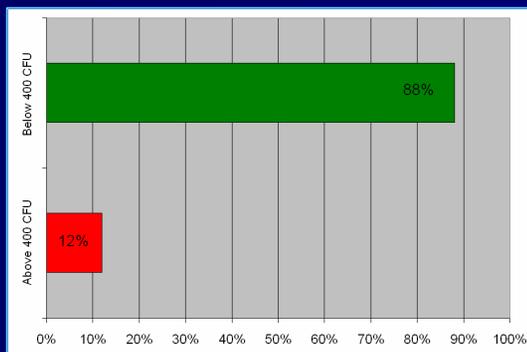
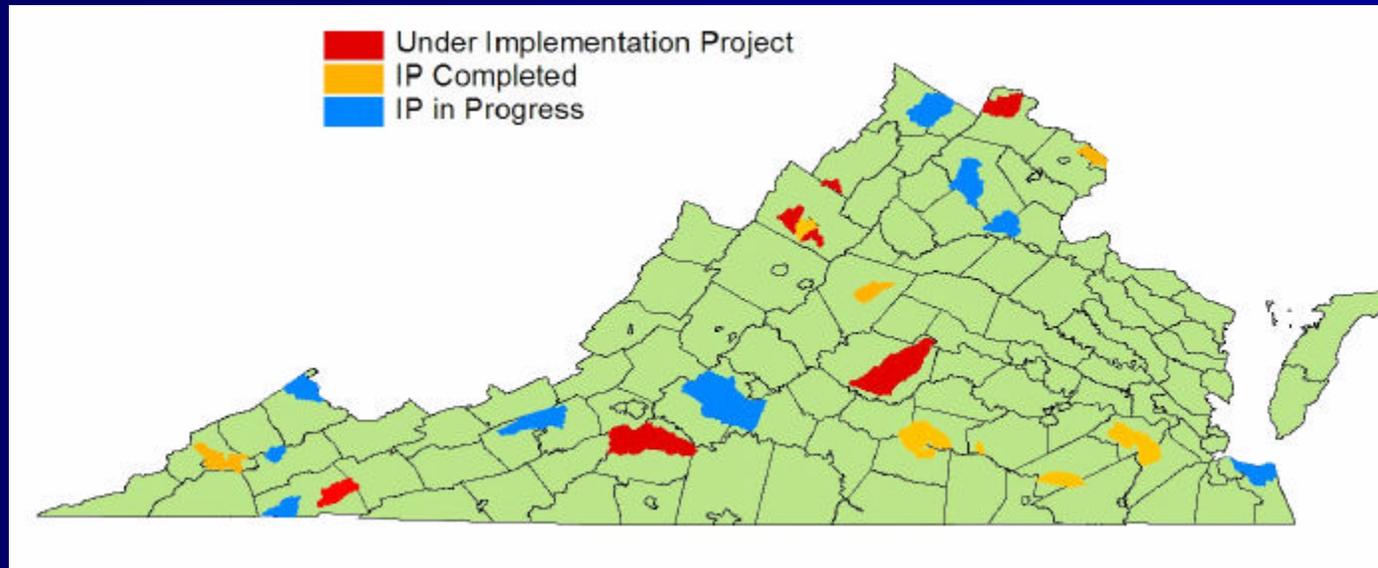
Support TMDL Development



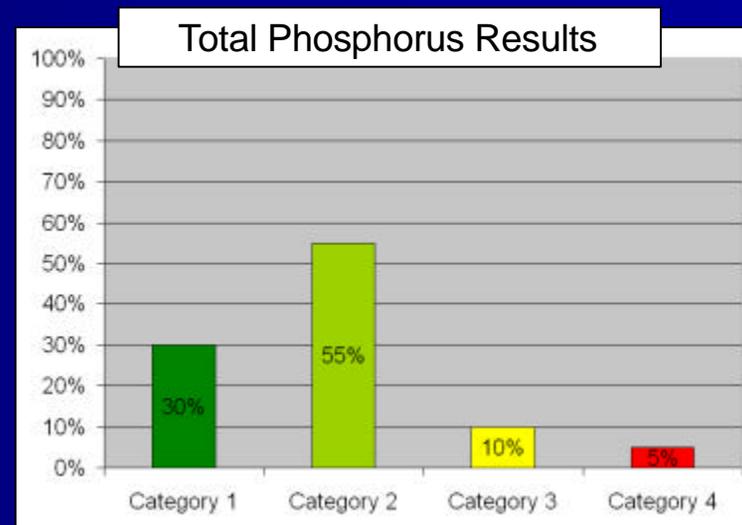
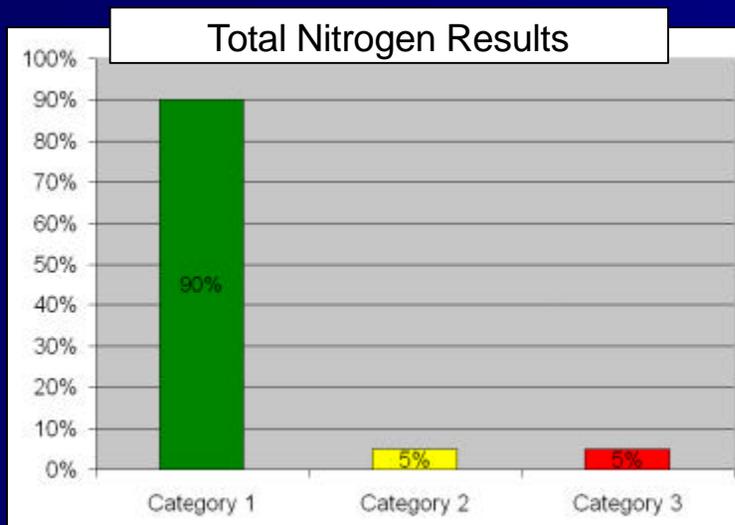
- Sediment endpoint in many biological studies
- Relative bed stability=quantitative habitat data

Tracking Watershed Management

Virginia has 8 Implementation Plans in progress



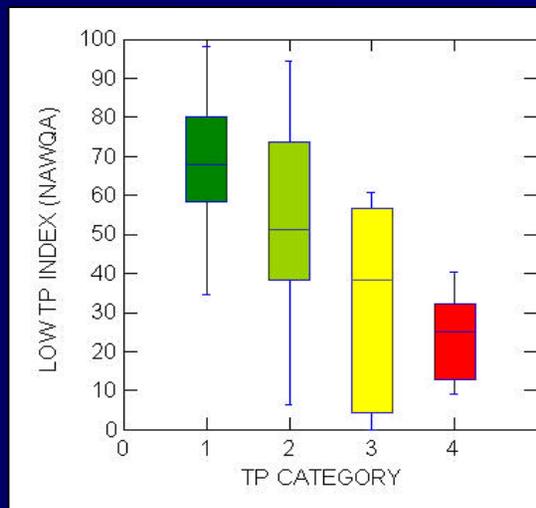
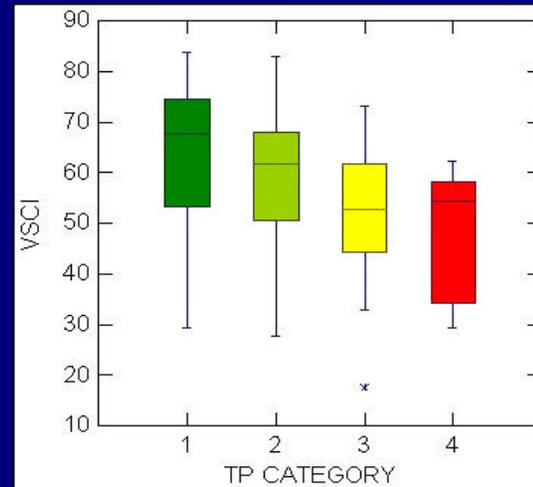
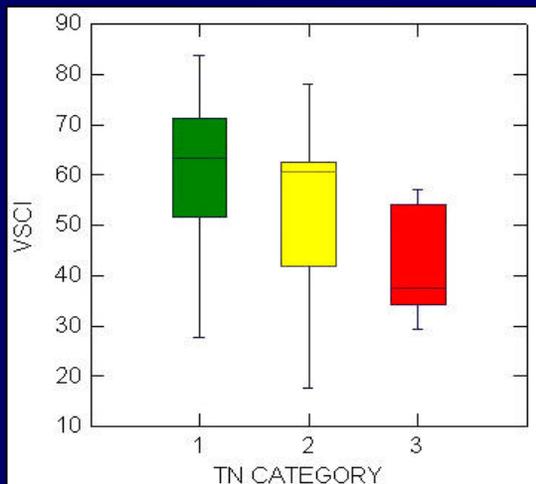
Standards Development



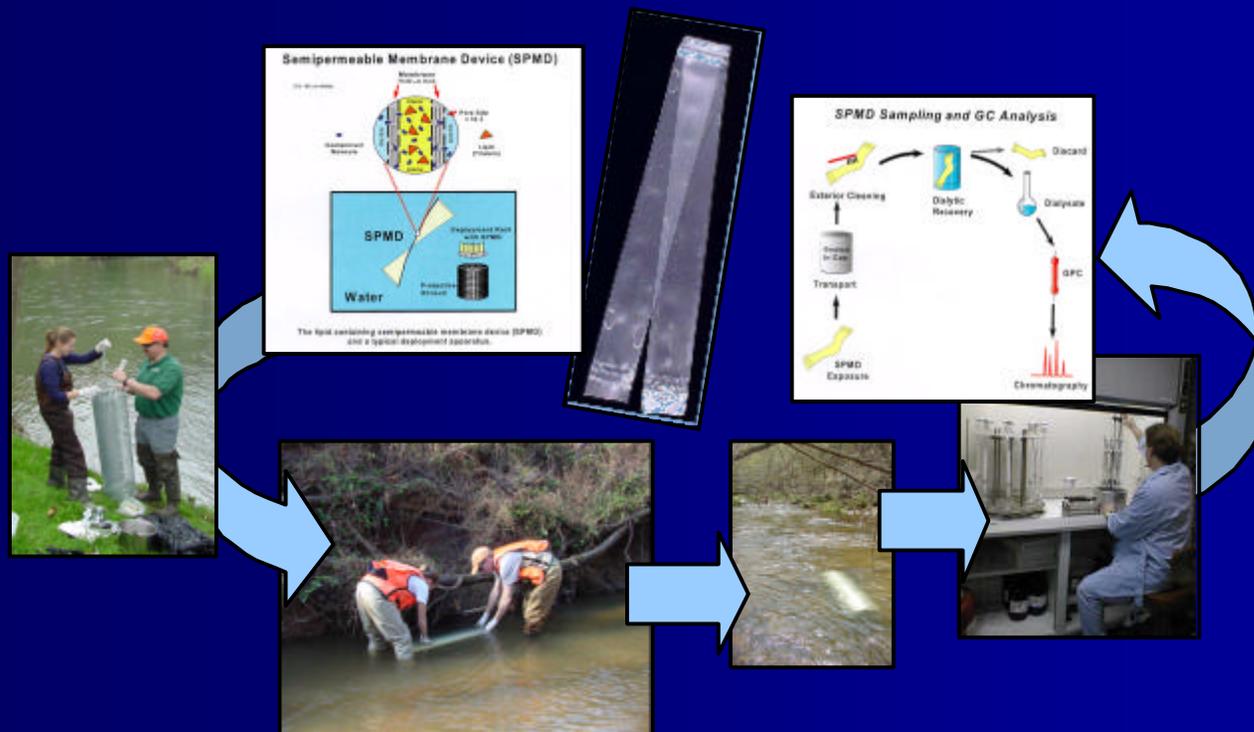
- Category 1: <1 mg/L
- Category 2: 1-2 mg/L
- Category 3: >2 mg/L

- Category 1: <.01 mg/L
- Category 2: .01-.05 mg/L
- Category 3: .05-.1 mg/L
- Category 4: >.1 mg/L

Standards Development

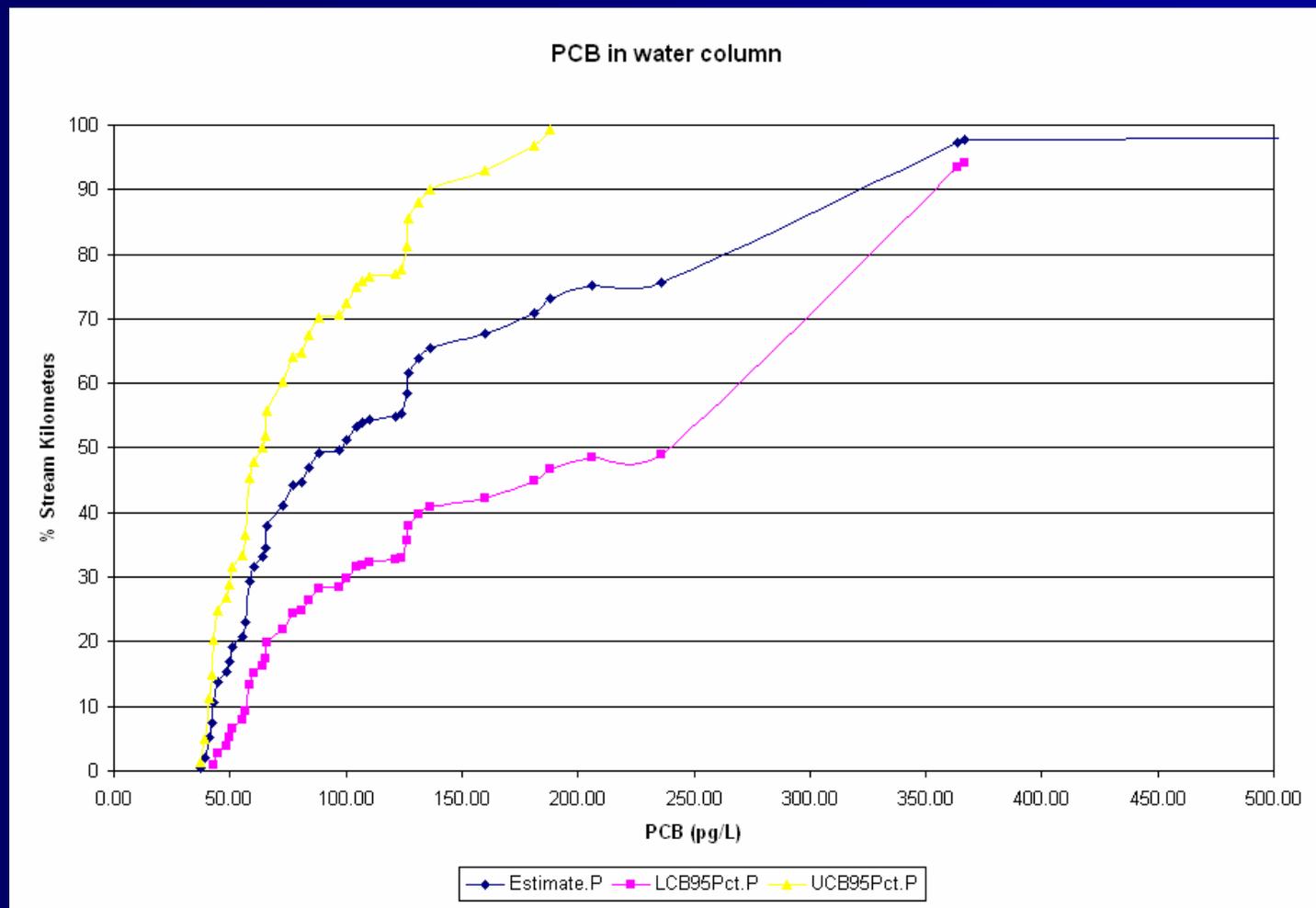


Innovative Monitoring



- Semi-permeable membrane device (virtual fish)
- Determine water column concentration

Innovative Monitoring



Summary of Benefits of ProbMon

- Biomonitoring
 - Doubled the number of reference sites
 - Validated VSCI
 - Identification of stressor(s)
- New Technologies
 - Relative bed stability
 - Virtual fish
- Assessments
 - Statistical confidence in stream conditions
 - Track water quality improvement
- Research
 - Provides design for testing new methods
 - Monitoring strategy allowed VDEQ to obtain grant money
- Community
 - Provide regional summaries to the public
 - Partnerships (DGIF, EPA, USGS, VT)

Questions?



VDEQ

Jason Hill

3019 Peters Creek Rd

Roanoke, VA 24019

phone: 540.562.6724

email: jrhill@deq.state.va.us

<http://www.deq.virginia.gov/probmon/>