Probabilistic Monitoring Beyond 305(b) Reporting: Other Data Uses

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Presentation Goals

- Increase general understanding of Virginia's probabilistic monitoring program
- Discuss uses of ProbMon data (Case Studies)
- Discuss TMDL support and monitoring data
- Review future goals and partnerships

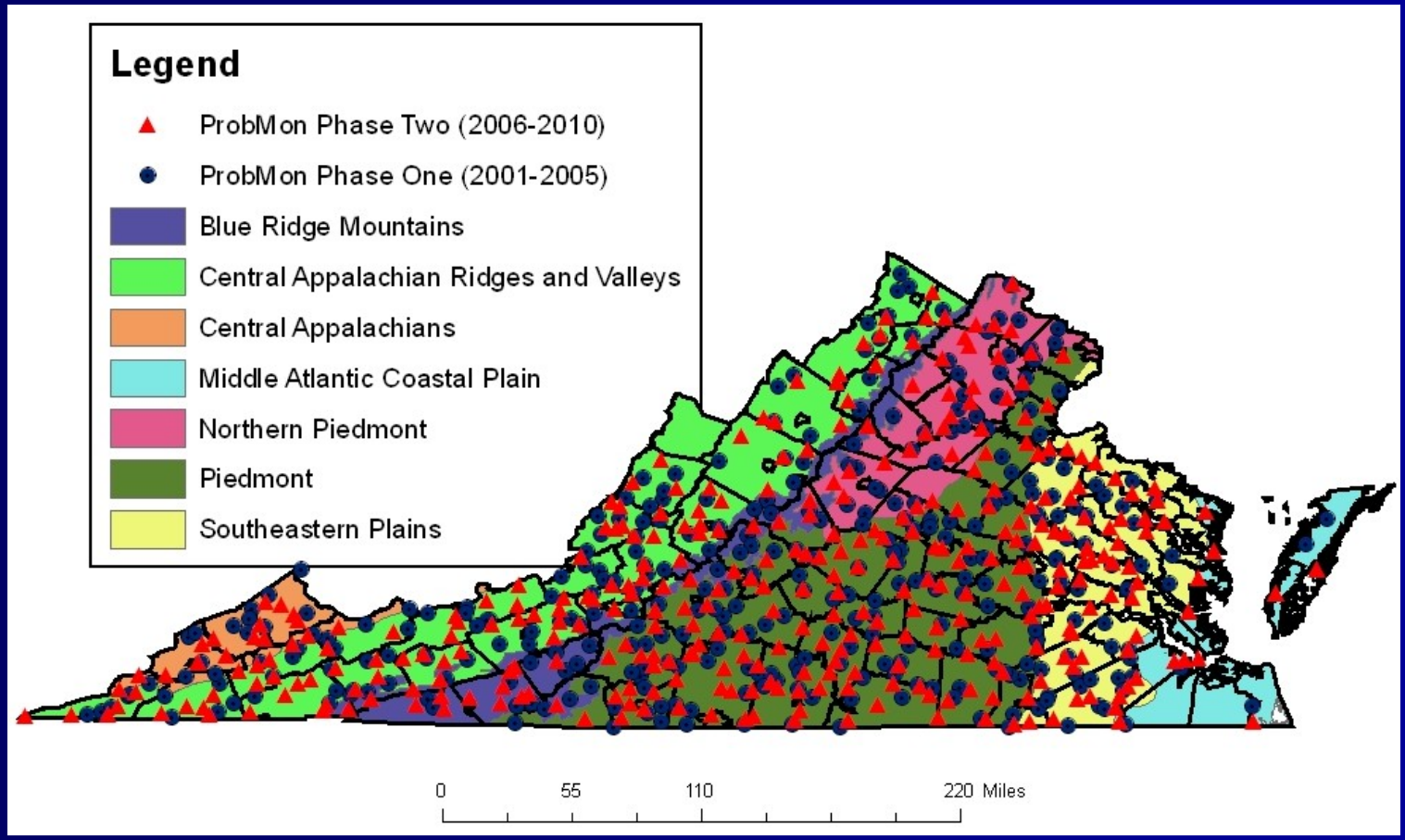
Virginia's Aquatic Resources

- 9 major river basins
  - 50,357 stream miles
- 248 public lakes
  - 162,230 acres
  - 2 "real" lakes
- 1,044,900 acres wetlands

History

- 1997 - Water Quality Monitoring, Improvement, and Restoration Act (WQMIRA)
- 1999 – VDEQ monitoring taskforce revamps monitoring programs
- 2001- Probabilistic monitoring (ProbMon) phase 1 begins
- 2006 – Probmon phase 2 begins

Sample Locations



Data Collected

- Field data
  - DO, Temp, pH, Specific Conductance
- Benthic community metrics
  - Rapid Bioassessment Protocol (RBP) & *Draft* Stream Condition Index (SCI)
- Habitat Survey
  - RBP & RBS
- Bacteria Indicators
  - Fecal Coliform & E. Coli
- Chlorophyll (water column)
- Total Organic Carbon
- Land Cover Data (GIS)
- Nutrients
- Solids
- Hardness
- Alkalinity
- Turbidity
- Chlorides
- Sulfates
- Heavy Metals & Pesticides (in sediment)
- Dissolved Metals (in water column)
- SPMDs
- Fish and Algae community (new for phase 2)

Case Studies

- Biomonitoring validation study
- Support Total Maximum Daily Load studies
- Track watershed management decisions
- Support water quality standards development
- Innovative monitoring strategies

Biomonitoring Validation

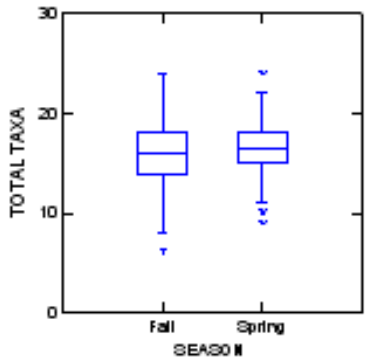
- 2001 biological index development for non-coastal Virginia begins (8 core metrics)
- Final report submitted in September 2003
- VDEQ concerned with data used to develop the Virginia Stream Condition Index (VSCI)
  - Lack of watershed size diversity
  - Bias toward mountainous ecoregions
  - Multiple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

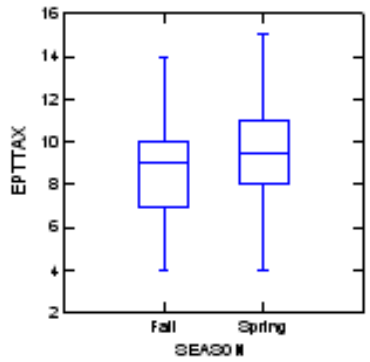
Biomonitoring Validation

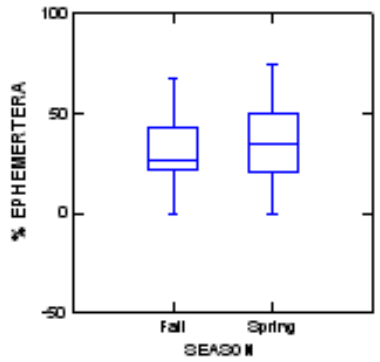
Categories: season, basin size, ecoregion, bioregion, basin size, VDEQ region, river basin

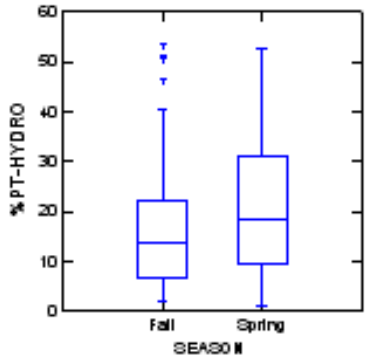
- Test for patterns in reference taxa
- Test for statistical significance
- Test for environmental significance
- Best standard value calibration

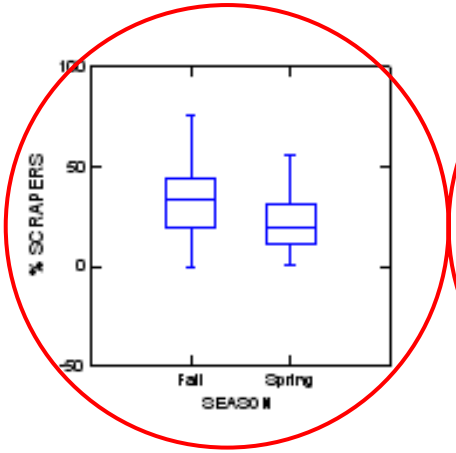
Environmental Significance? Season?

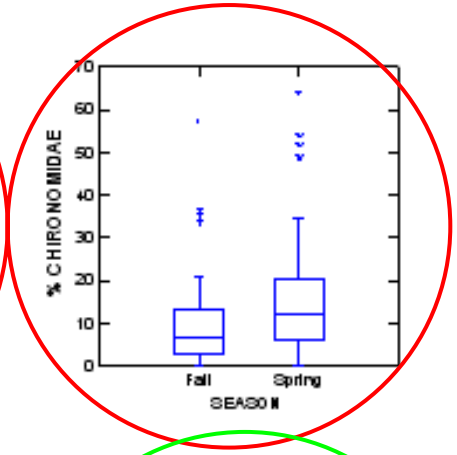


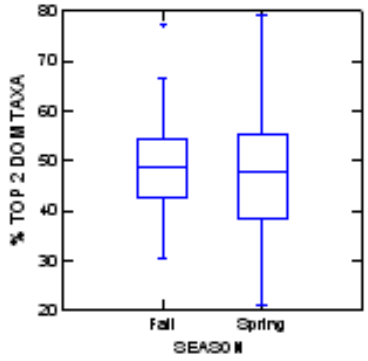


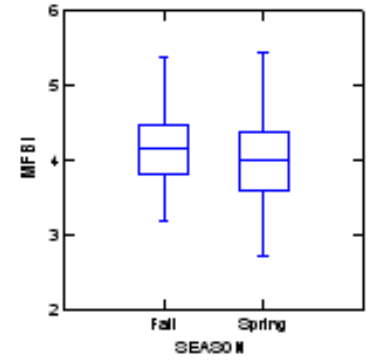


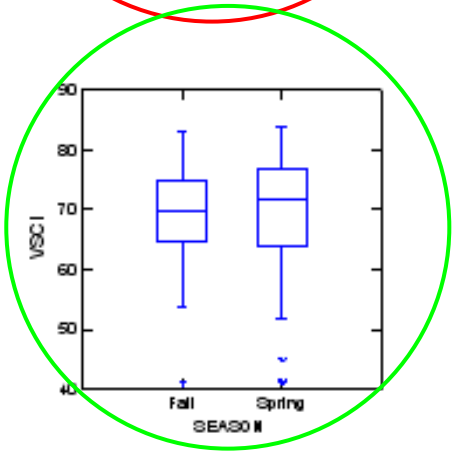






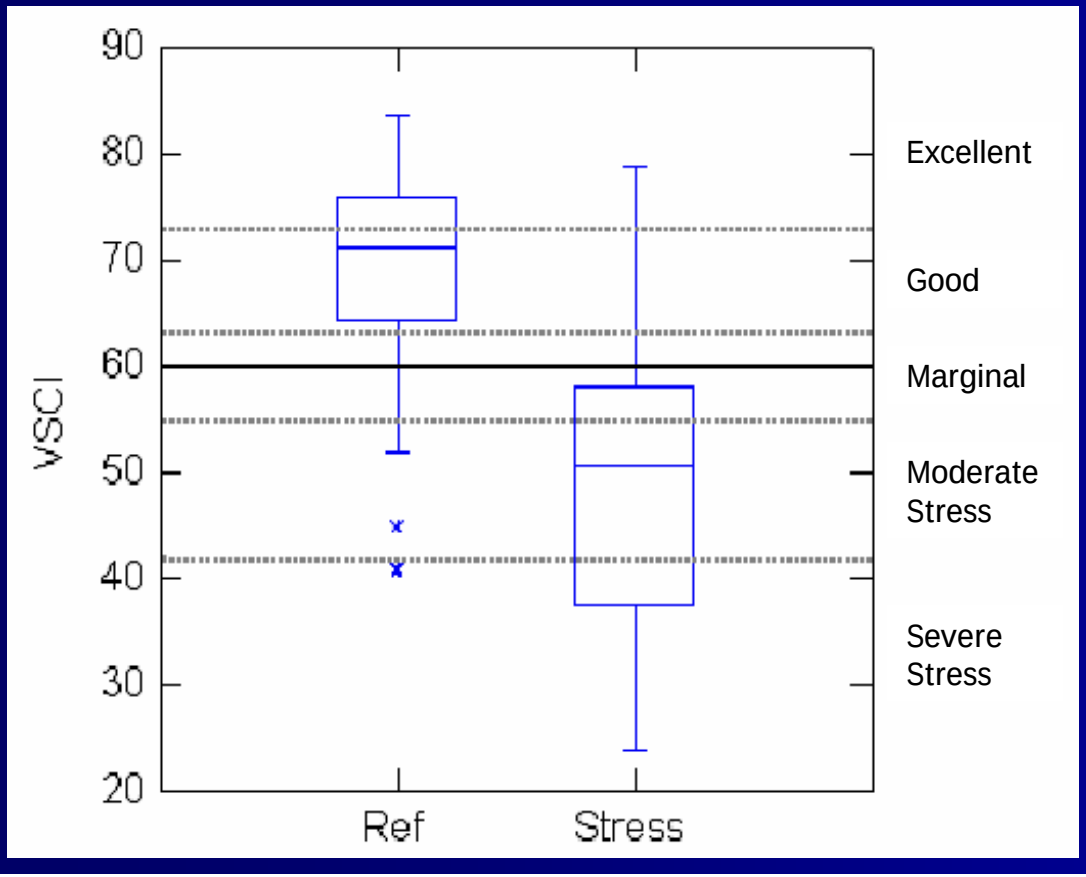




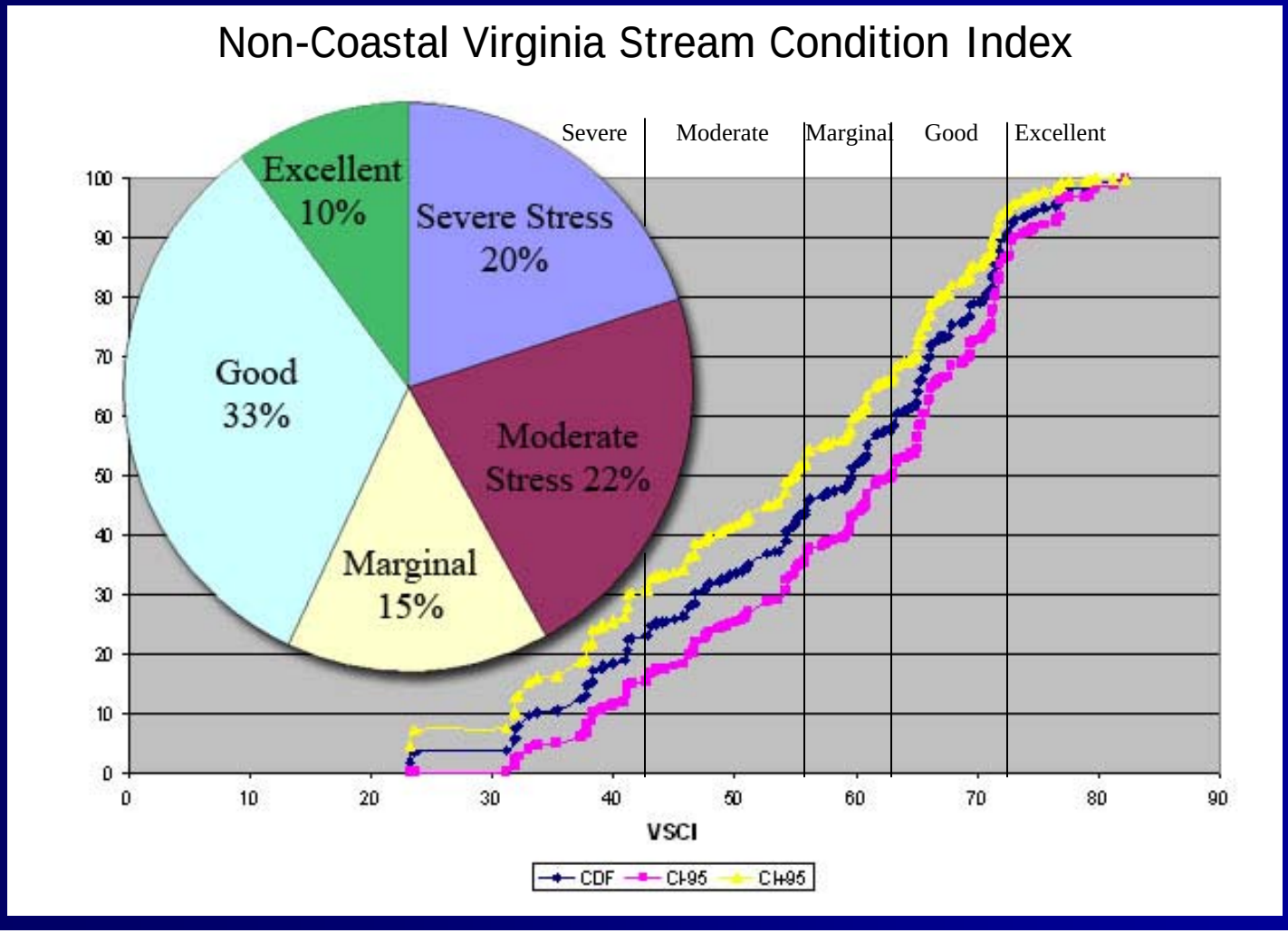


Biomonitoring Validation

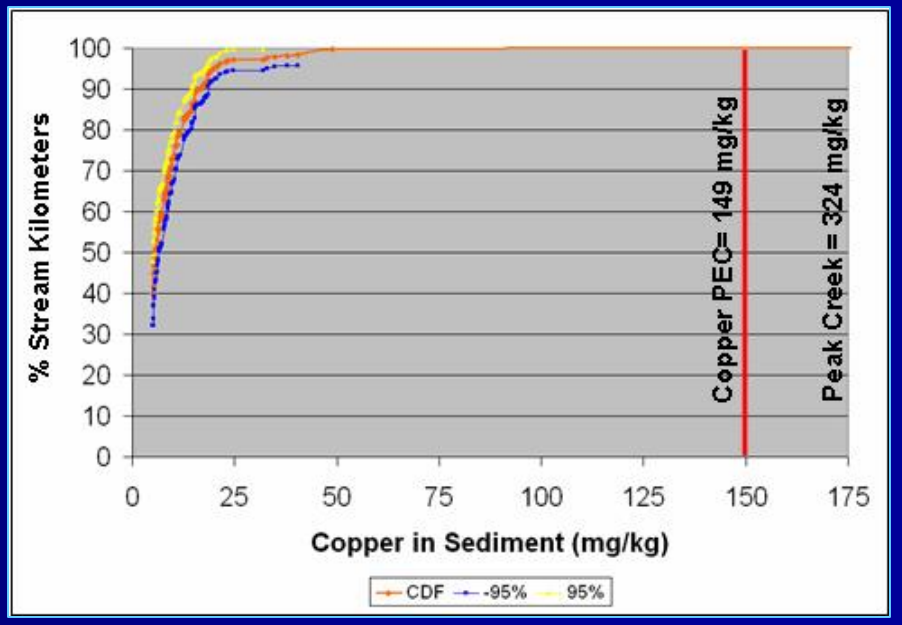
- VSCI works!
- http://www.deq.virginia.gov/probmon/pdf/scival.pdf



Report 100% Stream miles

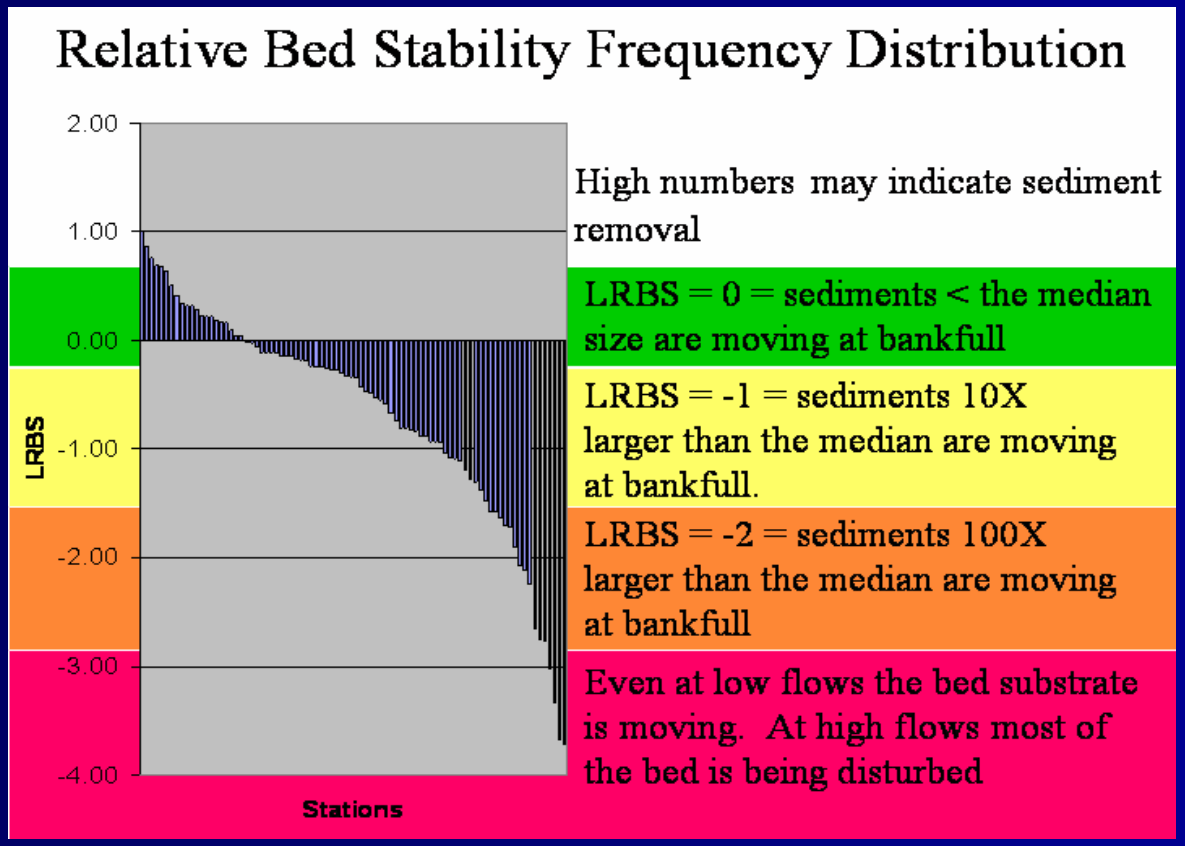


Support TMDL Development



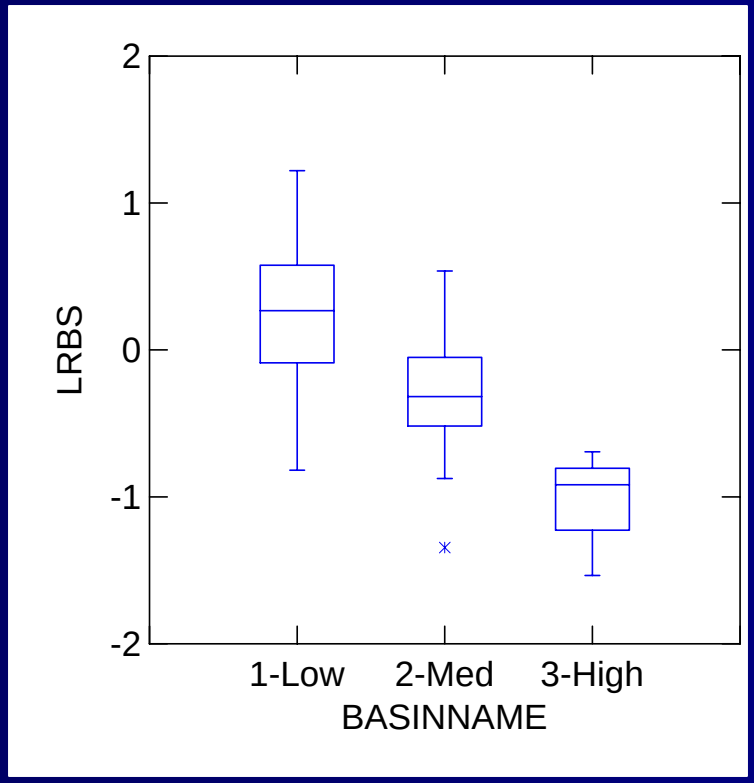
- Peak Creek (Metal TMDL)
- UT Chickahominy (Nutrient TMDL)
- Straight Creek (Ionic Strength TMDL)

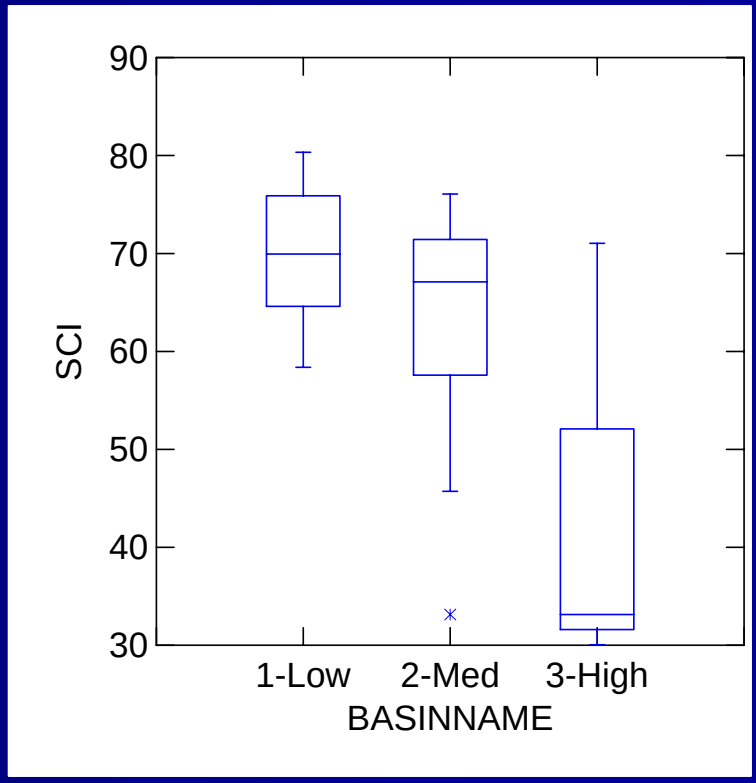
Support TMDL Development



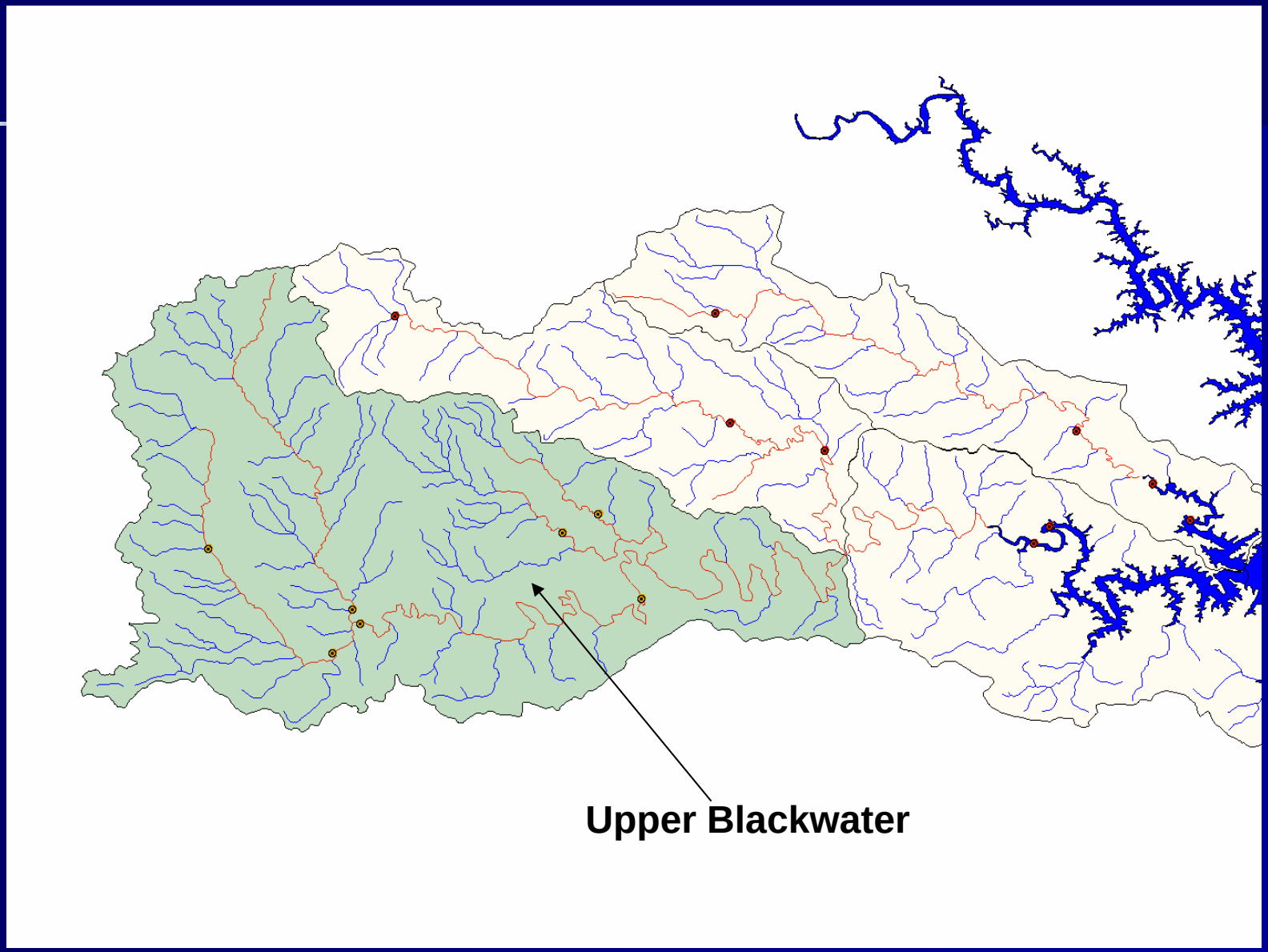
- Sediment endpoint in biological studies (84%)
- Relative bed stability=quantitative habitat data

EMAP Habitat Graphs





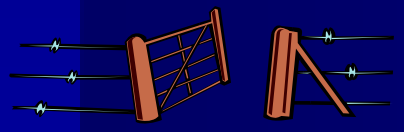
TMDL IP Monitoring



Stream Exclusion Fencing Completed

- MF Holston R. (14.6 mi.)
- North R.* (6.2 mi.)
- Blackwater R. (7.1 mi.)
- Catoctin Cr. (1.2 mi.)
- Holmans Cr. (1.3 mi.)
- Willis R. (0.3 mi.)

Total = 30.7 mi

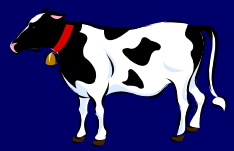


= 1 mile

*Does not include voluntary fencing

Livestock Excluded

- MF Holston R. (2010)
- North R. (1500)
- Blackwater R. (2040)
- Catoctin Cr. (50)
- Holmans Cr.* (260)
- Willis R. (205)



= 200 livestock excluded

Total = 6,065

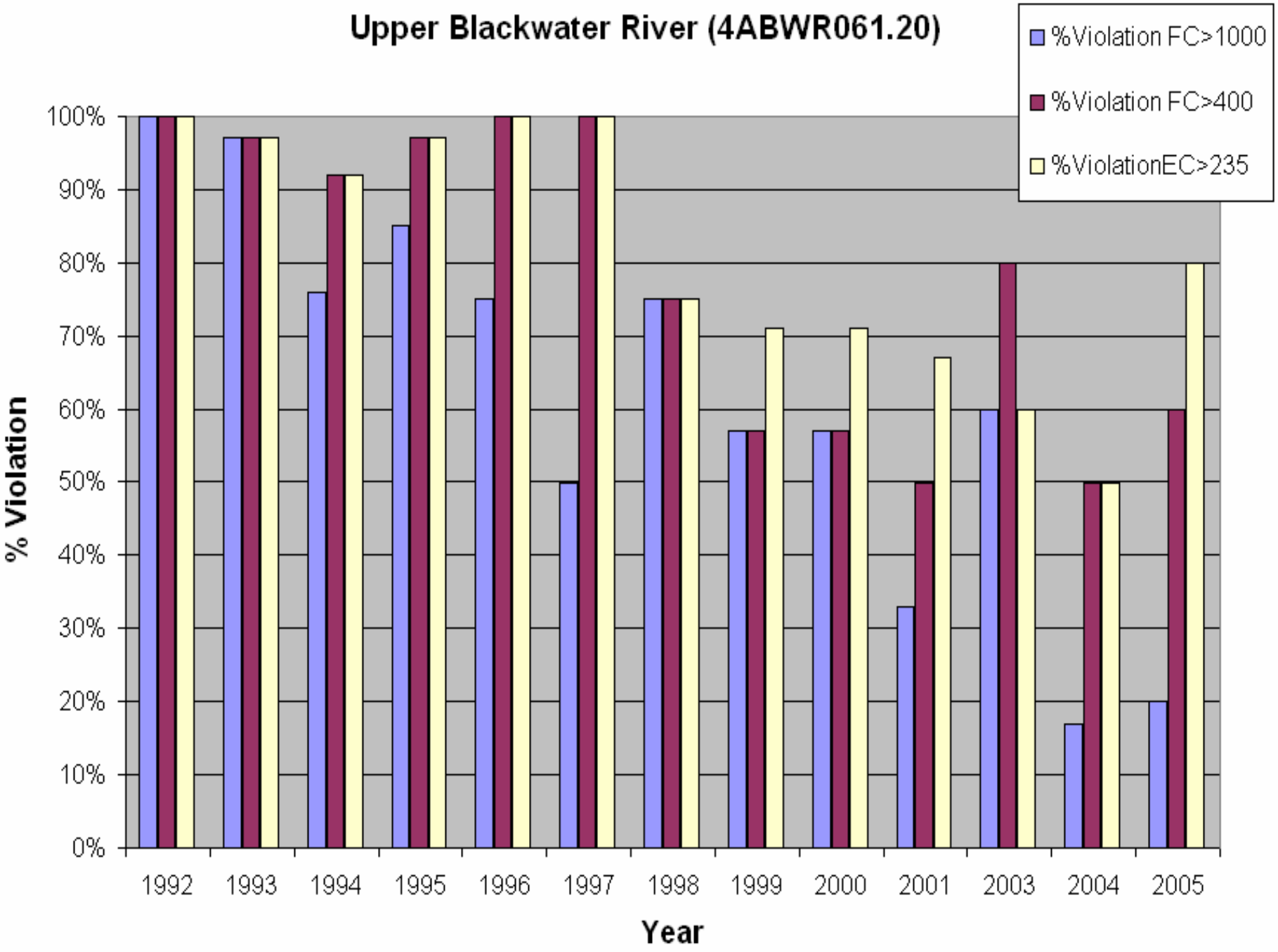
*Estimated

Straight Pipes or Septic Systems Repaired or Replaced

- ME Holston R. (18)
- North R. (19)
- Blackwater R. (20)
- Catoctin Cr. (3)
- Holmans Cr. (1)
- Willis R. (0)

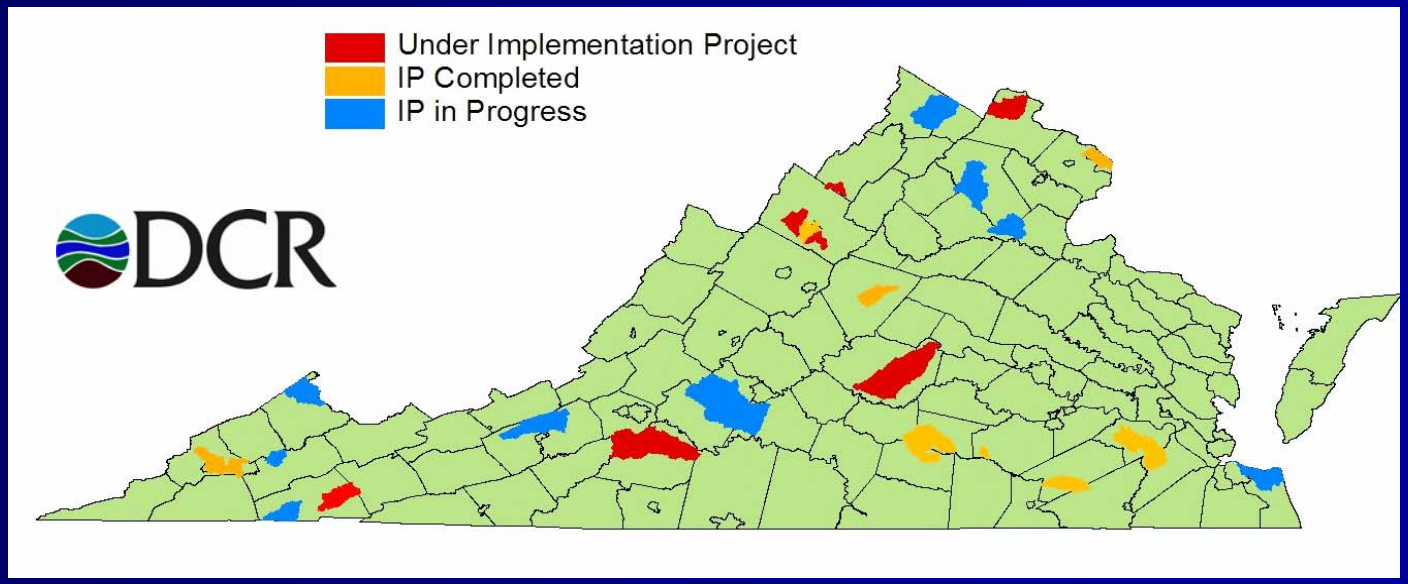
Total = 61

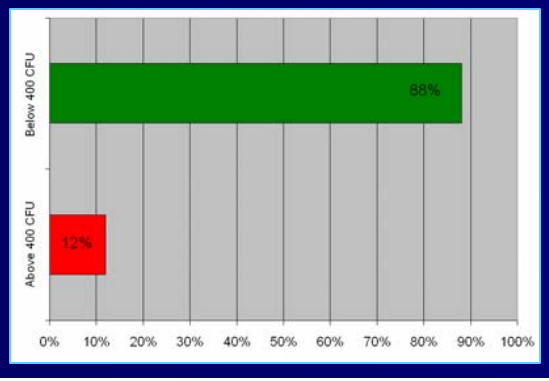
 = 2 systems


Upper Blackwater River (4ABWR061.20)
%Violation FC>1000
%Violation FC>400
%ViolationEC>235
% Violation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2003
2004
2005
Year

Tracking Watershed Management

Virginia has 8 Implementation Plans in progress





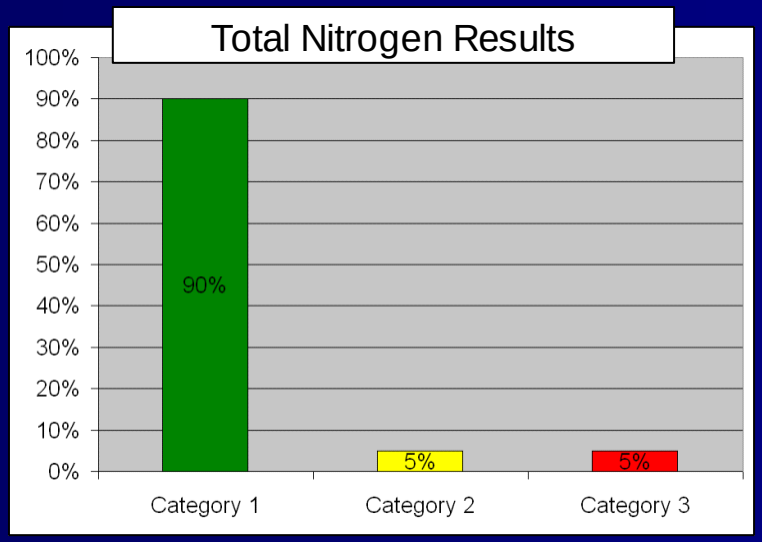
Support TMDL Development

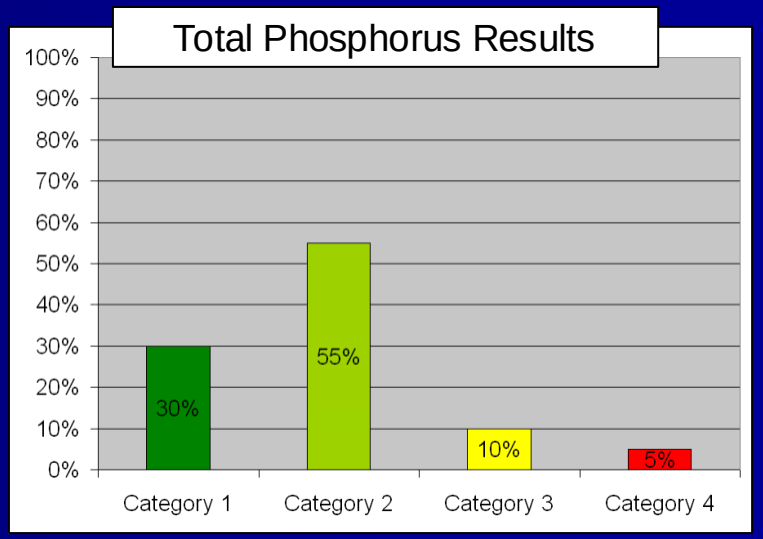
Forest			
>90%			
0%	FC	n=50	29 U
3%	EC	n=37	17 U
>99%			
0	FC	n=15	9 U
0	EC	n=11	7 U

Pasture			
>30%			
19%	FC	n=58	15 U
23%	EC	n=43	5 U
>50%			
43%	FC	n=14	0 U
71%	EC	n=7	0 U

- Wildlife generates rare violations of the bacteria standard in forested watersheds
- Urban violation rates are difficult to tease out (if urban >5%, then pasture >30%)

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

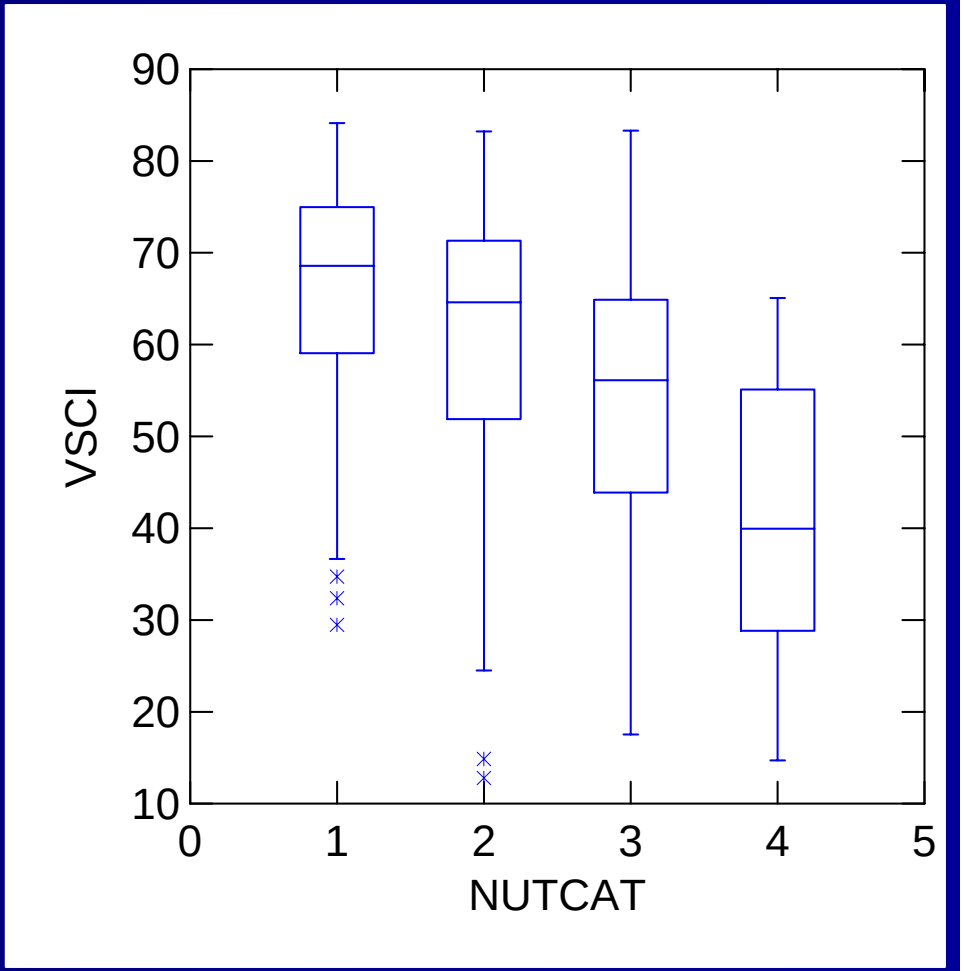
Categories:

1: <=0.01 TP mg/L (n=100)

2: Between 0.01 and 0.05 (n=150)

3: Between 0.05 and 0.1 (n=39)

4: >=0.1 TP mg/L (n=15)



Standards Development

Categories:

1: <=0.01 TP mg/L (n=100)

2: Between 0.01 and 0.05 (n=150)

3: Between 0.05 and 0.1 (n=39)

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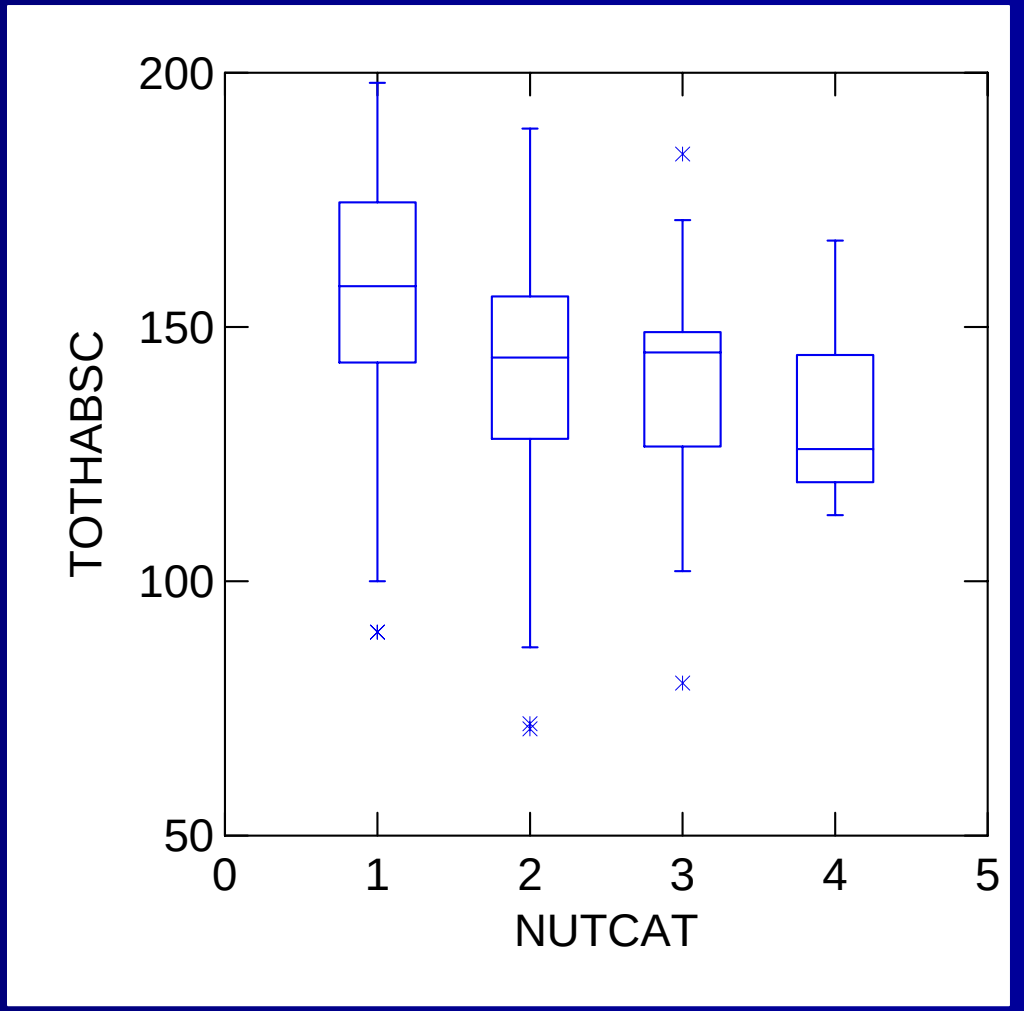
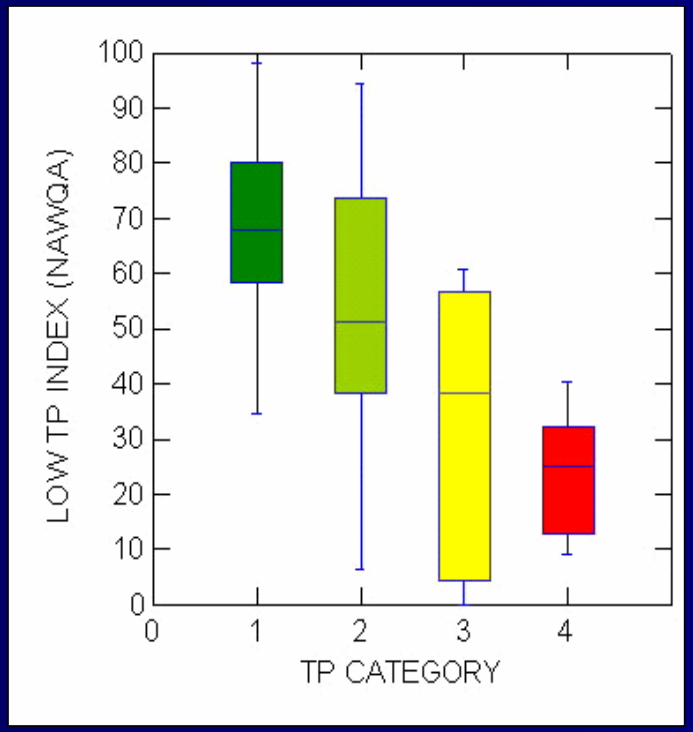


Standards Development



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
  - Algae Community
  - Fish Community
- 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, VCU)

Acknowledgements

Tony Olsen, EPA Corvallis Office, for assistance and support with random site selection, weighting, and CDF Curve generation

Private Landowners across the state of Virginia for allowing DEQ field staff to access ProbMon sites

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Questions?

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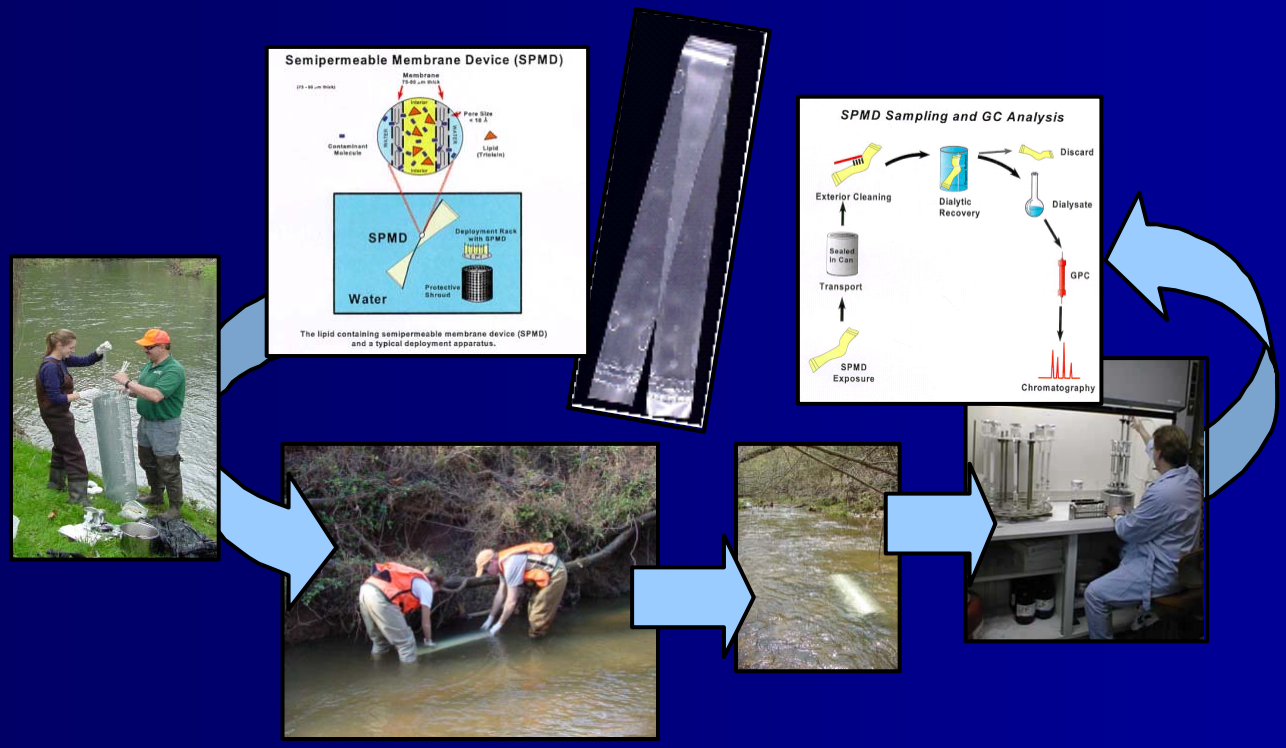
Innovative Monitoring



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

Innovative Monitoring