VCU

Preliminary Findings using Fish Community Data to Determine Biological Health in Virginia Streams

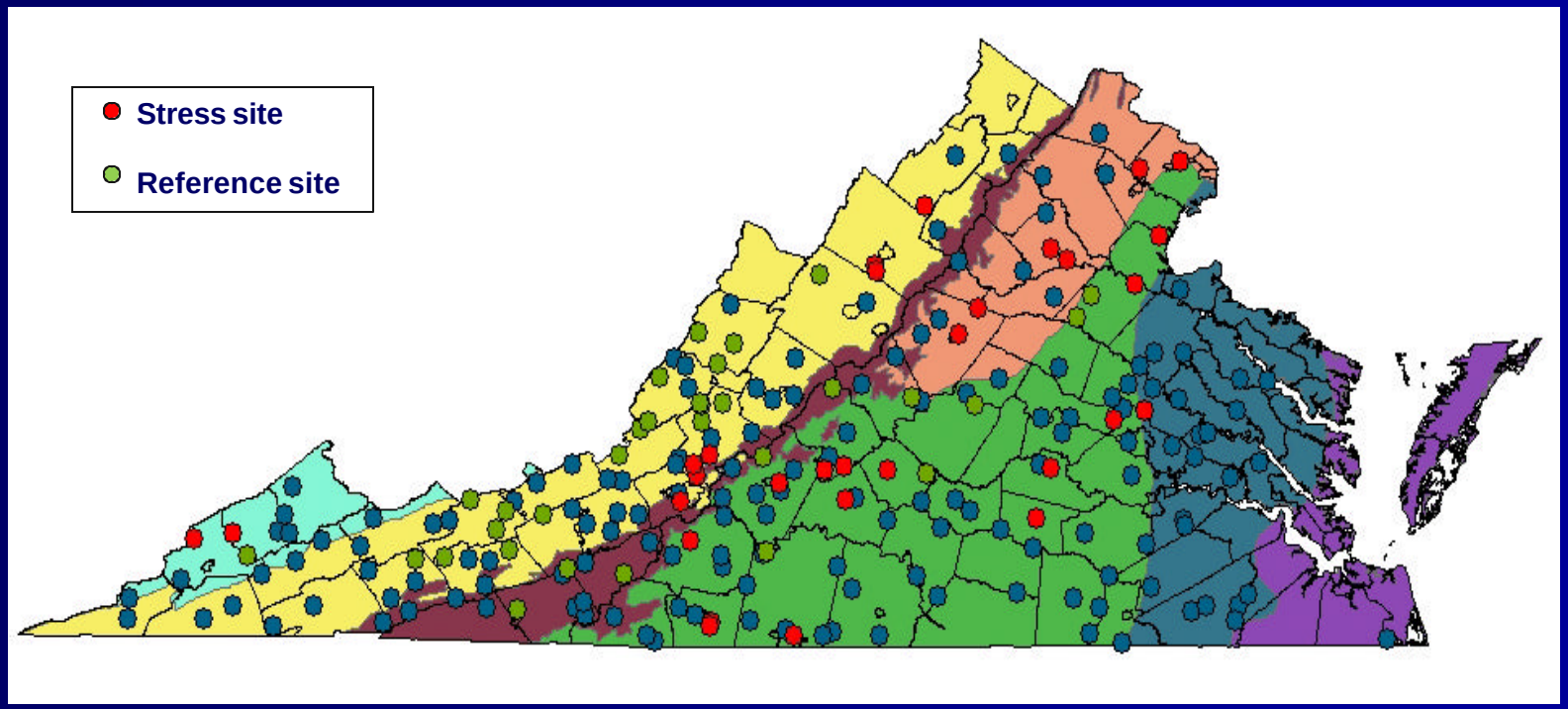
DEQ
Virginia Department of Environmental Quality

Talk Outline

- Program Overview
- Reference and Stress Filter Results
- Reference Classification
- Metric Evaluation
- Stressor Specific Evaluation
- Next Steps

Map of Fish Sites

All VA ProbMon Fish Sample Sites 2006-2009 (n=227)



VCU

DEQ
Virginia Department of Environmental Quality

Reference Filter

DO >6 mg/L
pH >6,<9
Sp Cond < 250 uS/cm
TN <= 1 mg/L
TP <= 0.02 mg/L
Total Habitat > 150
LRBS >= -0.5
PHAB Silt Index <= 20
TSS < 5 mg/L

Embed >12
RipVeg >12
All Metal CCU <= 3.0
ACCLMSSZ CCU <= 1.5
% W Urban <= 4%
% W Ag <=15%
Pop Dens (km) <= 15
Road Dens (km) <= 1.5
% W Rfor120 >= 70%

Stress Filter

DO < 5 mg/L
pH <6,>9
Sp Cond > 500 uS/cm
TN >= 2 mg/L
TP >= 0.05 mg/L
Total Habitat <= 120
LRBS <= -1
PHAB Silt Index >= 30
TSS > 30 mg/L

Embed <=7
RipVeg <=7
All Metal CCU >= 7.0
ACCLMSSZ CCU >= 3.5
% W Urban > 16%
% W Ag > 55%
Pop Dens (km) > 100
Road Dens (km) > 3.5
% W Rfor120 >= 70%

VCU

DEQ
Virginia Department of Environmental Quality

Ref /Stress Filter Results

Reference = 39 (Met 14-17 Ref Cond, 0/1 Stress)
Stress = 43 (Met 4-10 Stress Cond, <10 Ref)

BUT

4 Ref sites < 2 sq miles, 5 Ref sites < 50 fish,
3 Ref site replicates (Ref n=27)

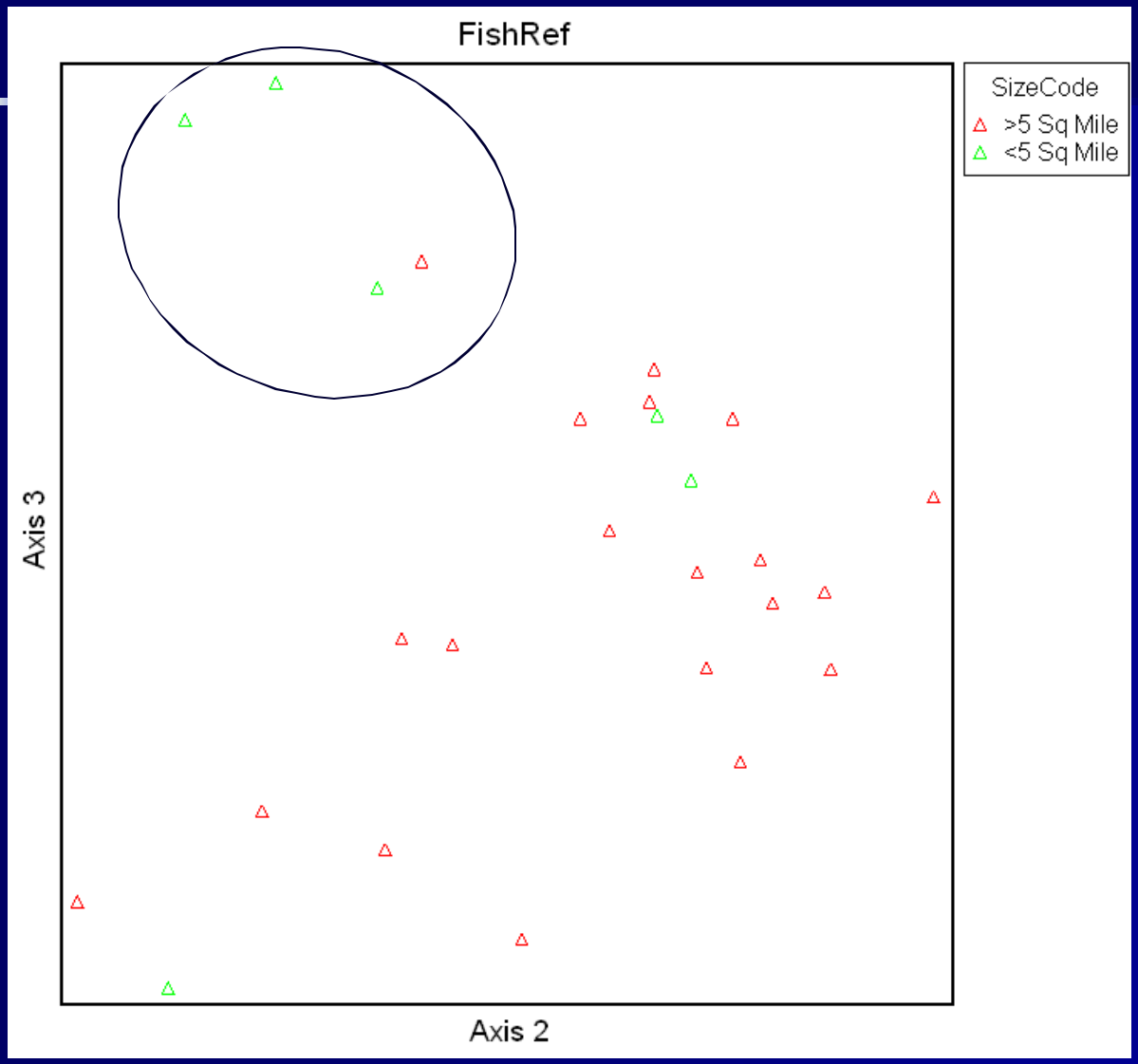
2 Stress sites < 2 sq mile, 3 sites replicates, 9 sites swamp/Chowan, 1 boatable (Stress n=28)

All Sites between 2 to 200 sq miles, no coast

VCU

DEQ
Virginia Department of Environmental Quality

Reference Classification (Size)



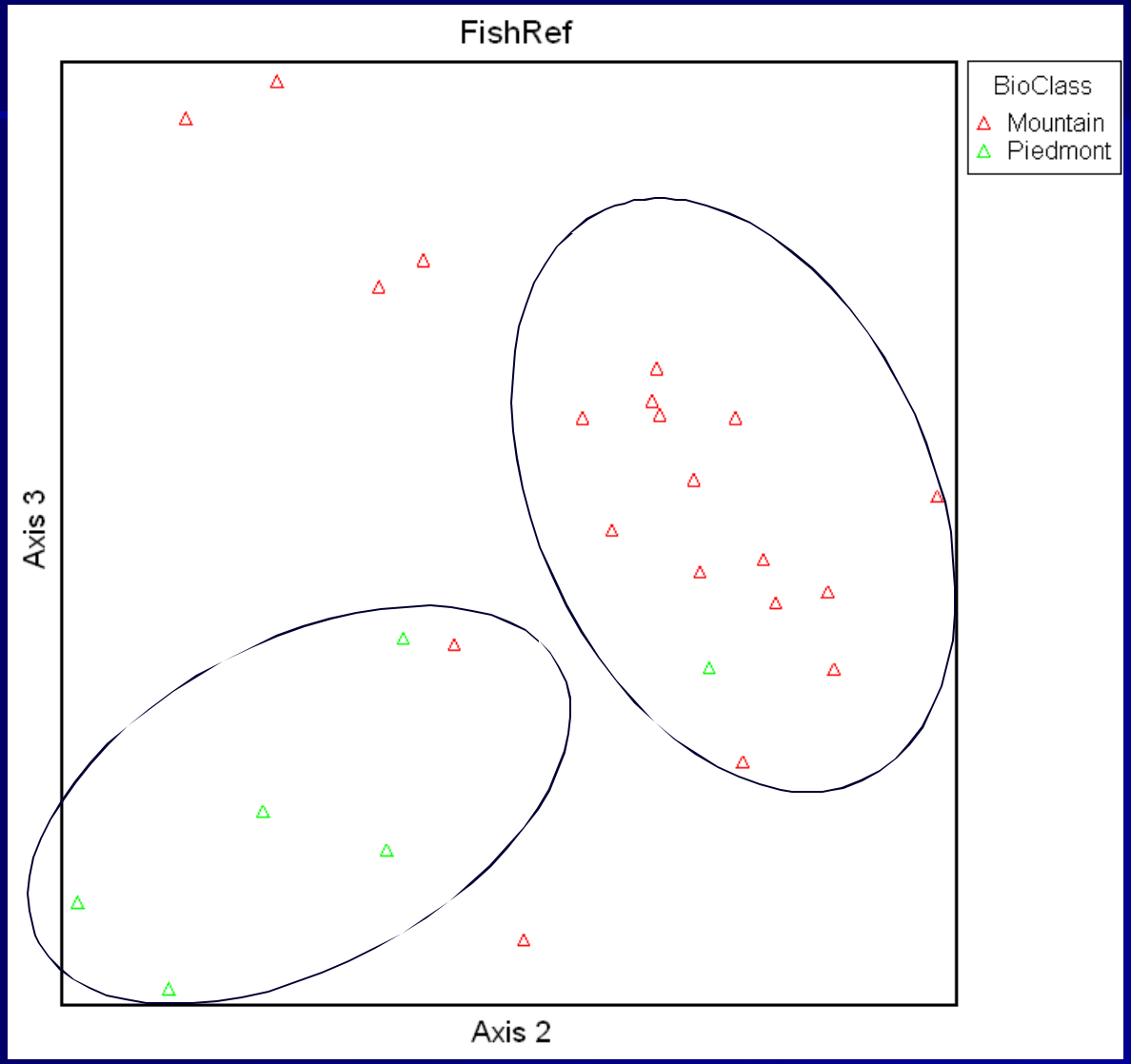
NMS Graph

Final stress was 11.39

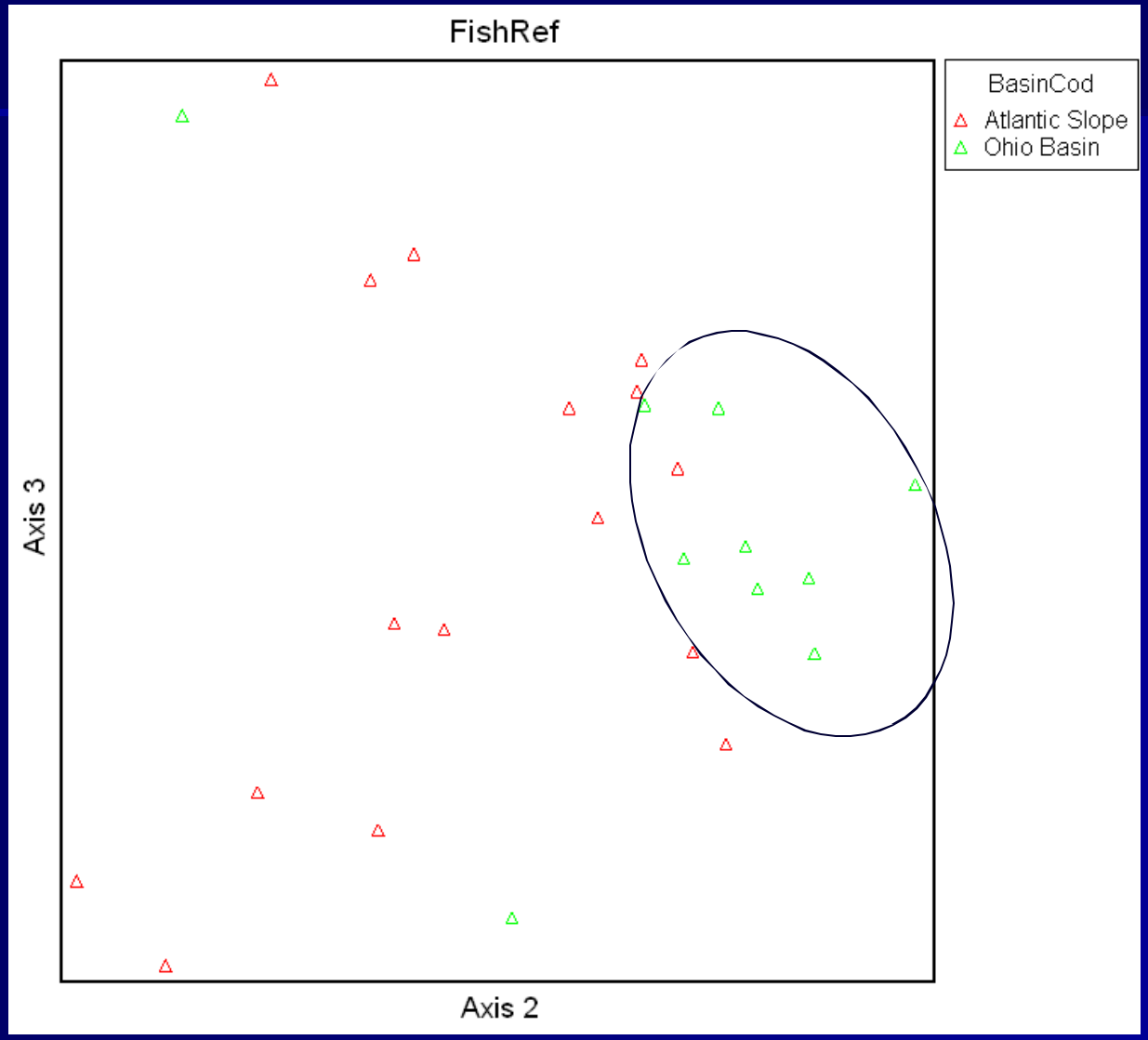
3 Axis = 0.83

Axis 2 and 3 are 0.67

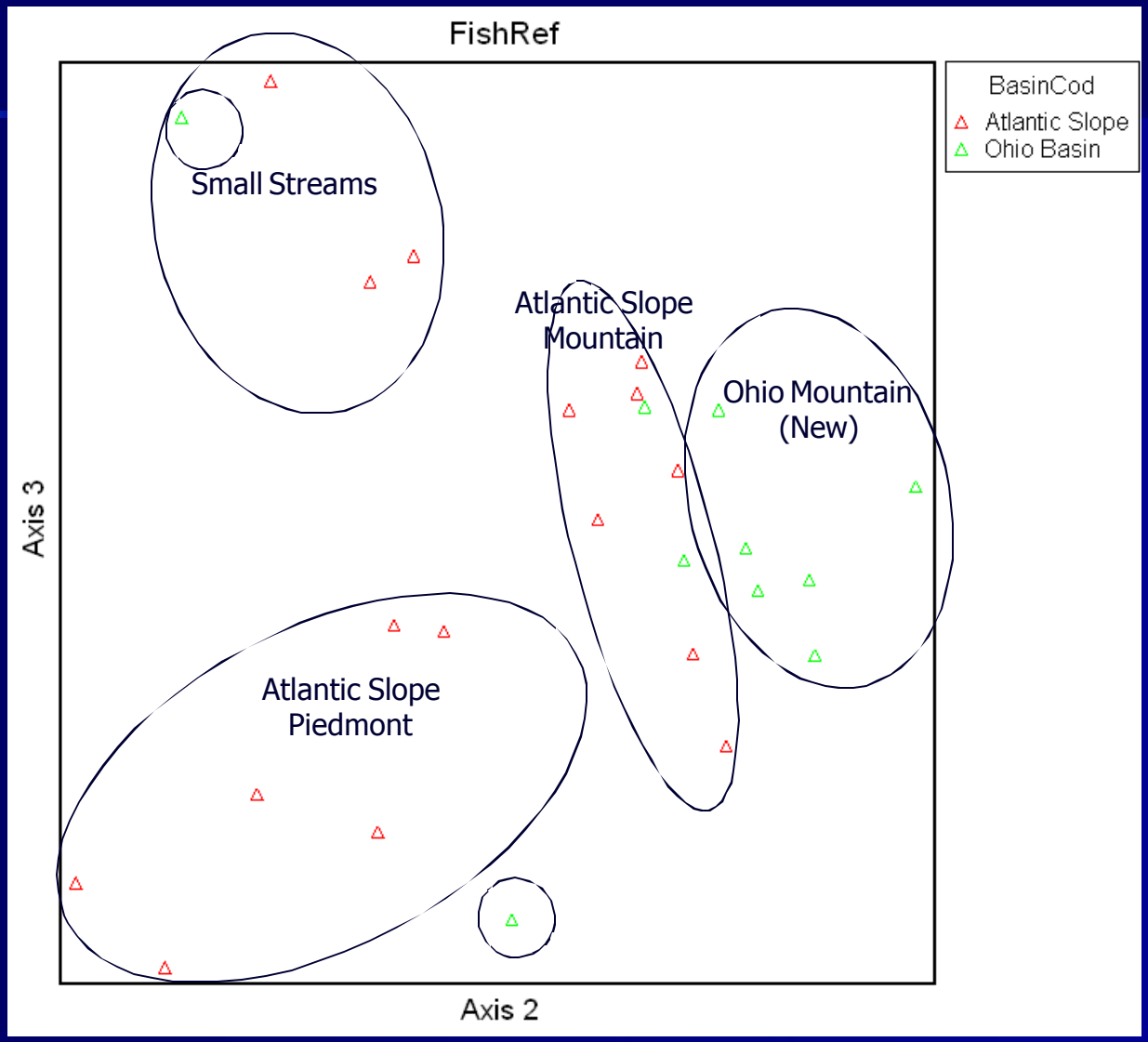
Reference Classification (Bioregion)



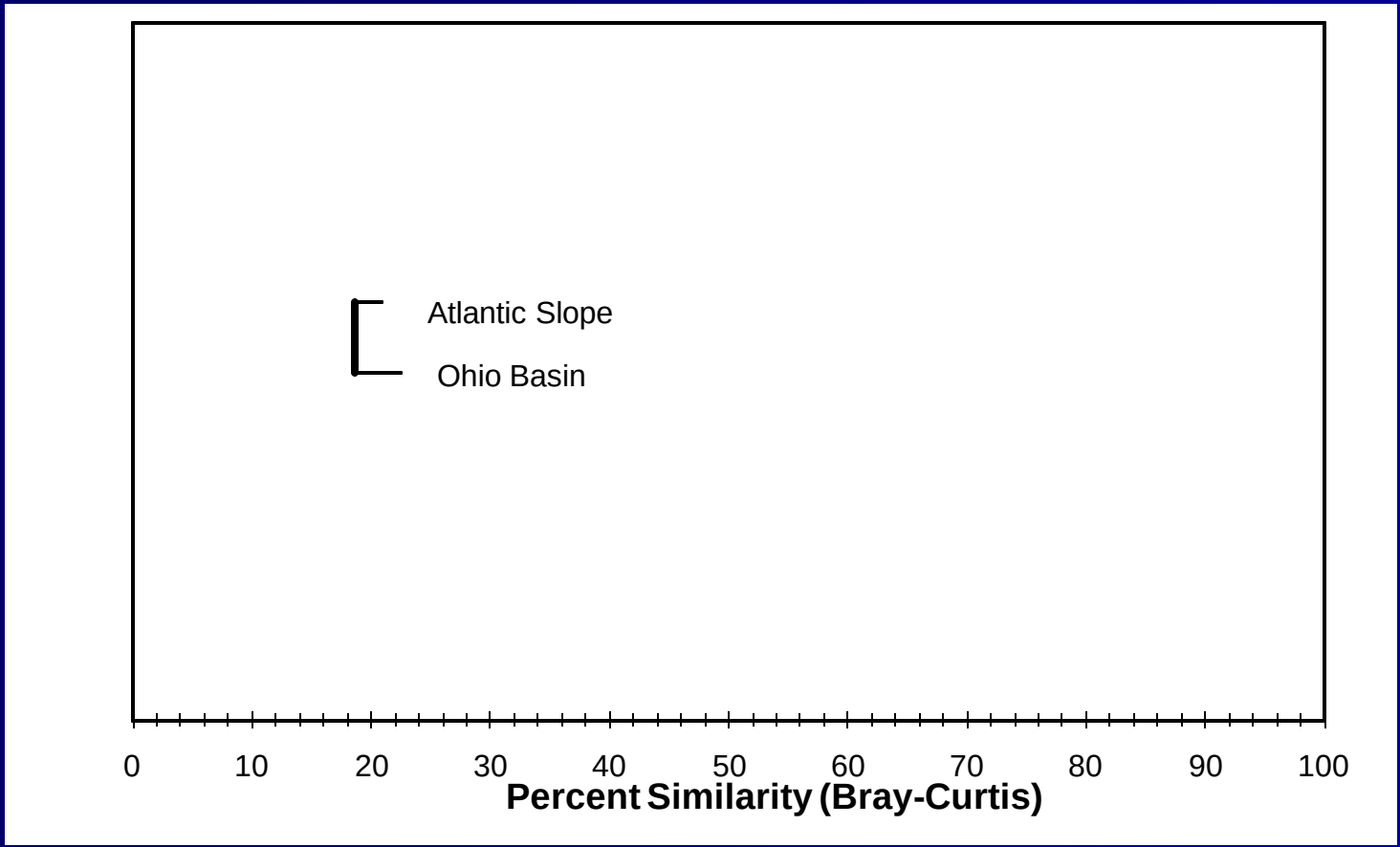
Reference Classification (Basin)



Reference Classification (All)

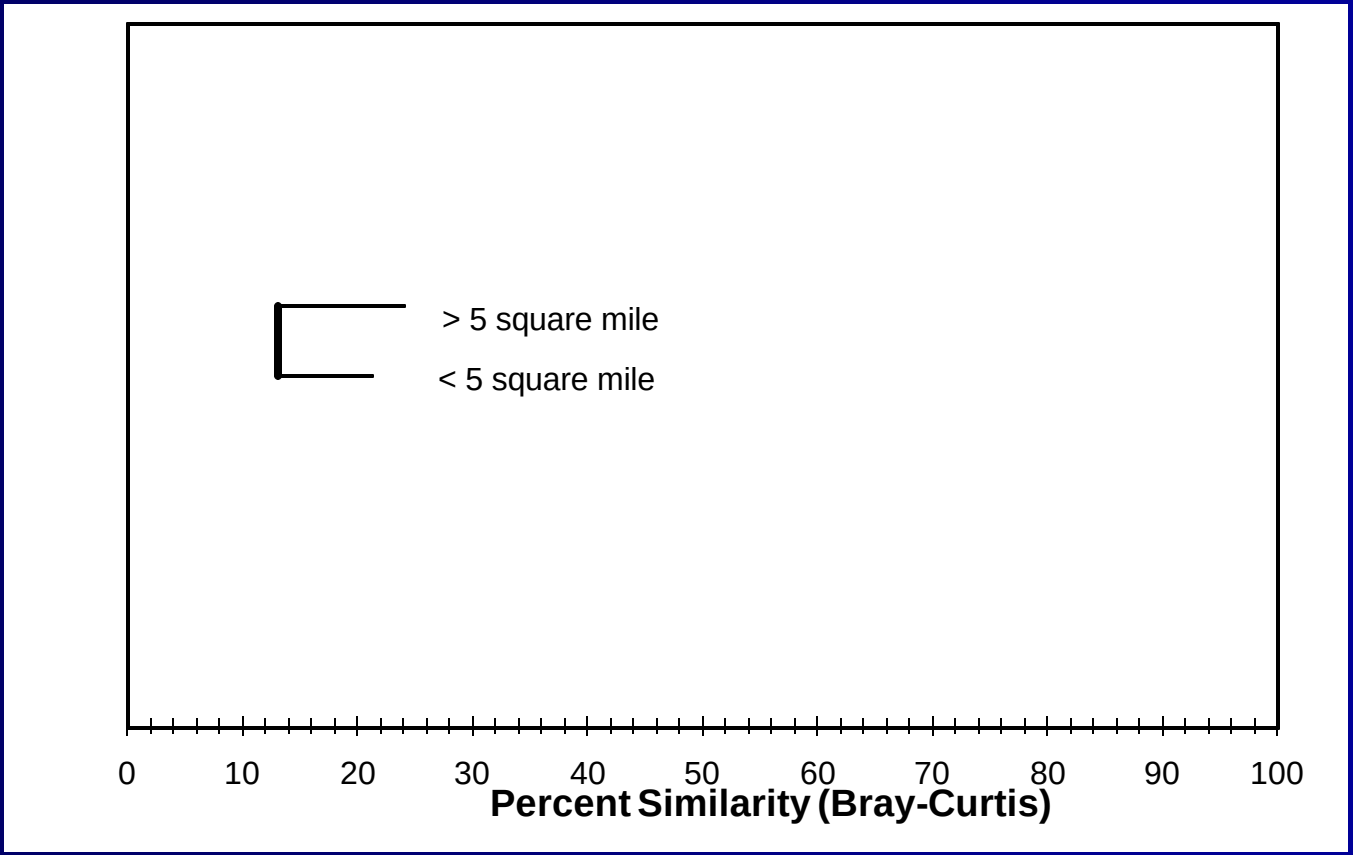


Reference Classification (Size)



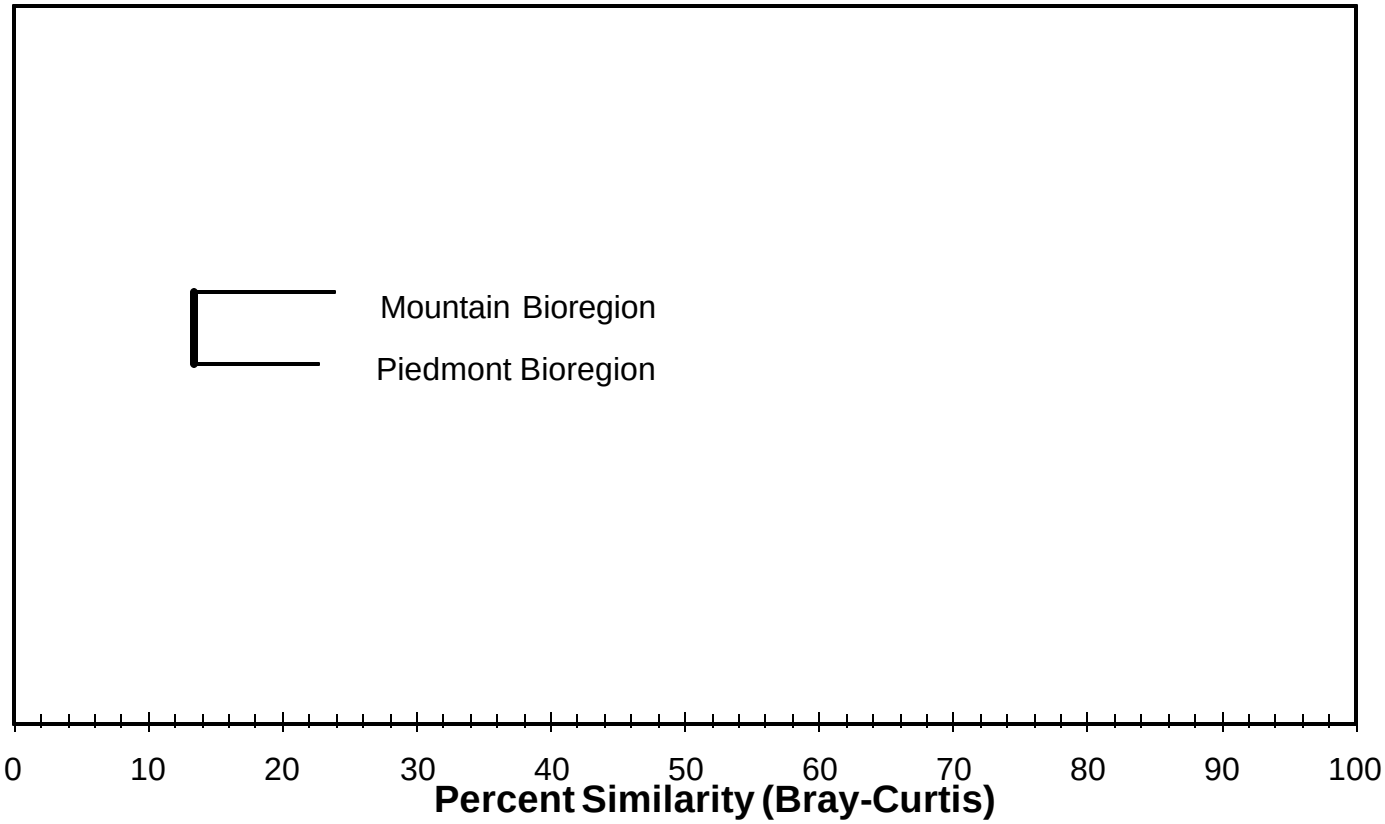
Classification Strength (CS) = 2.6 (not significant)

Reference Classification (Size)



Classification Strength (CS) = 10.9 (significant)

Reference Classification (Bioregion)



Classification Strength (CS) = 10.3 (significant)

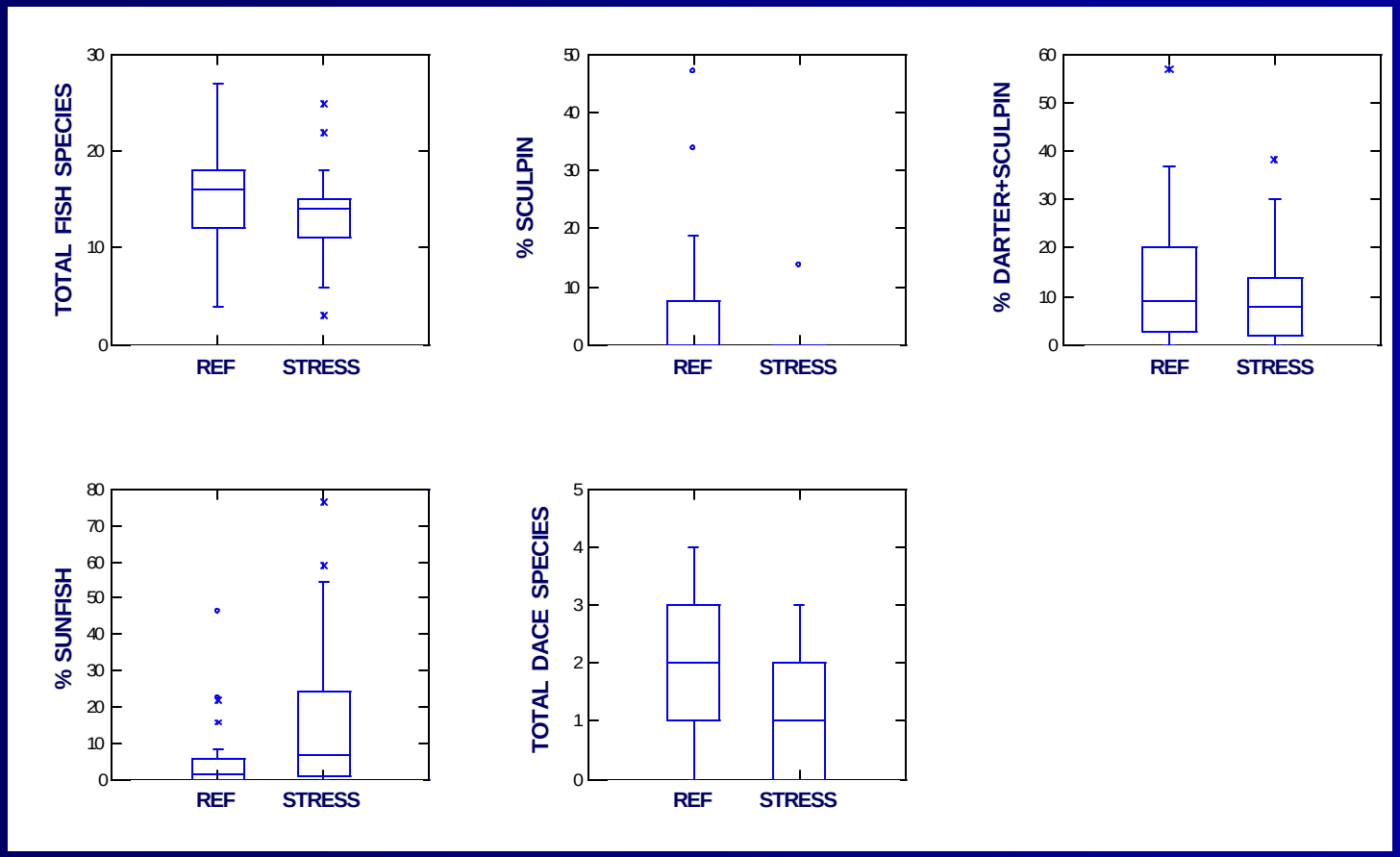
Metric Evaluation (Ref/Stress)

<u>Species Richness</u>

- Total Fish Species
- Total Dace Species
- Percent Sculpin
- Percent Darter + Sculpin
- Percent Sunfish

Metric Evaluation (Ref/Stress)

Species Richness



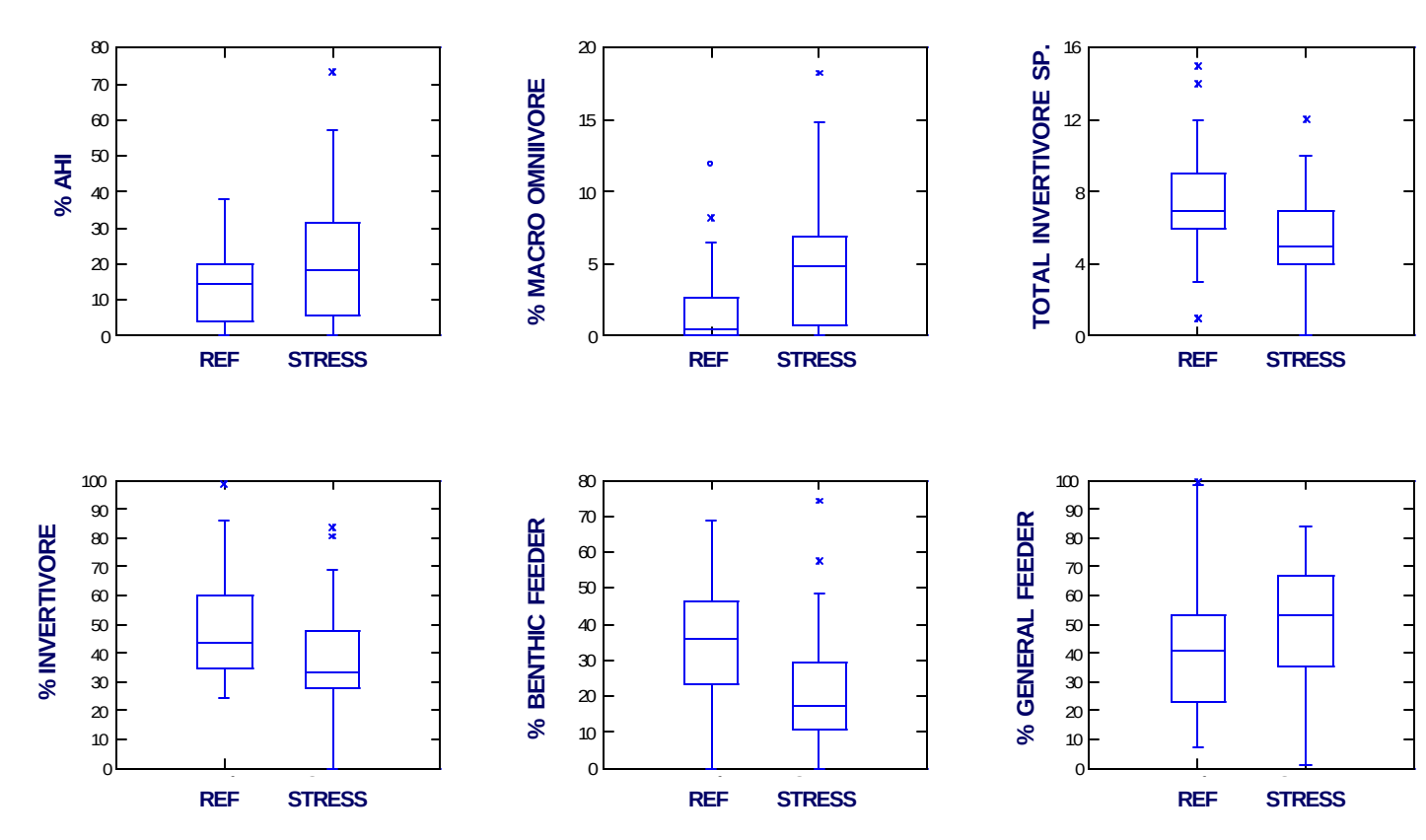
Metric Evaluation (Ref/Stress)

<u>Trophic Guild Metrics</u>

- Total Invertivore Species
- Percent Invertivore
- Percent Macro-omnivore
- Percent AHI (omnivore metric)
- Percent Benthic Feeder
- Percent General Feeder

Metric Evaluation (Ref/Stress)

Trophic Guild Metrics



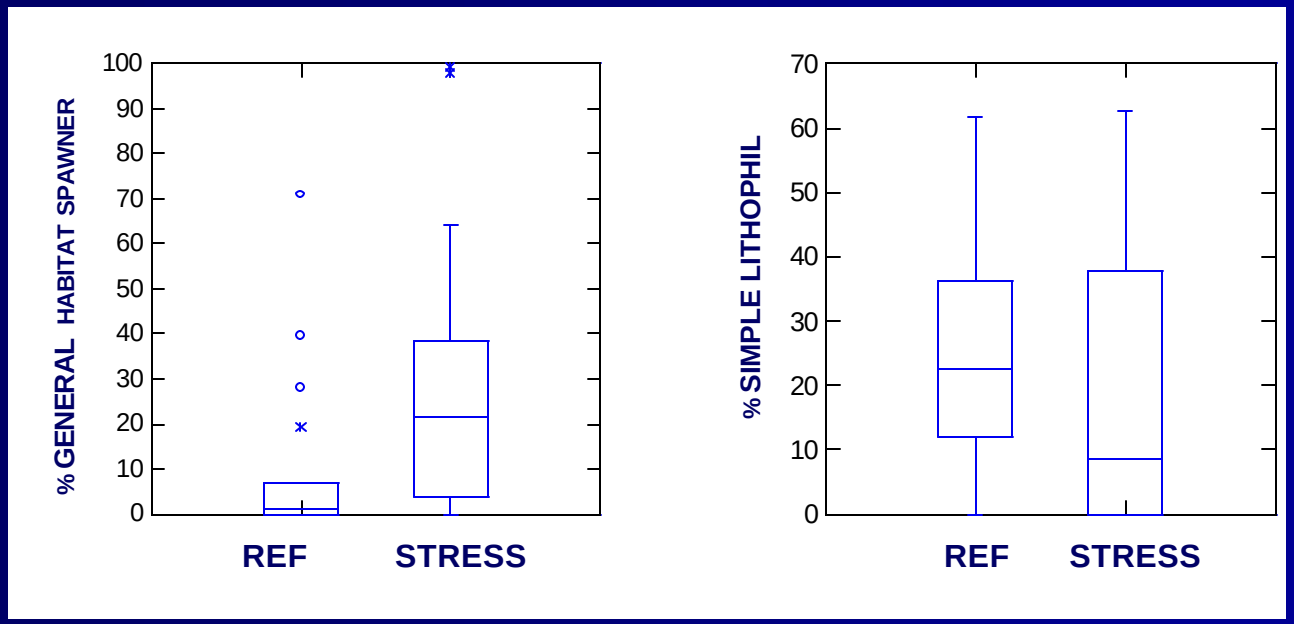
VCU

DEQ
Virginia Department of Environmental Quality

Metric Evaluation (Ref/Stress)

<u>Habitat/Reproductive Guild Metrics</u>

- Percent Simple Lithophil (Rock/Gravel)
- Percent General Habitat Spawner



Metric Evaluation (Ref/Stress)

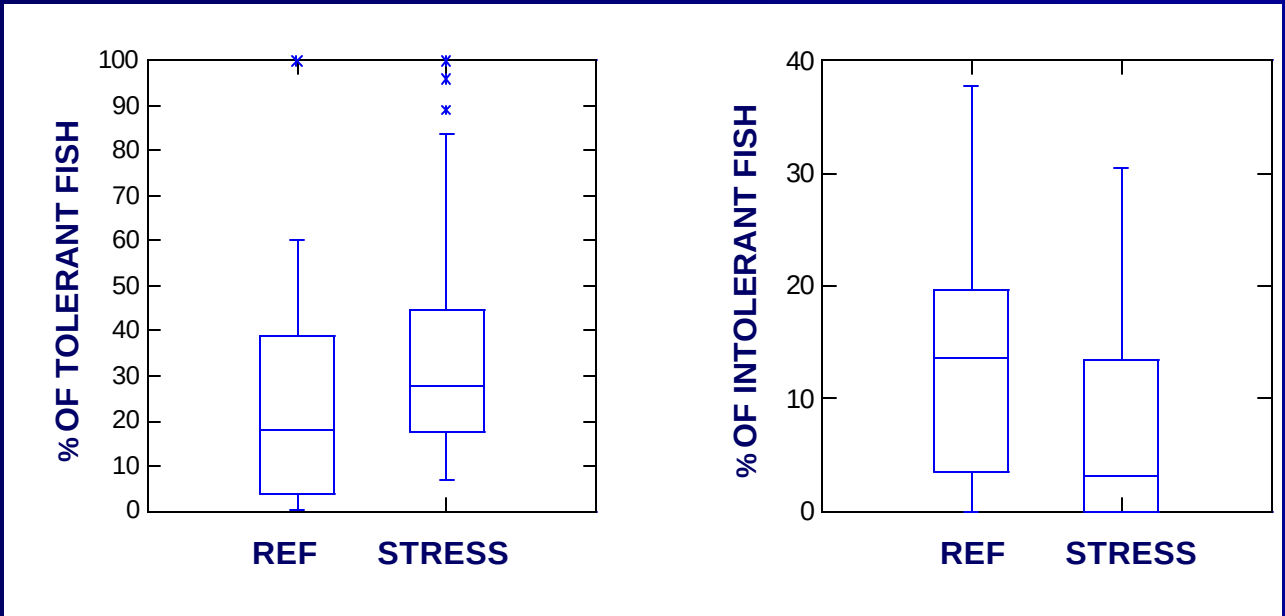
Fish Condition

- Percent DELT (Disease, eroded fins, lesions, tumors, etc.)
- Percent DELT + Parasites

Metric Evaluation (Ref/Stress)

<u>Tolerance Metrics</u>

- Percent of Tolerant Fish
- Percent of Intolerant Fish



Metric Evaluation (by stressor)

Stressor	Threshold	# of Sites	# of Metric Responses
Total Nitrogen	>2 mg/L	8	18 out of 45
Total Phosphorus	>0.07 mg/L	9	11 out of 45
Specific Conductivity	> 500 uS/cm	9	14 out of 45
PHAB Siltation Index	> 40	25	11 out of 45

- All sites > 2 sq miles, > 50 fish, non coastal sites
- Evaluated against 27 reference sites

VCU

DEQ
Virginia Department of Environmental Quality

Metric Evaluation

Category	Most consistant metrics across all stressors
Richness	# of Species
Richness	% Sculpin
Richness	% Sunfish
Trophic	% Macro-omnivore
Trophic	% Insectivore
Trophic	% Benthic Feeder
Habitat	% General Habitat
Habitat	% Simple Lithophil (Rock-Gravel)
Tolerance	% Tolerant
Tolerance	% Intolerant
Condition	DELT (without parasites)

VCU

DEQ
Virginia Department of Environmental Quality

Next Steps

- Data Collection, many more reference sites
- Exotic versus Native Fish Metrics
- Coastal ecoregion evaluation (INSTAR data)
- Stressor specific metric development
- Metric redundancy and variability analysis
- Best standard values
- Fish IBI

VCU

DEQ
Virginia Department of Environmental Quality

Acknowledgements

Greg Garman, Steve McIninch, Dave Hopler, Dan Cincotta, Stu Welsh, Allen Temple, Lou Reynolds, Ellen Tarquinio, Treda Grayson, Than Hitt, Paul Angermeier, and Bob Jenkins

Questions?

Contact Info

VDEQ
Jason Hill
3019 Peters Creek Rd
Roanoke, VA 24019
phone: 540.562.6724
email: jason.hill@deq.state.va.us
http://www.deq.virginia.gov/probmon/