

A Comparison of Biological Methods for Macroinvertebrate Collection in Missouri Streams

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WSA Purpose

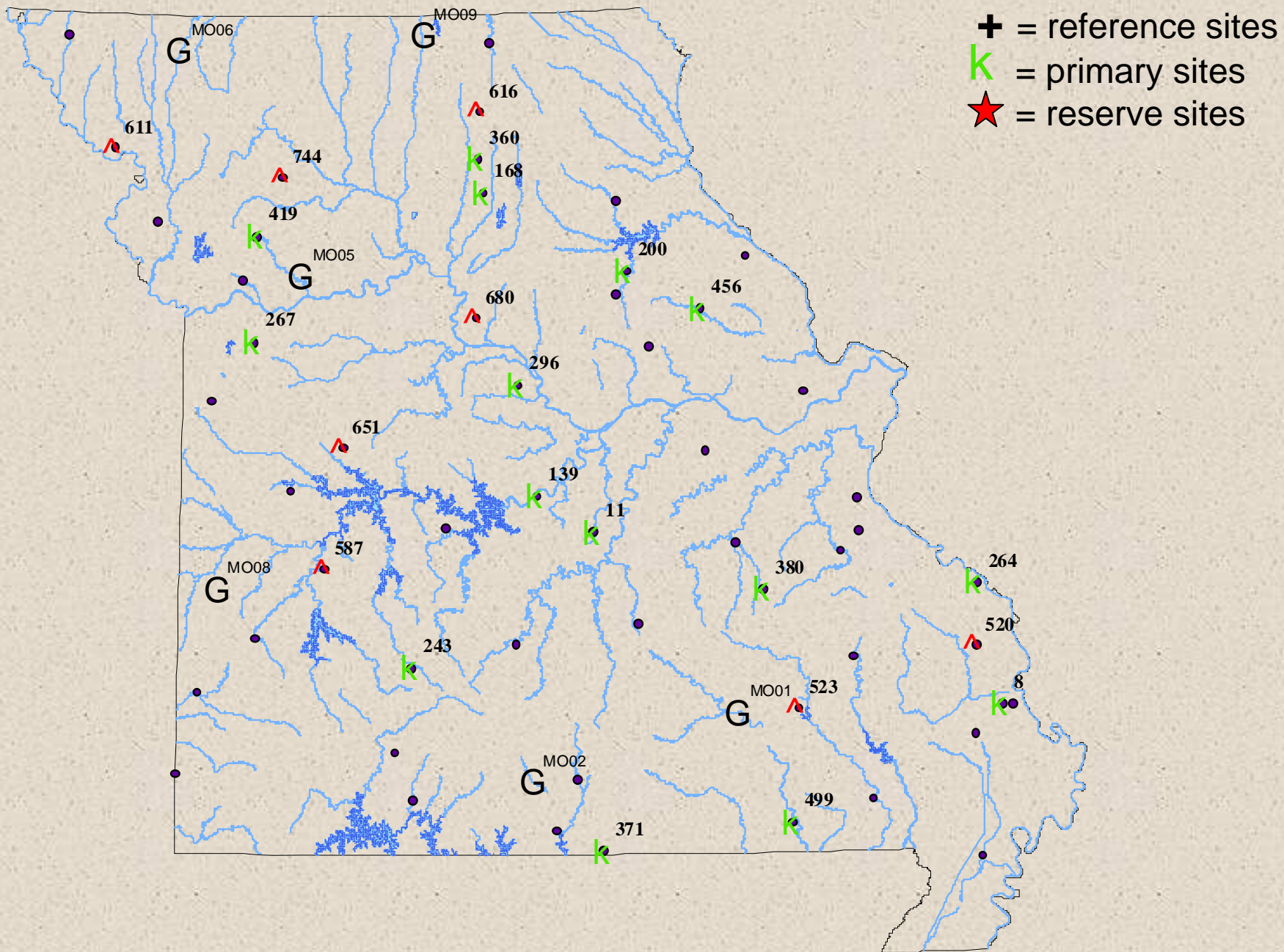
- Produce a national report on the condition of the nations wadeable streams
- Enhance individual states capacity for monitoring and assessment
- Promote collaboration among states and other key partners

A Secondary Purpose

- Have some states participate in comparability studies
 - (PA, VA, TN, IA, OK, MO)
 - Compare aquatic macroinvertebrate collection and processing methods
 - Compare at data & assessment levels

In Missouri

- All sites selected by the EPA using a probability-based design
- MDC personnel performed all field & lab work
- 24 sites sampled (plus 1 site re-sampled) between 27 July and 9 November 2004
- Missouri's RAM collection method used alongside the WSA collection method
- All samples processed at MDC's aquatic macroinvertebrate ID/wet lab



Collection Method Details

WSA

- 500 micron modified D-frame net
- In all streams
 - *1 ft² at each of 11 equally spaced transects throughout the reach (alternating left, center & right and combined into one composite sample)*

Missouri

- 500 micron D-frame net
- In cobble streams
 - *6 m² riffle*
 - *6 m² pool deposits*
 - *6 linear m root mat*
- In sand streams
 - *4800 cm² of large woody debris from 12 different pieces of debris*
 - *6 m² pool deposits*
 - *6 linear m root mat*

Lab Method Details

WSA

- Random subsample
 - *500 organisms*
 - *Large and rare search*
 - *ID to genus (in some cases only to family)*
 - *Internal & External QA/QC*

Missouri

- Random subsample
 - *600 organisms from riffle habitats*
 - *300 organisms from woody debris, depositional and rootmat samples*
 - *Large and rare search*
 - *ID to lowest possible level*
 - *Internal QA/QC*

Temperate Plains



Southern Appalachian



IBI's (metrics)

WSA

- SAP (6 metrics)

- 1) %Ephemeroptera
- 2) Shannon Diversity
- 3) Scraper Richness
- 4) % Burrower
- 5) EPT Distinct taxa richness
- 6) % Tolerant

WSA

- TPL (6 metrics)

- 1) % EPT individuals
- 2) Shannon Diversity
- 3) Scraper Richness
- 4) Clinger Distinct taxa richness
- 5) Ephemeroptera Distinct taxa richness
- 6) PTV 8-10% Distinct taxa

Missouri

- 4 metrics

- 1) Total taxa
- 2) EPT taxa
- 3) Biotic Index
- 4) Shannon Diversity

IBI's (scoring)

WSA

- Metric scores are calculated and added together to give an IBI score for that site (scale of 0-100)

Missouri

- Each metric receives a score of 1,3 or 5
- Metric scores are added together for an IBI score for that site (scale of 4-20)

IBI's (condition classes)

WSA

- SAP region
 - On 0-100 scale
 - *Above 51 = Good*
 - *37-51 = Fair*
 - *Below 37 = Poor*

WSA

- TPL region
 - On 0-100 scale
 - *Above 45 = Good*
 - *31-45 = Fair*
 - *Below 31 = Poor*

Missouri

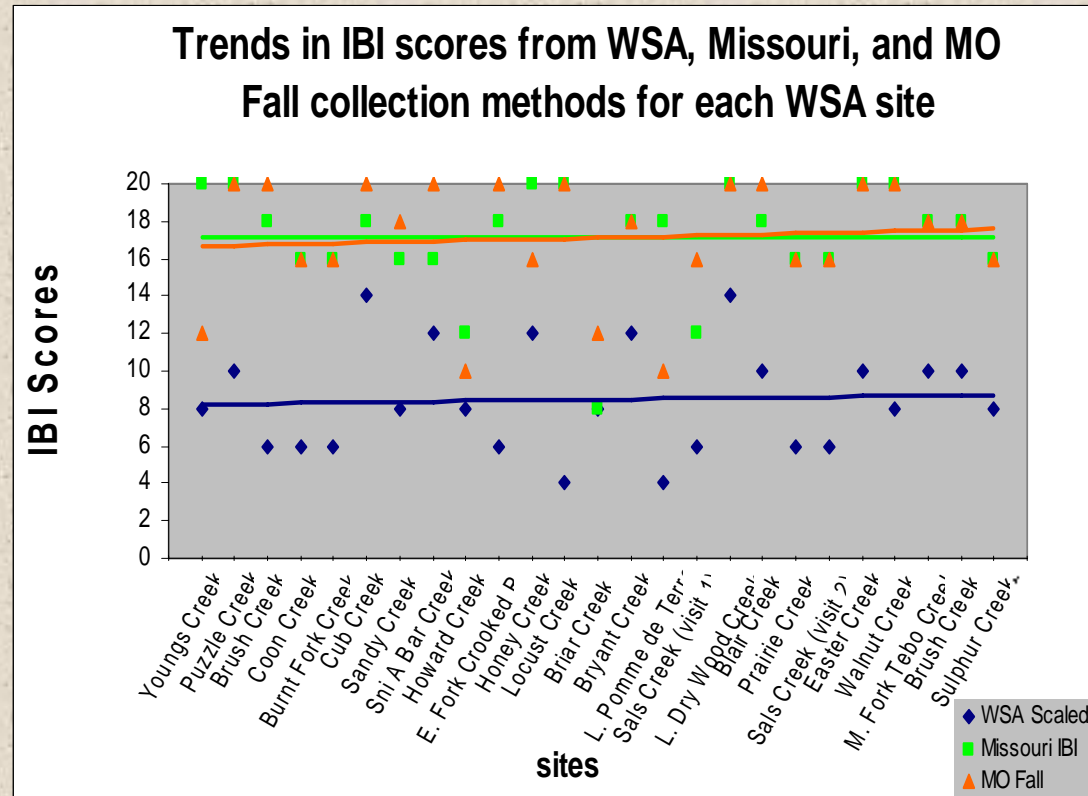
- Statewide
 - On 4-20 scale
 - *16-20 = Fully Biologically Supporting*
 - *10-14 = Partially Biologically Supporting*
 - *Below 10 = Non Biologically Supporting*

<u>Site #</u>	<u>Stream</u>	<u>WSA IBI</u>	<u>MO IBI</u>	<u>MO Fall</u>	<u>WSA</u>	<u>MO</u>	<u>MO Fall</u>
200	Youngs Creek	42.52	20	12	PBS	FBS	PBS
168	Puzzle Creek	45.41	20	20	FBS	FBS	FBS
360	Brush Creek	33.04	18	20	PBS	FBS	FBS
139	Coon Creek	32.56	16	16	PBS	FBS	FBS
419	Burnt Fork Creek	26.11	16	16	NBS	FBS	FBS
380	Cub Creek	70.64	18	20	FBS	FBS	FBS
456	Sandy Creek	39.73	16	18	PBS	FBS	FBS
267	Sni A Bar Creek	60.72	16	20	FBS	FBS	FBS
296	Howard Creek	39.18	12	10	PBS	PBS	PBS
M005	E. Fork Crooked R.	34.74	18	20	PBS	FBS	FBS
M006	Honey Creek	57.7	20	16	FBS	FBS	FBS
M009	Locust Creek	17.38	20	20	NBS	FBS	FBS
499	Briar Creek	41.6	8	12	PBS	NBS	PBS
M002	Bryant Creek	60.6	18	18	FBS	FBS	FBS
243	L. Pomme de Terre	20.6	18	10	NBS	FBS	PBS
8	Sals Creek (visit 1)	28.45	12	16	NBS	PBS	FBS
M008	L. Dry Wood Creek	67.12	20	20	FBS	FBS	FBS
M001	Blair Creek	48.95	18	20	PBS	FBS	FBS
11	Prairie Creek	28.75	16	16	NBS	FBS	FBS
8	Sals Creek (visit 2)	31.2	16	16	PBS	FBS	FBS
611	Easter Creek	51.28	20	20	FBS	FBS	FBS
616	Walnut Creek	43.91	20	20	PBS	FBS	FBS
651	M. Fork Tebo Creek	52.34	18	18	FBS	FBS	FBS
587	Brush Creek	54.93	18	18	FBS	FBS	FBS
680	Sulphur Creek	40.58	16	16	PBS	FBS	FBS

Good ~ FBS
Fair ~ PBS
Poor ~ NBS

Comparability at the Data Level

Site #	WSA Scaled	Missouri IBI	MO Fall
200	8	20	12
168	10	20	20
360	6	18	20
139	6	16	16
419	6	16	16
380	14	18	20
456	8	16	18
267	12	16	20
296	8	12	10
M005	6	18	20
M006	12	20	16
M009	4	20	20
499	8	8	12
M002	12	18	18
243	4	18	10
8	6	12	16
M008	14	20	20
M001	10	18	20
11	6	16	16
8	6	16	16
611	10	20	20
616	8	20	20
651	10	18	18
587	10	18	18
680	8	16	16

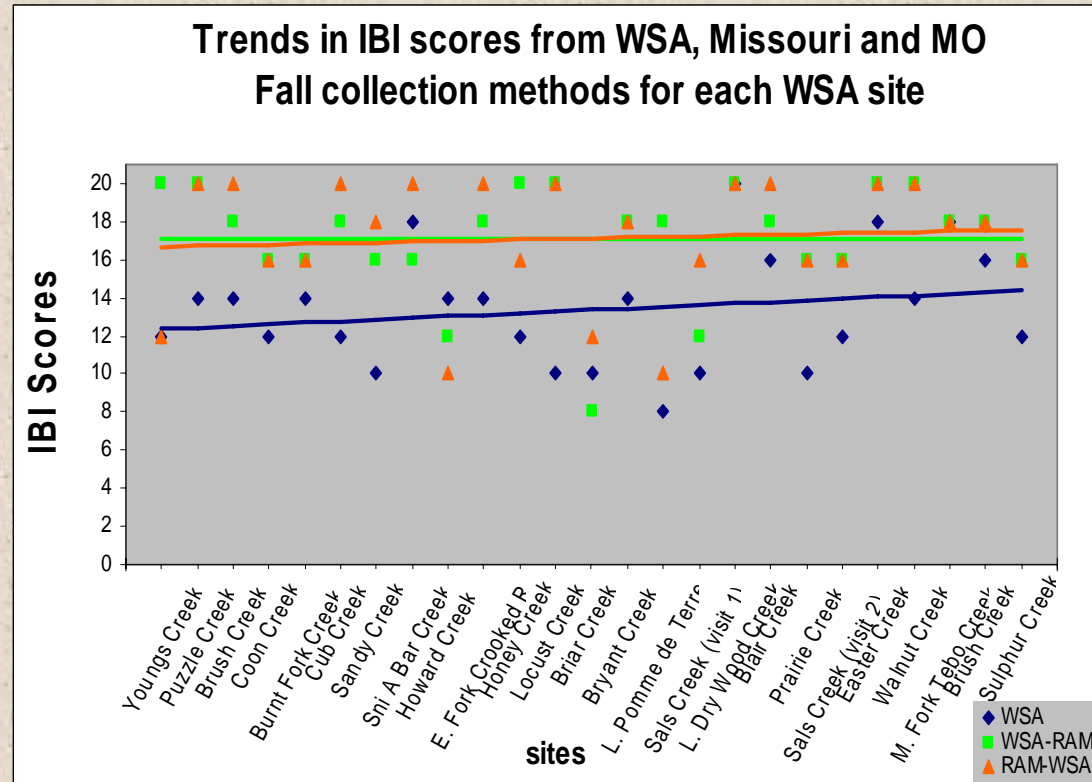


Student's t-test results:

WSA vs. MO $p < .0001$
 WSA vs. MO Fall $p < .0001$
 MO vs. MO Fall $p = 1.0000$

Comparability at the Data Level

Site #	WSA thru MO	Missouri IBI	MO Fall
200	12	20	12
168	14	20	20
360	14	18	20
139	12	16	16
419	14	16	16
380	12	18	20
456	10	16	18
267	18	16	20
296	14	12	10
M005	14	18	20
M006	12	20	16
M009	10	20	20
499	10	8	12
M002	14	18	18
243	8	18	10
8	10	12	16
M008	20	20	20
M001	16	18	20
11	10	16	16
8	12	16	16
611	18	20	20
616	14	20	20
651	18	18	18
587	16	18	18
680	12	16	16



Student's t-test results:

WSA vs. MO $p < .0001$

WSA vs. MO Fall $p < .0001$

MO vs. MO Fall $p = 1.0000$

MISSOURI

RHUM300 Disturbance

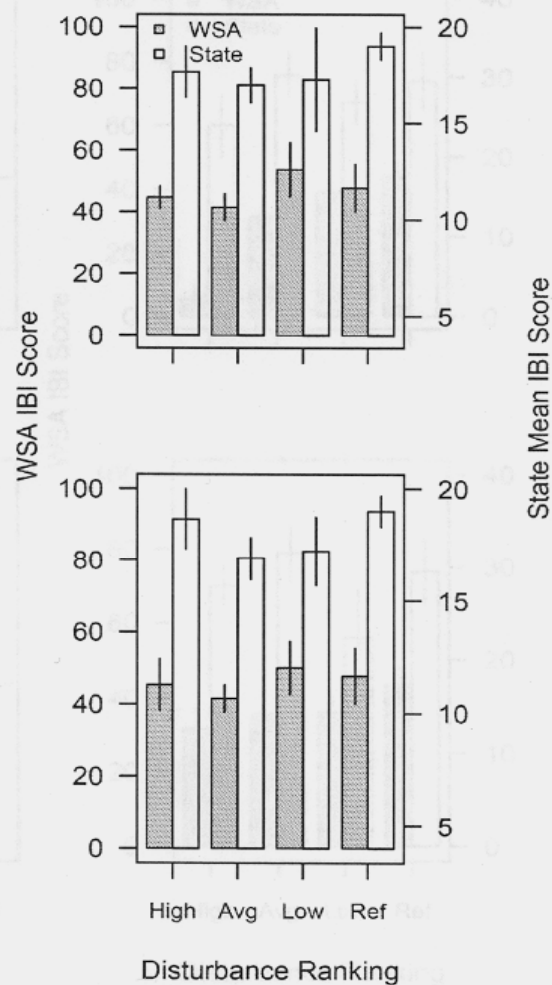
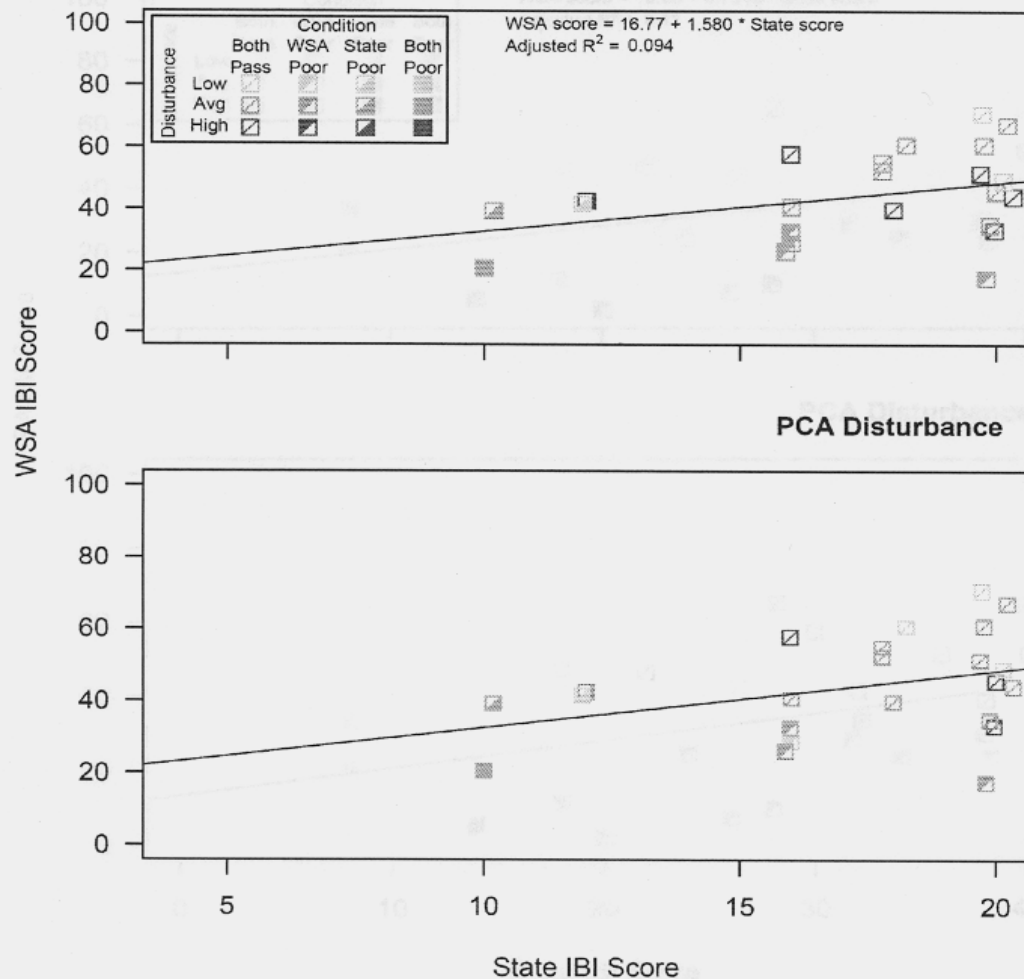
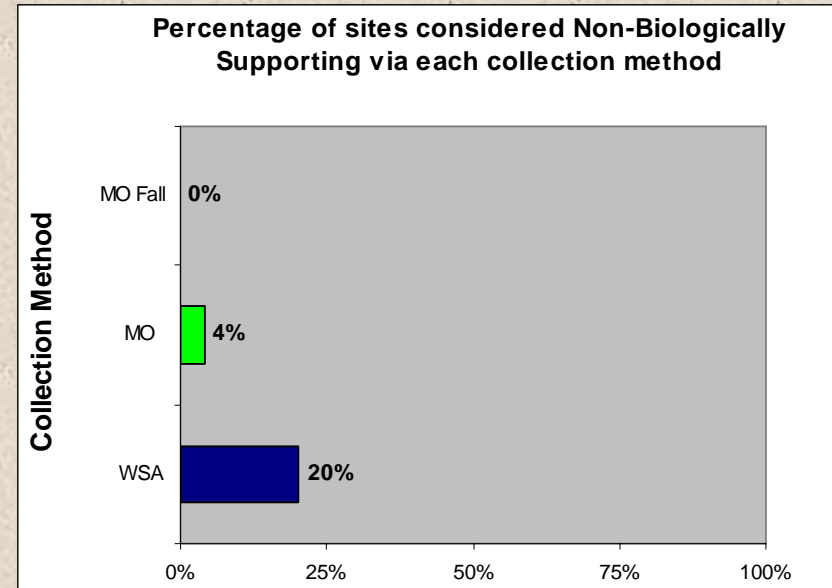
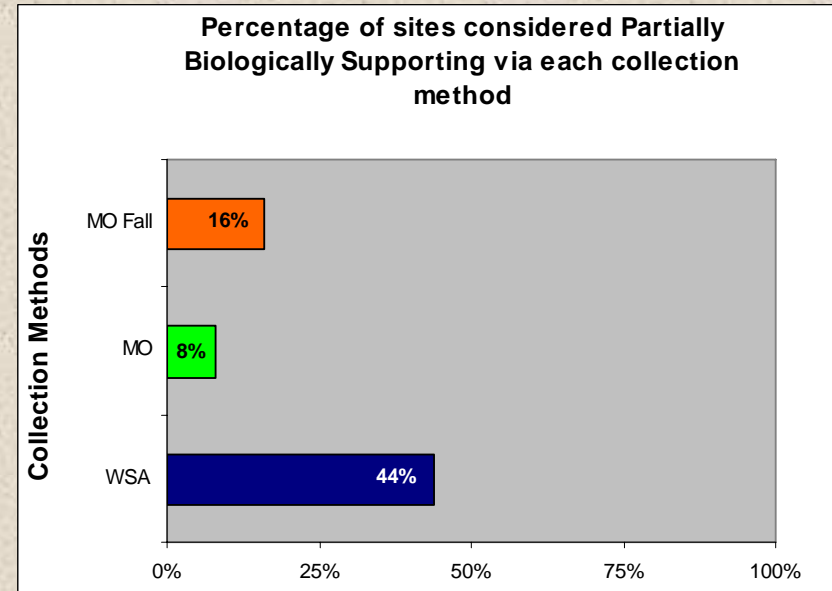
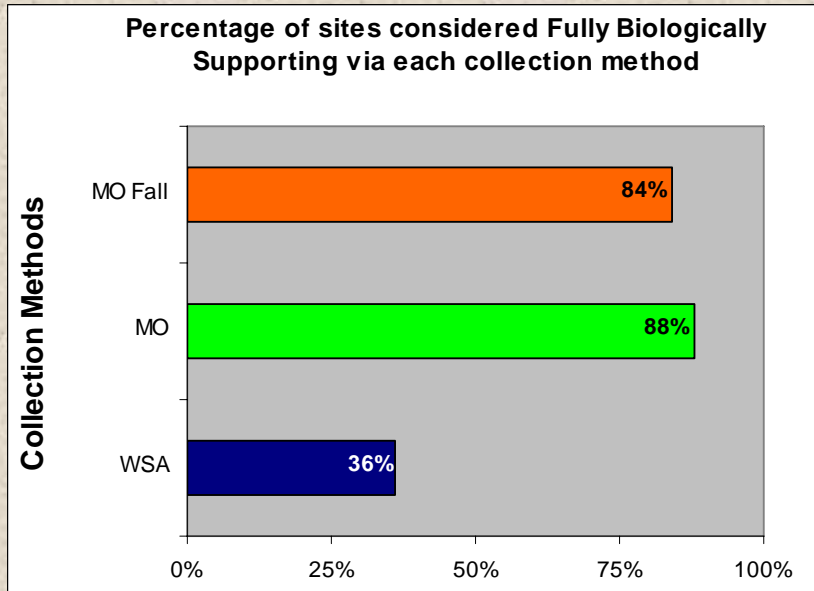


Figure 4. Regression graphs of WSA IBI scores on State IBI scores for Missouri with disturbance class for each site denoted by color. Agreement of pass-fail assessment for each site is denoted by the shading of the box for each site (half shaded boxes show disagreement). Bar chart of mean IBI scores in each disturbance class and for reference sites for both WSA and State

<u>Site #</u>	<u>Stream</u>	<u>WSA IBI</u>	<u>MO IBI</u>	<u>MO Fall</u>	<u>WSA</u>	<u>MO</u>	<u>MO Fall</u>
200	Youngs Creek	42.52	20	12	PBS	FBS	PBS
168	Puzzle Creek	45.41	20	20	FBS	FBS	FBS
360	Brush Creek	33.04	18	20	PBS	FBS	FBS
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M002	Bryant Creek	60.6	18	18	FBS	FBS	FBS
243	L. Pomme de Terre	20.6	18	10	NBS	FBS	PBS
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11	Prairie Creek	28.75	16	16	NBS	FBS	FBS
8	Sals Creek (visit 2)	31.2	16	16	PBS	FBS	FBS
611	Easter Creek	51.28	20	20	FBS	FBS	FBS
616	Walnut Creek	43.91	20	20	PBS	FBS	FBS
651	M. Fork Tebo Creek	52.34	18	18	FBS	FBS	FBS
587	Brush Creek	54.93	18	18	FBS	FBS	FBS
680	Sulphur Creek	40.58	16	16	PBS	FBS	FBS

Good ~ FBS
Fair ~ PBS
Poor ~ NBS

Comparability at the Assessment Level



Chi-Square test results:

WSA vs MO $\chi^2_1 = 14.3490$, $p = .0008$

WSA vs MO Fall $\chi^2_1 = 13.0667$, $p = .0015$

MO vs MO Fall $\chi^2_1 = 1.6989$, $p = .4276$

Comparability at the Assessment Level

Thresholds of Degradation:

WSA

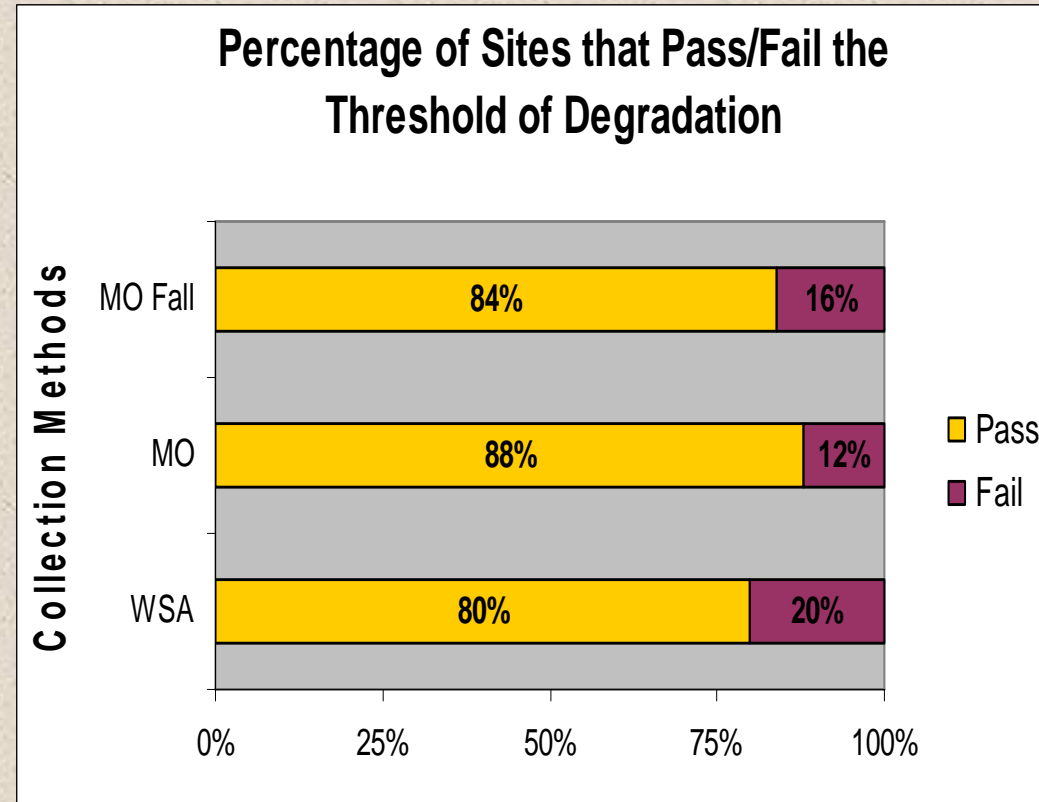
Pass = FBS, PBS

Fail = NBS

MO & MO Fall

Pass = FBS

Fail = PBS, NBS



Chi-Square test results:

WSA vs. MO $\chi^2_1 = .5952$, $p = .4404$

WSA vs. MO Fall $\chi^2_1 = .1355$, $p = .7128$

MO vs. MO Fall $\chi^2_1 = .1661$, $p = .6756$

Site	WSA	Class	P/F Versar	P/F MO	WSA- RAM	Class	P/F	RAM- WSA	Class	P/F
Youngs Creek	42.52	PBS	Pass	Fail	20	FBS	Pass	12	PBS	Fail
Puzzle Creek	45.41	FBS	Pass	Pass	20	FBS	Pass	20	FBS	Pass
Brush Creek	33.04	PBS	Pass	Fail	18	FBS	Pass	20	FBS	Pass
Coon Creek	32.56	PBS	Pass	Fail	16	FBS	Pass	16	FBS	Pass
Burnt Fork Creek	26.11	NBS	Fail	Fail	16	FBS	Pass	16	FBS	Pass
Cub Creek	70.64	FBS	Pass	Pass	18	FBS	Pass	20	FBS	Pass
Sandy Creek	39.73	PBS	Pass	Fail	16	FBS	Pass	18	FBS	Pass
Sni A Bar Creek	60.72	FBS	Pass	Pass	16	FBS	Pass	20	FBS	Pass
Howard Creek	39.18	PBS	Pass	Fail	12	PBS	Fail	10	PBS	Fail
E. Fork Crooked R.	34.74	PBS	Pass	Fail	18	FBS	Pass	20	FBS	Pass
Honey Creek	57.7	FBS	Pass	Pass	20	FBS	Pass	16	FBS	Pass
Locust Creek	17.38	NBS	Fail	Fail	20	FBS	Pass	20	FBS	Pass
Briar Creek	41.6	PBS	Pass	Fail	8	NBS	Fail	12	PBS	Fail
Bryant Creek	60.6	FBS	Pass	Pass	18	FBS	Pass	18	FBS	Pass
L. Pomme de Terre	20.6	NBS	Fail	Fail	18	FBS	Pass	10	PBS	Fail
Sals Creek (visit 1)	28.45	NBS	Fail	Fail	12	PBS	Fail	16	FBS	Pass
L. Dry Wood Creek	67.12	FBS	Pass	Pass	20	FBS	Pass	20	FBS	Pass
Blair Creek	48.95	PBS	Pass	Fail	18	FBS	Pass	20	FBS	Pass
Prairie Creek	28.75	NBS	Fail	Fail	16	FBS	Pass	16	FBS	Pass
Sals Creek (visit 2)	31.2	PBS	Pass	Fail	16	FBS	Pass	16	FBS	Pass
Easter Creek	51.28	FBS	Pass	Pass	20	FBS	Pass	20	FBS	Pass
Walnut Creek	43.91	PBS	Pass	Fail	20	FBS	Pass	20	FBS	Pass
M. Fork Tebo Creek	52.34	FBS	Pass	Pass	18	FBS	Pass	18	FBS	Pass
Brush Creek	54.93	FBS	Pass	Pass	18	FBS	Pass	18	FBS	Pass
Sulphur Creek	40.58	PBS	Pass	Fail	16	FBS	Pass	16	FBS	Pass

Comparability at the Assessment Level

Thresholds of Degradation:

WSA

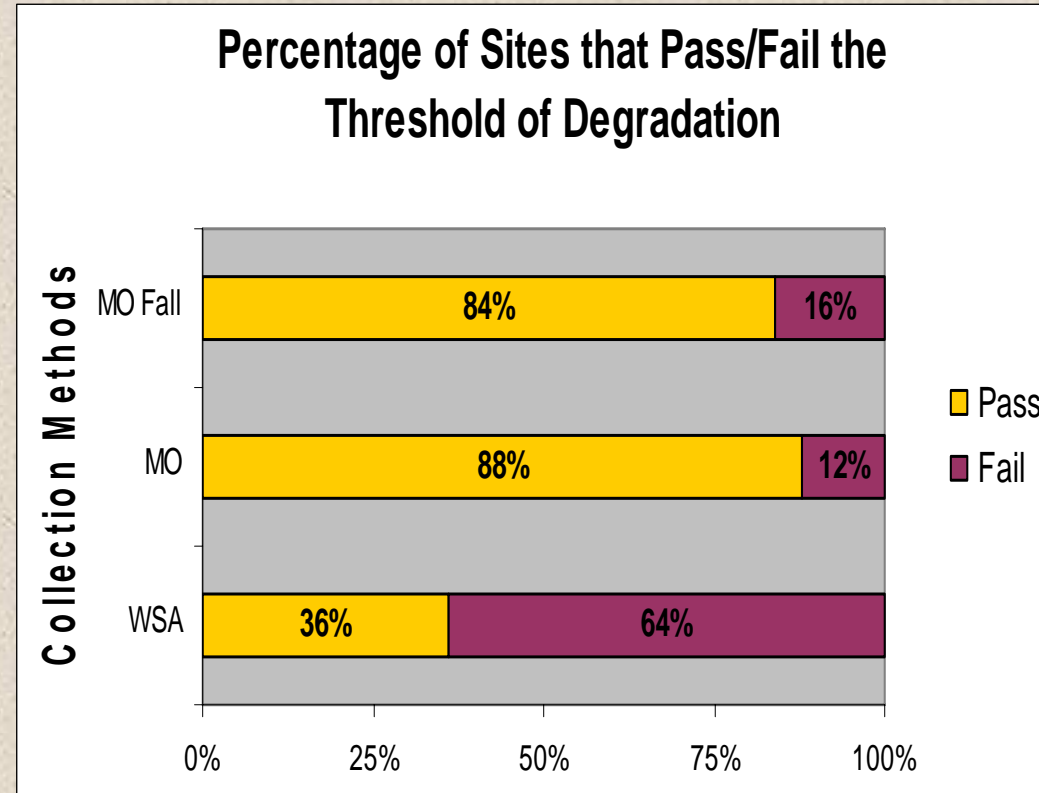
Pass = FBS

Fail = PBS, NBS

MO & MO Fall

Pass = FBS

Fail = PBS, NBS



Chi-Square test results:

WSA vs. MO $\chi^2_1 = 14.3463$, $p = .0002$

WSA vs. MO Fall $\chi^2_1 = 12.0000$, $p = .0005$

MO vs. MO Fall $\chi^2_1 = 0.1661$, $p = .6756$

Possible Reasons for Differences

- Lab procedures
 - Counts
 - ID's
- Field methods
 - Random vs. targeted
 - Effort

Conclusions

- Not comparable at the data level
- Mostly not comparable at the assessment level
 - Not comparable at the condition class assessment level
 - Not comparable at the Pass/Fail level (depending on the criteria used)

Acknowledgements

- Matt Combes – PI for MO
- Bill Mabee – MDC Lab manager & fieldwork
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