

Methods Comparability in Oklahoma's Low Gradient Streams

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Roadmap

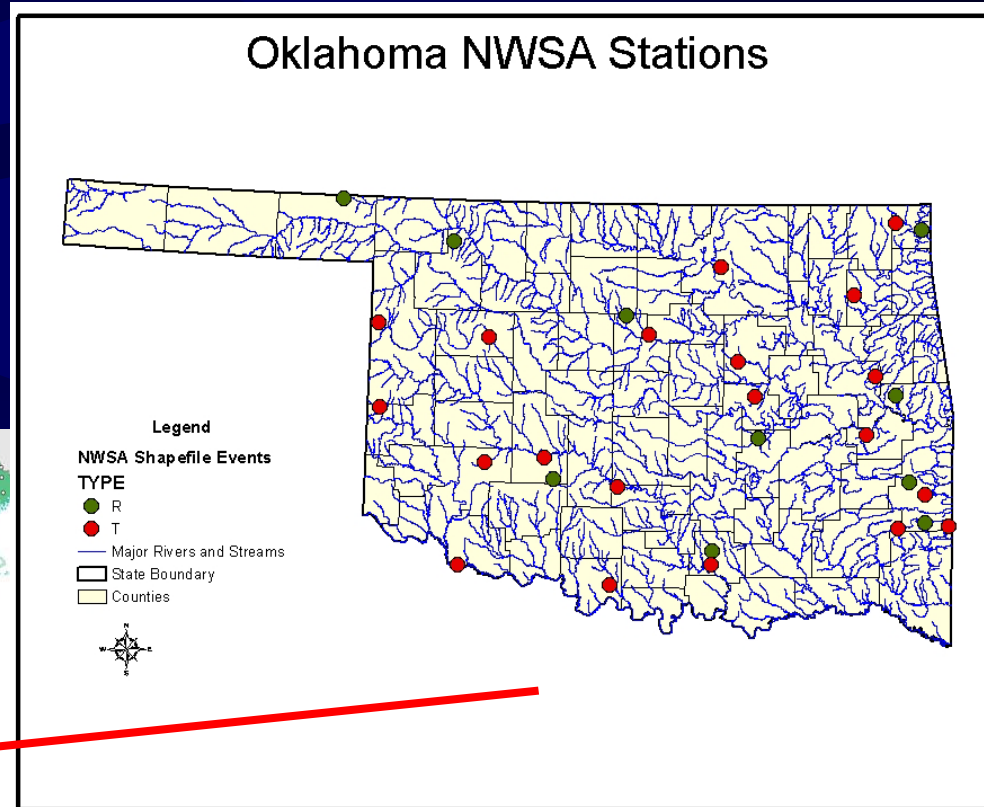
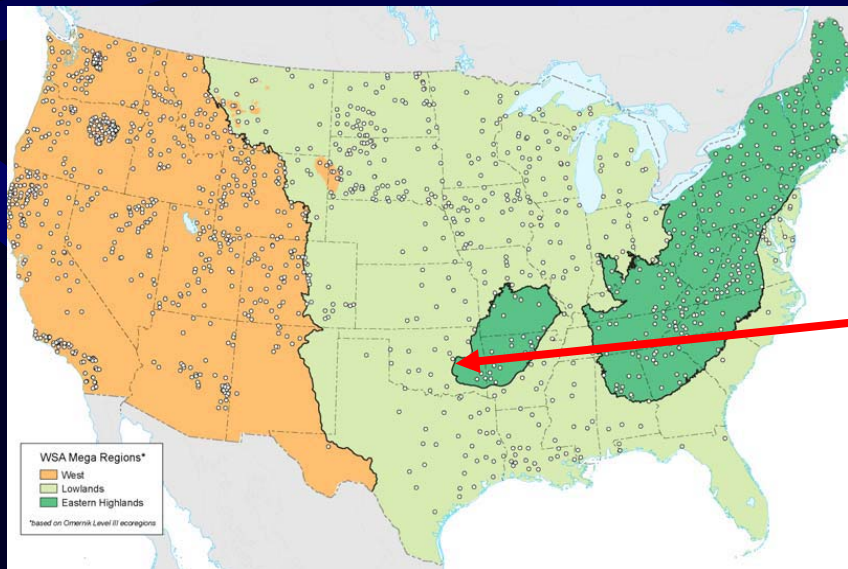
- **Oklahoma's part in the National Wadeable Streams Assessment (NWSA) and Methods Comparability**
- **What does an Oklahoma low gradient stream look like?**
- **A look at the data and some answers—maybe??**
- **How can we do it better?**

Questions???

- Do different sampling methods produce similar or different answers?
- Can the results of different sampling methods be combined to produce a national assessment?
- Is it realistic to expect states to change methods?

Oklahoma's Part in the NWSA

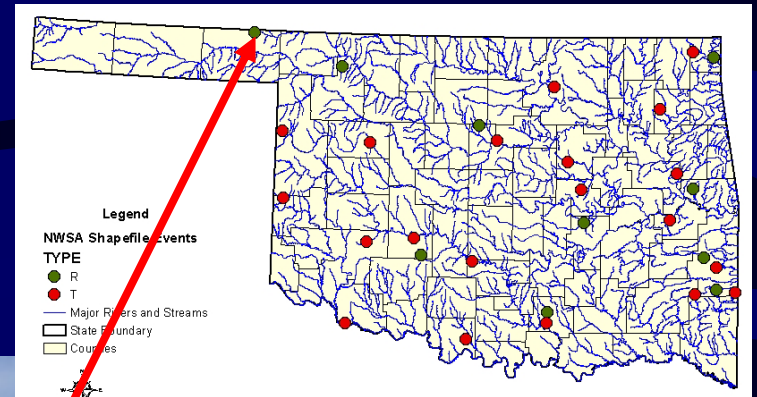
- Target Sites
 - 20 sites visited with comparability on 18 (Red River site excluded and West Buffalo Creek had sample issues)
 - 15 of these sites are low gradient
- Reference Site Selection
 - 10 stations visited with comparability on 8 (Trader's creek had sample issues)
 - 4 of these sites are low gradient
 - Station's were ecoregion-based
 - Used OCC reference site work and best professional judgment



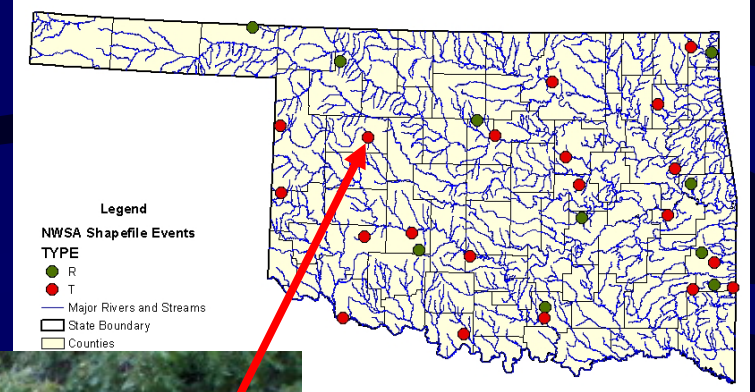
NWSA Parametric Coverage

- Typical *in-situ* parameters such as pH, dissolved oxygen, temperature, specific conductance
- Nutrients
- Major cations and anions
- Variety of metals
- Benthic Macroinvertebrates—single habitat
- Periphyton
- Physical Habitat
- Stream Flow

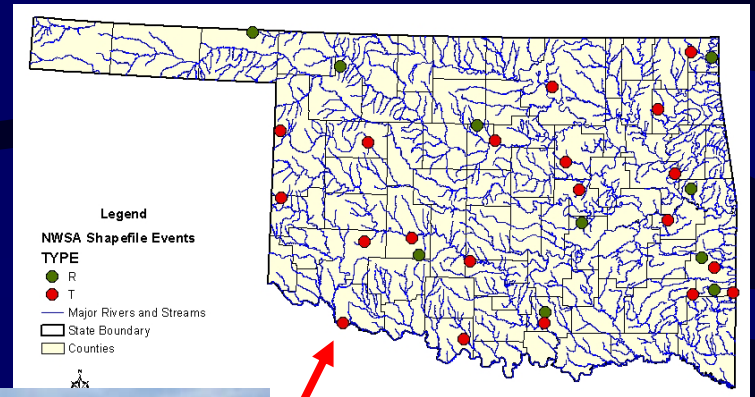




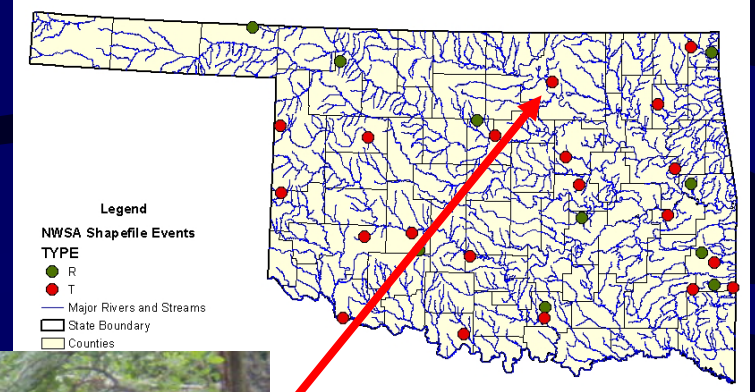
Cimmaron River, Beaver County, Southwest Tablelands Ecoregion



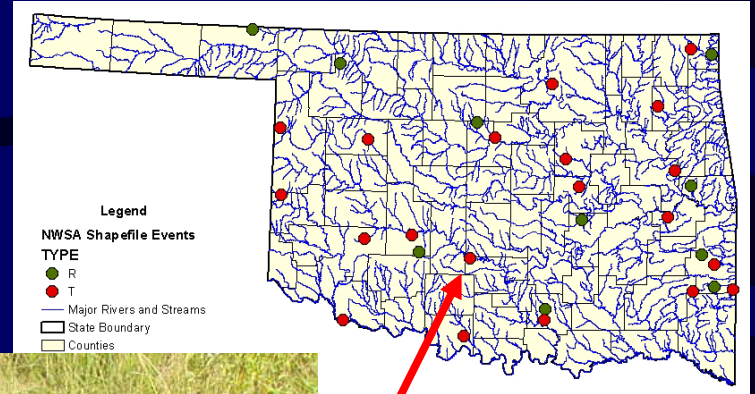
Trail Creek, Dewey County, Central Great Plains Ecoregion



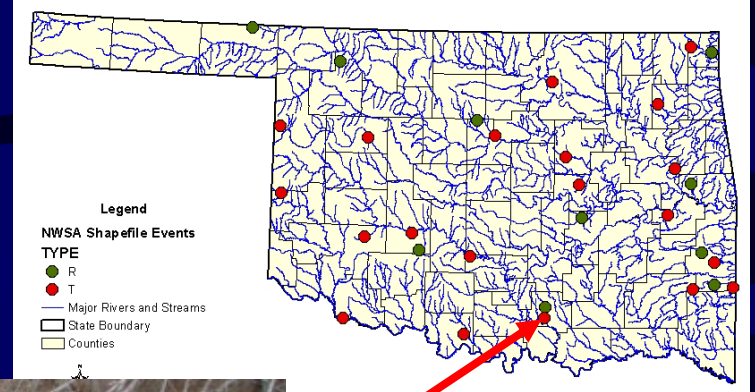
Red River, Tillman County, Central Great Plains Ecoregion



Grey Horse Creek, Osage County, Flint Hills Ecoregion



Hybarger Creek, McClain County, Central Great Plains Ecoregion



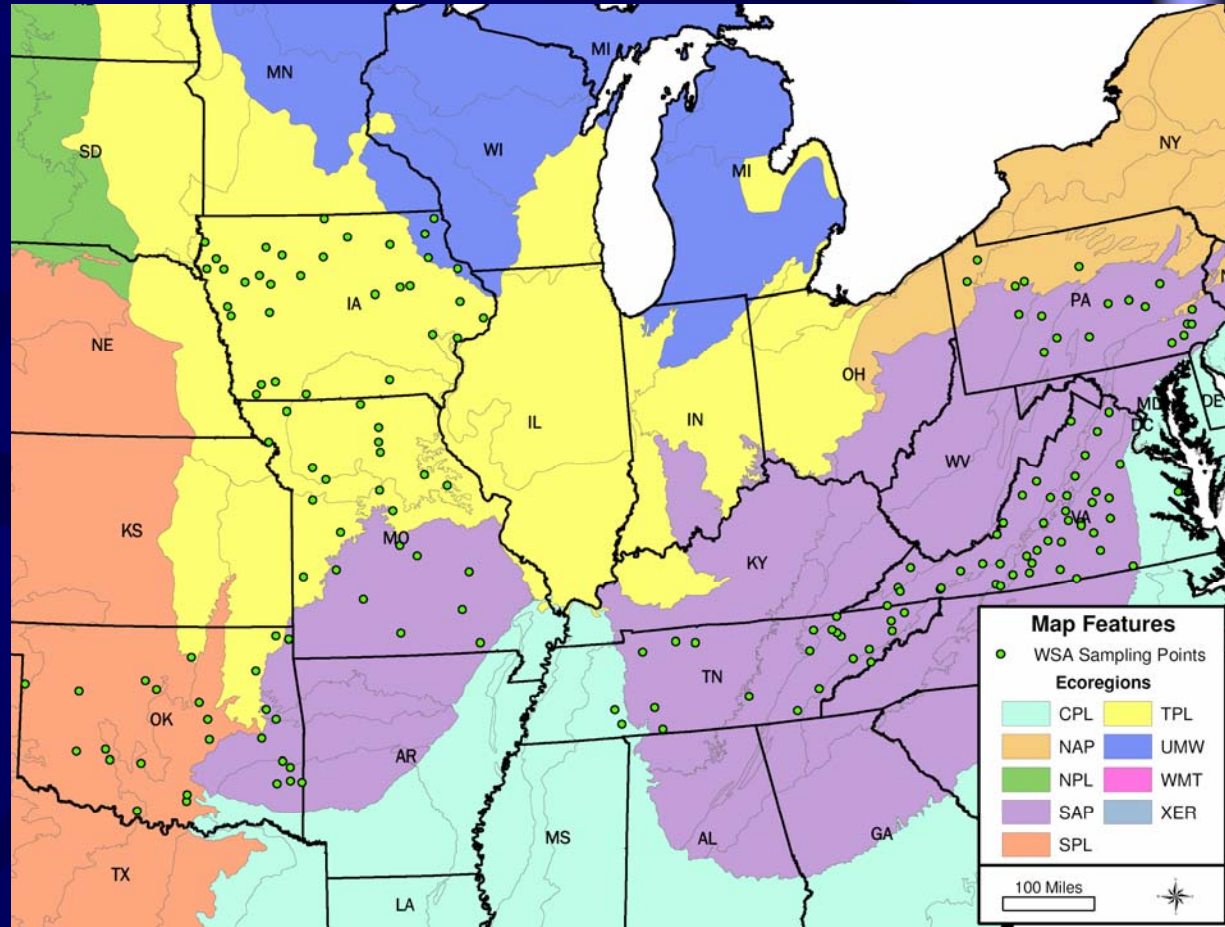
Unknown Creek in the Arbuckle Uplift, Johnston County, Central Oklahoma/Texas Plains Ecoregion

Methods Comparability Study (MCS)



MCS Design

- Spatially consists of Fourteen WSA Cooperators
- Incorporates both target and reference sites
- Side-by-side collections using multiple methods (Oklahoma compared W-EMAP to State RBP)



Objectives of the MCS

- **Compare state to federal methods to determine the extent of the difference between the methods.**
- **Is needed in future studies to assess the condition of the Nation's waters.**
- **Allays the need for standardized protocols across states**
- **Looked at both physical habitat and benthic macroinvertebrate sampling methodologies**

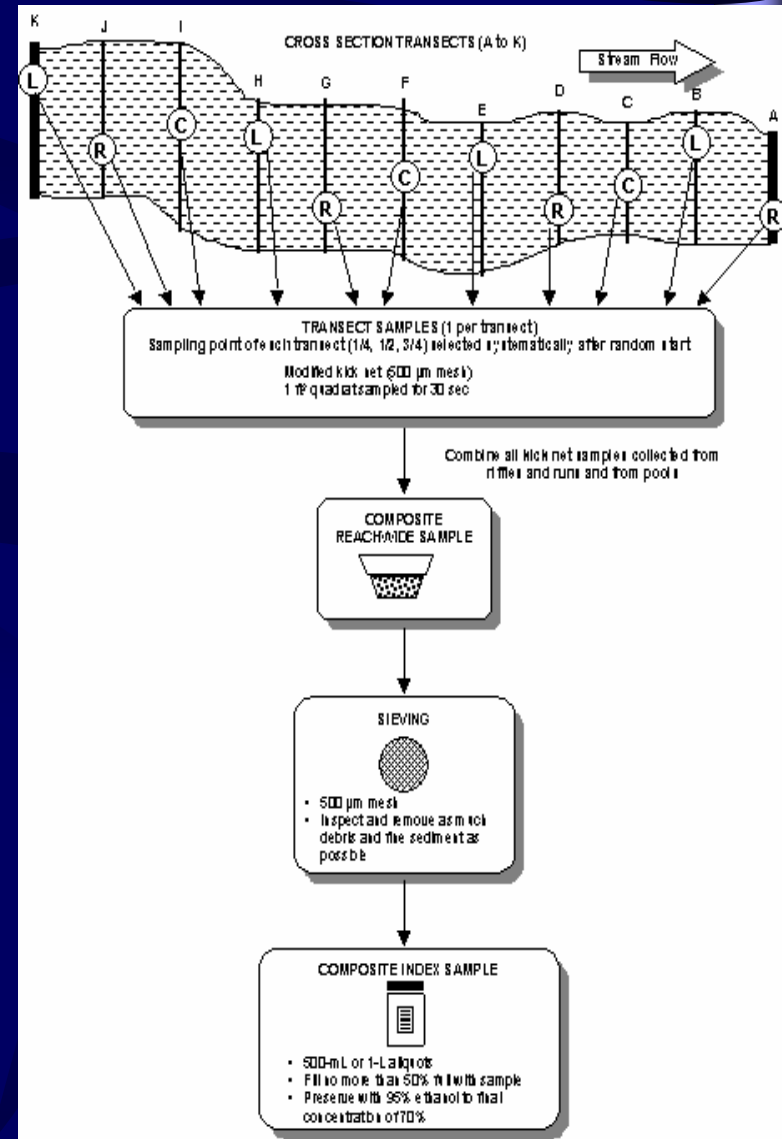
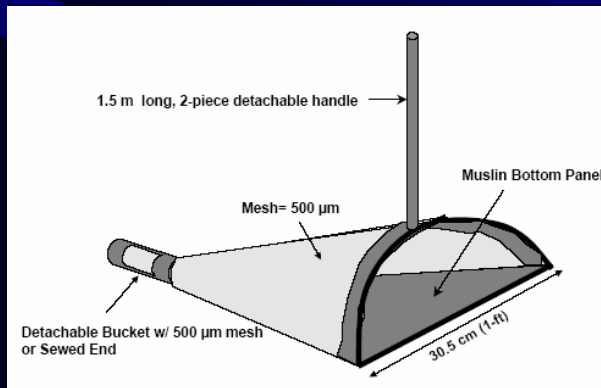
Oklahoma's Benthic Macroinvertebrate Collections

- **Source of Method**
 - Rapid Bioassessment Protocol adopted from Plafkin, et al (1999)
 - Method adopted by Oklahoma state agencies in OWRB Technical Document 99-3 (1999)
 - Use is codified into Oklahoma Administrative Code (OAC) through the Oklahoma Water Quality standards (OAC 785:45) and the Use Support Assessment Protocols (OAC 785:46)
- **Oklahoma RBP Method**
 - Multi-habitat method targeting richest habitats in flowing water over a 400-800 meter reach
 - 500 μ M nets and sieves are used
 - Composite Riffle—3 kicks in a fast, medium, and slow riffle
 - Streamside Vegetation—reachwide 3-minute collection of composited jabs
 - Woody Debris—reachwide 5-minute collection of composited scrapes/picks
 - 100-150 organism subsample with a large and rare scan
 - Identified to lowest practical taxonomic level



NWSA Methods—Benthic Macroinvertebrate Collections

- Sample taken reach wide
- Kick sample with modified D-frame net at 11 equidistant transects
- Work L, R, C
- Composite Sample
- Processed at any of a number of EPA contract labs
- 300-500 organism subsample
- Identified to lowest taxonomic level



MCS Results

- **Meetings**
 - National meeting of cooperators in Baltimore, MD
 - Regional meeting of cooperators in Lawrence, KS
- **Have results to date on only 6 states**
- **Focused comparability on macroinvertebrates**
 - Evaluate relationships of Indices of Biotic Integrity (IBIs)
 - Evaluate relationships of condition class assessment
 - Evaluate relationships of pass-fail assessment
 - Investigate effects of natural slope gradient
 - Investigate effects of stressor gradient
 - Investigate relationships with biological condition gradient

Data Analysis

- Data Sets

- WSA_WSA IBI—is the WSA dataset processed through the WSA IBI (Courtesy of Versar, Inc. and USEPA, OWOW)
- WSA_Ok IBI—is the WSA dataset processed through the Oklahoma IBI
- OK_Ok IBI—is the OK dataset processed through the Oklahoma IBI

- Oklahoma IBI

- Metrics are Taxa Richness, EPT Taxa Richness, EPT Abundance, Modified Hilsenhoff Biotic Index, EPT/Chironomidae Proportion, Percent Dominant Taxa, and Shannon-Weaver Diversity
- 5 condition classes including Reference (Good), Non-impaired (Good), Slightly Impaired (Fair), Moderately Impaired (Poor), and Severely Impaired (Poor)

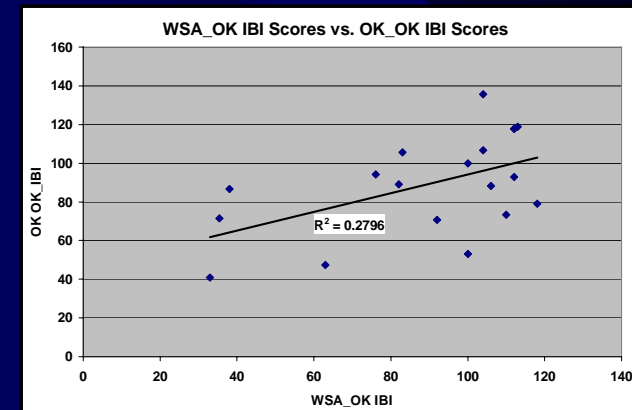
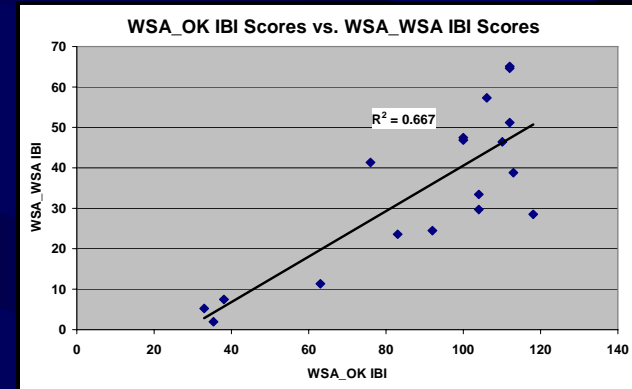
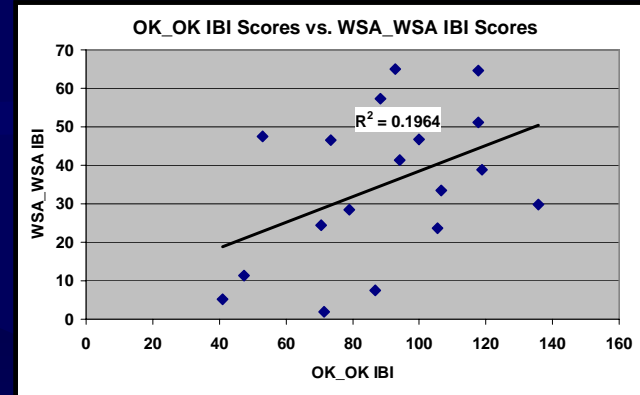
Data Analysis (continued)

- **Data Analysis**
 - Evaluate relationships of Indices of Biotic Integrity (IBIs)
 - Evaluate relationships of condition class assessment
 - Evaluate relationships of pass-fail assessment
 - **Make comparisons of IBI scores to some habitat and land use metrics**
 - **Look at some simple boxplots of data to see where some variation may exist**
- **Data Issues**
 - **Subsample counts not standardized between datasets**
 - **Taxonomic resolution**
 - **Did not compare Oklahoma Data to NSA IBI**
 - **Sample size is small**
 - **Data collection issues including sample handling and weather**
 - **Oklahoma IBI is well used but application of reference was a first run**
 - **Do not look at biological condition gradient in this analysis**

Relationships of Indices of Biotic Integrity (IBIs)

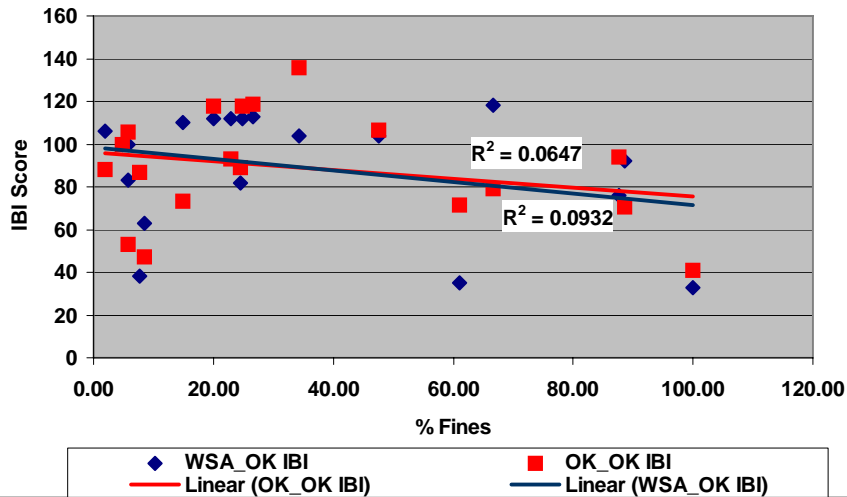
- Value of r^2 for Oklahoma Low Gradient Stream Data
 - WSA_Ok IBI vs. Ok_Ok IBI 0.20
 - WSA_WSA IBI vs. WSA_Ok IBI 0.68
 - WSA_WSA IBI vs. OK_Ok IBI 0.28

	WSA_WSA IBI	WSA_OK IBI	OK_OK IBI
mean	34.7	89.1	88.9
median	36.1	100.0	89.0
p25	23.8	79.0	72.4
p75	47.3	111.0	106.1
minimum	23.8	79.0	72.4
maximum	65.1	118.0	135.7

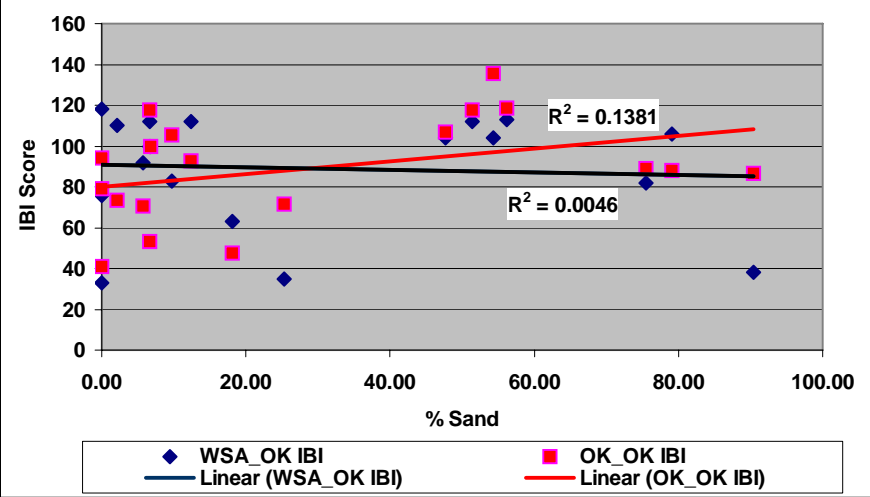


Comparison of WSA_OK IBI and OK_OK IBI Scores to Various Habitat Metrics

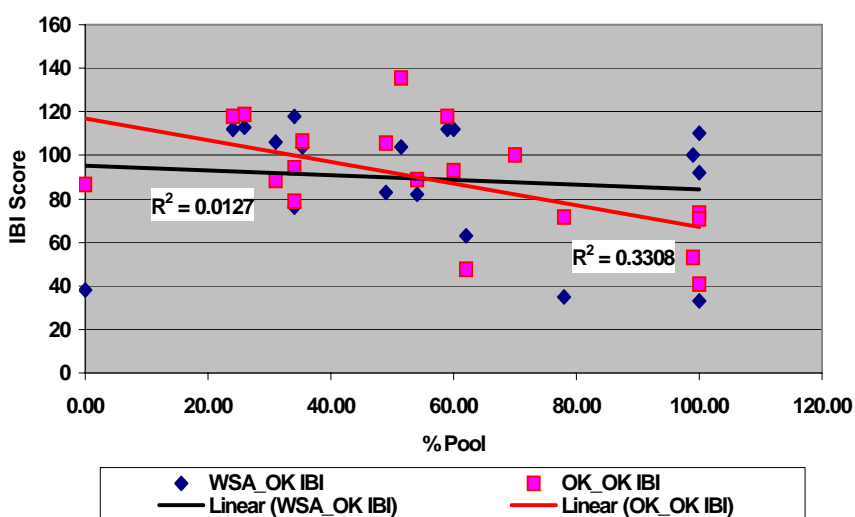
IBI scores vs. % Fines



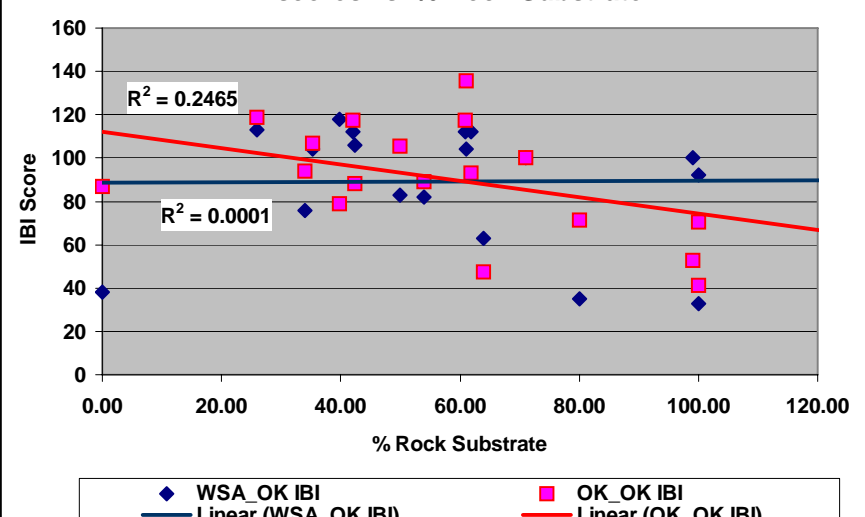
IBI scores vs. % Sand



IBI scores vs. % Pool

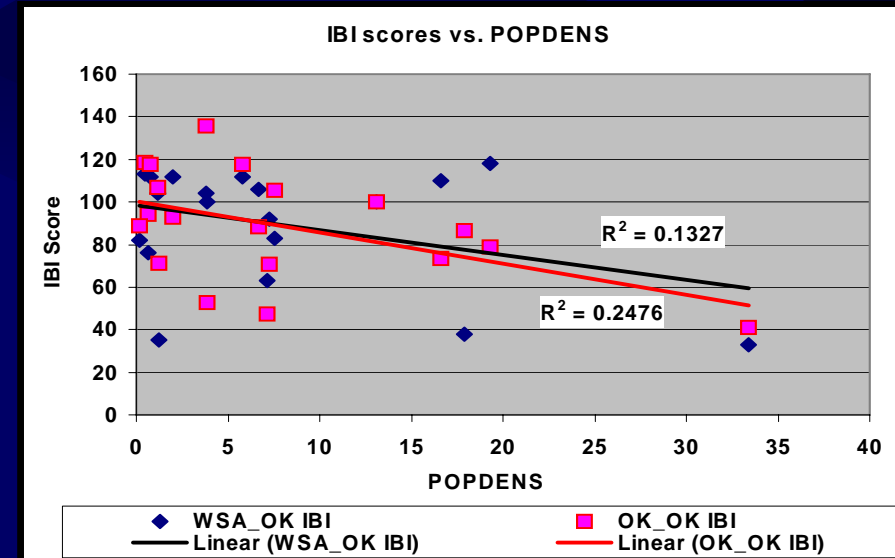
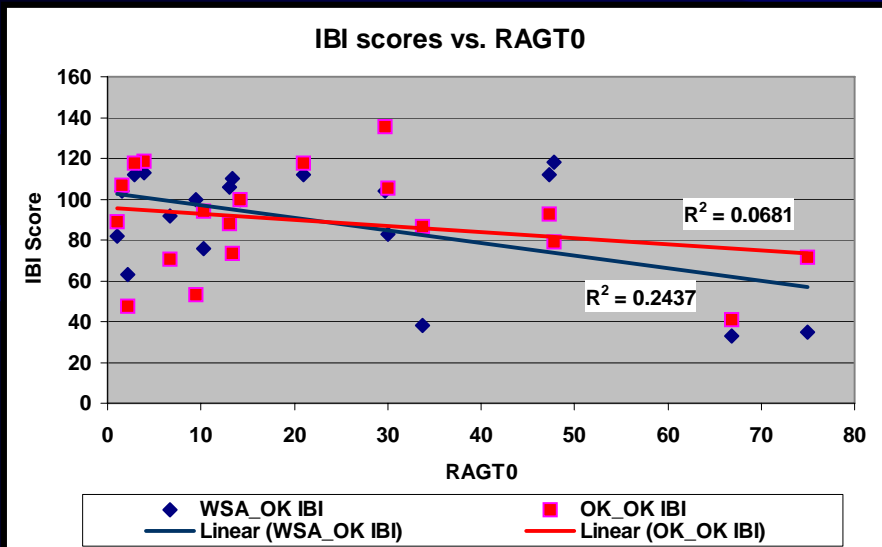
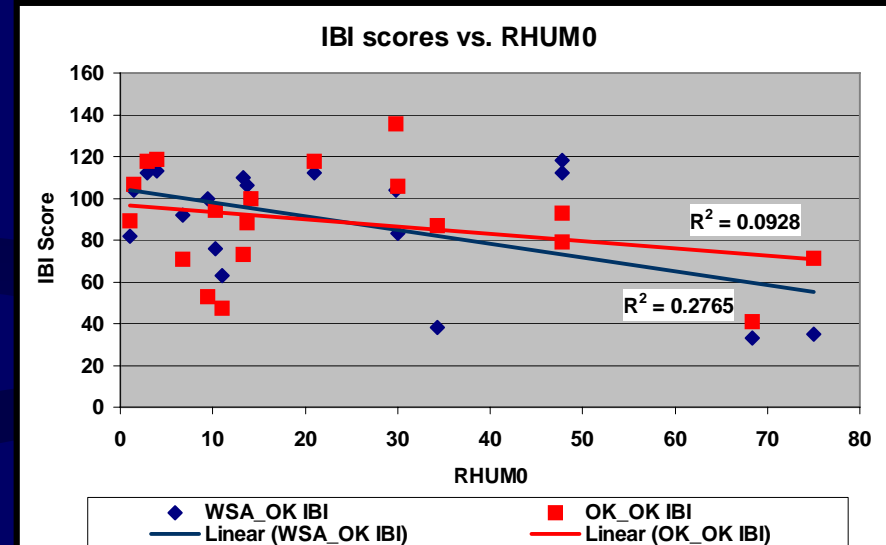


IBI scores vs. % Rock Substrate



Comparison of WSA_OK IBI and OK_OK IBI Scores to Several Land Use Metrics

- **RHUM0**—% of human land use at the site
- **RAGT0**—% of total agricultural land use at the site
- **POPDENS**—population density



Relationship of Condition Class Assessment

- **WSA Method/WSA IBI vs. OK Method/OK IBI**

- Not well compared
- 8 of 18, or 44% have different class

	OK_OK IBI			
WSA_WSA IBI	Poor	Fair	Good	Total
Poor	2	3	3	8
Fair	0	5	0	5
Good	0	2	3	5
Total	2	10	6	18

- **WSA Method/WSA IBI vs. WSA Method/OK IBI**

- Not well compared
- 9 of 18, or 50% have different class

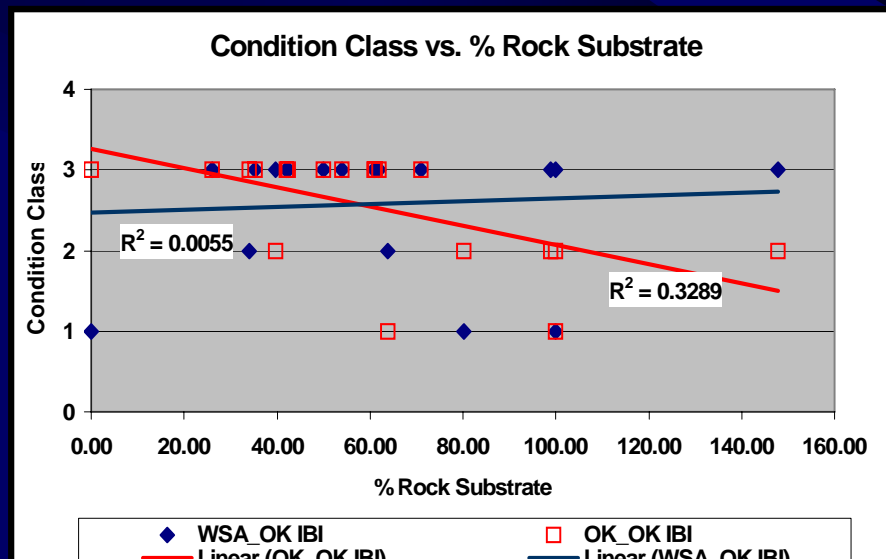
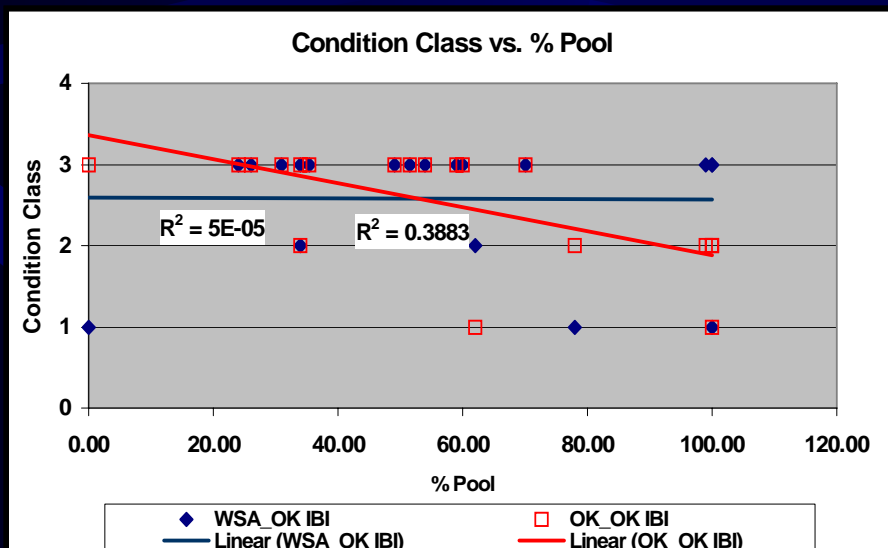
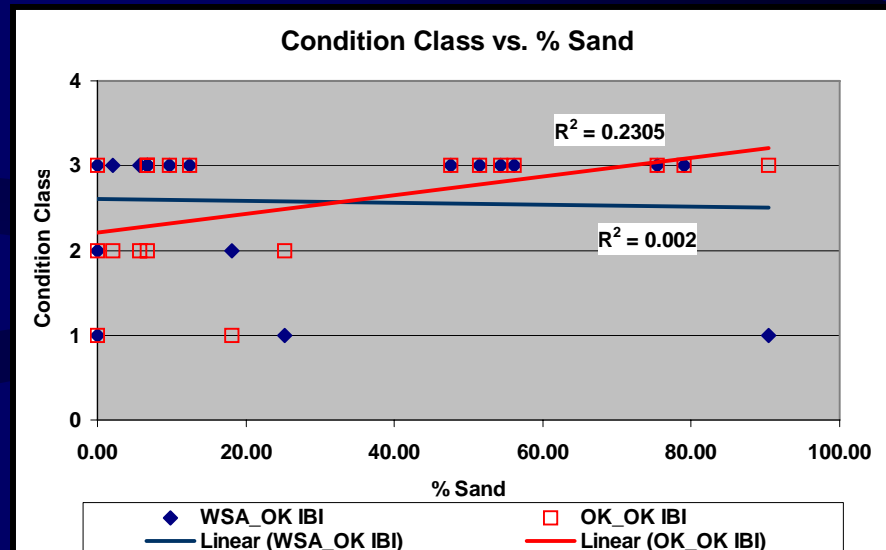
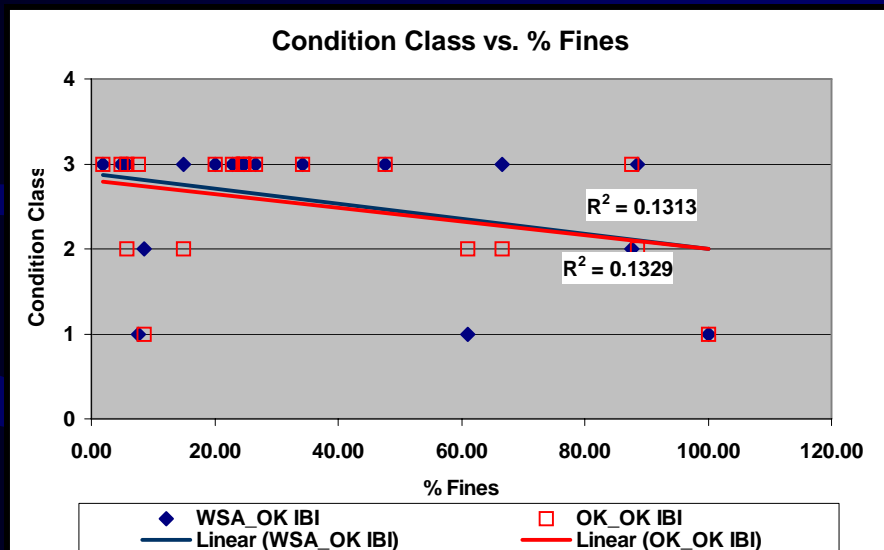
	WSA OK IBI			
WSA_WSA IBI	Poor	Fair	Good	Total
Poor	3	1	4	8
Fair	0	1	4	5
Good	0	0	5	5
Total	3	2	13	18

- **WSA Method/OK IBI vs. OK Method/OK IBI**

- Not well compared
- 9 of 19, or 42% have different class
- However, 50% of the divergence is at the Fair/Good classifications

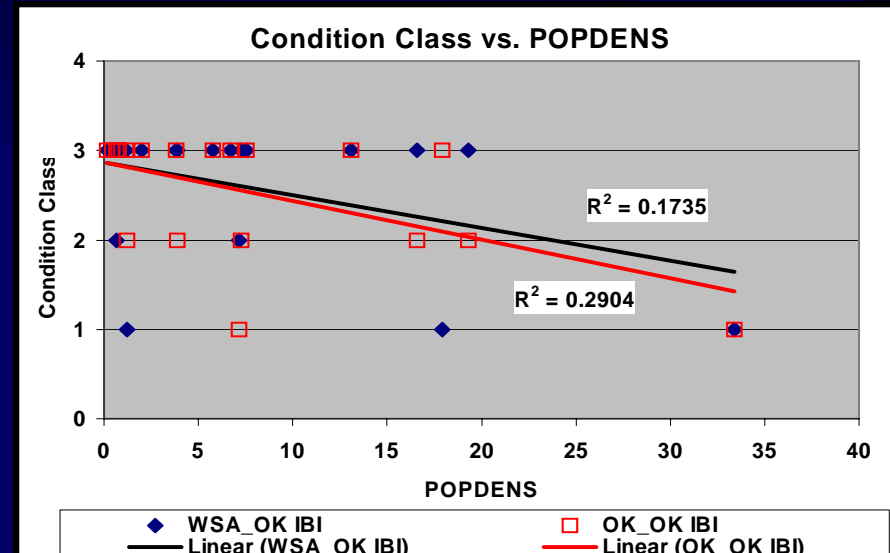
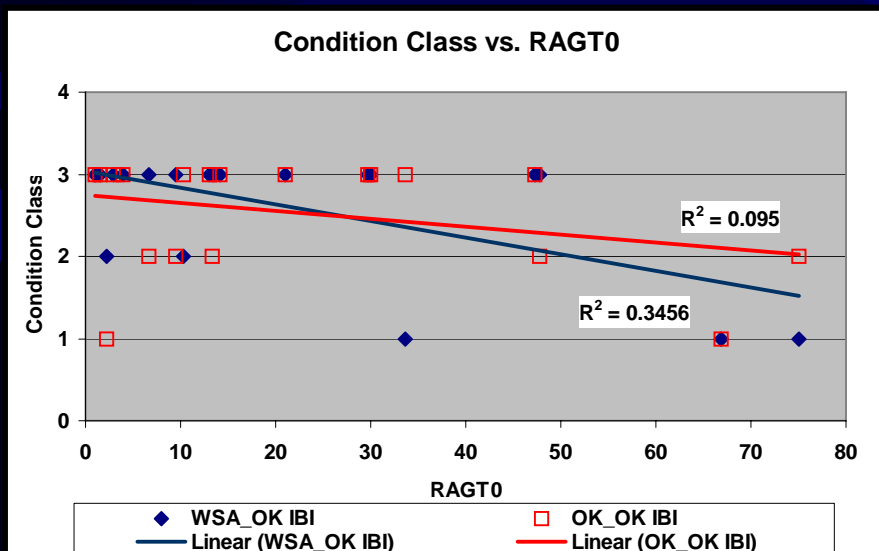
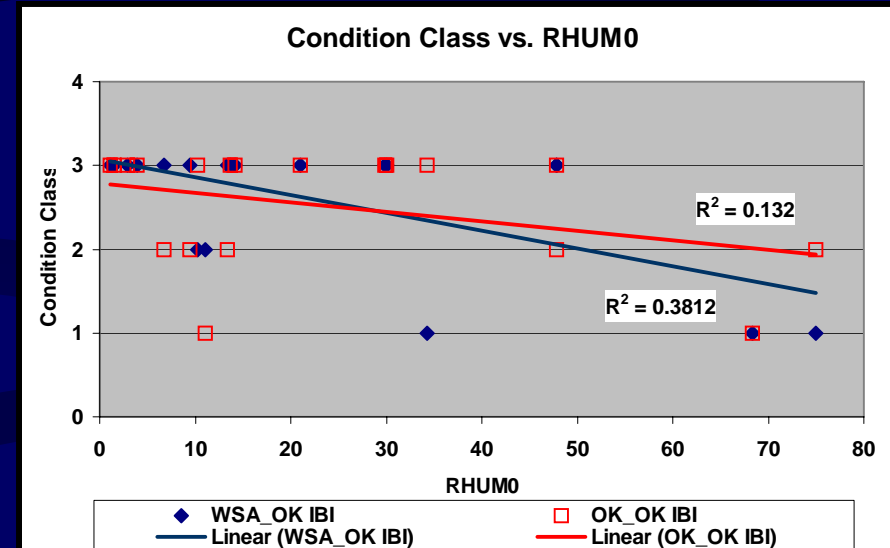
	OK_OK IBI			
WSA_OK IBI	Poor	Fair	Good	Total
Poor	1	1	1	3
Fair	1	0	1	2
Good	0	4	10	14
Total	2	5	12	19

Comparison of WSA_OK IBI and OK_OK IBI Condition Classifications to Various Habitat Metrics



Comparison of WSA_OK IBI and OK_OK IBI Condition Classifications to Several Land Use Metrics

- **RHUM0**—% of human land use at the site
- **RAGT0**—% of total agricultural land use at the site
- **POPDENS**—population density



Relationship of Pass/Fail Assessment

- **WSA Method/WSA IBI vs. OK Method/OK IBI**

- Not well compared
- 6 of 18, or 33% have different status
- More sites impaired per the WSA IBI

	OK OK IBI		
WSA_WSA IBI	Fail	Pass	Total
Fail	2	6	8
Pass	0	10	10
Total	2	16	18

- **WSA Method/WSA IBI vs. WSA Method/OK IBI**

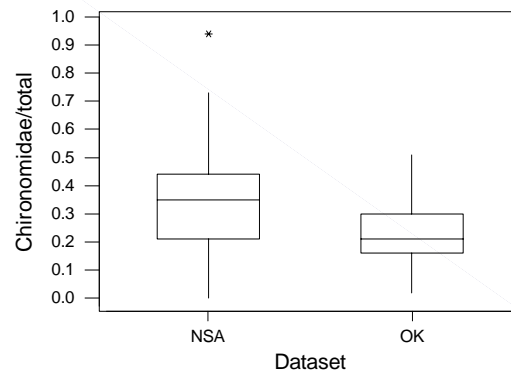
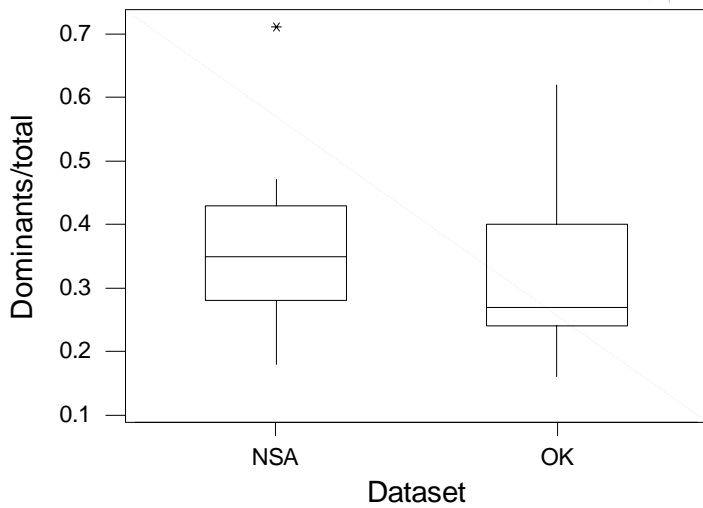
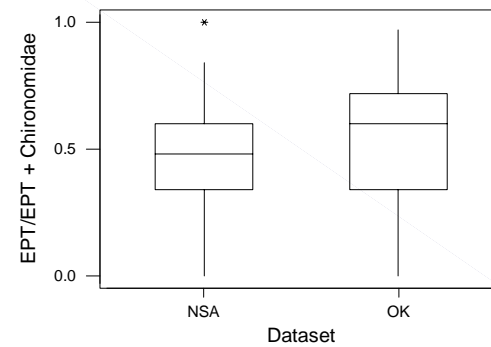
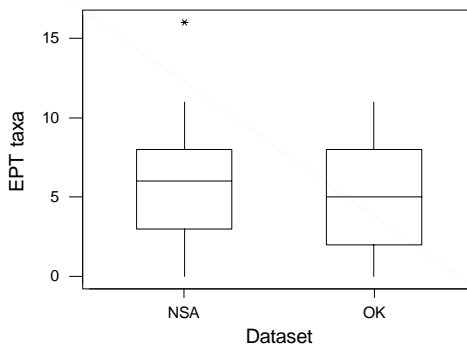
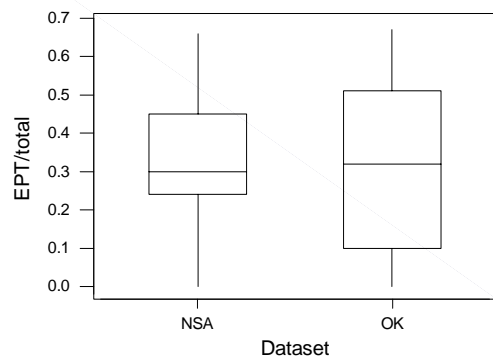
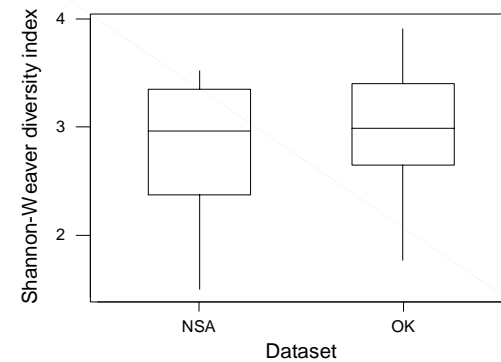
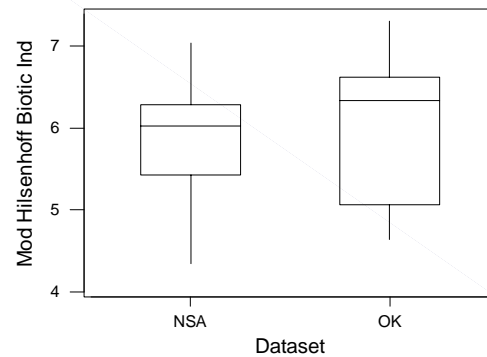
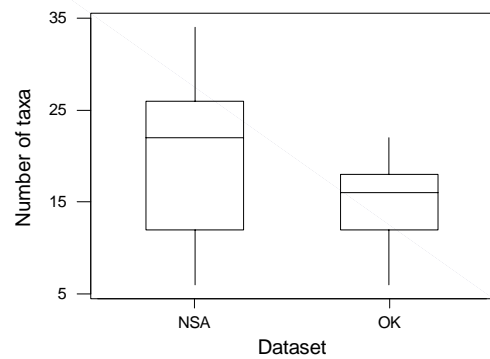
- Not well compared
- 5 of 18, or 28% have different status
- More sites impaired per the WSA IBI

	WSA OK IBI		
WSA_WSA IBI	Fail	Pass	Total
Fail	3	5	8
Pass	0	10	10
Total	3	15	18

- **WSA Method/OK IBI vs. OK Method/OK IBI**

- Well compared
- 3 of 19, or 16% have different status

	OK OK IBI		
WSA_OK IBI	Fail	Pass	Total
Fail	1	2	3
Pass	1	15	16
Total	2	17	19



Answers???

- Do different sampling methods produce similar or different answers?
- Can the results of different sampling methods be combined to produce a national assessment?
- The r^2 values between IBI scores show little to some relationship
- When use different IBI's see poor comparability between both condition classes and pass/fail designations
- Using same IBI
 - See poor comparability at the condition class level but 50% comes at the fair/good classifications
 - However, when use same IBI see a little better comparability between pass/fail designations
 - Relationship of datasets to habitat and land use metrics is a mixed bag

Answer

- **Is it realistic to expect states to change methods?**
 - **No**
 - **Not economically feasible**
 - **Not politically practical**
 - **Most states have developed, adopted and revised methods that fit that state**
 - **Are following RBP's adopted and pushed long ago by the EPA**
 - **RBP's have been used effectively by the states to both screen waterbodies and determine impairment status of streams**

So where can we go from here?

- **Need to invest money in comparability work**
- **Investigate comparability at all levels from sampling techniques to metric and index development**
- **In the end need to decide if the same final answer can be obtained**
- **Studies need to be more tightly designed and controlled**
- **Need to continue developing the good working relationship that came out of the national study and continues into the National Lakes Study**

Questions?

