State of Oklahoma

OWRB

WATER RESOURCES BOARD

the water agency

Oklahoma's Large River Sampling Program

Oklahoma Clean Lakes and Watersheds Association

April 9, 2014, Stillwater, OK

Monty Porter, Data and Quality Manager

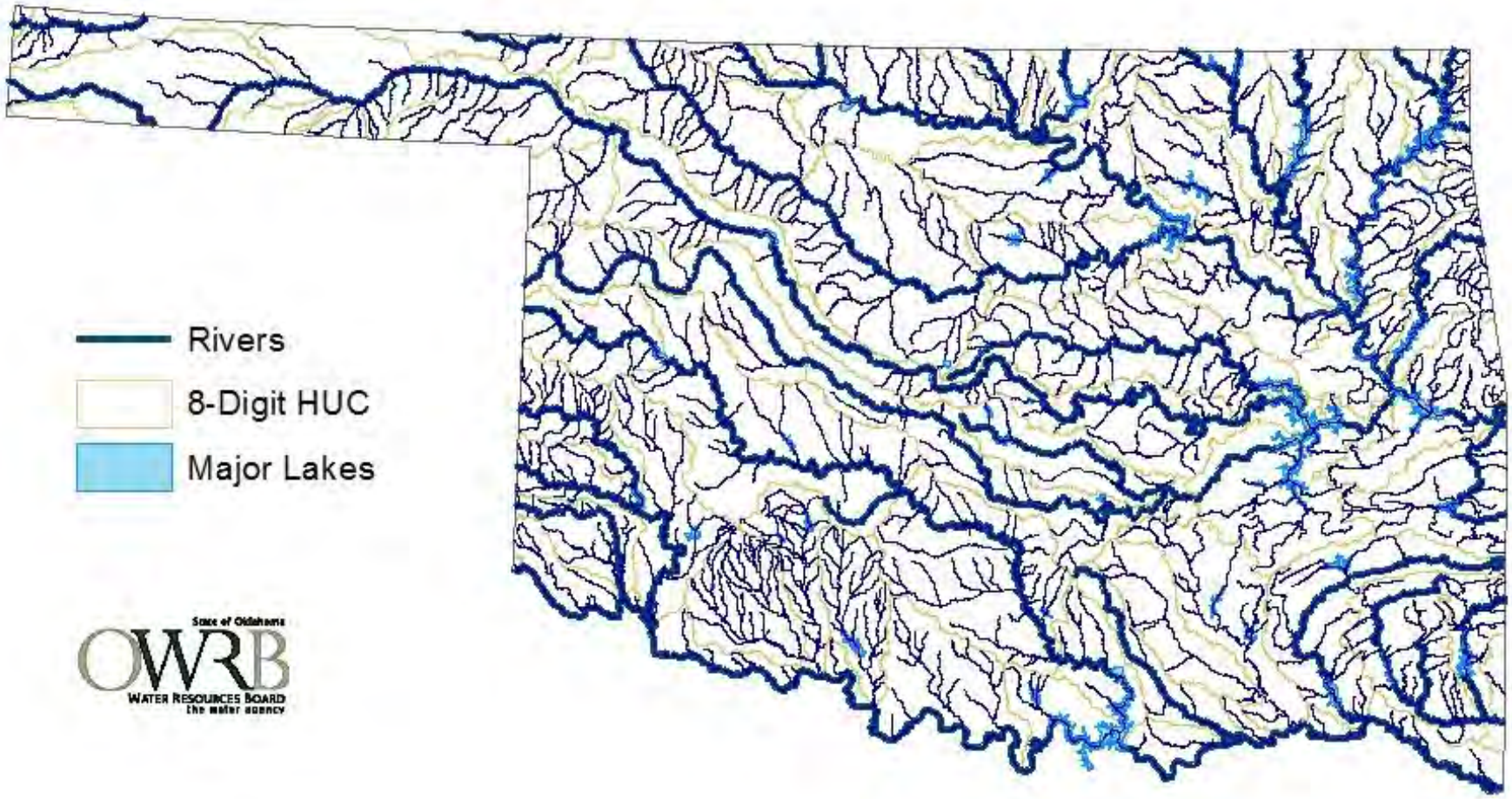
Josh Bailey, Biological Team Leader

OWRB Water Quality Programs Division

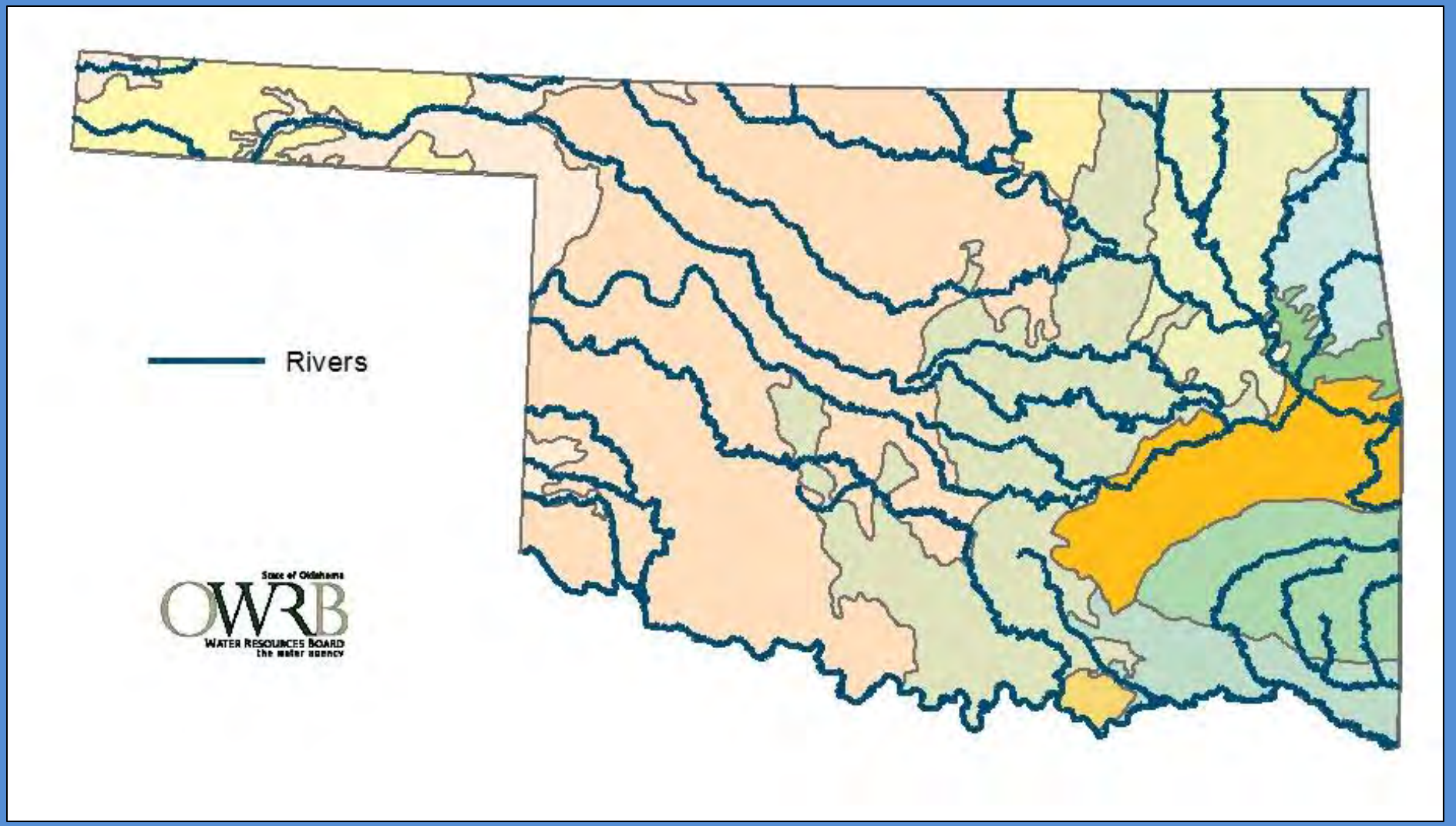
Oklahoma's Diversity

Large Rivers in Context of Small Rivers

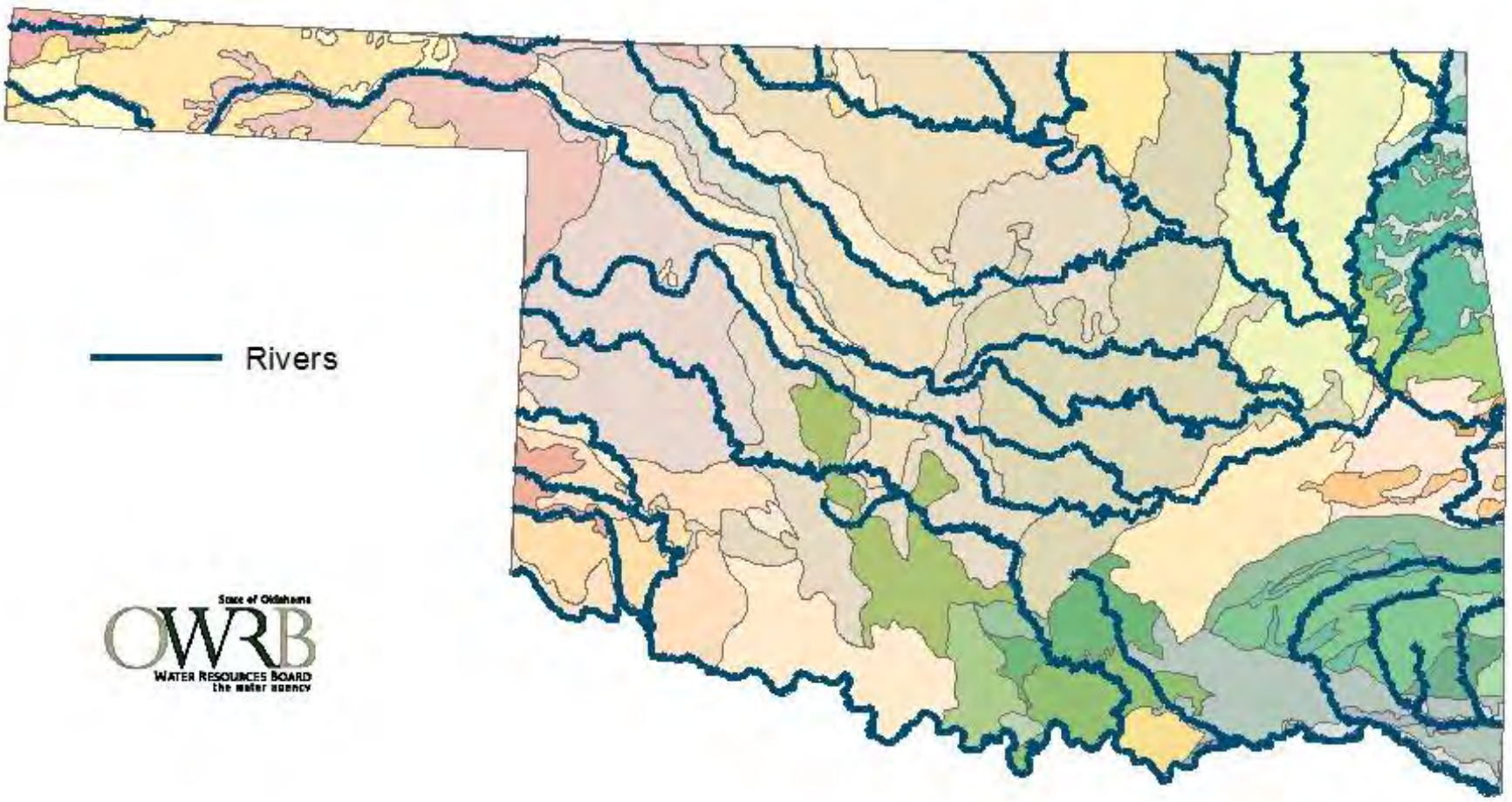
General Hydrology of Oklahoma



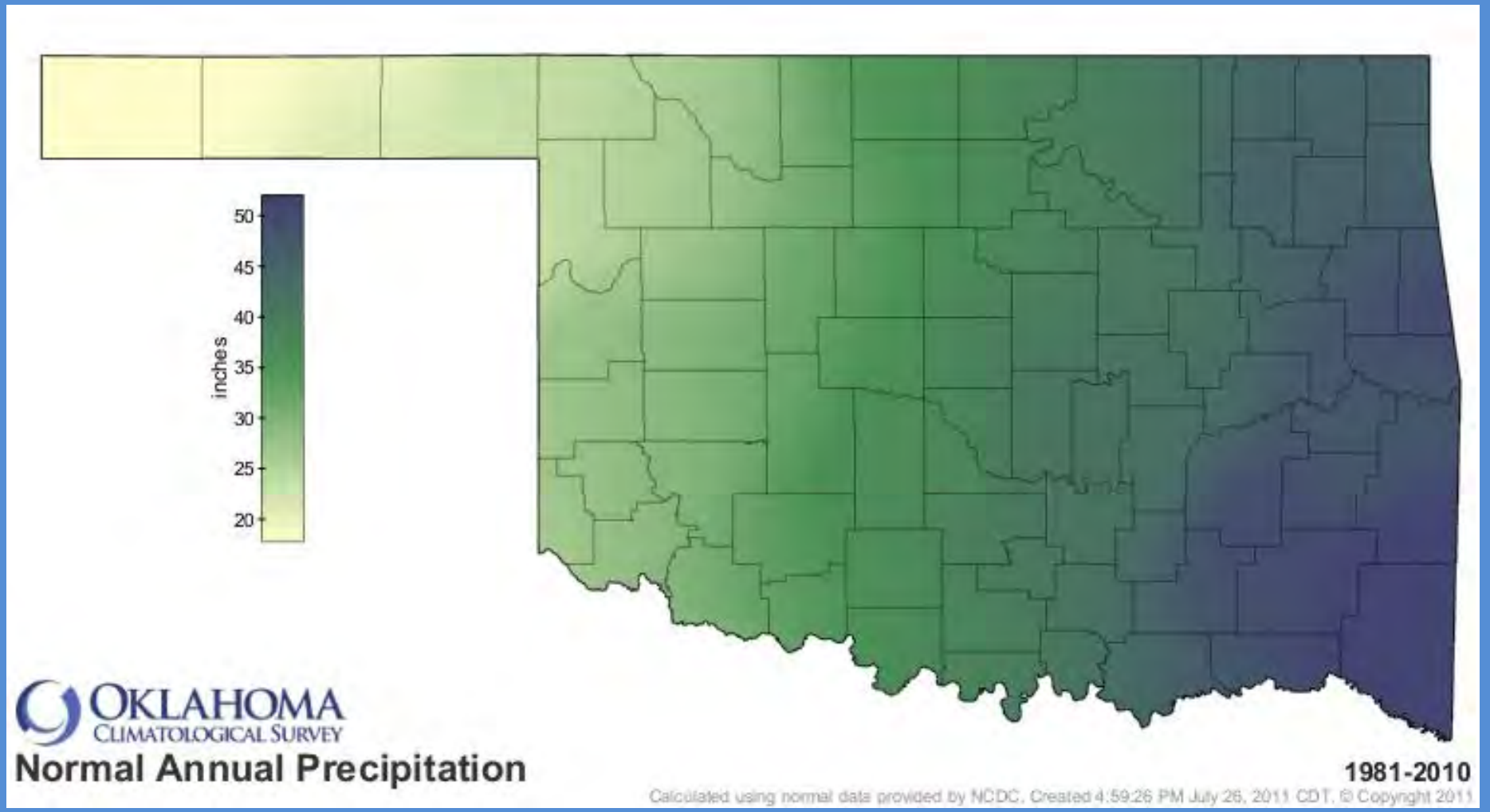
Ecological Diversity (12 Omernik III Ecoregions)



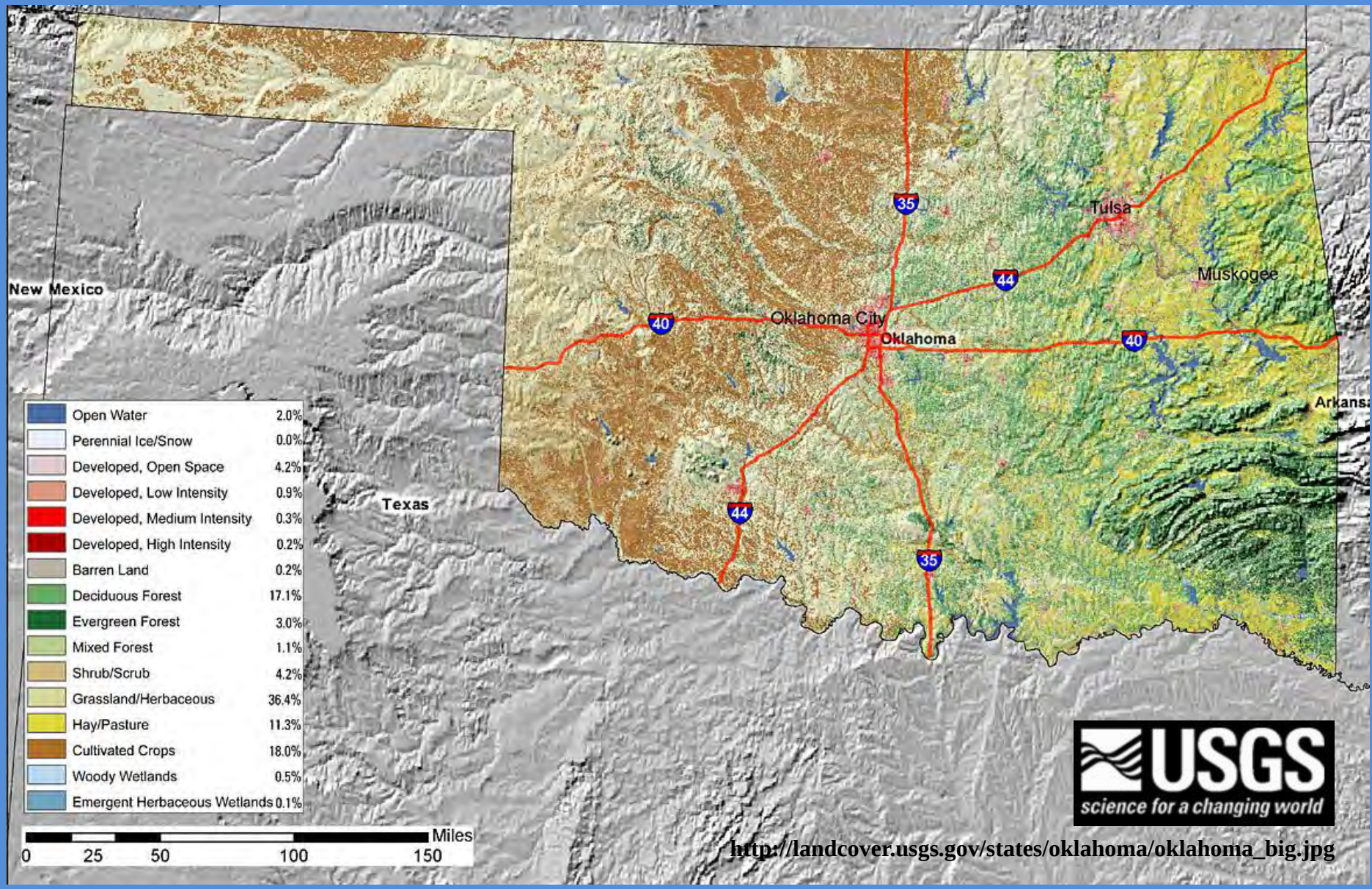
Ecological Diversity (46 Omernik IV Ecoregions)



Oklahoma Rainfall



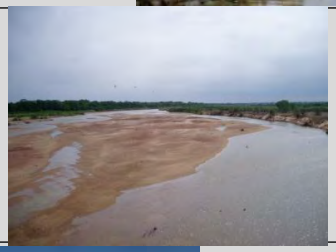
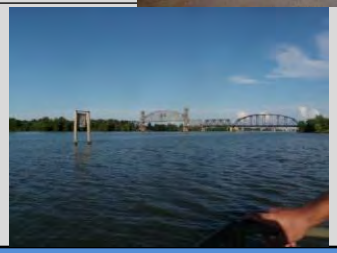
Oklahoma Land Cover



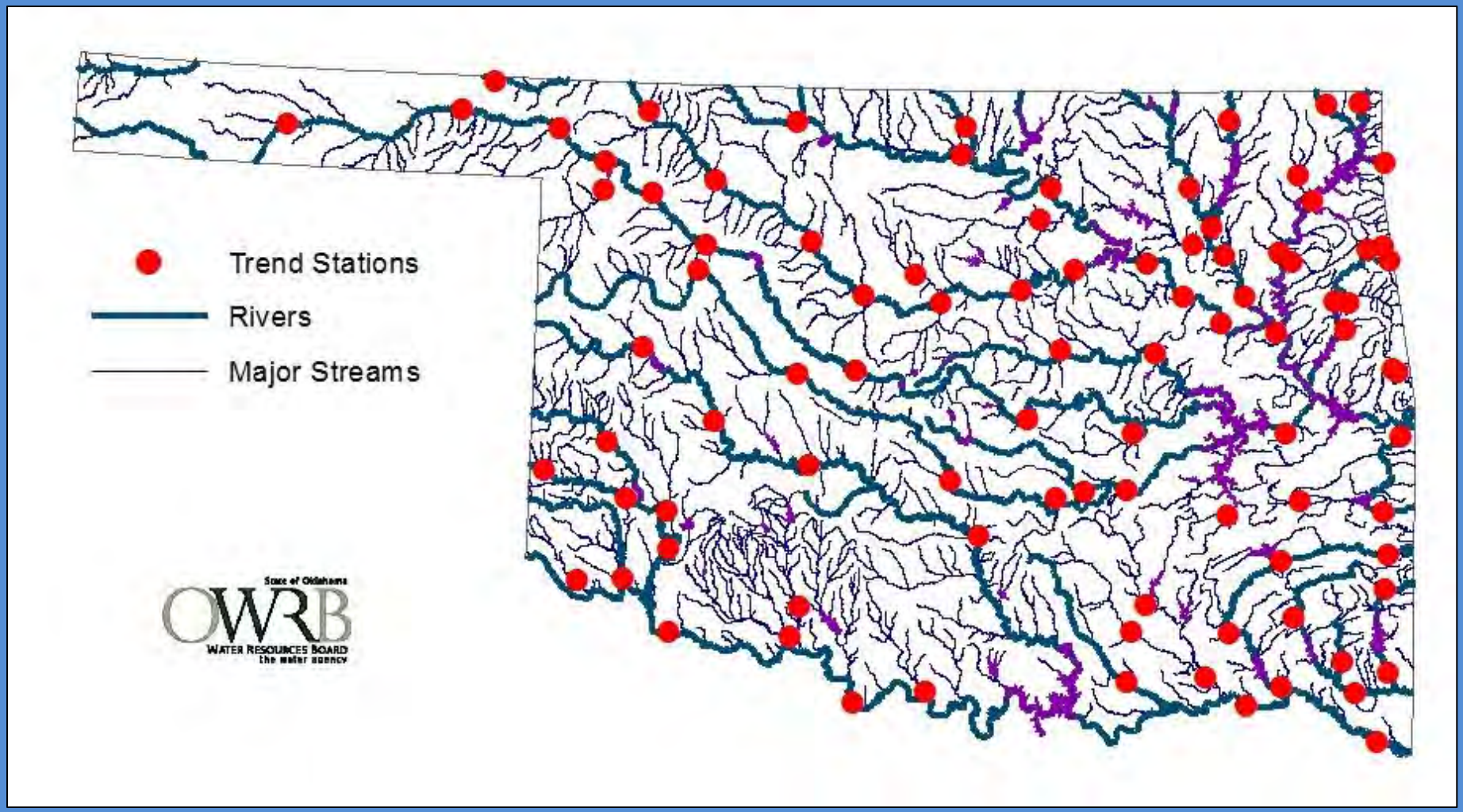
http://landcover.usgs.gov/states/oklahoma/oklahoma_big.jpg

Ecological Diversity

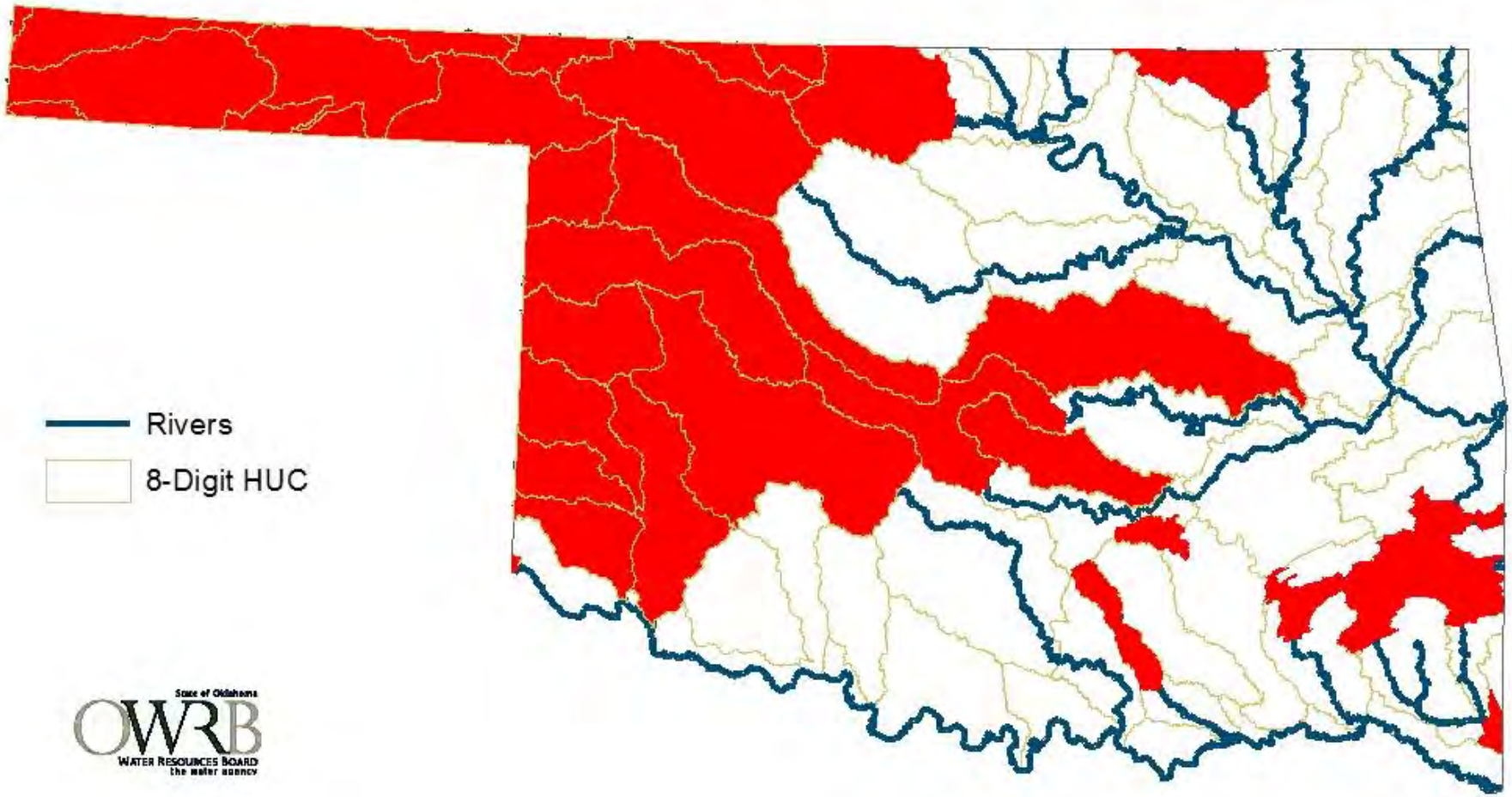
Waterbody Categorization

Category	Average Wetted Width	Fishable by Pram
Wadeable 	< 20 meters	> 50%
Small Boatable 		< 50%
Large Wadeable 	> 25 meters	> 50%
Boatable 		< 50%

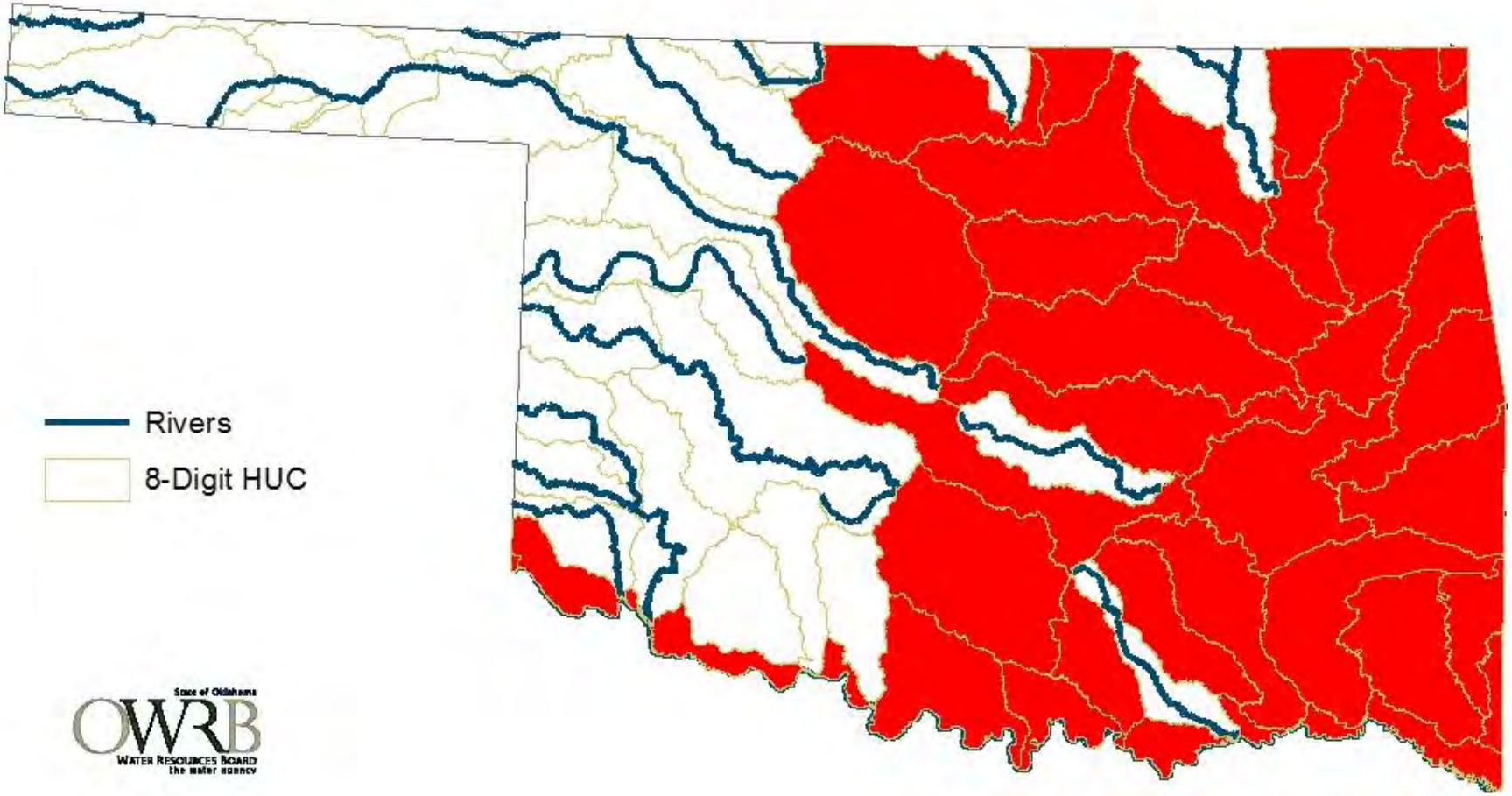
Surface Water Monitoring Stations



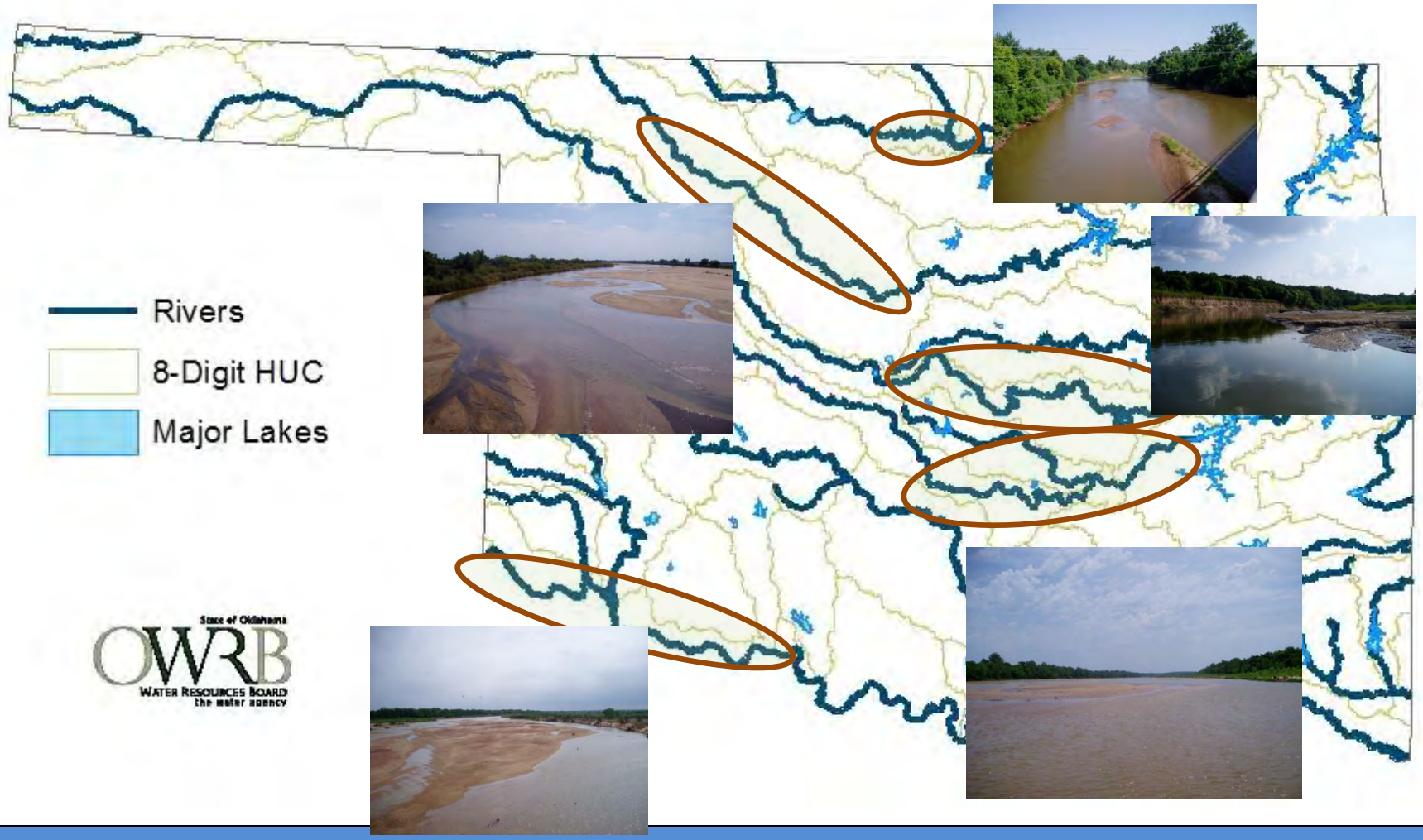
Generally Small Wadeable Protocols Used



Generally Large River Protocols Used



Large Wadeable River Protocols Used




HONDA

General Considerations

	Wadeable	Small Boatable	Large Wadeable	Boatable
Reach Length--General	40x Average Wetted Width Wadeable vs. Boatable = Major Electrofishing Method (Pram vs. Boat)			
Reach Length--Minimum	> 150 m	> 150 m	> 800 m (BPJ)	> 800 m (BPJ)
Reach Length--Maximum	< 1000 m (BPJ)	< 1000 m (BPJ)	< 2000 m	< 4000 m
Habitat--Quantitative (EMAP)	Yes (Wadeable)	Yes (Wadeable)	Yes (Wadeable)	Yes (Boatable)
Habitat--Qualitative (OK RBP)	Yes	Yes	Yes	No
Have Integrated Habitat Assessment Forms to Avoid Collecting Duplicate Data				

General Non-Large Boatable Layout

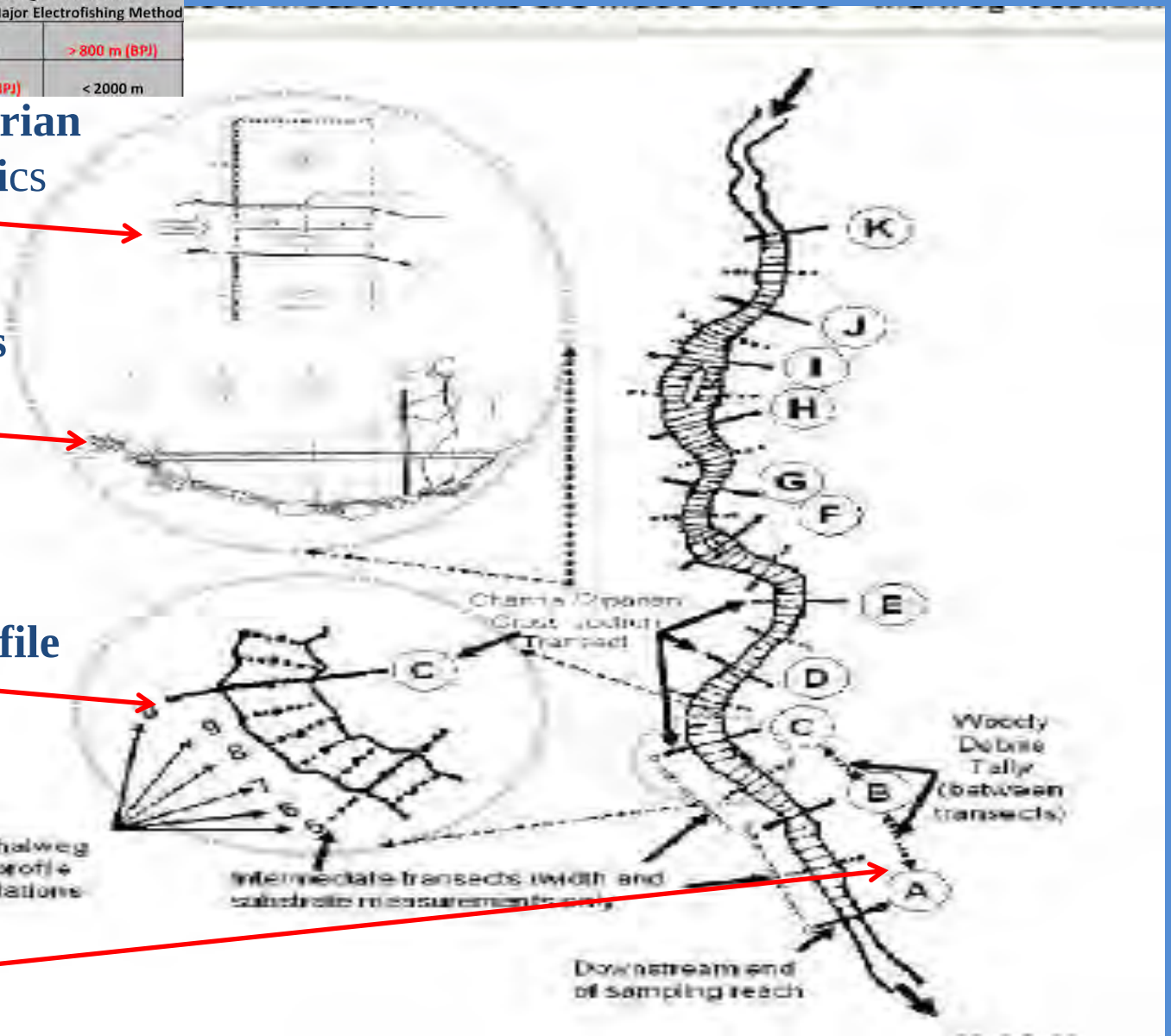
	Wadeable	Small Boatable	Large Wadeable
Reach Length--General	40x Average Wetted Width Wadeable vs. Boatable = Major Electrofishing Method		
Reach Length--Minimum	> 150 m	> 150 m	> 800 m (BPJ)
Reach Length--Maximum	< 1000 m (BPJ)	< 1000 m (BPJ)	< 2000 m

Channel/Riparian characteristics

Channel Cross Section

Thalweg Profile

Debris Tally

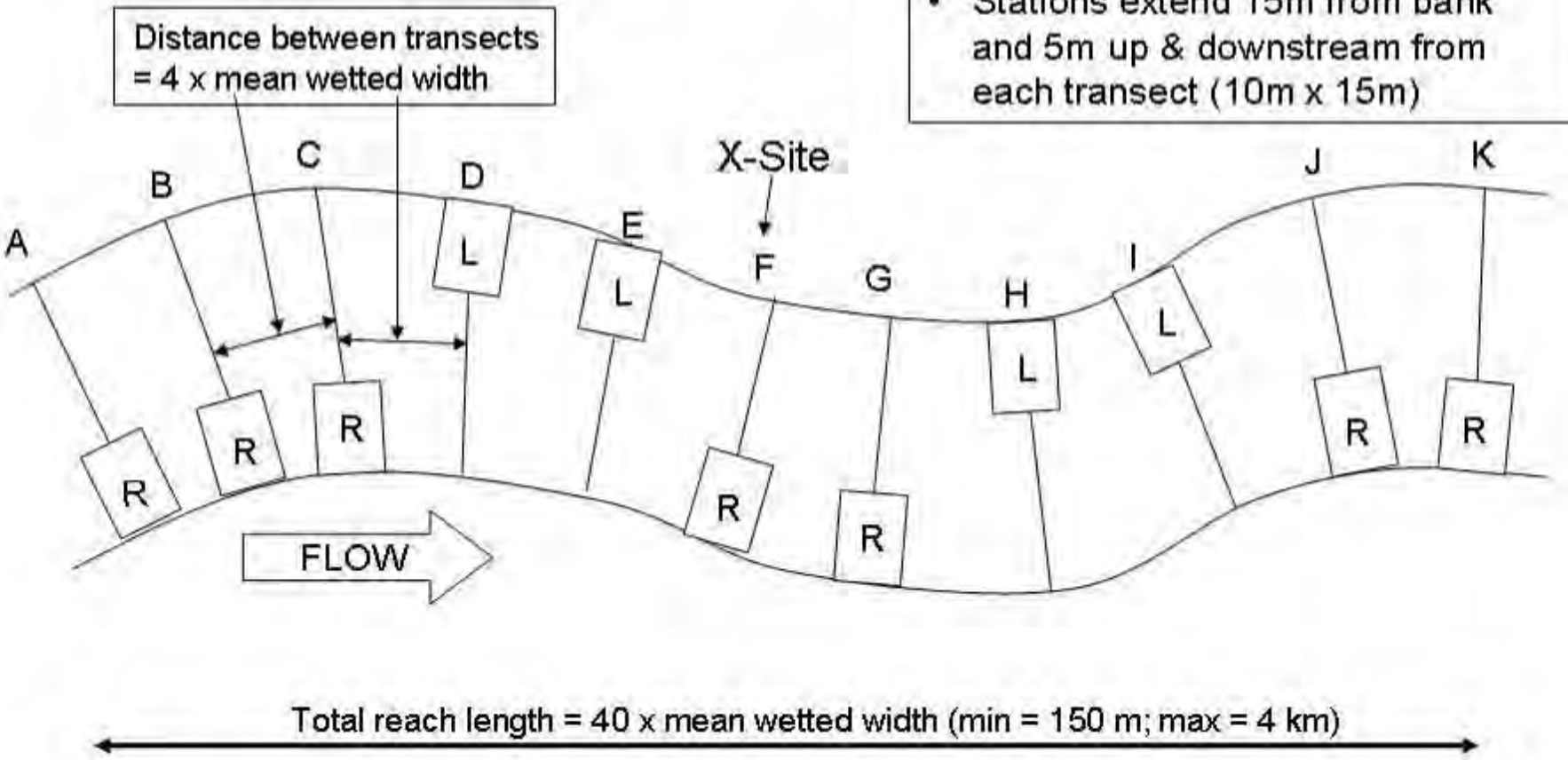


General Habitat Layout Large Boatable (Boatable > 20-25 AWW)

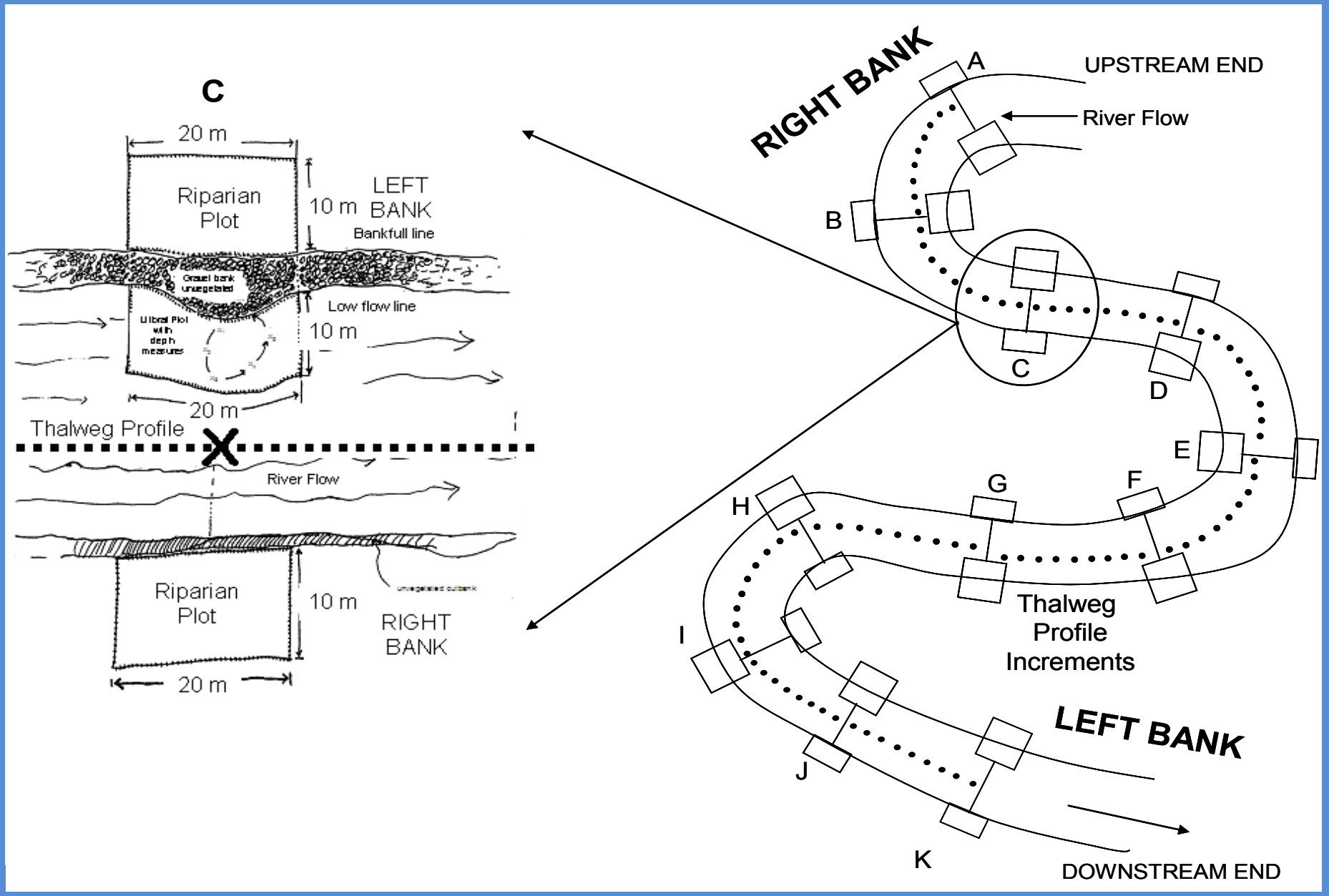
- ✓ Upstream endpoint is "Transect A"
- ✓ Downstream endpoint is "Transect K"

Sampling Stations

- L = left; R = right
- 1st station (at transect A) determined randomly; subsequent stations assigned systematically
- Stations extend 15m from bank and 5m up & downstream from each transect (10m x 15m)



Boatable Habitat Protocols



Fish Indicator Collection

Effort – Electrofishing

- Generally work Entire reach
- Minimum Units of Effort are 150 meters and 500 seconds
- Site fished until one of the following occurs:
  - End of pre-designated reach
  - Expend 4000 units for wadeable/7500 units for boatable
- Total Units Expended Should Positively Correlate Reach Length and Habitat Diversity
  - Care should be taken not to over or under fish a reach or sub-reach
  - Document occurrences of digression
- Deep Pools May be Re-fished by Working Concentric Circles

Effort – Seining

- Work reach as if electrofishing using various seine techniques depending on habitat structure and complexity
- BPJ should be used to determine if community is adequately characterized
- Generally lower natural diversity

	Wadeable @ 150 m RL (minimum)	All Other Wadeables	Boatable
Equipment – Primary	Backpack Electrofisher	2.5 GPP Pram Electrofisher	9.0 GPP Boat Electrofisher
Equipment – Alternate	Seine • as primary in conductivity > 4500 uS • as secondary for inaccessible deep pools		• 2.5 GPP Pram Electrofisher in shallow or inaccessible areas • Seine when conductivity precludes electrofishing

Macroinvertebrate Indicator Collection
Small Wadeables/Small Boatables

Riffles – All waterbodies where available (3-kick composite)

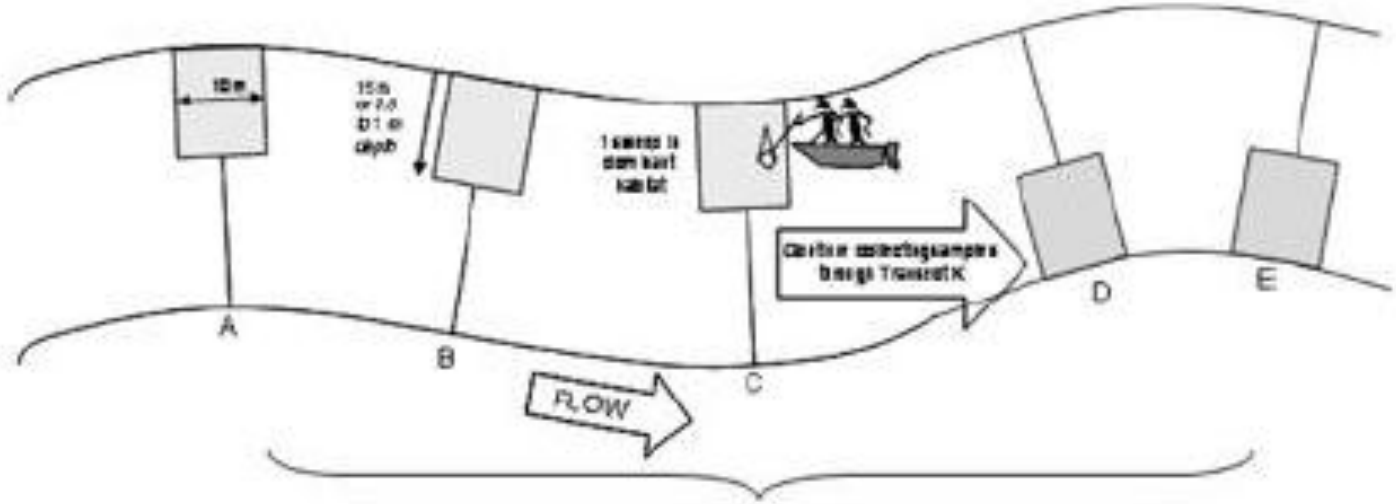
Wadeables and Small Boatables

- **Best Available Habitat (all sites)**
  - **Timed, reach wide methodologies**
  - **Woody Debris and Streamside Vegetation (typically root wads or emergent vegetation)**
- **NRSA Methodology on Statistical Survey Sites (additional)**
  - **Comparability for both methods and analyses**
  - **Study expectation**

Other Considerations

- **Samples sub-sampled at various rates to accommodate different purposes**
- **Metrics calculated different at taxonomic scales**
- **8 metric reports**

Large Wadeable and Large Boatable Macroinvertebrate Protocols



Combine **ALL** kick net samples collected from **ALL** transects

TRANSECT SAMPLES (1 per transect)

Sampling point at each transect selected systematically after random start

Modified D-frame kick net

1 linear sweep of dominant habitat

COMPOSITE SAMPLES FROM ALL TRANSECTS

- Seive bucket or other bucket(s)

Macroinvertebrate Indicator Collection Boatable/Large Wadeable

- aka, Large River Protocol (LRP)
- Transect based methodology based on NRSA protocol (alternating banks)
- Sample 2 distinct zones
  - dominant substrate (coarse or fine)
  - targeted habitat
- 1 meter linear sweep in 10x20m plot
  - Can move with sub-reach to find targeted habitat, if not available in plot
  - If chosen bank too deep, can move to other side
- LRP—Fine Substrate
  - muck, silt, sand, and fine gravel
  - Separate substrate and targeted habitat samples
- LRP—Coarse Substrate
  - Larger than 16 mm in diameter (coarse gravel, cobble, boulder)
  - Composite substrate and targeted habitat samples
- Bedrock only sampled if present across > 50% of wetted width (use other bank if not)
- Riffle if present

Macroinvertebrate Indicator Analysis

- **Use different indices for size categories**
- **Must have multiple samples for assessment of wadeables**
- **For boatables and some large wadeables use NRSA index and reference conditions**
- **Developing Oklahoma Boatable/Large River Indices**

OK BENTHIC IBI

B-IBI Metrics	6	4	2	0
Taxa Richness	>80%	60-80%	40-60%	<40%
Modified HBI	>85%	70-85%	50-70%	<50%
EPT/Total	>30%	20-30%	10-20%	<10%
EPT Taxa	>90%	80-90%	70-80%	<70%
% Dominant 2 Taxa	<20%	20-30%	30-40%	>40%
Shannon-Weaver Diversity Index	>3.5	2.5-3.5	1.5-2.5	<1.5

OK Benthic IBI CLASSIFICATION

% Comparison to the Reference Score	Biological Condition	Characteristics
>83%	Non-impaired	Comparable to the best situation expected in that ecoregion; balanced trophic and community structure for stream size
54 - 79%	Slightly Impaired	Community structure and species richness less than expected; percent contribution of tolerant forms increased and loss of some intolerant species
21 - 50%	Moderately Impaired	Fewer species due to loss of most intolerant forms; reduction in EPT index
<17%	Severely Impaired	Few species present; may have high densities of 1 or 2 taxa

Fish Indicator Analysis

- **Use multiple Indices**
- **For Large Rivers, NRSA Analysis Methods/Classifications Currently Used (developing comparable methods for Oklahoma)**
- **For condition, use a weight of evidence assessment**
- **For Impairment status use biocriteria unless unavailable or scored as undetermined**

BIOCRITERIA

Metric	Value	Scoring 5	Scoring 3	Scoring 1	Score
Total # of species		fig 1	fig 1	fig 1	
Shannon's Diversity based upon numbers		>2.50	2.49-1.50	<1.50	
# of sunfish species		>3	2 to 3	<2	
# of species comprising 75% of sample		>5	3 to 4	<3	
Number of intolerant species		fig 2	fig 2	fig 2	
Percentage of tolerant species		fig 3	fig 3	fig 3	
TOTAL SCORE FOR SAMPLE COMPOSITION					0
Percentage of lithophils		>36	18 to 36	<18	
Percentage of DELT anomalies		<0.1	0.1-1.3	>1.3	
Total individuals		>200	75 to 200	<75	
TOTAL SCORE FOR FISH CONDITION					0
TOTAL SCORE					0

Metrics	5	3	1
Number of species	>67%	33-67%	<33%
Number of sensitive benthic species	>67%	33-67%	<33%
Number of sunfish species	>67%	33-67%	<33%
Number of intolerant species	>67%	33-67%	<33%
Proportion tolerant individuals	<10%	10-25%	>25%
Proportion insectivorous cyprinid individuals	>45%	20-45%	<20%
Proportion individuals as lithophilic spawners	>36%	18-36%	<18%

ALT IBI CLASSIFICATION

OK FISH IBI

% Comparison to the Reference Score	Integrity Class	Characteristics
>97%	Excellent	Comparable to pristine conditions, exceptional species assemblage
80 - 87%	Good	Decreased species richness, especially intolerant species
67 - 73%	Fair	Intolerant and sensitive species rare or absent
47 - 57%	Poor	Top carnivores and many expected species absent or rare; omnivores and tolerant species dominant
26 - 37%	Very Poor	Few species and individuals present; tolerant species dominant; diseased fish frequent

Algal Indicator

- Collection Methodology
  - Benthic is Reachwide/Transect Composite
  - Sestonic is Single Grab Sample
- Currently use chlorophyll-a as an indicator
- Developing Phytoplankton and Periphyton Community Indicators

Questions?