



ORSANCO

Biological Programs

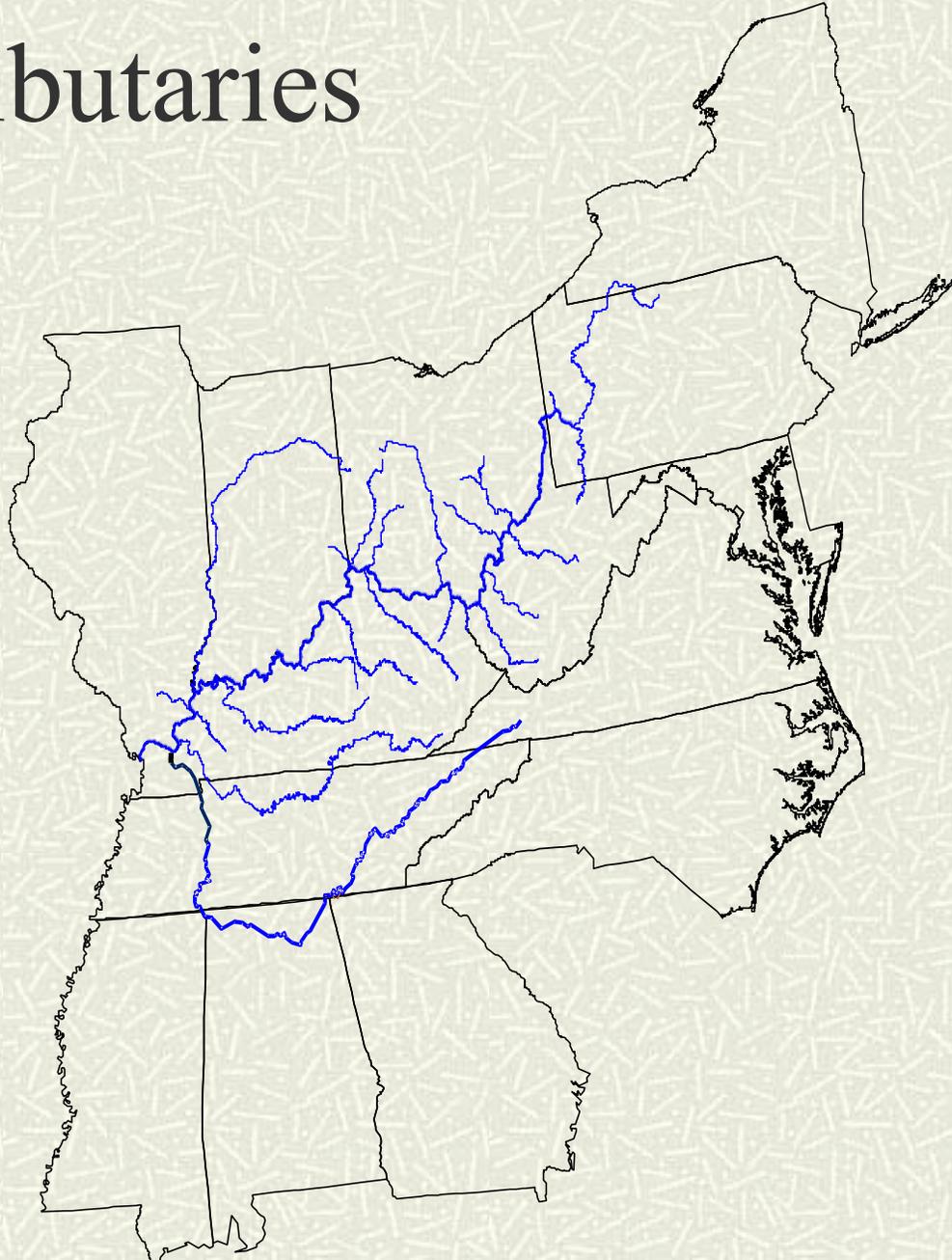
“Lifting the fog on Great Rivers”

About ORSANCO

- Compact Signed in 1948.
- Eight States (NY-VA-PA-WV-OH-KY-IN-IL).
- Committee Structure (All States represented).
- Regulatory Authority.
 - Wastewater Discharge Requirements
 - Pollution Control Standards
 - Ohio River 305(b)



The Ohio River Mainstem and Major Tributaries

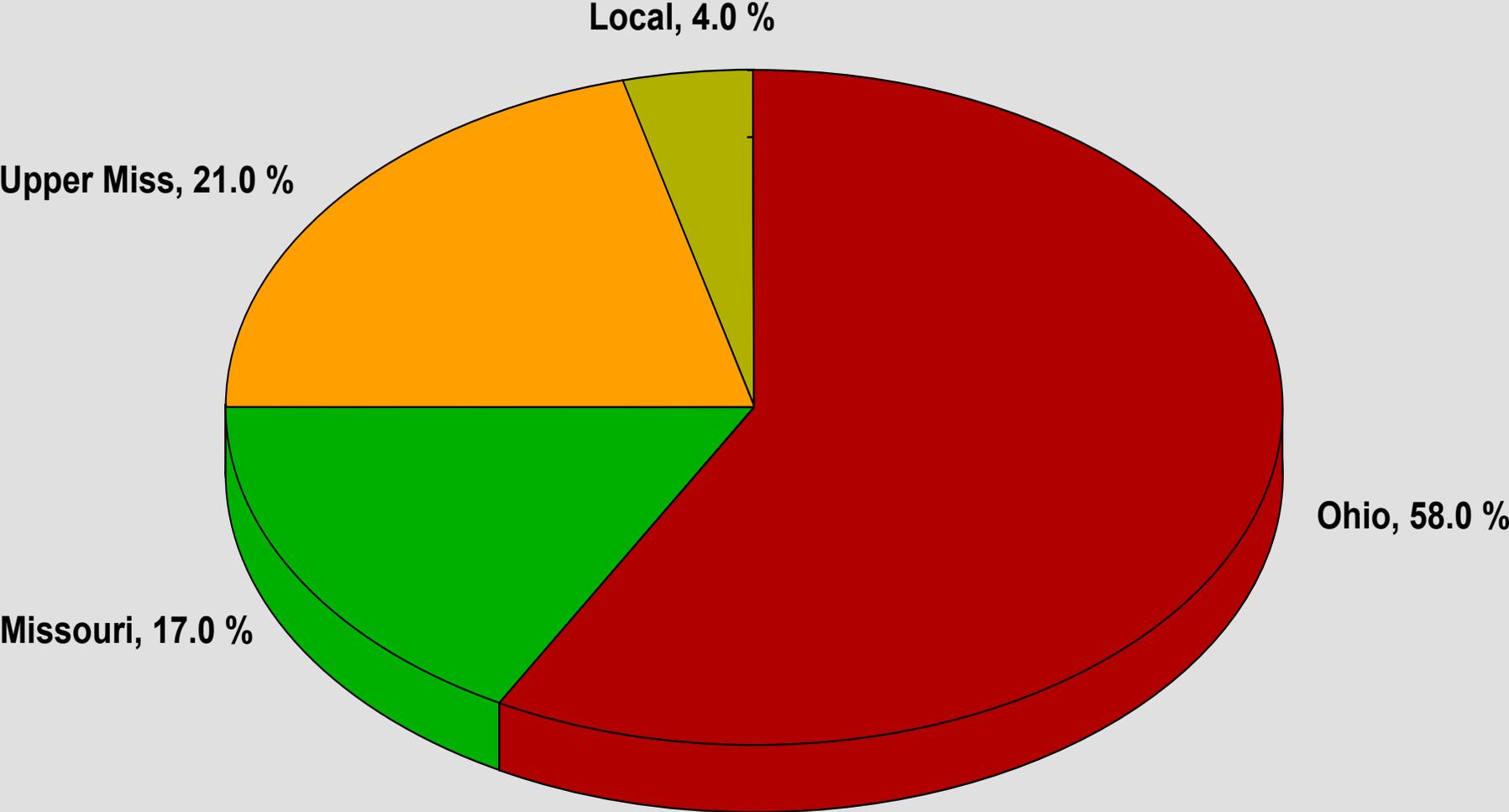


Ohio River Facts

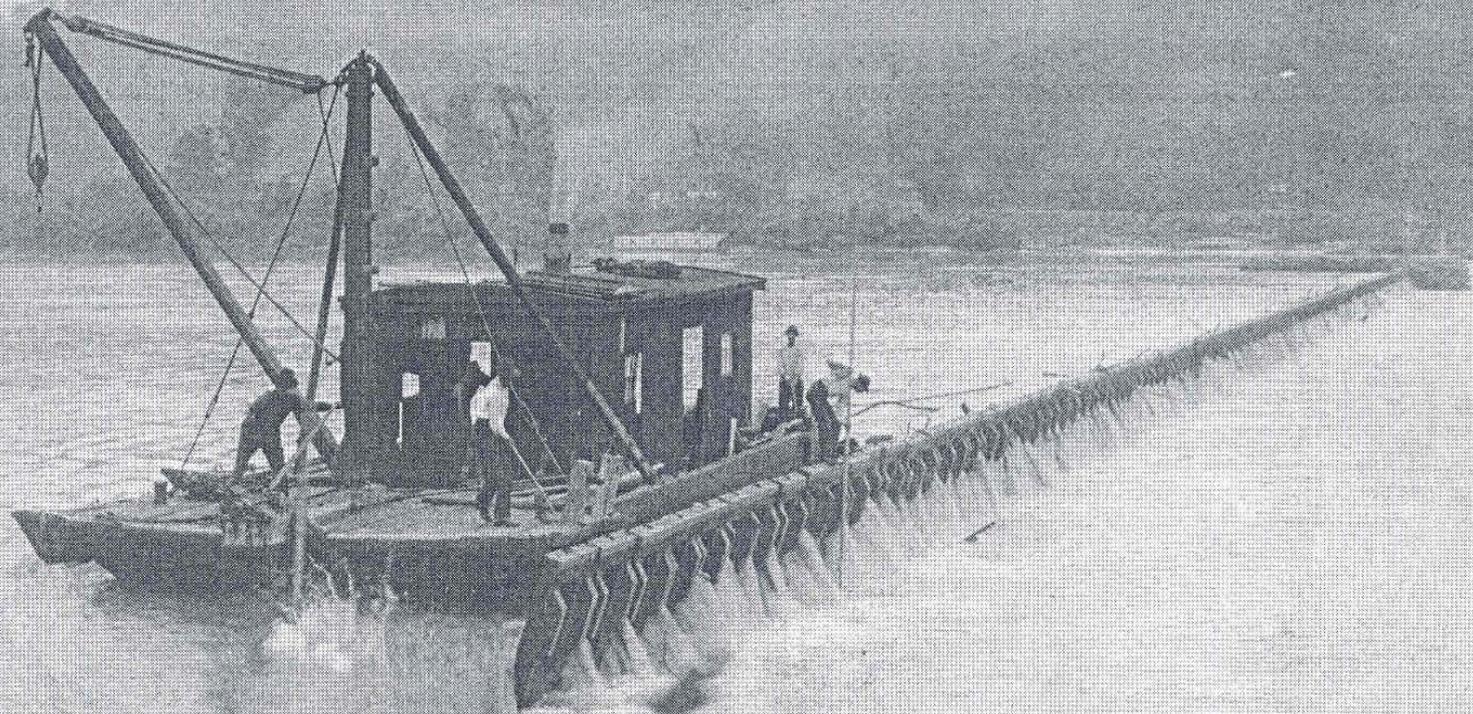
- **Basin contains more than 10% of Nation's population.**
- **Mainstem Ohio River provides drinking water to more than 3 million people.**
- **Over 240 Million tons transported annually.**
- **Drainage area: 13 States; >203,000 sq.miles.**

Average Annual Flow

Percent Contribution to Lower Mississippi River



HISTORY

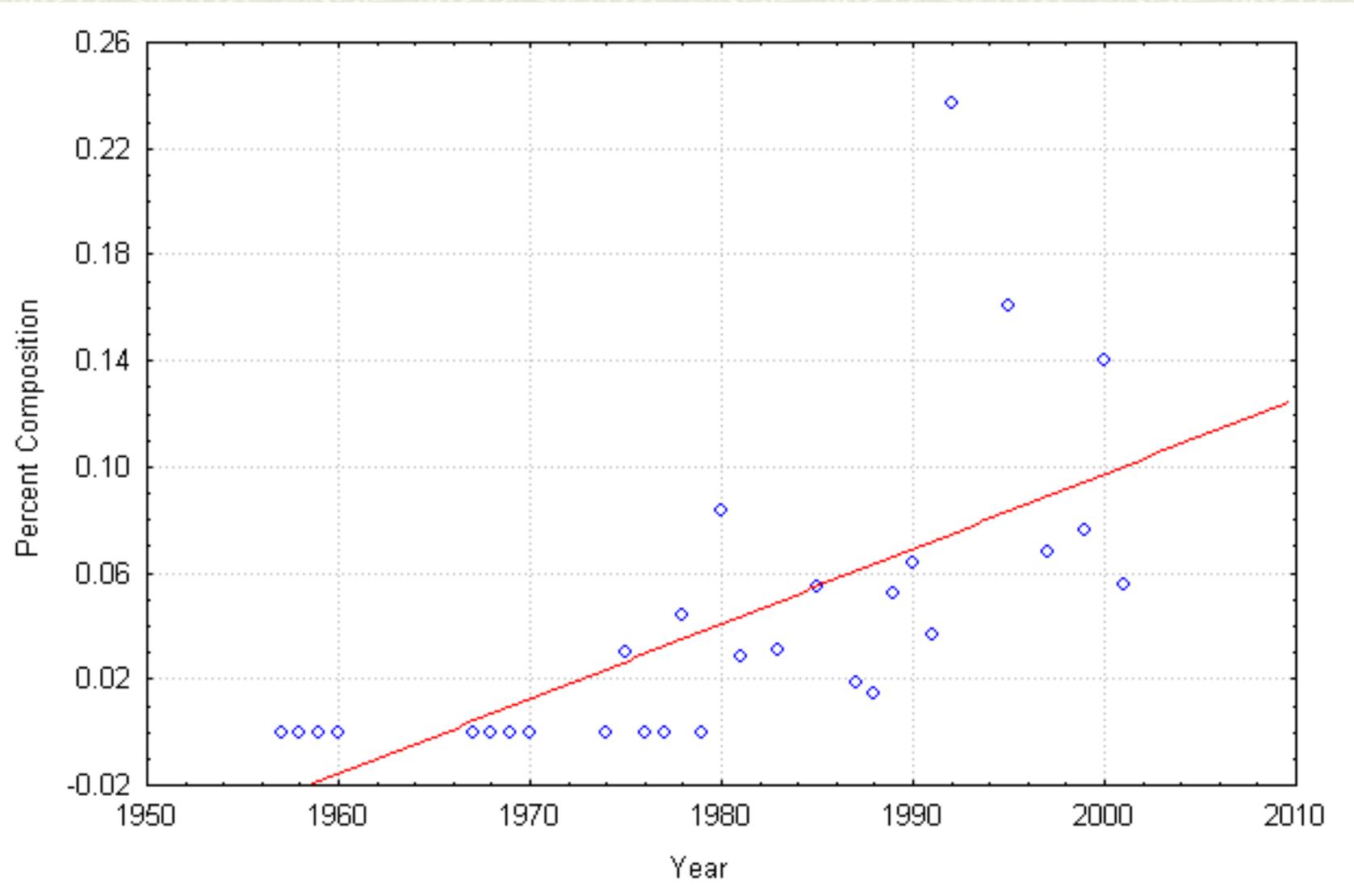


Biological Programs

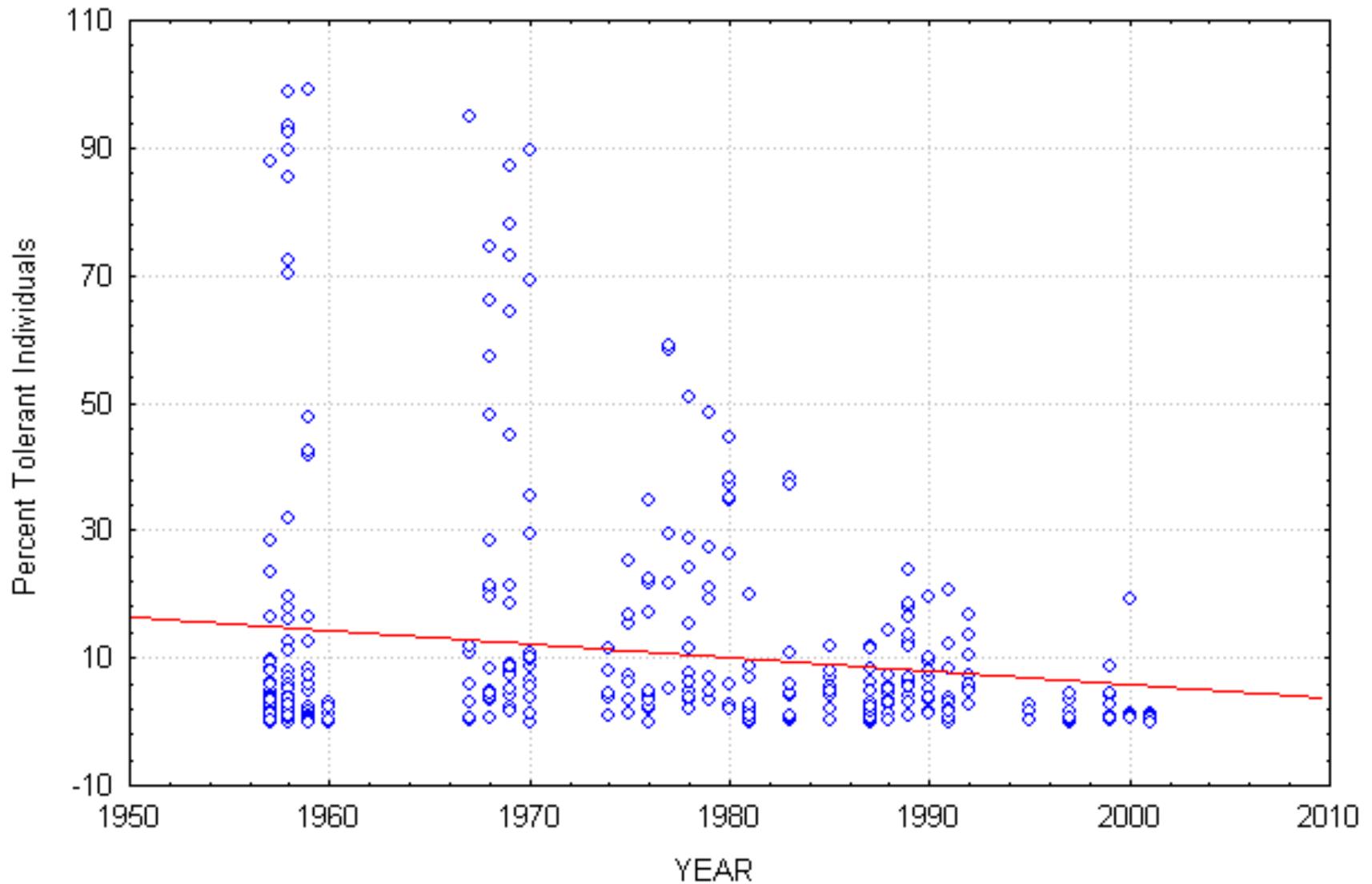
History

- Lockchamber rotenone sampling began in 1957.
- 378 Collections 1957-2001
- Long-term trends assessment.
 - Species level trends.
 - Assemblage or metric level trends.
 - Trends in the MIwb.
 - Relationship with water quality.

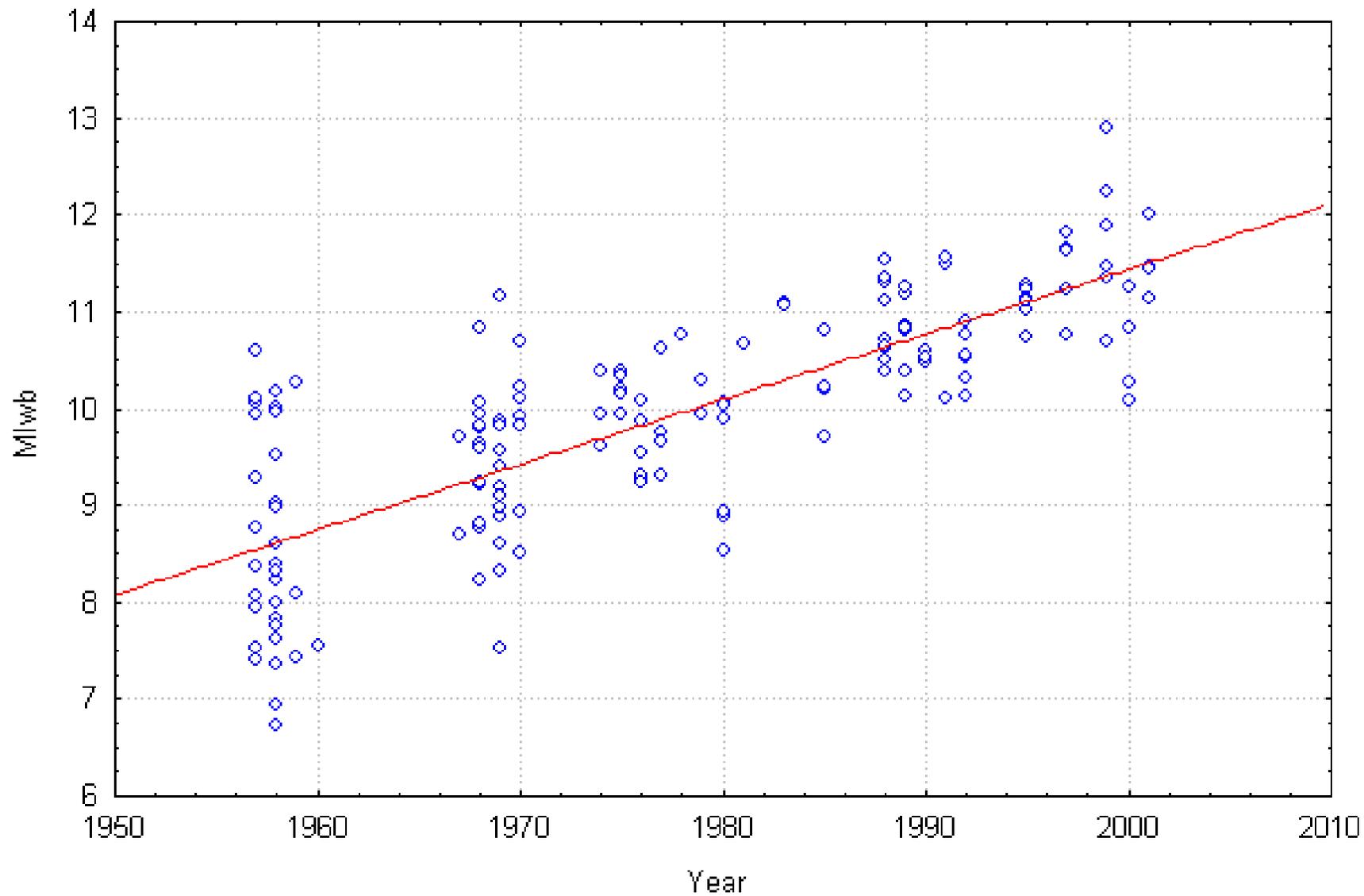
Species Level (Shorthead Redhorse)



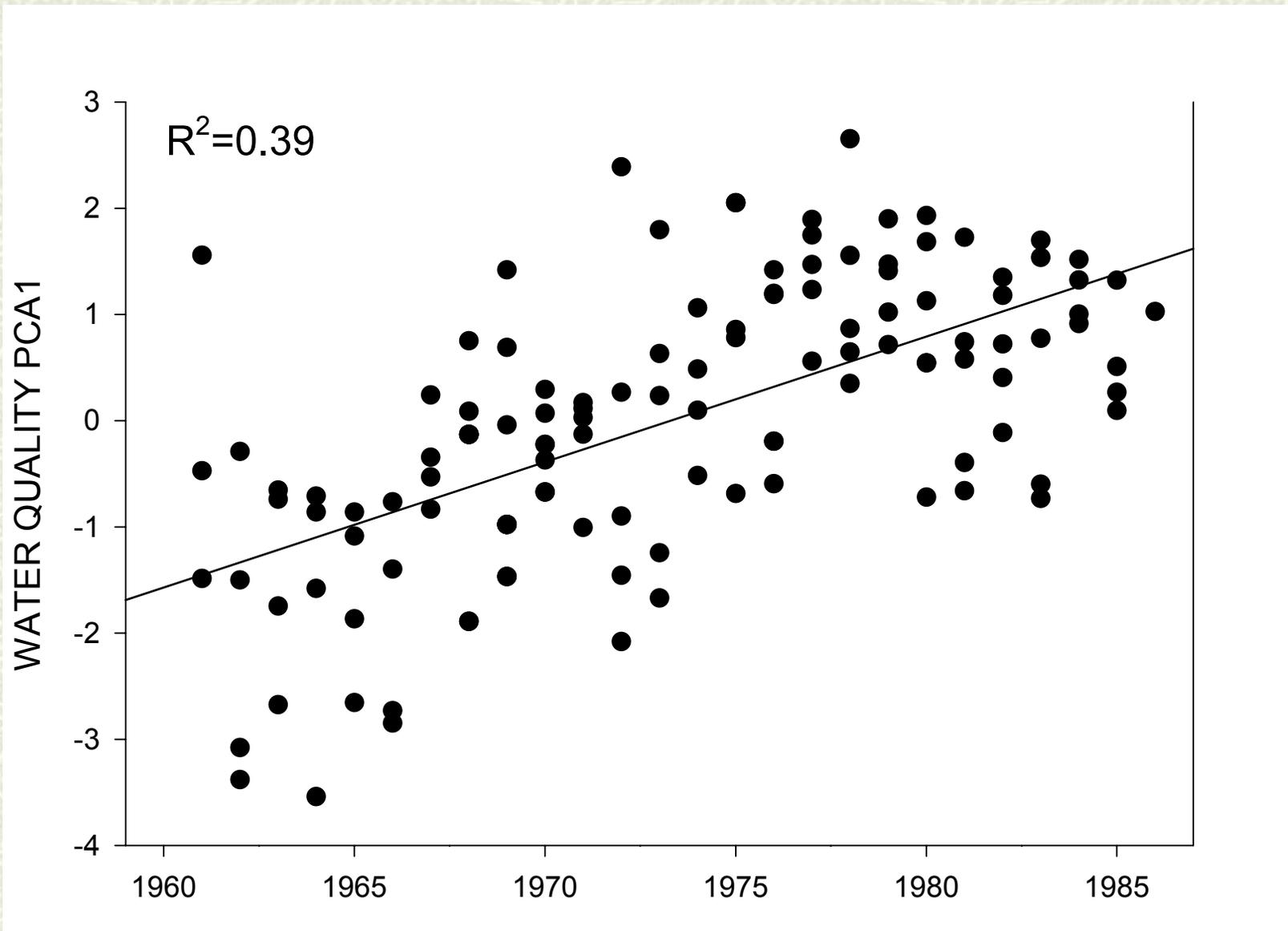
Metric Level



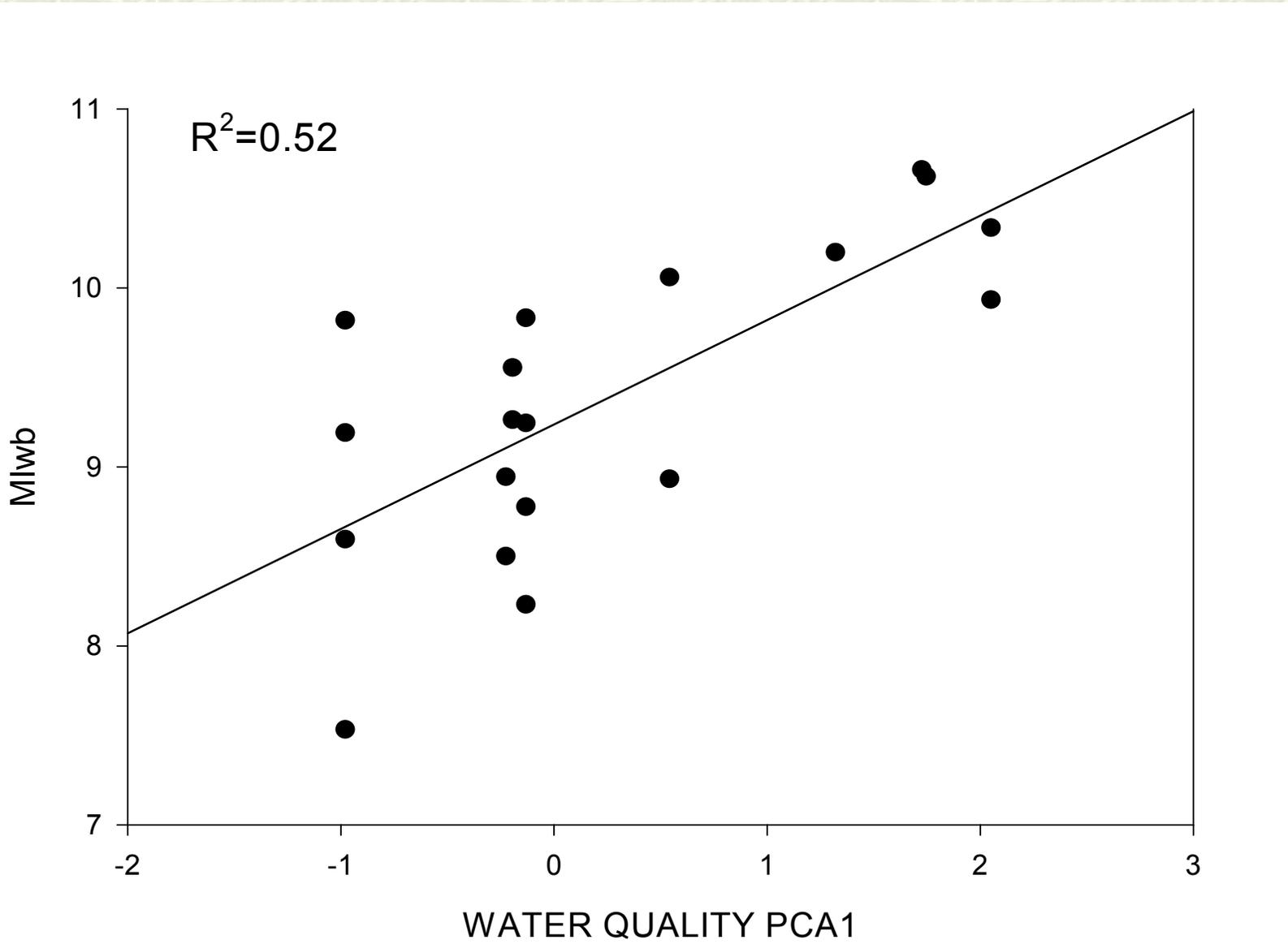
MIwb



Water Quality Trends (All)



Water Quality –vs- MIwb (East Liverpool)



1990: A NEW ERA



Biocriteria Development

 Fish

 Macroinvertebrates

 Mussels

 Algae

Fish

- **1991** – Began night electrofishing program
 - Mobile technique allowing multiple habitat types to be sampled.
- Surveys initially conducted in conjunction with lockchamber surveys. (above dam, below dam and mid-pool locations).
- Researchers noticed longitudinal patterns in data.
- **1993** – began conducting ‘Intensive Surveys’ of individual pools. (2-4 mile resolution).
- **1993-2001** – 11 of 20 pools sampled following IS approach.

Fish Cont'd...

- **1995** – Panel of Biological Experts assembled to assist in development of IBI-type index for the Ohio River.
- **1995-Present** – Panel met annually, reviewing results, directing future activities and overseeing the development of the Ohio River Fish Index (*ORFI*).

Issues addressed by Fish Panel

- Is it an IBI? What are we measuring?
- How it can be used?
- What metrics to consider?
- Species by species determine characteristics and develop metrics.
- How to test the metrics.
- What metrics to select.
- How to score the index.
- How to incorporate habitat expectations.
- How to use the index as criteria (Standards).

Established Methods

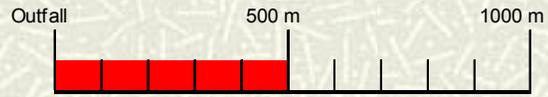
- Night electrofishing.
- Near shore area – depth < 15ft.
- 500m zonelength
- 2000sec. Minimum time requirement.
- All fish netted.
- Lengths and weights recorded.
- Small fish preserved and identified at office.

Selected Metrics

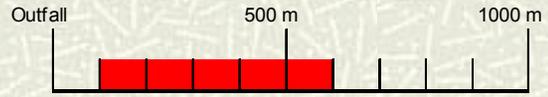
- Number of Native Species
- Number of Sucker Species
- Number of Centrarchid Species
- **Number of Great River Species**
- **Number of Intolerant Species**
- **Percent Tolerant Individuals**
- Percent Simple Lithophils
- **Percent Non-Native Individuals**
- Percent Detritivores
- Percent Invertivores
- Percent Top-Piscivores
- Relative Number of DELT Anomalies
- Catch Per Unit Effort

Testing Metrics

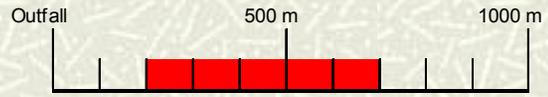
- New Method – ‘Traveling (T) Zone’
- Examines metric response to known water quality gradient as related to background variability.



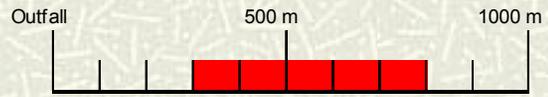
T 1



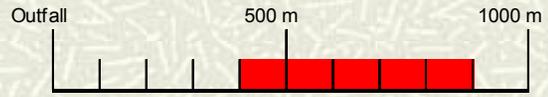
T 2



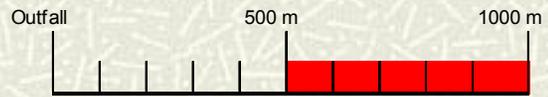
T 3



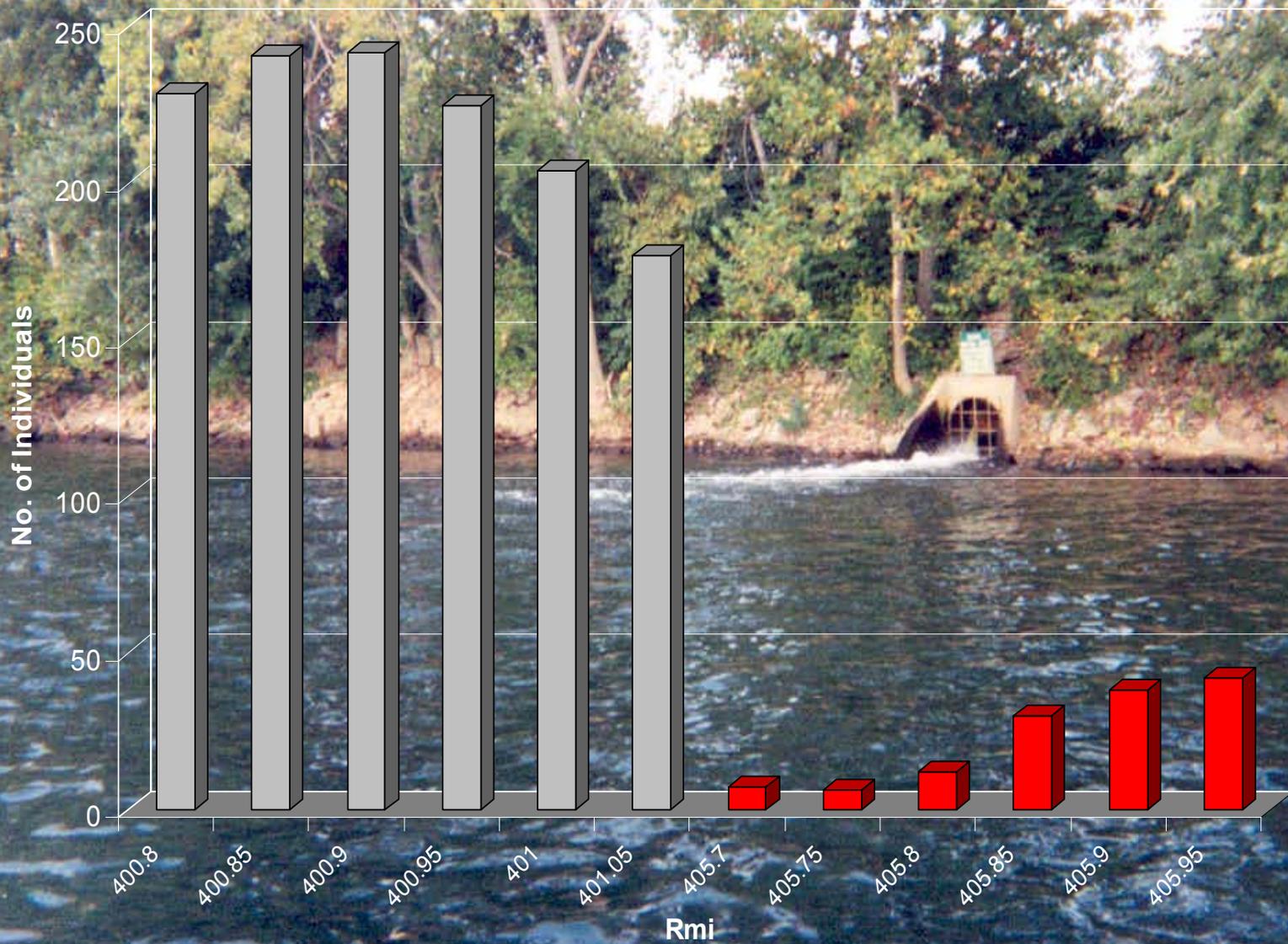
T 4

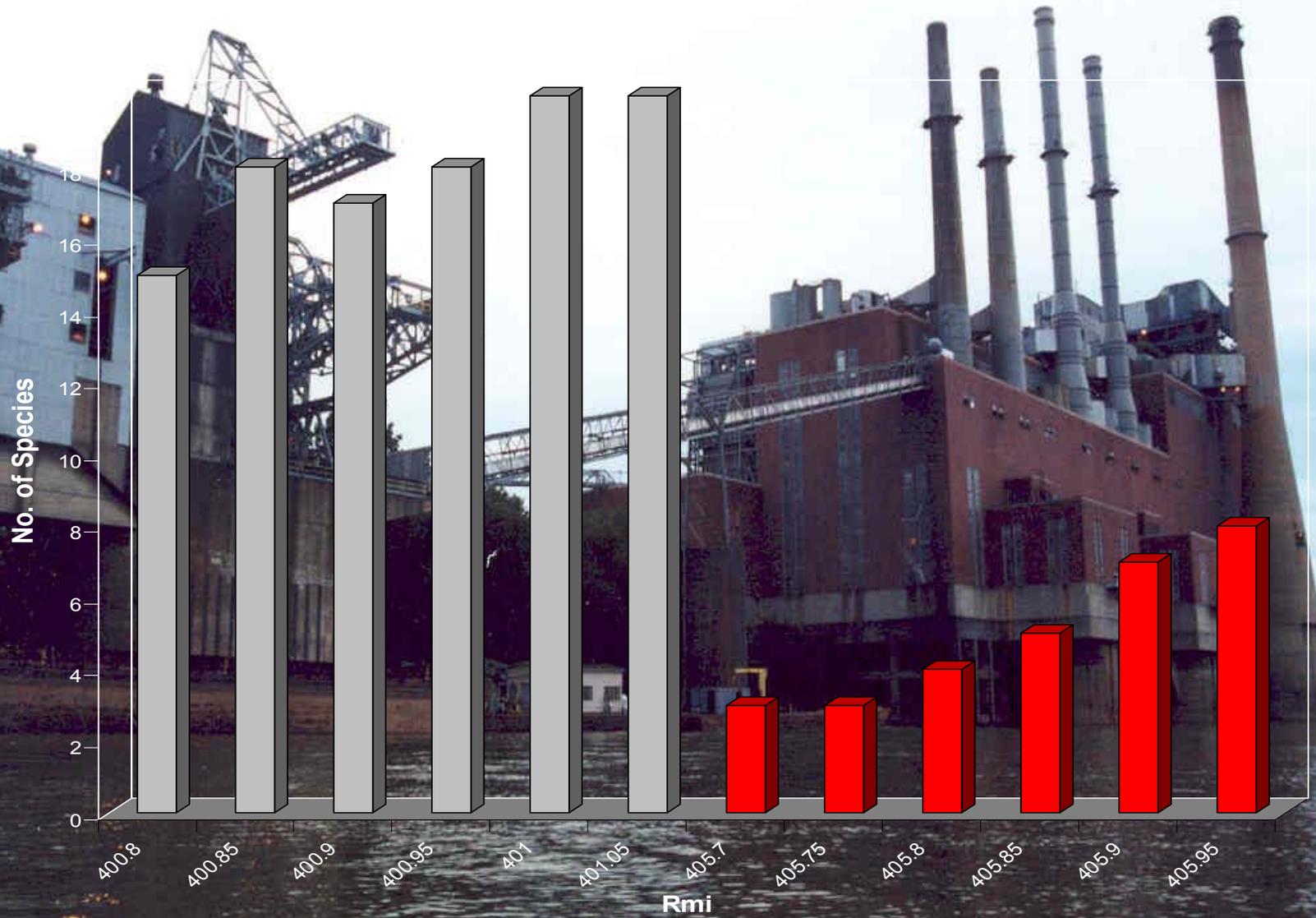


T 5

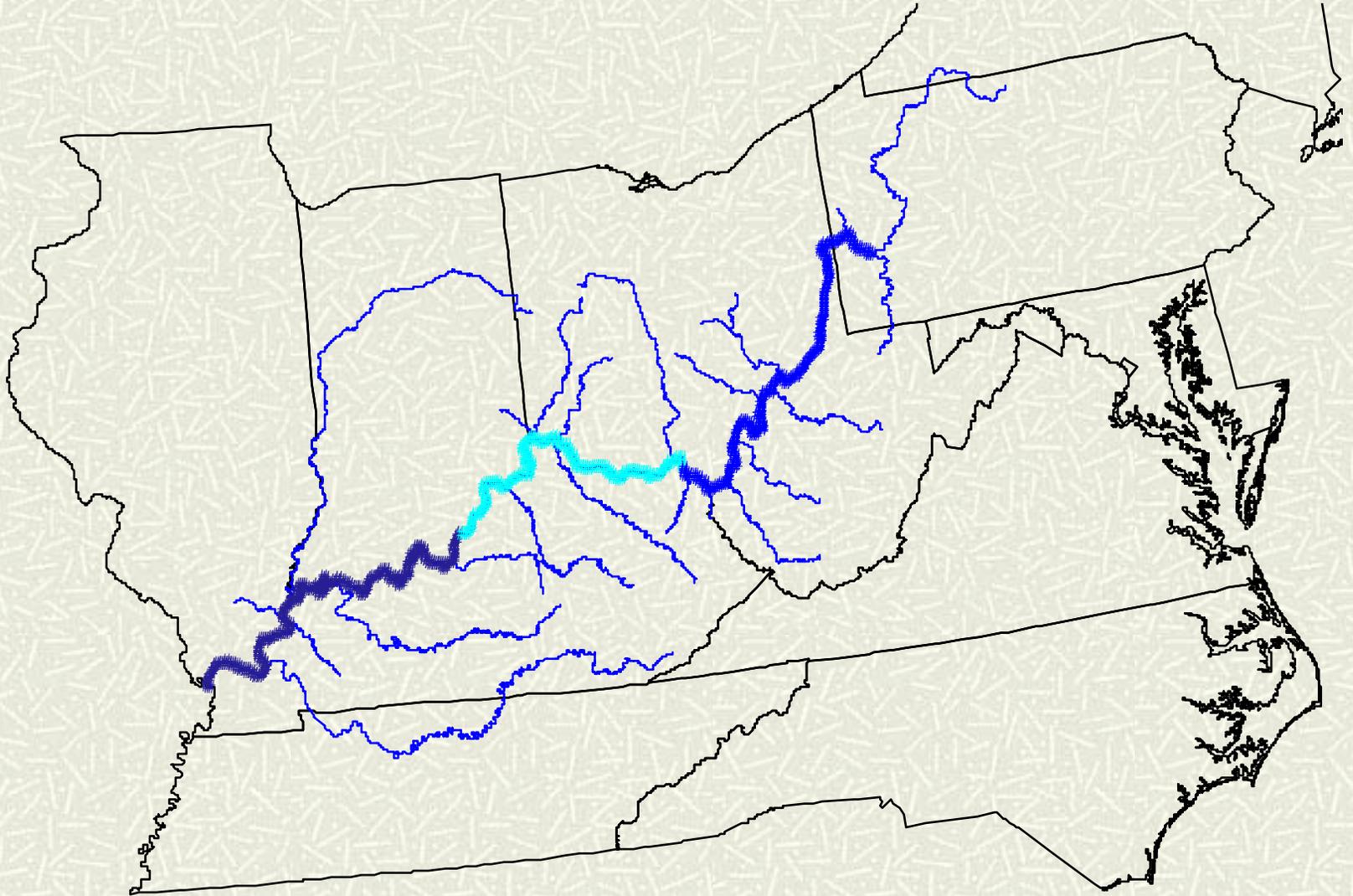


T 6

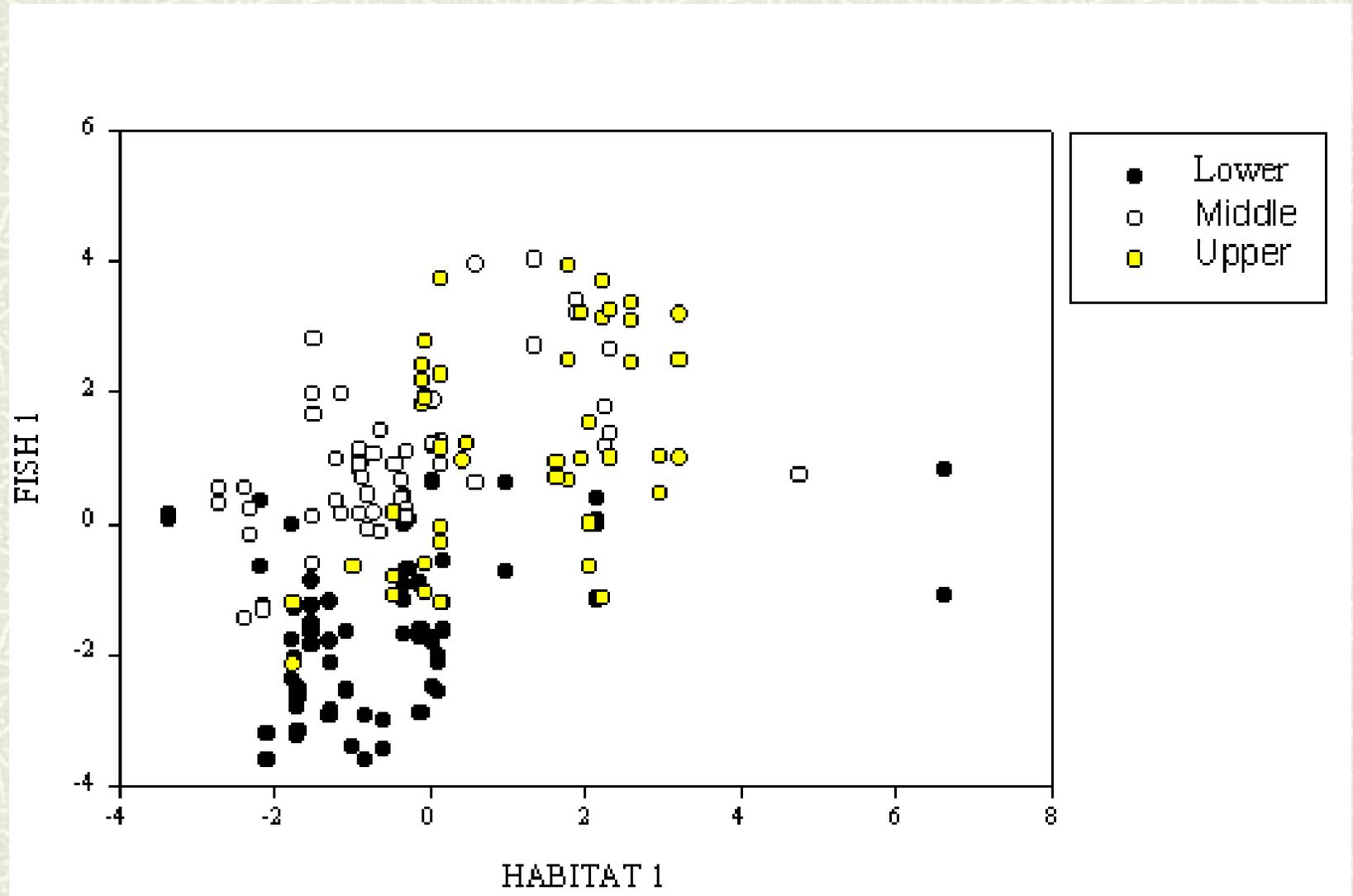




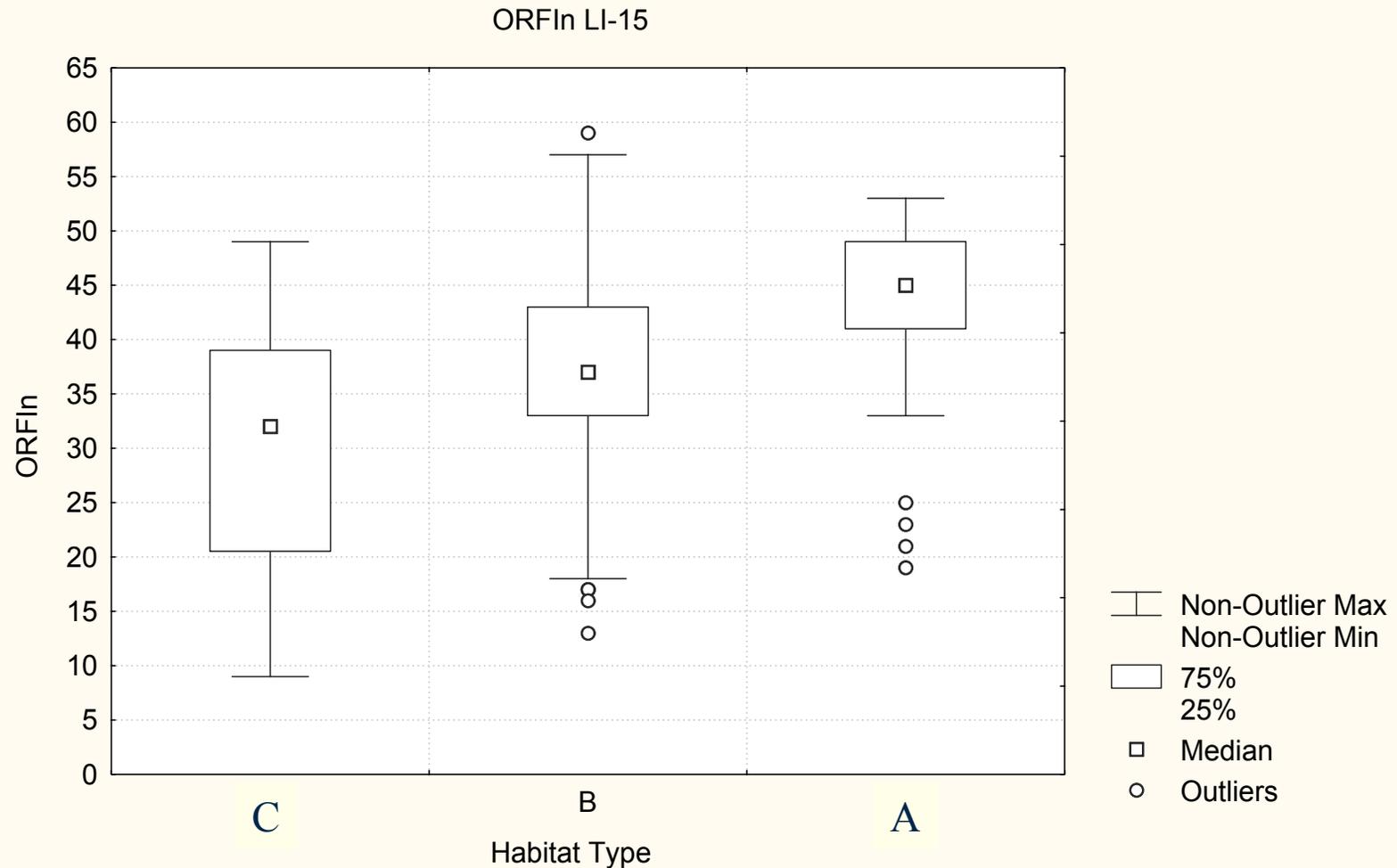
Geographic Regions Identified



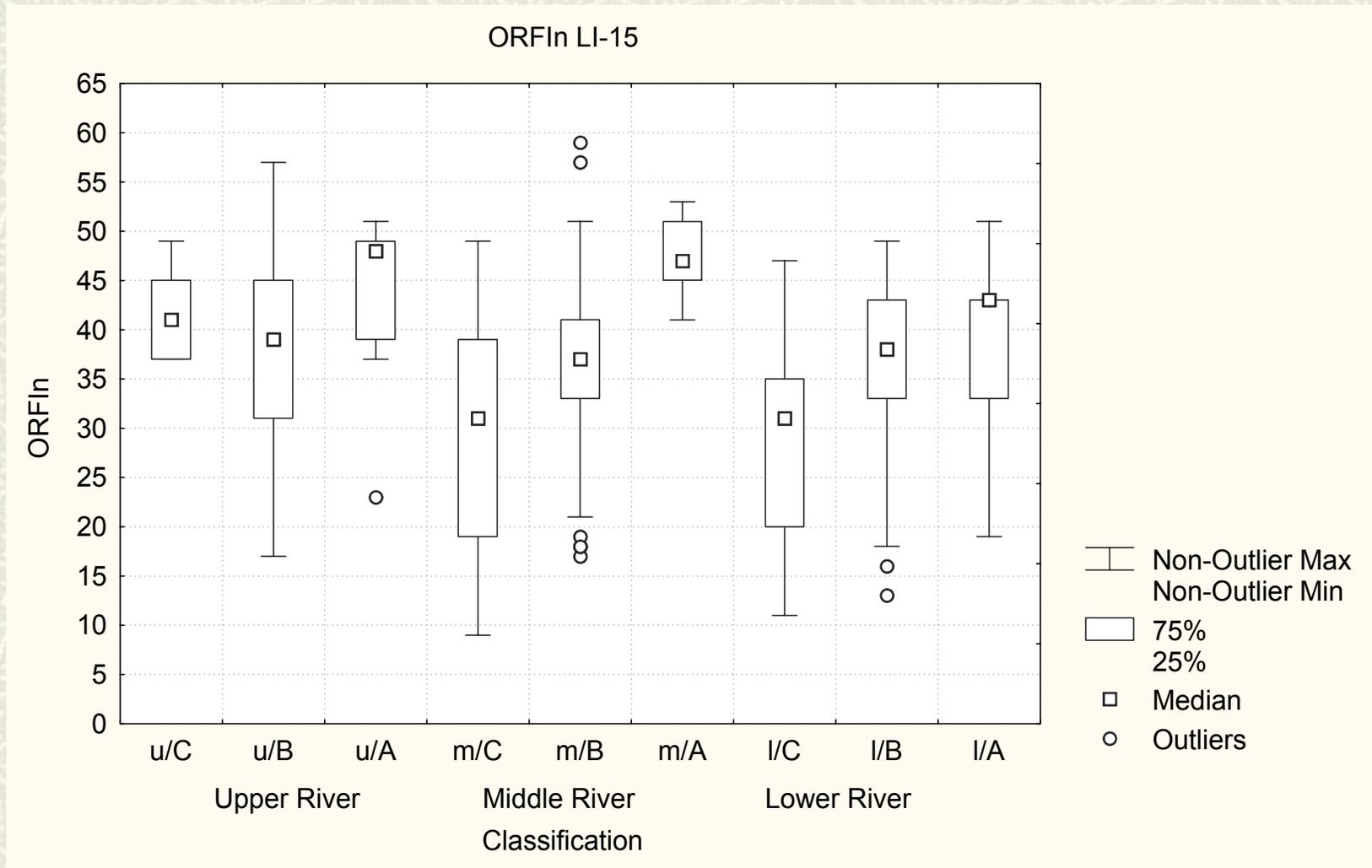
Fish / Habitat interactions among distinct geographic regions.



3 Habitat Types Identified



3 Habitat Types X 3 Regions



Status of Index Development

- Index completed.
- Two years of testing/validation complete.
- Index ready for publication
 - Reviews by:
 - Biological Water Quality Subcommittee
 - 11 co-authors
 - Submitted to *Transactions of the American Fisheries Society*, June 2001.

Status of Biocriteria

- ORFI is first component of Commission's biocriteria.
- Under consideration by Standards Committee for adoption into (or referenced by) ORSANCO's Pollution Control Standards.



MACROINVERTEBRATES

History

- 1990-1992: Methods Development
 - Hester-Dendy Multiplates
 - Composite of 5 units
- 1993-1996: Gathering Baseline Data
 - Concurrent with fish sampling
- 1997: Macroinvertebrate Panel
 - 1997 - Riverwide Survey
 - 1998 - Riverwide Survey
 - 1999 - Outfall Work
 - 2000 - Outfall Work
 - 2001 – Outfall Work
- 2002: Macro Panel
 - Draft Index

Macroinvertebrate IBI (Draft)

- Over 1000 samples collected 1990-2002
- 60 metrics examined
- 12 metrics accepted

Final Metrics

| | <u>Exp.</u> | <u>Part.</u> | <u>6-line</u> |
|--------------------------|-------------|--------------|---------------|
| ➤ # Taxa | + | qs | MOV |
| ➤ # Individuals | + | tb | 95% |
| ➤ % Tolerant Individuals | - | qs | 95-5% |
| ➤ % Diptera | - | qs | 95-5% |
| ➤ % Hydroptilidae | + | db | 95% |
| ➤ % Tanypodinae | - | db | 95% |
| ➤ ET/Chironomid | + | tb | 95% |
| ➤ % Amphipoda | + | db | 95% |
| ➤ %EPT Individuals | + | db | 95% |
| ➤ # Diptera Taxa | + | qs | MOV |
| ➤ # EPT Taxa | + | qs | MOV |
| ➤ % Oligochaeta | - | db | 95% |

Status

- Index being recalculated using new scoring criteria.
- Final Index expected June, 2002
- Index variability being examined to aid in establishing index expectations.
- 2002: Repeat of 1970's EPA rockbasket study.

ALGAE & MUSSELS

Status

Mussels

-  Viewed as next important indicator for development of an index and in developing aquatic life uses for the Ohio River.

Algae

-  Data collection by drinking water utilities.
 -  Taste and odor problems.
 -  Link to nutrient criteria development.

Future Plans

Future Plans

- Fish Population Genetics.
- Expanding Efforts to Major Tributaries.
- Probability Design.
 - 2002 RARE Project
 - Positioning for Central Basin EMAP

Ohio River Genetic Analyses

- Genetic research on large river fishes is an under-utilized but potentially useful assessment tool.
- Utilize multiple genetic markers (mtDNA and nucDNA sequence and microsatellite data).
- Determine if measurable genetic structure is present in populations of fish species distributed throughout the river.
 - Correlation with biogeographical features?
 - Correlation with abiotic features?
- Enable a river-wide perspective of genetic continuity in fish populations.

Tributaries

- Expand biological community research to tributaries.
 - Assist states in developing methods and assessment techniques for large rivers.
 - Allow a smooth transition of criteria and assessments when moving along a continuum of river size.
- 2002: Ohio River – Kanawha River comparison.

2002 RARE Project

- 2 Region III Ohio River Pools Selected
 - Apply the newly developed ORSANCO assessment strategy.
 - Intensive Survey design –vs- Probability design
 - Compare 305(b) assessment endpoints reached following two different strategies.
 - Investigate the performance of probability designs on a great river.

Probability Design

- Refine monitoring and assessment approaches.
- Unbiased assessment for 305(b) and other reporting efforts.
- ‘Better’ Biocriteria.
- Application to other large rivers.
- Basin wide assessment.

What we have...

- 54 years of Experience.
- 45 years of Data
- Multimetric Indices Developed
- Geographic and Habitat Expectations
- Biocriteria ready for Standards
- 305(b) assessment approach
- 8 Cooperative States
- 3 Cooperative EPA Regions
- Many other cooperative partner agencies.

What we need...

- Incorporate probability design into monitoring and assessment framework.
- Streamline our biocriteria development and calibration methods.
- A better understanding of large/great river transition.
- More players to help us get this done.

Questions?

