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

- Ohio, 58.0%
- Missouri, 17.0%
- Upper Miss, 21.0%
- Local, 4.0%
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)

R² = 0.39
Water Quality –vs- MIwb (East Liverpool)

$R^2=0.52$
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 (*ORFIn*).
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
- 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.
Geographic Regions Identified
Fish / Habitat interactions among distinct geographic regions.
3 Habitat Types Identified

ORFIn LI-15

- Non-Outlier Max
- Non-Outlier Min
- 75%
- 25%
- Median
- Outliers

Habitat Type

C

B

A
3 Habitat Types X 3 Regions

ORFIn LI-15

- Non-Outlier Max
- Non-Outlier Min
- 75%
- 25%
- Median
- Outliers

Upper River                Middle River                 Lower River

ORFIn Classification
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
Status of Biocriteria

- ORFIn 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

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<th>Direction</th>
<th>Method</th>
<th>Threshold</th>
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<td>qs</td>
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<tr>
<td># Individuals</td>
<td>+</td>
<td>tb</td>
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<tr>
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<tr>
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Status

- Index being recalculated using new scoring criteria.
- Final Index expected June, 2002
- Index variability being examined to aid in establishing index expectations.
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 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?