



EMAP-GRE and ORSANCO's Ohio River Biological Monitoring Program



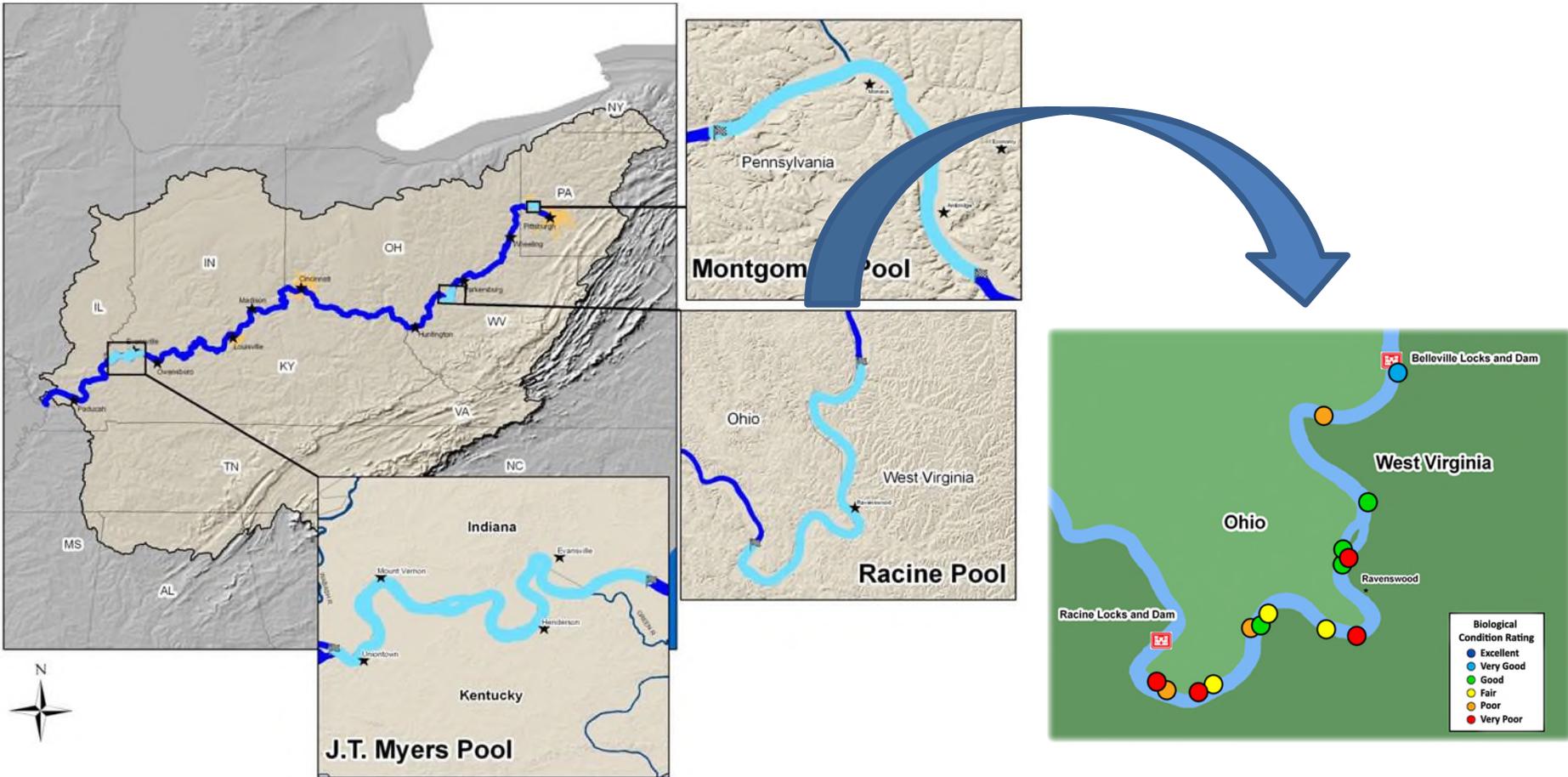
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ORSANCO Biological Programs

- **Ohio River Valley Water Sanitation Commission (est.1948)**
 - Interstate water pollution control agency
 - Compact signed by 8 states
 - IL, IN, KY, OH, PA, WV, NY, VA
- **Task :** Ensure the Ohio River is ***capable of maintaining fish and other aquatic life***
- **Tools:** Biological Indices, Annual Assessments
 - Nighttime boat electrofishing (500m zones)
 - Hester-Dendy macroinvertebrate samplers
- Prior to the early 2000's
 - Sampling events lacked detailed paired abiotic data

How we survey the Ohio River



3 to 4 pools survey per year

15 random sites surveyed within each pool

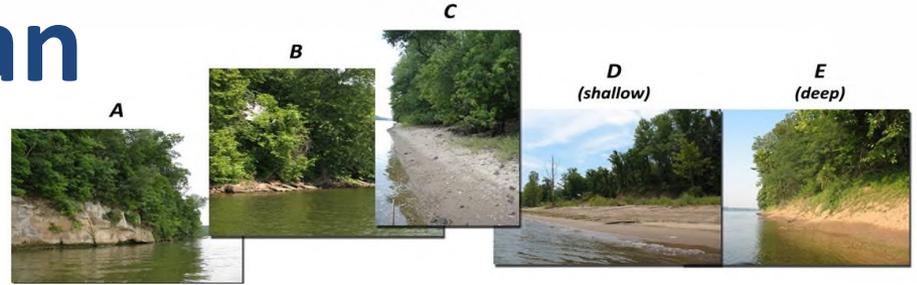


EMAP – Great River Ecosys



- **Environmental Monitoring and Assessment**
 - Awarded grant in 2007 – 2011
- **Goal:** Identify additional stressors and create/recalibrate biological indicators
- **Augmented regular collections at ~400 sites**
 - Instream and Riparian Habitat
 - Water Chemistry
 - Sediment Chemistry
 - Macroinvertebrate Kicks
 - Periphyton
 - Benthic Trawling

Instream & Riparian



- **Parameters**

- Instream

- Aquatic Vegetation, Woody Cover, Rock Cover, Anthropogenic Influences

- Local Riparian

- Vegetation, Bank grade & erosion, Acid Mine Drainage, Land Type/Use

- **Methods**

- Subjective percentages/weights given for each measure

- Collected at each site and surrounding “neighborhood”

- 2mile above, and 1mile below each site

- **Implications**

- Results used in classification of sites and setting IBI expectations

- GIS is a an appropriate surrogate for neighborhood level

- Still in progress

Water Chemistry



- **Parameters**

- Ammonia (N), Nitrate+Nitrite, TKN, Chloride
- Hardness, Phenolics, Sulfate, Phosphorus, TSS, TOC
- Cost precluded metals

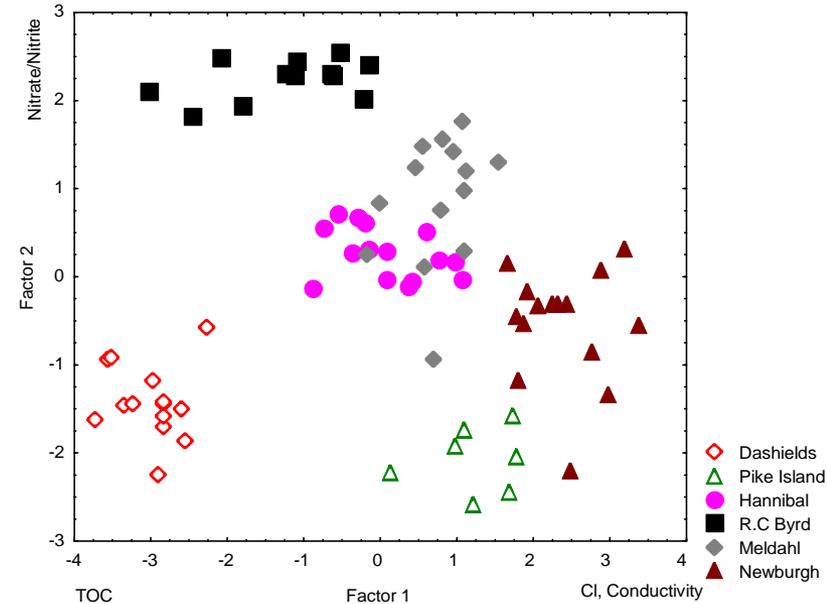
- **Methods**

- Mid-water column grab sample
- DS end of 500 m zone, 100' from shore
- 3 rounds w/in index period (July – Aug – Sept)

Water Chemistry

- **Results**

- Inter-pool var. \geq Intra-pool var.
- No inter-round sign variation*
- Fish and bugs exhibited a response to water chemistry parameters and gradient

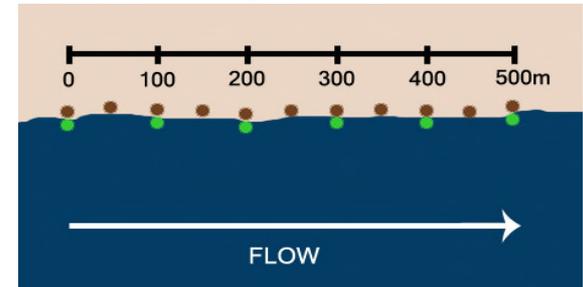


- **Implications**

- Dropped phenolics due to non-detects
- Shifted to one sample at time of biological survey
- Used for site classification and index development

Sediment Chemistry

- **Parameters**
 - pH, organics, toxicity
 - N (tot & available), P (tot & available)
- **Methods**
 - 11 point composite
- **Results**
 - Few toxicity detects (2/440 obs)
 - Bug metrics responsive to a sediment gradient
- **Implications**
 - Dropped toxicity tests due to cost and non-detects
 - Bring 10' of 2" x 8" and tread lightly
 - Used for site classification and index development



Turning Raw Values into Abiotic Gradients



POOR Abiotic Quality
Most Disturbed (MD)

GOOD Abiotic Quality
Least Disturbed (LD)

WATER_CHEM	SED_CHEM	TOT_NUTR	NUTR_INTXN*
CaCO ₃	LOI	TN_Sed	TN_WQ
Cl	pH_Dev	TP_Sed	TP_WQ
Cond	TOC	TN_WQ	NH ₃
SO ₄		TP_WQ	
TSS			
TOC			

*Ohio EPA method - Miltner and Rankin 1998

Macroinvertebrates

- **Questions**

- What is the best sampling method?
- Can they serve as a 2nd indicator?

- **Methods**

- 2 Hester-Dendy Sets
 - HD Shallow (HDS) and HD Deep (HDD)
 - Six week incubation
- EMAP method Multihabitat (MH) Kicks
 - 10 – 1m kicks at 6 transects
- Collected at each site



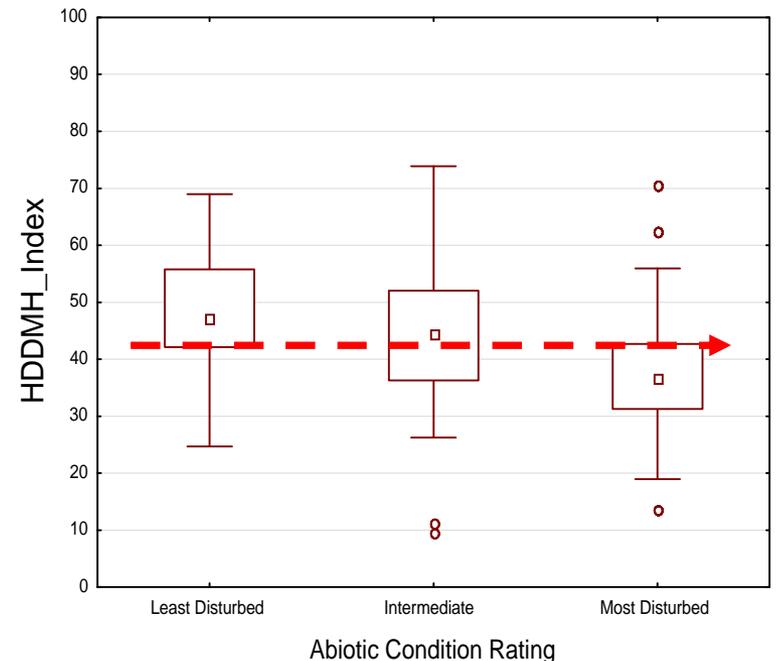
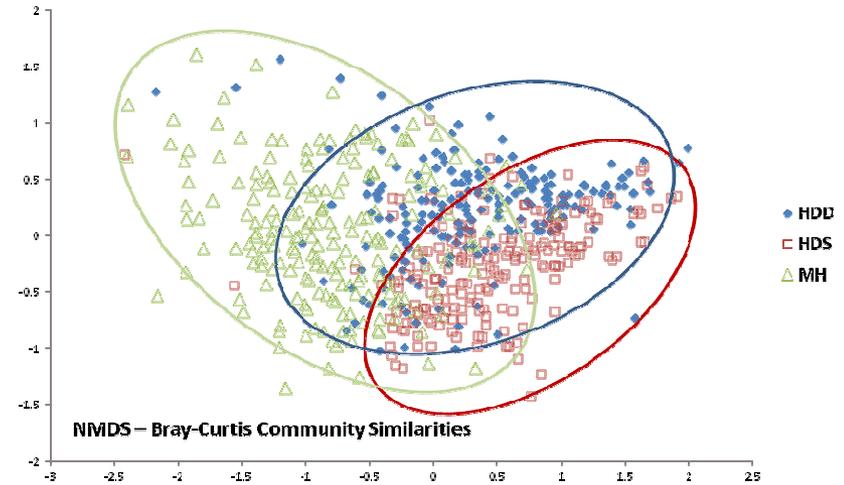
Macroinvertebrates

- **Results**

- Generated 7 macro IBIs
- HDDMH combo was most responsive to site condition

- **Implications**

- Discontinued HDS sampling
 - Limited variation in assemblages
- HDD & MH have limitations
 - Choose based on local conditions
 - Multiple visits can be costly
- Macros will be used in assessments and nutrient criteria development



Periphyton

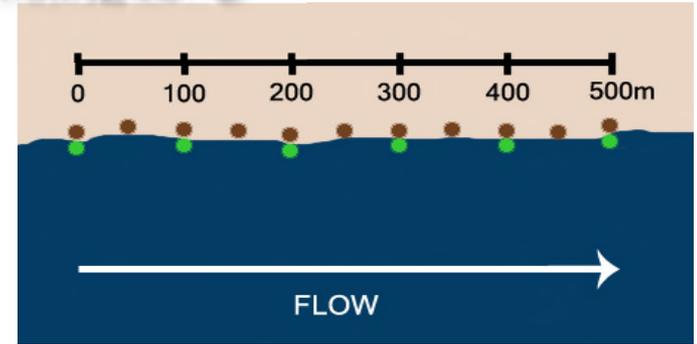


- **Questions**

- Can it serve as a 2nd indicator?

- **Methods**

- 6 point composite
- Scrape 2" x 2" area of permanent structure
- Or 50c³ of fine substrate to a maximum depth of 2cm by vacuum (turkey baster)



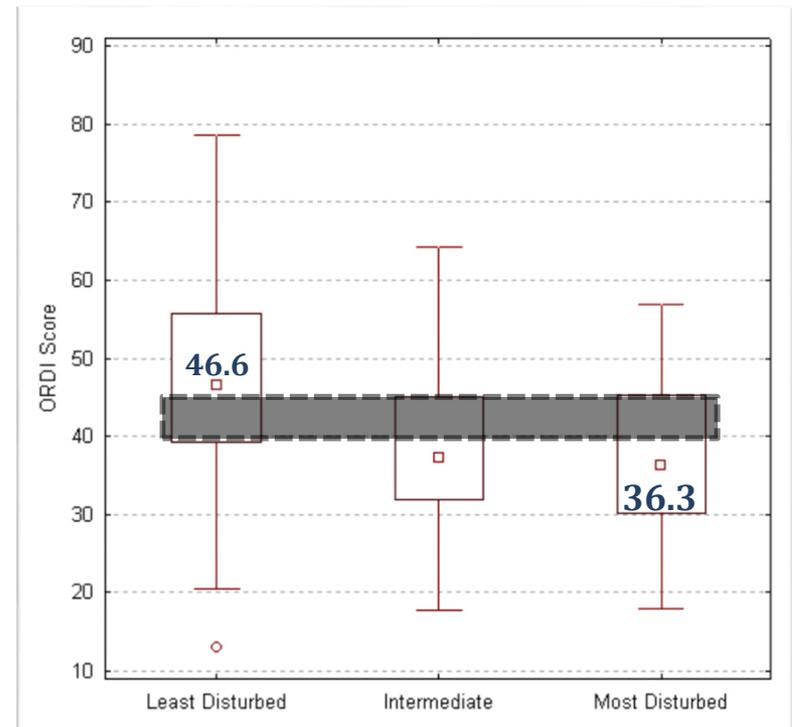
Periphyton

- **Results**

- Analytical time and cost increased annually
- Metrics only slightly responsive
- Resulting periphyton IBI responsiveness limited

- **Implications**

- Only collected for 3 years
- Limited responsiveness possibly due to
 - Sample size and/or improper predictor or response variables
- Diatoms will not be used as an OH River indicator



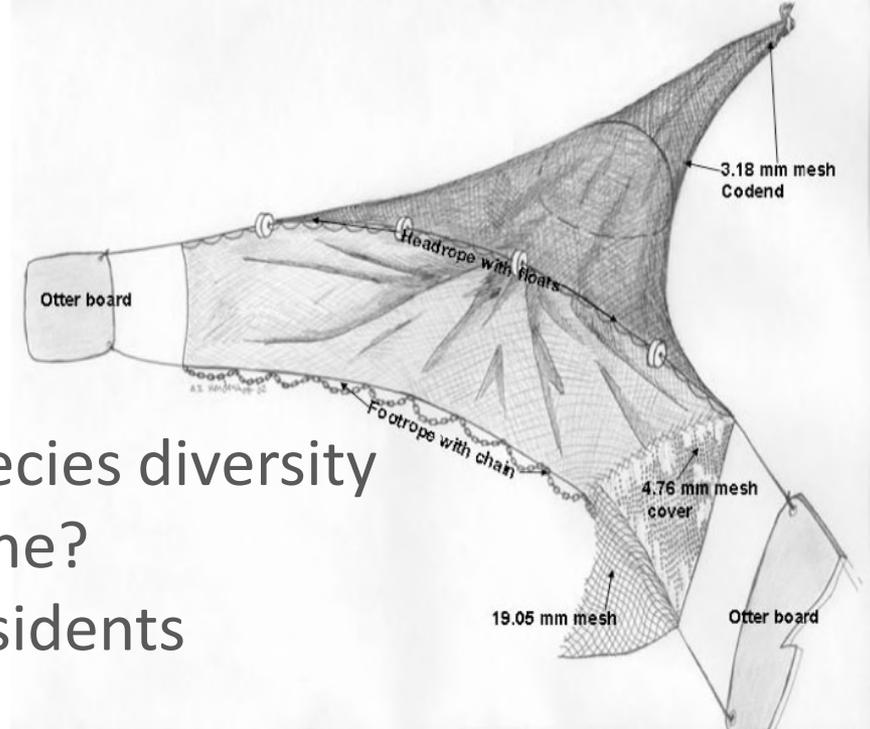
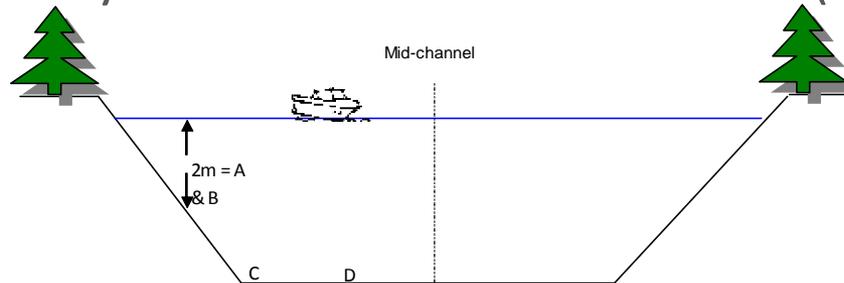
Benthic Trawling

- **Question**

- Are we underestimating species diversity and abundance with EF alone?
- Identifying true OH river residents

- **Method**

- 4, 1 minute trawls at all 60 EF Pool sites
- 2 close to shore ~6' deep (A, B)
 - Most representative of EF zone
- 1 where shoreline slope levels out to flat bottom of river (C)
- 1 done halfway between C & center of river (D)



Benthic Trawling



- **Result**

- Lower CPUE relative to EF
- High occurrence of no-catch trawls
- Captured unique or fish rare to EF sampling

- **Implication**

- Can add new records to determine true residents
- Viable supplemental sampling for EF
- Needs adaptation to local conditions for best results and to maximize cost effectiveness

The Doggie Bag

- Benefit
 - Additional data allowed for improvement of old and generation of new indicators
- How EMAP lives on
 - Macro sampling with MH kicks
 - Special studies allow for EMAP data set continuation
 - e.g. sestonic nutrients and macros for nutrient criteria development
 - EF Fixed stations & paired water quality
- Advice to new programs
 - Limit paired data collection to most essential variables
 - Requires preliminary studies or *a priori* knowledge
 - A successful assessment program should include
 - probabilistic (unbiased assessment)
 - targeted (point source determination)
 - fixed station sampling (temporal tracking)