

National Biological Assessment  
and Criteria Workshop

Advancing State and Tribal Programs



Coeur d'Alene, Idaho  
31 March – 4 April, 2003

**LR 101**

# LARGE RIVER BIOLOGICAL ASSESSMENT METHODS

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## Course Presenters and Contributors

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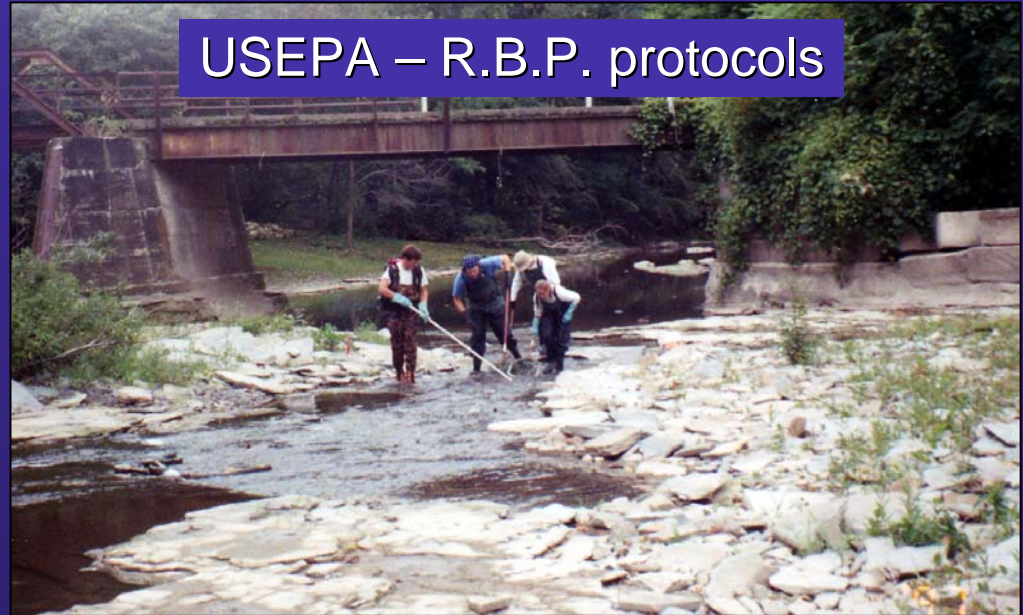
# *Section 1: Introduction and Course Objectives*

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*Presented by*  
Joseph E. Flotemersch, USEPA,  
Office of Research & Development

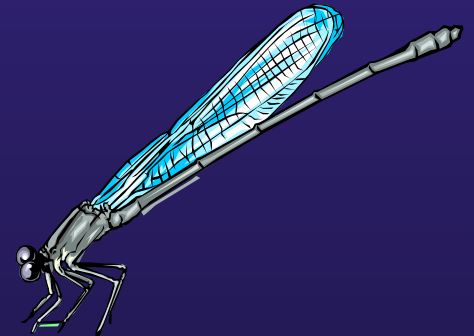
# Historical Focus

Methods for wadeable streams and smaller rivers



Taxonomically:

Focused largely on  
benthic macroinvertebrates



## Increased awareness

- Non-point sources
- Diffuse sources of stressors
- Increased interest in larger rivers



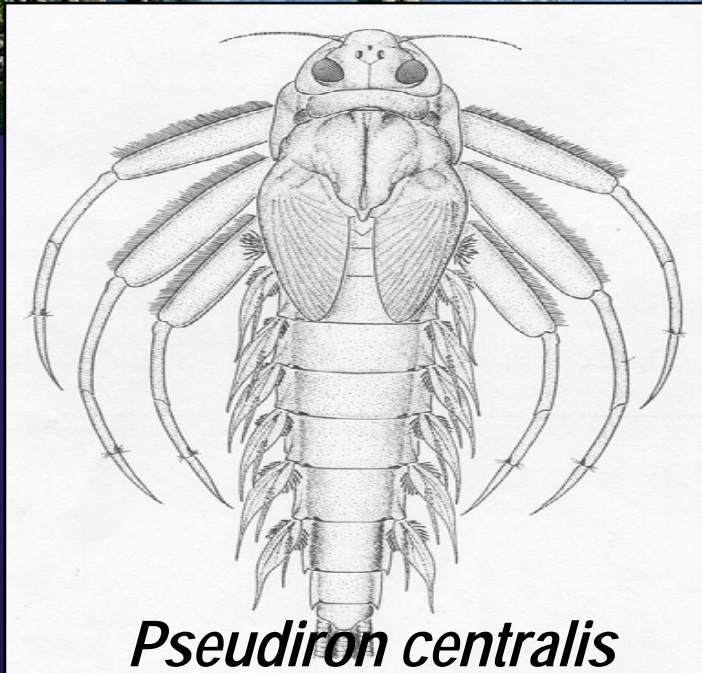
## In larger systems, stressor(s)

- Are rapidly diffused
- Are often integrated
- Can be masked by another stressor
- Sources are less clear-cut.



# As Systems Get Bigger:

- Physical Habitat Changes
- Biota Changes
- Large River Taxa



*Pseudiron centralis*



As we move into these systems,  
methods will need to change.



# Non-Wadeable Methods

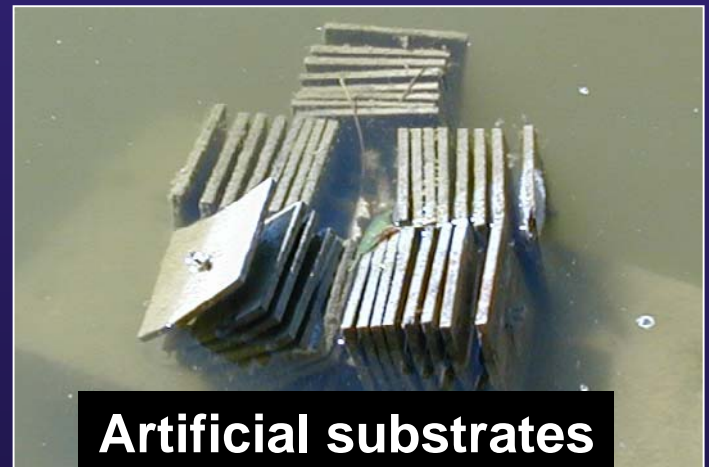
Many are slightly or unmodified wadeable method used in shallow areas

**Wadeable net sampling**



**Net sampling near shore**

Others, developed specifically for non-wadeable applications

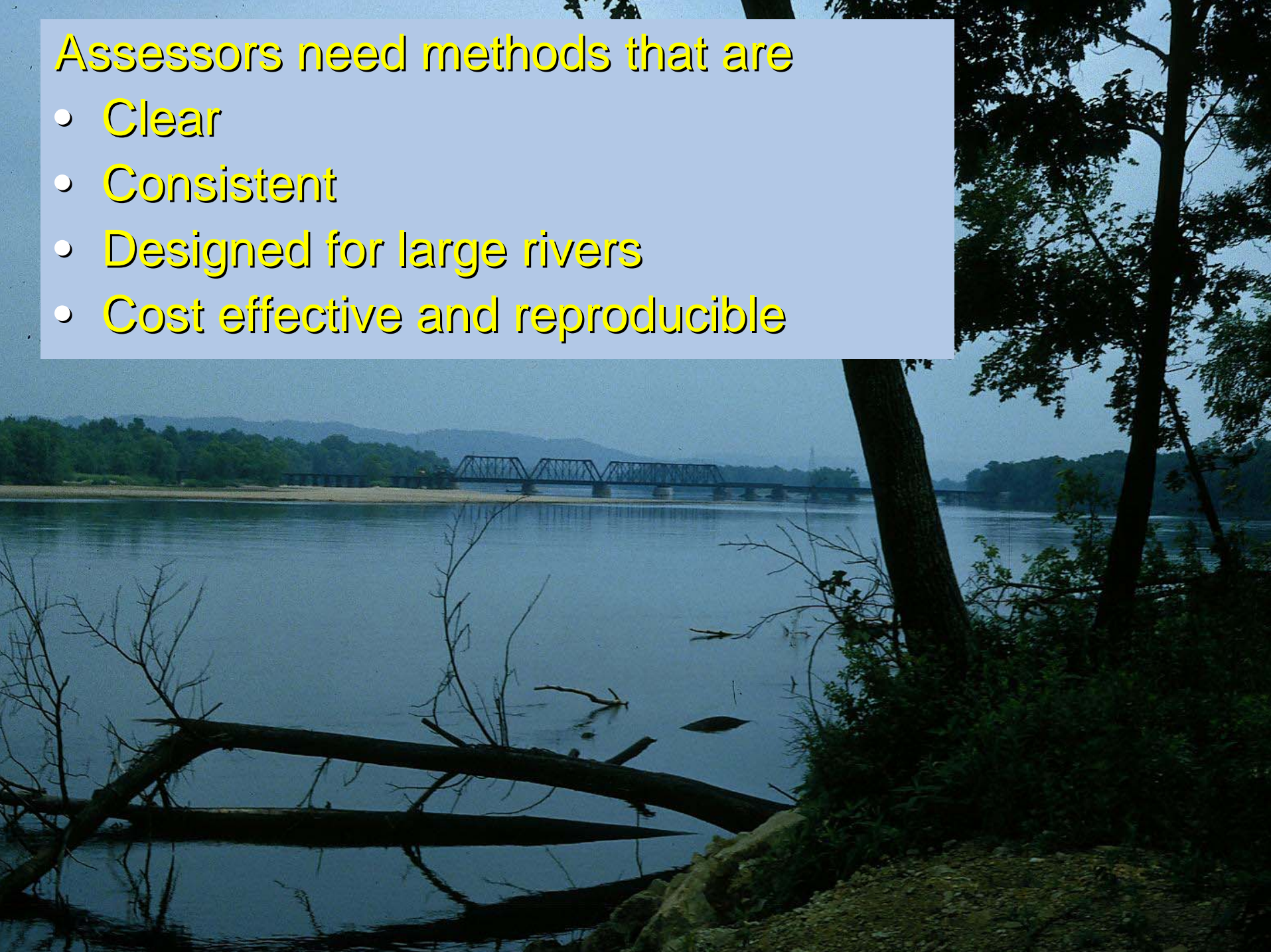


**Artificial substrates**



## Assessors need methods that are

- Clear
- Consistent
- Designed for large rivers
- Cost effective and reproducible



# What makes large rivers different

Issues unique and important  
to large river studies

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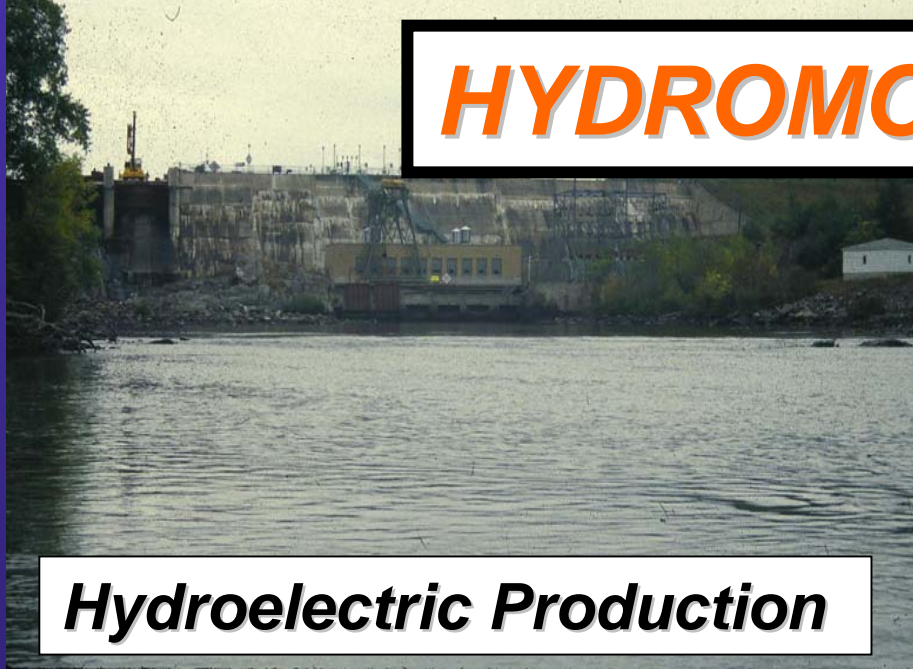
- **Sample period**
- **Segment delineation**
- **Target assemblages**
- **Representative sampling**
- **Logistics**

# Other unique issues:

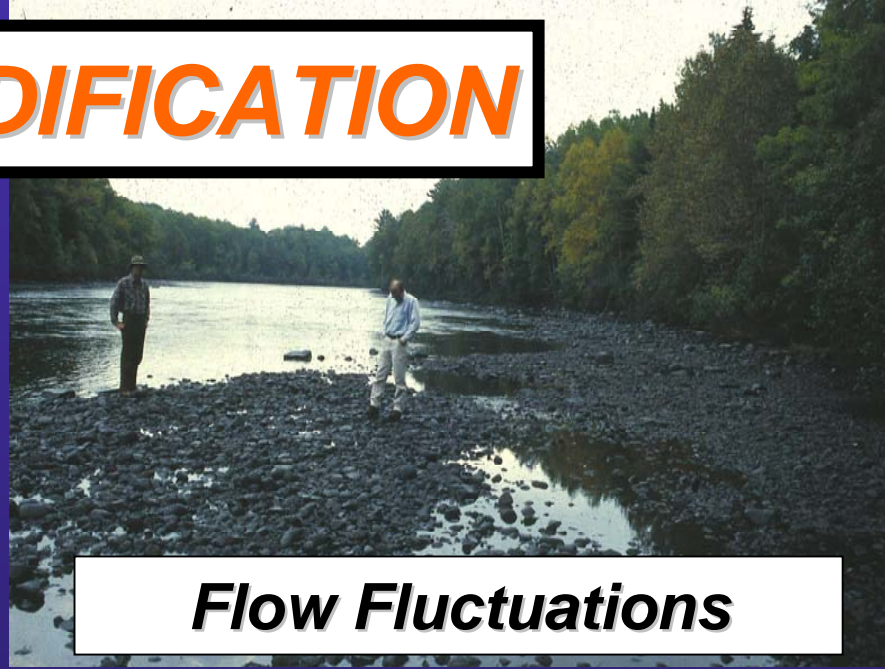
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- Floodplain to channel ratio
- Presence / importance of adjacent habitats
- Volume of water to sample / represent
- Dams and impoundments
- Unique habitat characteristics
- Different faunas / floras
- Sampling methods

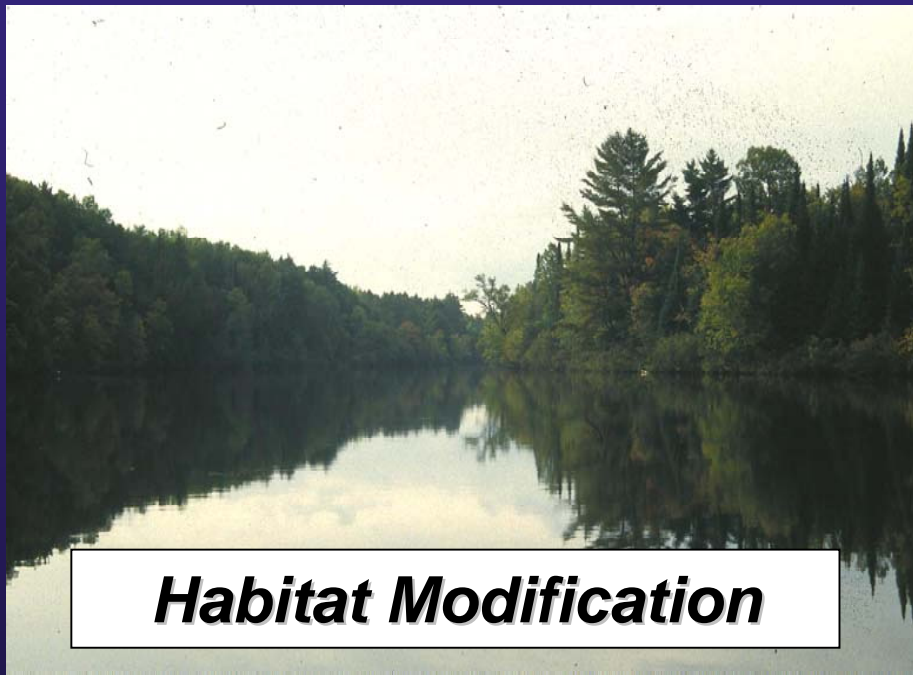
# ***HYDROMODIFICATION***



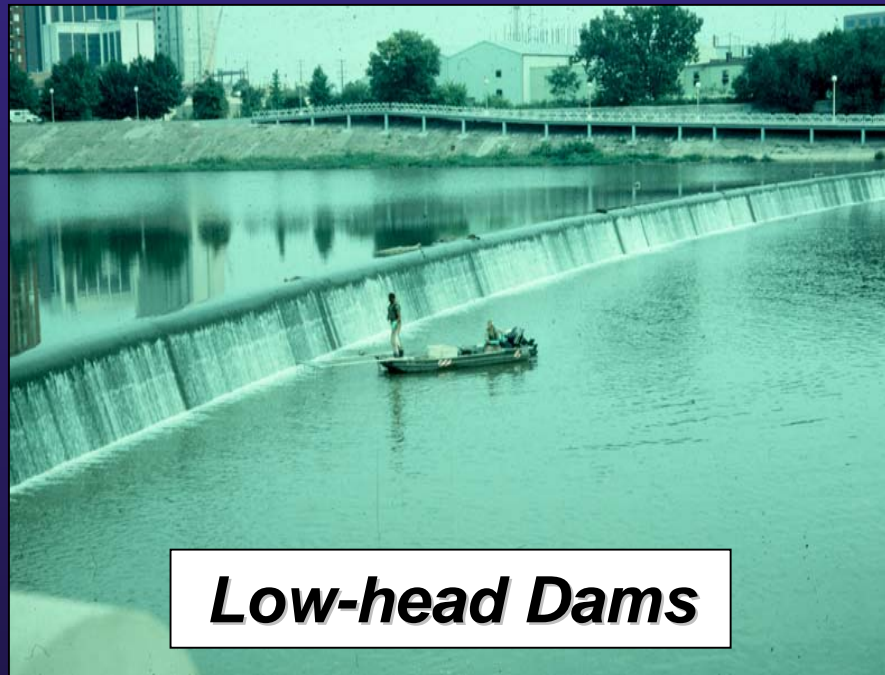
***Hydroelectric Production***



***Flow Fluctuations***



***Habitat Modification***



***Low-head Dams***

# ***NONPOINT SOURCES***

A photograph showing a steep, exposed soil bank with vertical erosion marks, indicating severe bank erosion.

***Severe Bank Erosion***

A photograph of a stream with a large amount of debris, including plastic bottles and sticks, floating in the water, illustrating urban stormwater pollution.

***Urban Stormwater***

An aerial photograph showing a river winding through a landscape with agricultural fields and dense trees, illustrating riparian encroachment.

***Riparian Encroachment***

A photograph of a stream with a large, light-colored rock partially submerged in the water, illustrating siltation of substrates.

***Siltation of Substrates***

# ***POINT SOURCES***



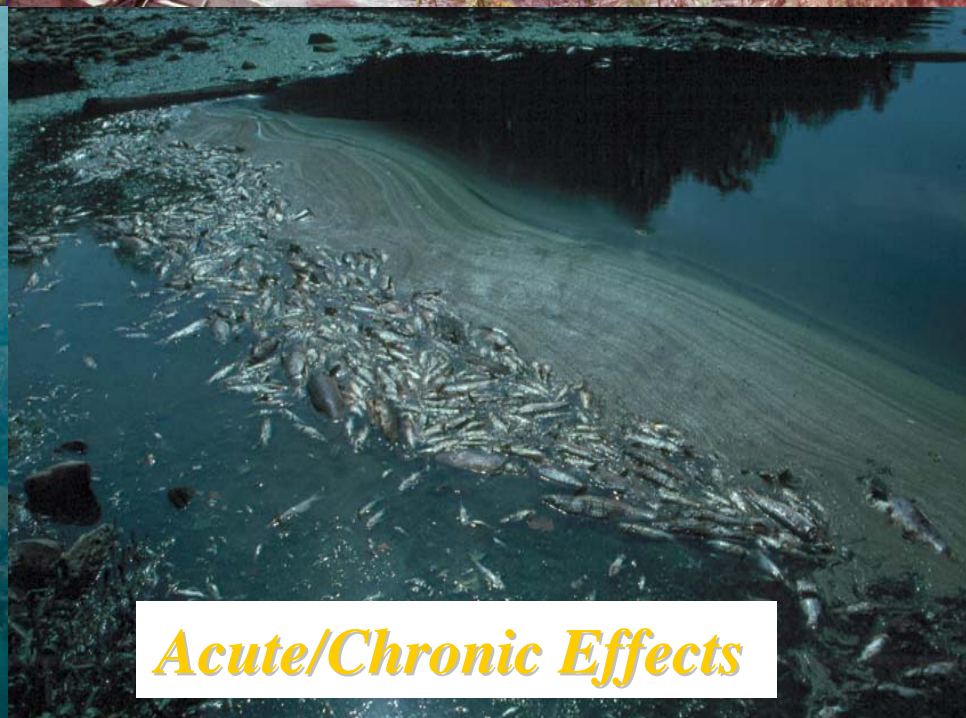
***Domestic Wastewater***



***Industrial Wastewater***



***Multiple, Interactive Sources***



***Acute/Chronic Effects***

# Course Objectives :

**Increase familiarity with**

- **an array of topics relevant to the development of an effective large river bioassessment program**
- **field methods for core biological indicator assemblages**
- **a diverse array and appropriate application of field methods currently being used or developed**



***What Is a  
Large River?***

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***Wisconsin River***





***Kentucky River: Impounded***



***Ohio River – Ohio/Ky.***



***Ohio – Allegheny Plateau***



***Wisconsin – N. Lakes/Forests***



***Oregon – Cascades***



***Floodplain Rivers,  
Mississippi***

# So, what is a Large River?

- Drainage area designations?
- Stream order designations?
- On-site call by field crew?
  
- Non-wadeable lotic stream ecosystems
  - General characteristics:
    - Boatable or raftable
    - Significant presence of riverine species
    - Does not include large reservoirs
    - May be impounded, yet retain generalized form and function of a flowing river ecosystem
  - ***Bottom line: There is no Bright Line***

# What is a Large River?

*A lotic stream system that is better sampled with boat-based field methods rather than wadeable techniques.*

- Fish perspective: Boat or raft-mounted methods
- Benthic Macroinvertebrates: Dip-net or artificial substrates in shoreline margins
- Algae: Periphyton to Phytoplankton



# **DESIRABLE TRAITS OF A LARGE RIVER BIOASSESSMENT PROGRAM**

- **Cost-effective**
- **Transcends sub-habitat differences**
- **Reasonably rapid turn-around for data**
- **Readily obtained decisions or judgments**
- **Easily translated to management and public**
- **Complete multiple sites in a day**

# DESIRABLE TRAITS OF A LARGE RIVER BIOASSESSMENT PROGRAM

- **Methods**

- Adaptable to the multi-purpose sampling needs within a water quality organization.
  - Bioassessment
  - Trend analysis,
  - Point source
  - Non-point source
- Accepted by participating scientist

# **TECHNICAL ISSUES FOR LARGE RIVER BIOLOGICAL PROGRAMS**

- **Designing study objectives**
- **Defining reference conditions**
- **Identifying an appropriate index period**
- **Taking a representative sample**
- **Understanding ecological relationships**
- **Diagnosing the source and cause of impairment**

# What is a Representative Sample?

- **What it is:**
  - An adequate sample for bioassessment
    - Representative of the system
    - Discrete
    - Reproducible (across segments)
    - Consistent (low variability within segment)
    - Diagnostic (desirable objective)
- **What it is not:**
  - Exhaustive survey of all taxa or targeted taxa

# Logistical Issues...

- Equipment
- Facilities
- Experience
- Technical procedure
- Training

# Constraining Issues...

- Typically monitored by a different agency (with different objectives)
- Common focus on wadeable streams
- Site specific approach to assessment
- Interstate and trans-boundary waters jurisdictions is unclear

# Example

*Lack of Reference  
condition and  
accepted models...*

- “Natural” reaches are rare
- “Least Disturbed” often = highly disturbed
- Models exist but ecological theory hampered by loss of the resource

# Exercise 1:

- 1) **Additional constraining issues**
- 2) **Options for overcoming  
constraining issues**
- 3) **Objectives and assessment  
questions of greatest interest to  
group**