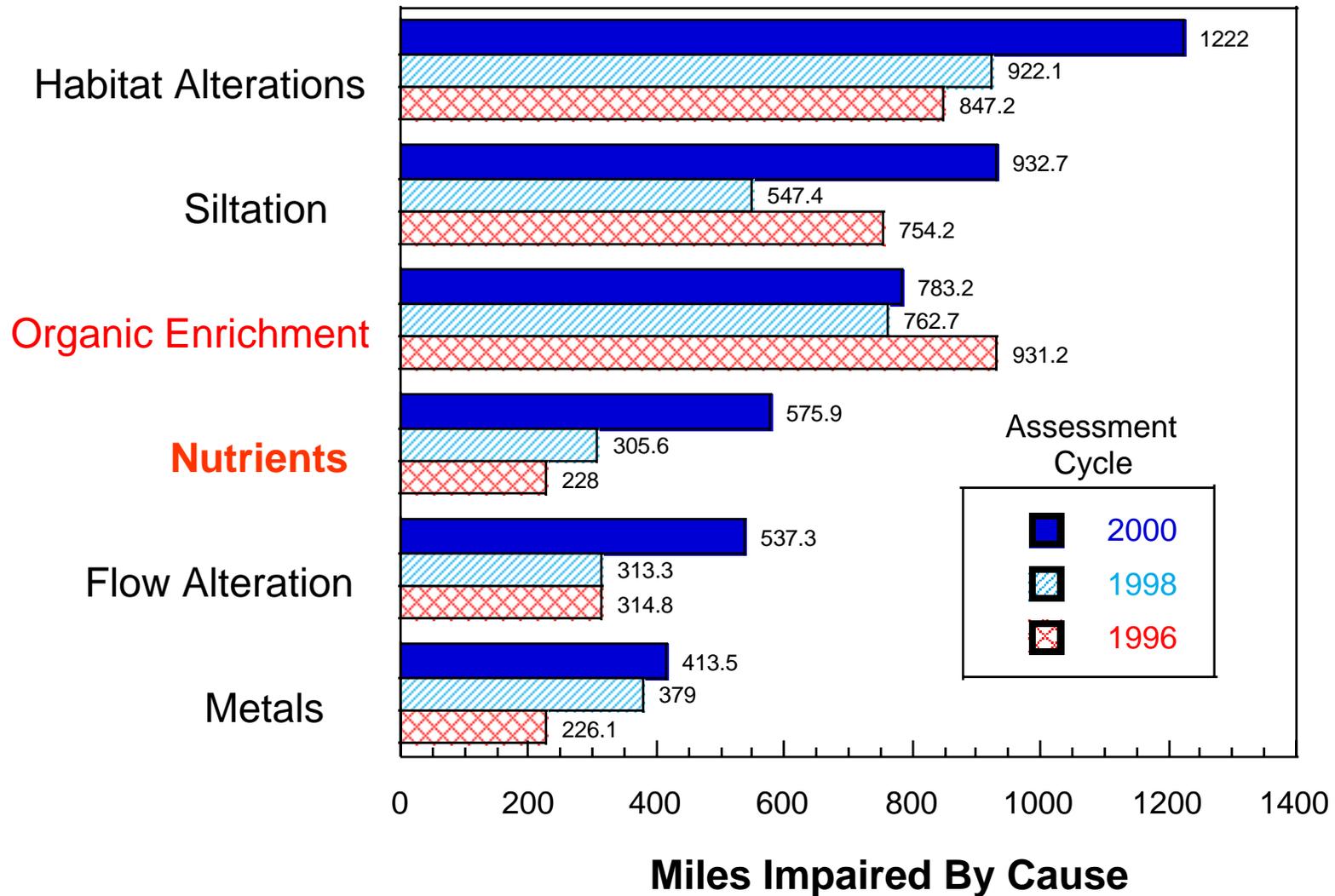


# Habitat Quality as a Cornerstone for Sustaining Healthy Aquatic Communities

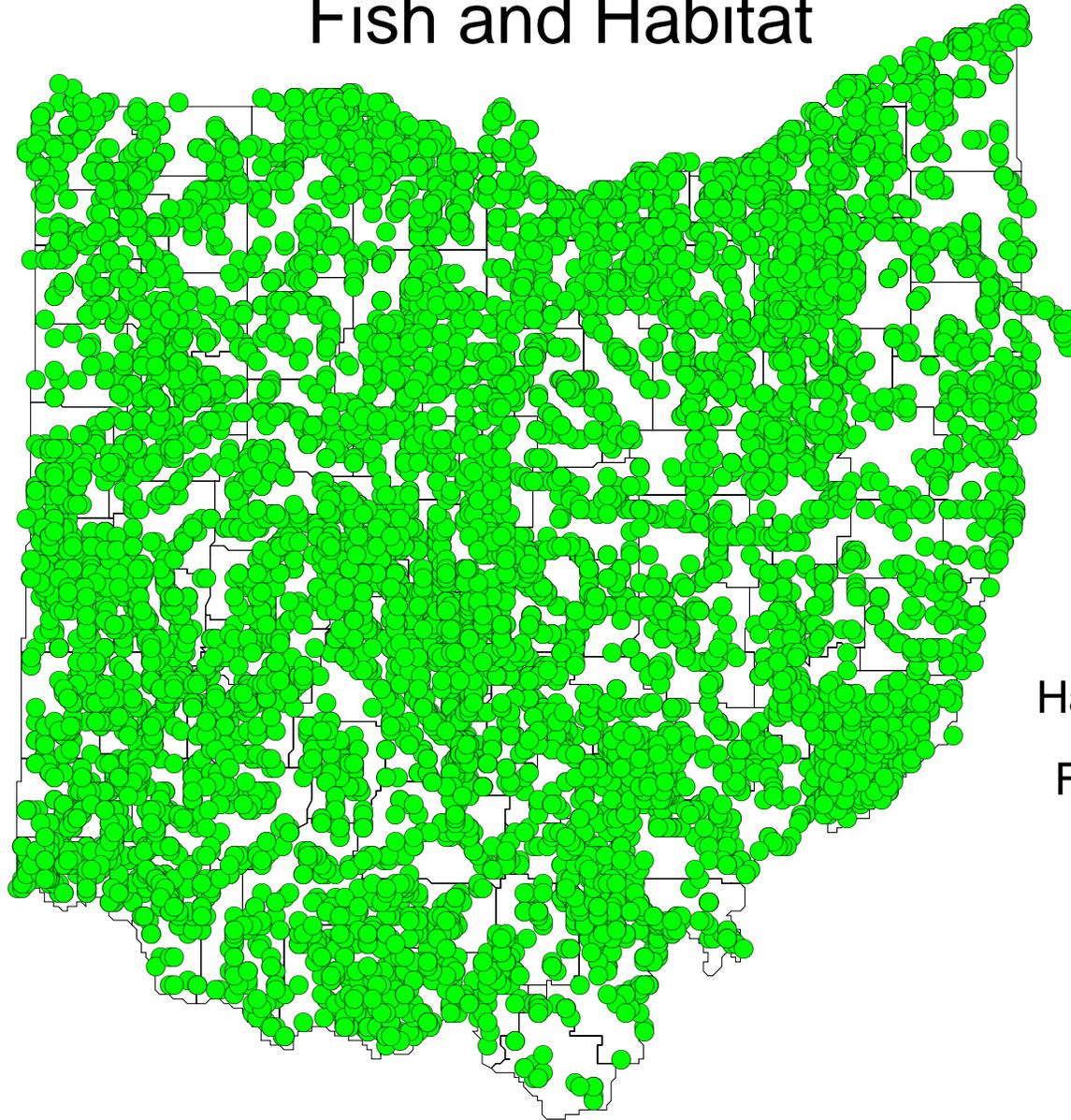
Robert J. Miltner  
Ohio Environmental Protection Agency  
4675 Homer-Ohio Lane  
Groveport, Ohio 43125

# Leading Causes of Impairment 2000 Ohio Water Resources Inventory



# Ohio EPA Data Collections

## Fish and Habitat



Habitat – 10,400

Fish – 22,700

# Measuring Habitat Quality

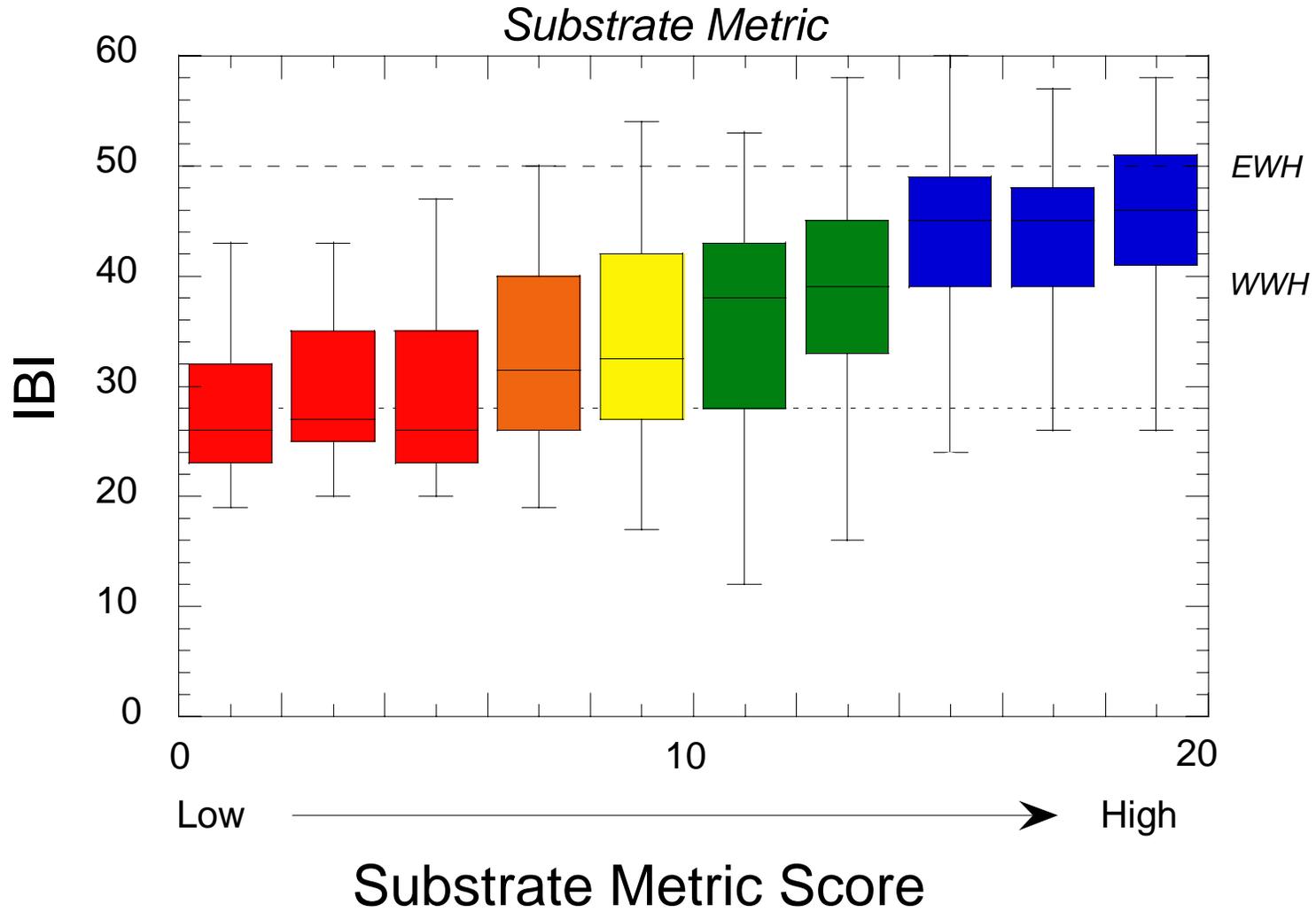
- Qualitative Habitat Evaluation Index
  - Visual assessment of key functional macrohabitat features
    - Substrate
    - Cover
    - Channel Morphology
    - Riparian
    - Pools
    - Riffles
    - Gradient
  - Developed by Ed Rankin (Midwest Biodiversity Institute)



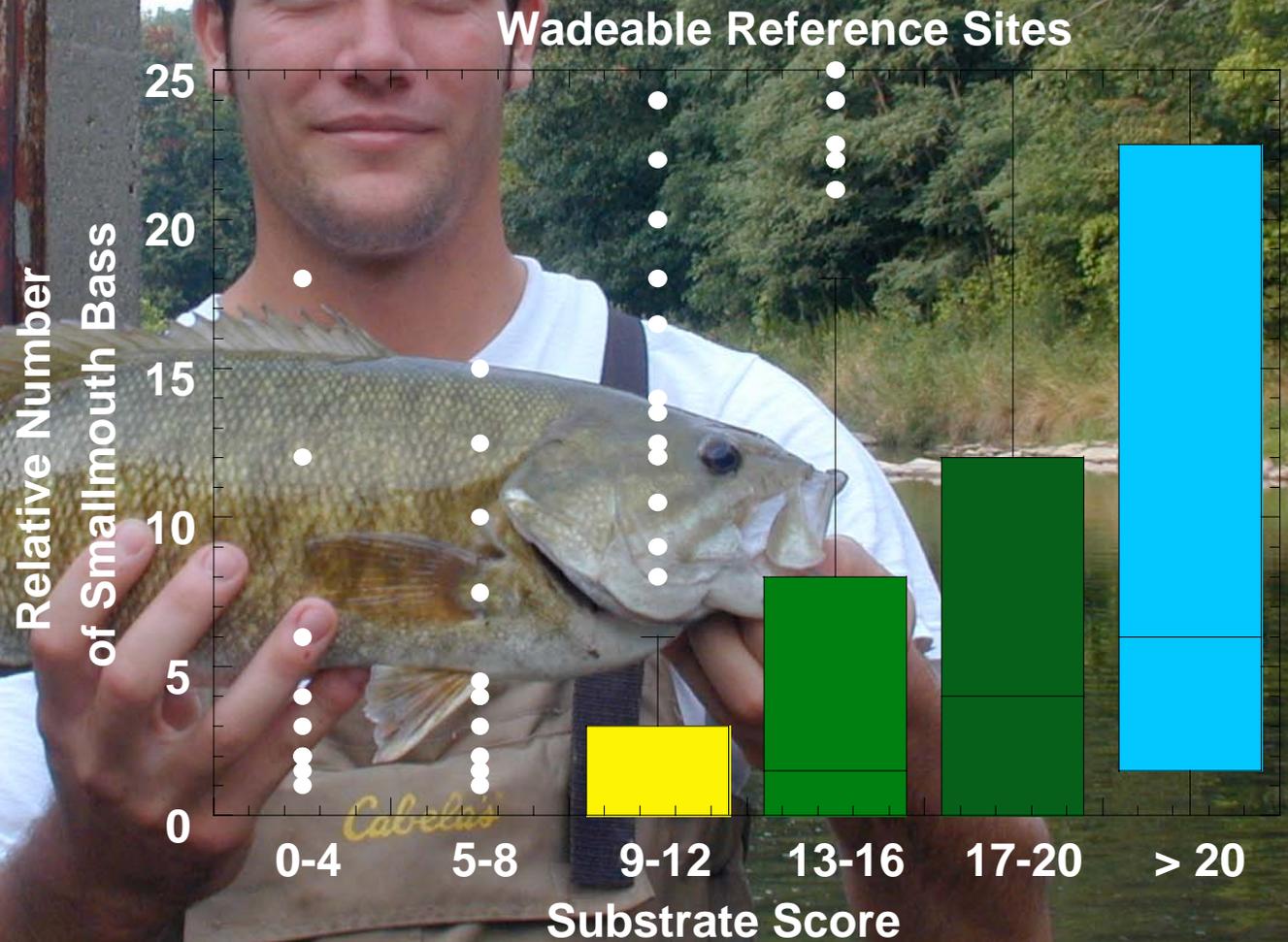
# Essential Components of Good Habitat

- Substrate
  - Composition
    - boulders, cobble, gravel, bedrock, sand, silt and clay
  - Quality
    - *Heterogeneous* and *clean*, or homogeneous and polluted with sediment
    - Clean substrates are essential for reproductive success, production of macroinvertebrates, and living spaces for a variety of species (e.g., madtoms, darters, smallmouth bass, mudpuppy, salamanders)

# Substrate Score vs IBI



# Smallmouth Bass vs QHEI Substrate



# Essential Components of Good Habitat

- Cover
  - Provides refuge from predation
  - Ambush points for top carnivores
  - Adds heterogeneity
    - current velocity, scour and deposition, surface area, stability
  - Quantity and Quality
    - Number of different kinds and the amount of each
    - Boulders and Bedrock Slabs
    - Rooted Aquatic Vegetation (e.g., water willow)
    - Rootwads
    - Woody Debris
    - Depth (i.e., pools greater than ~ 2 ½ feet deep)
    - Undercut Banks

# Essential Components of Good Habitat

- **Channel Morphology**
  - Riffle-Pool-Run sequences
  - Sinuosity
  - Stability



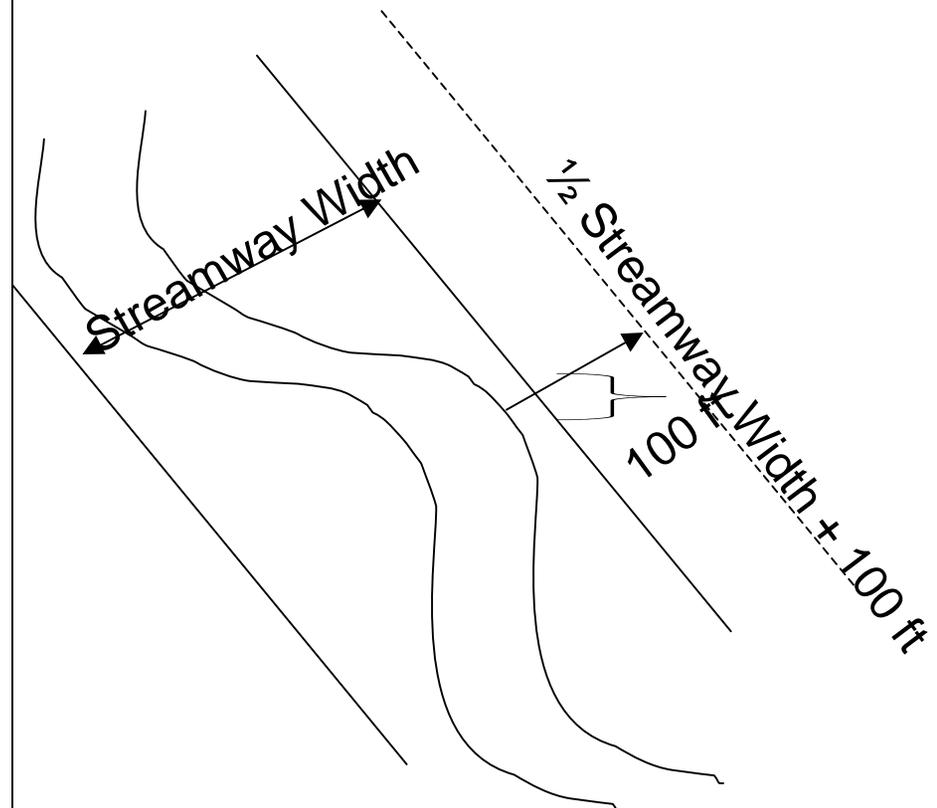
# Importance of Stability

Unstable – massive bank erosion and sedimentation



Stability - plan for equilibrium

$$SW = 120(DA^{0.43})^*$$



\*Dan Mecklenburg and Andy Ward

# Essential Components of Good Habitat

- Riparian Habitat
  - Stability
    - buttress against bank erosion, dissipate energy during flood events, sediment storage
  - Hydrology
    - dissipate energy, water storage
  - Water Quality
    - filter pollution, shading and cooling
  - Production
    - source of energy (leaf litter)
  - Habitat
    - supply woody debris to wetted channel, rootwads, rootmats, home for riparian obligate species

# Essential Components of Good Habitat Riffles, Runs and Pools



# Riffle



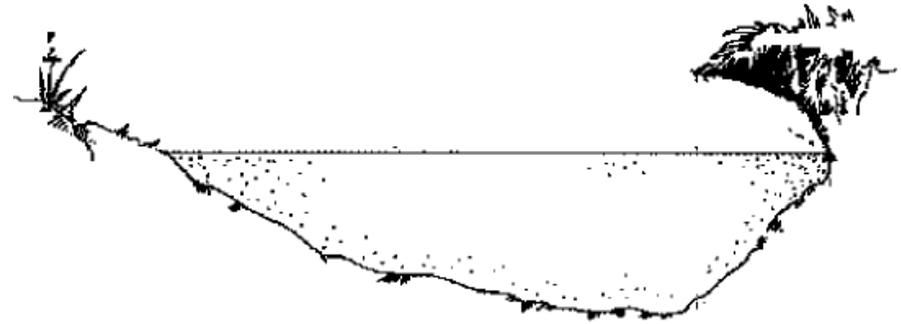
- areas of the stream with fast current velocity and shallow depth;
  - the water surface is visibly broken by rocks, boulders, etc.
- *Functions:*
    - *High production zone for macroinvertebrates*
    - *Spawning area for many sensitive species*
    - *Feeding area for species groups such as darters*
    - *Oxygenation*

# Run



- areas of the stream that have a rapid, non-turbulent flow;
  - runs are deeper than riffles with faster current velocity than pools;
  - generally located downstream from riffles where the stream narrows;
  - the stream bed is often flat beneath a run and the water surface is not visibly broken.
- *Functions:*
    - *Spawning Area*
    - *Feeding Area*
    - *Oxygenation*
    - *Macroinvertebrate Production*

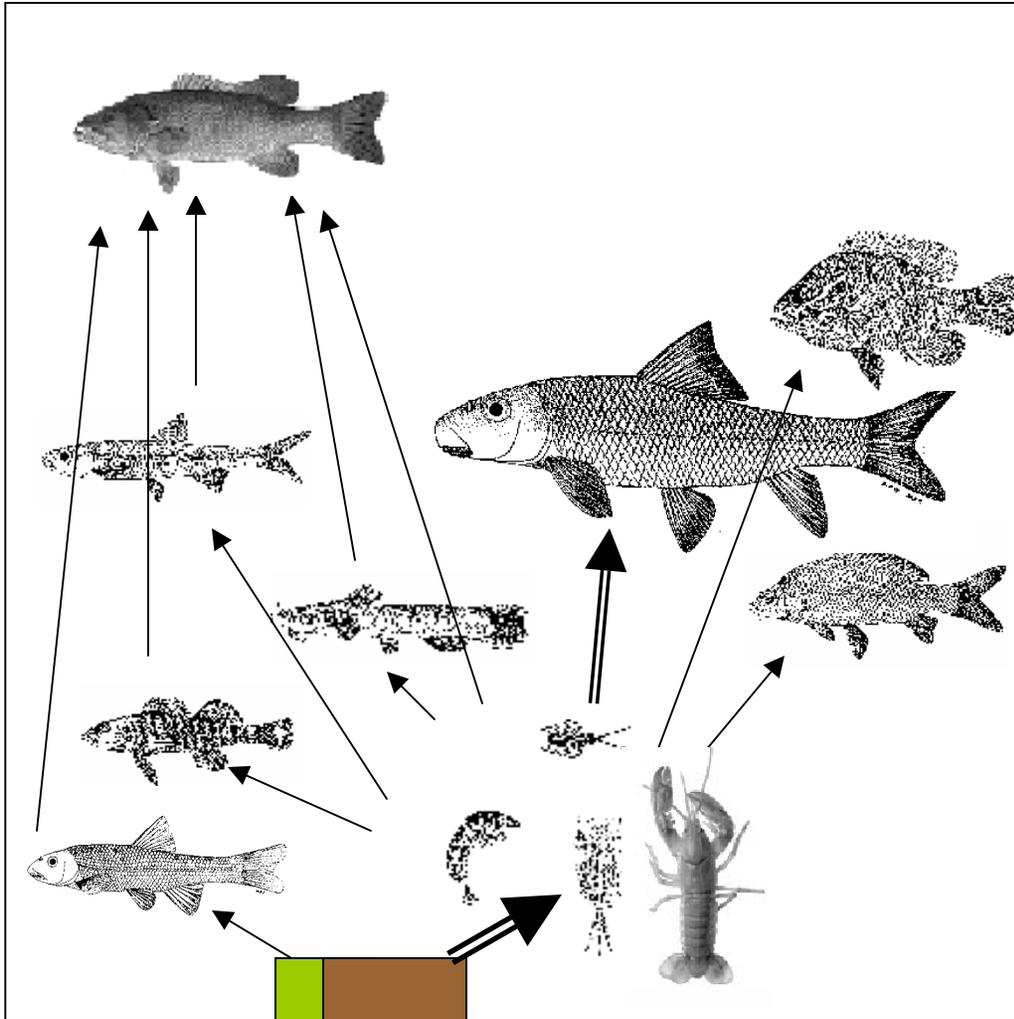
# Pool



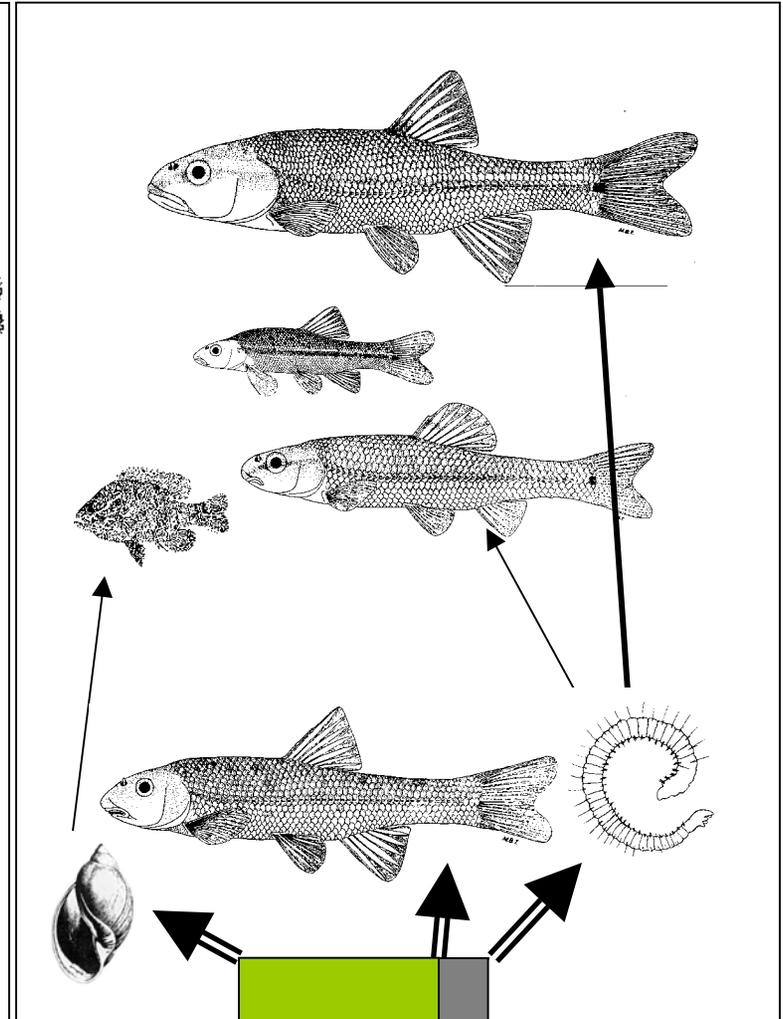
- an area of the stream with slow current velocity;
  - depth greater than riffle and run areas;
  - the stream bed is often concave;
  - stream width frequently is the greatest;
  - the water surface slope is nearly zero.
- *Functions:*
    - *Low Flow Refugia*
    - *Nursery Area*
    - *Resting Area*
    - *Cover*

# Habitat Destruction and Nutrient Enrichment Effects on Stream Fish Community

Healthy Fishery



Degraded Fishery



# Good Habitat

(Shading, Better Nutrient Processing, More Living Places)



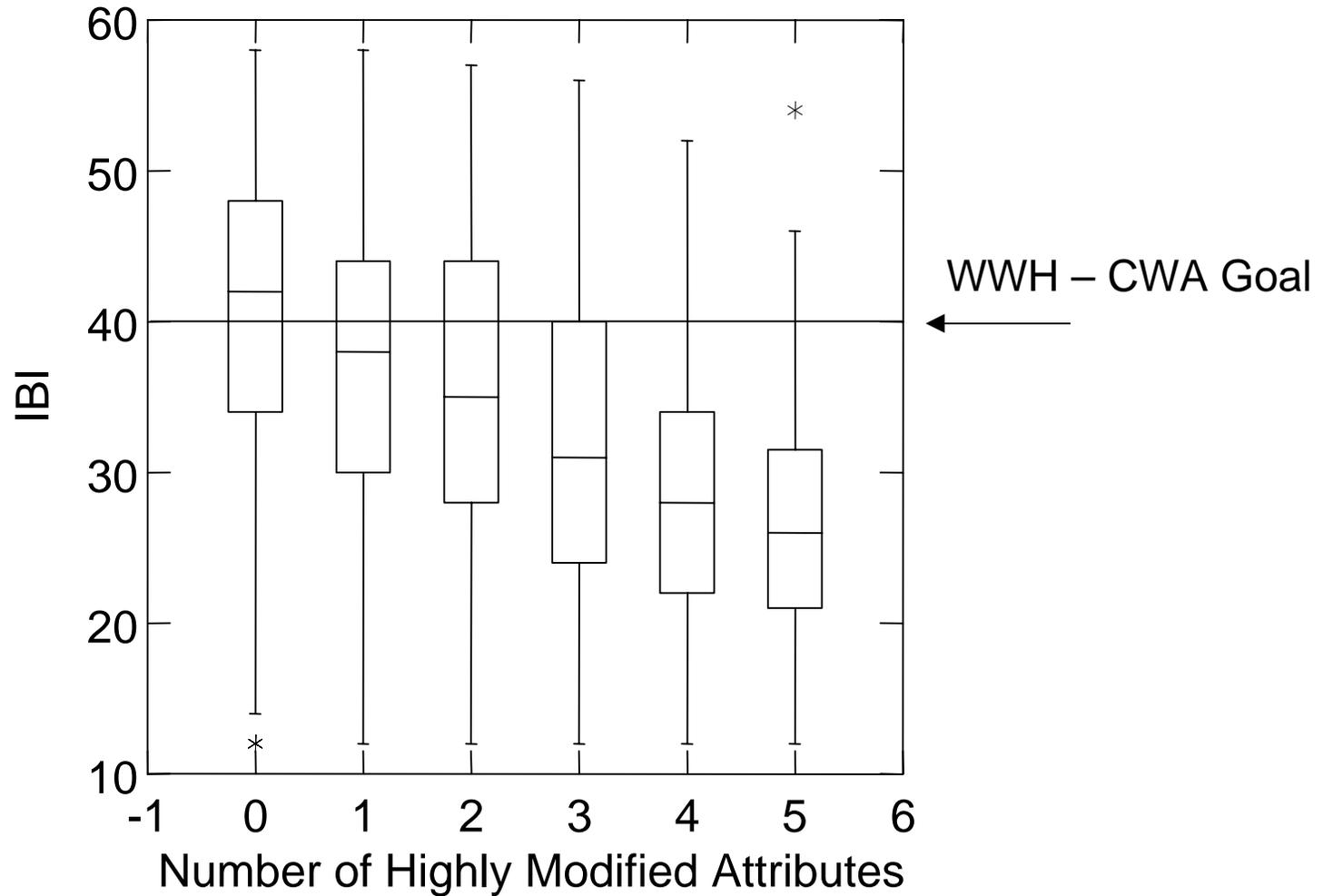
# Poor Habitat

(Full Sunlight, Boom and Bust Production, Fewer Living Spaces)



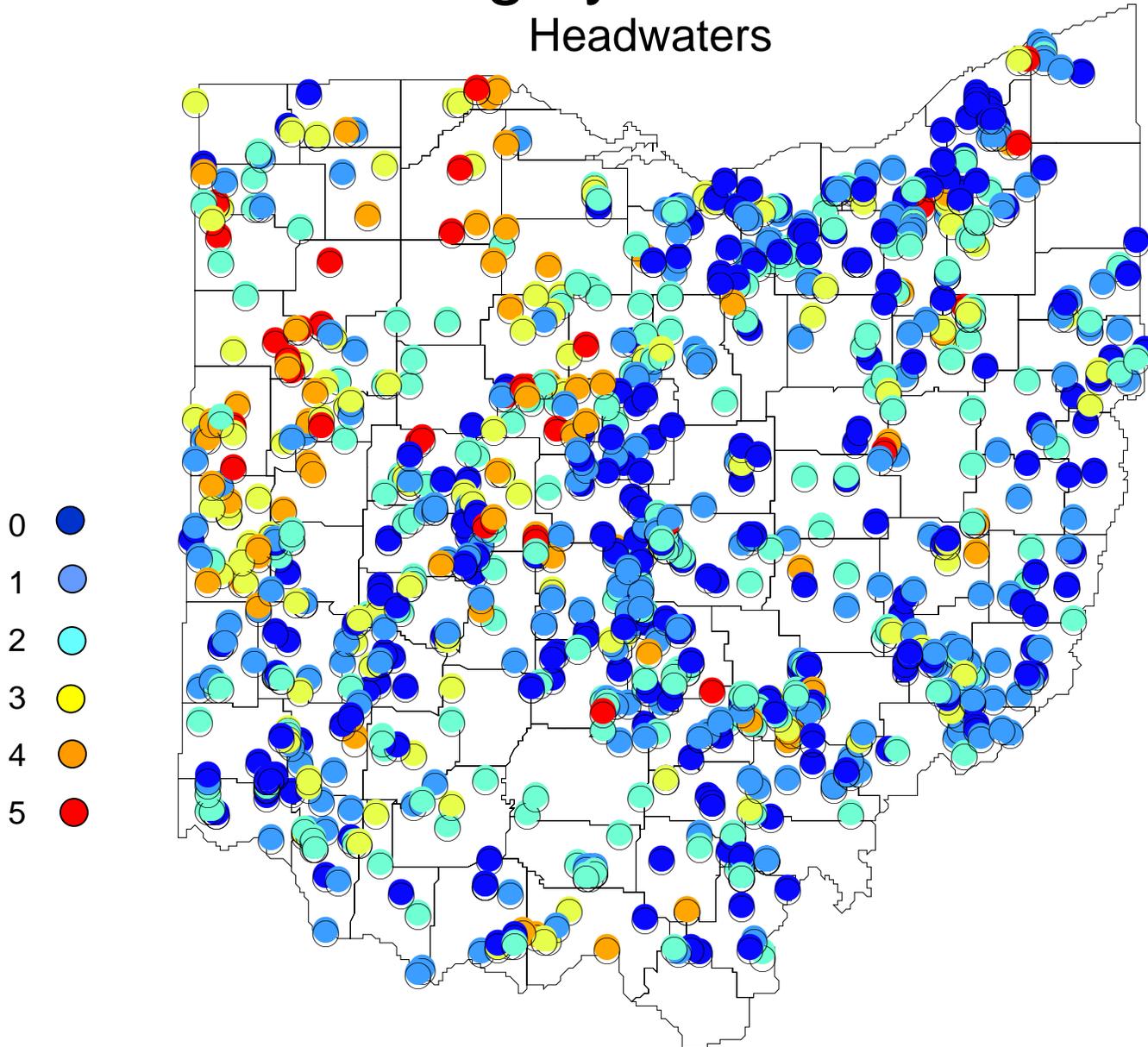
# Habitat Quality and Biological Integrity

(data for ECBP headwaters, 1981-2005)



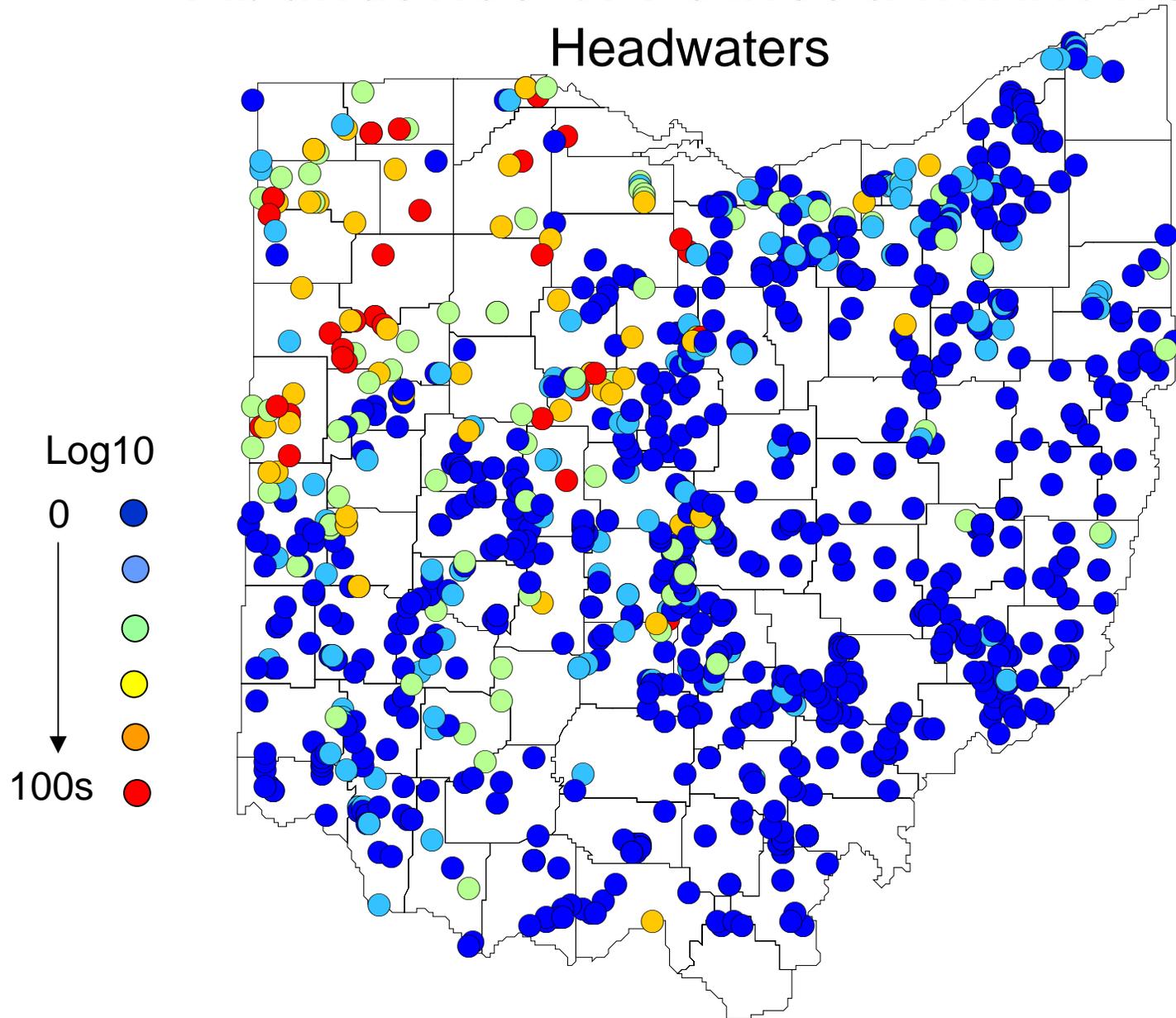
# Number of Highly Modified Attributes

Headwaters



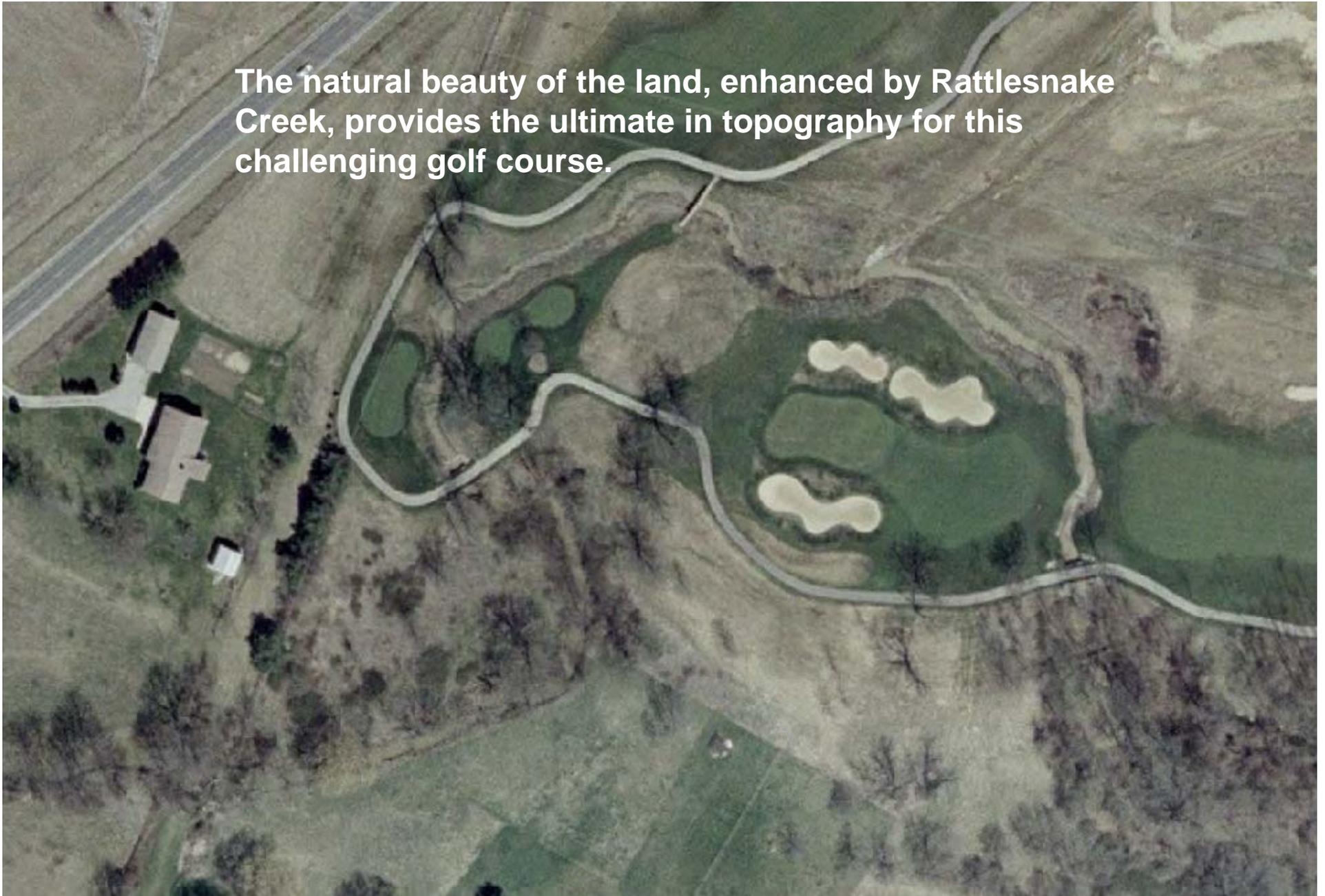
# Abundance of Fathead Minnows

## Headwaters

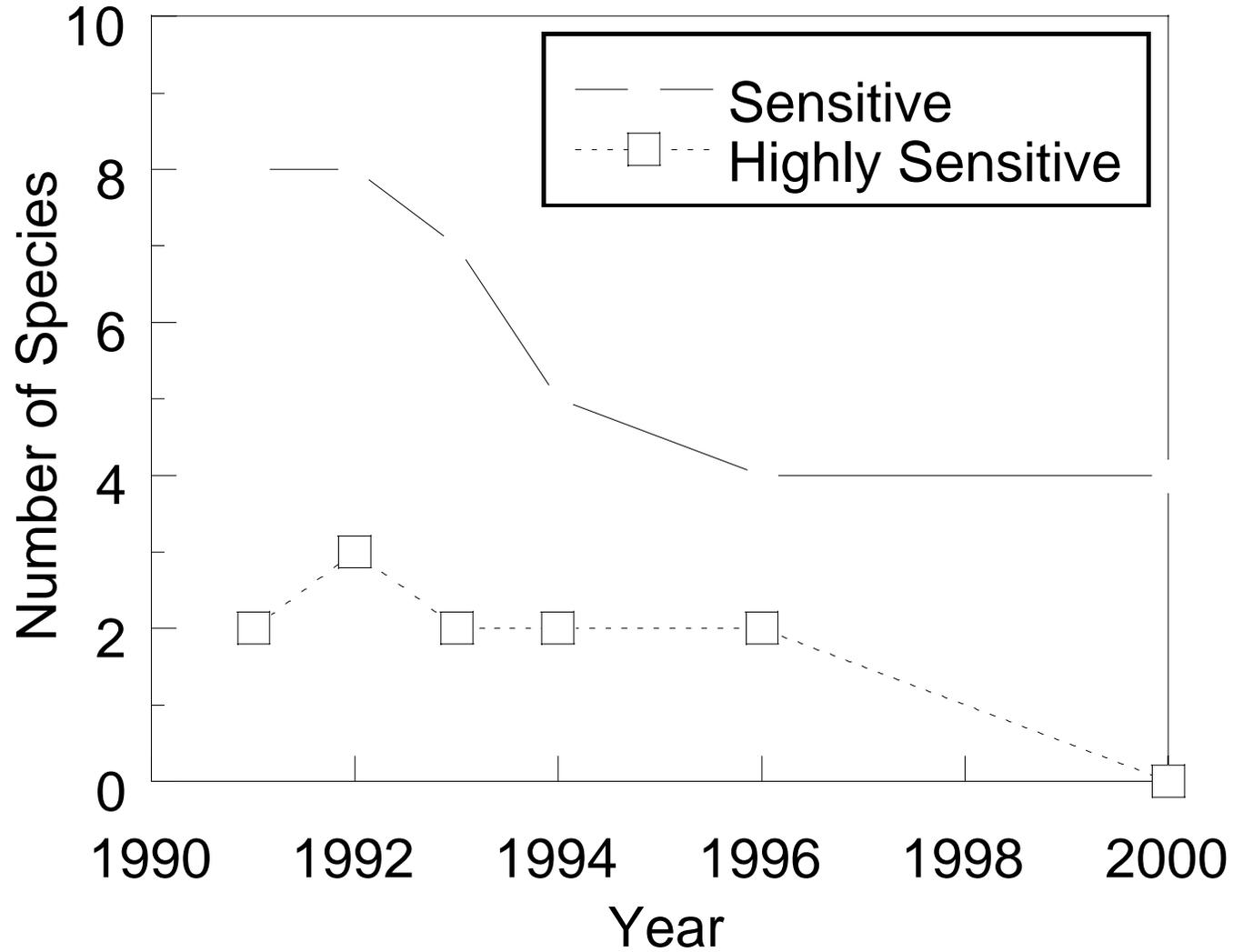




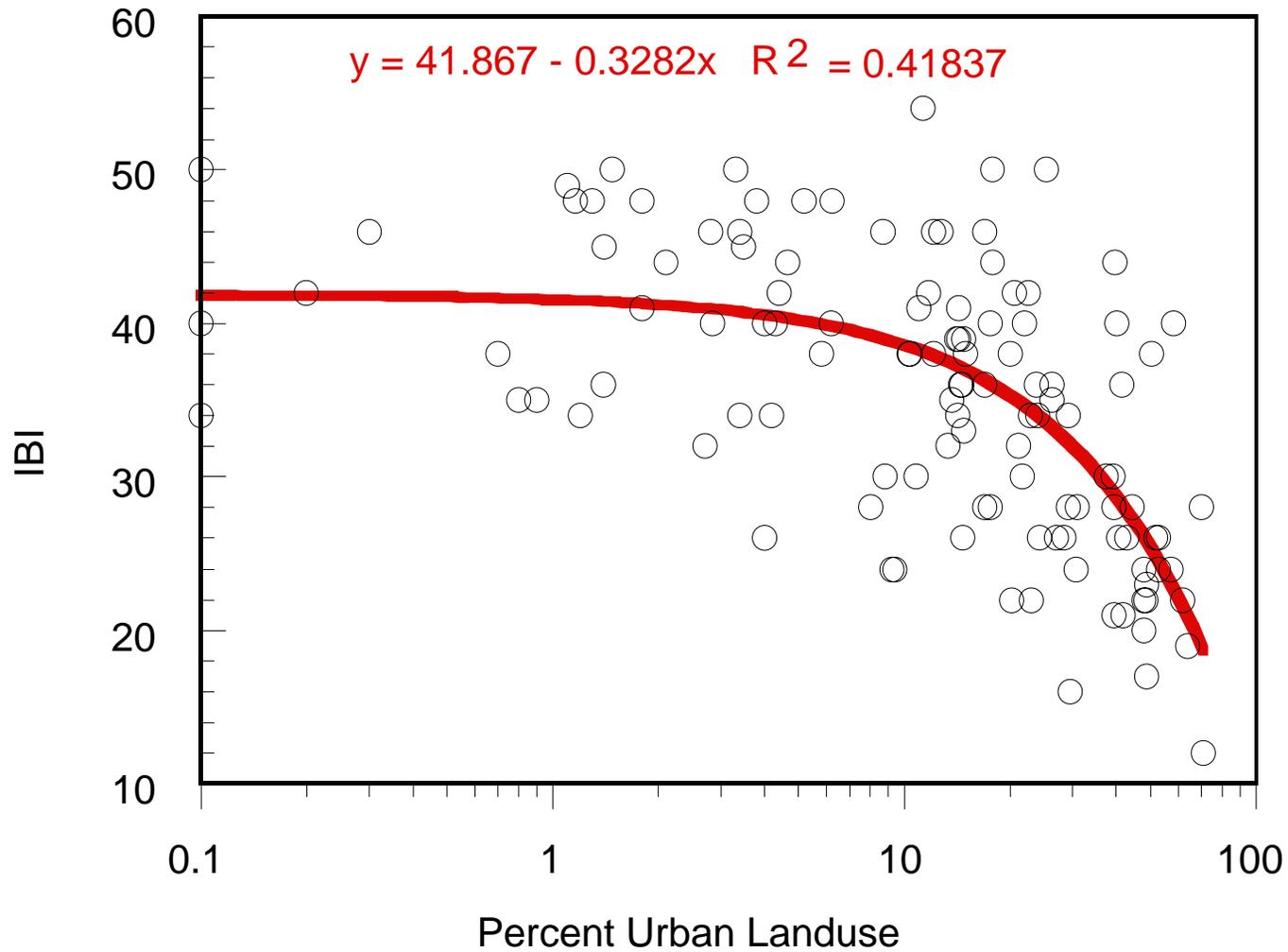
The natural beauty of the land, enhanced by Rattlesnake Creek, provides the ultimate in topography for this challenging golf course.



# Sensitive Species Through Time (@ RM 3.1 in Rocky Fork)



# Percent Urban Land and Biotic Integrity



# Tippecanoe Darter – The Importance of Maintaining Habitat Quality

