# Rivers & Streams Habitat Enhancement

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# Sources of Habitat Impairment

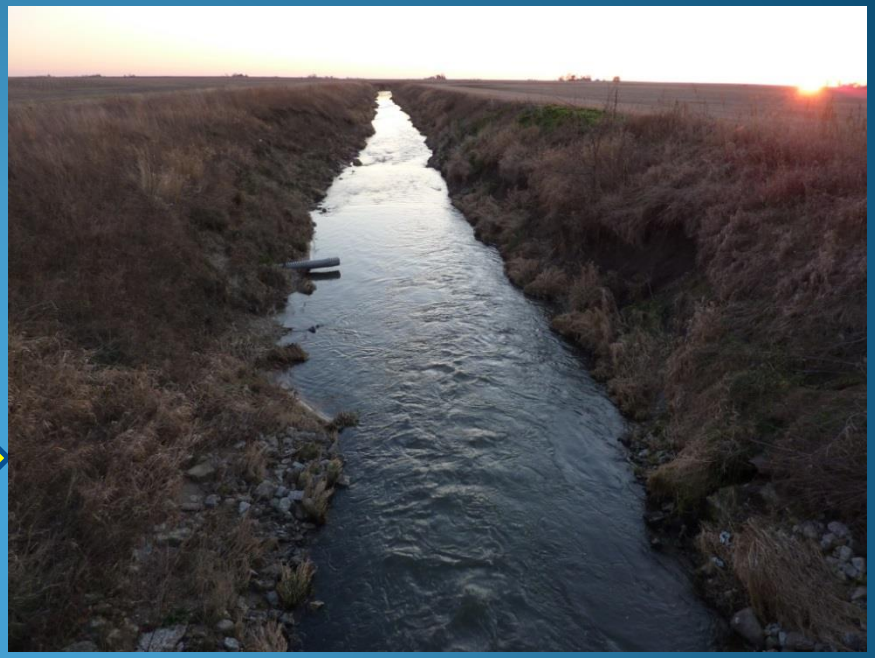
- Sedimentation

- Buries coarse substrates
  - Affects feeding and breeding, species loss
  - Salt Fork: 92% Generalists, 22% species loss, 26% IBI drop, from B to D Diversity rating, 100% mussel loss
- Reduces pool depth
  - Species loss
  - Mackinaw River: 80% reduction in Smallmouth Bass abundance
- Increases turbidity
  - Affects feeding and breeding (hybridization)
  - Iroquois River basin: 75% Hybrids, up to 100% loss of Spotfin Shiners
- Impedes plant growth
  - Habitat loss=Species loss, reduced nutrient uptake

- Channelization
- Dredging
- Impounding

# Sources of Habitat Impairment

- Sedimentation
- Channelization
- Dredging
- Impounding



- Increased erosive flows → bank failure → sedimentation
- Down-cutting → bank failure → sedimentation
- Widening → sediment deposition
- Homogenization of habitat = Homogenization of fish pop.
  - Uniformity: Loss of riffles and pools → featureless runs
  - Loss of species

# Sources of Habitat Impairment

- Sedimentation
- Channelization
- Dredging
- Impounding

- Common practice for Drainage Districts to maintain drainage efficiency
- ACOE dredges large rivers to maintain navigation channel for barge traffic
- Removes riffles
- Removes woody debris and vegetation
- Spoon River: 39% species loss, 45% IBI drop

# Sources of Habitat Impairment

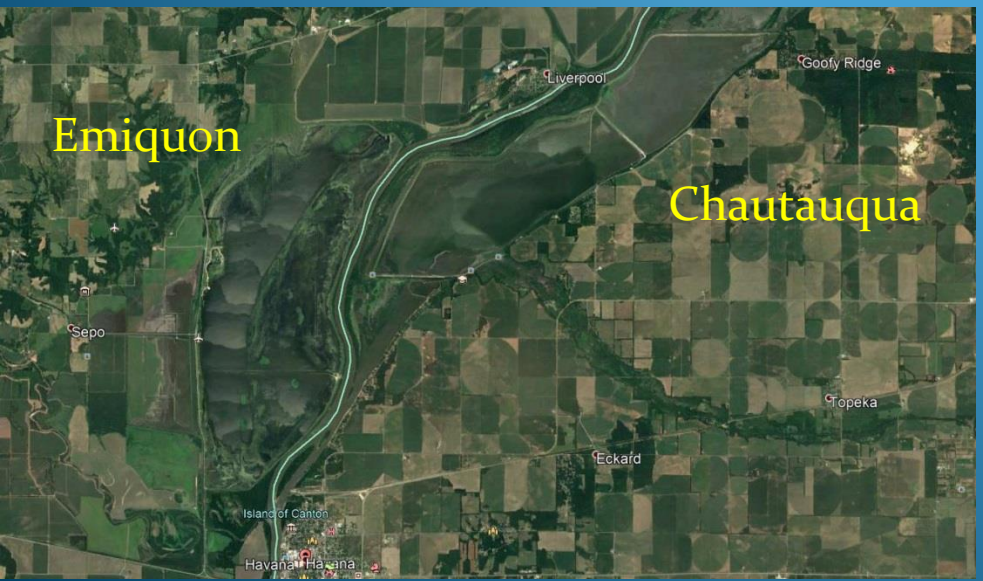
- Sedimentation
- Channelization
- Dredging
- Impounding

- Low-Head Dams
- Barrier to fish movement
- Increases sedimentation
- Leads to water quality problems

- Vermilion River: 44% less species in impoundment, EIU study: distribution 37% of species disrupted by dams, 45-62% drop in fish abundance

# Sources of Habitat Impairment


- Barriers
- Riparian Clearing
- Armoring
- Chemical Runoff



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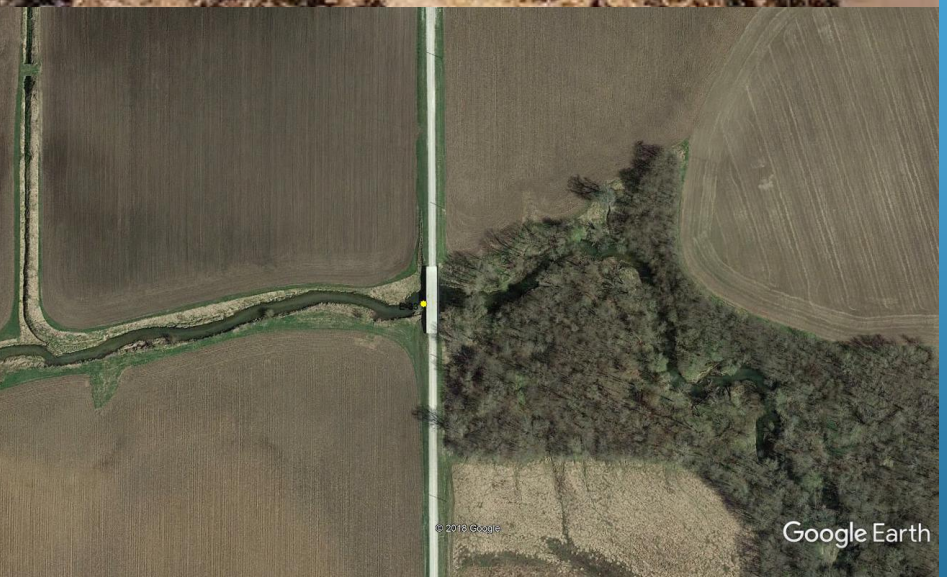



- Barriers
- Riparian Clearing
- Armoring
- Chemical Runoff

- Study by EIU in 2000 showed riparian tree removal leads to habitat fragmentation.
- Sangamon River: 2013 surveys - Wooded: 24 species in 280’ vs. Grassed: 19 species in 450’

# Sources of Habitat Impairment

- Barriers
- Riparian Clearing
- Armoring
- Chemical Runoff

- Zero habitat = zero fish
- Water quality issues
- Super-heated water has downstream impacts

# Sources of Habitat Impairment

- Barriers
- Riparian Clearing
- Armoring
- Chemical Runoff

- Fish Creek: 100% loss of Redspotted Sunfish for over 4 years.

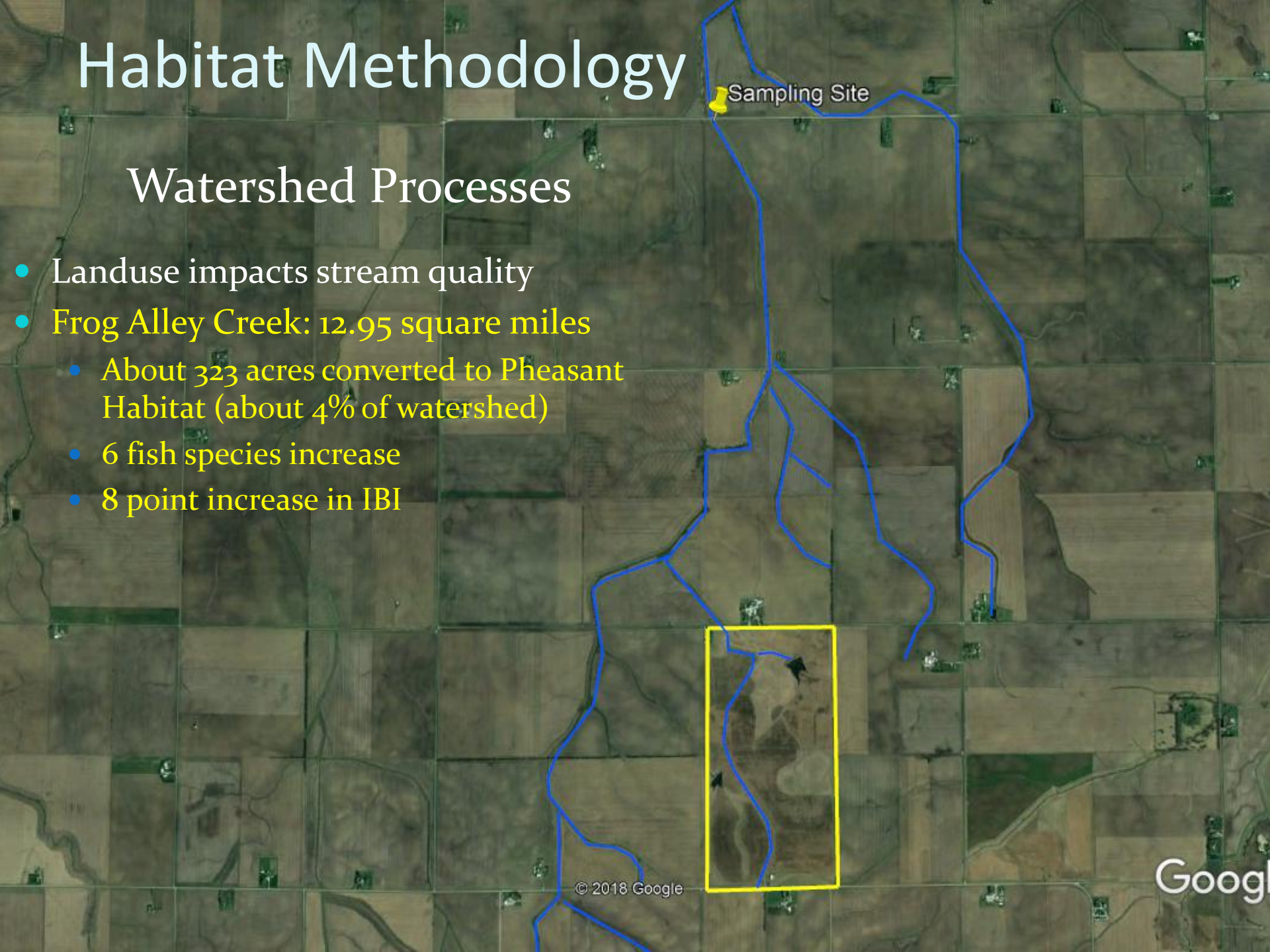
# Rivers & Streams Habitat Enhancement

- In some ways, very similar to the lake habitat methods

- In other ways, very different
- Highly regulated
- Require permitting
  - Army Corps of Engineers
  - IDNR Office of Water Resources
  - Illinois Environmental Protection Agency
- Almost all methods require some degree of engineering
- More costly $$$

- **Less than 10% of all stream restoration projects are monitored**

# Habitat Methodology




## Watershed Processes

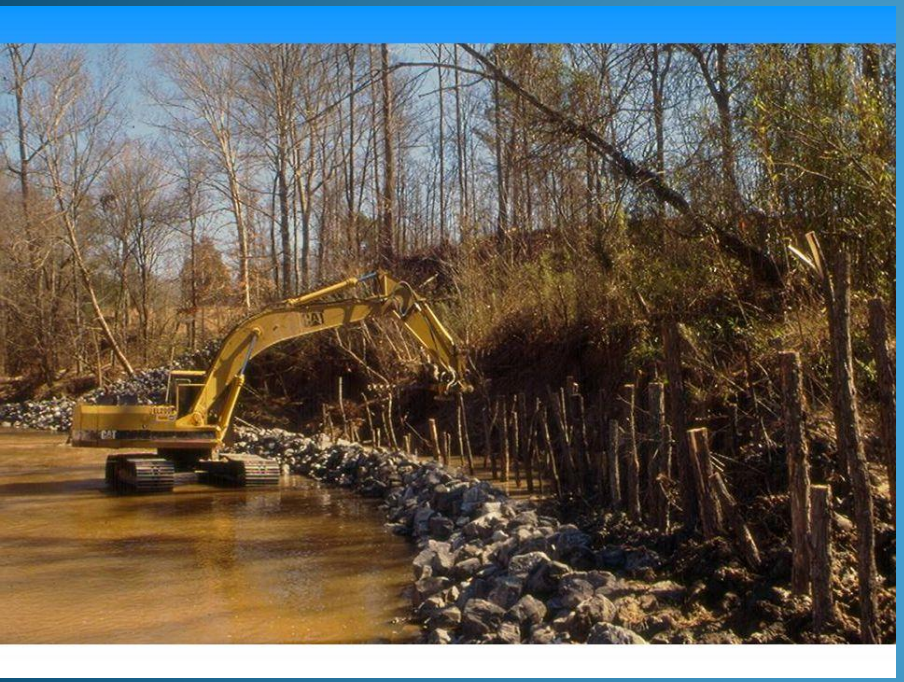
- Landuse impacts stream quality
- Frog Alley Creek: 12.95 square miles
  - About 323 acres converted to Pheasant Habitat (about 4% of watershed)
  - 6 fish species increase
  - 8 point increase in IBI

# Habitat Methodology


- Bank stabilization
- Intercept run-off
- Nutrient uptake
- Shading
- LWD: Large Woody Debris
- Allochthonous inputs

# Habitat Methodology

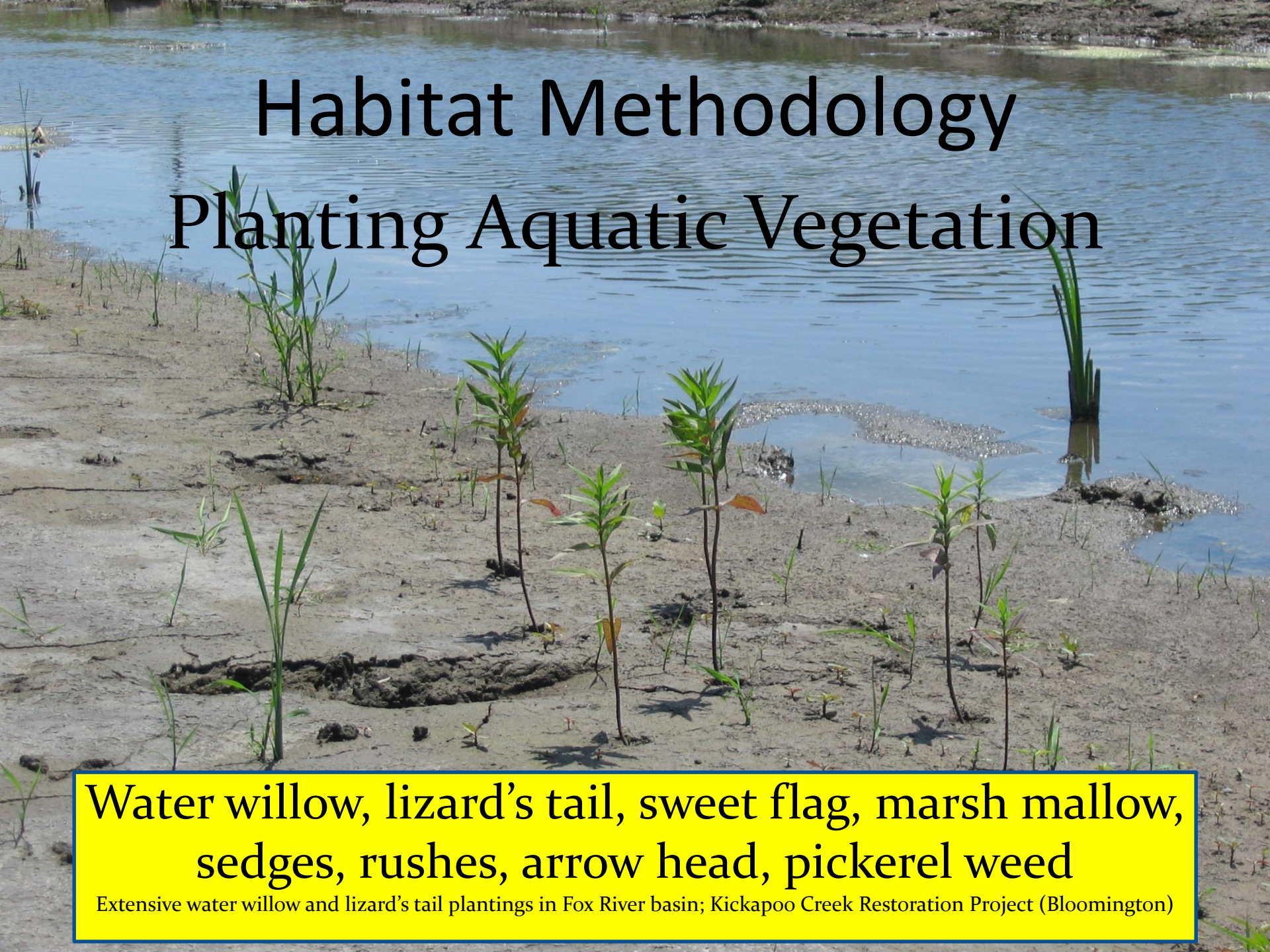
## Willow Posts



- Tried as a cheap alternative to rock
- High failure rate
- Cox Creek at Jim Edgar SFWA

- Bank stabilization
- Shading
- LWD: Large Woody Debris
- Allochthonous inputs

# Habitat Methodology
# Planting Aquatic Vegetation



Water willow, lizard's tail, sweet flag, marsh mallow, sedges, rushes, arrow head, pickerel weed

Extensive water willow and lizard's tail plantings in Fox River basin; Kickapoo Creek Restoration Project (Bloomington)

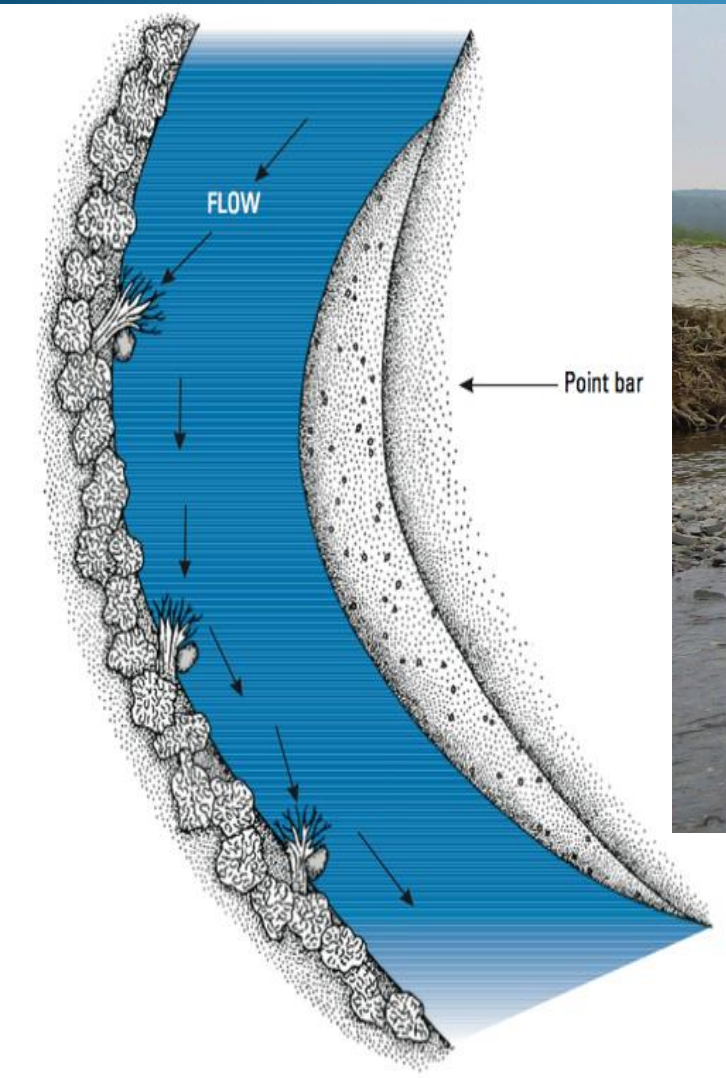
# Habitat Methodology

## LWD – Large Woody Debris Reintroduction

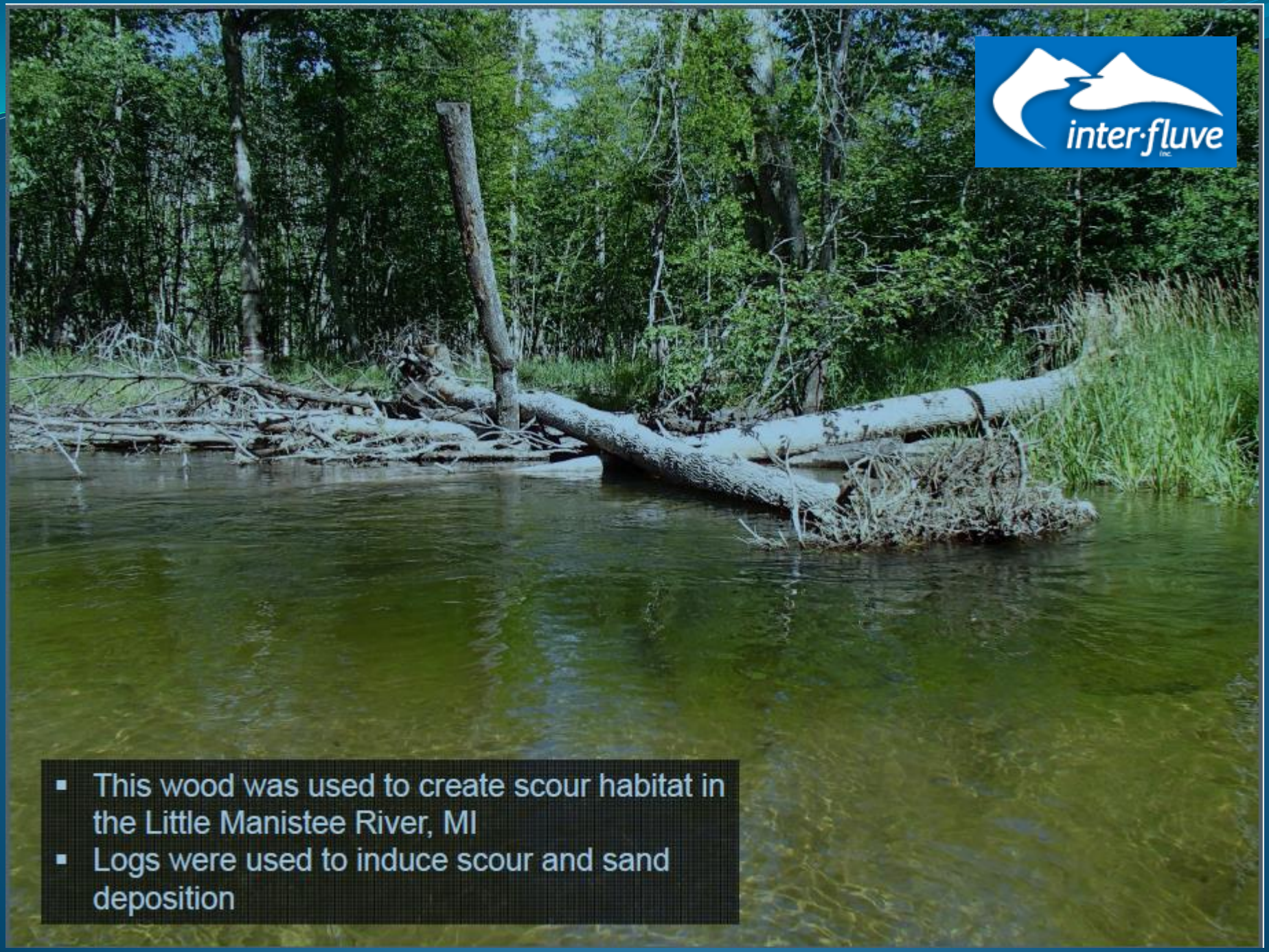
- Creates habitat
- Breaks-up flow patterns
- Develops scour pools
- Increases autochthonous productivity

# Habitat Methodology

## Root Wads




- Creates habitat
- Bank protection
- Increases autochthonous productivity
- DuPage River


inter·fluve
inc.
This wood was used to create scour habitat in the Little Manistee River, MI
Logs were used to induce scour and sand deposition

# Sediment Management

- This wood was used to protect the banks, cause sediment to drop out, and create scour at wood endpoints

Sucker River, MN

# Log jam deflectors

- Log jam deflectors can be used effectively to cause sediment to deposit where we want to create complexity

# 3.5 Narrowing of an over-widened channel using low cost groynes

## River Avon

Location - Stratford-Sub-Castle, Salisbury, Wiltshire SU127327
Date of construction - October 1997
Length - 125m
Cost - £2,000 (excluding fencing)

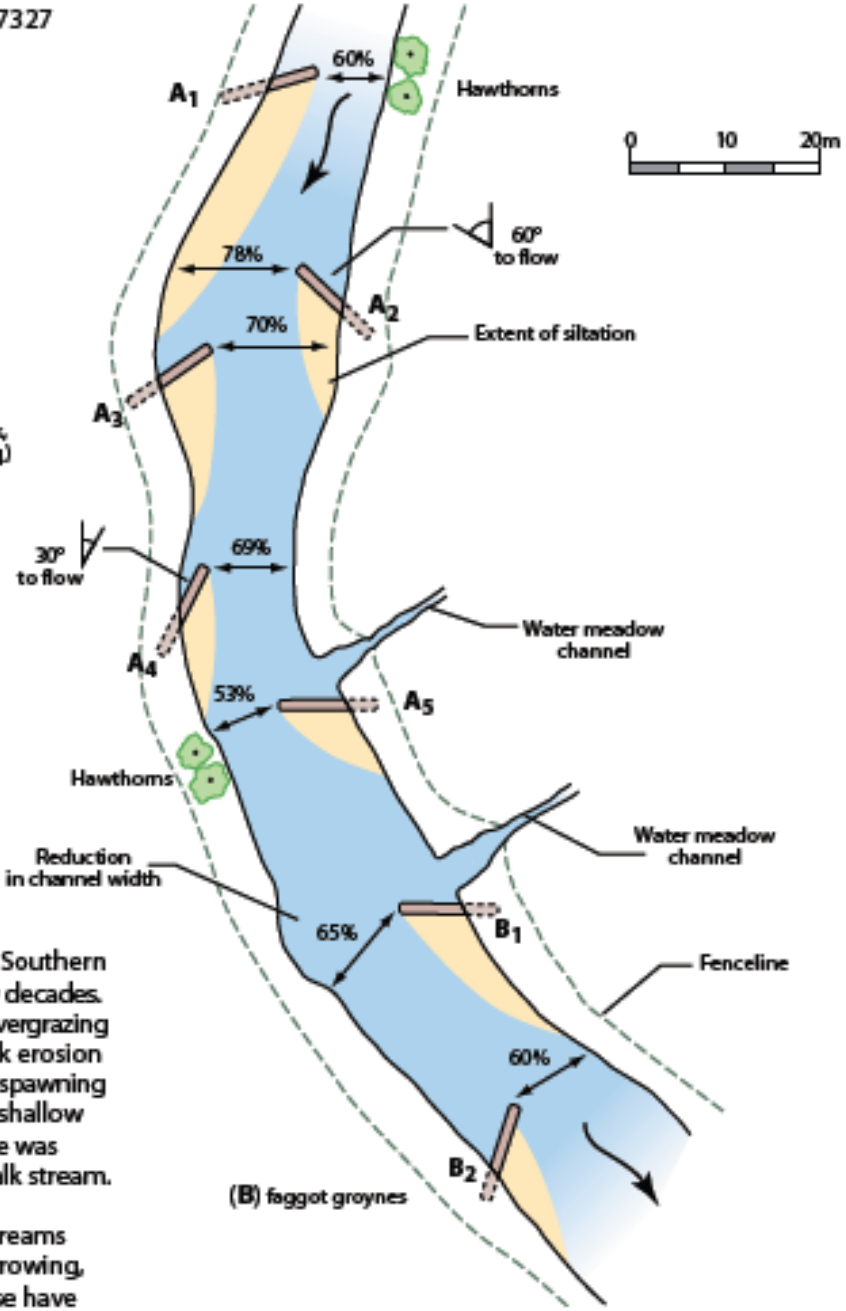



*Figure 3.5.1*
Plan of narrowing works

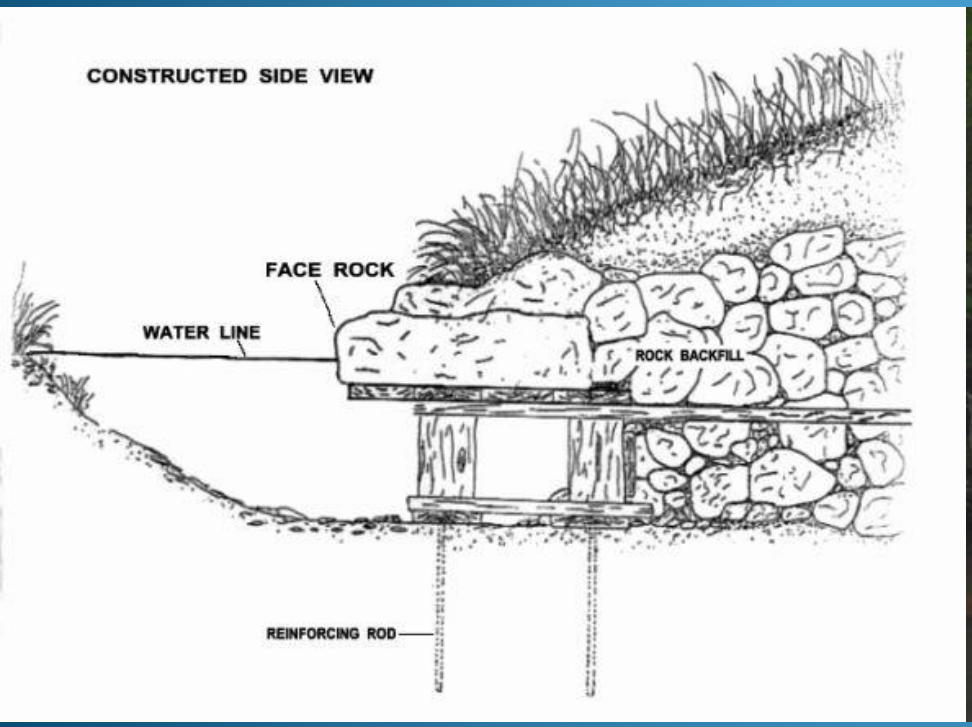
## Description

The Wiltshire Avon, like many other chalk streams in Southern England has been severely degraded over the past few decades. Excessive stock of cattle in adjacent fields have lead to overgrazing and poaching of its banks resulting in extensive bank erosion and the accretion of sediment in downstream salmonid spawning gravels. The overall result has been the creation of a shallow over-wide channel with poor habitat diversity. This site was chosen because it represents a severely degraded chalk stream.

Recent habitat enhancement techniques on chalk streams have concentrated on modifying, and frequently narrowing, the channel to sustain increased flow velocities. These have involved bio-engineering methods such as the extensive use

# Habitat Methodology

## Lunker Structures




- Mostly used for Salmonid sp.
- Simulates undercut banks
- Provide habitat and bank protection
- Clear Creek (NW IL): significant increases in Rainbow Trout and Black Redhorse

# Habitat Methodology

## Mid-Channel Boulders

- Intended to provide habitat for ambush predators, such as Smallmouth Bass
- Sugar Creek: included 11 boulder clusters, unfortunately post-project Smallmouth Bass catch rates failed to reach pre-project levels.

# Habitat Methodology

## Bendway Weirs and Stream Barbs

- Common bank stabilization practice
- In some cases, may provide habitat
- Flow heterogeneity
- Scour pools at tips

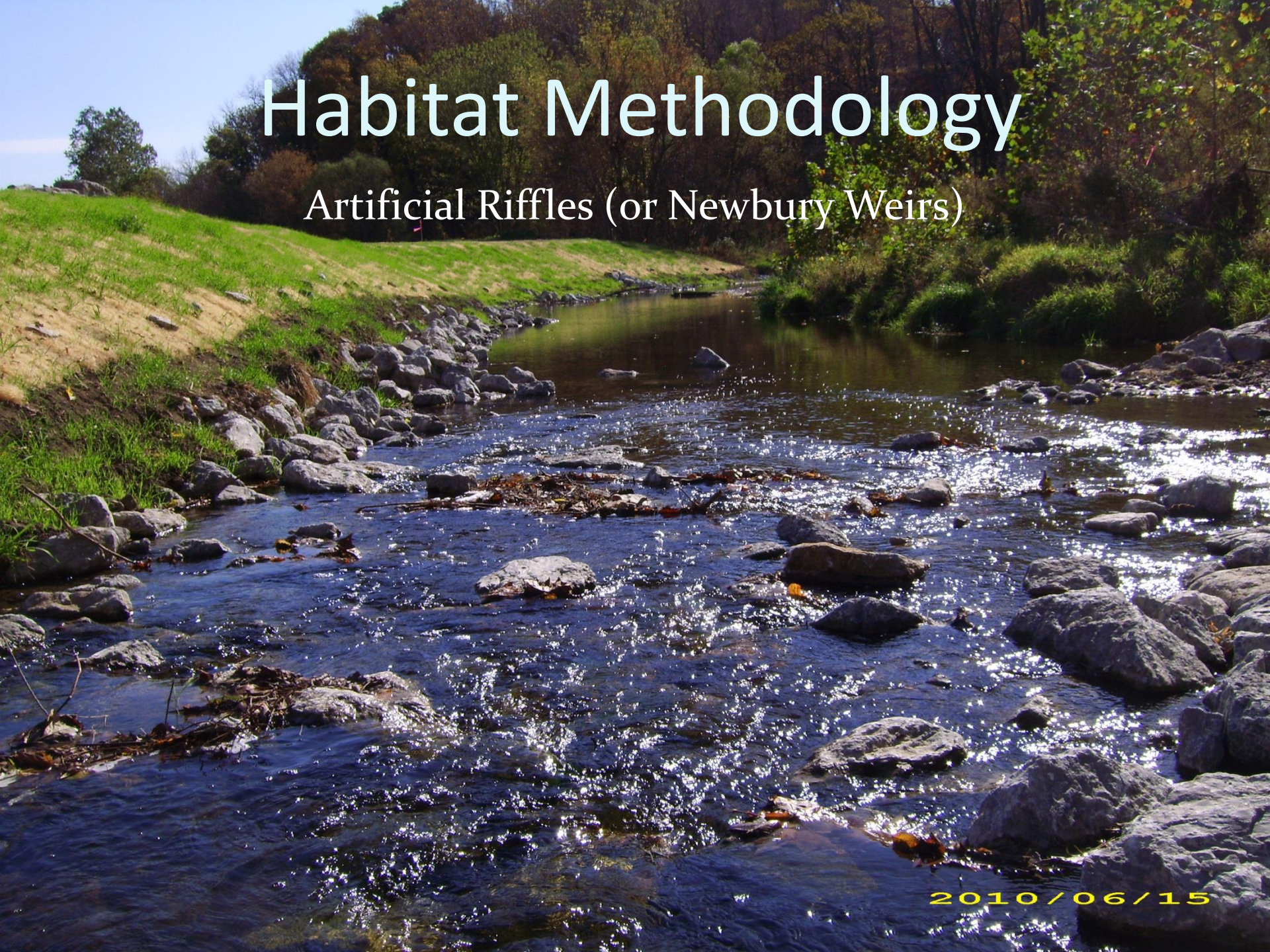
- Potential to destroy valuable habitat
- Cause deep water pools on outside bends to fill-in
- Embarras River: EIU study of 21 Bendway weirs – 92% increase in fish abundance, but 50% species loss and 14% decrease in IBI at 34 months post-project

# Opportunistic Habitat Improvements

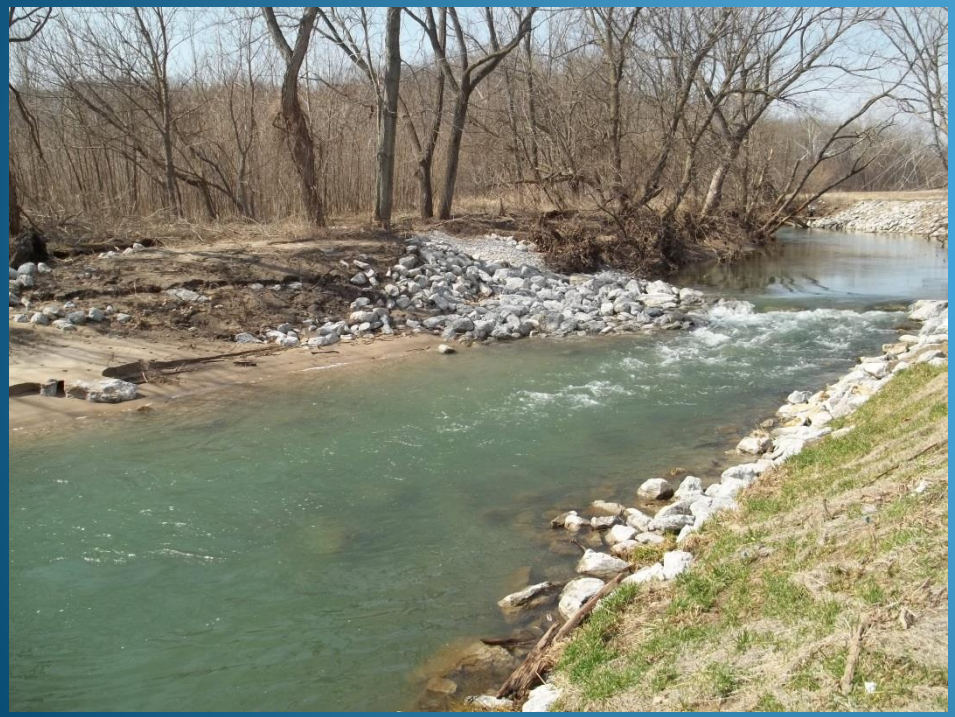
- Embarras River
  - 1,520 feet of bank stabilization to protect an oil refinery
  - Incorporated concrete culvert pipes for catfish spawning habitat

# Habitat Methodology

## Artificial Riffles (or Newbury Weirs)



# Successful instream habitat projects in the area…



**Kickapoo Creek** (Embarras River basin)

2 riffles
2000 feet of bank stabilization

Results
fish abundance more than doubled
Benefits well beyond project boundaries

# Successful instream habitat projects in the area…

**Farmers Branch** (Sangamon River basin)

14 riffles

Results

69% increase in fish abundance

Averages 4-5 more species post-restoration

Including successful smallmouth bass spawning in the West Branch

# Habitat Methodology

## Dam Removal

- Removes barriers to fish migration
- Improves water quality and habitat

- Over 20 dam removals in the Chicago area
  - Fish species increased 50-182%
  - IBI scores increased 8-68%

- 2 dams in this area scheduled for removal
  - Danville Dam – Vermilion River
  - Ellsworth Park Dam – North Fork Vermilion River

# Successful habitat projects in the area…

**Kickapoo Creek** (Sangamon River basin)

2 miles of re-meandered stream channel
25 riffles
Aquatic vegetation
88 acres of reconnected floodplain
9 wetlands
2-stage ditch demonstration

Results
193% increase in fish abundance
Increases of individual species up to 9400%
12 additional species following restoration

Benefits well beyond project boundaries
(as far as 5 miles downstream)