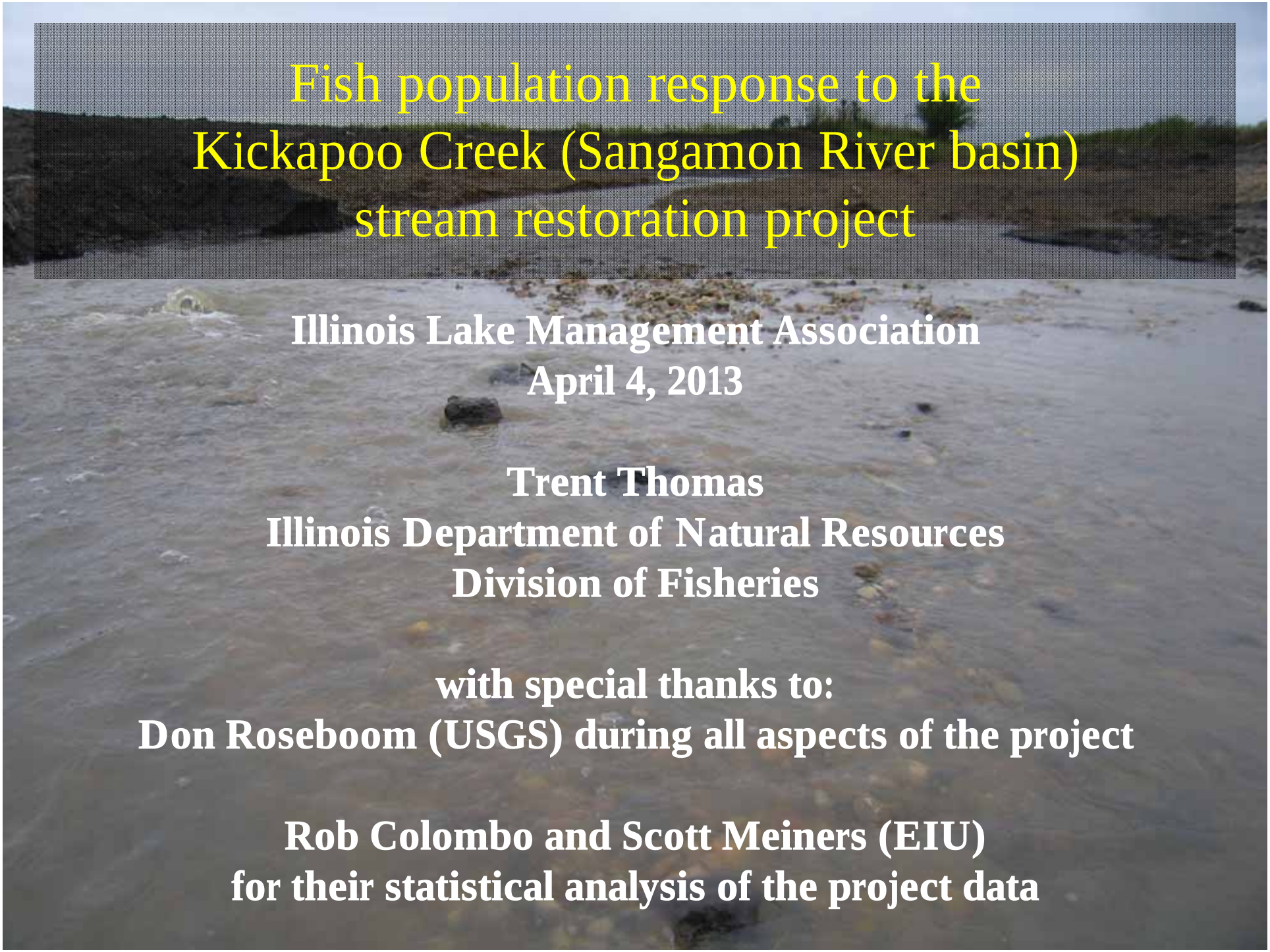


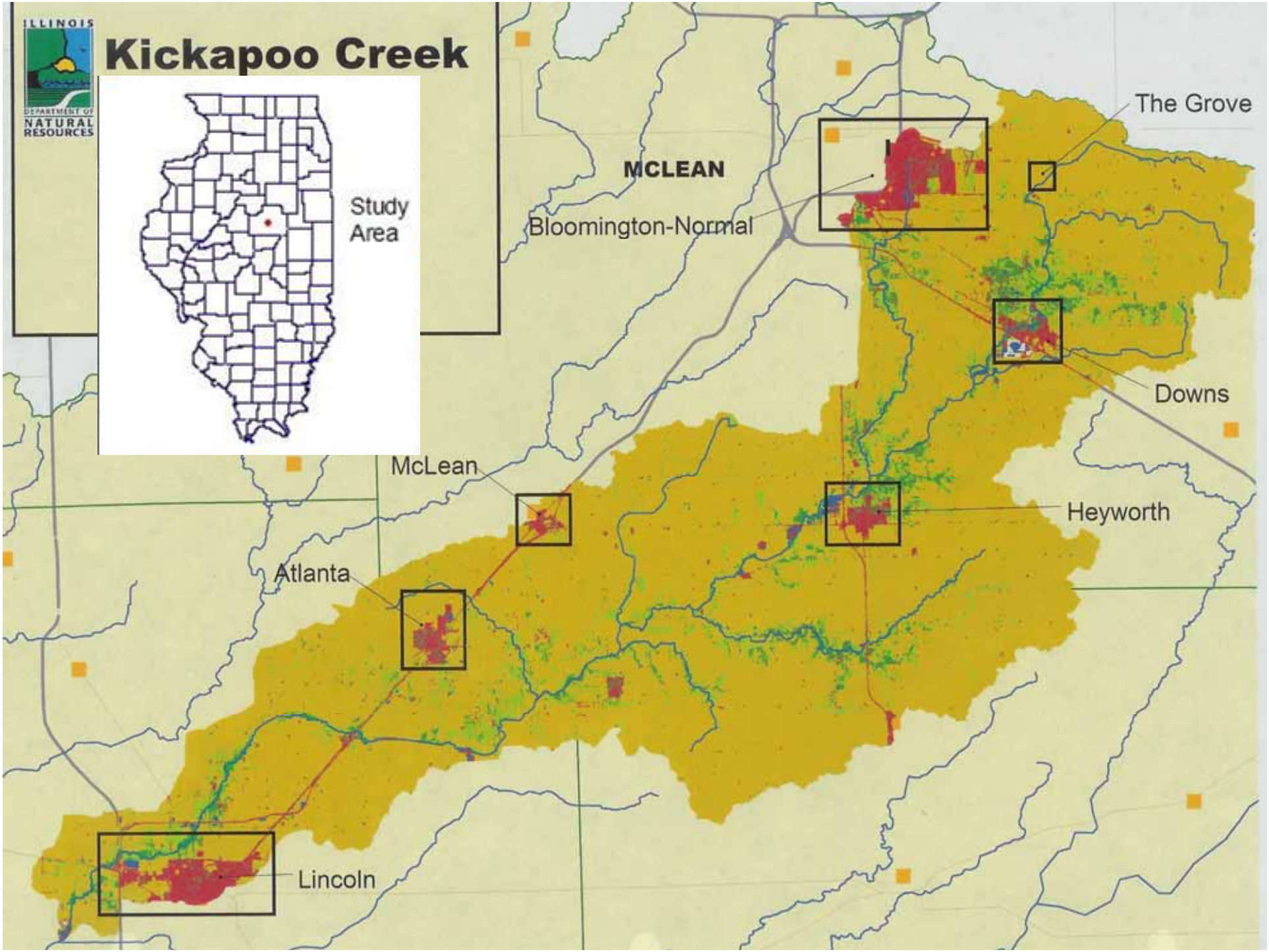
Fish population response to the Kickapoo Creek (Sangamon River basin) stream restoration project

Illinois Lake Management Association
April 4, 2013

Trent Thomas
Illinois Department of Natural Resources
Division of Fisheries

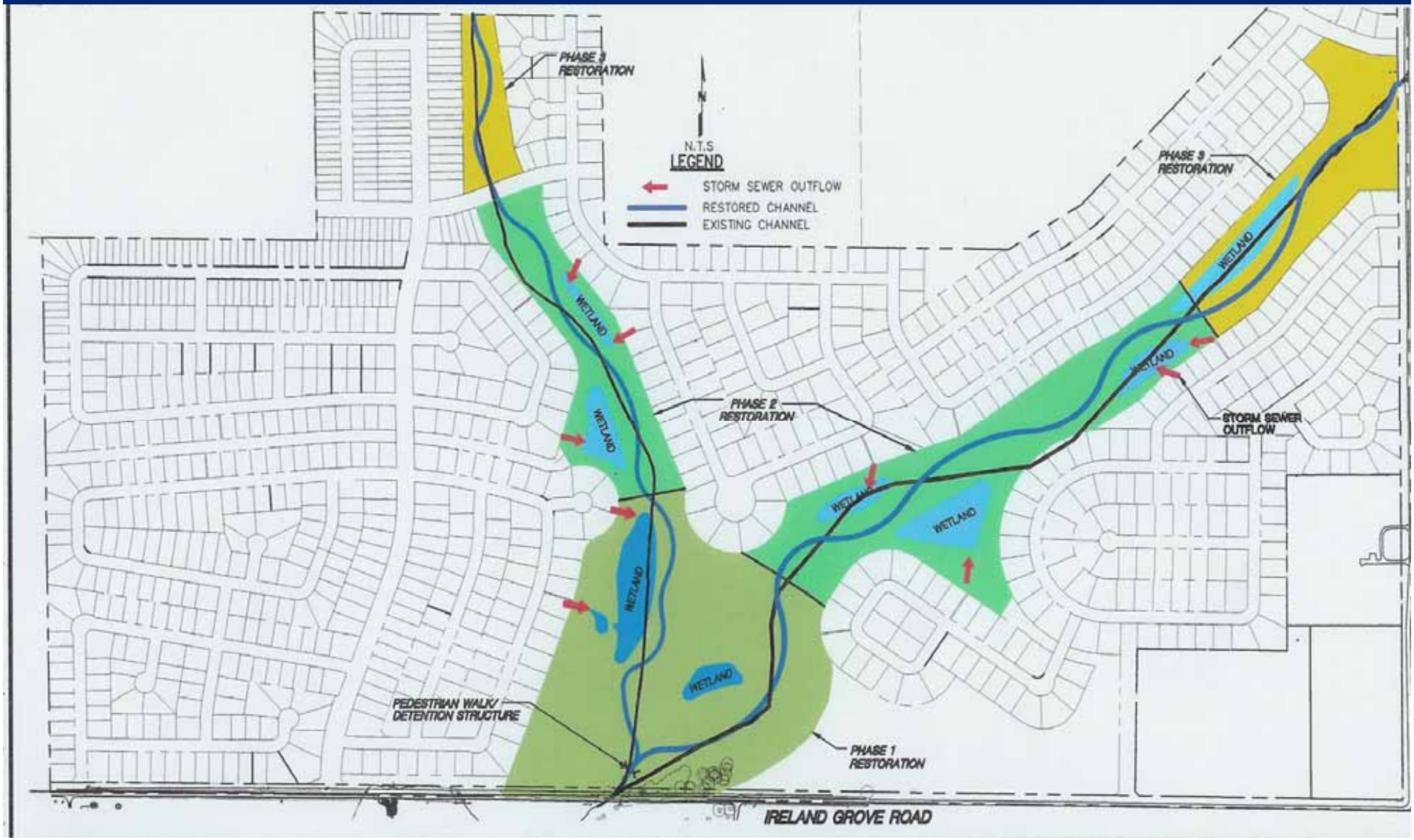
with special thanks to:
Don Roseboom (USGS) during all aspects of the project

Rob Colombo and Scott Meiners (EIU)
for their statistical analysis of the project data


ILLINOIS
DEPARTMENT OF NATURAL RESOURCES
Kickapoo Creek
Study Area
MCLEAN
Bloomington-Normal
The Grove
Downs
McLean
Heyworth
Atlanta
Lincoln

- Kickapoo Creek among the most diverse streams of the Sangamon River basin with 60 fish species and 23 mussel species
- "Biologically Significant Stream" reach for high mussel diversity about 5 miles downstream from project site
- Largescale Stoneroller (Species in Greatest Need of Conservation)

Project Design




Sugar Creek at Main Street

Project Goals

- Maintain (or improve) biotic conditions in the presence of increased development
  - Maintain fish species counts
  - Maintain fish abundance
- Maintain (or improve) habitat, water quality, and hydrologic conditions

Pre-restoration Condition

Lowering the floodplain

Re-meandered Channel

Constructed Riffles

Scour Pools

Two-Stage Ditch


sweet flag, water willow, marsh mallow, sedges, rushes…

Wetlands to intercept run-off

The Finished Project

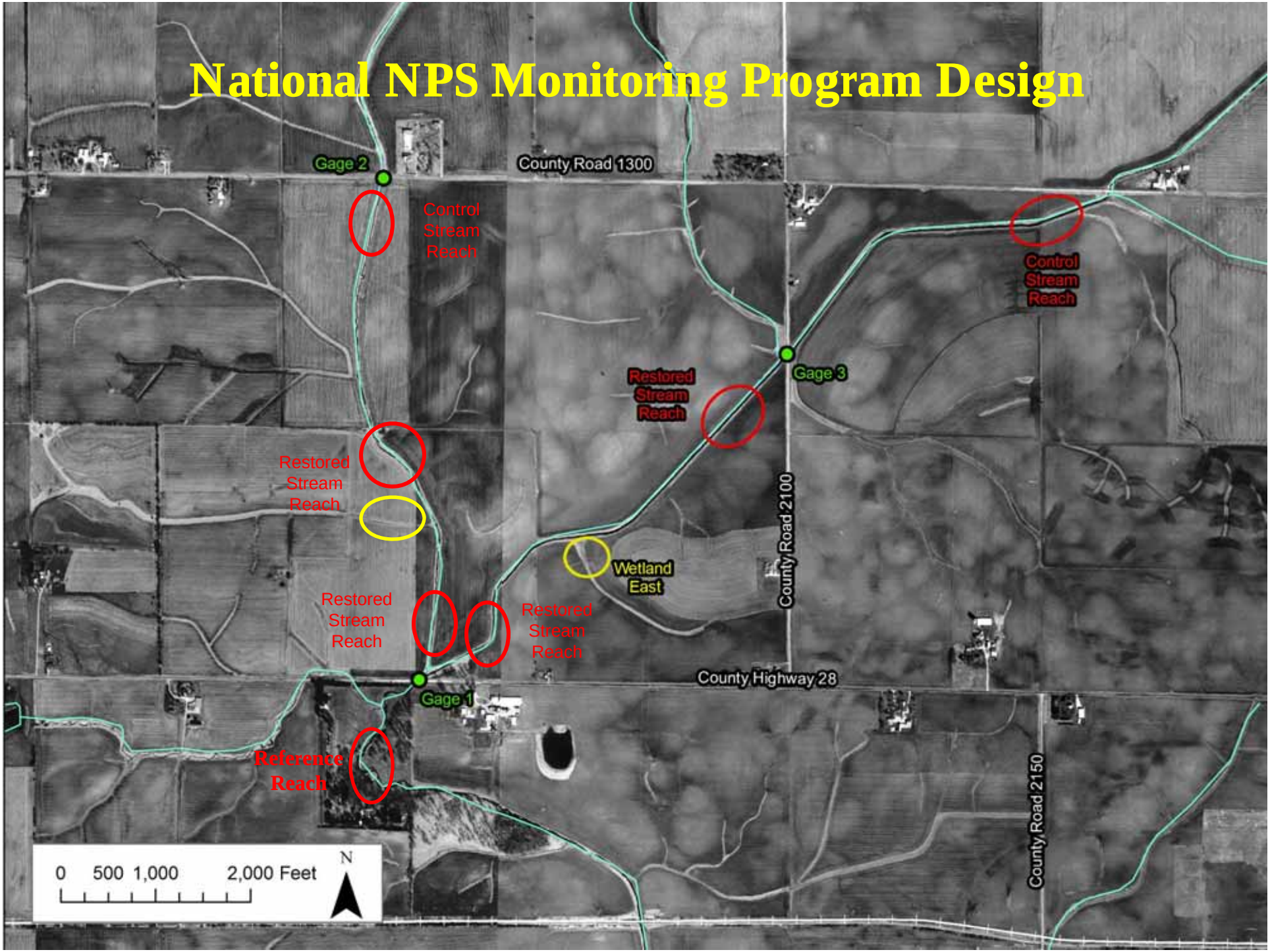
88 acres of restored prairie
A reconnected floodplain
8 wetlands
Nearly 2 miles of re-meandered stream channel
A two stage ditch demonstration
25 riffles

Phase 1 – 2008
re-meandered channel
with exaggerated width,
flattened bank slopes,
heavy plantings

Phase 2 – 2009
re-meandered channel
constricted width,
steeper bank slopes
accelerated riffles with
definitive scour pools

Phase 3 – 2011
two stage ditch
with riffles


Grove
10-2011
N 2100 East Rd
County Rd 2100 E
Longfield Rd
Kickapoo Creek Rd
Guiness Dr
Watersound Way
Francesco Ln
Ferryman Rd
Winterberry Ct
Stagghorne Way
Jackpine
Black Oak Ln
Benjamin Elementary
28
Ireland Grove Rd
County Rd 1200 N
County Hwy 28
E 1200 North Rd
County Rd 1200 N
Ireland Grove Rd


National NPS Monitoring Program Design
Gage 2
County Road 1300
Control Stream Reach
Control Stream Reach
Gage 3
Restored Stream Reach
Restored Stream Reach
Wetland East
County Road 2100
Restored Stream Reach
Restored Stream Reach
Gage 1
County Highway 28
Reference Reach
County Road 2150
0 500 1,000 2,000 Feet
N

Stream Fisheries

Six reaches (300 feet) sampled twice per year

4 treatments & 2 controls

(modified BACIP design)

West Branch
Downstream
Treatment

Before

During

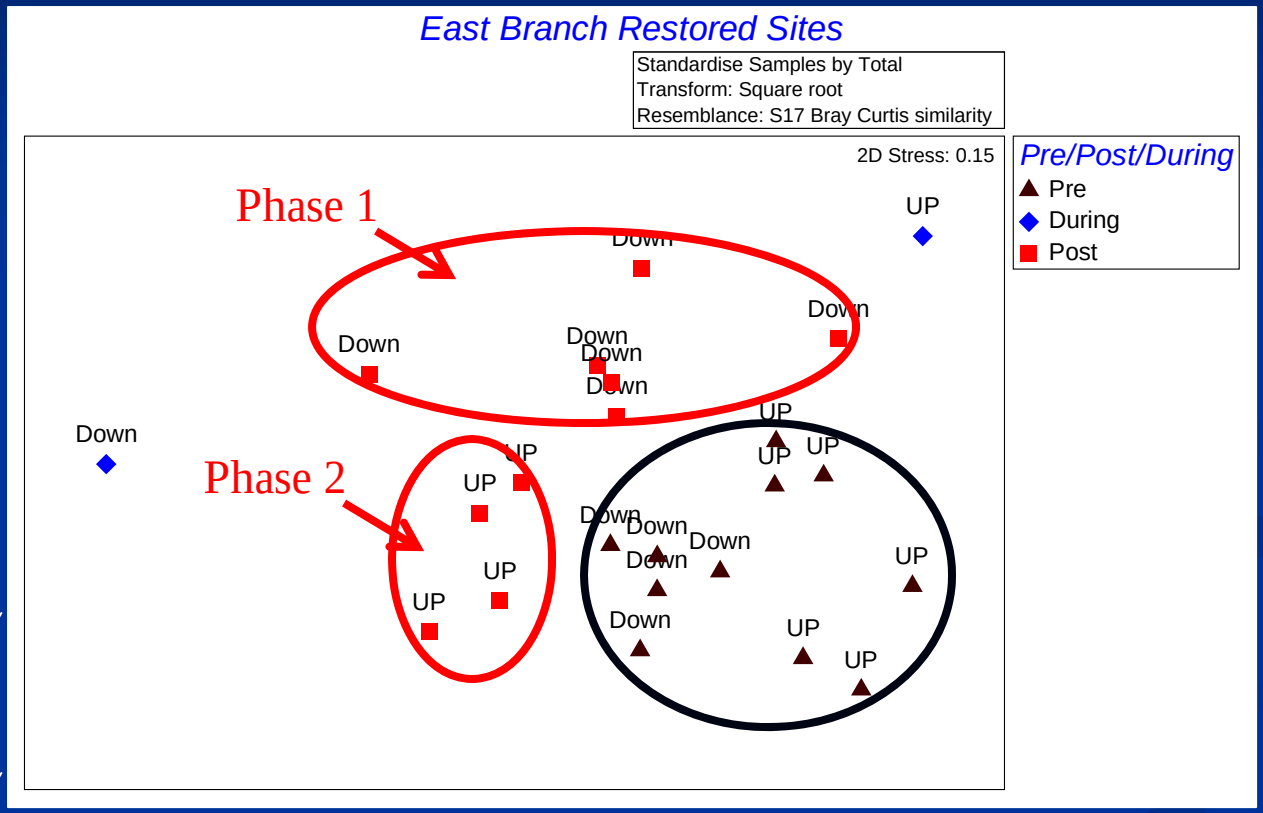
After

Total Effort through 2011

- 69 fish population surveys
- Over 33 electrofishing hours
- 31,868 fish
- 33 species

Can we effect a change in the fish community through stream restoration / enhancement methods?

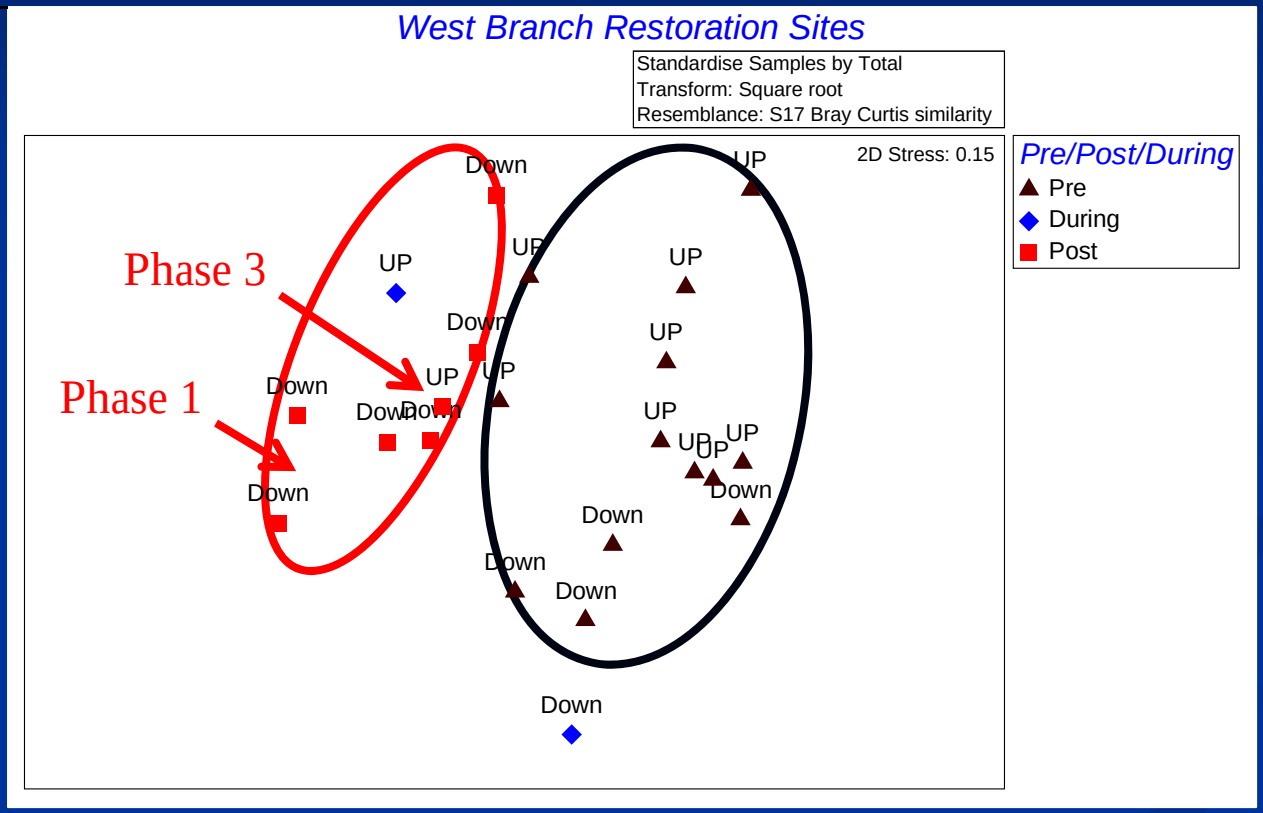
Bigmouth shiner
Striped shiner
Central stoneroller
Bluntnose minnow
Green sunfish
Sand shiner
Creek chub
Hornyhead chub
White sucker
Johnny darter
Blackstripe topminnow
Bluegill
Redfin shiner
Rock bass
Yellow bullhead
Largescale stoneroller
Carp



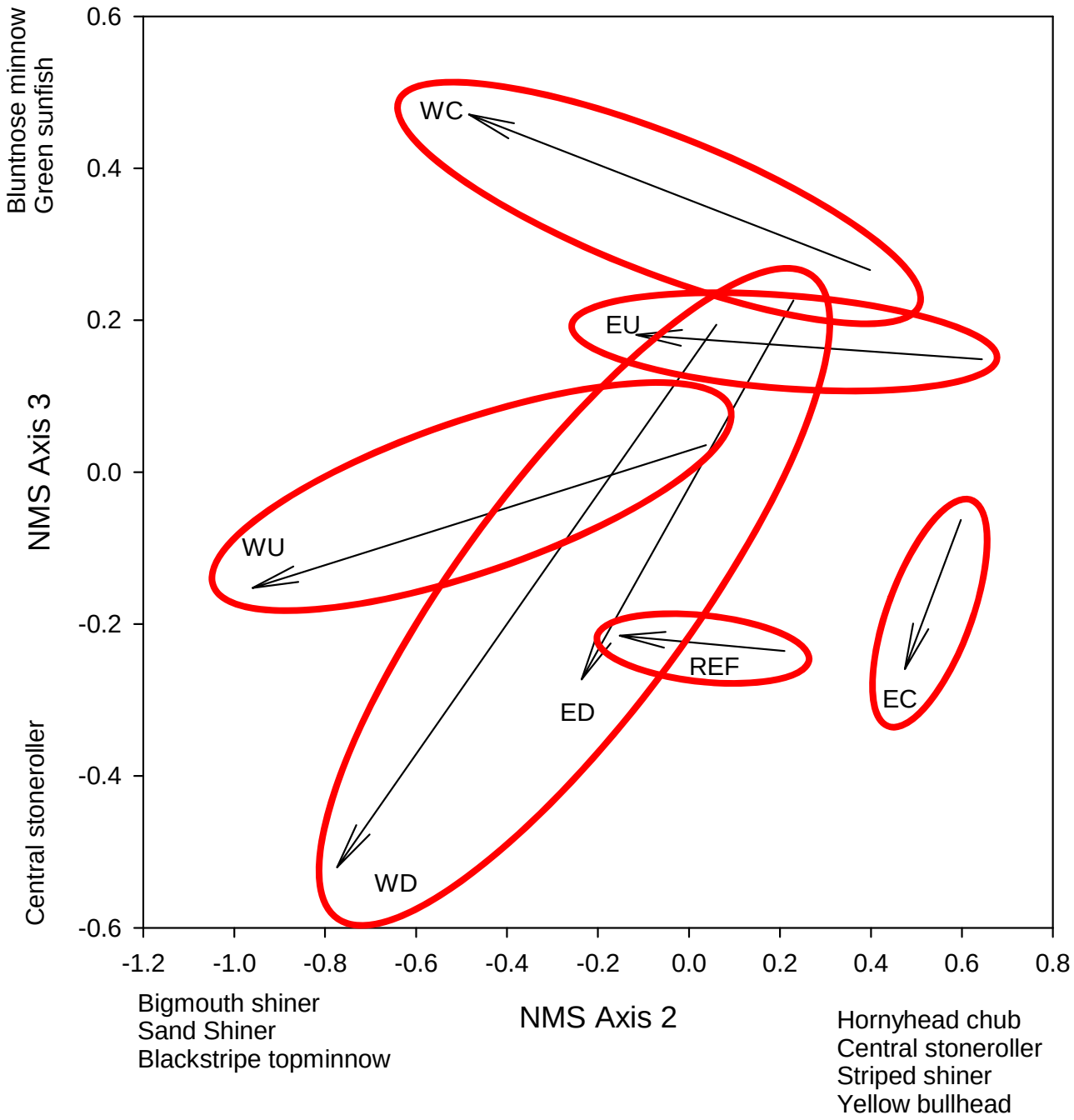
Non-metric multidimensional scaling plot based on Bray-Curtis similarity for the east branch restored sites of Kickapoo Creek. The communities sampled pre restoration are significantly different than those sampled during restoration (ANOSIM, $p < 0.02$) and those sampled post restoration (ANOSIM, $p < 0.0001$). Additionally, the communities sampled during restoration are significantly different than those sampled post restoration (ANOSIM, $p < 0.02$).

Can we effect a change in the fish community through stream restoration / enhancement methods?

Bigmouth shiner
Striped shiner ↓
Creek chub
Sand shiner
Central stoneroller
Hornyhead chub ↓
Green sunfish ↓
Blackstripe topminnow
Johnny darter
Bluntnose minnow
White sucker

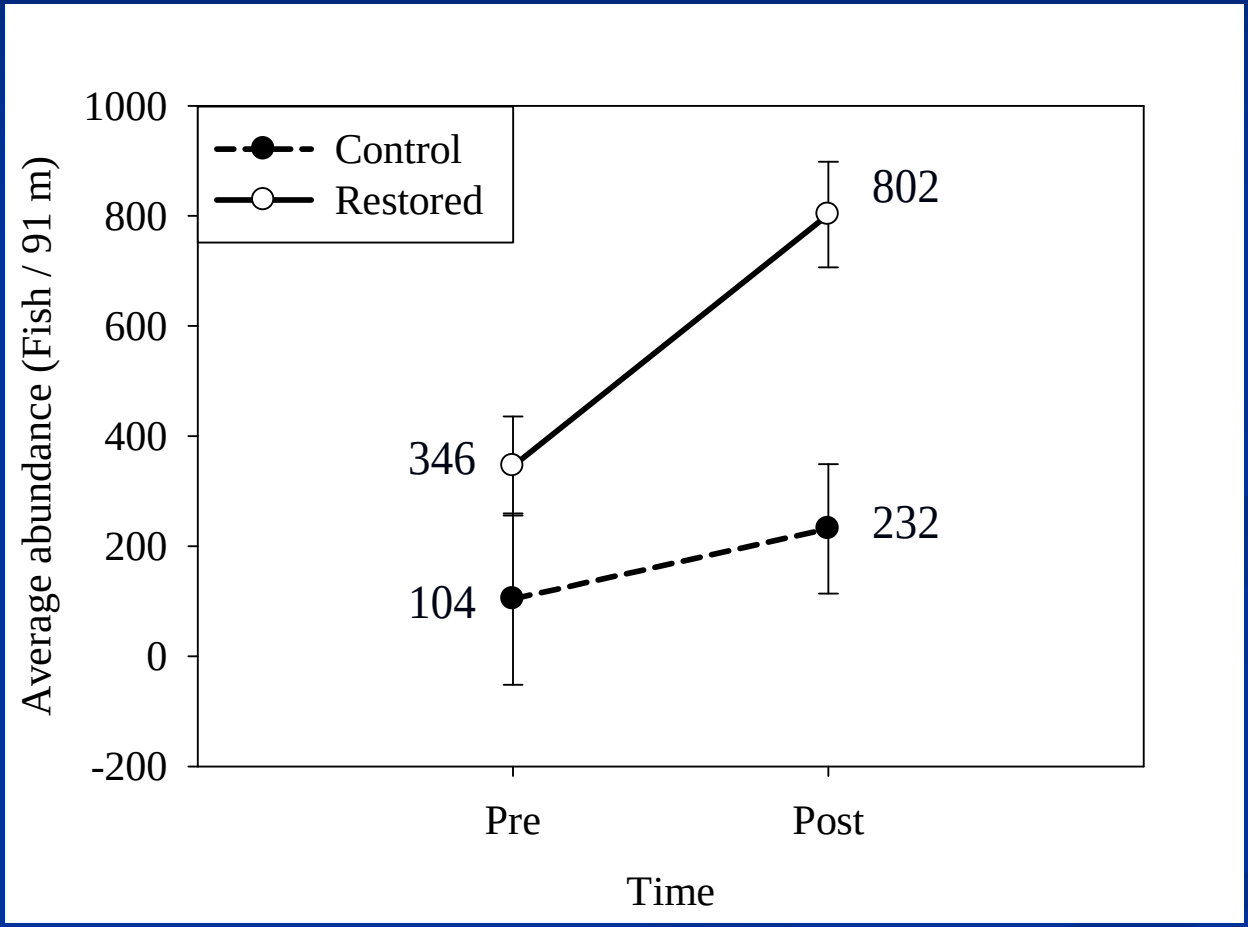


Non-metric multidimensional scaling plot based on Bray-Curtis similarity for the west branch restored sites of Kickapoo Creek. The communities sampled pre restoration are significantly different than those sampled during restoration (ANOSIM, $p < 0.02$) and those sampled post restoration (ANOSIM, $p < 0.0001$). However, the communities sampled during restoration are not significantly different than those sampled post restoration (ANOSIM, $p > 0.10$).

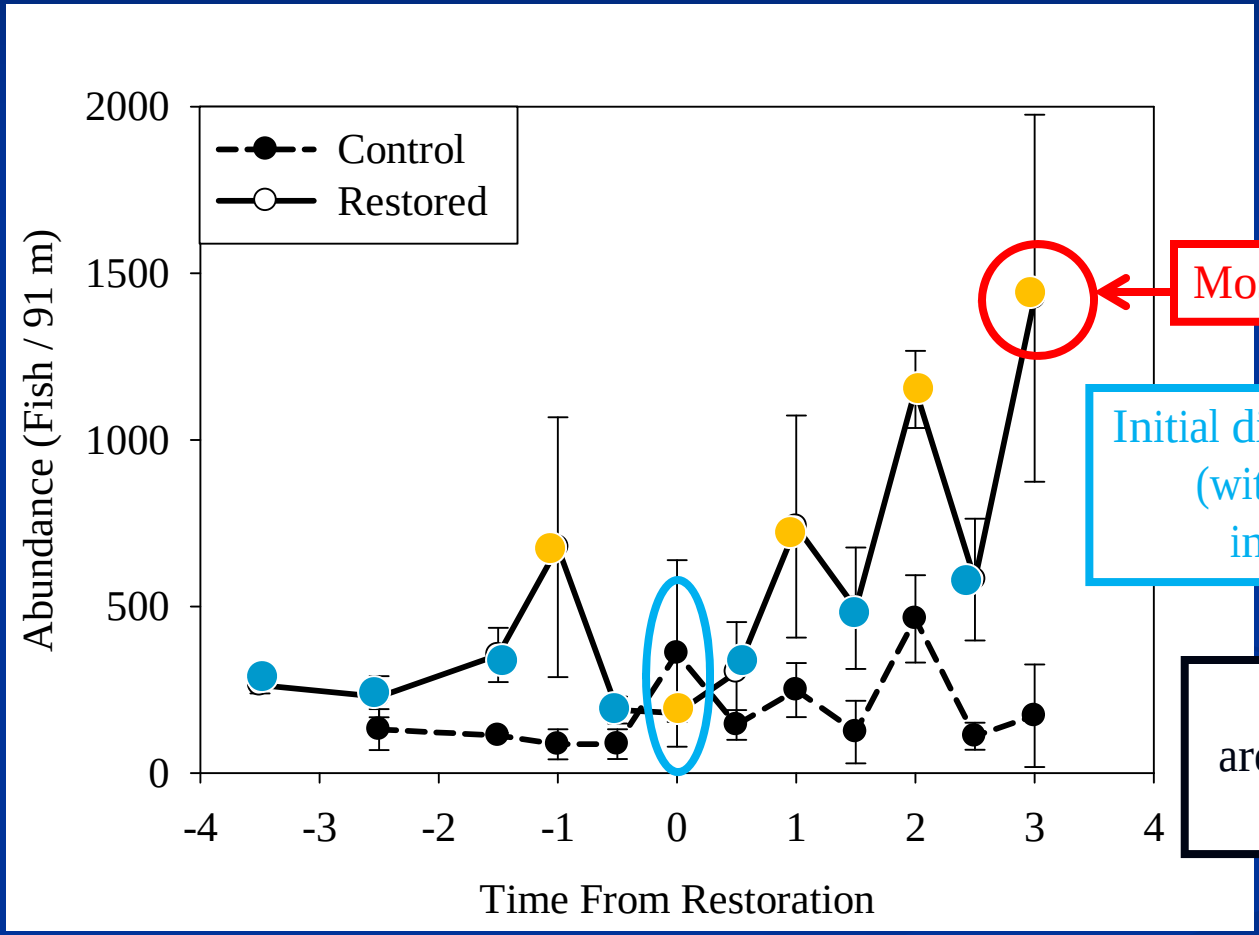


Influence of restoration on fish assemblage composition in Kickapoo creek. Data shown are vectors connecting the mean position of each location in ordination space before and after stream restoration. Fish species along the NMS axes were significantly associated with the ordination axes following correction for multiple comparisons. As only NMS axes 2 and 3 were associated with the restoration, only these two are shown here. Locations are identified as the East (E) and West (W) branches and the upstream (U), downstream (D) and control (C) reaches. The reference location (REF) is also included in this figure.

Significant increase in fish abundance



Fish abundance continues to increase



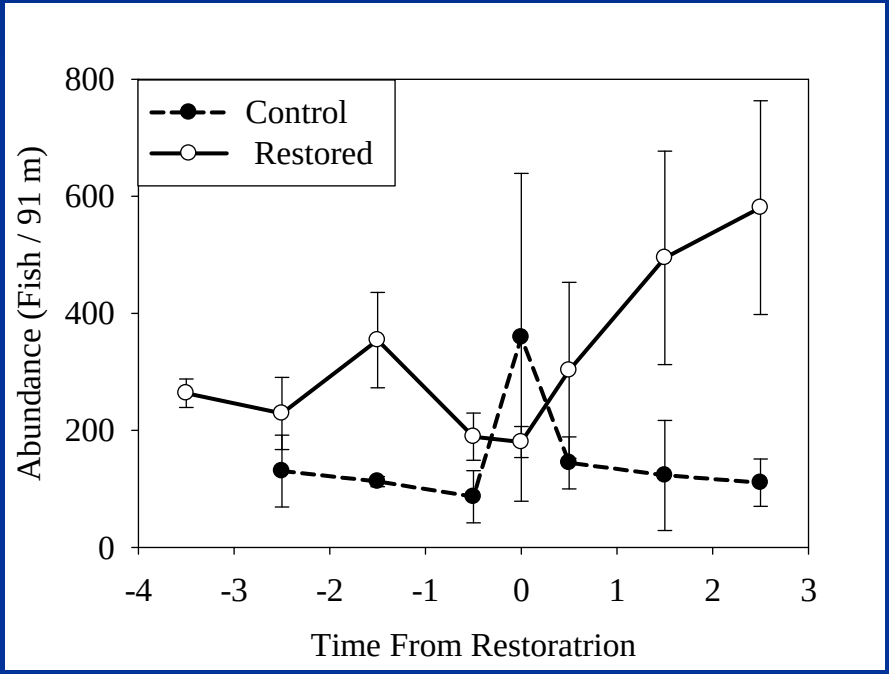
Most recent sample

Initial dip in **Treatment** abundance (with corresponding jump in **Control** abundance)

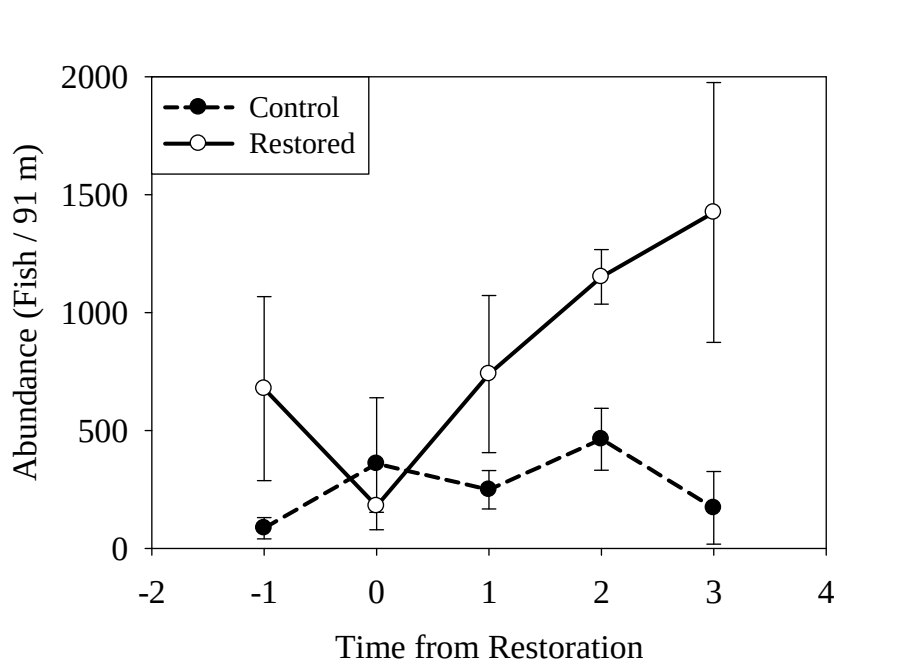
Fall samples are consistently higher than **Spring samples**

Spring vs. Fall samples

Spring



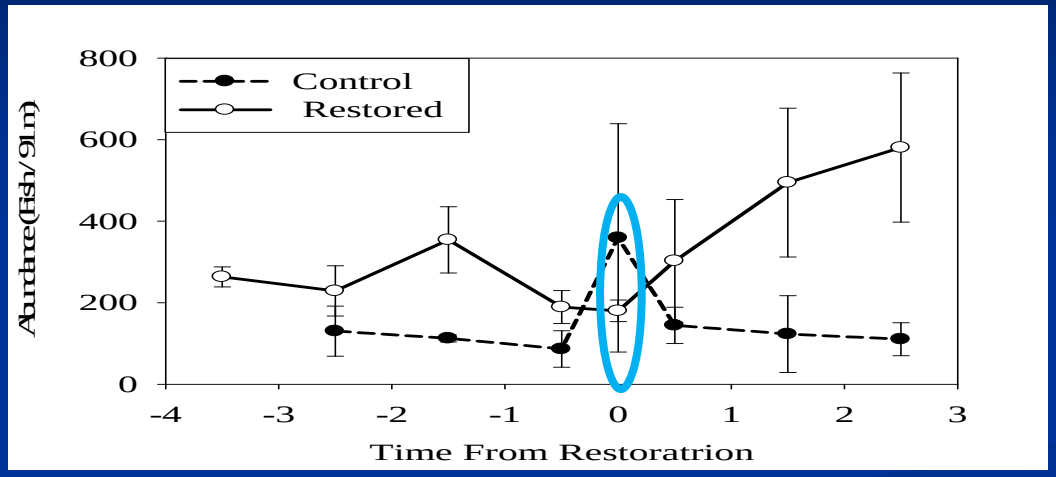
Fall



Fall abundance is consistently more than double the Spring abundance.

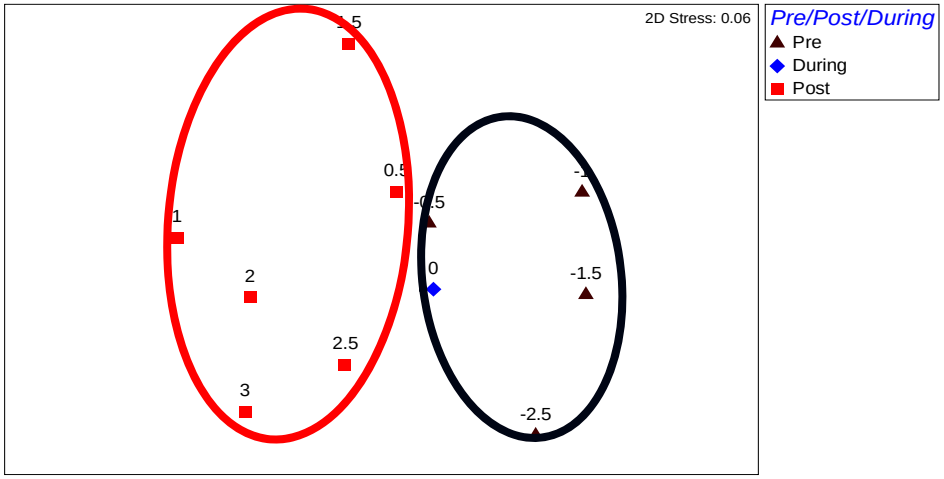
An indication of strong inputs from successful reproduction.

Evidence that the Control sites are not completely independent of the Treatment sites

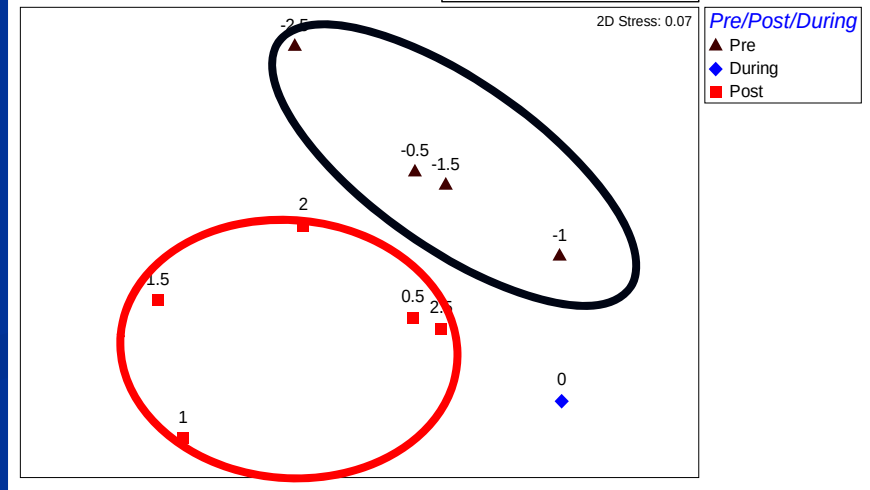


Jump in Control abundance at time of restoration

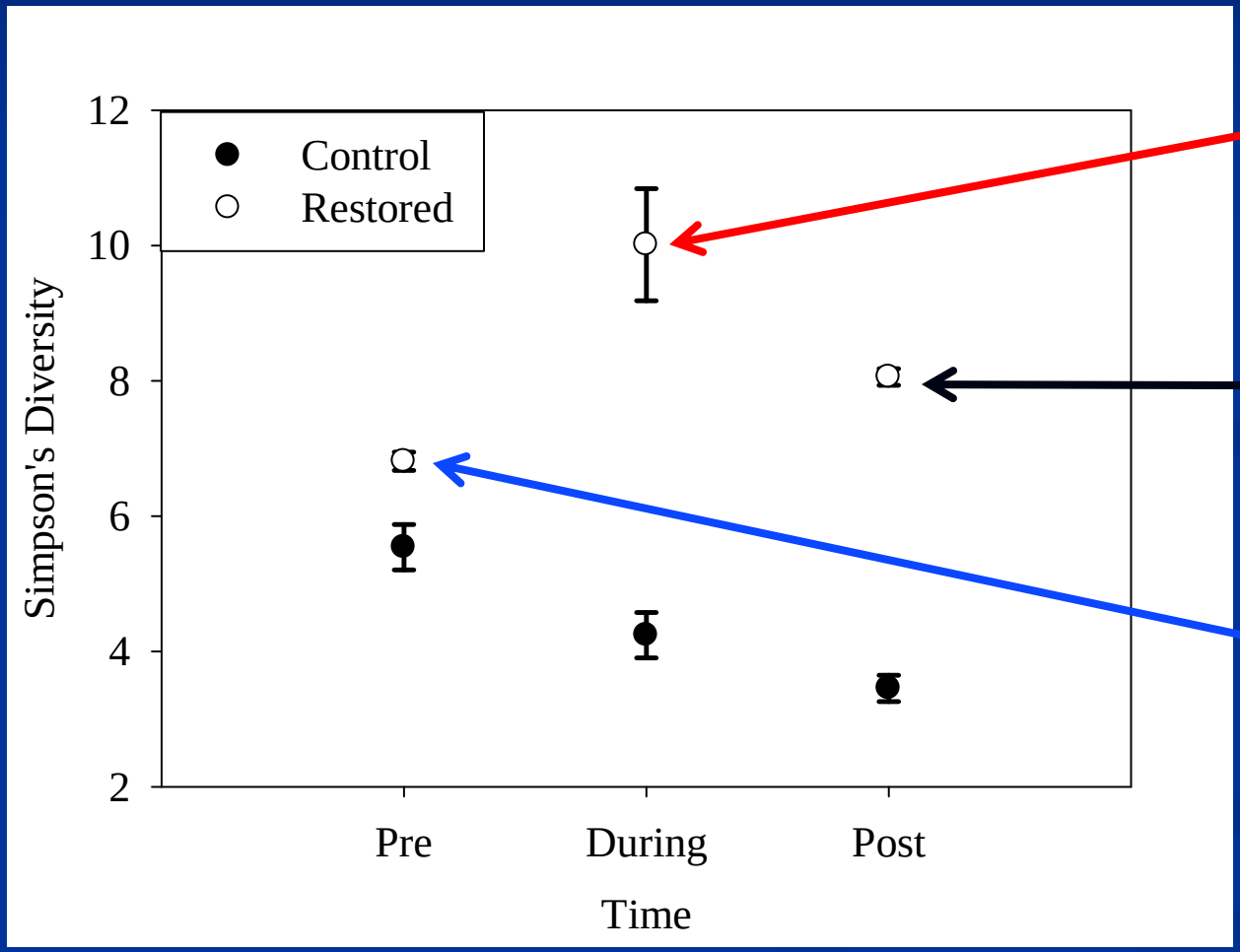
West Branch Control



East Branch Control



The "Clean Slate" phenomenon at the time of restoration

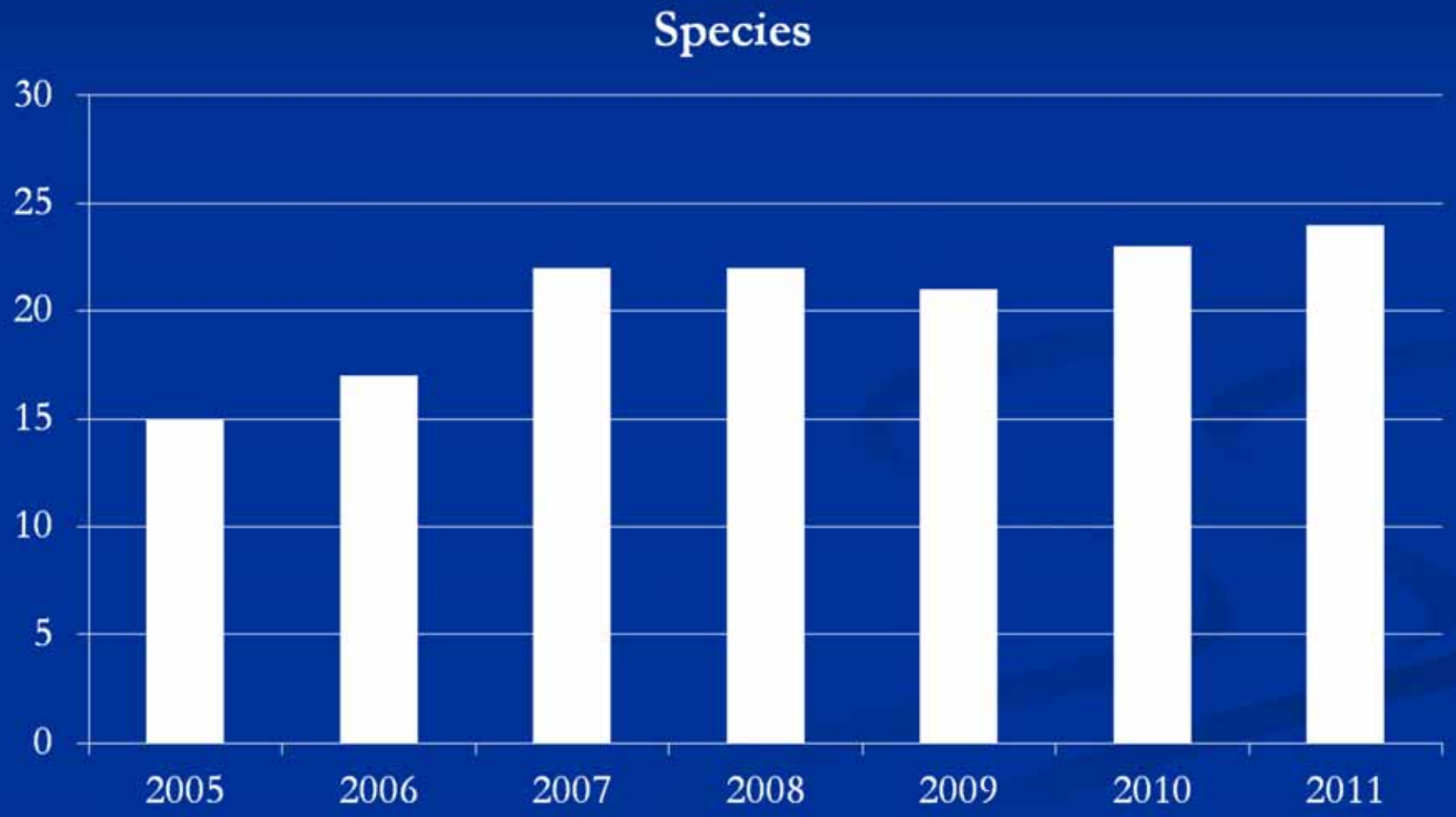


A variety of "pioneer species" are first to invade the new habitat in low numbers.

A boom in pioneer species numbers drives diversity down initially.

Low diversity pre-restoration

Additional species are slow to colonize.



Mostly what we are seeing are dramatic increases in species already present.

Blackstripe Topminnow (9400%)

Bigmouth Shiner (5585%)

Largescale Stoneroller (2300%)

Largemouth Bass (975%)

Bluegill (516.7%)

Sand Shiner (431.4%)

Green Sunfish (371%)

Johnny Darter (267.2%)

Creek Chub (179.5%)

Hornyhead Chub (136.1%)

However, some additional species have appeared following restoration work.

Gizzard Shad – 11 in 2008

Spotfin Shiner – 8 in 2011

Fathead Minnow – 1 in 2010

Quillback – 4 in 2009

Brook Silverside – 4 in 2010

Black Crappie – 1 in 2009

Redear Sunfish – 1 in 2011

Banded Darter – 2 in 2010
and 5 in 2011

Fantail Darter – 1 in 2011

We have also seen an increase in species post-restoration at the downstream reference site. Indicating possible carryover benefits beyond the boundaries of the project.

Largescale Stoneroller

Stonecat

Blackstripe Topminnow

Brook Silverside

Largemouth Bass

Bluegill

Banded Darter

Driving Forces

- Habitat Enhancement
  - Riffles
  - Pools
  - Aquatic vegetation
  - Meander bends
  - Refuge during floods
- Water Quality Improvements
  - Nutrient reductions
  - Higher dissolved oxygen levels
  - Lowered sedimentation rates
  - Lowered flood peaks

E8 riffle pool
8-17-2012


Questions?