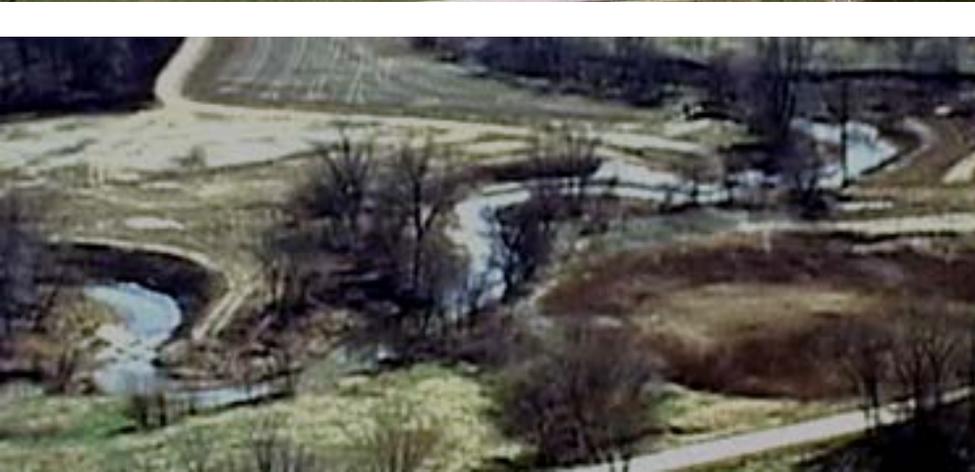


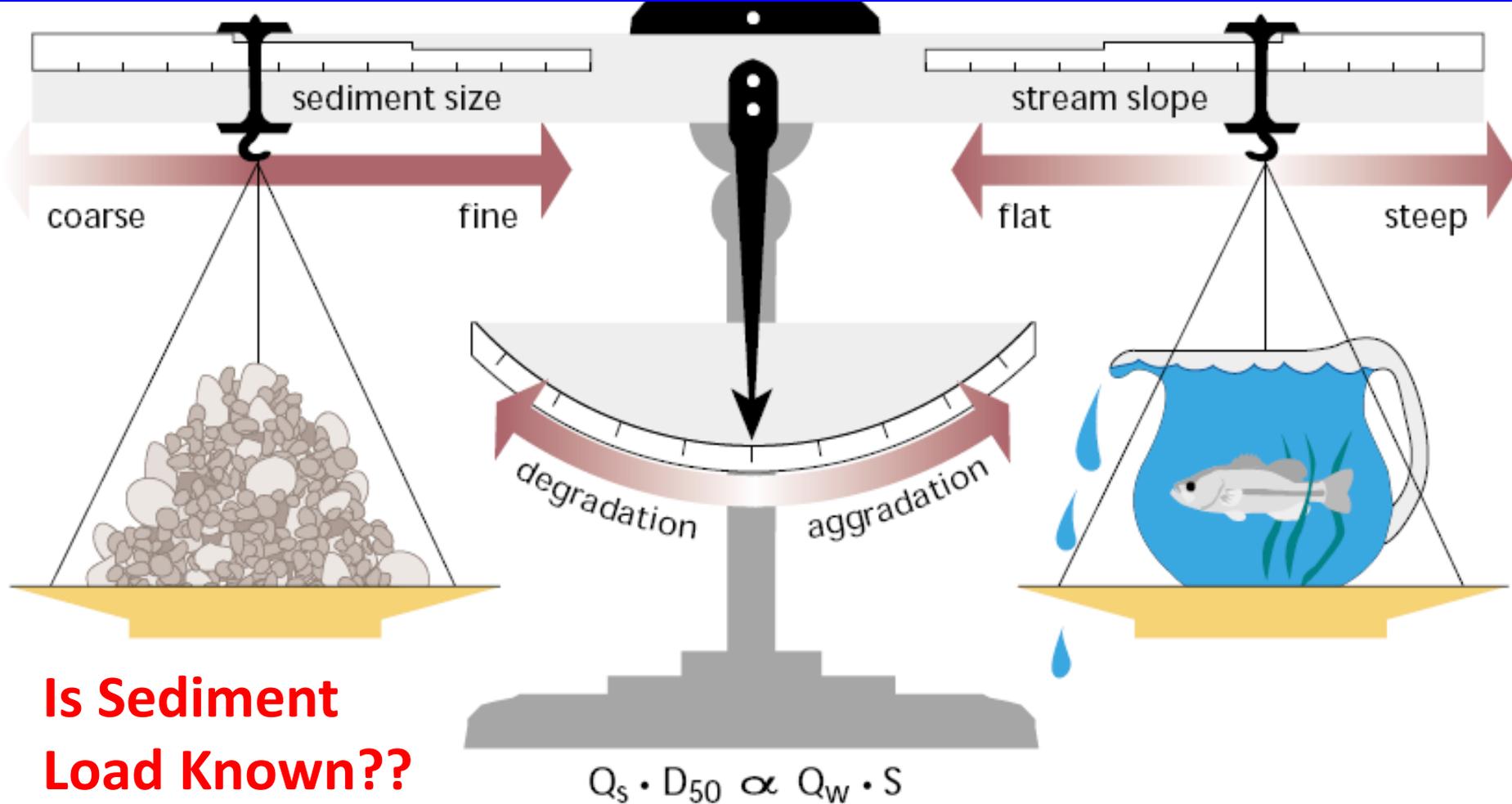
**OSM NATURAL STREAM DESIGN  
WORKSHOP MID-CONTINENT  
REGION TECHNOLOGY TRANSFER  
May 2011 Mt. Vernon IL**



**Major  
Natural  
Stream  
Restoration  
Projects  
In the  
Midwest**

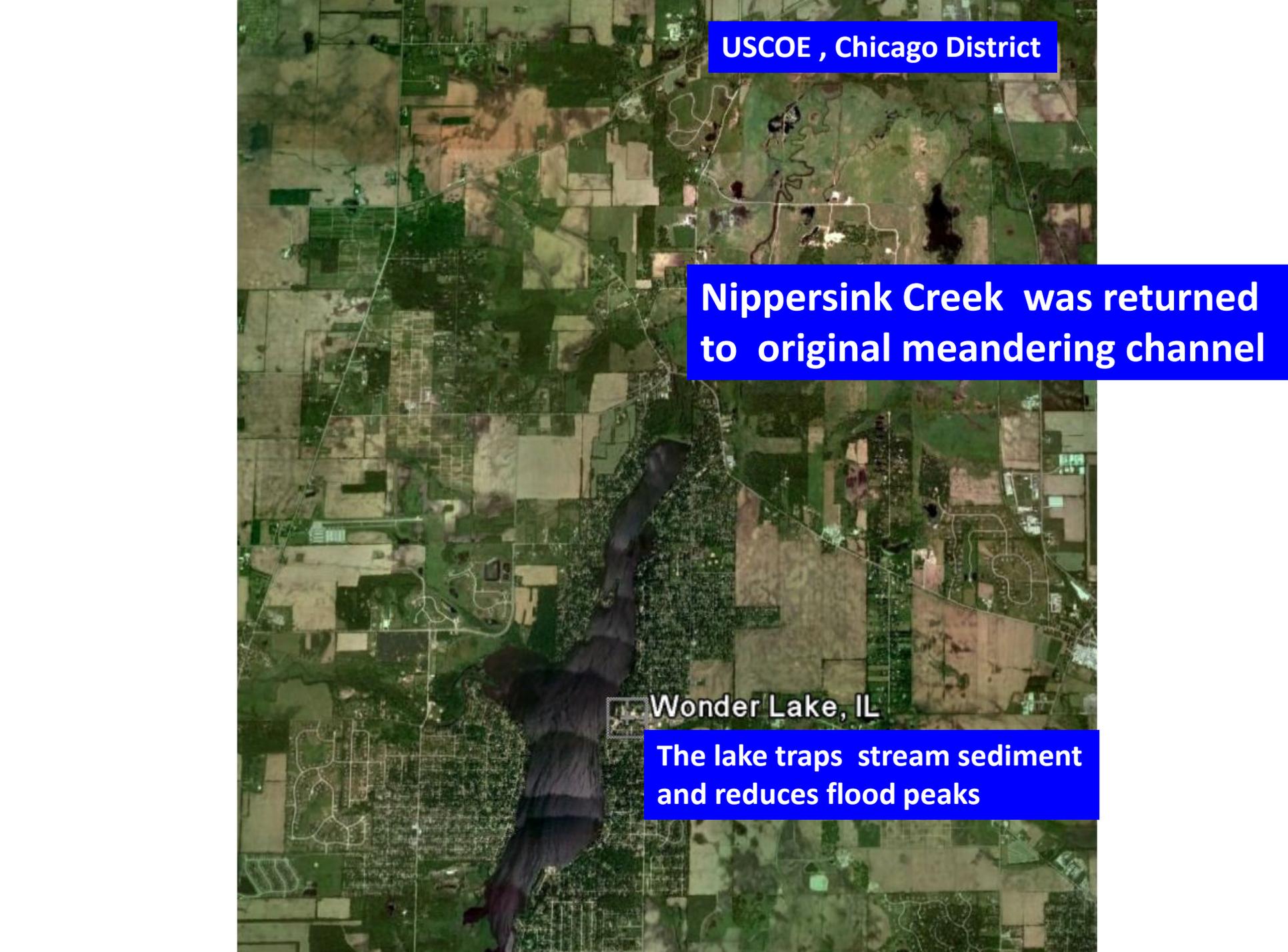


# How sediment load and particle size affects natural design



**Is Sediment  
Load Known??**

*Figure 1.13: Factors affecting channel equilibrium. At equilibrium, slope and flow balance the size and quantity of sediment particles the stream moves.*

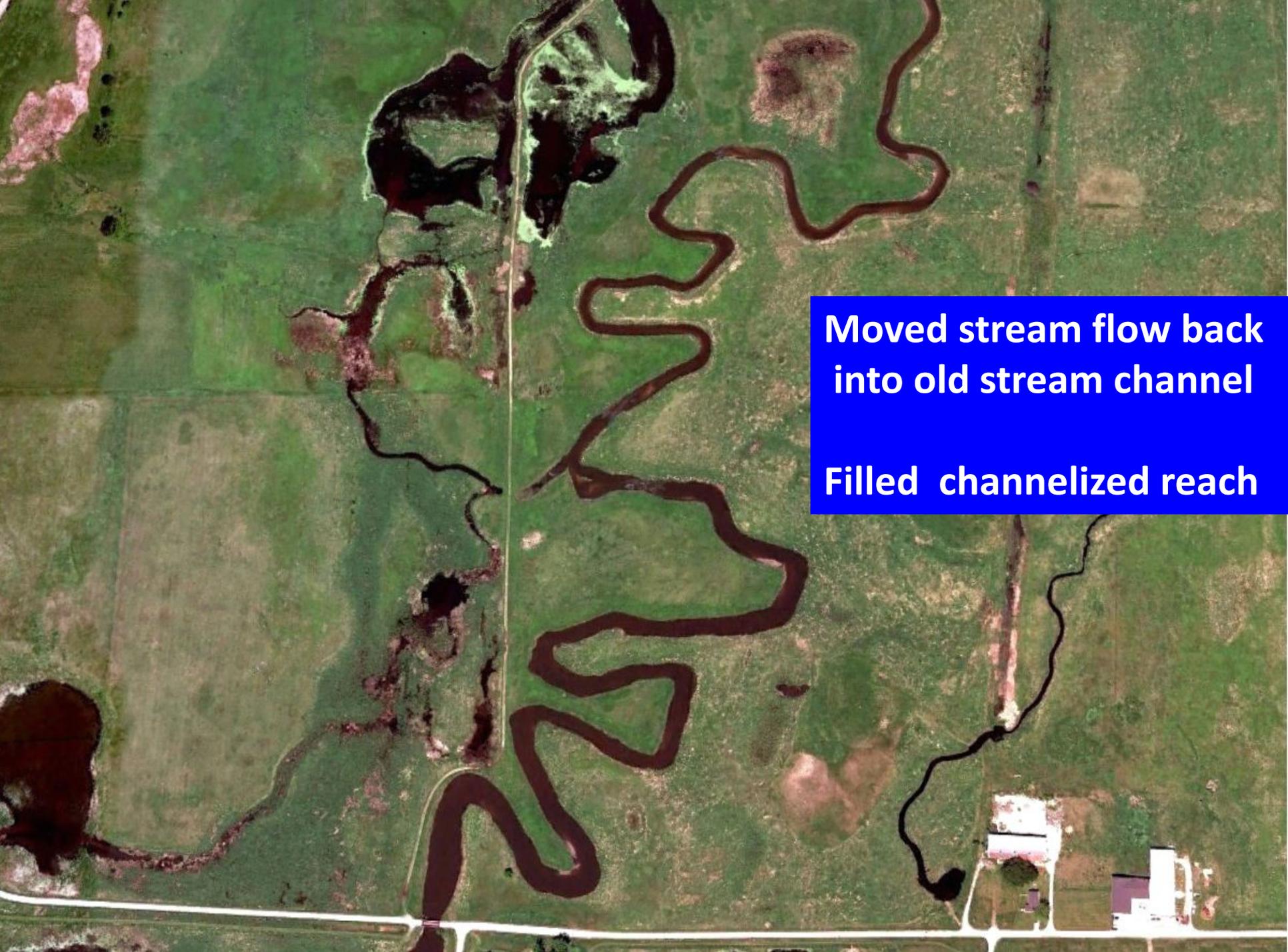


USCOE , Chicago District

Nippersink Creek was returned to original meandering channel

Wonder Lake, IL

The lake traps stream sediment and reduces flood peaks



**Moved stream flow back  
into old stream channel**

**Filled channelized reach**

**Geomorphologist from NIU  
determined excessive  
erosion in meanders -**



**Sand deposition builds on point bars from channel scour since Wonder Lake Dam traps over 90 percent of sediment**



**USCOE added riffles after flood discharges  
from upstream Wonder Lake  
increased channel erosion in meanders**





**Indianapolis airport expansion  
Near I-70 with stream restoration**

**What can go wrong in a natural stream design in an urban setting**

cross-vane as a rock riffle



**Bankfull channel dimensions at riffle  
do not transport bed materials  
and recreate instream habitat**



**Note bedload deposition over cross vane and bank scour around mid channel bar**



# Brown Deer Stream and Wetland Restoration

at Iowa City after record floods in 2007 and 2008



July 2009

stream after major floods in Iowa



# Muddy Creek, Iowa City 2006

Diverse native prairie  
on bank with rock toe

Low point bar – start of veg growth



**Sand deposition limits  
prairie grass growth**

**high point bar deposition**



07.03.2007

12-7-2010



Vegetation growth through  
sand deposition on point  
pools narrow and deepens



# The Grove on Kickapoo Creek

## EPA National Non-Point Pollution Monitoring Project

2007



## Change Rowcrop Drainage to Stormwater Detention in a prairie stream/wetland park

West Branch

East Branch

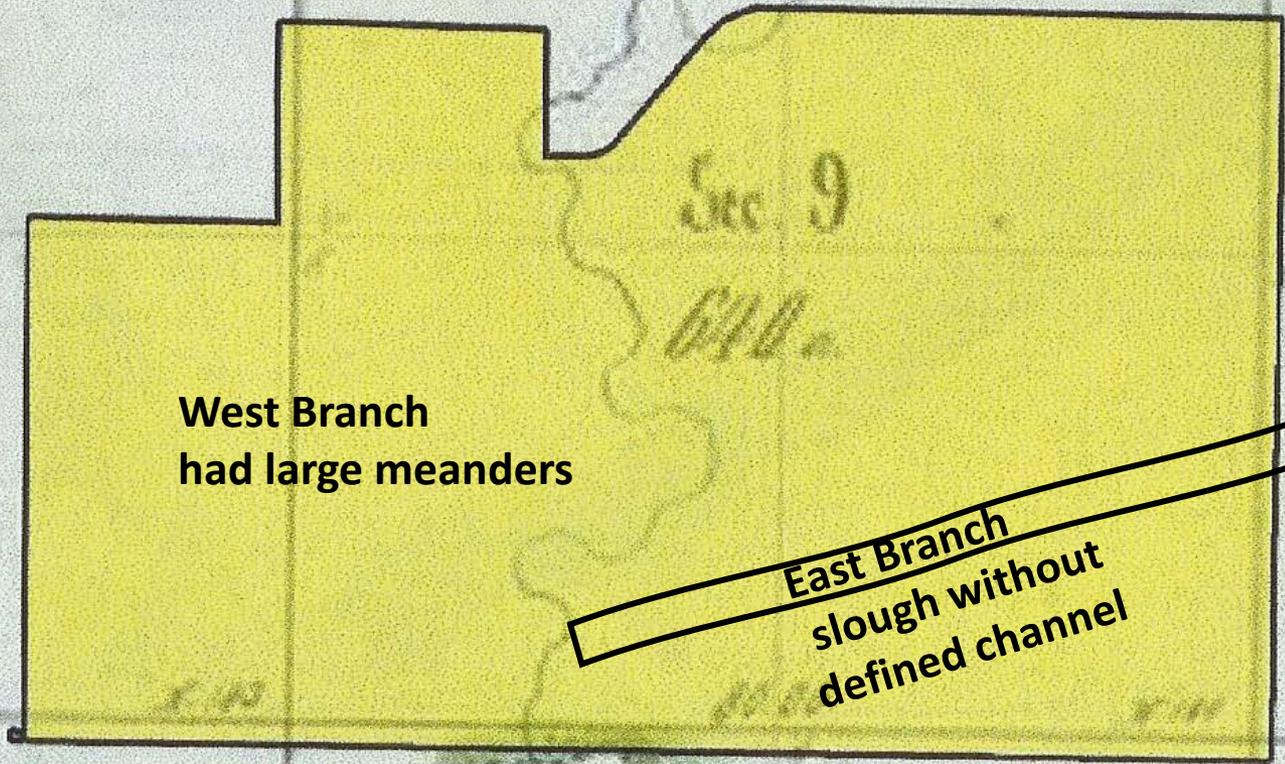
2009



**Row crops of corn and soybeans are the dominant landuse in the 14.8 sq mi watershed above the Grove**

# Grove waterways in the 1800's

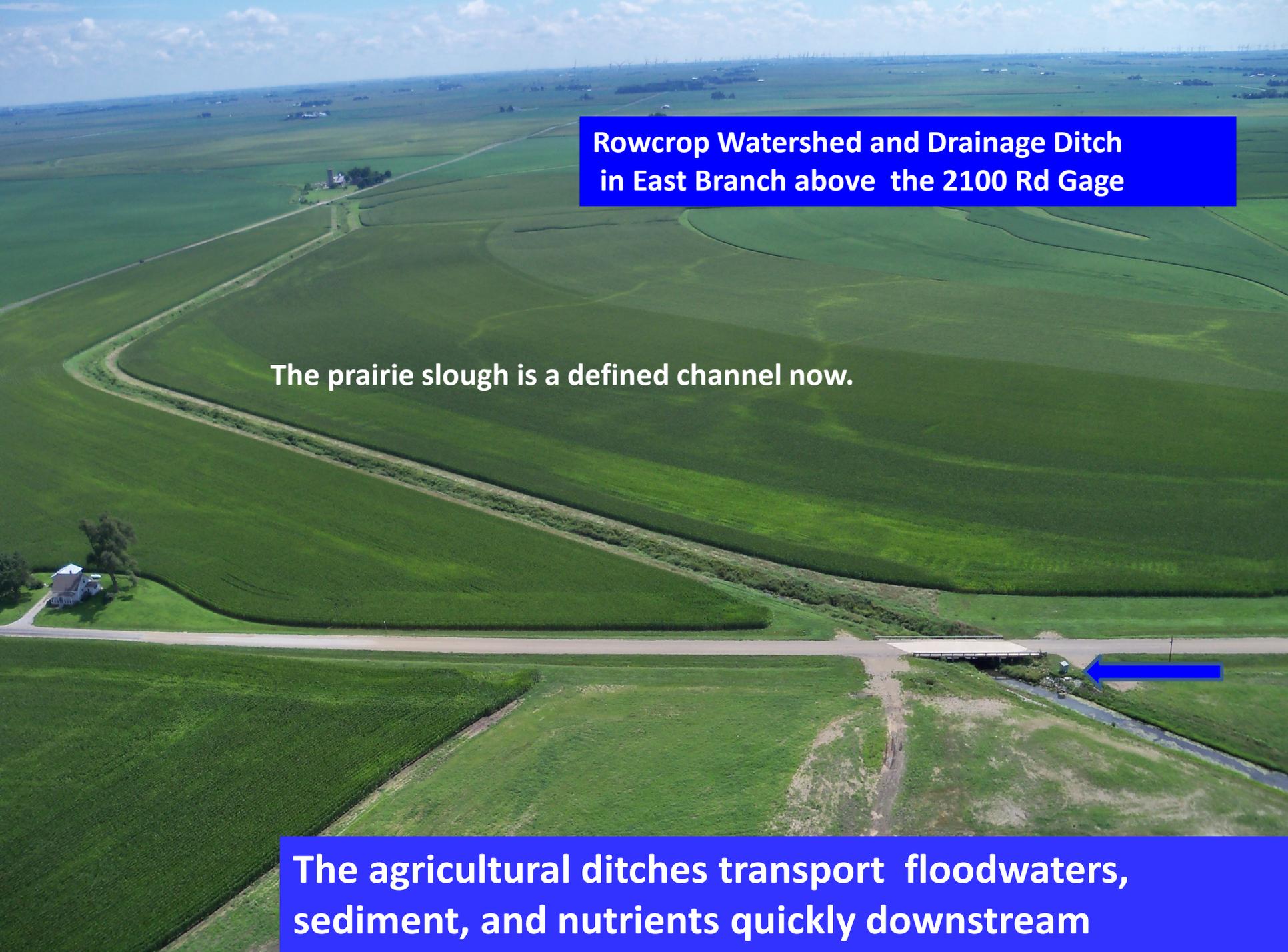
The Grove  
Housing  
Development  
Area



West Branch  
had large meanders

East Branch  
slough without  
defined channel

The larger East Branch existed as a slough  
steeper West Branch had large stream meanders

An aerial photograph showing a vast agricultural landscape. A prominent drainage ditch runs diagonally across the frame, with a prairie slough branching off to the right. The fields are lush green, and a road is visible in the lower third of the image. In the distance, a line of wind turbines is visible against a blue sky with scattered clouds. A blue arrow points to a structure on the drainage ditch in the lower right quadrant.

**Rowcrop Watershed and Drainage Ditch  
in East Branch above the 2100 Rd Gage**

**The prairie slough is a defined channel now.**

**The agricultural ditches transport floodwaters,  
sediment, and nutrients quickly downstream**

# Phase 1: Temporary wetland basin storage above the undersized Grove Park Bridge. Pictured during second summer of prairie/wetland growth



Undersized Grove Park Bridge



1200 Rd gage

E2 riffle

Center Wetland

West Branch

West Wetland

East Branch

**To reduce downstream flooding, runoff is detained  
in the park floodplains and wetlands by the undersized bridge**

**Shave the peak off larger floods but reduce sedimentation**



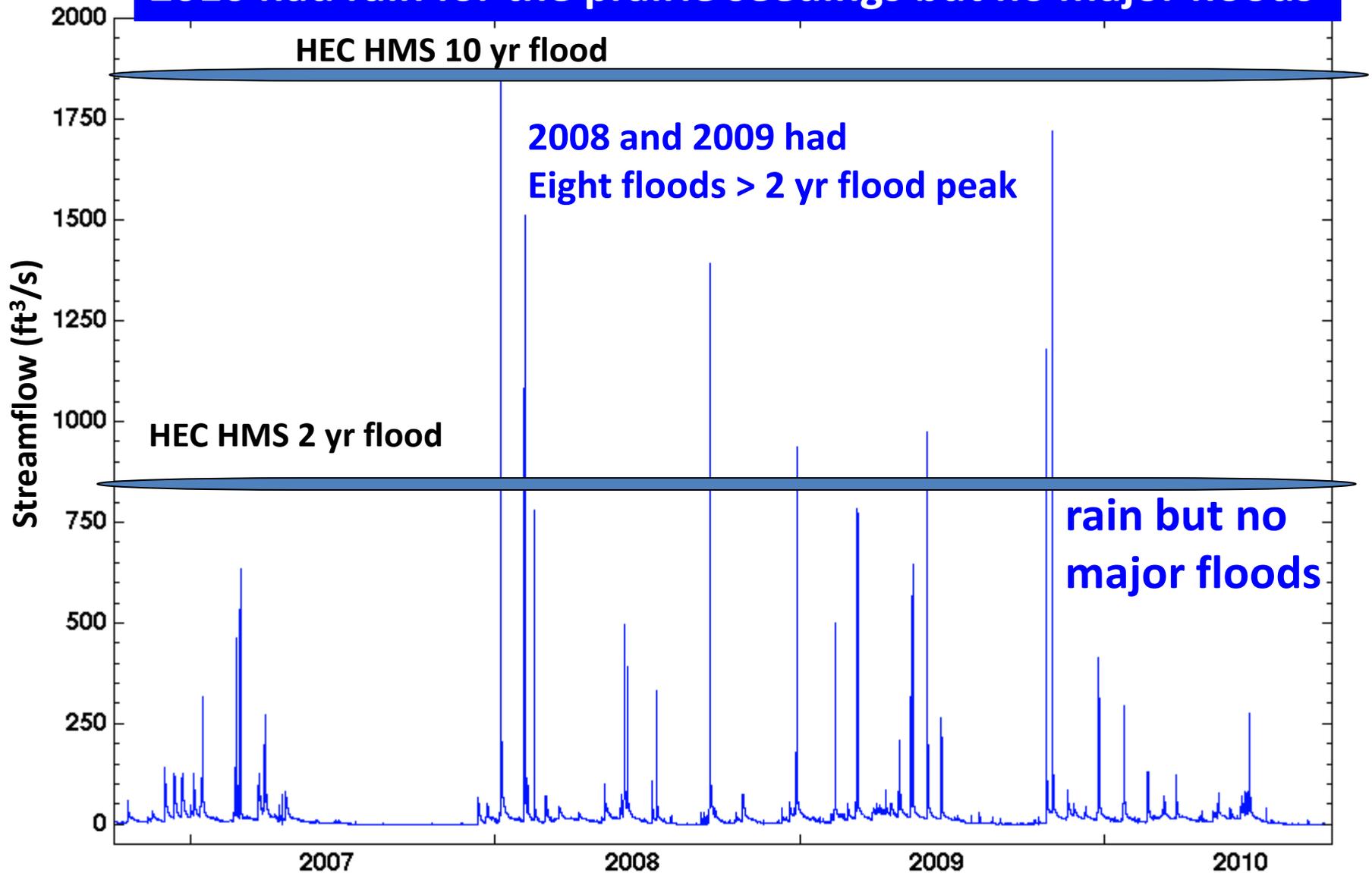
**Oct 30, 2009**



**Nov 2, 2009**



# 2010 had rain for the prairie seedings but no major floods



With strong growth of native prairie and wetlands in 2010, improvements of water quality in the Grove are beginning.

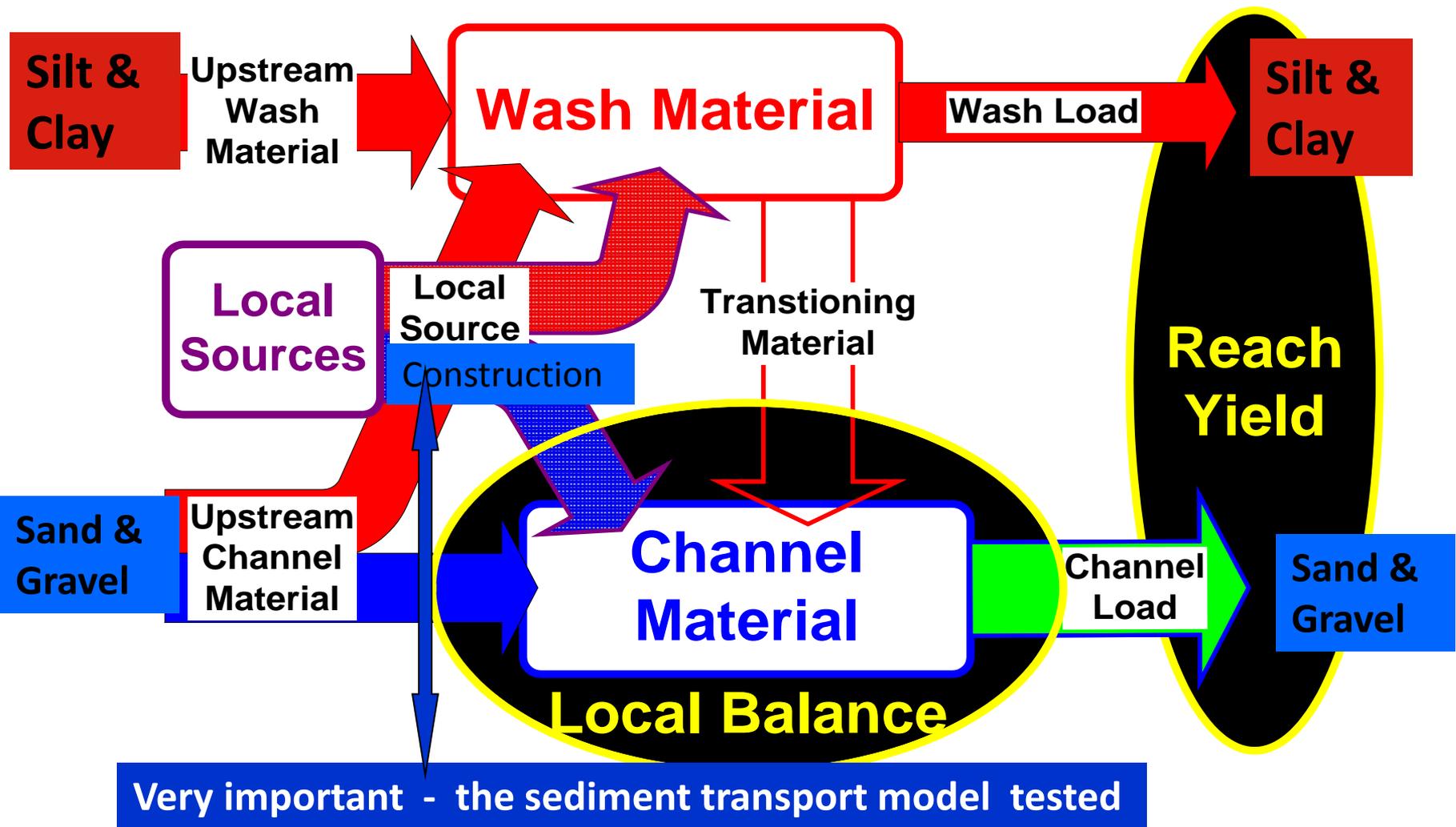
2010

**Large scale earth moving on steep bluffs  
Is an large construction erosion problem**



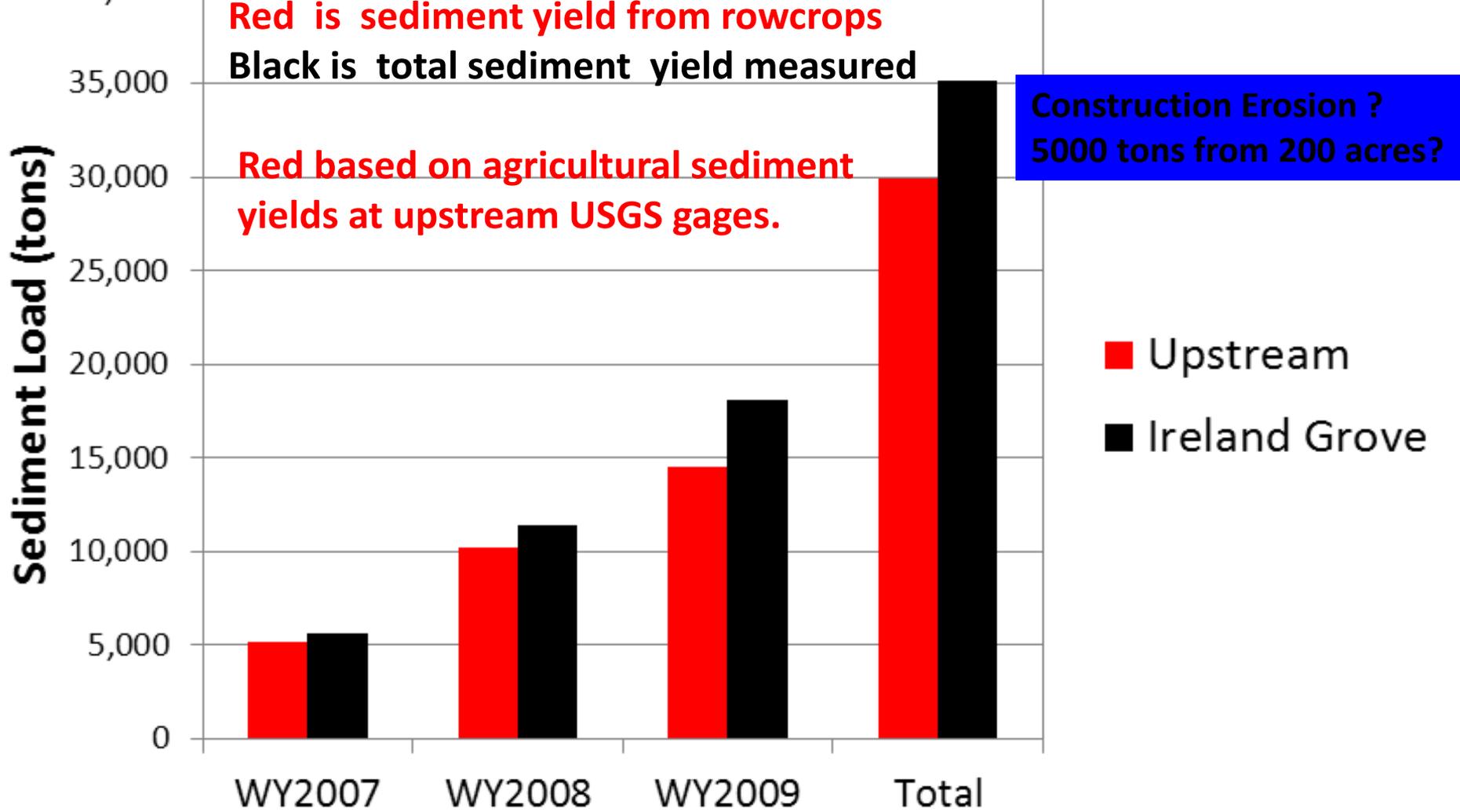
**Central Wetland**

# SIAM - Reach Conceptual Model



Construction runoff from steep bluff  
before entering sediment basin  
10-30-2009





Year	West	East	Upstream	Ireland Grove
WY2007	1,976	1,806	5,215	5,661
WY2008	3,341	4,167	10,206	11,429
WY2009	7,262	2,935	14,552	18,068
Total	12,579	8,908	29,973	35,158

**Outflow from sedimentation basin  
Into West Branch – 10-30-2009**

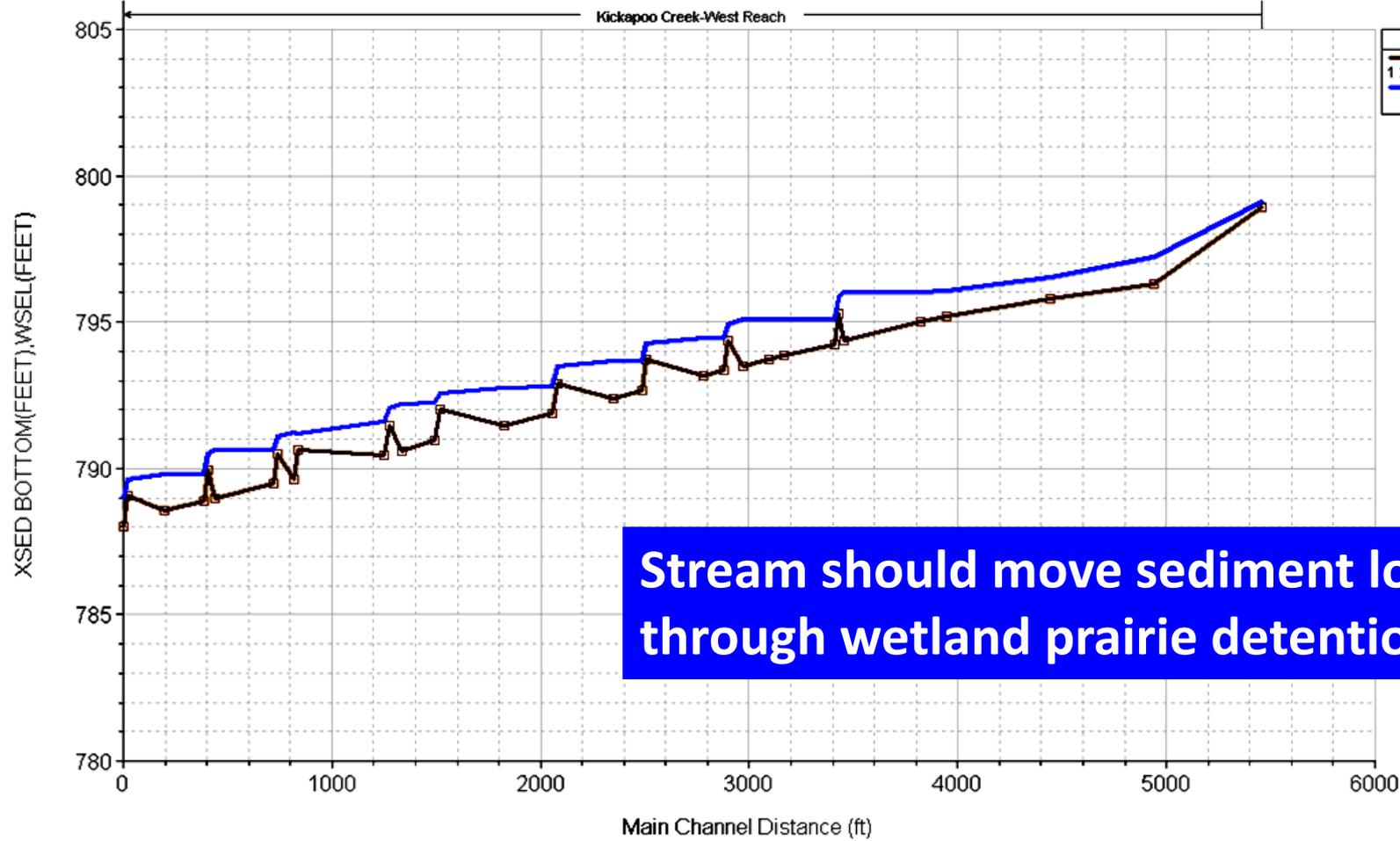


21Feb2007 12:00:00

Kickapoo Creek-West Reach

Legend

1 21Feb2007 12:00:00-XSED BOTTOM(FEET)  
1 21Feb2007 12:00:00-WSEL(FEET)



**Stream should move sediment load through wetland prairie detention basin**

**HEC-RAS 4 beta mobile bed sediment transport**

**IDNR and IEPA fall surveys of E2 riffle pools find pollution sensitive aquatic insects and fast growing bass along a prairie floodplain**



**Stream agrees so far**

## Largescale Stoneroller



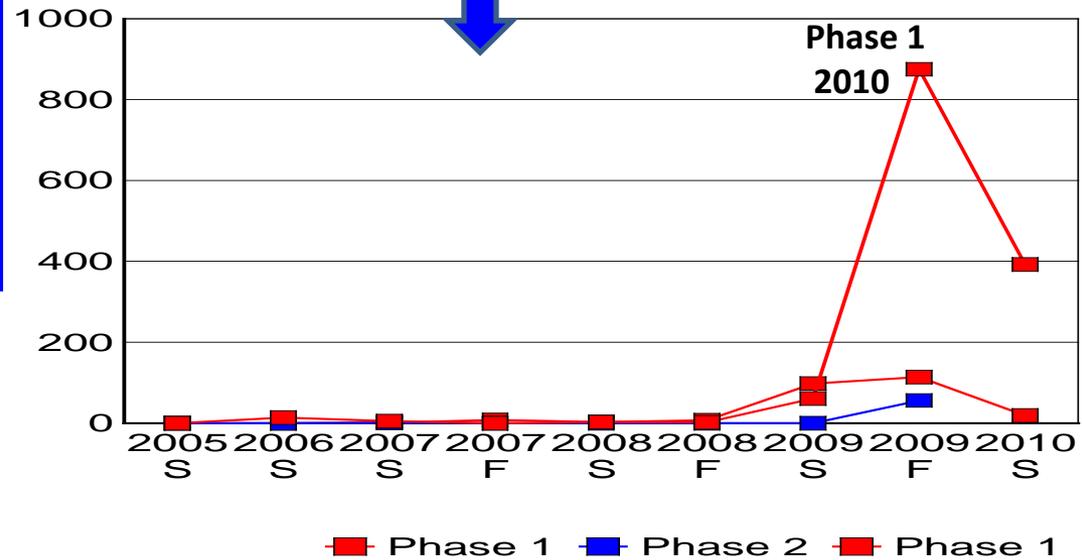
Species in Greatest Need of Conservation

## Bigmouth Shiner



Intolerant Species

Only one individual showed up in years of pre-restoration sampling, so far 22 have been collected post-restoration



# Phase 2: East Branch remeandered and wetlands pictured (7-26-2010) in the first summer of prairie/wetland growth



Phase 1

Wetland

Wetland

Wetland

corn field

E8 riffle  
fish survey

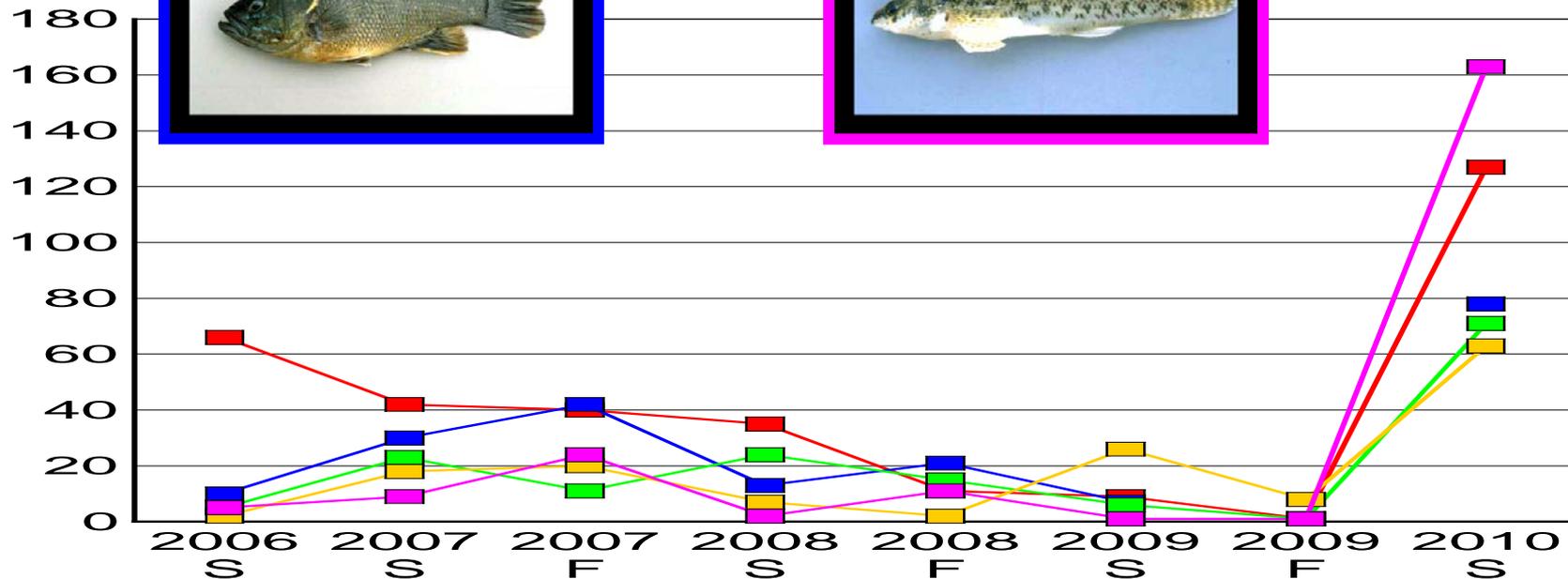
Wetland

Wetland

East Branch

corn field

# East Branch – Phase 2 Site





Environmental Excellent Award received by The American Council of Consulting Engineering Companies of Illinois, the first ever for stream restoration or green infrastructure for stormwater management

The innovative method of providing a combination of stormwater wetlands, creek meandering, floodplain restoration and a downstream restriction to re-connect a straightened agricultural drainage ditch to its restored native floodplain at the Kickapoo Creek Stream Restoration project has resulted in water quality improvements and...

This project has been designated as part of the National Nonpoint Source Planning Program (NNSPP). This program was developed by the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act to reduce water quality impairments from nonpoint source pollution. Kickapoo Creek is one of only three NNSPP projects in the state of Illinois and one of 25 nationwide.

"Instead of merely restoring a development after nature, they are actually 'letting nature'," said Angelo Capparella, a representative from Friends of Kickapoo Creek and a biology professor from Brescia State University. "The water quality of the creek is already showing improvement." - The Paragraph

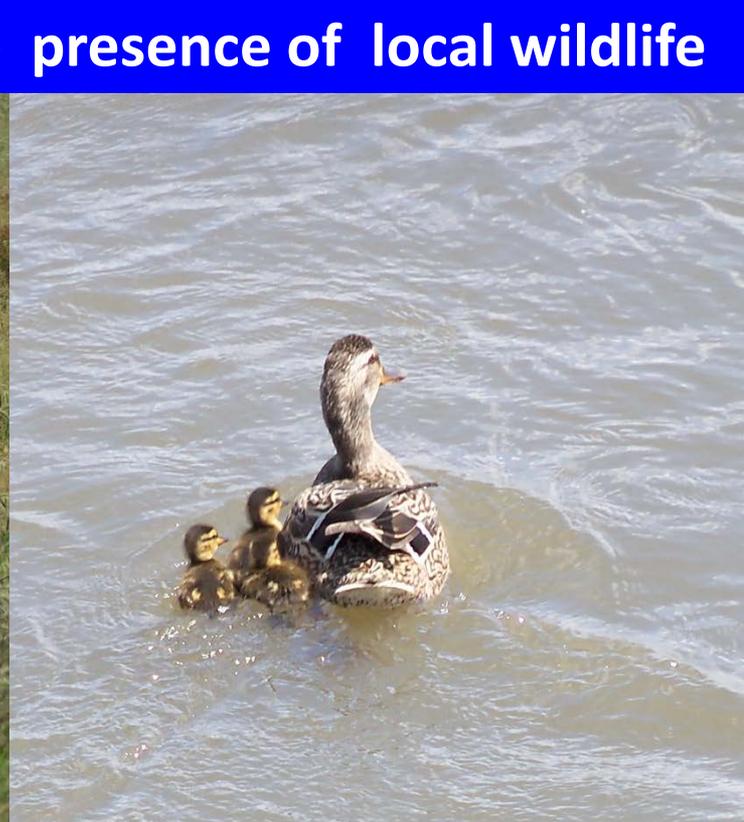
**Kickapoo Creek Stream Restoration**  
Bloomington, Illinois

Executive Firm: Farmstead Group, Inc. | Bloomington, Illinois  
Client/Owner: City of Bloomington





**Best award - presence of local wildlife**





Natural riffle is the granite boulders and cobbles from the outwash of glacial melting.

Served as a fixed hard grade control to channel incision after stream was channelized



**Design (Tim Straub - this afternoon)  
Enhance riffle/pool habitat and prairie grass/rock banks**