



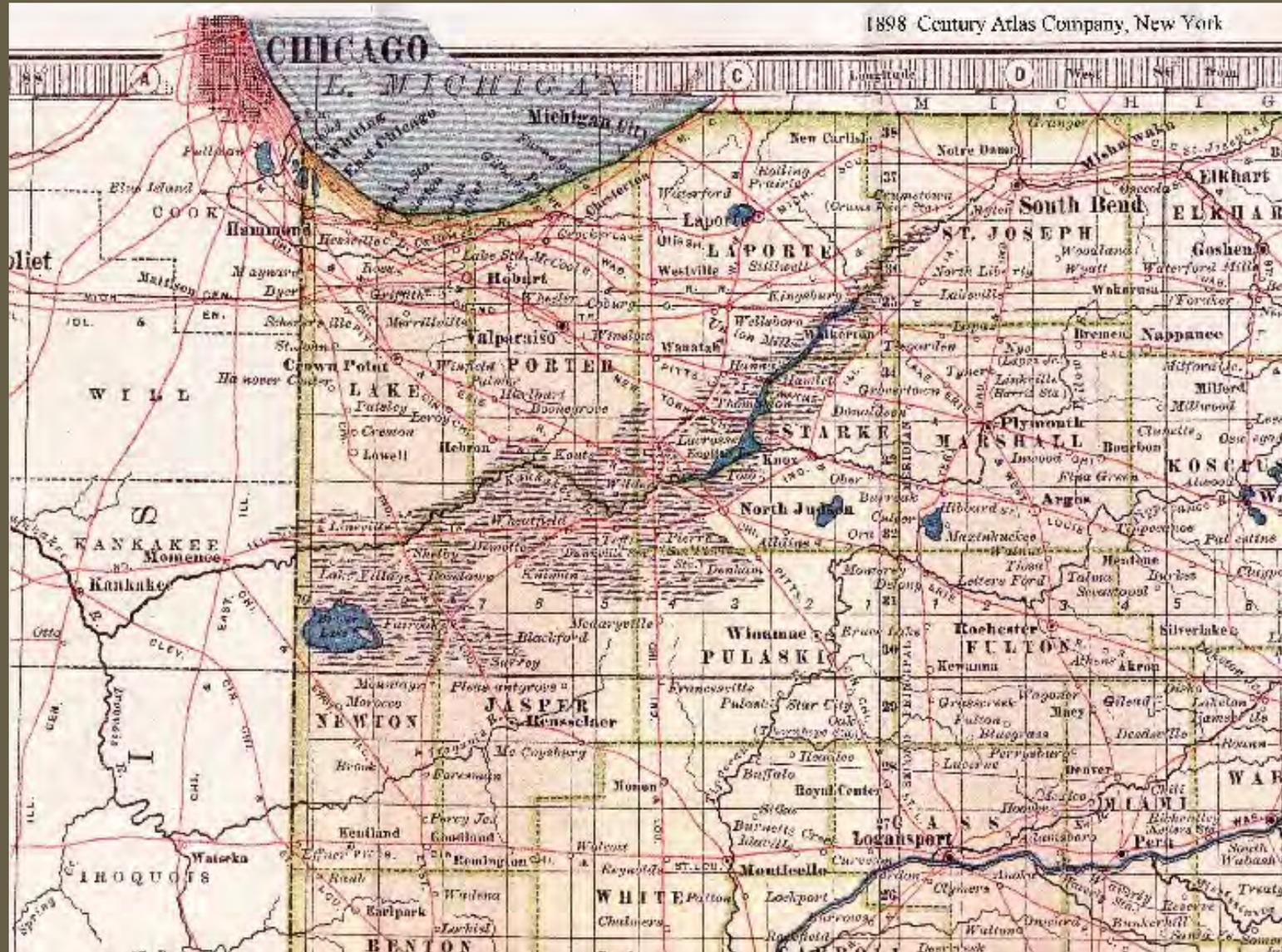
Yellow River System Assessment

Robert Barr and Siavash Beik

Operation Stay Afloat 2016

March 15, 2016

Background







Kankakee River in St Joseph County. -Walkerton Area Historical Society



Burrows Camp near Dunn's Bridge. -Northwest Indiana Genealogical Society Collection



Photo) Northwest Indiana Genealogical Society Collection

Traditional Restoration Example



Kankakee River , Indiana, June 2015 - reach was “restored” in 2013

Traditional Maintenance Example

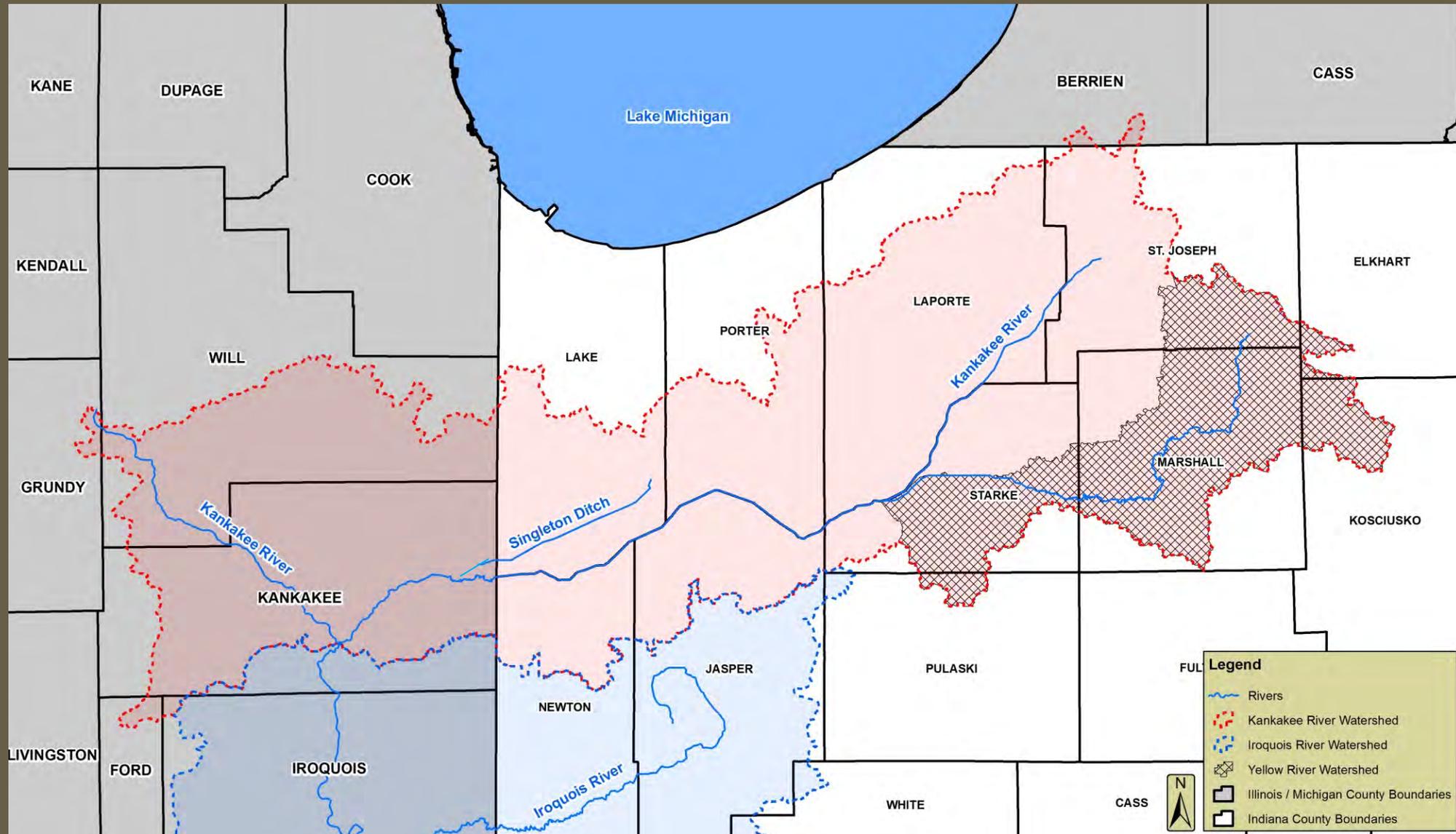


Bank “maintenance” on a tributary channel, Kankakee River, Indiana 2015

Introduction

- Study initiated and funded by KRBC
- Problem Statement
 - Too much, repeated maintenance expenditures needed to deal with significant bank failures, erosion, and sediment aggradation
 - Too much sediment is going to Illinois
 - Yellow River cited as a major sediment source
 - Degraded habitat and quality in Yellow River and Kankakee
- Our Charge
 - Pinpoint the root causes
 - Recommend sustainable solutions (where to do what)

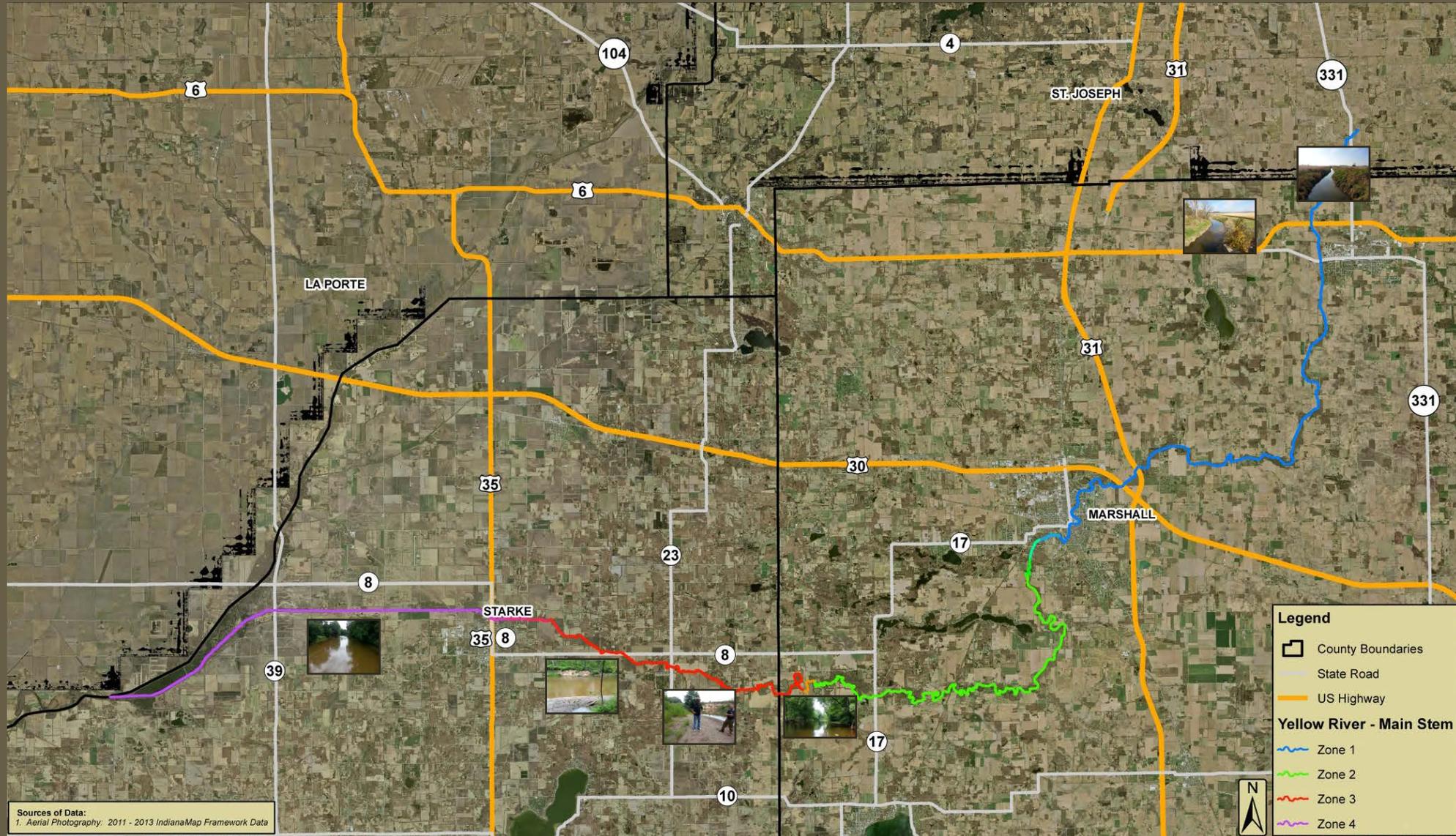
Study Area



Selected Previous Studies

- CBBEL, 1992
- Holmes (USGS), 1997
- Bhowmik and Demissie, 2001
- USACE, 2007 (Illinois Basin Comprehensive Plan)
- CBBEL, 2012
- Kankakee River Basin Evaluation of Sediment Management Strategies, Little and Jonas, 2013
- Kankakee River Mainstem Critical Restoration Project Summary Report, 2014

System Assessment: Channel Morphologic Zones



Yellow River Headwaters at St. Joseph County Line



Yellow River near Armey Ditch, Marshall County



Yellow River at Marshall – Starke County Line



Yellow River, Starke County



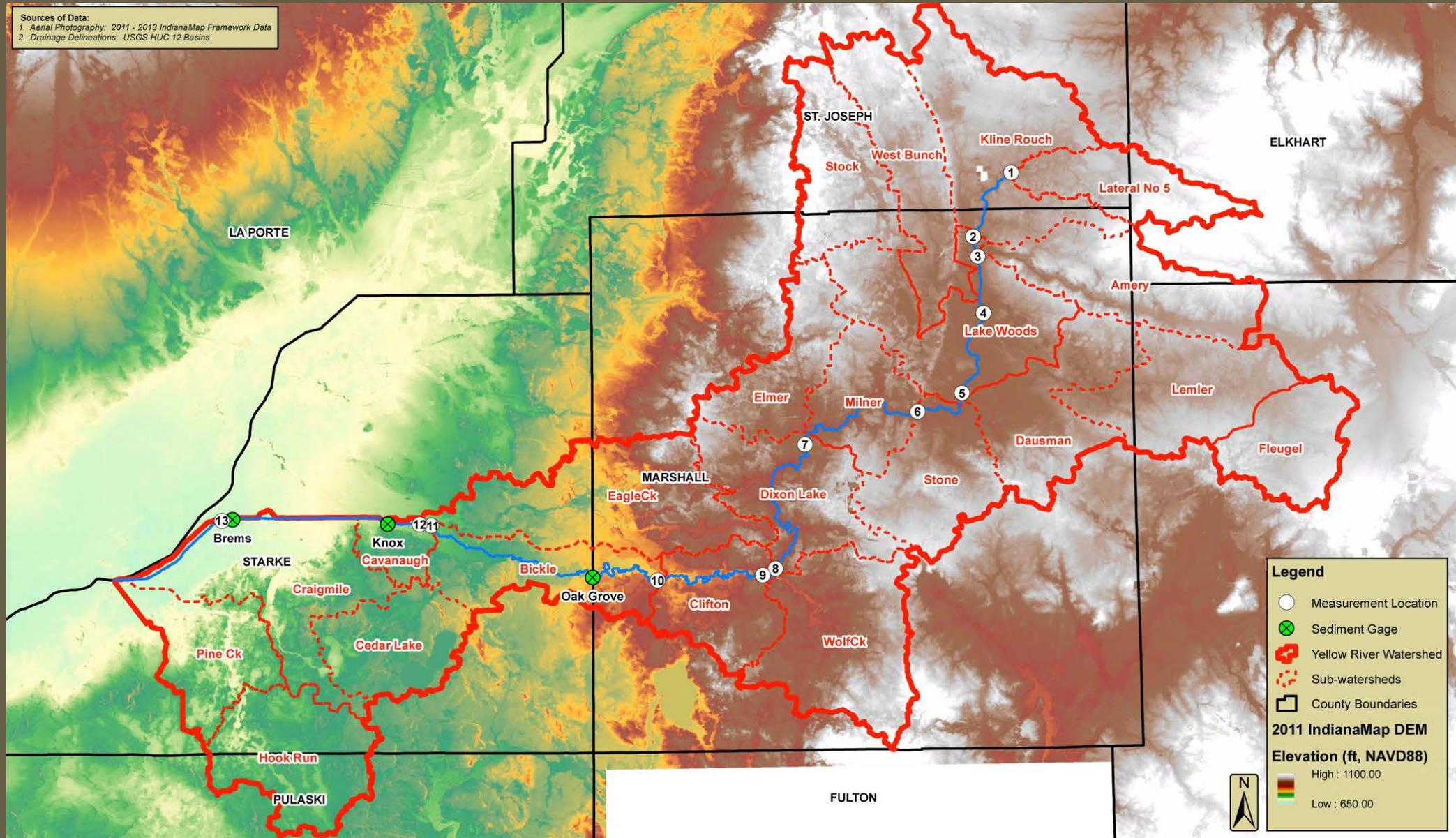
Yellow River, Starke County



Yellow River West of Knox



Location of USGS Gages

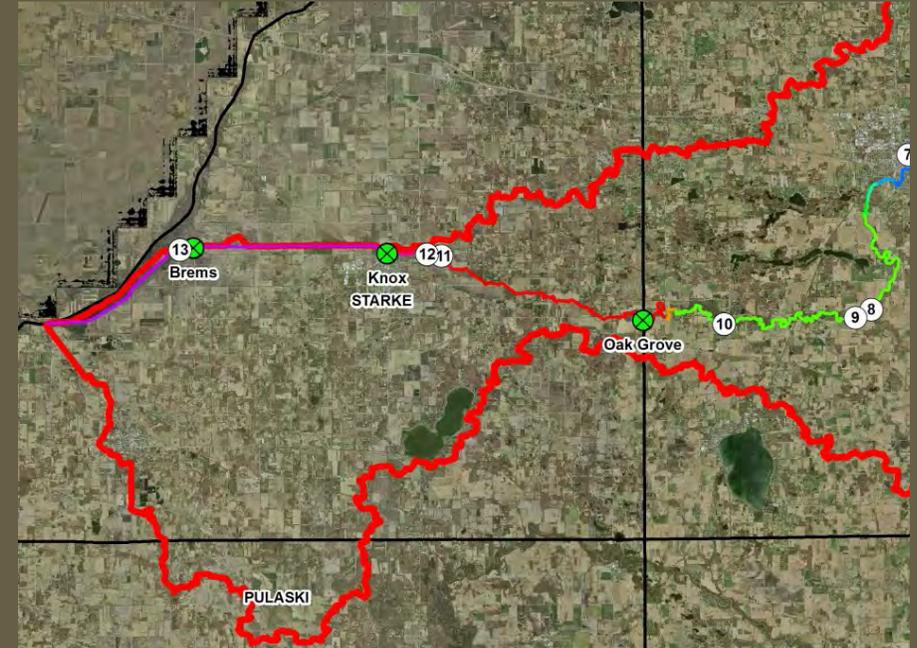


Data Analysis

- Drainage modification
- Soils & land management
- Sediment gage data
- Sediment source analysis
- Channel geometry
- Channel processes
- Bank Failures

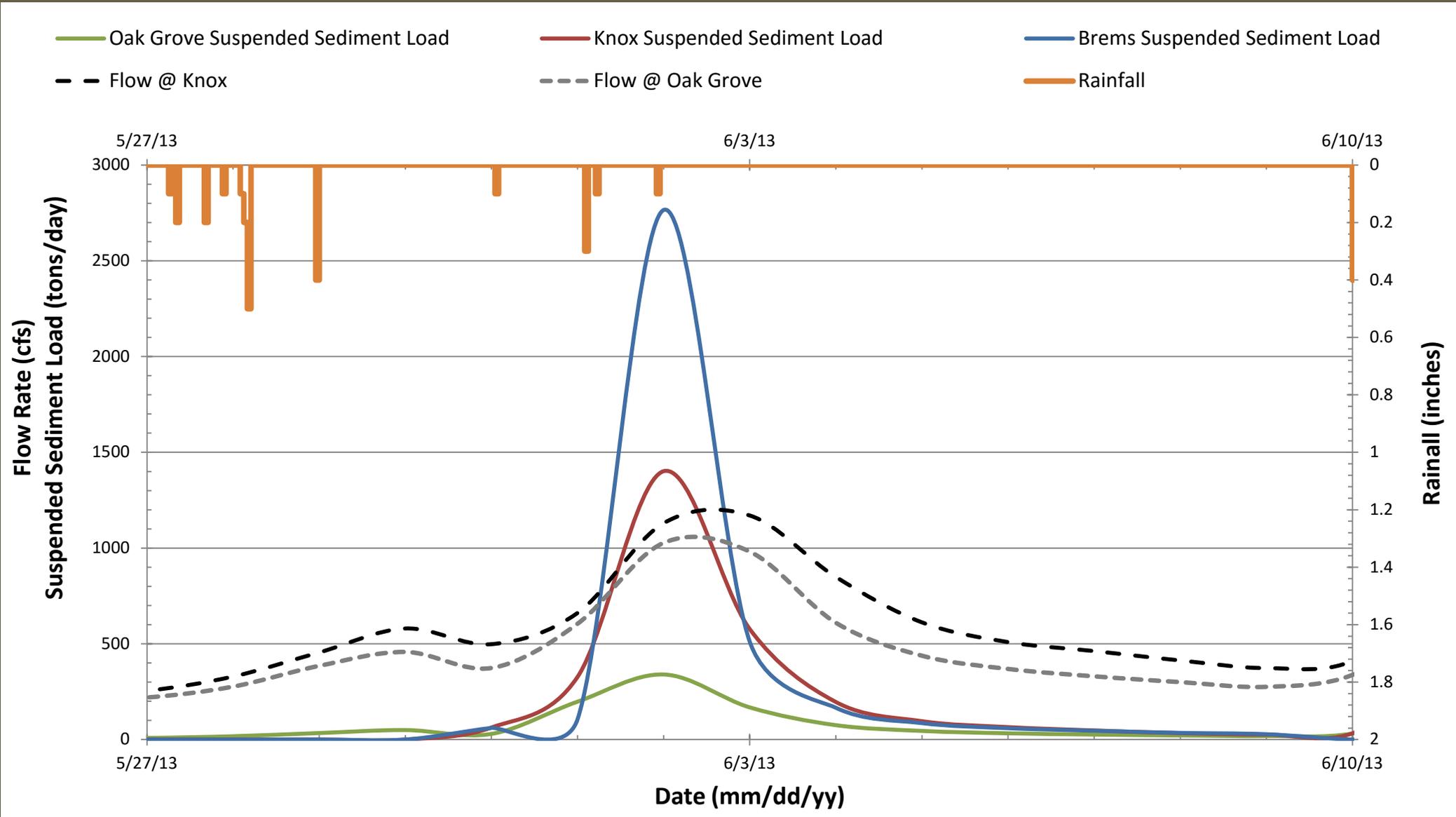
Sediment Gage Data

- Variability from year-to-year
- Sharp increase in sediment between Oak Grove & Knox
- Knox sediment load \approx Brems sediment load



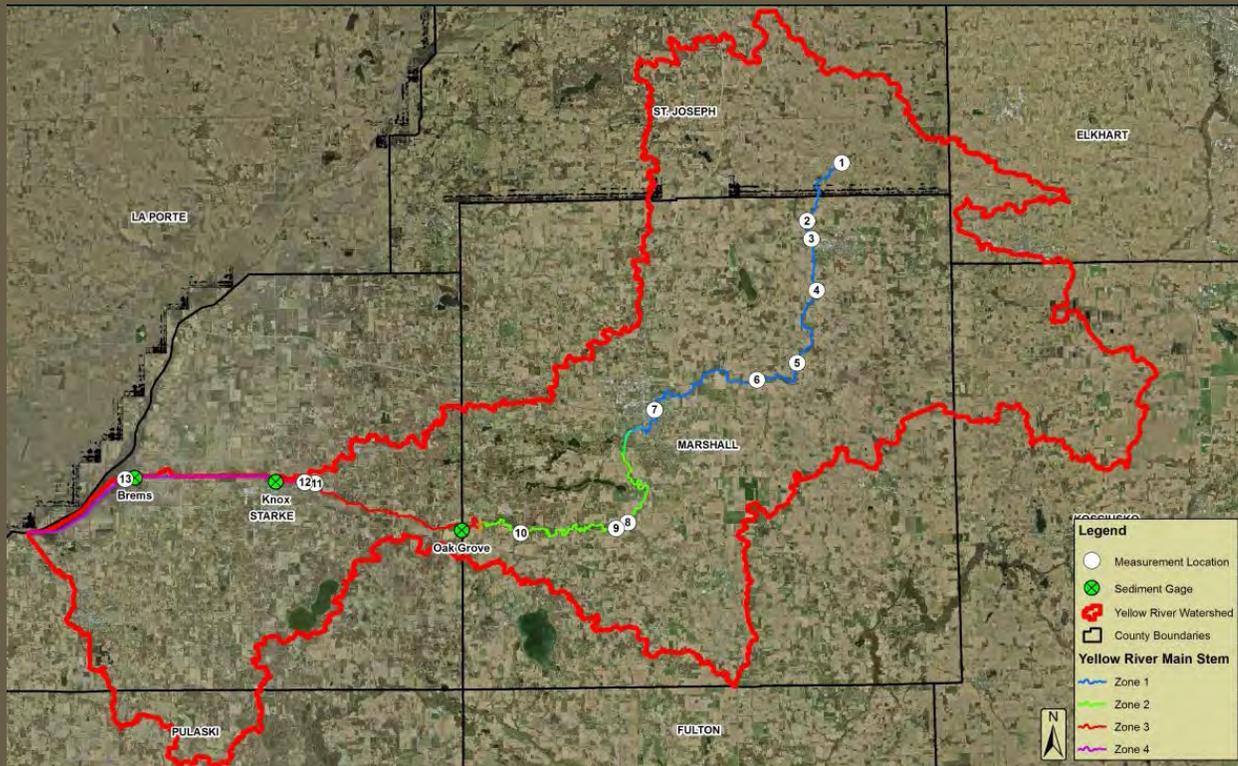
Location	Contributing Drainage Area (sq. mi.)	Adjusted Annual Suspended Sediment Load (tons)			
		2013	2014	2015	Average Annual
Oak Grove	377	20,340	12,682	20,324	17,782
Knox	435	61,179	29,028	57,023	49,077
Brems	438	70,232	19,392	49,353	46,325

Sediment Gage Data



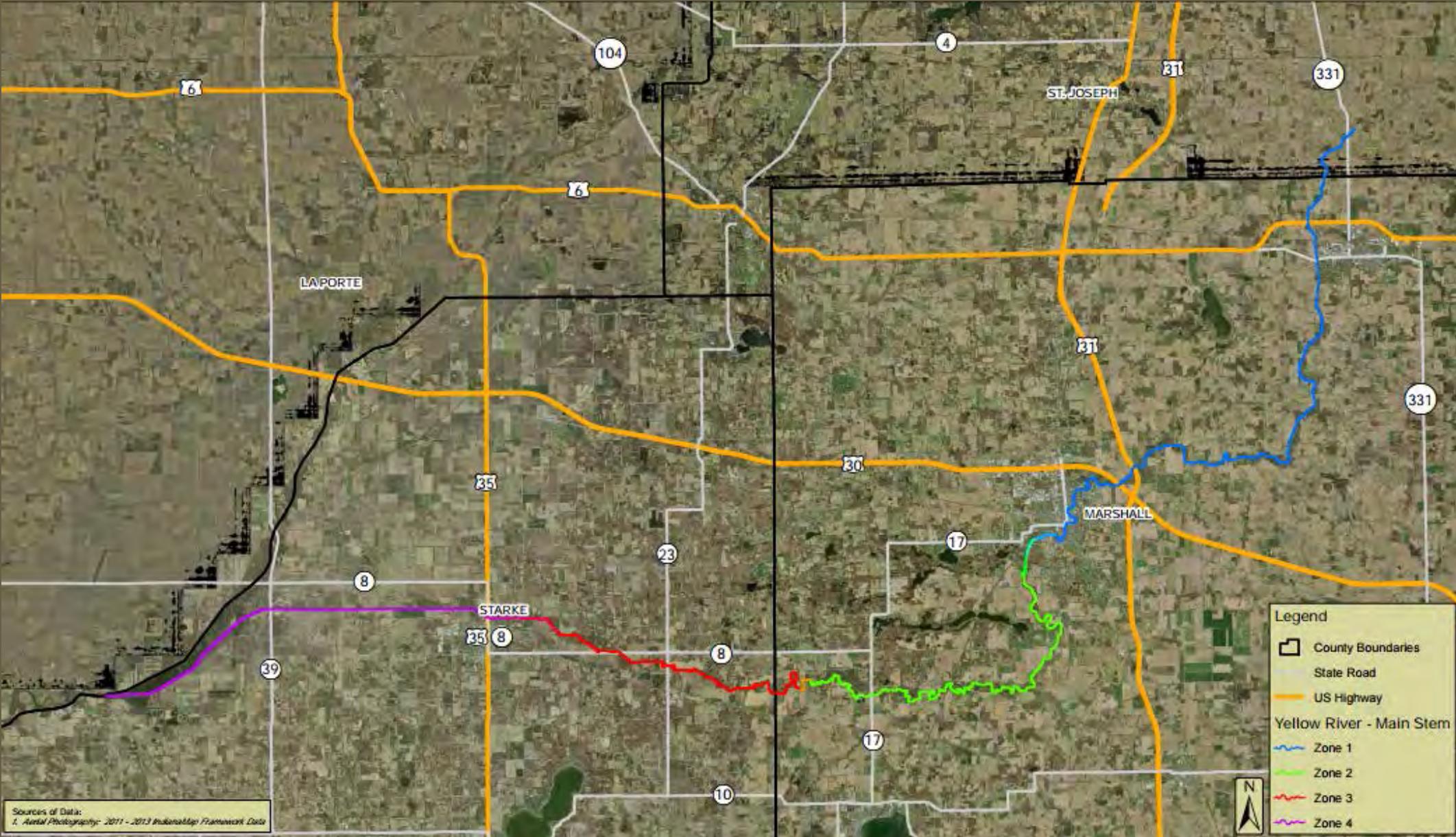
Channel Geometry

- Channel dimensions are what we expect in natural channel reach
- Difference from 'stable' channel dimensions is greatest downstream of Knox



Location	Approx. Bankfull Width (ft)	Regional Equation Bankfull Width (ft)	Description of Measurement Location
1	22	33	Man-made ditch
2	30	48	Man-made ditch
3	45	54	Man-made ditch
4	49	63	Man-made ditch
5	54	68	Man-made ditch
6	70	78	Natural channel
7	84	82	Natural channel
8	89	84	Natural channel
9	96	87	Natural channel
10	88	88	Natural channel
11	101	90	Channelized stream
12	102	92	Channelized stream
13	129	93	Man-made ditch

Recommendations



Sources of Data:
1. Aerial Photography- 2011 - 2013 Indanapolis Framework Data

Recommendations, Basin-Wide

- In partnership with the County SWCDs, NRCS, and ISDA, promote soil health practices on all agricultural areas
- Reduce bank slopes as maintenance is done
- Utilize multi-stage ditch where possible and beneficial



Recommendations, Zones 1 and all headwater Laterals

- Zone 1
 - Establish/maintain riparian corridor
 - Reduce bank slopes as maintenance is done
 - Utilize multi-stage ditch where possible and beneficial



Recommendations, Zone 2

- Zone 2
 - Monitor
 - Maintain riparian corridor

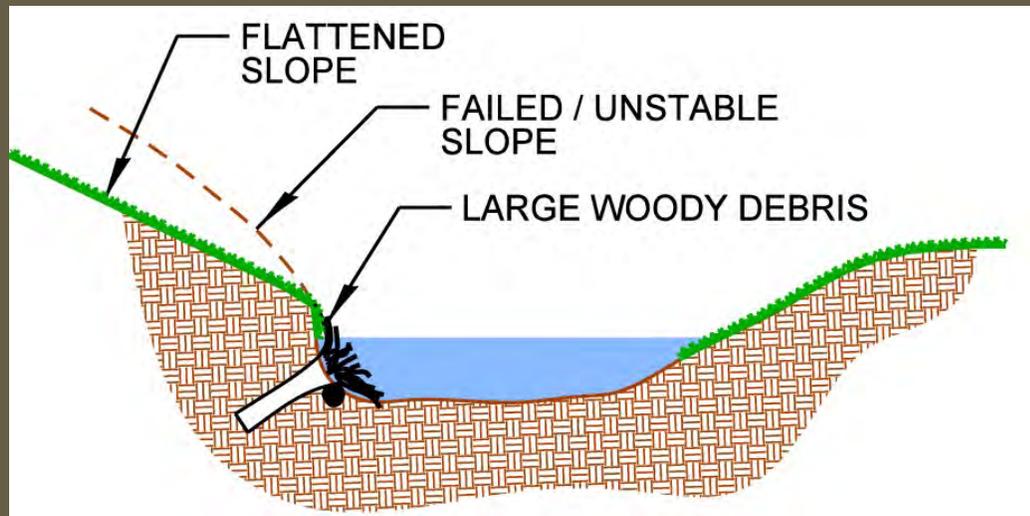


Recommendations, Zone 3



Recommendations, Zone 3

- Stabilize banks - Use “Toe wood” technique for bank stabilization
- Develop typical cross sections for bank reconstruction
- Develop cost estimates for reach
- Initiate pilot projects to refine model



Recommendations, Zone 4

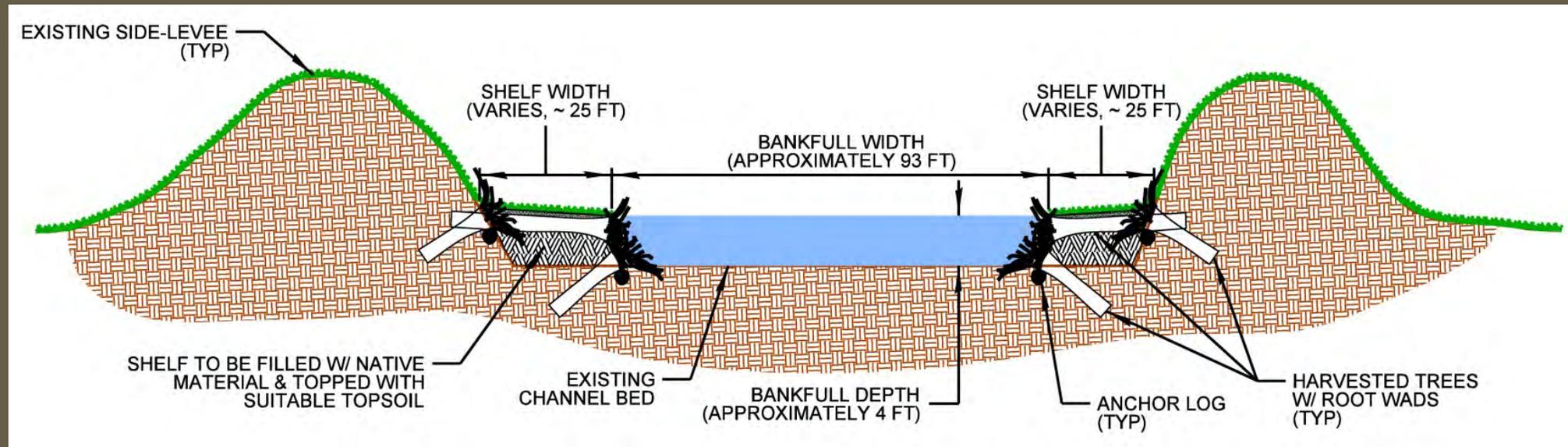




Yellow River at N Range Rd., Starke Co. (2010)

Recommendations, Zone 4

- Narrow bankfull width and create floodplain shelves (within levees)
- Develop typical cross sections for floodplain reconstruction
- Work with contractor to develop cost estimates for reach
- Initiate pilot project



Recommendations, Zone 4



Bottom Line

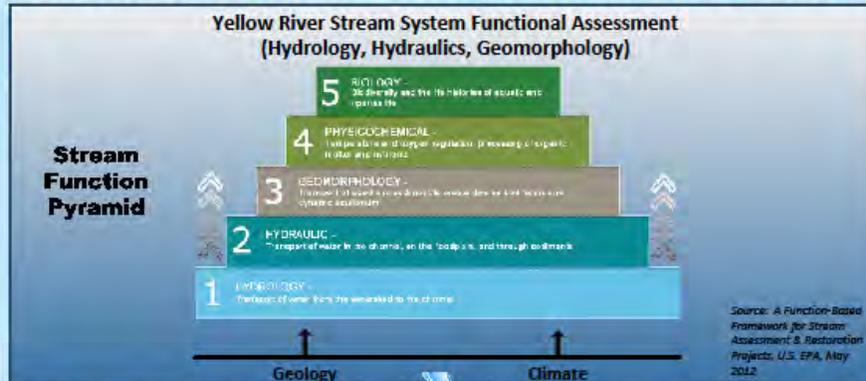
- Major sources of sediment production:
 - Sand on headwater land surfaces
 - Severe streambank erosion between Knox and Starke-Marshall County line
- Major cause for severe aggradation in lower reaches:
 - Too much incoming sand
 - Lack of an efficient sediment transport mechanism
- Recommended measures:
 - Agricultural conservation practices – watershed-wide
 - Flatter side slopes and appropriate slope cover to minimize sand production
 - Streambank stabilization through use of “Toe Wood” techniques u/s of Knox
 - Creating a 2-stage low flow channel by narrowing the width at bankfull flow depth through addition of stable shelves in the lower reach

Call for Action

- Incentivize conservation practices on headwaters land surfaces
- Proceed with flattening side slopes/2-stage ditching of select headwaters tributaries (when maintaining ditches)
- Proceed with design and cost estimating of a suitable streambank stabilization measure for the problem area upstream of Knox – **Currently designing a pilot project**
- Proceed with design and cost estimating of creating low flow inset channel in the lower reaches - **Start with a pilot project**
- Continue supporting sediment gages to promote good designs and to make sure improvements are working – **& Add gages along Kankakee**
- Consider expanding this type of assessment to the entire Kankakee (to determine where to do what) – **Include the Momence reach in Illinois**

Implementation Roadmap

Yellow River Flooding, Erosion, and Sedimentation Risk Management Plan



Recommendation #1 Watershed-Wide Reduction of Sediment Production

- Promote and incentivize use of cover crops with help from NRCS and others
 - Set up meeting with NRCS
 - Prepare MOU/Commitments
 - Assess progress

- Flatten laterals' side slopes/2-stage as needed
 - Remind individual Drainage Boards to solicit specific geomorphic recommendations for each ditch reconstruction project

- Promote use of appropriate vegetative cover on banks and buffer strips along laterals
 - Prepare a list of appropriate streambank vegetative cover for Kankakee area and where they can be purchased
 - Remind individual Drainage Boards to encourage/require buffer strips along the top of ditch banks

Recommendation #2 Reach-Specific Stream Restoration along Yellow River

- Streambank stabilization upstream of Knox using Toe Wood techniques to reduce erosion and cut down on sediment production

We are here!

- PILOT PROJECT**
- Estimate design and permitting fees
 - Secure funding for design and permitting
 - Design/permitting proposal
 - Prepare construction documents, permitting, and construction cost estimate
 - Secure funding
 - Project construction
 - Initiate a periodic maintenance program
 - Assess success of results

- ENTIRE REACH**
- Estimate design and permitting fees
 - Secure funding for design and permitting
 - Design/permitting proposal
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- Adding stable shelves downstream of Knox using wood-armored vegetated shelves to improve sediment transport

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Recommendation #3 Kankakee River Stream System Functional Assessment (Hydrology, Hydraulics, Geomorphology)

- Estimate assessment fee
- Secure funding for the system assessment
- Proposal
- Conduct assessment to determine:
 - Watershed-wide recommendations
 - Major tributaries recommendations
 - Kankakee River reach-specific recommendations
 - Other recommendations

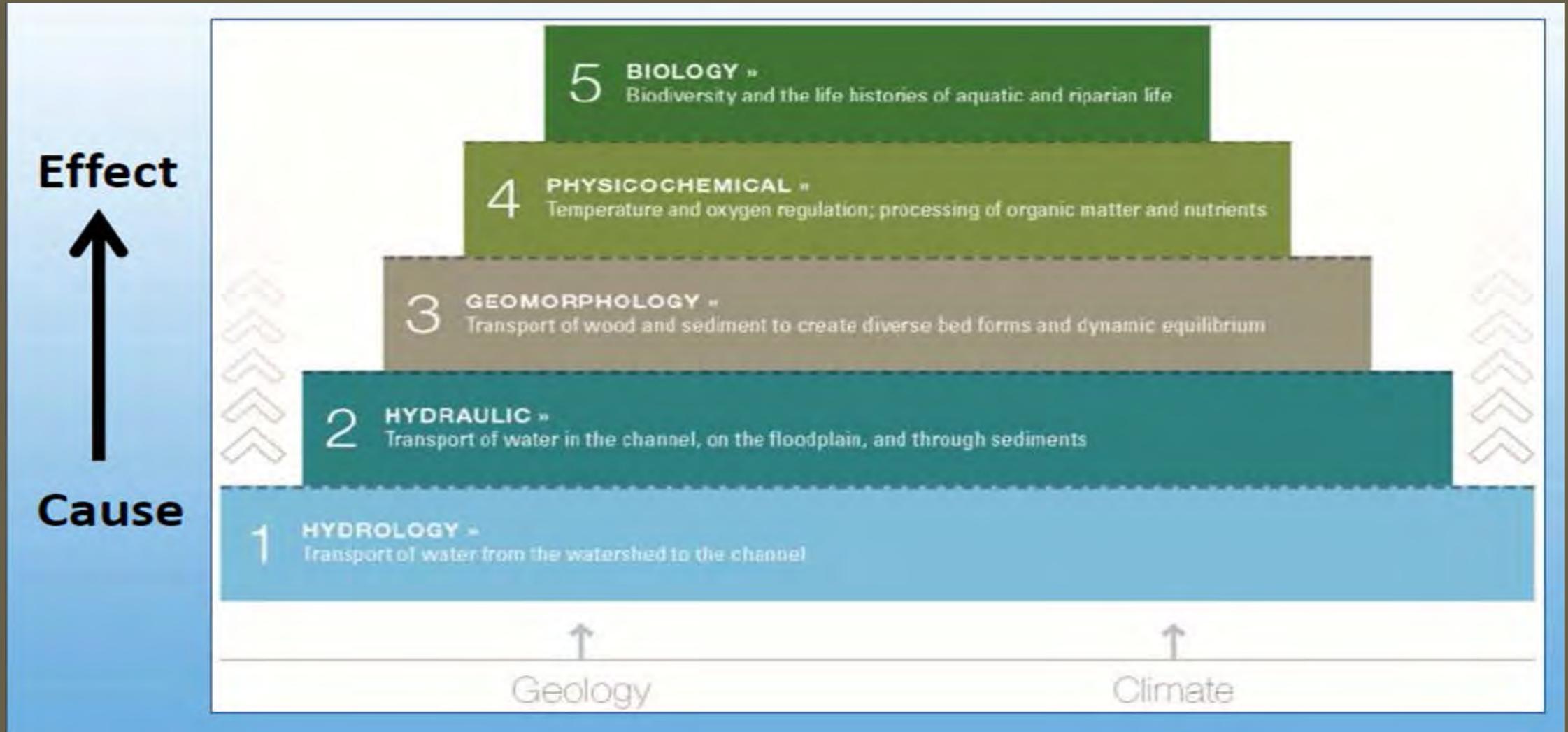
Pilot Project Approach

Initial project is for a pilot project designed to showcase methods and develop a larger team for the Yellow River

“Larger” Yellow River project will serve as the pilot for the Kankakee River in Indiana (13 Counties and 2989 mi²), and the Lower Kankakee Basin in Illinois (2169 mi²)

Function-based Hierarchy

Function-based approach for addressing a legacy “ecosystem” restoration need & achieving “ecological lift”



QUESTIONS?

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