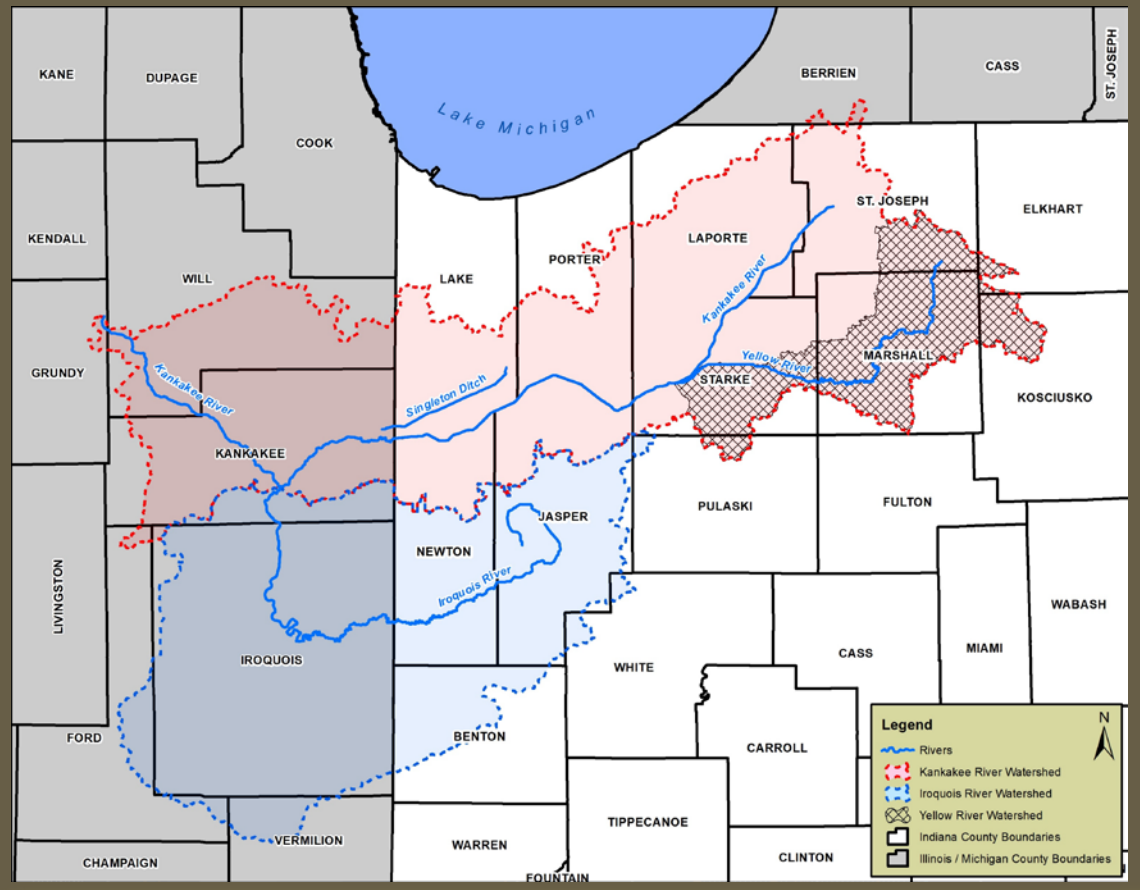
Kankakee River Flood and Sediment Management Work Plan

Siavash Beik and Robert Barr

INAFSM
September 6, 2019

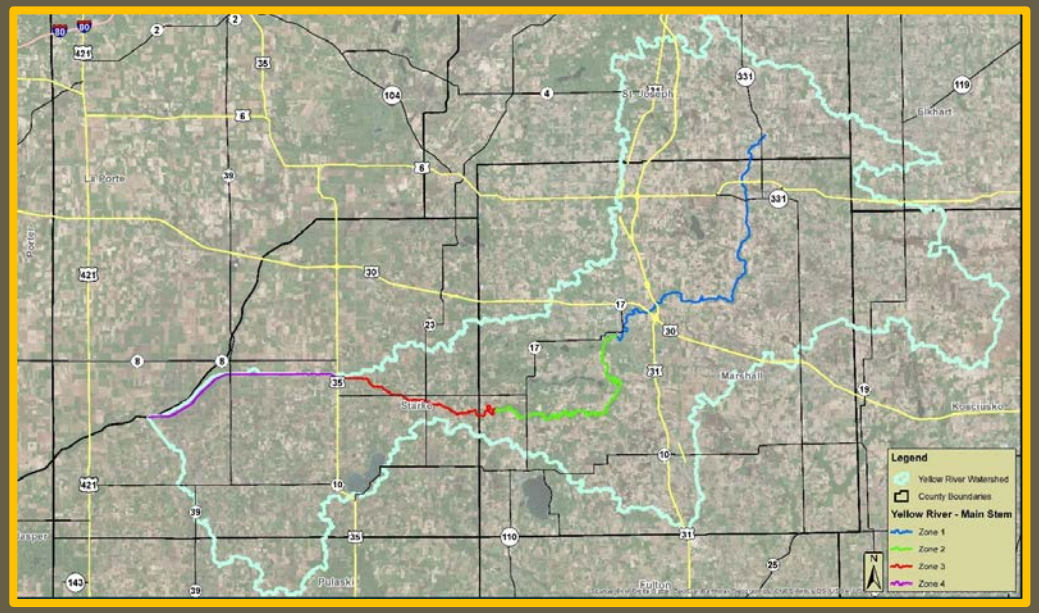
Kankakee River Flood & Sediment Management Work Plan

- **Diagnose** the Root Causes of Erosion, Sedimentation, and Flooding through Detailed Field and Desktop Assessment
- **Communicate** the Extent of Existing Risks and Expected Trends (Changing Climate)
- **Identify** Strategies for Addressing the Issues in a System-wide Approach
- **Develop** a Work Plan for Implementing Various Strategies Specific to Each Area Within the Watershed (Main Stem Reaches, Laterals, Urban Areas, Ag Areas)



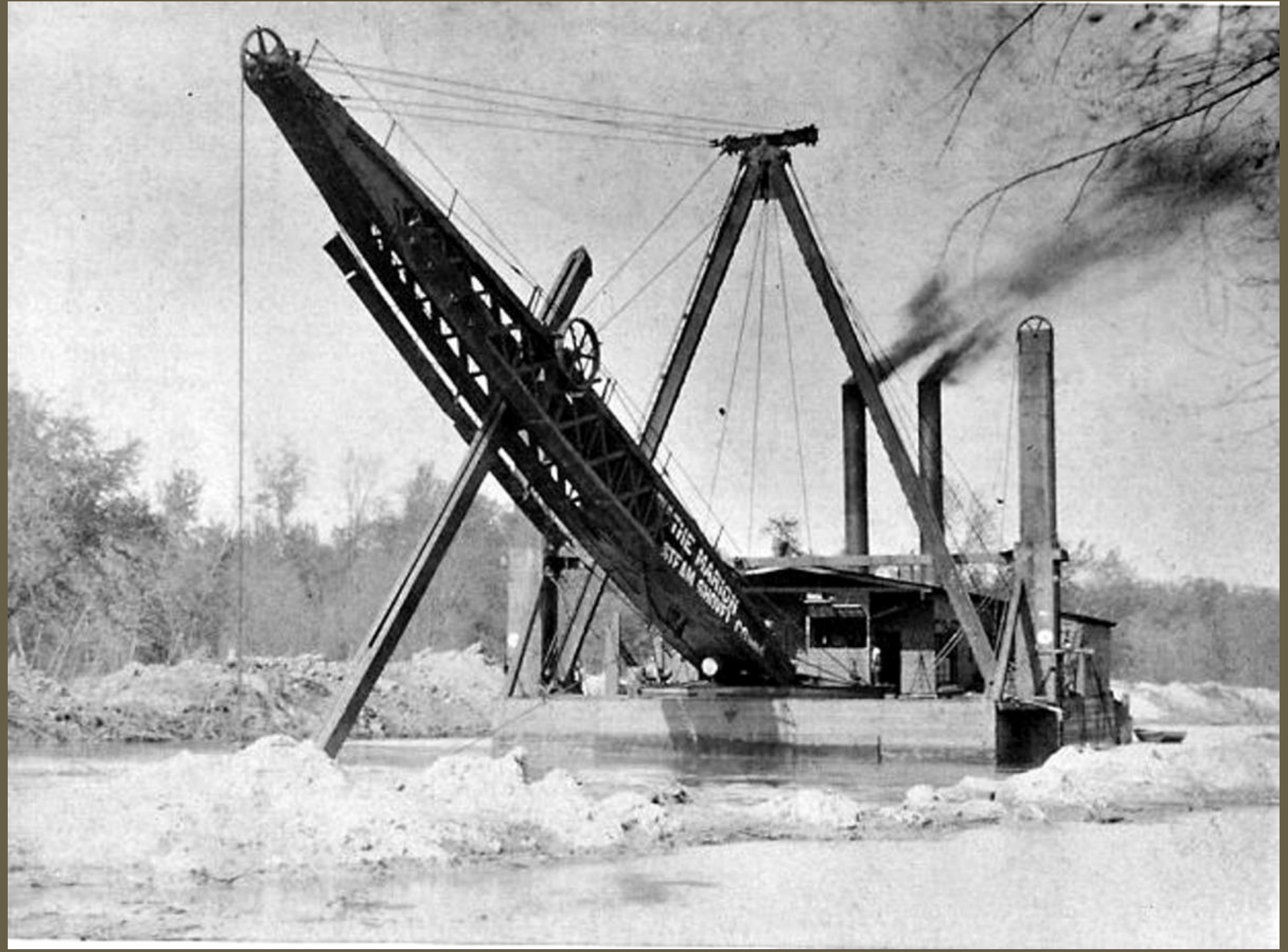
A Joint Indiana – Illinois Effort to Address a Legacy Problem Facing Both States!

Yellow River Conditions



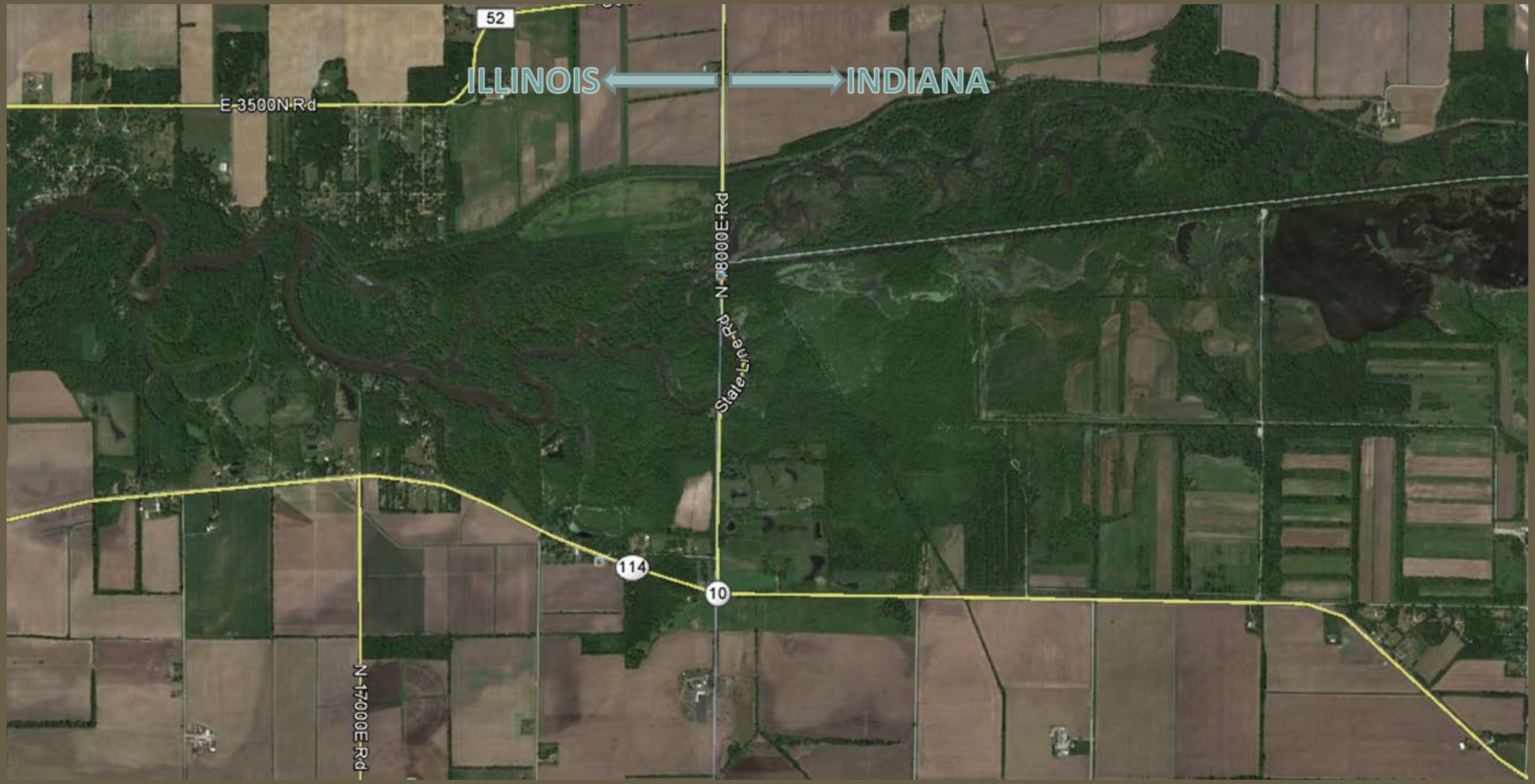
RIVER HISTORY

1898 Extent of Grand Kankakee Marsh

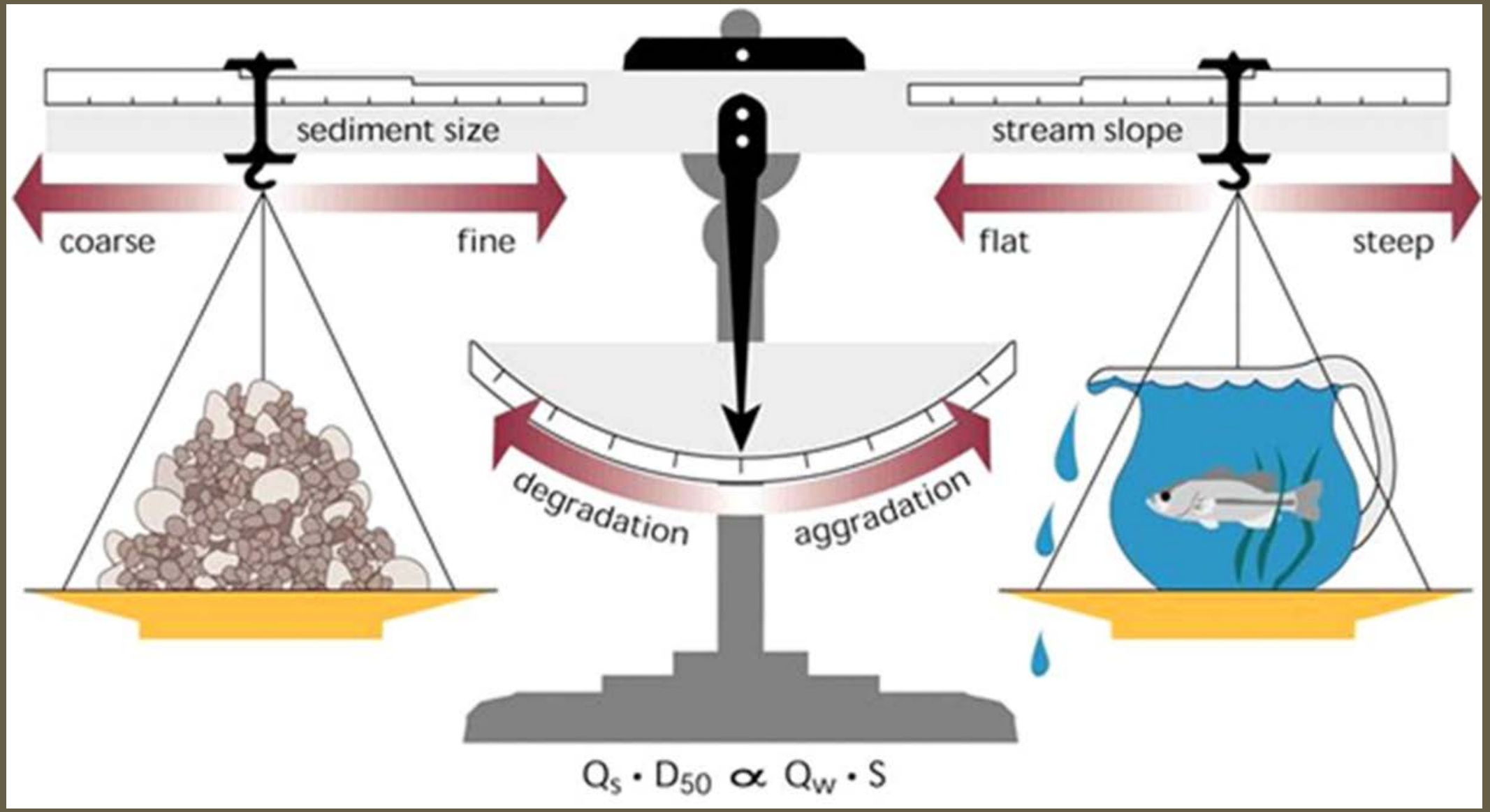


(Kankakee Valley Historical Society)

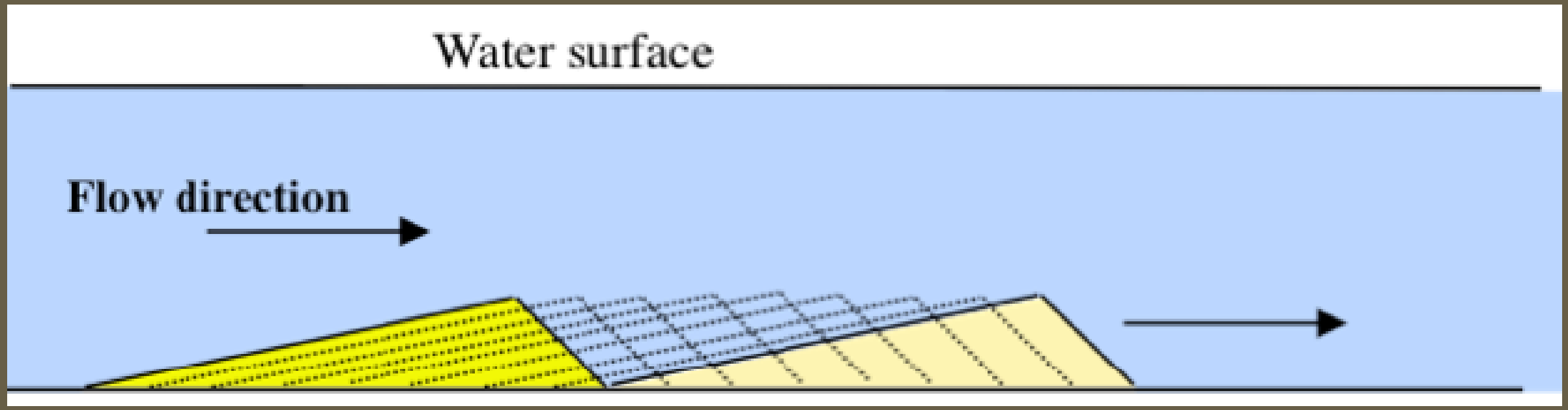
Northwest Indiana Genealogical Society Collection



Kankakee River at the Indiana-Illinois State Line



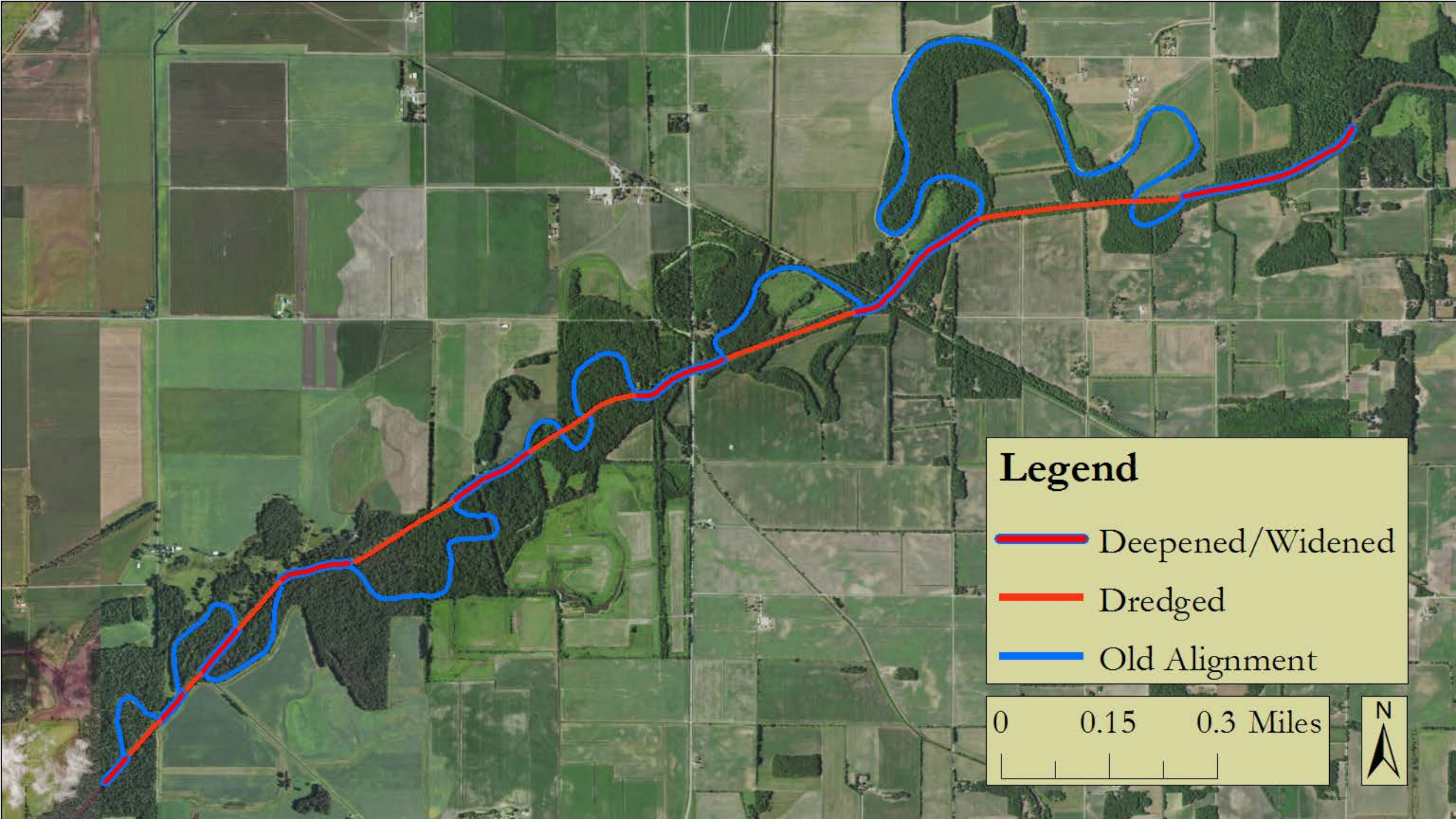
Wildland Hydrology, after Lane, 1955



Sand waves translating downstream (Hickin)

Sand wedge, Willow Creek, Portage, Indiana

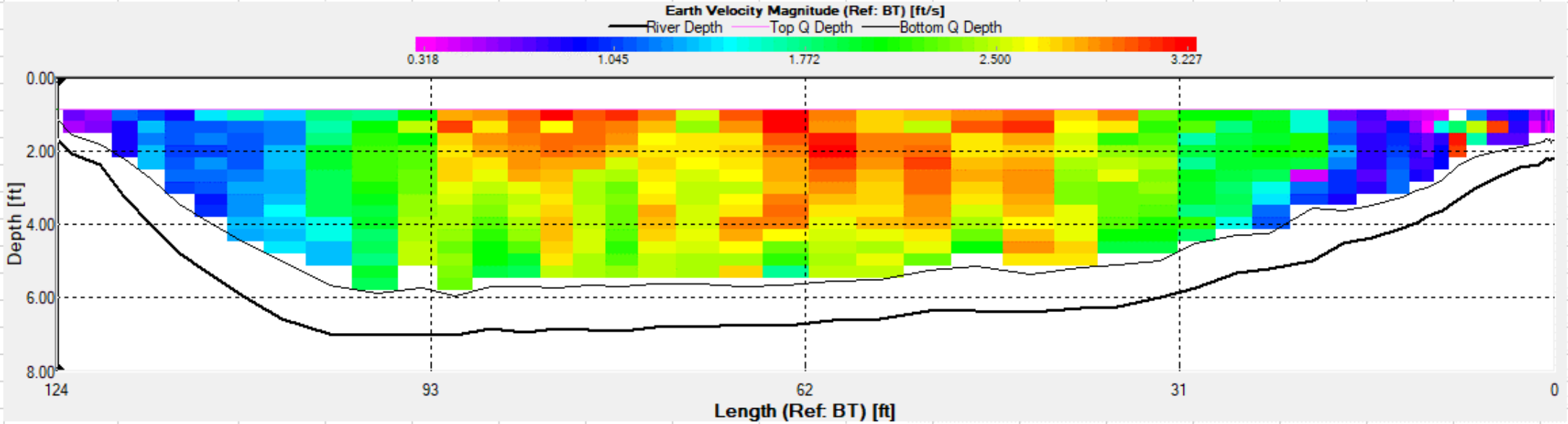
KEY FINDINGS


Legend
Deepened/Widened
Dredged
Old Alignment
0
0.15
0.3 Miles
N

Kankakee River, Lake County, Indiana

Yellow River at Kankakee Fish and Wildlife Area

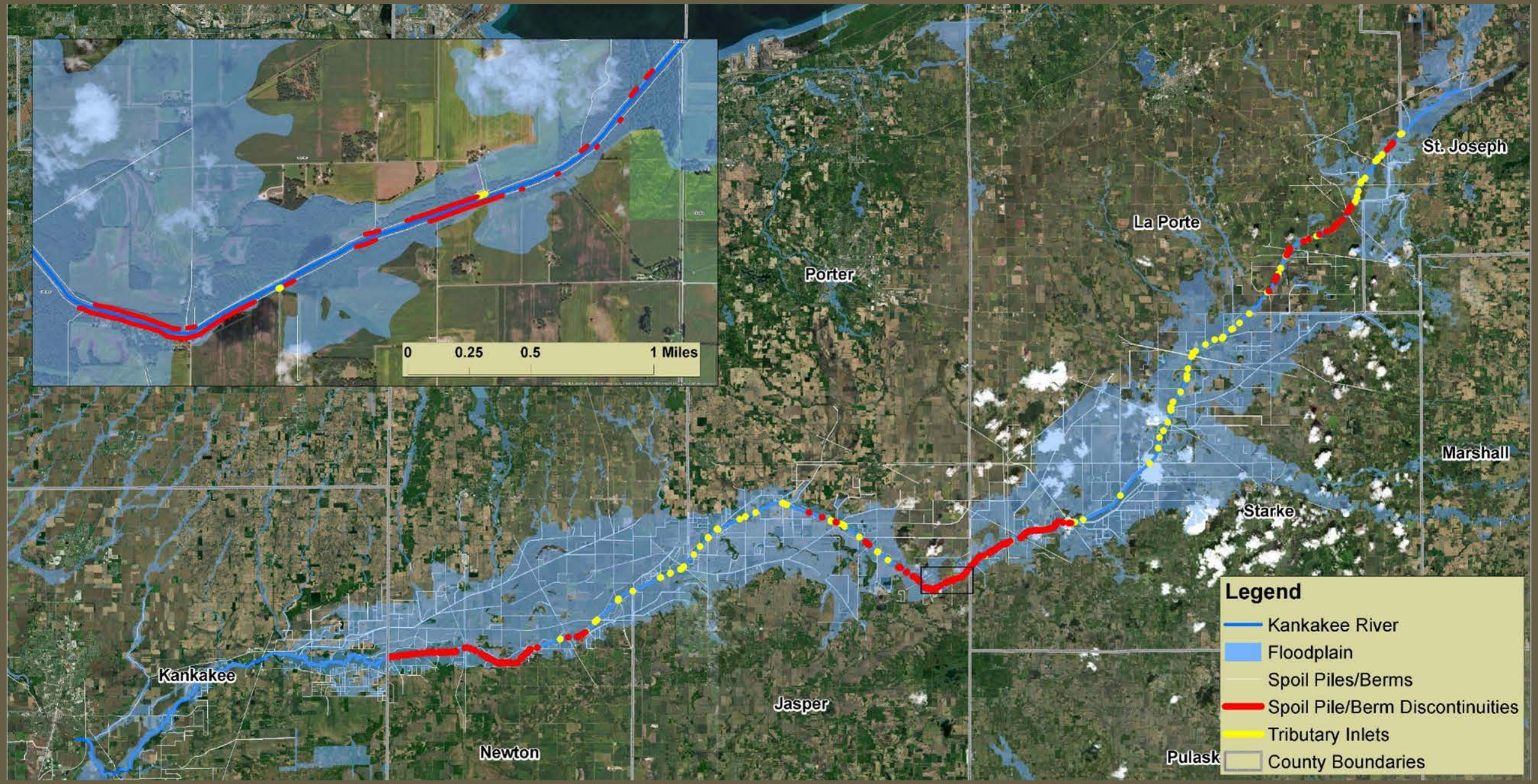
Transect #	Latitude	Longitude	Cross Section Area	
14	41.24548334	-86.91959847	665.07	sq feet



Kankakee River, LaPorte and Starke Counties

Measured Channel Dimensions		Predicted Bankfull Channel Dimensions
Area	= 538 ft^2	= 596 ft^2
Width	= 116 ft	=132 ft
Mean d	= 4.64 ft	= 4.4 ft
Max d	= 7.0 ft	= 6.2 ft

Kankakee River, Porter County, Indiana

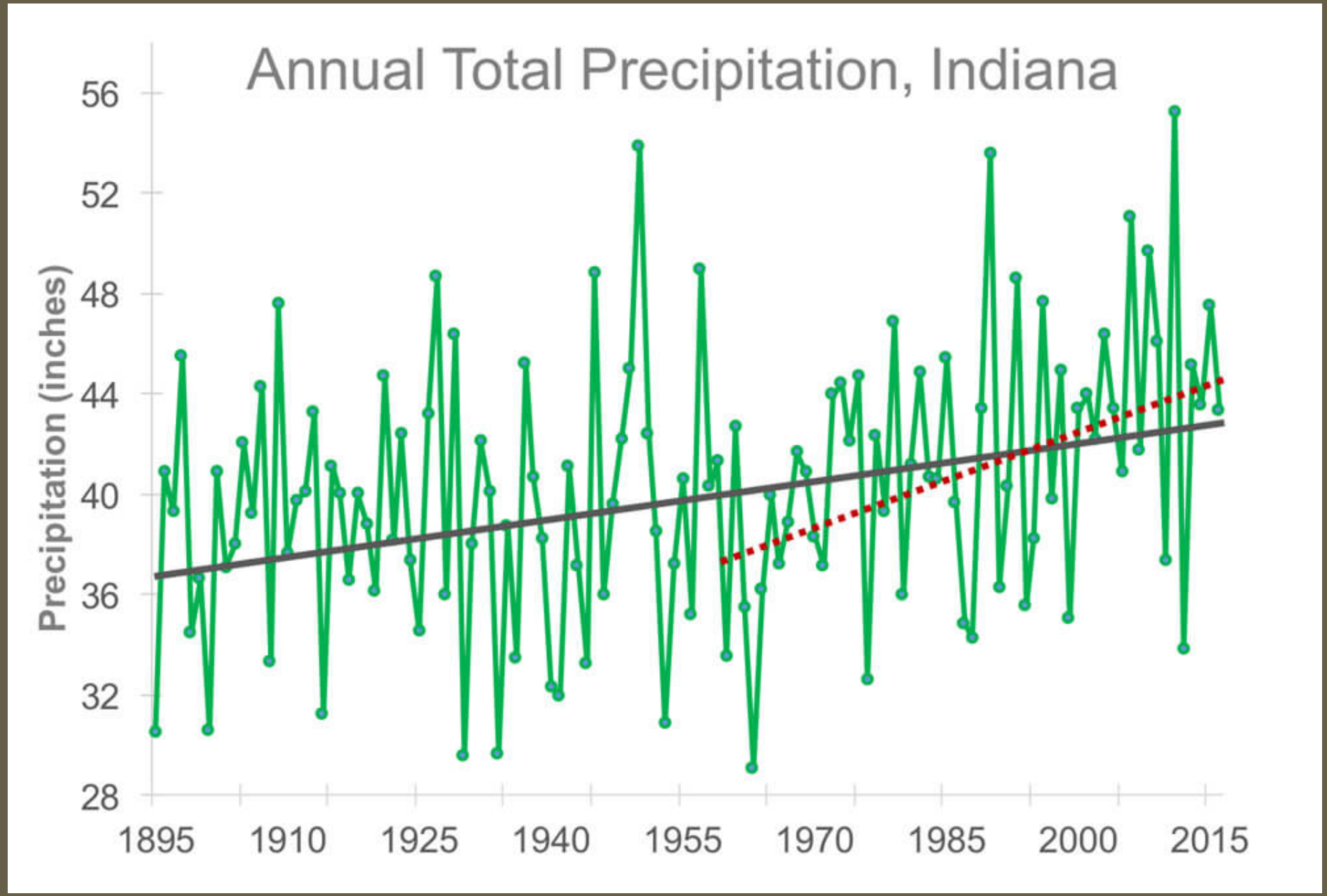


Berm discontinuities along Kankakee River

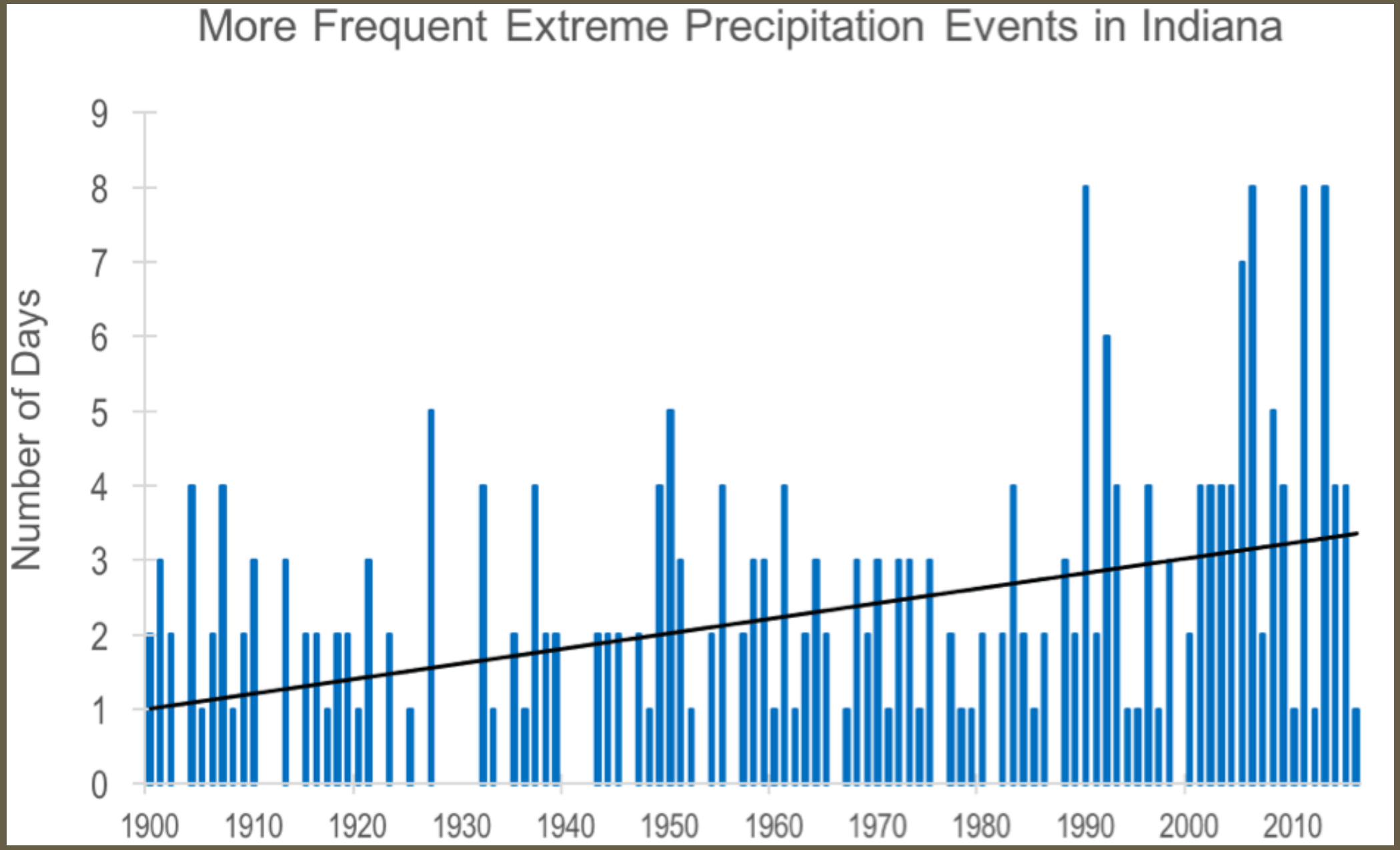
Kankakee River between I65 and Shelby, Newton and Lake Counties

Kankakee River downstream from Baum’s Bridge, Porter and Jasper Counties

CHANGING CONDITIONS AND THEIR IMPACTS ON STRATEGIES



Purdue Climate Change Research Center (2018)



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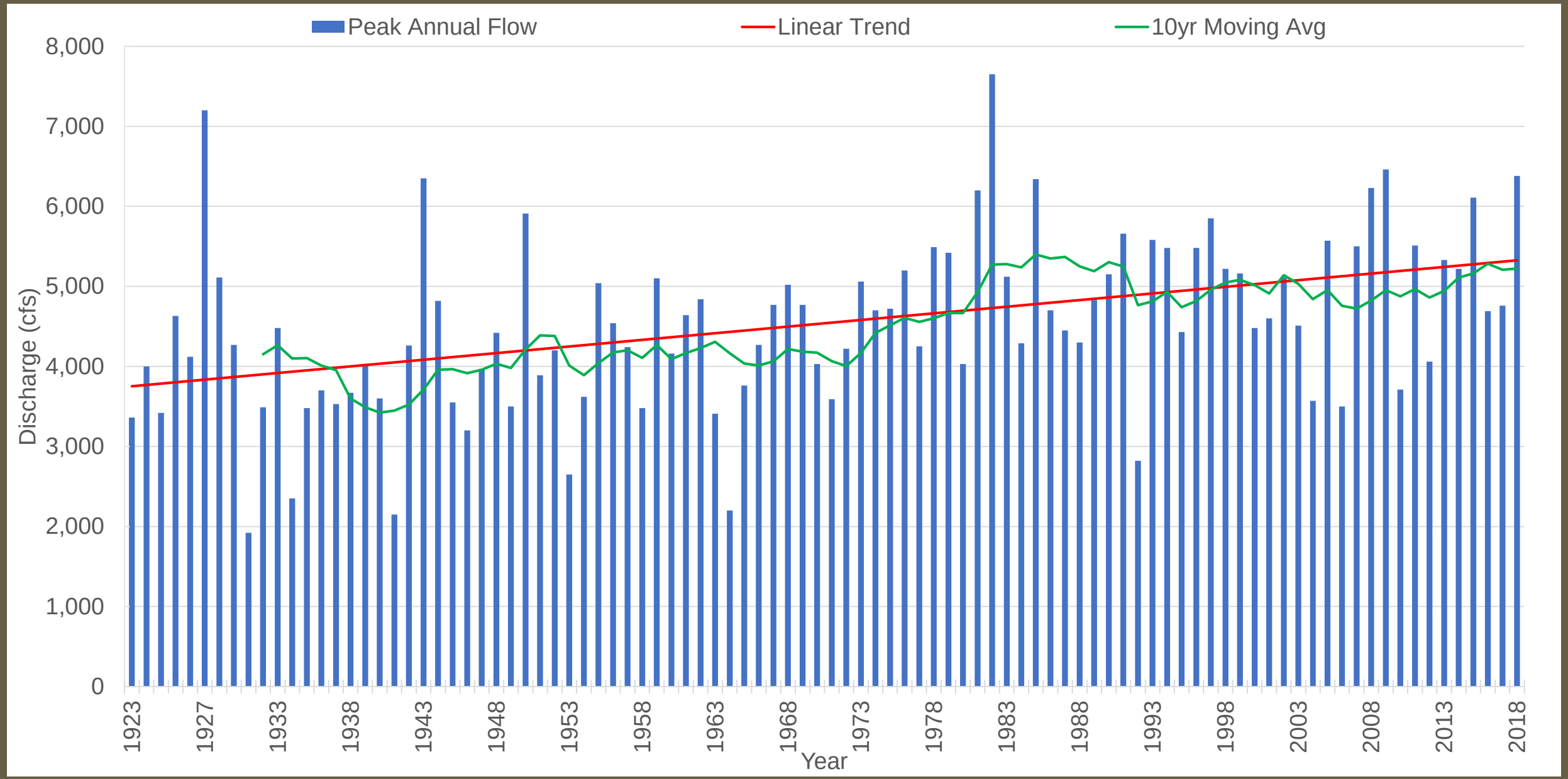
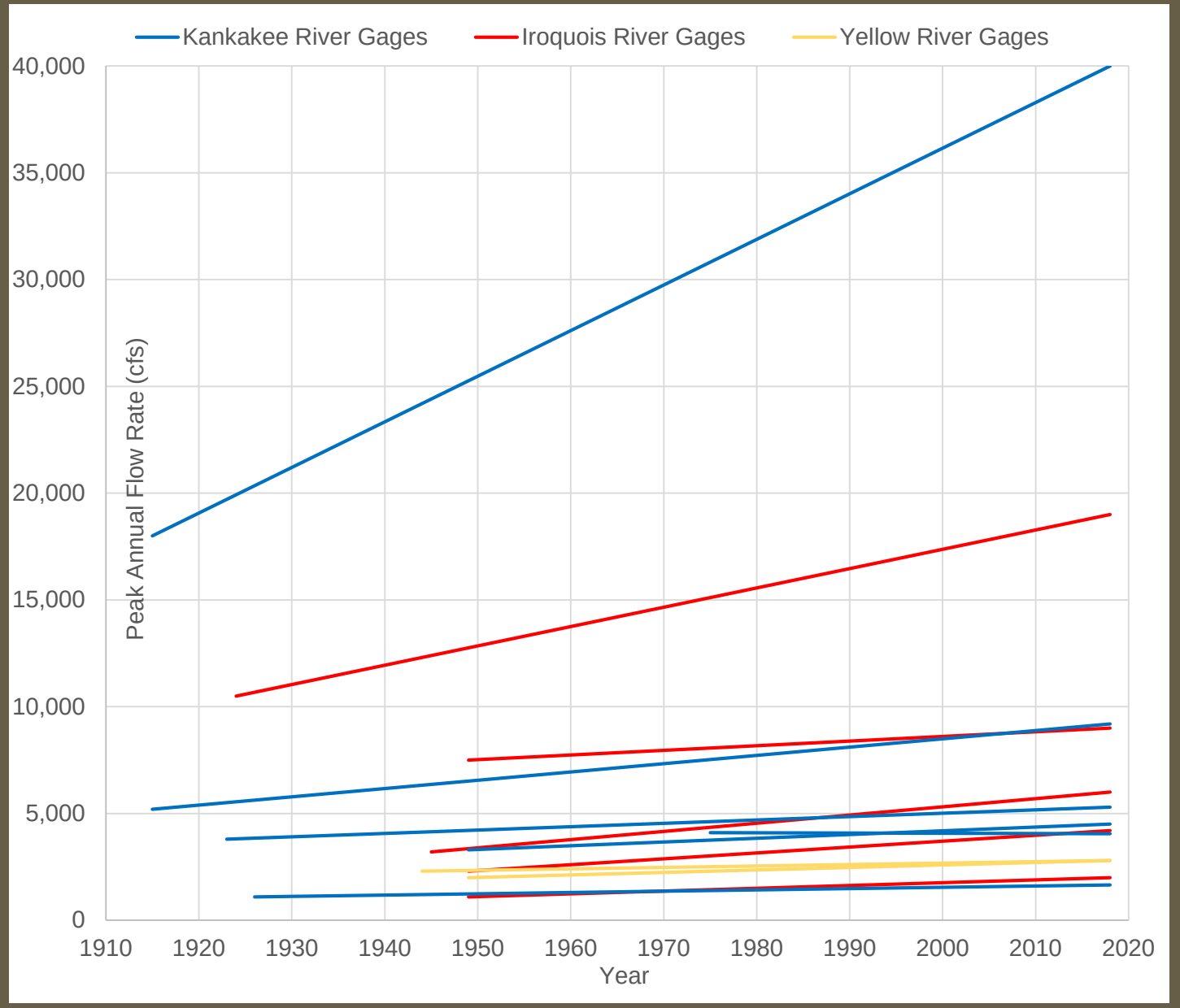
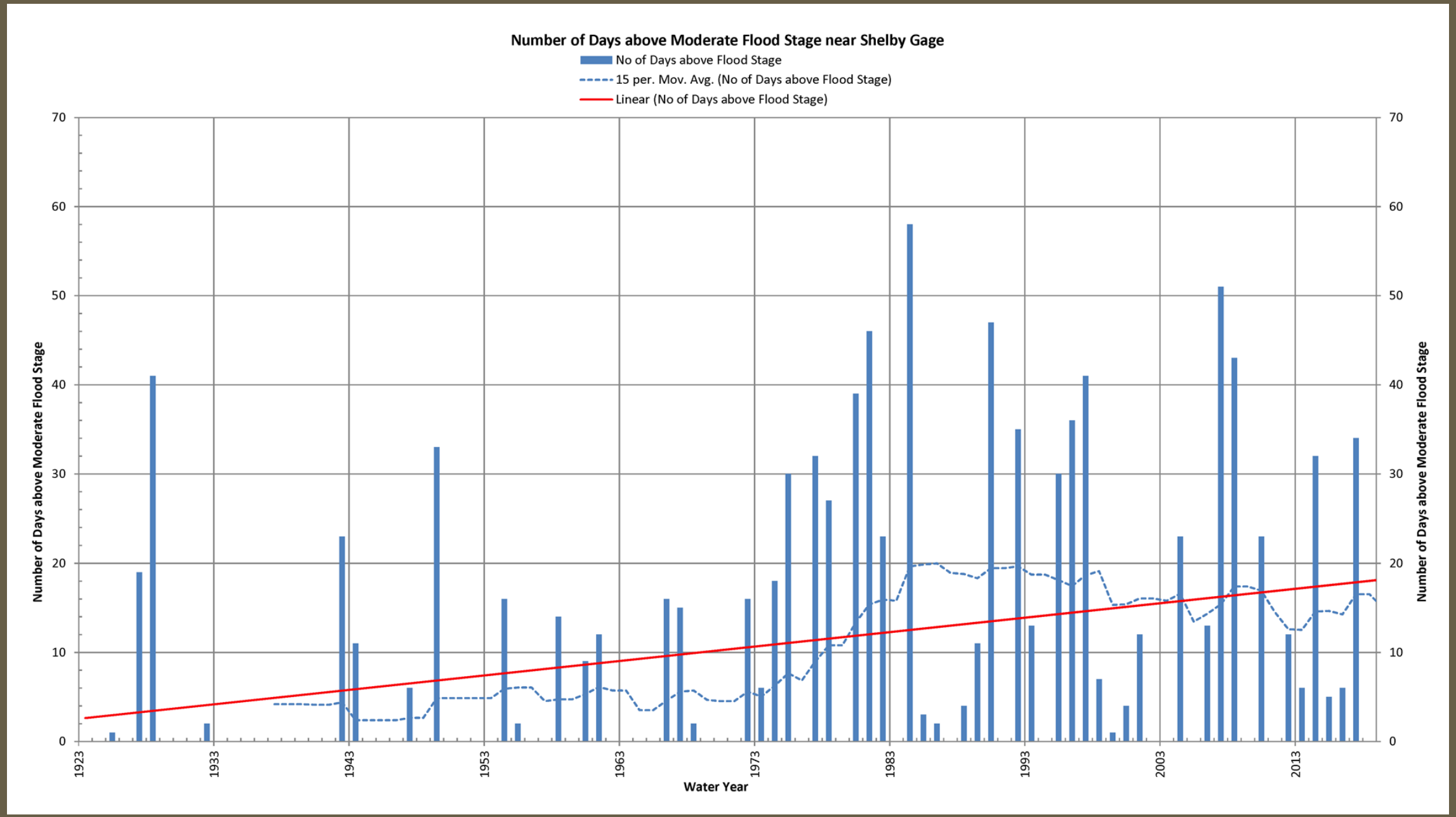


Recorded Peak Annual Discharges at Kankakee River at Shelby USGS Gage

Gage		Year	Peak Annual Flow Rate (cfs)	Percent Increase over Gage Record
Kankakee River	Wilmington	1915	18,000	122%
		2018	40,000	
	Momence	1915	5,200	77%
		2018	9,200	
	Shelby	1923	3,800	39%
		2018	5,300	
	Kouts	1975	4,100	-1%
		2018	4,050	
	Dunns Bridge	1949	3,300	36%
		2018	4,500	
	Davis	1926	1,100	50%
		2018	1,650	
Yellow River	Plymouth	1949	2,000	40%
		2018	2,800	
	Knox	1944	2,300	22%
		2018	2,800	
Iroquois River	Chebanse	1924	10,500	81%
		2018	19,000	
	Iroquois	1945	3,200	88%
		2018	6,000	
	Foresman	1949	2,300	83%
		2018	4,200	
	Rensselaer	1949	1,100	82%
		2018	2,000	
	Milford	1949	7,500	20%
		2018	9,000	

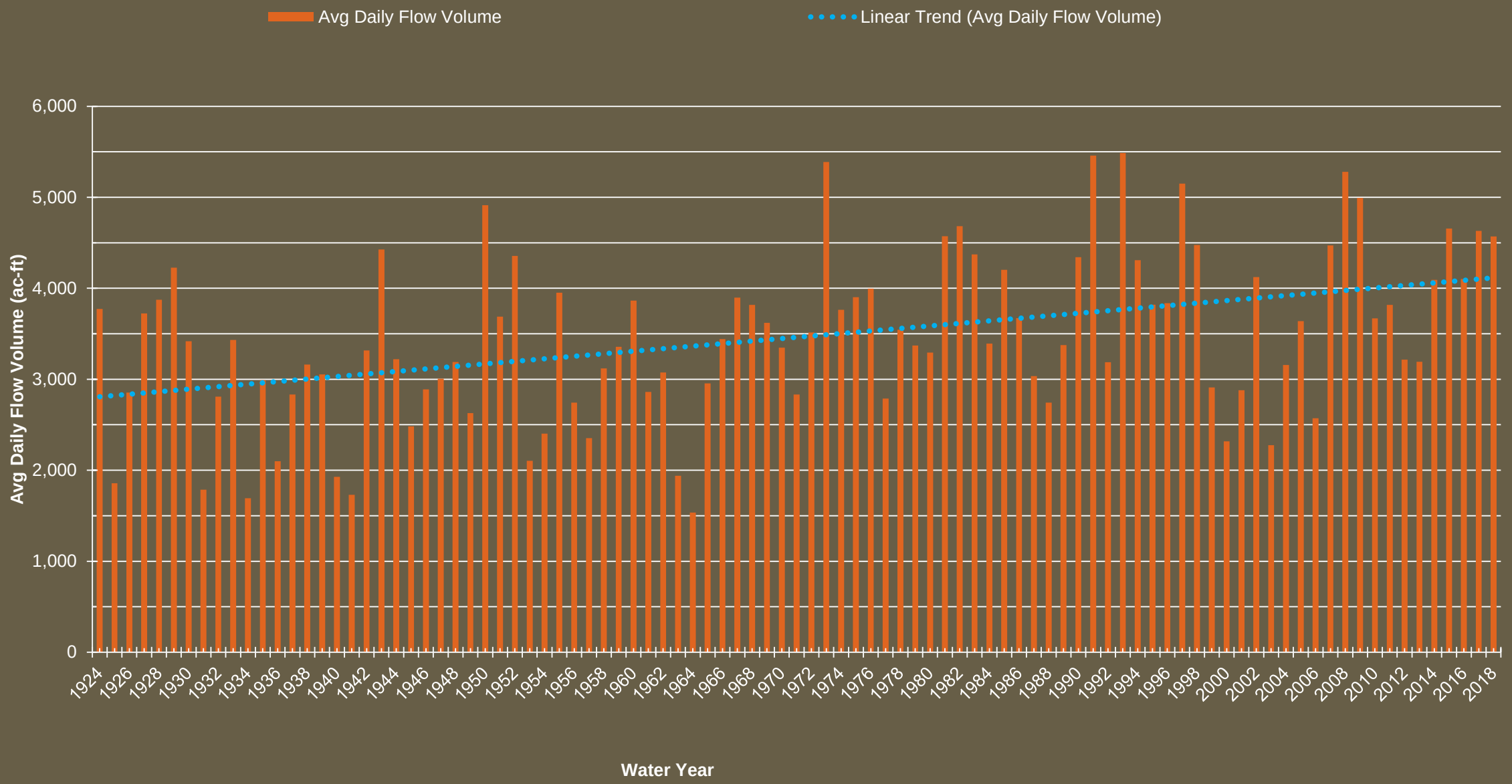


Peak Annual Flow Increases at Kankakee River, Iroquois River, and Yellow River USGS Gages



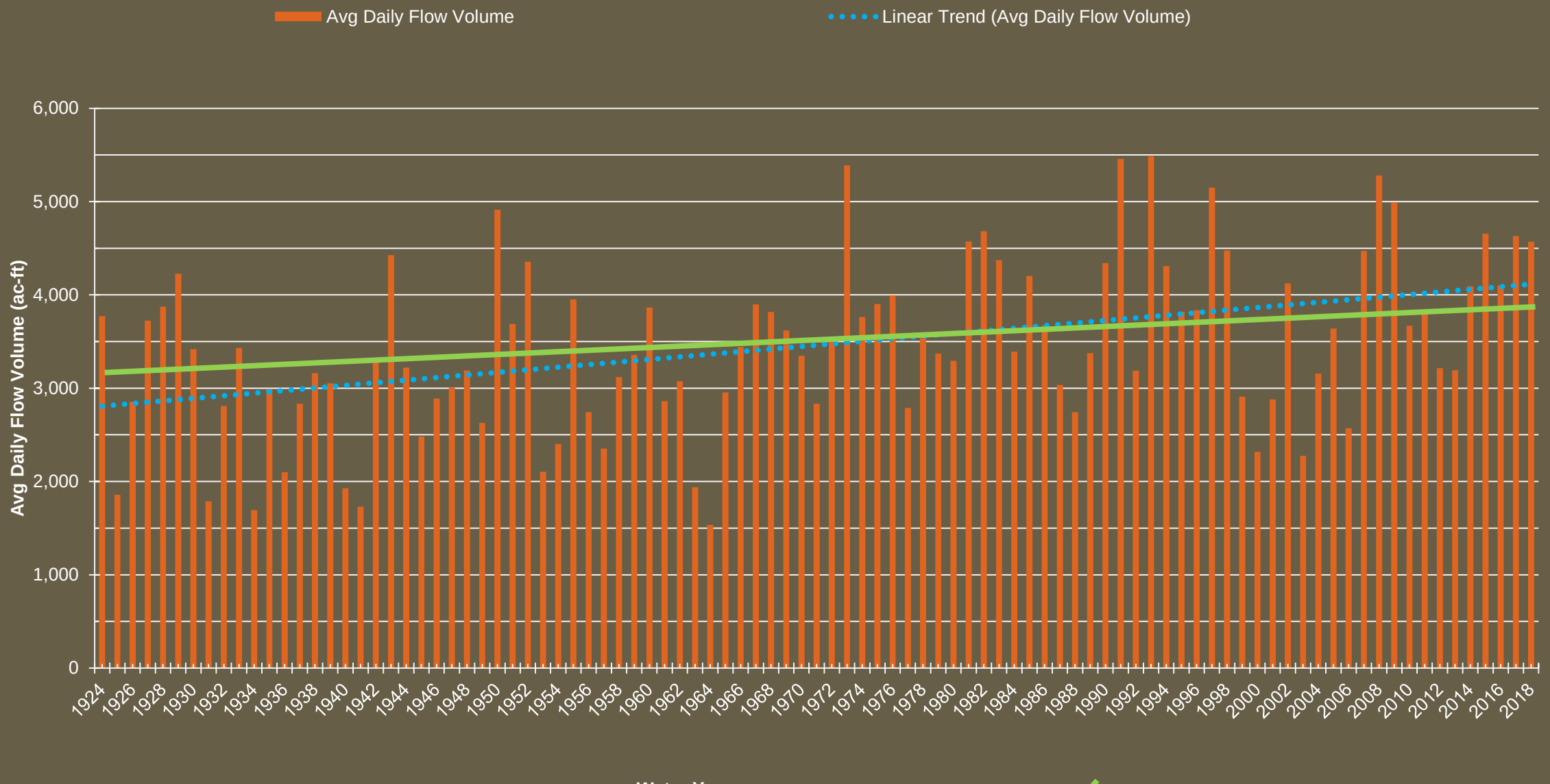
Number of Days above Flood Stage at the Kankakee at Shelby USGS Gage

Average Annual Daily Flow Volume at Kankakee River at Shelby USGS Gage



39% Increase! Potential Causes >>> Ag Drainage ⬆ Urban Development ⬆ Rainfall ⬆

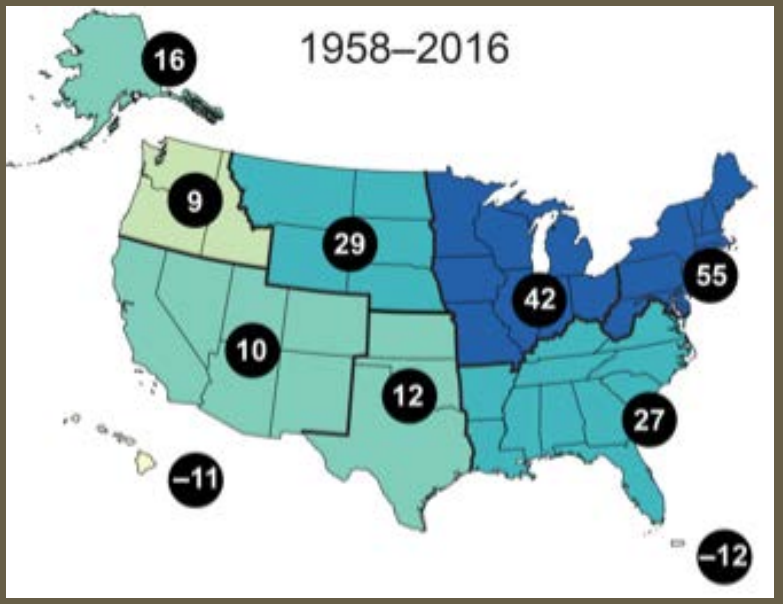
Average Annual Daily Flow Volume at Kankakee River at Shelby USGS Gage



20% ~~39%~~ Increase! Potential Causes >>> Ag Drainage ↑ Urban Development ↑ ~~Rainfall~~ ↑

Why are Peak flows and Average daily Flow Volumes Increasing?

- Increased rainfall depths and intensities due to climate change
- Uncompensated Impacts of urban development
- Increased agricultural tiling and surface draining projects (some in response to increasing rainfalls!)



Observed % Change in Total Annual Precipitation Falling in the Heaviest 1% of Events (1958 – 2016)

Extensive tile drainage

How Do These Increasing Trends Affect Management Strategies?

- "Controlling" flooding by traditional structural alternatives is no longer feasible or prudent (moving target)
- Strategies have to be cognizant of continued increase and fluctuations in flows (management versus elimination of hazards)
- Nature-based solutions can better cope with changing climate and fluctuations in flow
- Minimizing impacts of agricultural and urban development has been and will become even more crucial

RECOMMENDATIONS

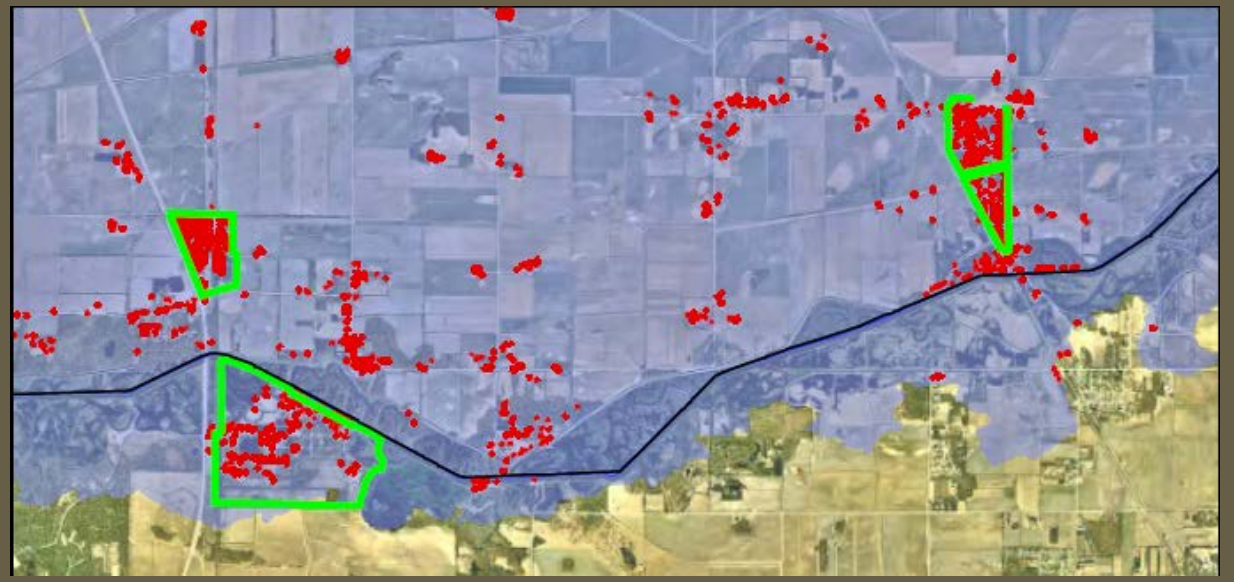
Addressing Systemic Flooding and Sedimentation in the Face of Changing Conditions

1. Adaptation
   - ❑ Recognizing that flooding is going to occur again, taking steps to keep our risk exposure from increasing further, and reducing existing and future vulnerabilities to reduce pain and suffering

2. Mitigation
   - ❑ Reducing the stressors to the system and to the Flooding and Sedimentation sources through common sense and feasible actions without adverse impact to others

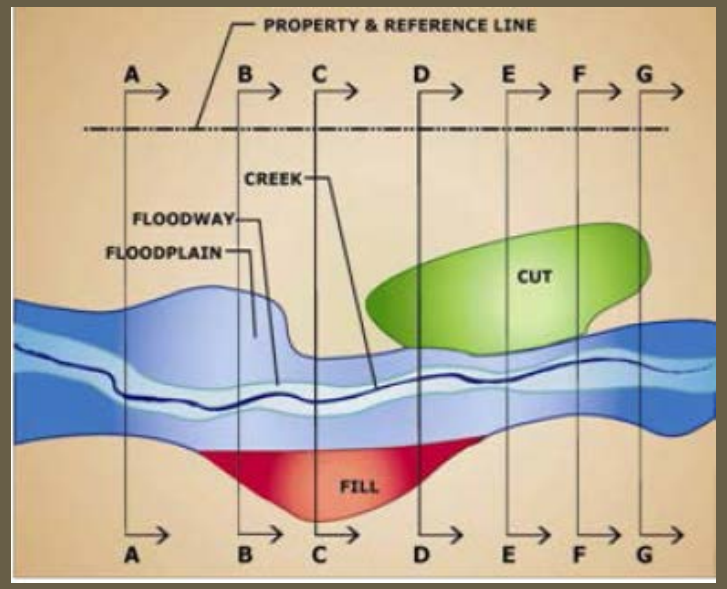
Recommended Adaptation Strategies

- Provide Strategic Flood Protection to Critical Facilities & Key Infrastructure
  - Strategic approach is needed due to inability to eliminate flooding everywhere
  - Existing developments in floodplains are Legacy issues that are not related to or affected by the river corridor management strategies



Recommended Adaptation Strategies (cont.)

- Adopt NAI Stormwater Ordinance and Technical Standards for New Urban Development
  - Comp Floodplain Storage, Channel Protection Volume, Detention,…
- Adopt NAI Standards for New Farm Drainage & Regulated Drain Projects
  - Needed to offset the impacts of new surface ditching and subsurface tiling on increased runoff in the River



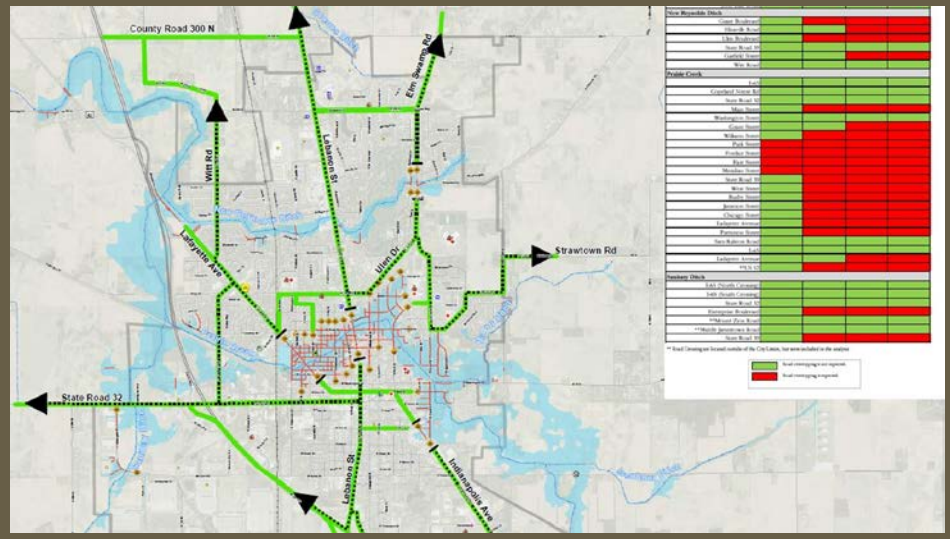
With Cover Crop

Without Cover Crop

Recommended Adaptation Strategies (cont.)

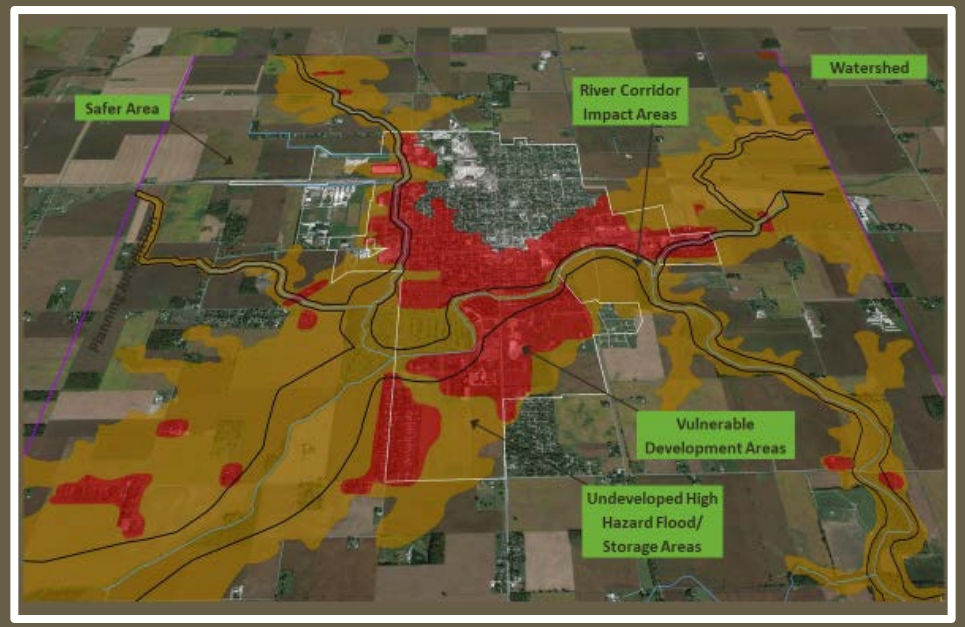
➢ Develop Flood Response Plans

- ❖ Flooding, such as that observed in 2018, cannot be prevented



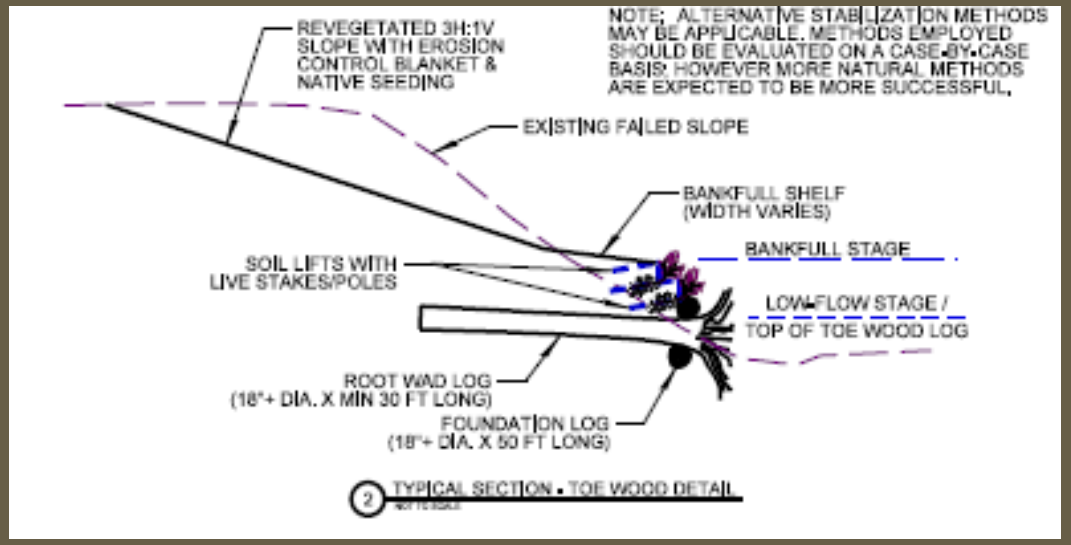
➢ Develop Flood Resilience Plans

- ❖ Zone-specific strategies are needed to curb increase in flood vulnerability

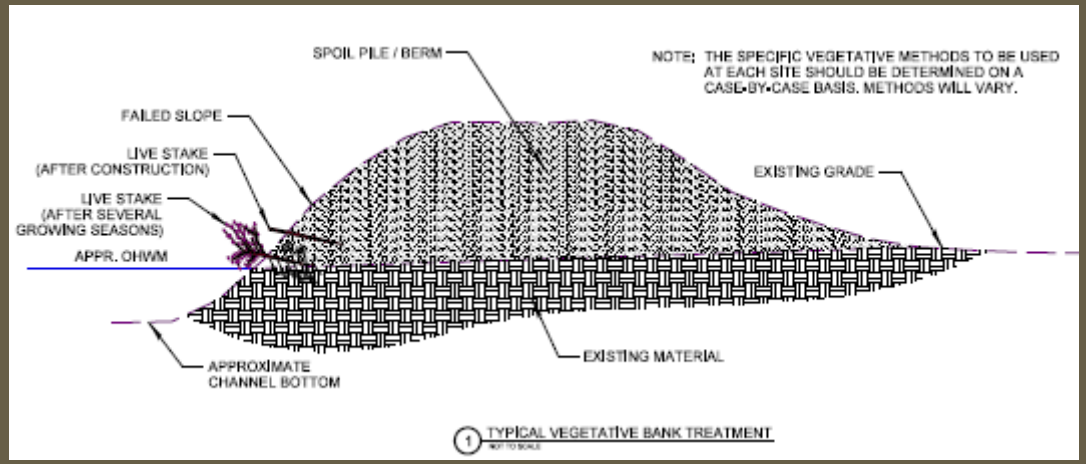


Recommended Mitigation Strategies

- Reduce Sediment Supply from Yellow River Upstream of Knox
  - Utilize nature-based methods to address erosion and stream instability



- Reduce Sediment Supply from Severely Eroded Kankakee Slopes
  - Utilize bioengineering methods to keep sediment from falling into the River



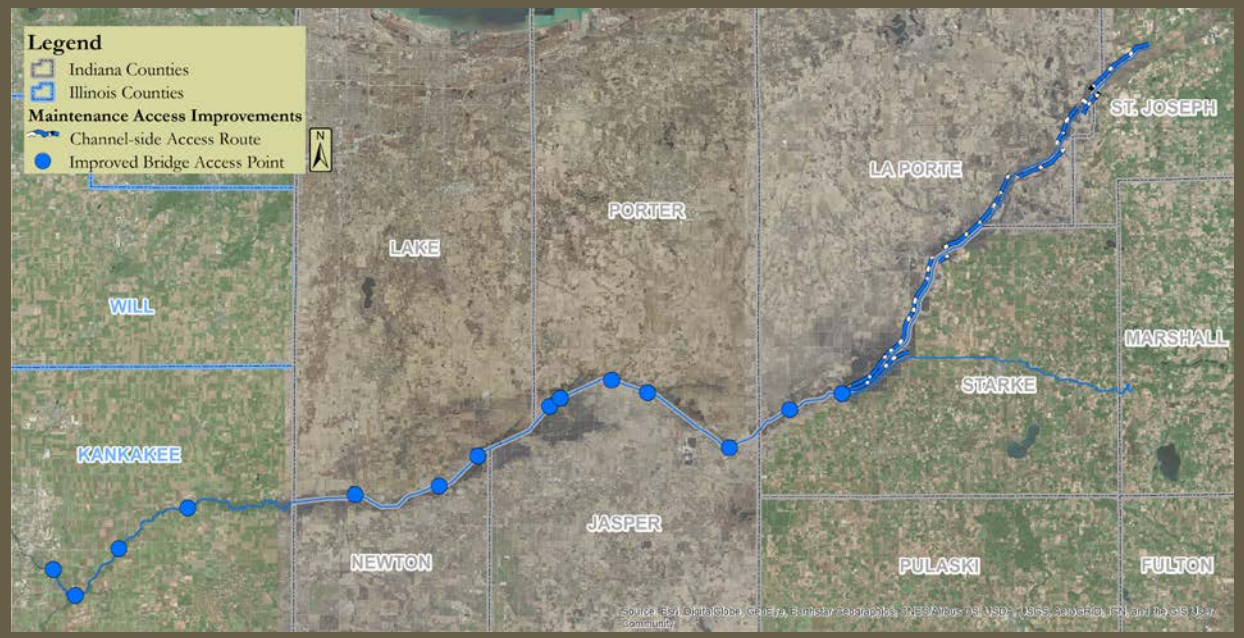
Recommended Mitigation Strategies (cont.)

- Stop Maintaining and Strategically Breach Some Berms, Mitigating Flooding Using Setback Berms
  - Connect river to its floodplain for improved conveyance, storage, and sediment distribution through Constructed Breaches

- Maintain Selected Reaches of Berms that are not Slated for Breaching
  - Complete elimination of all river edge spoil pile berms is not practical in short term until conditions change

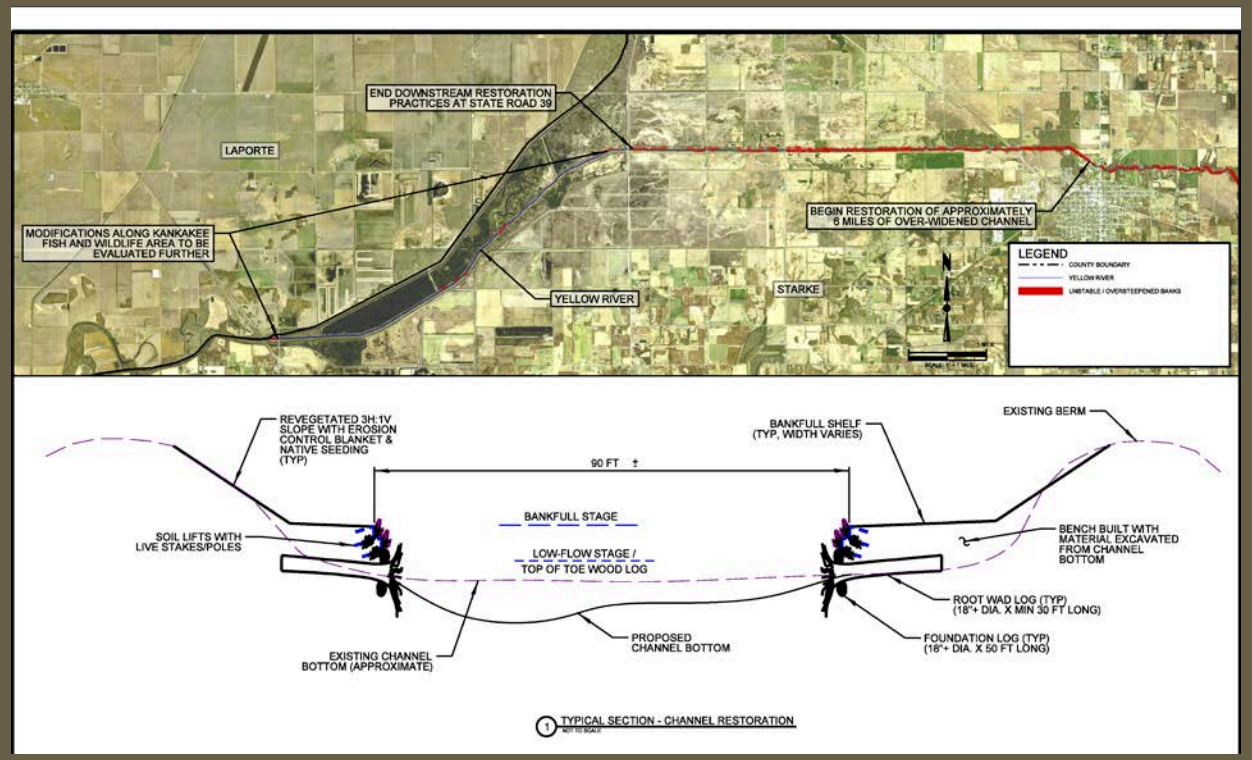
Recommended Mitigation Strategies (cont.)

- Purposefully remove and relocate infrastructure from berm-reliant areas
  - The end goal is to reconnect floodplains and give room to the river.
- Provide Zone-specific access to River for Managing Logjams
  - Improved bridge access for logjam removal is recommended at select locations



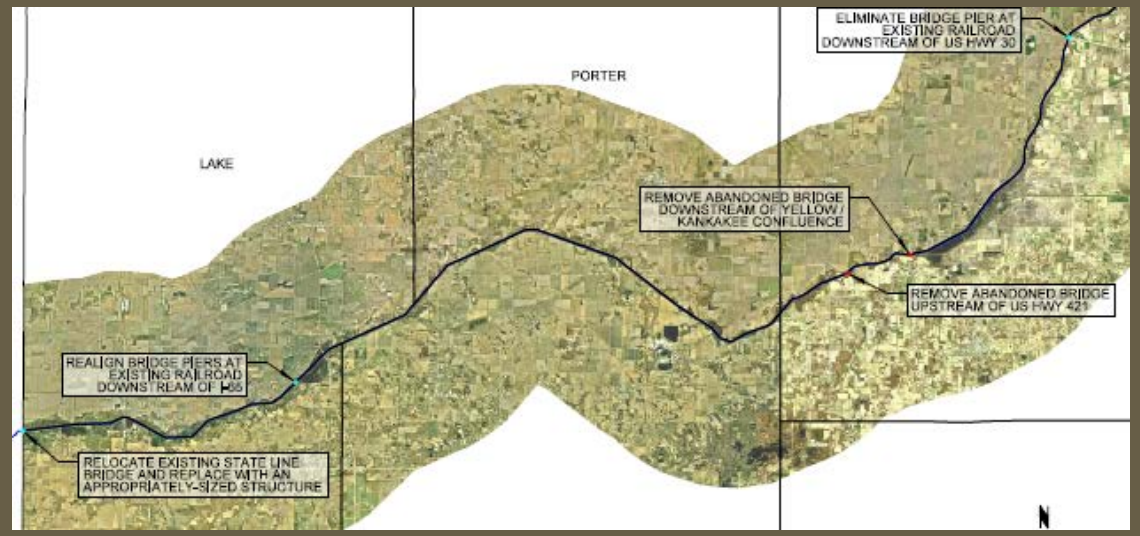
Recommended Mitigation Strategies (cont.)

- Restore Yellow River Sediment Transport Capacity Downstream of Knox
  - Utilize nature-based concepts used in Pilot Project to promote effective sediment transport
- Remove Large wood in the most downstream reach of Yellow River
  - Use of amphibious log removal equipment is preferred

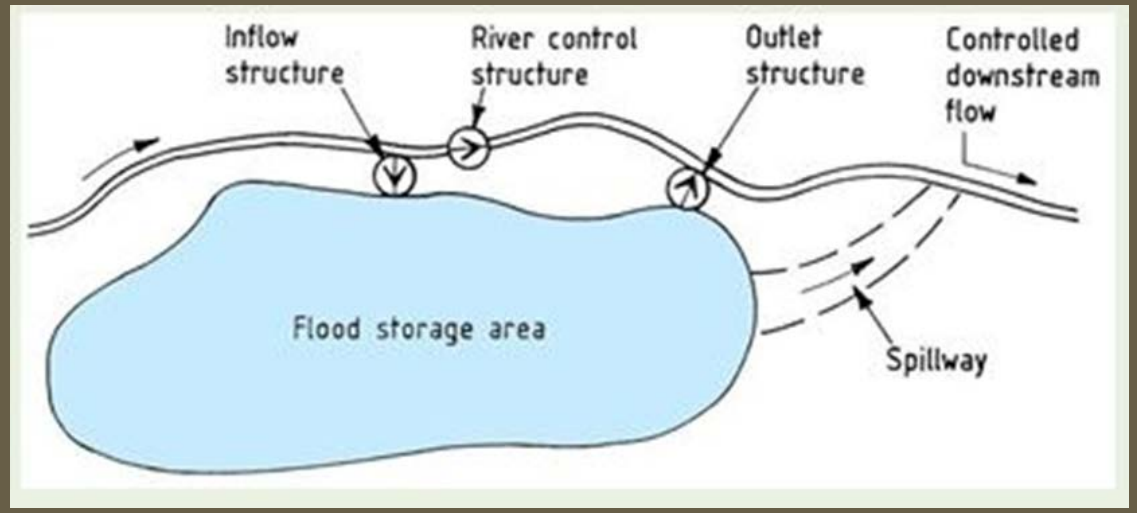


Recommended Mitigation Strategies (cont.)

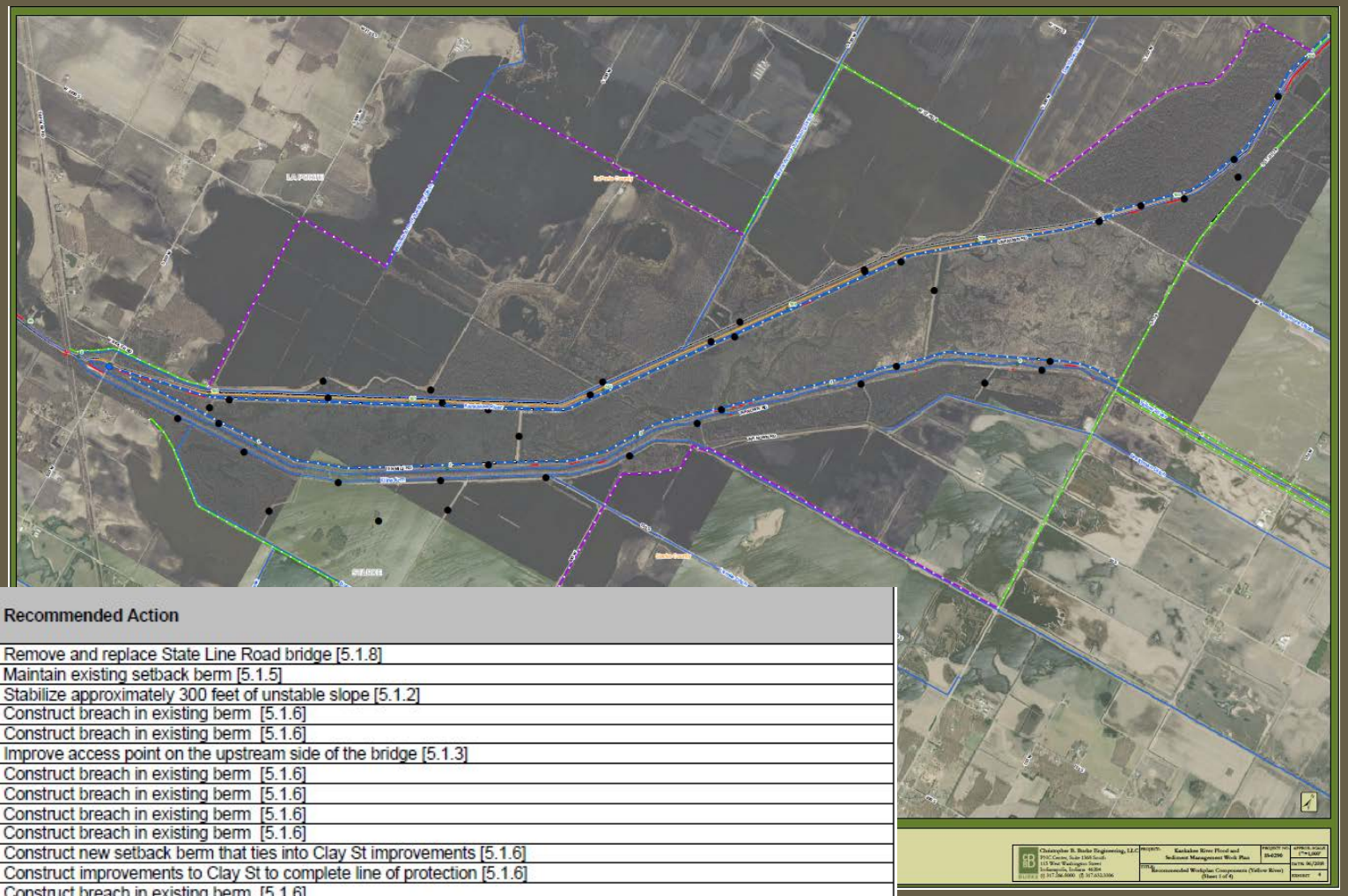
- Remove and/or Replace Restrictive Bridges
  - Several active and abandoned bridges are interrupting the sediment flow and cause flow backup



- Construct off-line Retention or detention storage areas along Laterals
  - Needed to offset increase in runoff due to past and ongoing land drainage activities in the watershed and/or increased rainfall



Summary of Work Plan Mitigation Components (Plan Sheets and Tables)



County	Extent of Improvement (River Mile)	DS Limit Description	US Limit Description	Recommended Action
Lake	59.4	State Line Road	State Line Road	Remove and replace State Line Road bridge [5.1.8]
Lake	59.4 - 73.5	State Line Road	US of I-65	Maintain existing setback berm [5.1.5]
Lake	65.7	-	-	Stabilize approximately 300 feet of unstable slope [5.1.2]
Lake	65.7 - 68.2	-	-	Construct breach in existing berm [5.1.6]
Lake	68.8	-	-	Construct breach in existing berm [5.1.6]
Lake	69.9	State Road 55	State Road 55	Improve access point on the upstream side of the bridge [5.1.3]
Lake	71.4	-	-	Construct breach in existing berm [5.1.6]
Lake	72.5	-	-	Construct breach in existing berm [5.1.6]
Lake	73	DS of I-65	DS of I-65	Construct breach in existing berm [5.1.6]
Lake	73.4	US of I-65	US of I-65	Construct breach in existing berm [5.1.6]
Lake	73.5 - 74.1	US of I-65	-	Construct new setback berm that ties into Clay St improvements [5.1.6]
Lake	74.1 - 74.2	-	Clay St	Construct improvements to Clay St to complete line of protection [5.1.6]
Lake	74.3	US of Clay St	US of Clay St	Construct breach in existing berm [5.1.6]
Lake	74.3 - 77.3	US of Clay St	-	Construct new setback berm that ties into existing berm [5.1.6]
Lake	74.8	-	-	Construct breach in existing berm [5.1.6]
Lake	75.0	-	-	Construct breach in existing berm [5.1.6]
Lake	75.7	-	-	Construct breach in existing berm [5.1.6]
Lake	76.4	-	-	Construct breach in existing berm and internal berms [5.1.6]
Lake	76.5	-	-	Construct breach in existing berm and internal berms [5.1.6]
Lake	77.2	-	-	Construct breach in existing berm and internal berms [5.1.6]
Lake	77.3 - 77.7	-	Lake - Porter Co Line	Maintain existing berm [5.1.5]

Other Alternatives Considered, but Not Recommended

- ❑ Dredging in the Kankakee and Yellow River
- ❑ Modification to the control section downstream of Momence Wetlands
- ❑ Converting berms to flood control levees
- ❑ Clearing trees from banks
- ❑ Increased tile drainage to reduce flooding
- ❑ Construction/Improvement of ditches to increase flood conveyance
- ❑ Berm improvements along tributaries

A Few Take Away Notes

- Most of the problems we face along streams in Indiana:
  - Flooding
  - Erosion and stream instability
  - Sediment aggradation

- Often times, the root causes of these problems are:
  - Stressors within the watershed
    - Increase in flows due to climate change
    - Increase in flow due to unwise urban development
    - Increase in flow due to farmers/drainage boards response to increased rainfall/runoff
  - Mis-steps in attempts to fix problems in one location (dredging, tiling, berming, armoring banks) without an understanding of the entire stream system

- Given a changing climate we are facing, the only way out is embracing a system-wide , watershed-based approach of adaptation and mitigation that includes No-Adverse-Impact development decisions, Smart Growth resilience strategies, and Nature-based solutions.

QUESTIONS?

Siavash Beik, PE, CFM, D.WRE
Vice President, Principal Engineer
Christopher B. Burke Engineering, LLC
115 West Washington Street, Suite 1368 South
Indianapolis, IN 46204
317.266.8000 (office)
317.509.1673 (mobile)
Email: sbeik@cbbel-in.com

Robert Barr
Research Scientist
Center for Earth and Environmental Science
Department of Earth Sciences
IUPUI
317.278.6911 (office)
317.332.5463 (mobile)
e-mail: rcbarr@iupui.edu

KANKAKEE RIVER BASIN COMMISSION
6100 Southport Road Portage, Indiana 46368
(219) 763-0696 Fax (219) 762-1653
www.kankakeeriverbasin.org

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