

# Update on Fox River Fishery and Review of Dam Removal Projects in Northeastern Illinois: Benefits to Fish and River Ecosystems



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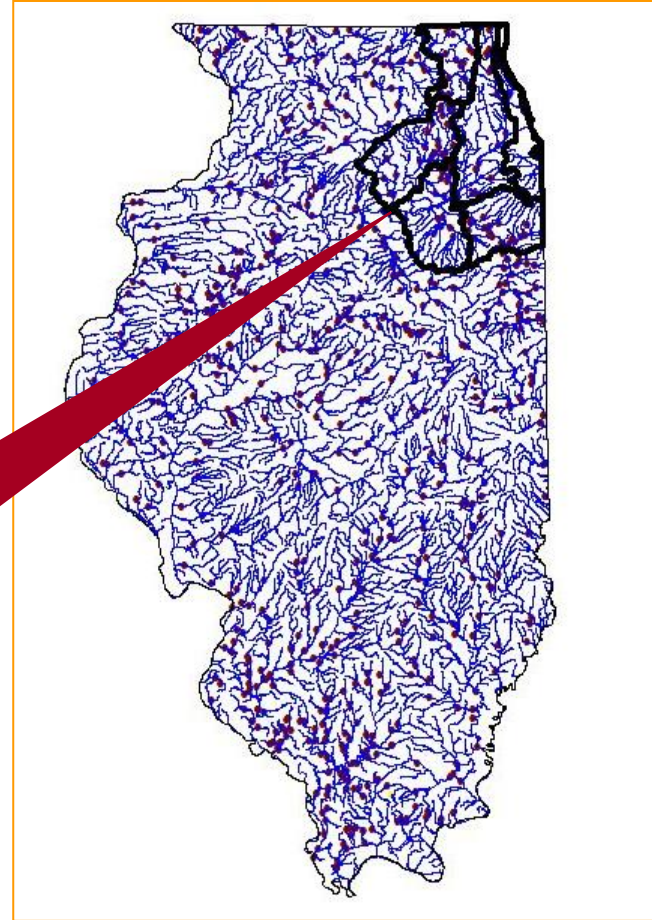
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# IDNR REGION 2 Division of Fisheries Streams Program

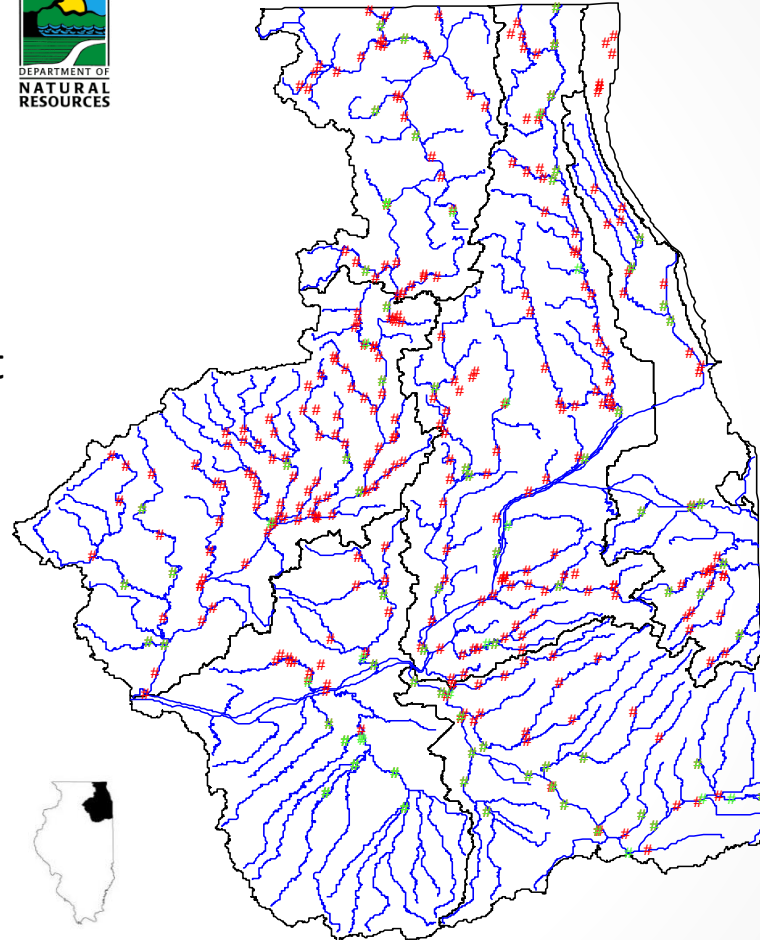


Fox  
Des Plaines  
-DuPage  
Lake Michigan  
Kankakee  
Mazon  
Aux Sable

# IDNR Stream Sampling Program



- **Basin Survey sites**
  - statewide, large scale
  - five-year rotation
  - IEPA – WQ, macroinverts, habitat
- **Region 2 Sub-basin sites**
  - local scale
  - priority watersheds
  - active watershed groups/projects







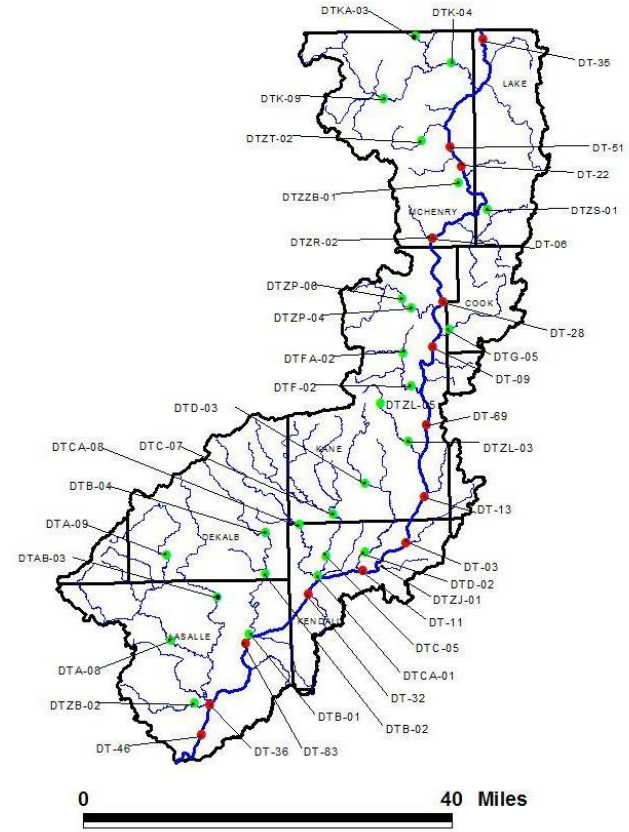
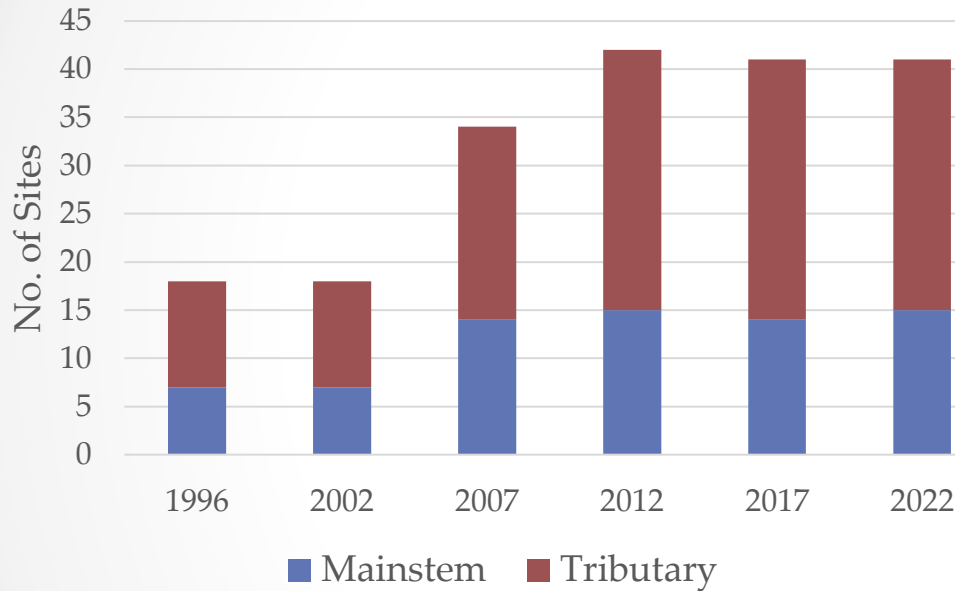
# Fish Survey Data Applications

- Stream Health
- Management Decisions
- Watershed Planning
- Project Evaluation
- Permit Review

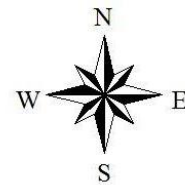




# Fox River Basin Survey Sites



- Mainstem Stations
- Tributary Stations
- Fox River
- Tributary Streams
- County Boundaries





# 2022 Fox River Basin Survey

	No. Stations	Total Fish	No. Species
Mainstem	15	17,094	62
Tributaries	26	24,239	61
Total	41	41,333	76



# Fox River Basin Survey







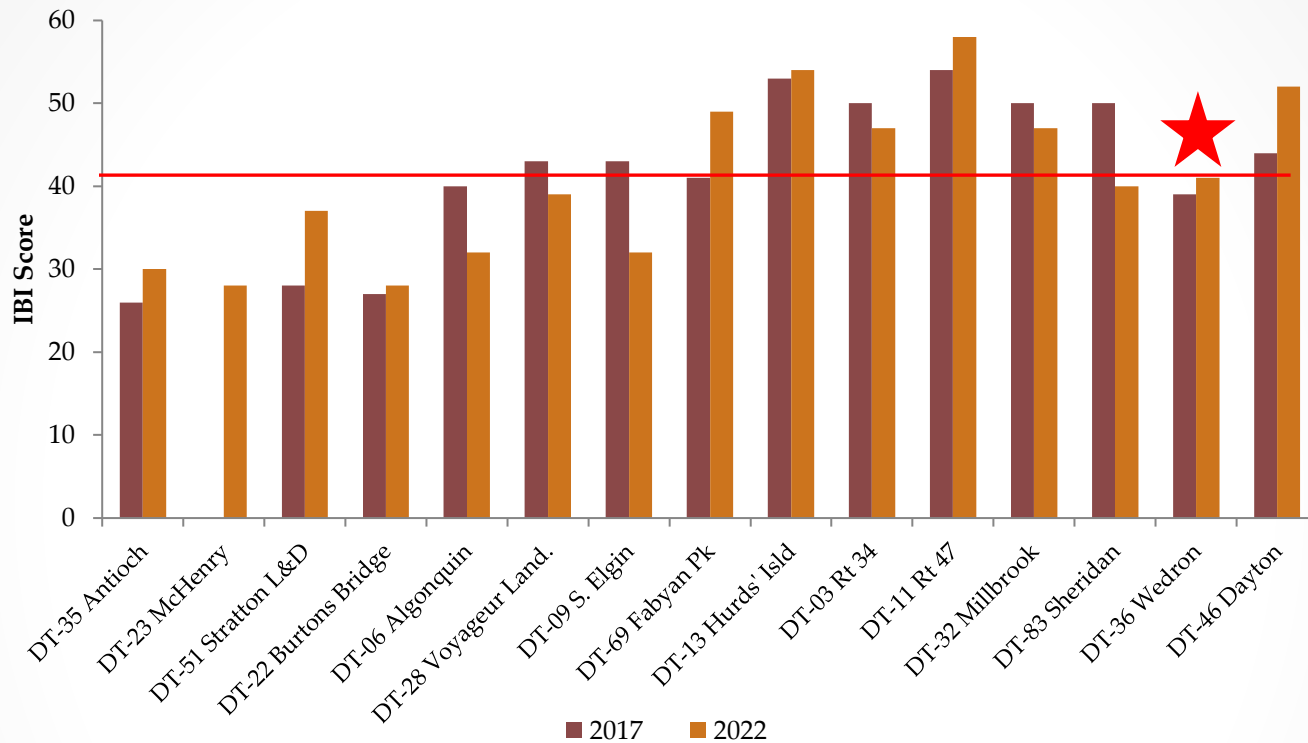


# Index of Biotic Integrity – IBI

<b>METRIC</b>	<b>SCORE</b>
<b>No. native fish species</b>	<b>0-6</b>
<b>No. sucker species</b>	<b>0-6</b>
<b>No. sunfish species</b>	<b>0-6</b>
<b>No. intolerant species</b>	<b>0-6</b>
<b>No. minnow species</b>	<b>0-6</b>
<b>No. benthic invertivore species</b>	<b>0-6</b>
<b>Prop. specialist benthic invertivores</b>	<b>0-6</b>
<b>Prop. generalist feeders</b>	<b>0-6</b>
<b>Prop. coarse mineral spawners</b>	<b>0-6</b>
<b>Prop. tolerant species</b>	<b>0-6</b>
<b>total</b>	<b>0-60</b>

**Difference of IBI >10 = biologically meaningful change (Smogor 2005)**

# Fox River Mainstem – IBI Scores 2017, 2022

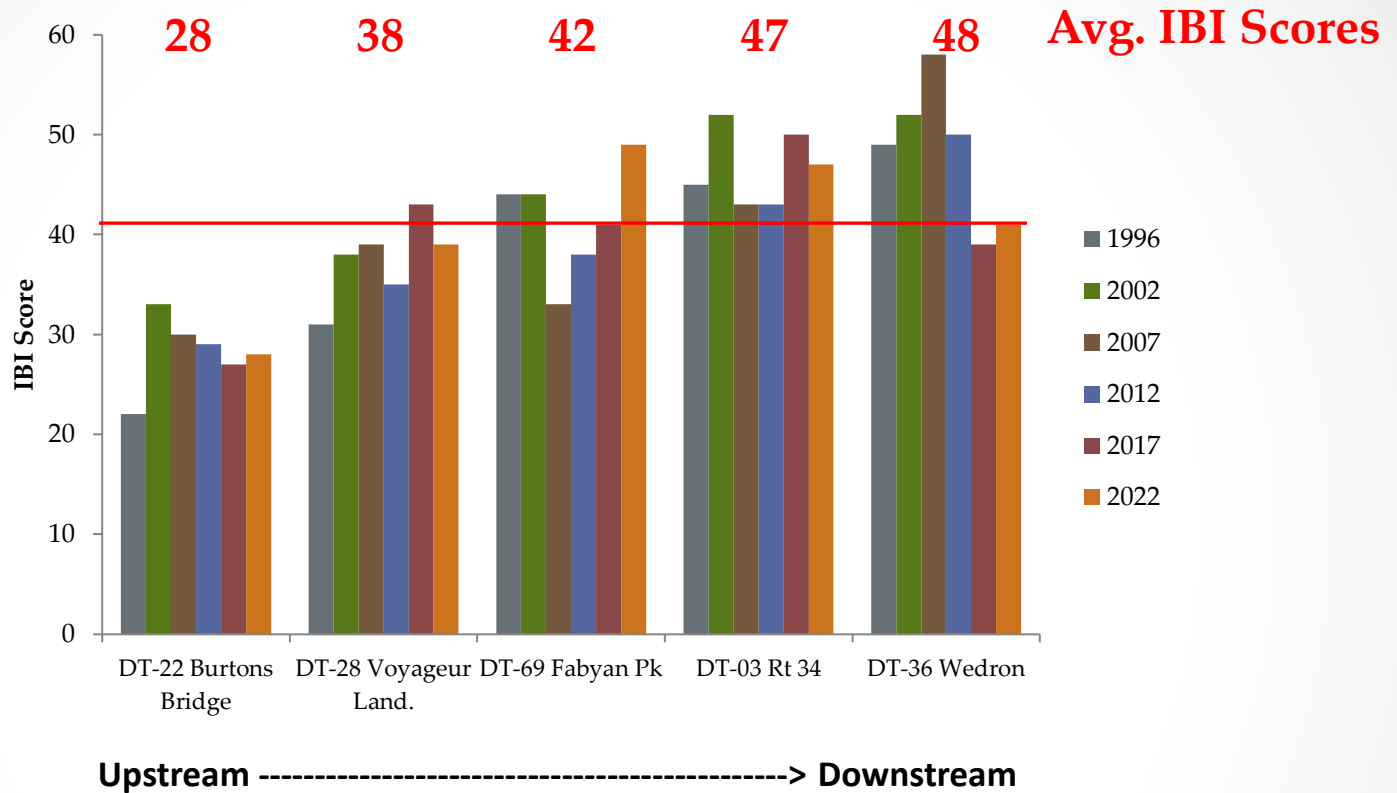


Upstream -----> Downstream



- IBI  $\geq$  41 “full supporting aquatic life use” – IEPA
- Upstream of Algonquin: low gradient, dammed, lake-like
- Mid Fox: many dams, highly urbanized
- Lower Fox: less urbanized, free flowing until Dayton Dam
- Wedron???

# Fox River Mainstem – IBI Scores 1996 to 2022



- Stations sampled in all Fox Basin surveys since 1996
- IBI scores variable, though urban gradient is evident
- Overall higher IBI scores in Lower Fox – less urban, fewer dams



# Fish factors: Habitat / Connectivity

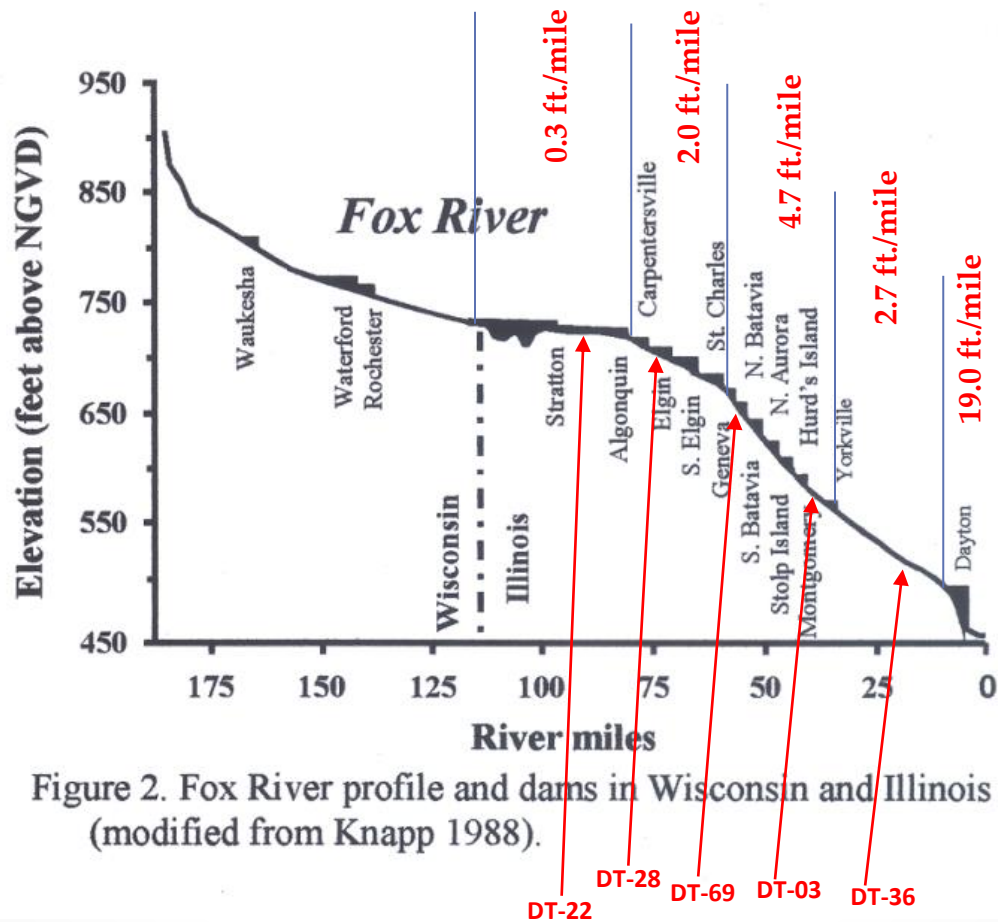
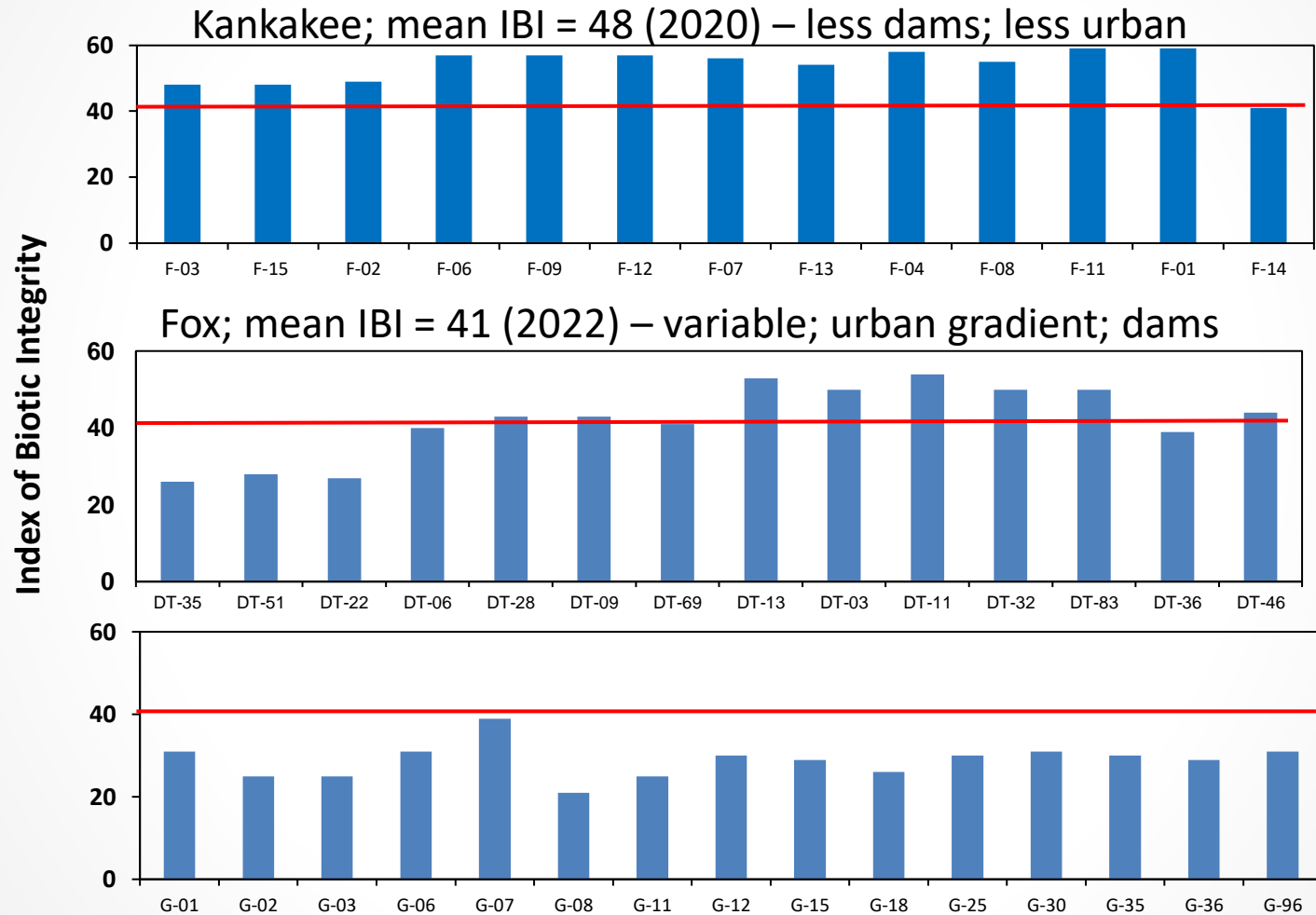


Figure 2. Fox River profile and dams in Wisconsin and Illinois (modified from Knapp 1988).

# Comparing the Fox River IBI to other NE IL rivers



## Dam Projects

Northeastern Illinois

### Legend

-  Dam Removals
-  Fish Passage
-  Planned Projects
-  Removal Evaluations
-  Streams

Lake  
Michigan

Chicago

- **33 projects completed**
- **29 removals**
- **4 fish passage**
- **>500 Miles re-connected**
- **4 in study phase**

40 mi




arth



# Dam Evaluations

Watershed Condition

## Legend

 Dams Studied

YWCA (Brewster)  
Urban LC: **Moderate**  
DS IBI: **37- 49**

Creek Bend (Ferson)  
Urban LC: **Moderate**  
DS IBI: **45-48**

River Road (Blackberry)  
Urban LC: **Low**  
DS IBI: **56-59**

Seavey Creek  
Urban LC: **High**  
DS IBI: **31-39**

Hofmann  
Urban LC: **High**  
DS IBI: **26-36**

**IBI Range = 0 to 60**

20 mi



# Dam Details

Dam	Stream	Watershed Area (mi. <sup>2</sup> )	Year compl.	Hgt (ft.)	Wth (ft.)	Dam Condit.	Cost
YWCA (2)	Brewster Creek	18	2006	8	50	poor	\$400,000
Golf Course	Seavey Creek	11	2009	4	45	poor	\$60,000
Creek Bend	Ferson Creek	54	2010	4	60	fair	\$85,000
Hofmann	Des Plaines River	480	2012	12	259	good	\$2,500,000
River Road	Blackberry Creek	73	2013	12	75	fair	\$900,000







# Brewster Creek



**YWCA Dam - 2004**



**DeSanto's Dam - 2006**





## Brewster Creek

**2004 – New channel in former lake bed 4 months post removal**



**2008 – New channel in former lake bed**





# Hofmann Dam Removal





# Blackberry Creek Dam Removal







**Fox River**

Image USDA Farm Service Agency



5/23/2013



1998

Imagery Date: 5/23/2013 41°38'47.42" N 88°27'08.40" W elev 584 ft



# Dam Removal Evaluation

PRE-PROJECT

Sampling Sites: ○

POST-PROJECT

**“System-wide” effects**

- Species distribution
- Habitat reconnection
  - Spawning runs
  - Seasonal migrations

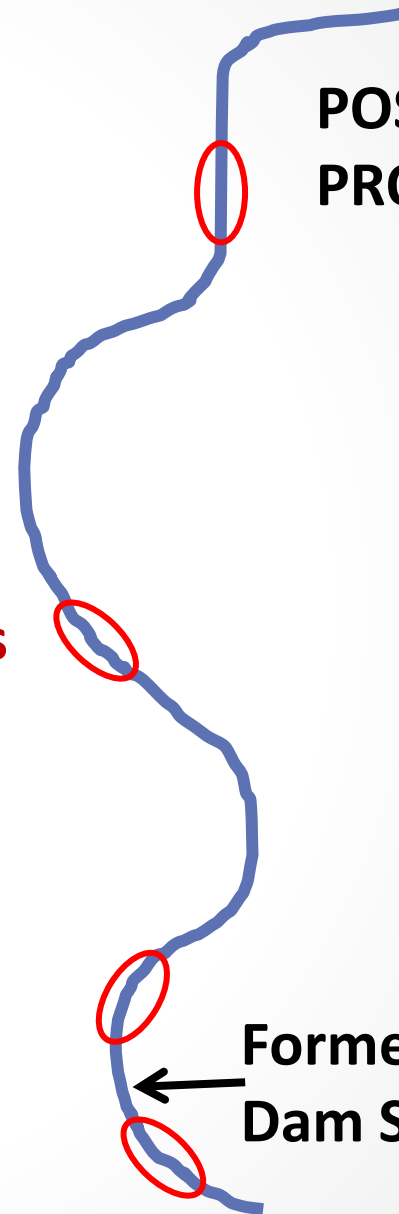
**“Localized” effects**

- Dam pool

Dam Pool



Dam



Former Dam Site



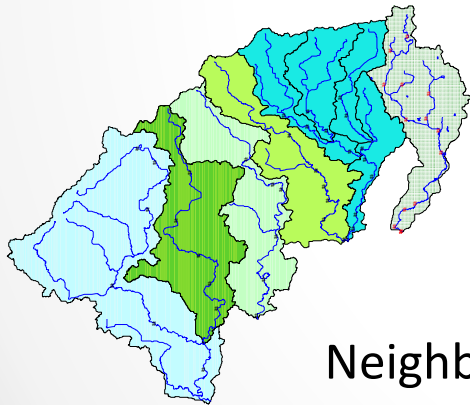
# Dam Removal Evaluation

## Metrics:

- Species richness
- Catch Per Unit Effort (CPUE)
- Index of Biotic Integrity (IBI)

## Analysis

- T-test
- ANOVA w/ Tukey's HSD



Neighboring  
Watersheds

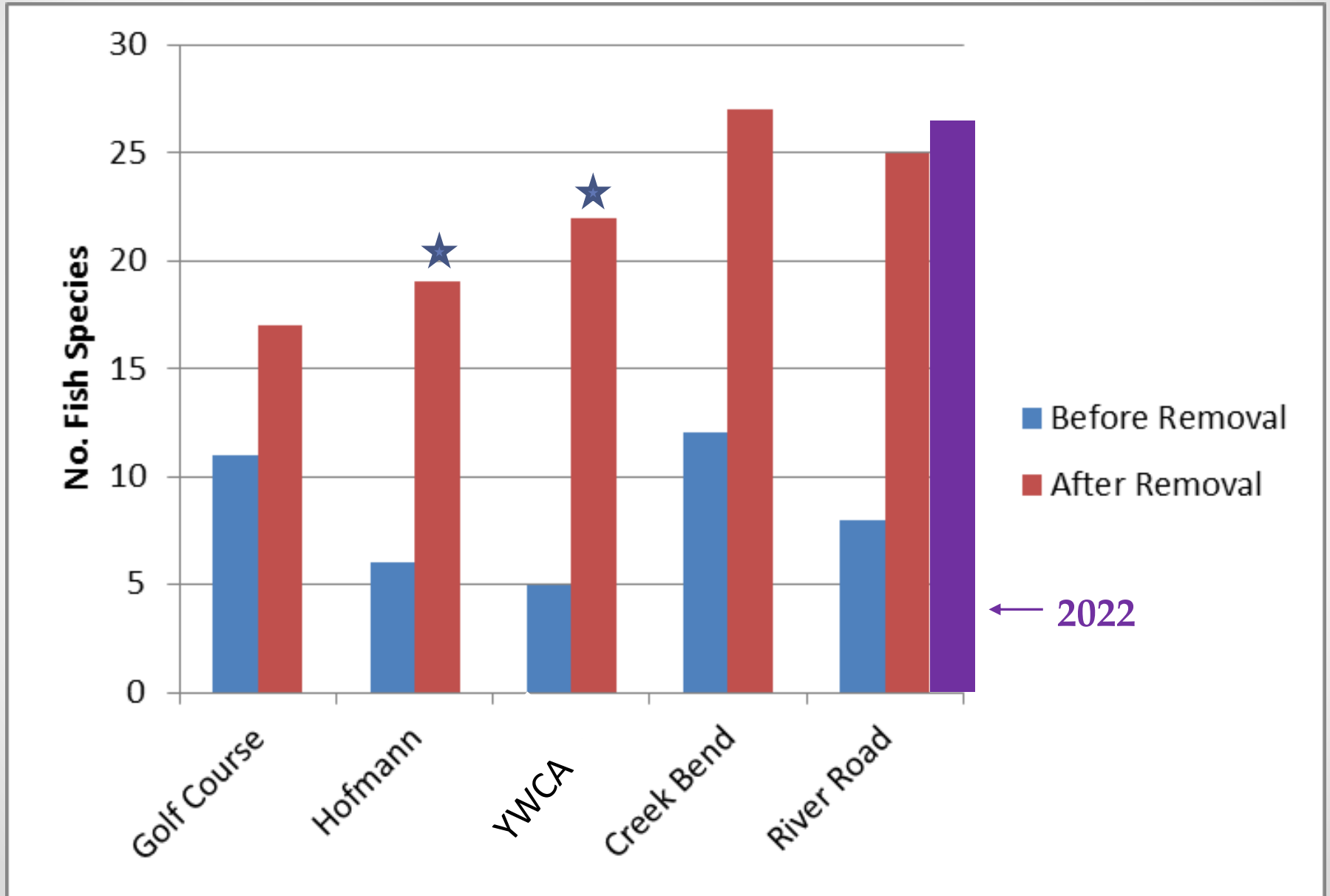


# Dam Fish Sampling

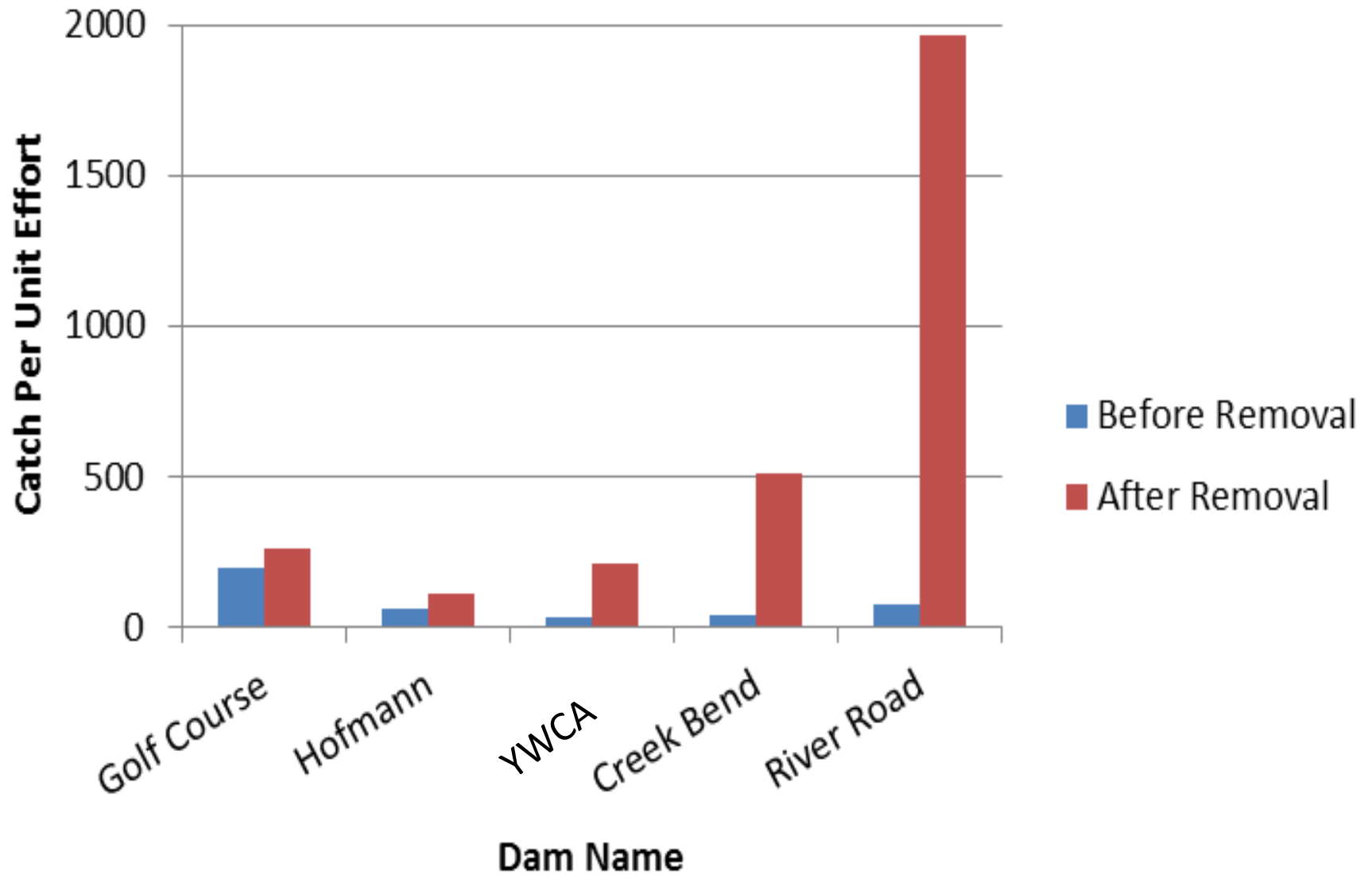
Dam	Stream	Year remvd	No. years in study	Pre Samples	Post Samples
YWCA	Brewster Creek	2006	7	2	5
Golf Course	Seavey Creek	2009	1	1	1
Creek Bend	Ferson Creek	2010	4	1	2
Hofmann	Des Plaines River	2012	14	6	3
River Road	Blackberry Creek	2013	3	1	3



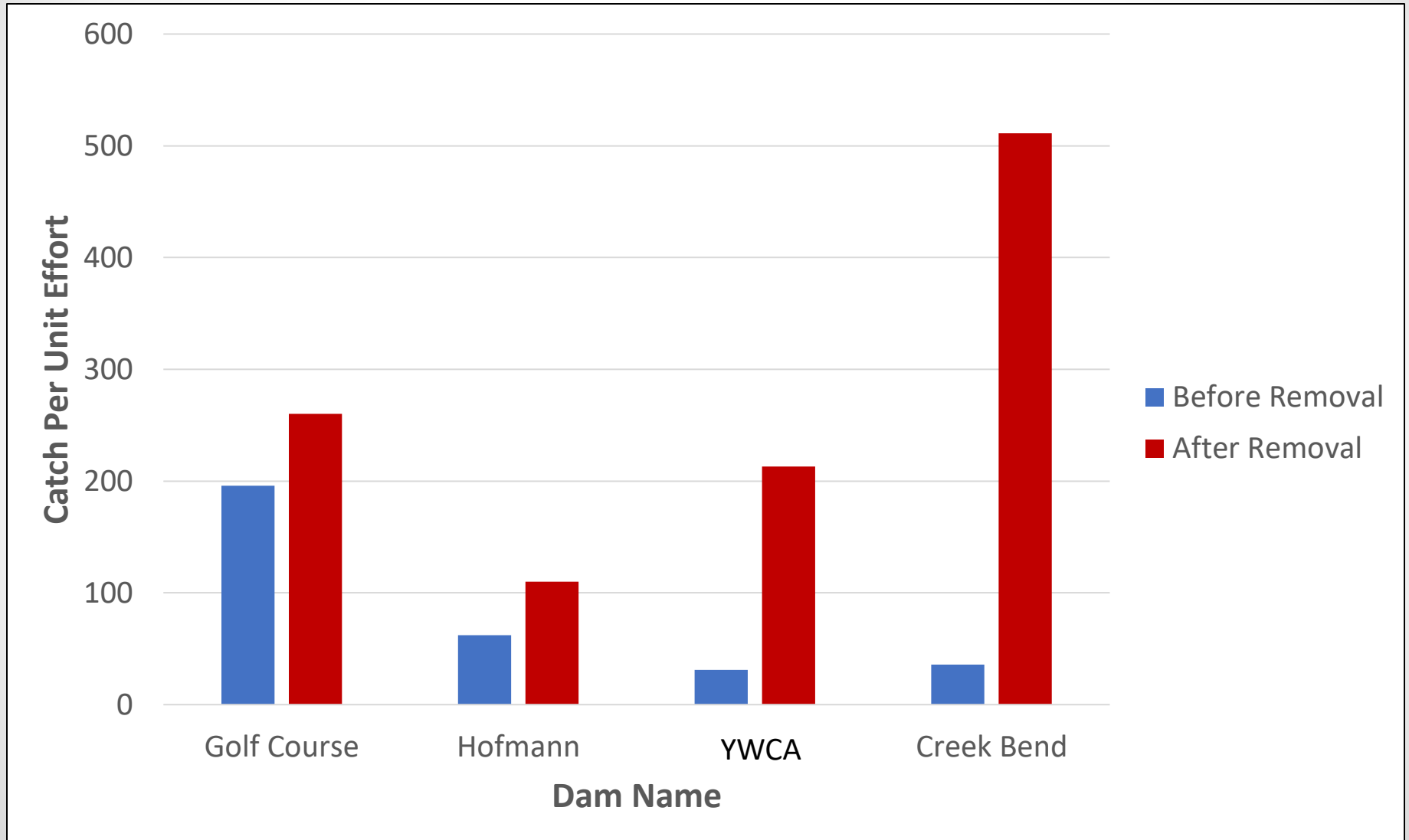
# Species Richness in Dam Pool Area Before and After Removal



# Catch Per Unit Effort in Dam Pool Area Before and After Removal

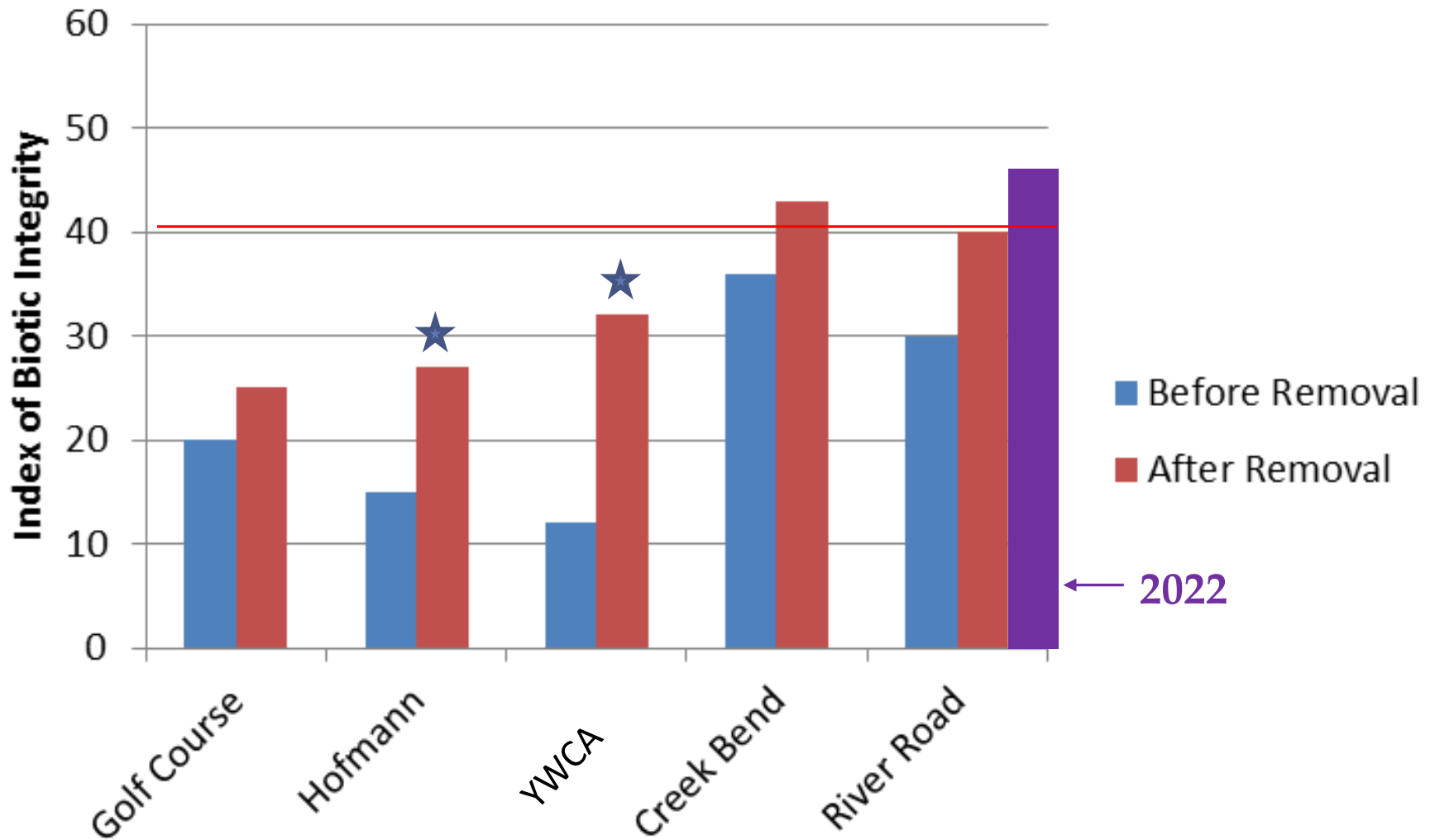


# Catch Per Unit Effort in Dam Pool Area Before and After Removal





# IBI in Dam Pool Area Before and After Removal



## Results for all dams

(CPUE = Catch per Unit Effort; IBI= Index of Biotic Integrity)

Dam	Species Richness		CPUE		IBI	
	Before	After	Before	After	Before	After
Golf Course	11	17	196	260	20	25
Hofmann	6	19	62	110	15	27
YWCA	5	22	31	213	12	32
Creek Bend	12	27	36	511	36	43
River Road	8	25	74	1967	30	40
mean	8.4	22.0	79.8	612.2	22.6	33.4
T-test	p=0.000175		p=0.100		p=0.0484	





**Riverine species in  
Brewster Creek after removal**



**River Road (Blackberry Creek)  
Spring 2013 – 2 weeks post removal  
Shorthead Redhorse and Quillback spawning runs  
First spawning runs in 180 years**







**Shorthead Redhorse  
Spawning Nests  
Observed in  
Blackberry Creek**



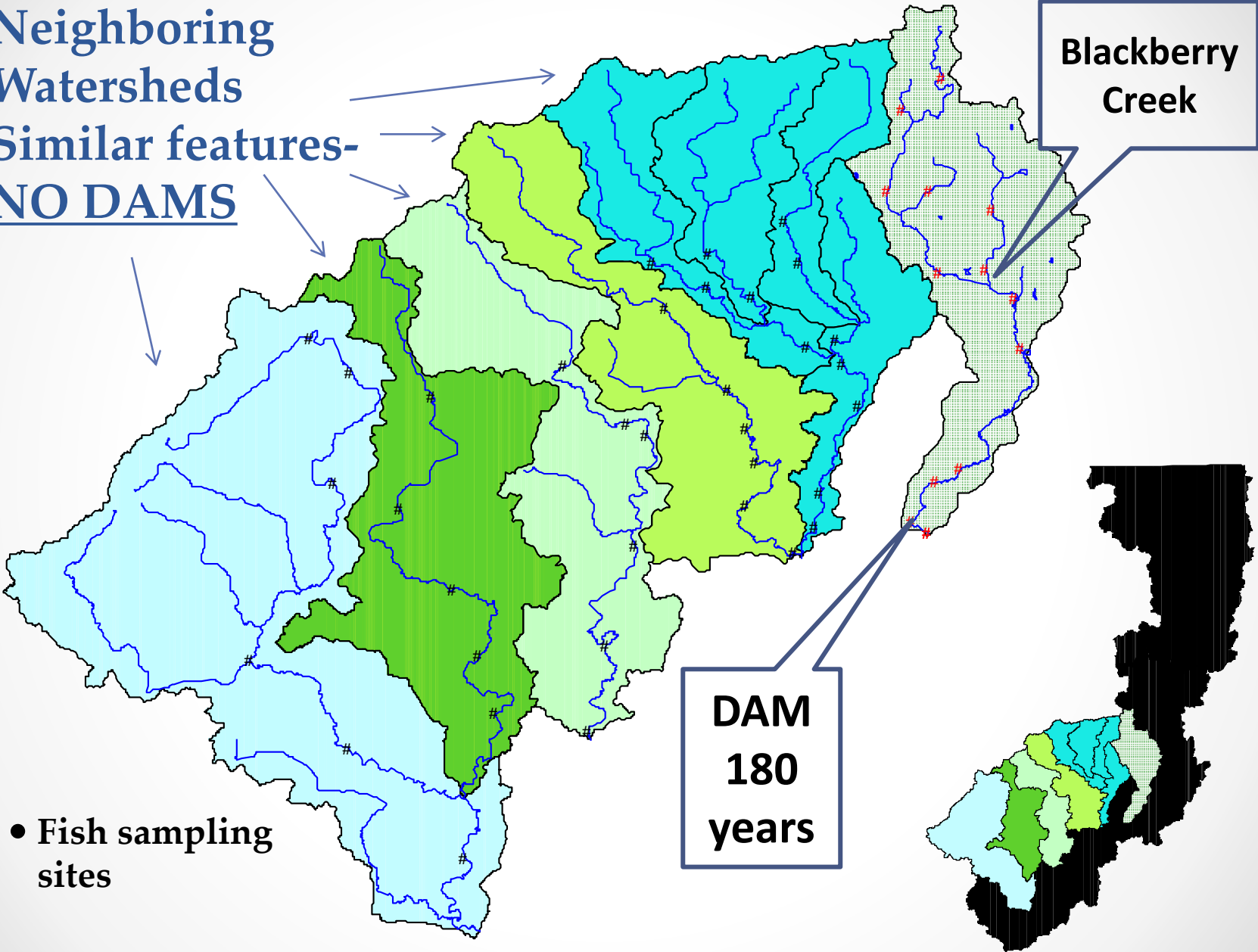
Neighboring

Watersheds

Similar features-

NO DAMS

Blackberry  
Creek



● Fish sampling sites

DAM  
180  
years

**PRE – PROJECT : Fish species absent from  
Blackberry Creek compared to neighboring,  
un-dammed tributaries**

<b>Species</b>	<b>Blackberry</b>	<b>Big Rock</b>	<b>Somonauk</b>	<b>Indian</b>	<b>Little Indian</b>	<b>Little Rock</b>
Rosyface Shiner	0	X	X	X	X	X
Southern Redbelly Dace	0	X	X	X	X	X
Largescale Stoneroller	0	X	X	X	X	X
Shorthead Redhorse	0	X	X	X	X	X
Black Redhorse	0	X	X	X	X	0
Quillback	0	X	X	X	X	X
Banded Darter	0	X	X	X	X	X
Rainbow Darter	0	X	X	X	X	X
Orangethroat Darter	0	X	X	X	X	X
Channel Catfish (1996)	3	10	27	10	5	1
Smallmouth Bass (1996)	4	336	151	18	13	71



# PRE-PROJECT: IBI Scores from Blackberry Creek compared to neighboring, un-dammed tributaries

(ANOVA; P = 9.65E-05)

Sampling Site		Blackberry	Big Rock	Little Rock	Indian	Little Indian
DS	1	34	52	52	48	51
	2	34	59	48	53	49
	3	35	56	44	56	44
	4	35	58	45	49	47
US	5	33	57	43	40	35
mean		34.2	56.4	46.6	49.2	45.2
difference		---	+22.2	+12.4	+15	+11
Tukey's HSD		a	b	b	b	b

## POST PROJECT - Blackberry Creek fish species compared to neighboring, un-dammed tributaries

Species	Blackberry	Big Rock	Somonauk	Indian	Little Indian	Little Rock
Rosyface Shiner	√	X	X	X	X	X
Southern Redbelly Dace	0	X	X	X	X	X
Largescale Stoneroller	√	X	X	X	X	X
Shorthead Redhorse	√	X	X	X	X	X
Black Redhorse	0	X	X	X	X	0
Quillback	√	X	X	X	X	X
Banded Darter	√	X	X	X	X	X
Rainbow Darter	√	X	X	X	X	X
Orangethroat Darter	√	X	X	X	X	X
Channel Catfish*	9 (3)	10	27	10	5	1
Smallmouth Bass*	44 (4)	336	151	18	13	71

\*Y-O-Y present four miles upstream



# “System-wide” Results: New Species Upstream



Fish  
Passage  
Projects:

fish use them,  
BUT more costly  
and require  
maintenance



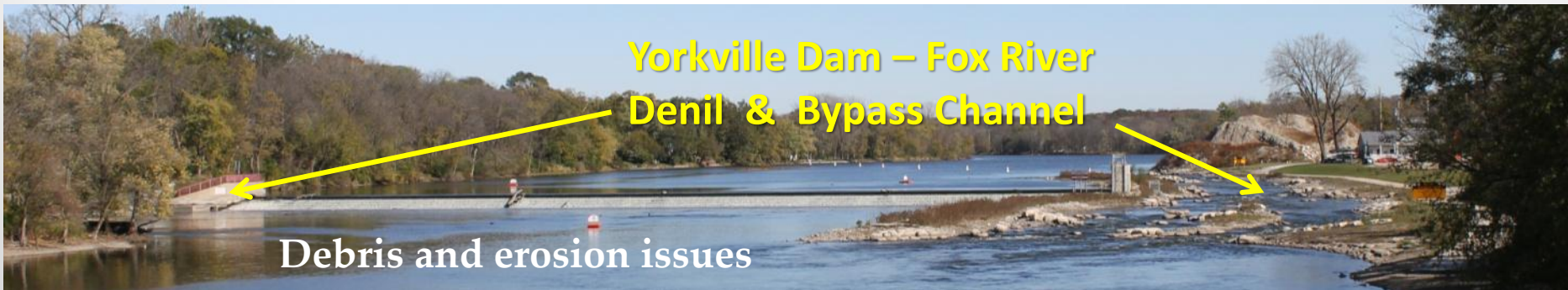
**Big Rock Creek Ramp**

Repaired  
2006



**Big Rock Creek Bypass**

Repaired  
2007



**Yorkville Dam – Fox River  
Denil & Bypass Channel**

Debris and erosion issues



## Evaluation of Dam Removals - Summary

- Fish assemblages improved at all dams across a ranges of dam sizes and watershed characteristics
- Repopulation of former dam pool rapid; reliant on downstream recruitment source – avg. species richness increased >2X
- Avg. IBI increased in former dam pool – statistically and “biologically” significant (>10 points)
- Catch per unit effort increase variable; avg. increase >7X in former dam pool area
- Tributary spawning runs re-established rapidly, also benefiting mainstem populations
- “Missing” fish species repopulate upstream segments
- Fish passage structures used by variety of species; connection partial; often more costly and require rebuild and/or maintenance