Oxbow Restoration for Fish Habitat and Water Quality

Chris Jones and **Aleshia Kenney**

Iowa Soybean Association
ENVIRONMENTAL Programs and Services

U.S. Fish and Wildlife Service
Partners for Fish and Wildlife Program

February 9, 2015
Dubuque, Iowa

ISA Environmental Program

- **Provide Leadership for Iowa Agriculture**
  - ***Environment***
  - ***Profit***
  - ***Policy***

The Nature Conservancy
Protecting nature. Preserving life.™

ACWA
Agriculture's Clean Water Alliance

Iowa Soybean Association
EXPANDING OPPORTUNITIES. DELIVERING RESULTS.

Des Moines Water Works

U.S. Fish & Wildlife Service

DNR

Iowa Department of Agriculture and Land Stewardship

CARD

Fishers & Farmers Partnership for the Upper Mississippi River Basin

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Boone River Watershed Association

Leopold Center for Sustainable Agriculture

Iowa State University

USDA ARS
United States Department Of Agriculture
Agricultural Research Service

Monitoring Foundation

- Certified Sampling - QAQC
  - Nitrate and Bacteria
- Real-time Remote Monitoring
- Investigative Monitoring
  - Ammonia
  - Cyanobacteria
- Effectiveness and Special Project Monitoring
  - Bioreactors
  - Event-triggered monitoring
  - Paired micro-watershed studies

FISHERS AND FARMERS

- Healthy Fish
- Healthy Streams
- Healthy Farms

National Fish Habitat Action Plan

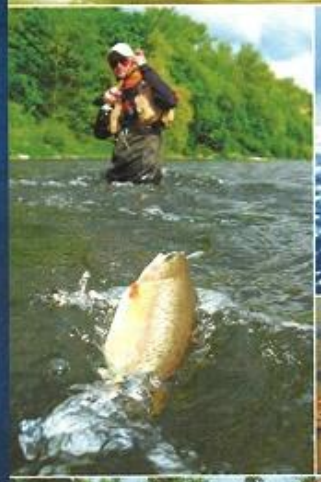
2nd Edition

Cooperation

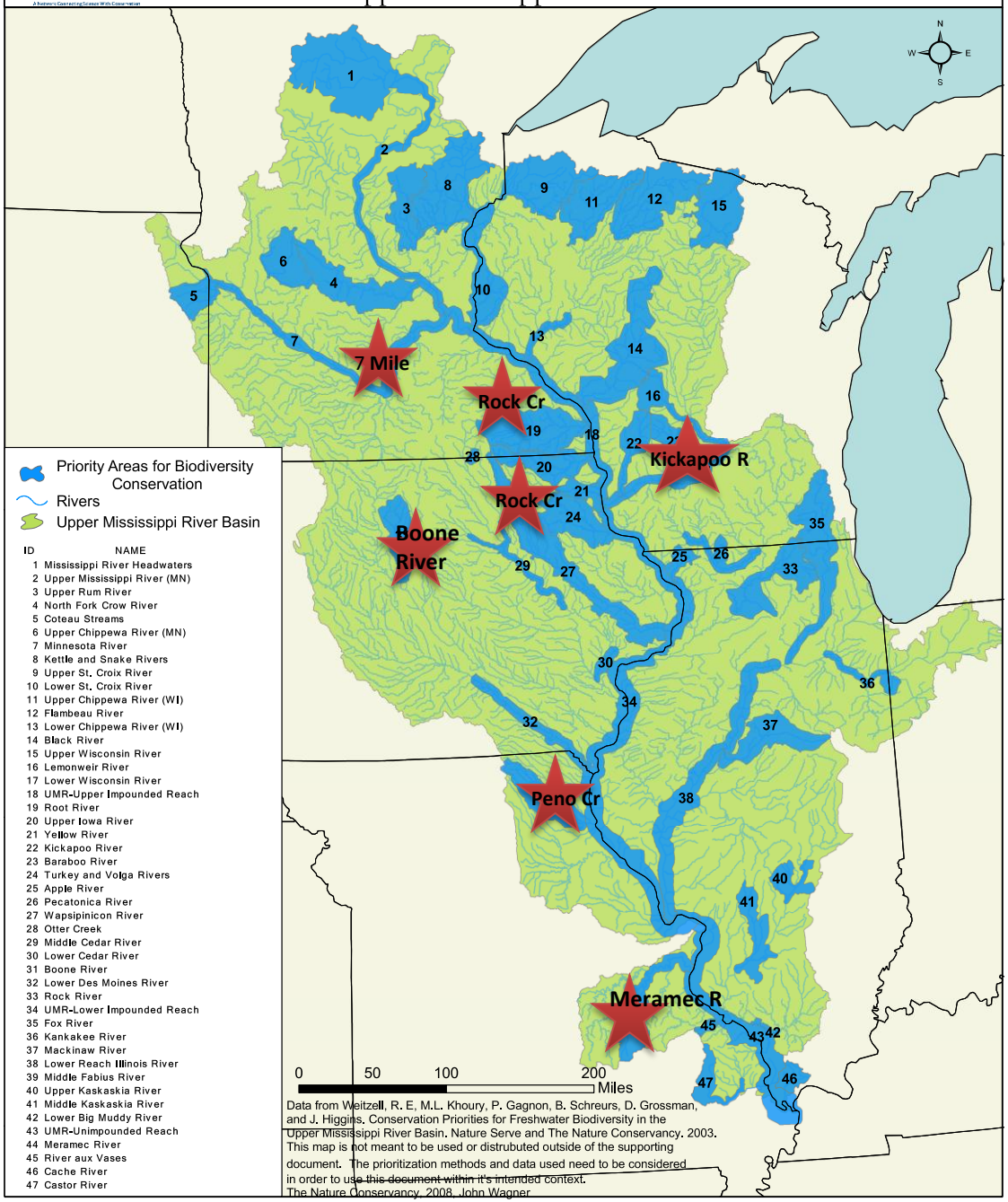
Investment

Stewardship

National Fish Habitat Partnership

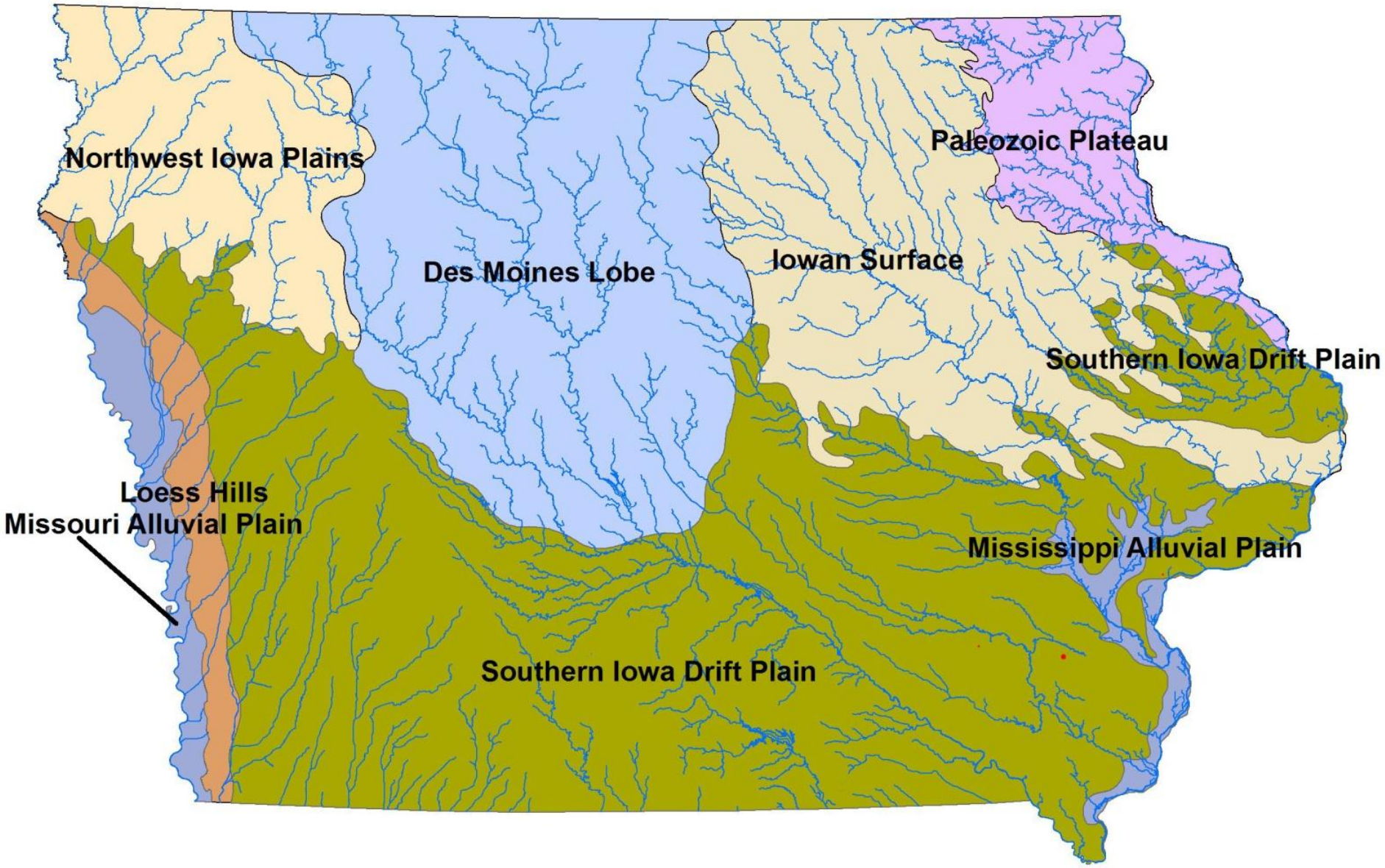


Priority Areas for Biodiversity Conservation
Upper Mississippi River Basin



ID	NAME
1	Mississippi River Headwaters
2	Upper Mississippi River (MN)
3	Upper Rum River
4	North Fork Crow River
5	Coteau Streams
6	Upper Chippewa River (MN)
7	Minnesota River
8	Kettle and Snake Rivers
9	Upper St. Croix River
10	Lower St. Croix River
11	Upper Chippewa River (WI)
12	Flambeau River
13	Lower Chippewa River (WI)
14	Black River
15	Upper Wisconsin River
16	Lemonweir River
17	Lower Wisconsin River
18	UMR-Upper Impounded Reach
19	Root River
20	Upper Iowa River
21	Yellow River
22	Kickapoo River
23	Baraboo River
24	Turkey and Volga Rivers
25	Apple River
26	Pecatonica River
27	Wapsipinicon River
28	Otter Creek
29	Middle Cedar River
30	Lower Cedar River
31	Boone River
32	Lower Des Moines River
33	Rock River
34	UMR-Lower Impounded Reach
35	Fox River
36	Kankakee River
37	Mackinaw River
38	Lower Reach Illinois River
39	Middle Fabius River
40	Upper Kaskaskia River
41	Middle Kaskaskia River
42	Lower Big Muddy River
43	UMR-Unimpounded Reach
44	Meramec River
45	River aux Vases
46	Cache River
47	Castor River

Data from Weitzell, R. E, M.L. Khoury, P. Gagnon, B. Schreurs, D. Grossman, and J. Higgins. Conservation Priorities for Freshwater Biodiversity in the Upper Mississippi River Basin. Nature Serve and The Nature Conservancy. 2003.
This map is not meant to be used or distrubuted outside of the supporting document. The prioritization methods and data used need to be considered in order to use this document within it's intended context.
The Nature Conservancy, 2008, John Wagner


Northwest Iowa Plains
Des Moines Lobe
Iowan Surface
Paleozoic Plateau
Southern Iowa Drift Plain
Loess Hills
Missouri Alluvial Plain
Mississippi Alluvial Plain
Southern Iowa Drift Plain

NY Times: September 22, 1910

PAYING $307,000,000 FOR IOWA DRAINAGE

Private Owners of Farms to Spend All But $60,000,000 of the Sum.

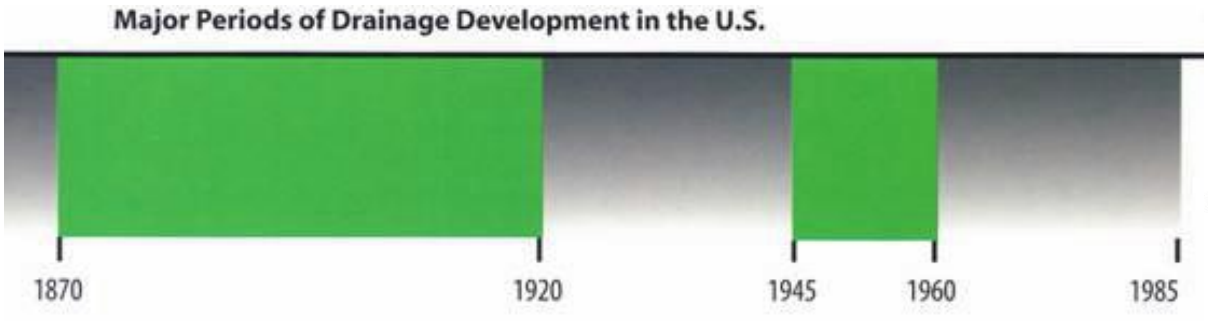
TO RECLAIM SWAMP LANDS

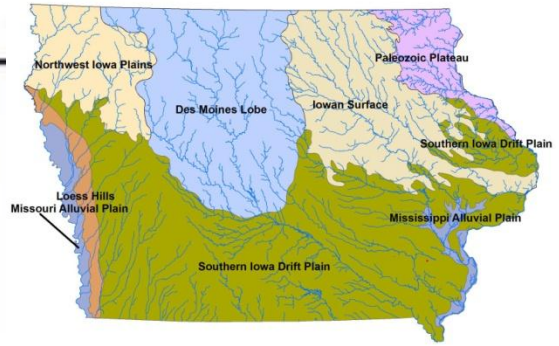
Values Will Be Increased Millions of Dollars, Making the State One of the Richest for Agriculture.

Hydrologic Alterations – Artificial Drainage

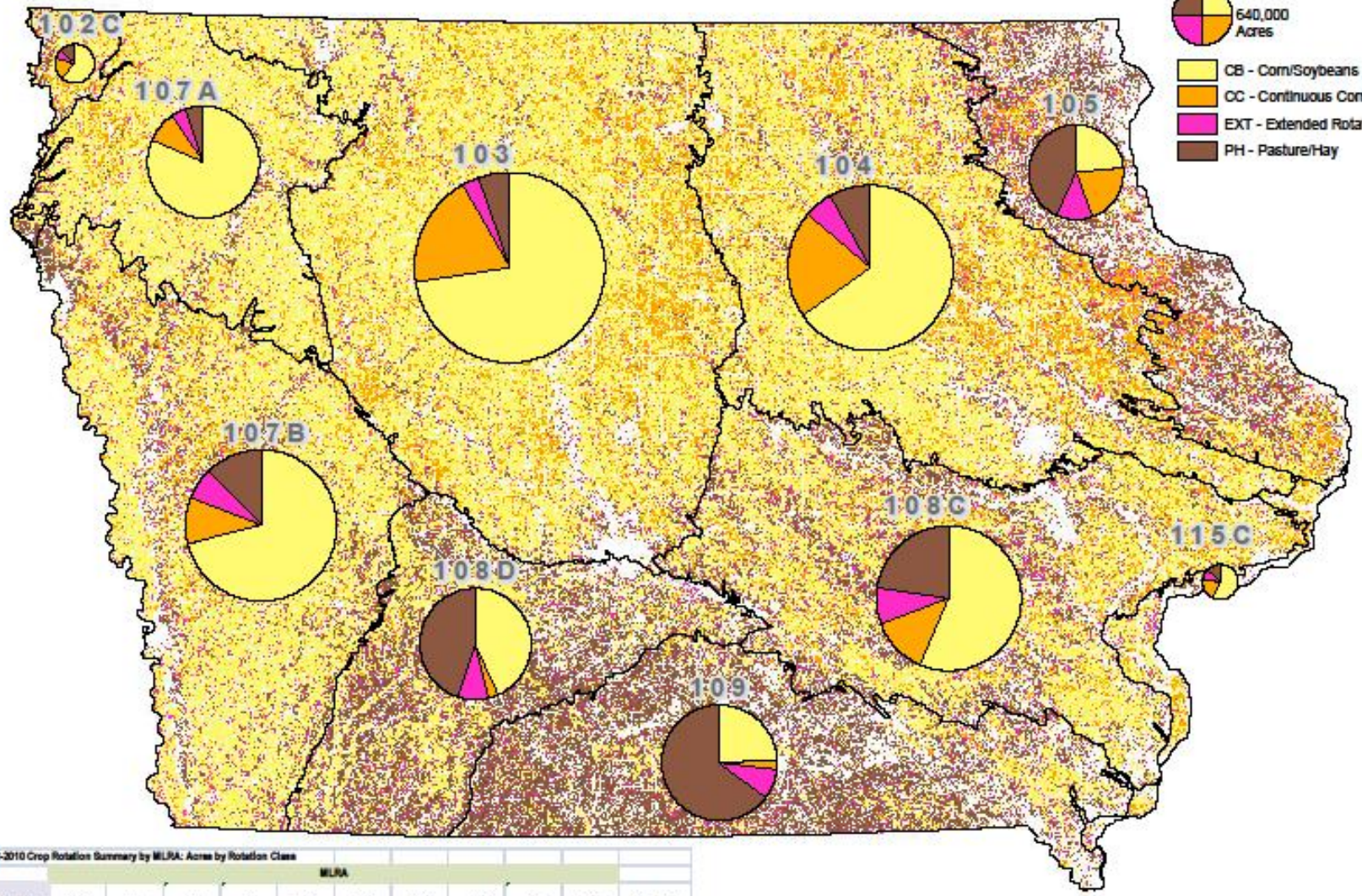
Hand digging tile, Boone Co. IA. ca 1914
Source: 'An Iowa album: a photographic history, 1860-1920' by M. J. Bennet, University of Iowa Press, Iowa City, Iowa

Excavating a large ditch using steam power, circa 1910.





Crop Rotations by MLRA 2006-2010

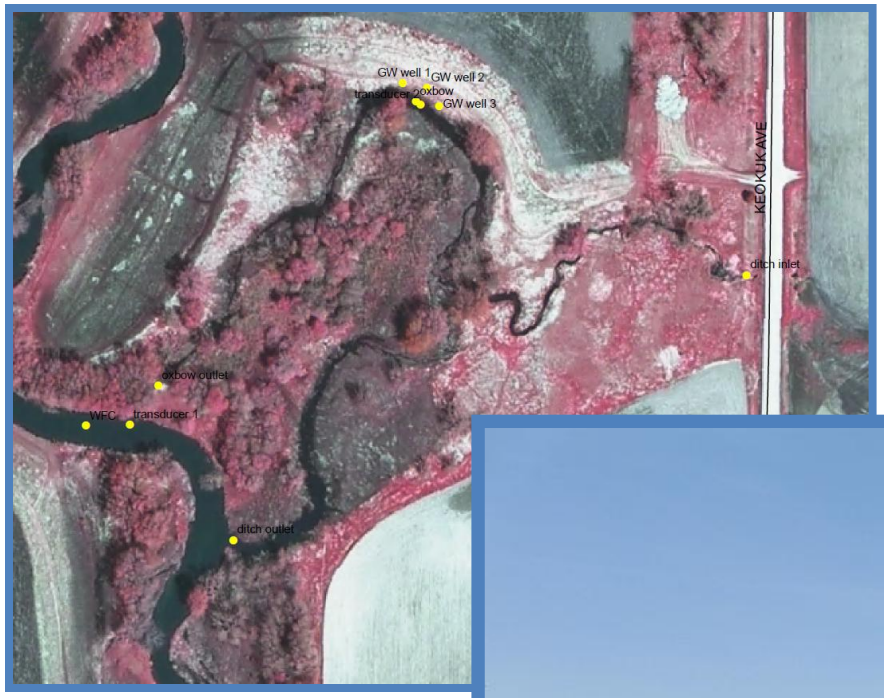


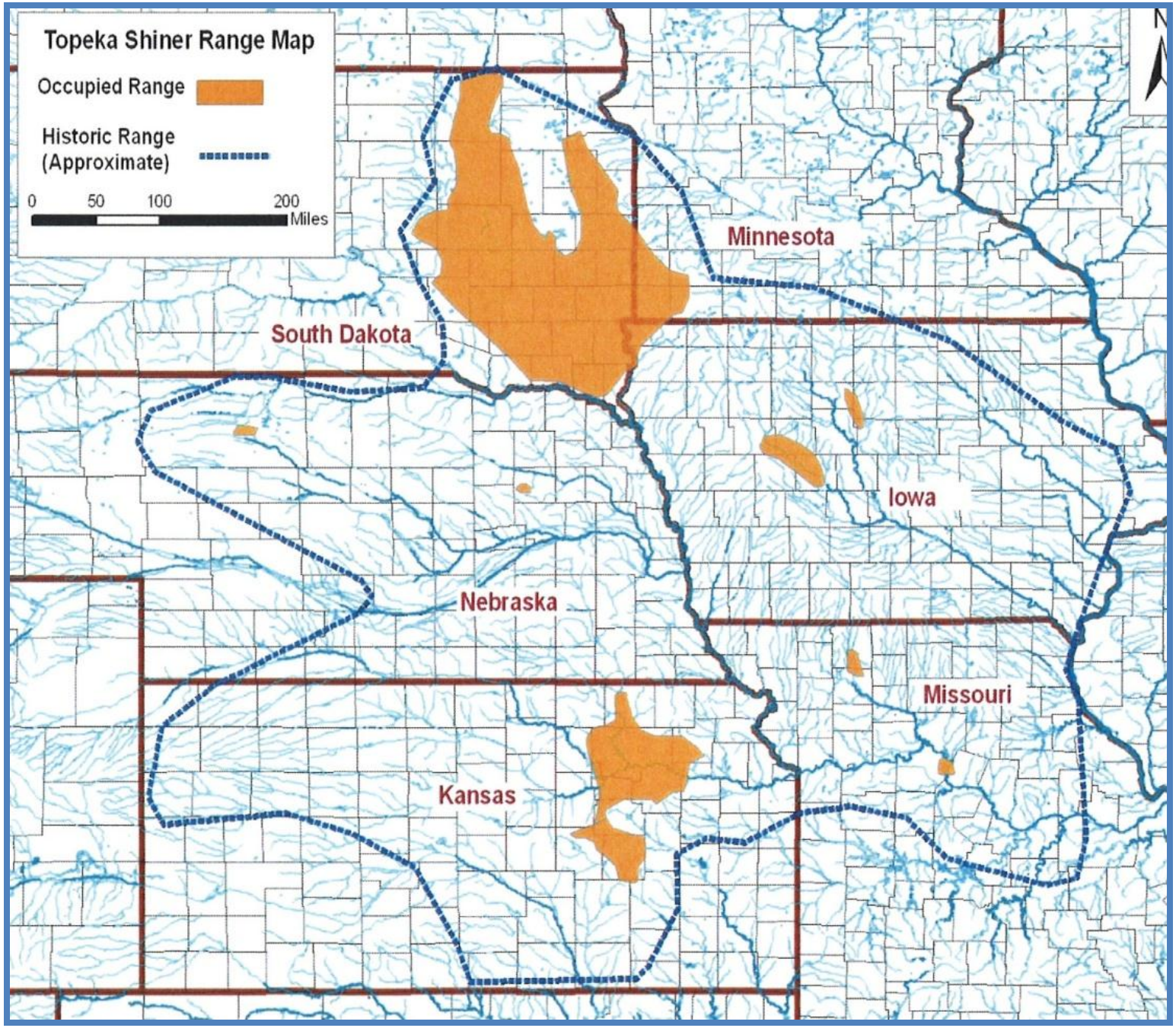
2006-2010 Crop Rotation Summary by MLRA: Acres by Rotation Class

	MLRA										
Rotation Class	102C	103	104	105	107A	107B	108C	108D	109	115C	Class Total
CB	170,150	4,737,173	3,198,747	381,385	1,833,614	2,938,063	2,137,446	960,322	582,198	127,776	17,064,874
CC	50,077	1,252,578	1,031,193	339,917	208,446	408,404	479,205	65,003	63,872	44,987	3,943,684
EXT	18,180	190,573	275,015	201,089	95,205	280,602	310,546	199,801	201,817	20,183	1,792,811
PH	38,865	351,382	402,027	705,143	118,910	510,566	855,005	999,998	1,584,762	31,536	5,578,193
MLRA Total	281,365	6,568,812	4,970,105	1,657,127	2,283,620	4,185,566	3,830,637	2,253,208	2,436,344	228,875	

Source: USDA NASS

Oxbow Restoration: Boone R. WS Iowa




Topeka Shiner Range Map
Occupied Range
Historic Range
(Approximate)
0
50
100
200
Miles
Minnesota
South Dakota
Iowa
Nebraska
Missouri
Kansas

1930

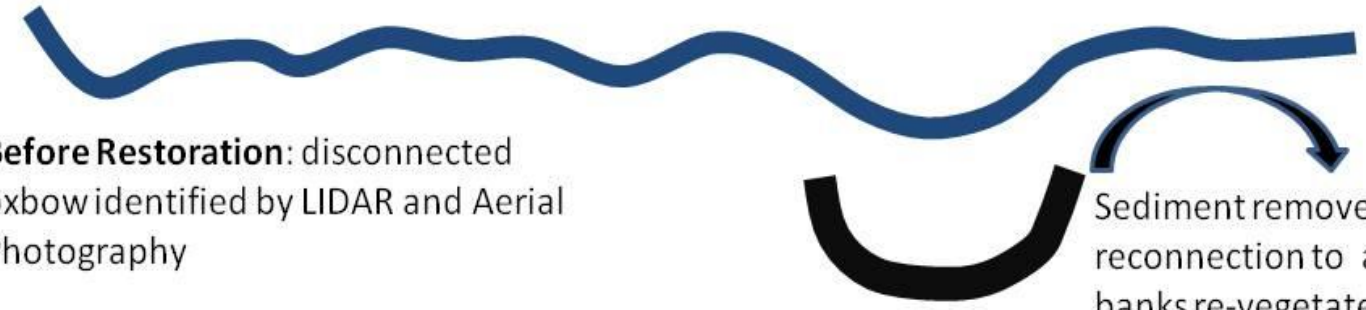
1950

1960s

1970s

1990

2011



Before Restoration: disconnected oxbow identified by LIDAR and Aerial Photography

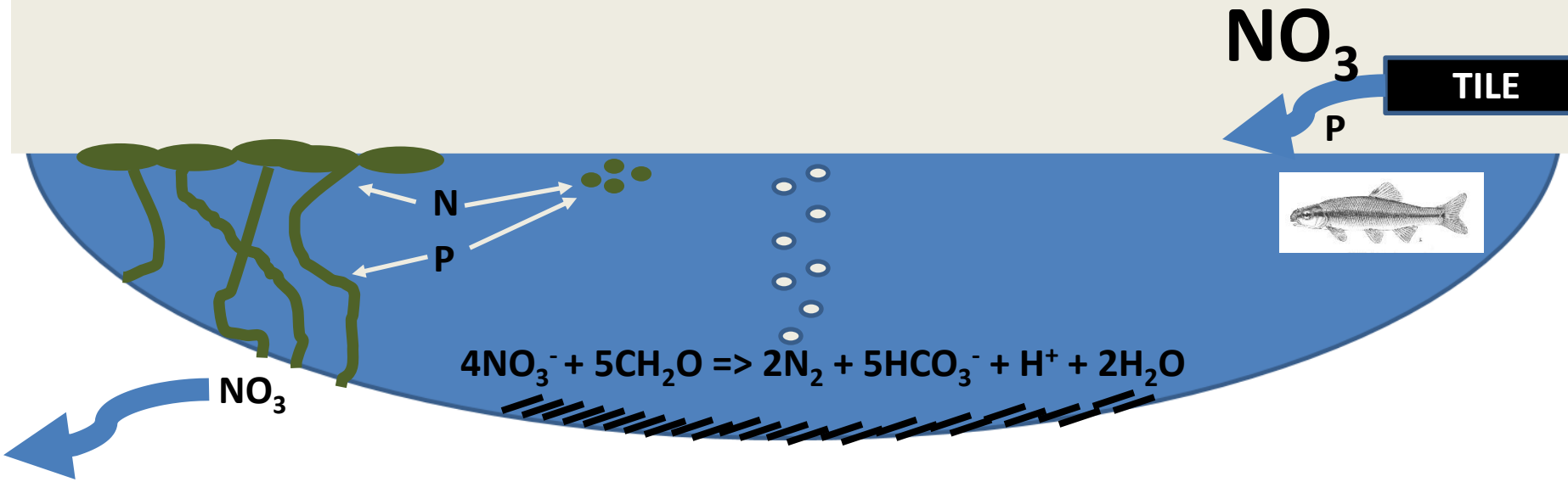
Sediment removed, reconnection to aquifer, banks re-vegetated

After Restoration: Stream at flood stage enables colonization of oxbow

After Restoration: Stream at normal flow

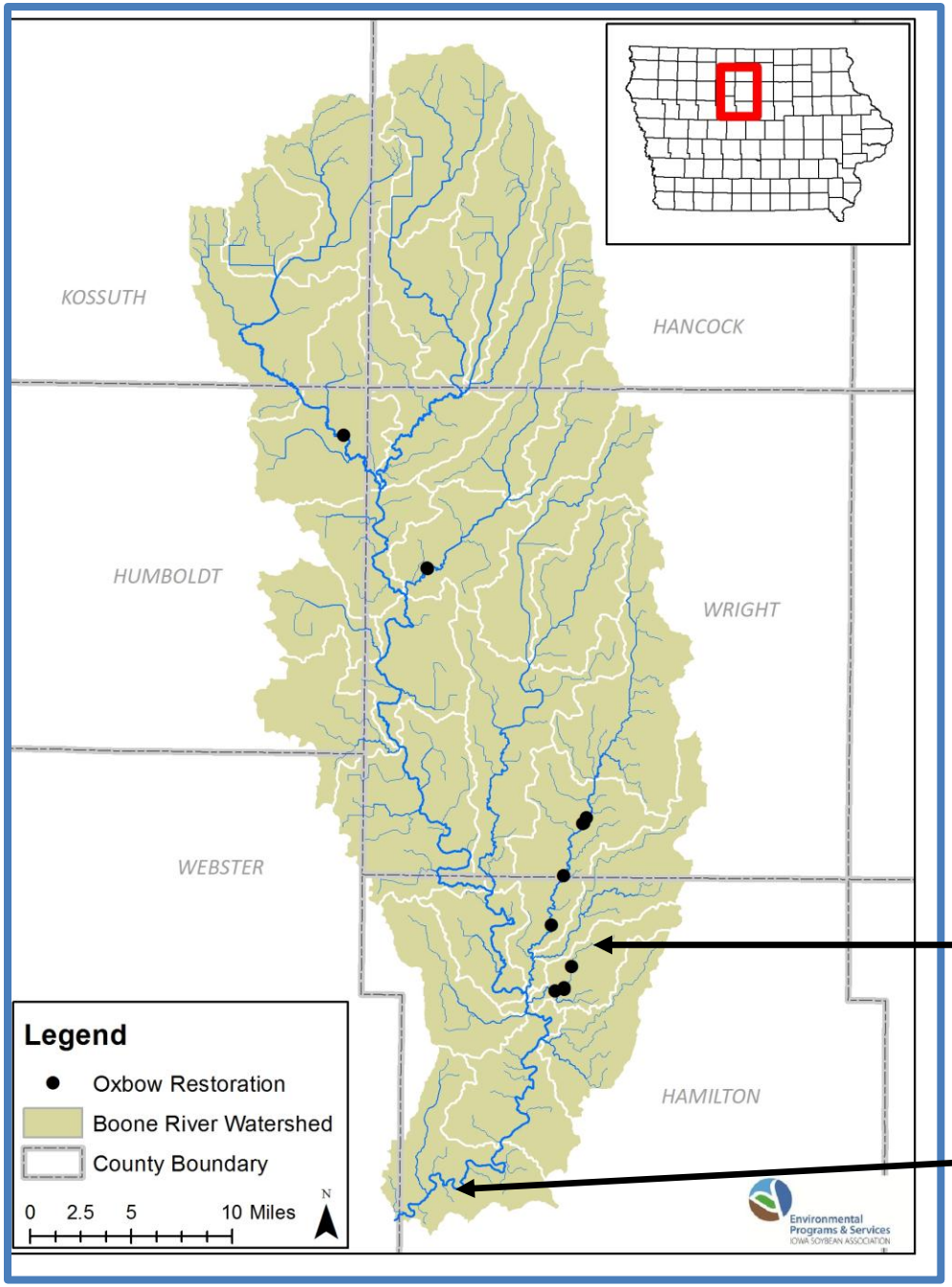
Topeka shiner thrives in off-channel habitat

Nutrient Processing



Nutrient Processing

Site	NO_3-N (mg/L)		
	Inlet	Oxbow	% Change
1	16.3	6.2	-62
2	8.8	4.8	-45
3	8.8	3.4	-61



14.7 mg/L N

10.4 mg/L N

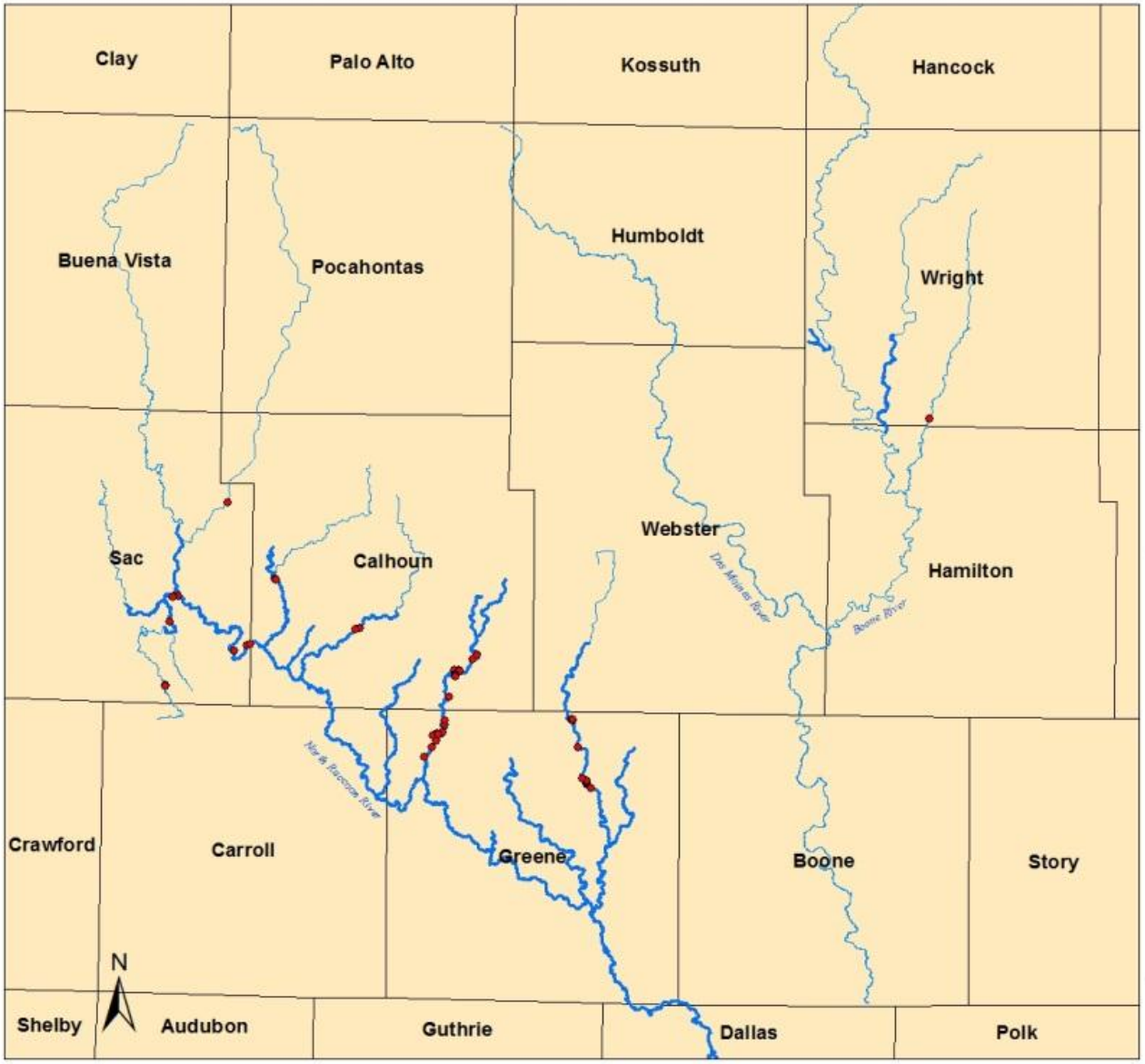

FOX
CREEK

Oxbows as Fish Habitat

USFWS Oxbow History

- In 2002 the first oxbow restorations in Iowa took place
  - 4 of them with Recovery funds left over from instream work
- Found out that Topeka shiners love them!
- Between 2002-2014 55 oxbows were restored in the N. Raccoon River watershed and starting in 2011, 11 were restored in the Boone River watershed

To Date 66 oxbows restored!



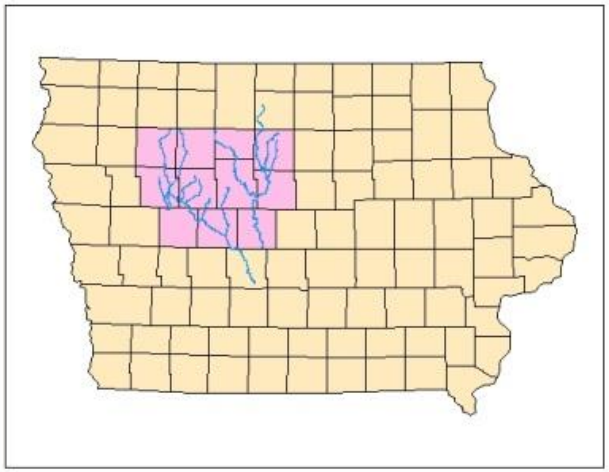
U.S. Fish and Wildlife Service
Partners for Fish & Wildlife

Topeka Shiner Oxbow Restorations

Legend

- Topeka_oxbows
- Critical_Habitat_2012

Map created 4-30-2012 by Aleshia Kenney/USFWS



0 2.5 5 10 15 20 Miles

Importance of oxbows, cutoffs and ponds

- Topeka shiners do not like fast moving water.
- During floods Topeka shiners and other fish leave the stream and enter the floodplain seeking sanctuary from high flow.
- Once the flood waters recede, the shiners settle into depressions in the landscape (in Iowa mostly oxbows) where they stay until the next flood allows them to return to the stream, or the oxbow dries up.

So What's the Problem?

- Pre-settlement, when Iowa was covered in prairies, the streams meandered a lot more, small bank full events were more frequent, and the oxbows connected with the stream a lot more frequently.
- There were also a lot more pools within the actual stream that served as habitat for Topeka shiners

connieherbergfineart.blogspot.com

But Today….

The Solution!

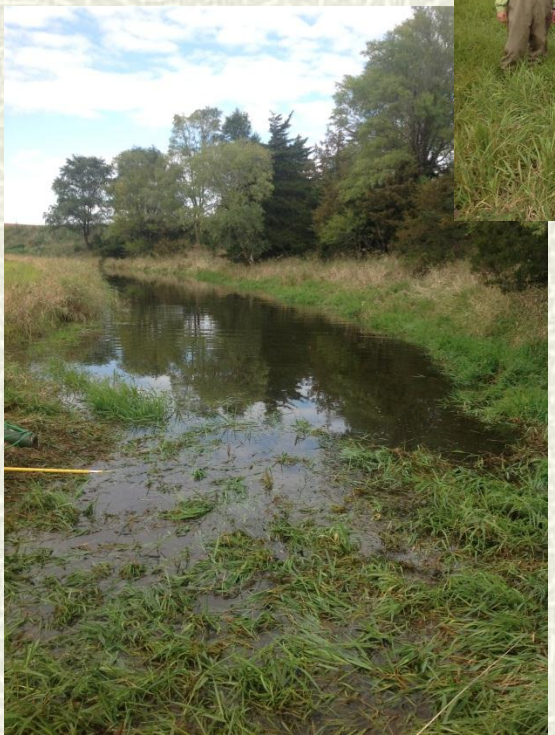
- Restore the off-channel habitat

Fisheries Results

- 43 species of fish collected in N. Raccoon River and Boone River oxbows
  - 1 Federally endangered species
    - Topeka shiner (just N. Raccoon so far)
  - 2 Iowa Species of Greatest Conservation Need
    - Blackside darter
    - Longnose gar
  - 11 Game fish
    - Largemouth bass
    - Bluegill
    - Northern rock bass
    - Yellow perch
    - Northern pike
    - Channel catfish
    - White crappie
    - Black crappie
    - Black bullhead
    - Yellow bullhead
    - Green sunfish

Oxbows as Fish Nurseries

- Up to 13,000 fish of 18 different species have been collected in one restored ½ acre oxbow
- In September 2014 found over 1,300 juvenile Topeka shiners in 2 restored oxbows on the same property!
  - 19 adult T.S.
  - 14 different species present
  - >10,000 fish per oxbow



2014 Overwinter Survival

- After 2 of the worst droughts in Iowa's history, they suffered one of the coldest winters on record
- Sampled 11 oxbows directly after ice off
  - All showed signs of a winter kill
  - 2 oxbows had complete winter kills – including intertebrates and amphibian
  - All others had survival of 2 - 8 species
  - 1 contained 4 juvenile Topeka shiners and very few fathead minnows

Multiple Benefits of Oxbow Restoration

- Multiple Aquatic Life Benefits
  - Fish, frogs, turtles, insects, waterfowl
- Flood Retention
- Water Quality
  - Diverting drainage tile into the oxbows
    - Doesn't hurt the fish, provides a water source, and reduces nitrates before the water goes back into the stream
- Recreation


QUESTIONS?