

The Missouri River

A River of Connections

A River of Change?

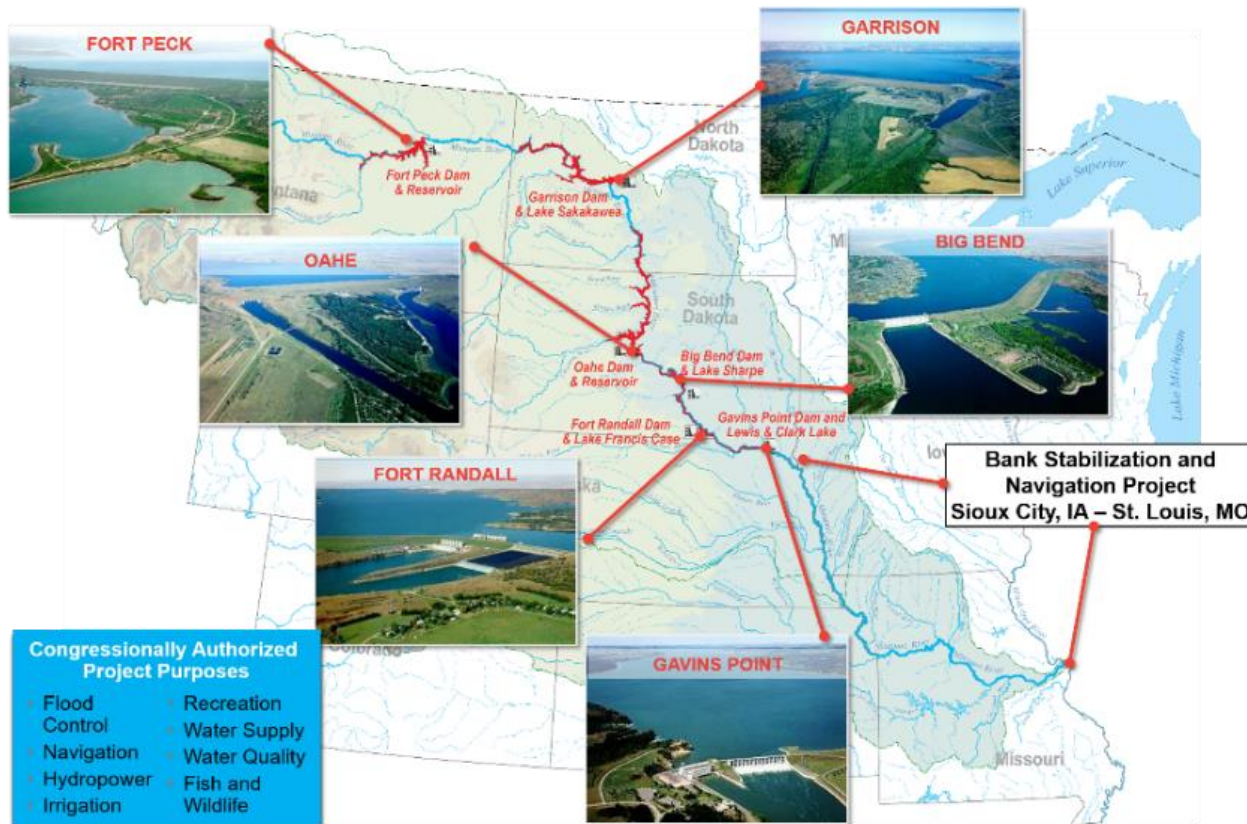
Wayne Nelson-Stastny
Missouri River Coordinator US Fish & Wildlife Service



The Missouri River Watershed



MISSOURI RIVER



- 529,350 square miles
- 2,341 miles long
- 10 states, 2 Canadian provinces
- **Highly diverse**
 - Geographically/geologically
 - Meteorologically/hydrologically
- **River of thirds**
 - 1/3 channelized
 - 1/3 impounded
 - 1/3 natural state
- 279,480 mi² regulated by mainstem projects
- 83,800 mi² regulated by tributary projects
- 165,070 mi² unregulated

A River of Change

"The Missouri River was located in the United States at last report. It cuts corners, runs around at night, lunches on levees, and swallows islands and small villages for dessert. Its perpetual dissatisfaction with its bed is the greatest peculiarity of the Missouri. Time after time it has gotten out of its bed in the middle of the night with no apparent provocation, and has hunted a new bed, all littered with forests, cornfields, brick houses, railroad ties, and telegraph poles. Later it has suddenly taken a fancy to its old bed, which by this time has been filled with suburban architecture, and back it has gone with a whoop and a rush as if it had found something worthwhile. It makes farming as fascinating as gambling. You never know whether you are going to harvest corn or catfish.

George Fitch, 1907

59-mile MNRR

James River

Vermillion River

Big Sioux River

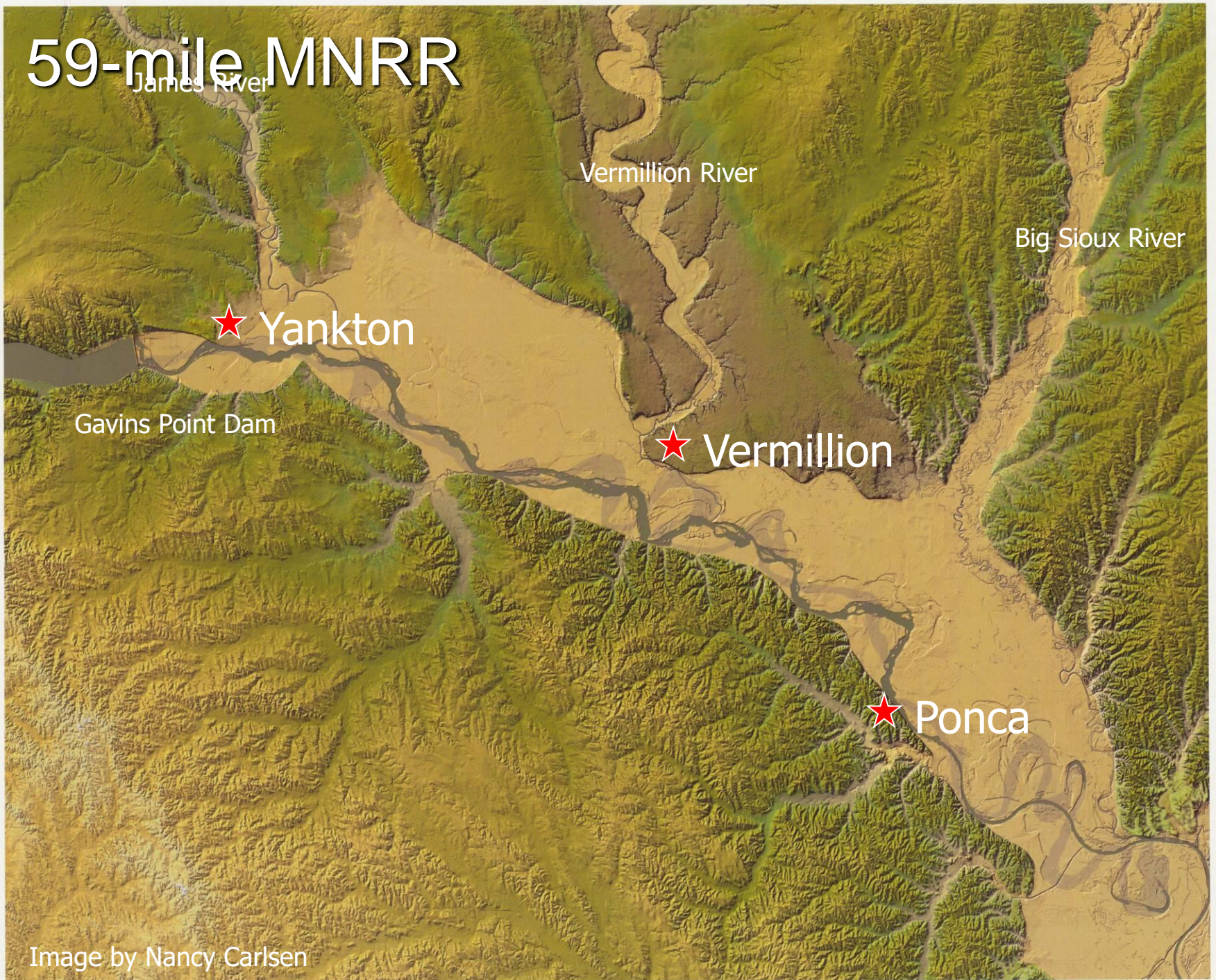
★ Yankton

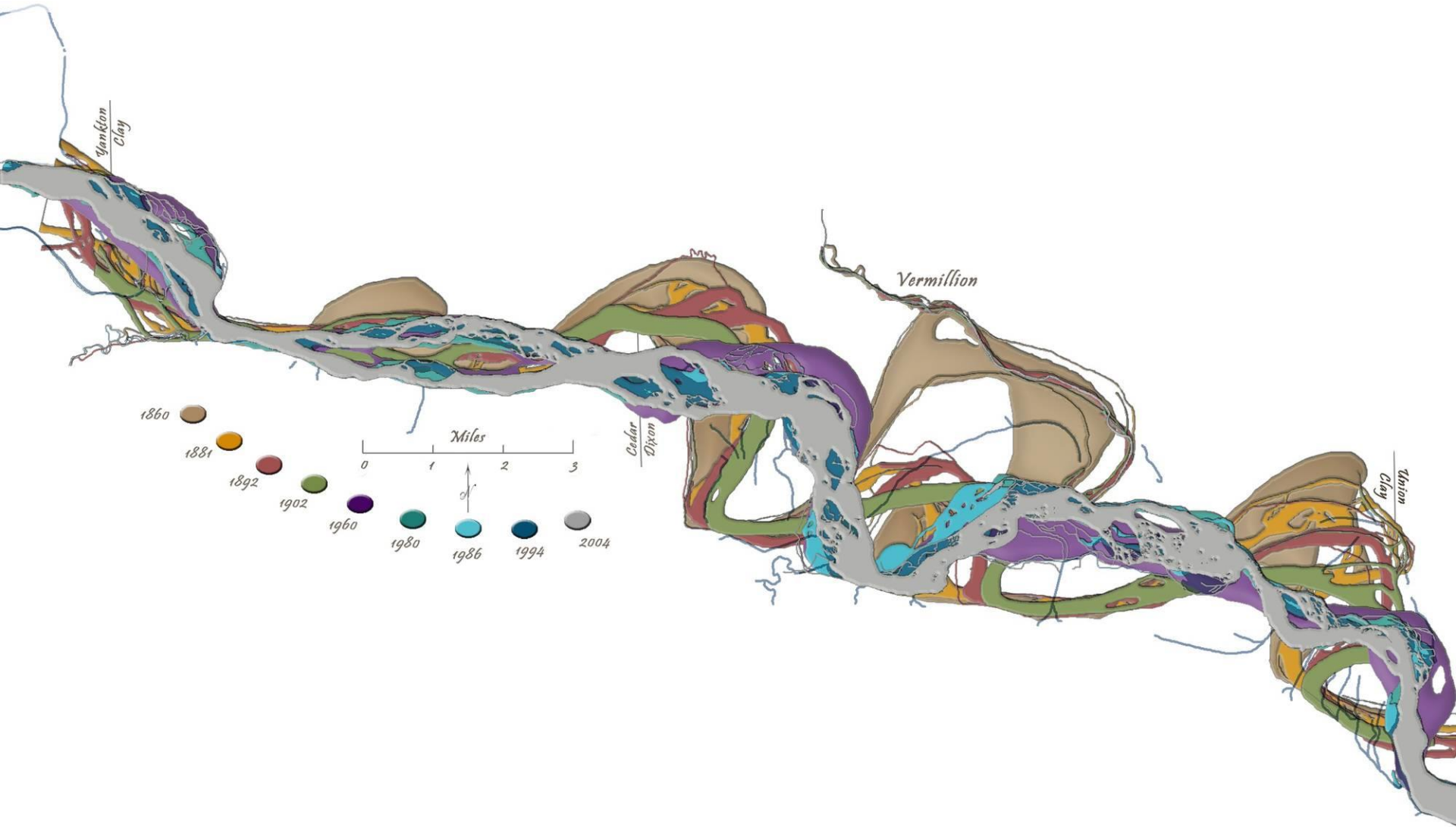
Gavins Point Dam

★ Vermillion

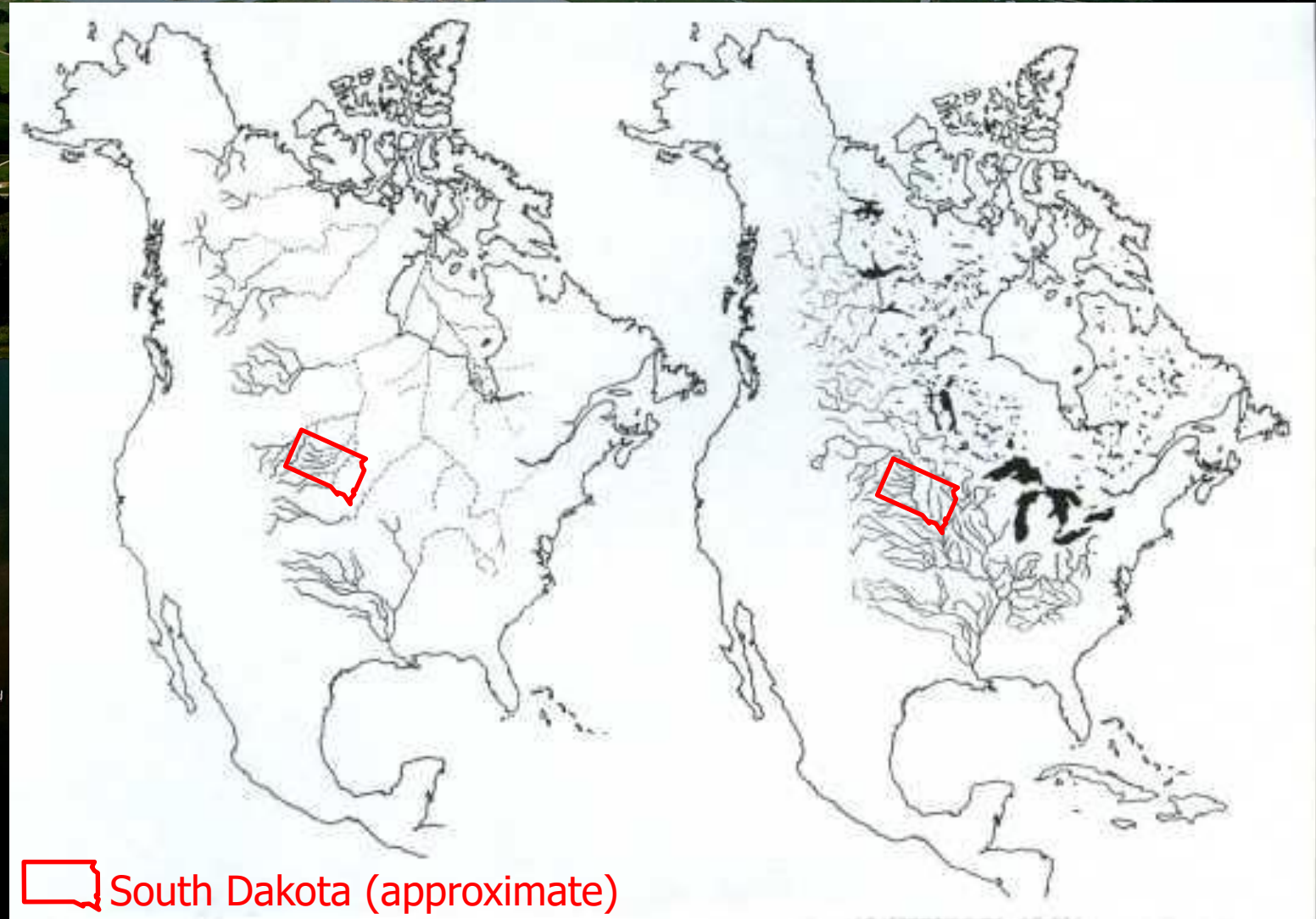
★ Ponca

Image by Nancy Carlsen





Pre- and postglacial drainage of North America



Lewis & Clark
1804-06



Commercial
Steamboat Travel
1829



Peak of
Steamboat
Era, **1869**



Rail Replaces
Steamboats
1902



Snag Removal
Begins, **1832**

Last COE Dam
1963



Channelization &
Bank Stab. begins,
1912

C&BS
Complete
~1980



Ft Peck Dam, COE
1937



Pick-Sloan Act
1944



Res. System
Operational,
Master Manual
1967



**Master Manual
Revision Begins**
1989



WRDA
Mitigation
Expanded
1999 Jeopardy BiOp
2000



Multiple Litigations
2000-?



Great
Midwest Floods
1993, 1995



Missouri River Euro-american Chronology

Least Tern
Endangered
1985



Piping Plover
Threatened

WRDA
Mitigation
1986

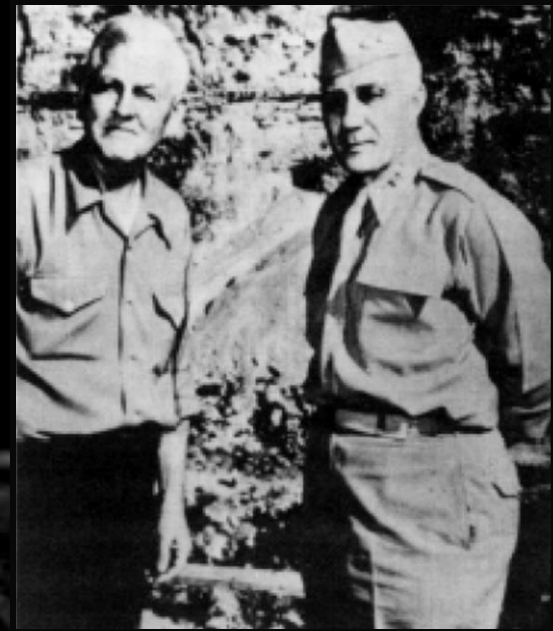


Pallid Sturgeon
Endangered
1990

Missouri River Euro-american Chronology

Driving forces behind the Pick-Sloan Plan

- **Irrigation, Flood Control, Navigation & other uses**
- Pick Plan - USACE
 - Flood Control
 - Navigation
- Sloan Plan - BR
 - Irrigation
 - Hydroelectric Power



Driving forces behind the Pick-Sloan Plan

- **Drought, Depression & Demographics**

- Post World War I – Cash crop and livestock prices fell below production costs
- Drought of the 1930's coincided with the fiscal distress

Effects on the Missouri River Basin

- Declines in Average land value and buildings/farm acre from 1930-1940
- Basin farm population decreased because of migration out of the region



Driving forces behind the Pick-Sloan Plan

- **World War II & Demographics**

- 300,000 civilians left the states of MT, WY, ND, SD, NE & KS for employment in war industries
- 322,200 residents of plain states were in the armed forces
- Demographers concluded that about 600,000 people would be seeking work or government assistance in Missouri Basin States
- Public works were advocated to solve anticipated problems of a post war economy



The projects would, "afford a practicable aid to millions of persons who will soon be returning victoriously from this war and to whom the Federal government plainly owes the obligation of post-war readjustment" Gov. Sharpe (SD) February 16, 1944

Driving forces behind the Pick-Sloan Plan

FLOODS

1942

1943

1944

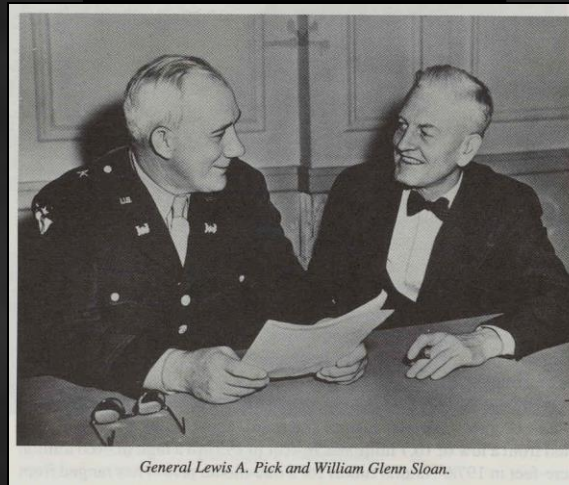
1943

- Nearly \$50 million in flood damages

1943 ~ Before the Committee on Flood Control, Rep. & chairman Will M. Whittington's opening statement to the lengthy and complex legislation keyed the Missouri, "During the past 3 months there have been excessive floods along the Missouri River and the Missouri River System..."



Sloan Plan
Irrigation
Hydropower



General Lewis A. Pick and William Glenn Sloan.

Pick Plan
Flood Control
Navigation

The Pick-Sloan Plan

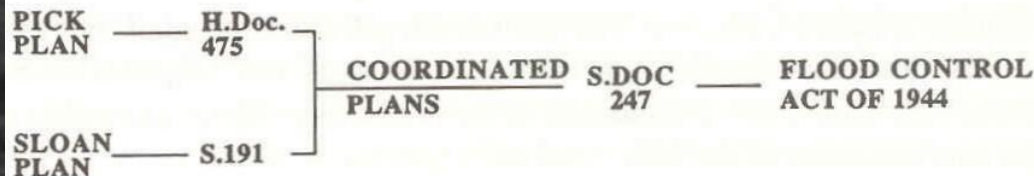
Drivers

- Flood Control
- Jobs for Returning Soldiers
- Irrigation, Navigation and Other Uses

Crisis - Despite diverse objective, special interest groups were united by their common fears.

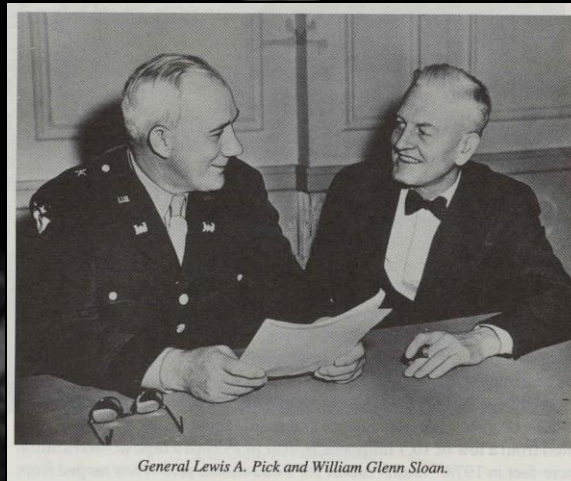
Control – Sloan and Pick or MVA

COORDINATED PICK AND SLOAN PLANS INTO FLOOD CONTROL ACT OF 1944



“The question is whether the legitimate offspring of two programs which matured in contrasting climates, wet and dry, have proved to be adapted to the peculiar climate of the Missouri basin.. The question is whether the ten-year olds show promise of growing to maturity and doing a man's work.”

Mr. W. Glenn Sloan in his final report to the Missouri Basin Inter-Agency Committee before his retirement



General Lewis A. Pick and William Glenn Sloan.

The Pick-Sloan Plan

Outdoor Life

December 1944

Watch Those Dam Builders!

for flood control, irrigation, hydroelectric development, and navigation, carrying with it an appropriation of 200 million dollars with which to make a start on a job which probably will cost taxpayers 3½ billions.

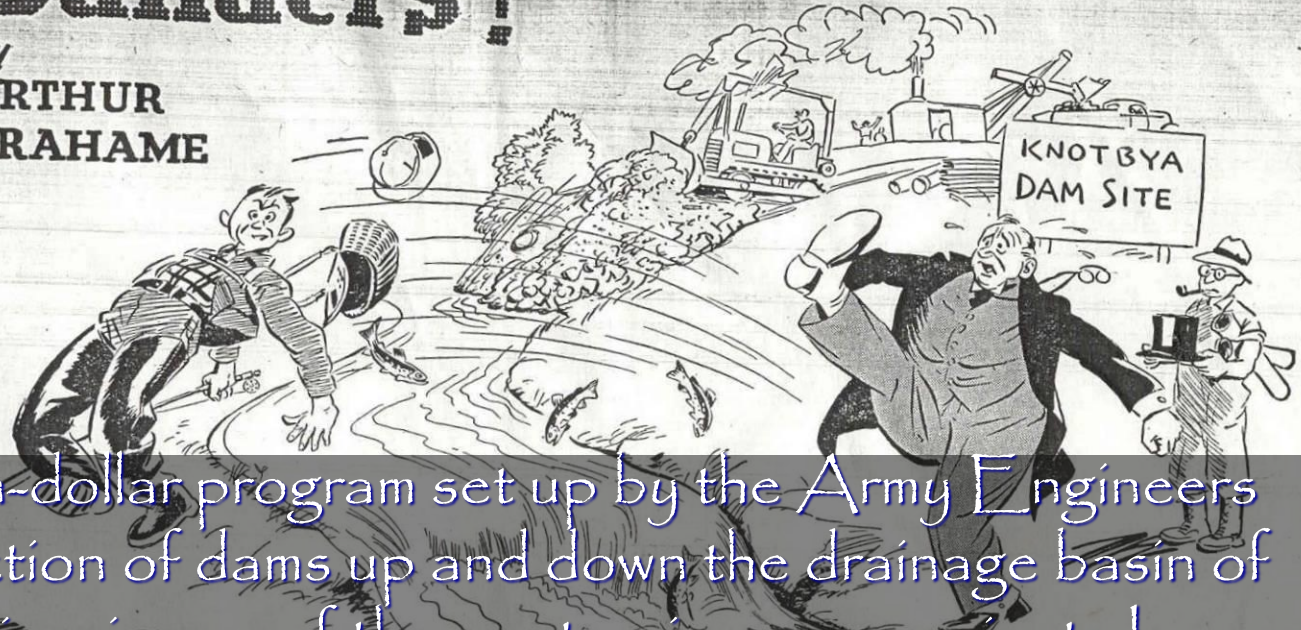
J. N. ("Ding") Darling, resident of the Missouri Valley, former chief of the Bureau of Biological Survey (now the Fish and Wildlife Service) and as widely known as an ardent but level-headed conservationist as he is as an outstanding political cartoonist, says of this titanic scheme:

"The 3½-billion-dollar program set up by the Army Engineers for the construction of dams up and down the drainage basin of the Missouri River is one of the most poisonous projects I can think of in the category of alleged conservation. That program has been devised without the slightest attention to biological consequences. On the face of it, the average citizen living in the Missouri River drainage basin will think of dams and artificial lakes created by the dams as more water for ducks and fish, but to skilled and experienced workers in fish and game restoration these dams have little merit either as flood-control or power projects for which they are purported to be designed, and their other consequences will be 99 percent destructive."

The Interior Department's Bureau of Reclamation has presented a rival plan for carrying out the same development, and the same arguments have been made to

Builders!

ARTHUR
RAHAME



The 3½-billion-dollar program set up by the Army Engineers for the construction of dams up and down the drainage basin of the Missouri River is one of the most poisonous projects I can think of in the category of alleged conservation. That program has been devised without the slightest attention to biological consequences.

WHY CARES GOD FOR YOUR FISH-WE HAVE A BIG JOB TO DO!"

J. N. ("Ding") Darling, 1944



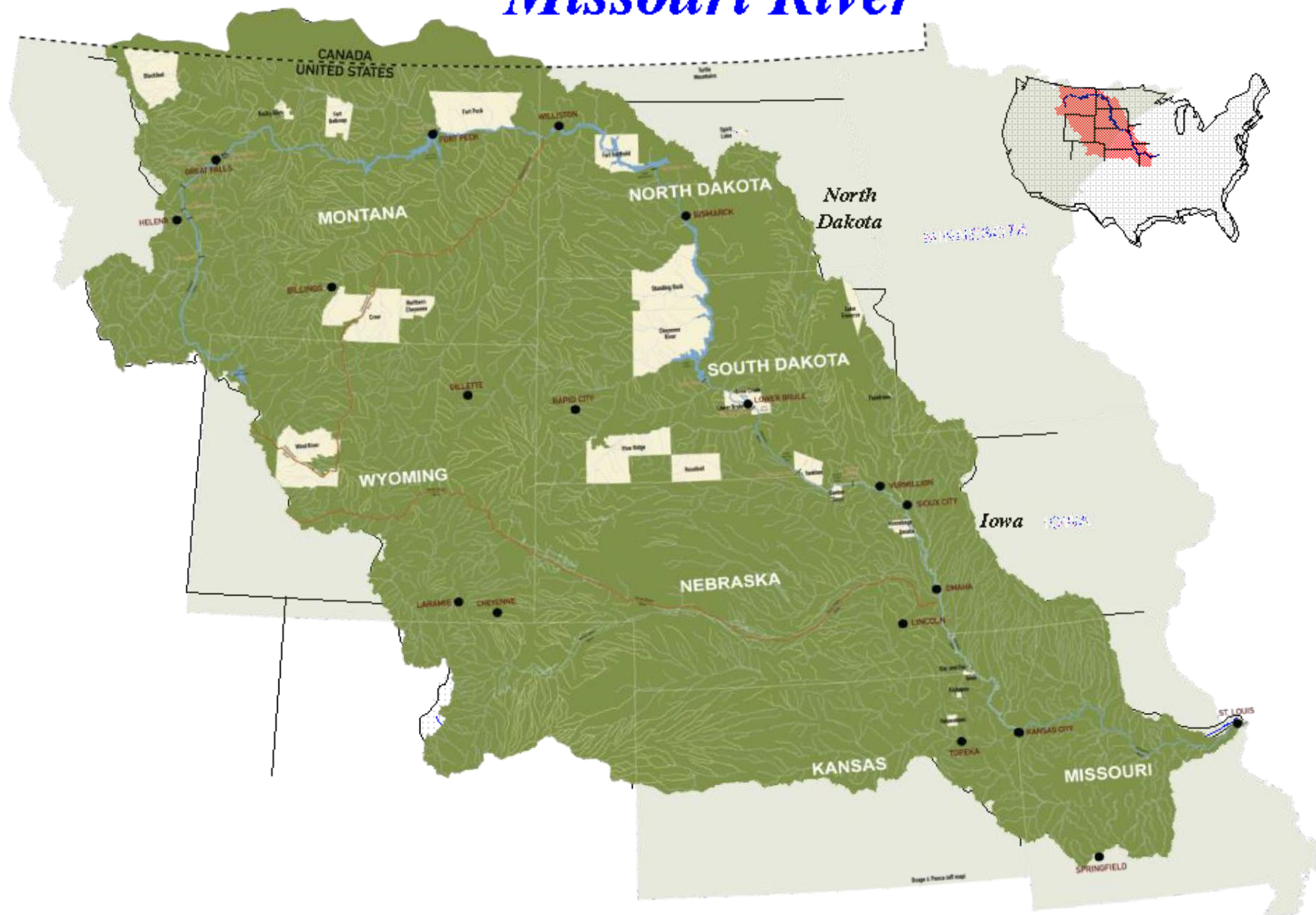
Hidatsa Mandan Arikara Earth Lodges

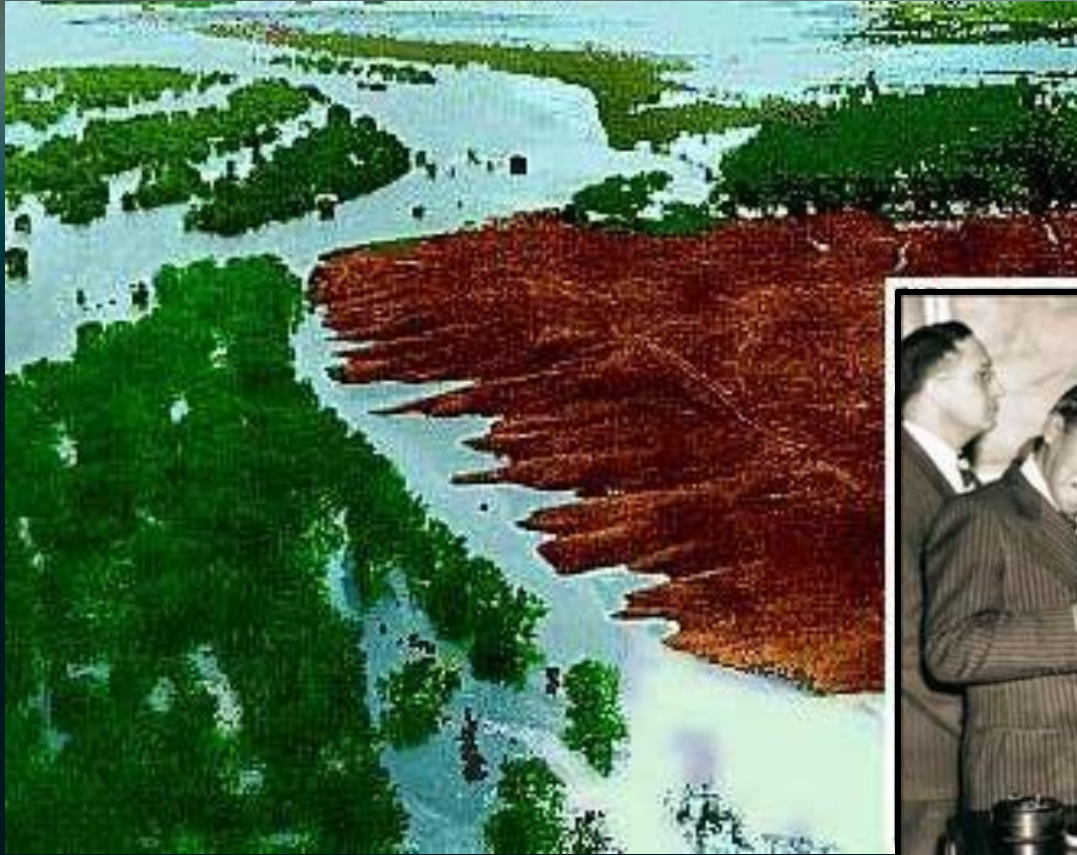


Along the upper Missouri, and its tributaries, ... lived the people who farmed the river valleys, hunted the windy plains, and made great earth-covered lodges surrounding a sacred dancing plaza at the center, in the valleys.

George Catlin painted this Hidatsa village in 1832.

Missouri River





George Gillette, Council chairman of the Three Affiliated Tribes -- Hidatsa Arikara, Mandan -- weeps as the US Secretary of the Interior signs the 1948 papers confirming the forced sale of 155,000 acres of the Fort Berthold reservation to flood them by the Garrison Dam and Reservoir.



Five Mainstem Dams

- Destroyed 550 Square Miles of Tribal Land in ND and SD
- Dislocated 900 Indian Families

Dani Sue Deane testified: "I would like to address the things that cannot be measured statistically by the taking. A self-sufficient supporting society changed radically. The economic heartland was taken away, leaving deeper poverty, social dysfunction, further complicated by separating the communities. This separation caused a breakdown of families, clan culture, tribal government, and left many feeling totally defeated. "

Municipal Water Supplies Impacted

Fort Yates without water -
November 2003



- Taste and odor problems
- Increased pumping costs
- Intake relocations

A New Day






DOI Secretary Deb Haaland – 2021 & DOI Agency Representatives

River of Thirds

Congressionally Authorized Project Purposes

Flood Control
Navigation
Hydropower
Irrigation
Recreation
Water Supply
Water Quality
Fish and Wildlife

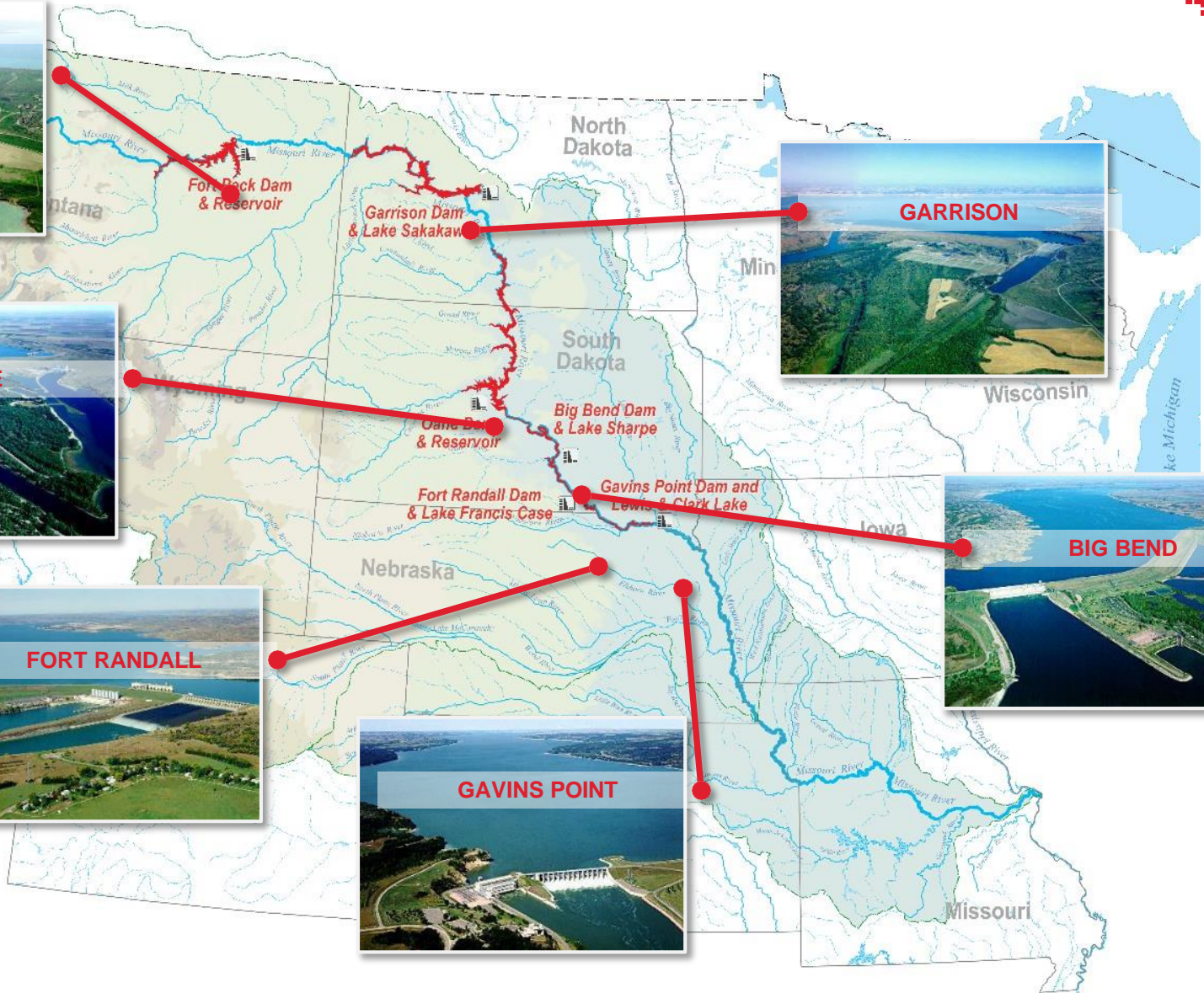
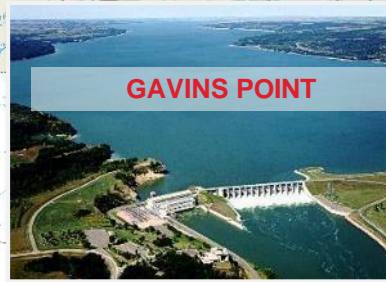
-  Channelized
-  Inter-Reservoir
-  Reservoir



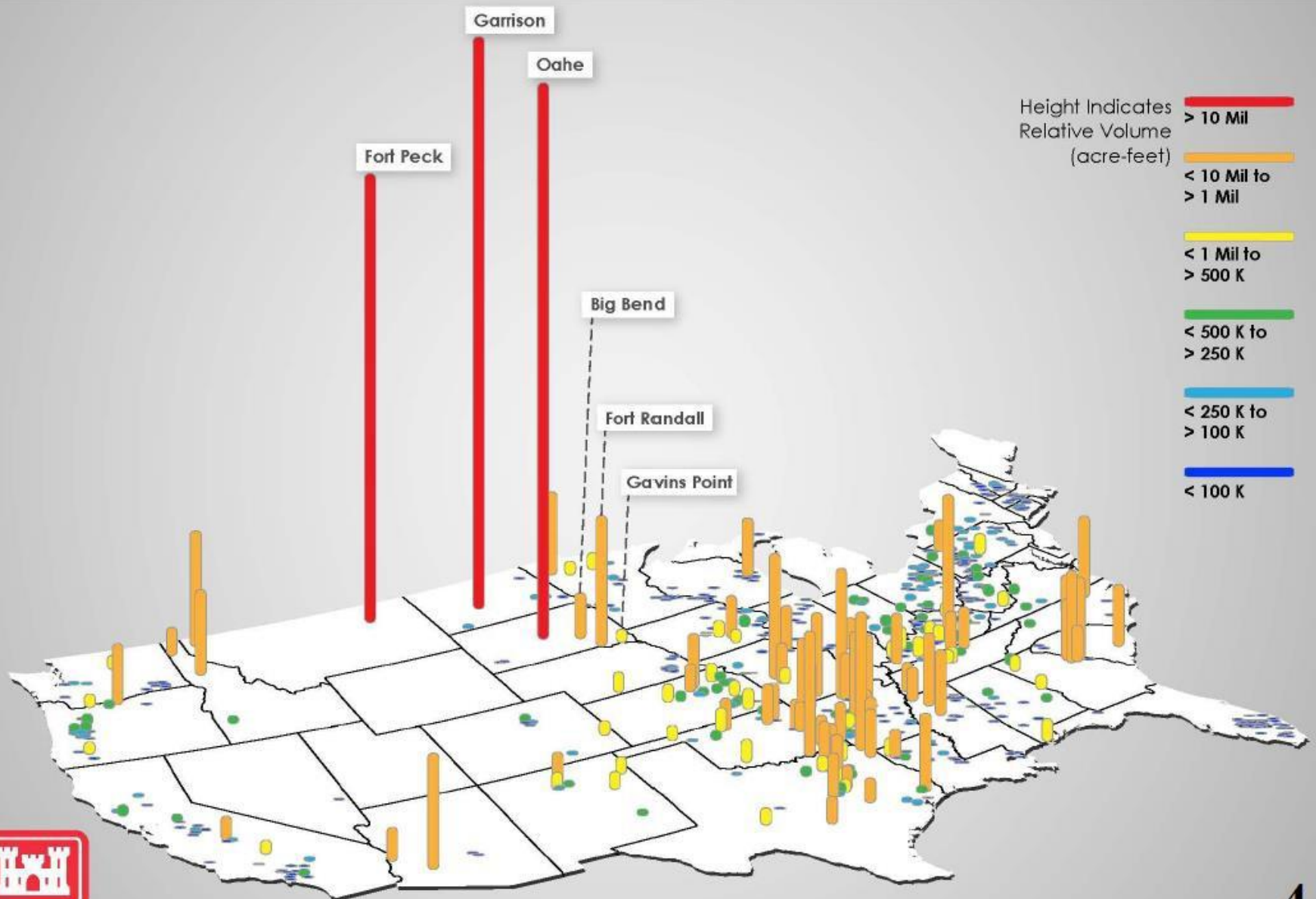


MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

2



Storage Capacity of Corps Reservoirs



US Army Corps of Engineers
BUILDING STRONG

USACE MISSION

REGULATE MISSOURI RIVER MAINSTEM RESERVOIRS

- **Priority:** Life and Safety
- **Operational Decisions:** Driven by Annual Runoff Conditions
Water captured in System flood control storage zones each year must be evacuated prior to the start of the following year's runoff season.
- **Master Manual:** Storage and release decisions designed significantly around **Flood Control**, **Navigation & Water Supply** purposes
- **Authorized Purposes:**



Flood Control



Navigation



Hydropower



Water Supply



Fish & Wildlife



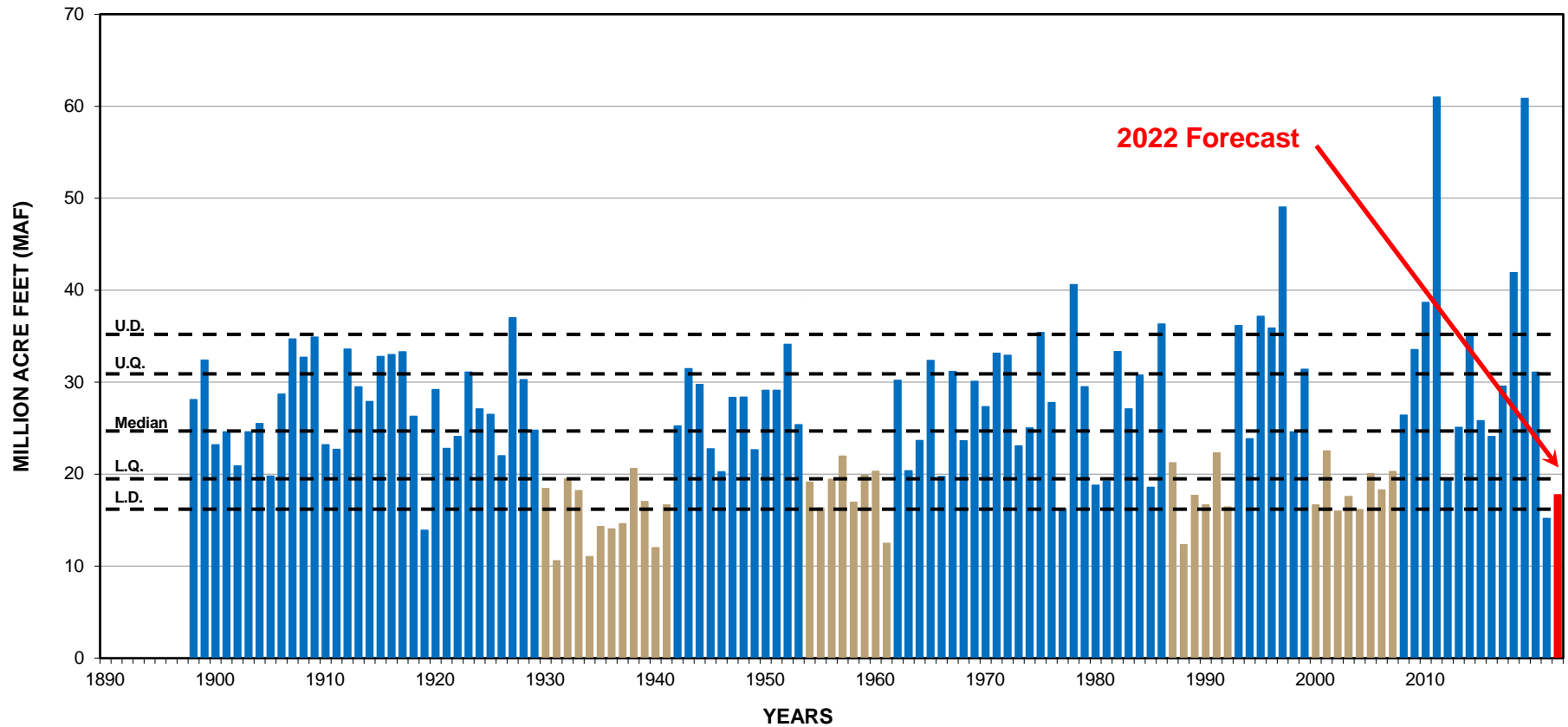
Irrigation


Water Quality
Control

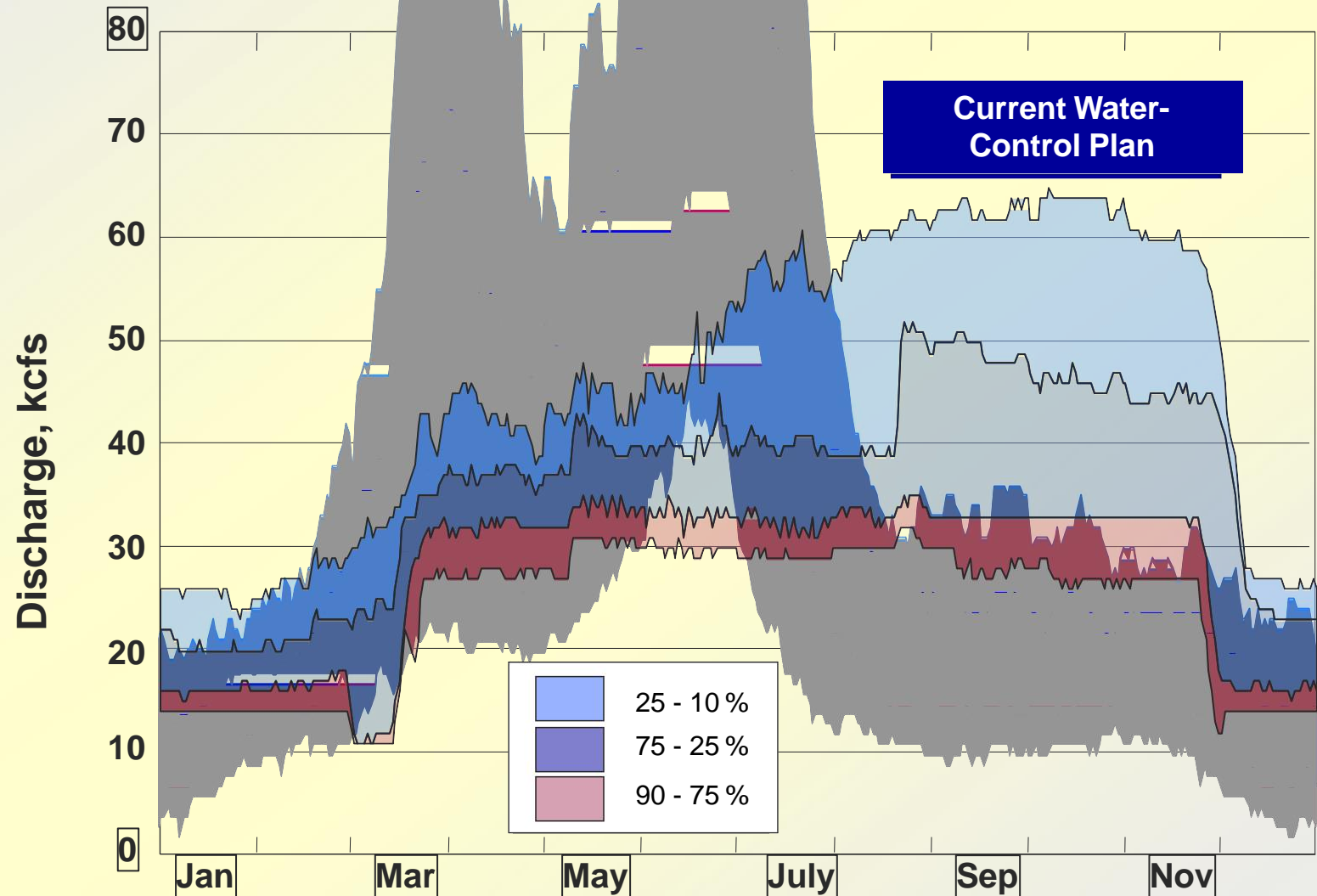
Recreation
n



ANNUAL RUNOFF ABOVE SIOUX CITY, IA



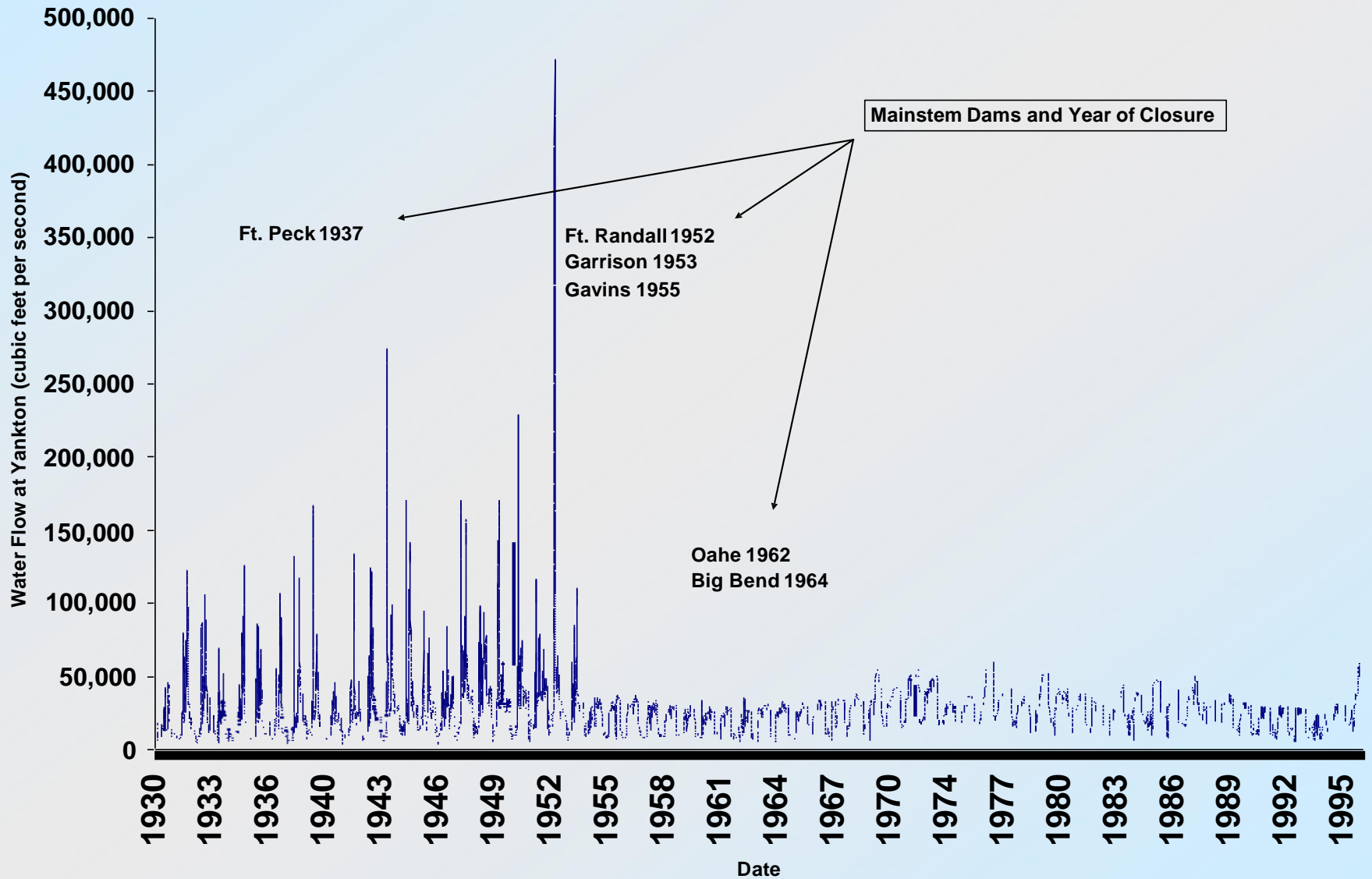
Hydrologic Alteration, Sioux City, IA



The Heart Beat of a River...Lost

Missouri River Flow at Yankton, SD

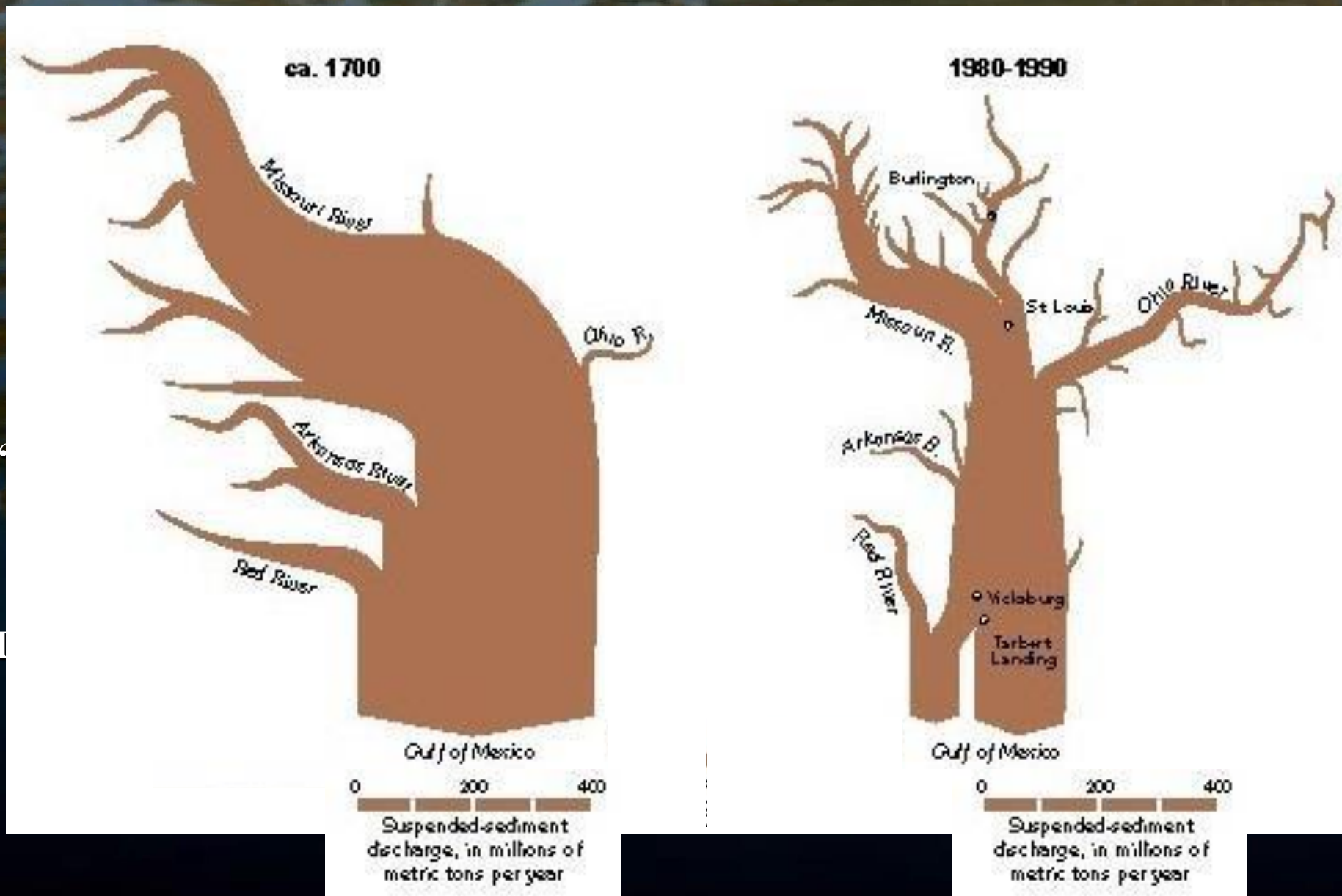
1930 - 1995



Reservoirs



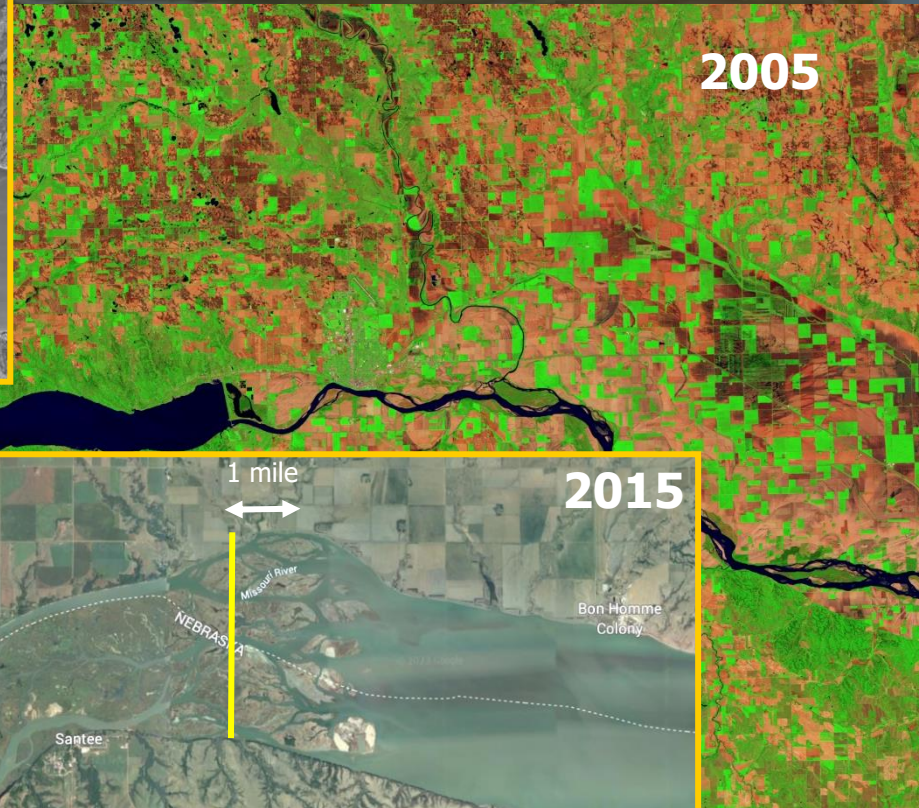
We Need to Think Globally



Springfield - 2005



Lewis and Clark Lake Delta



© 1999 J.N. "Ding" Darling Foundation

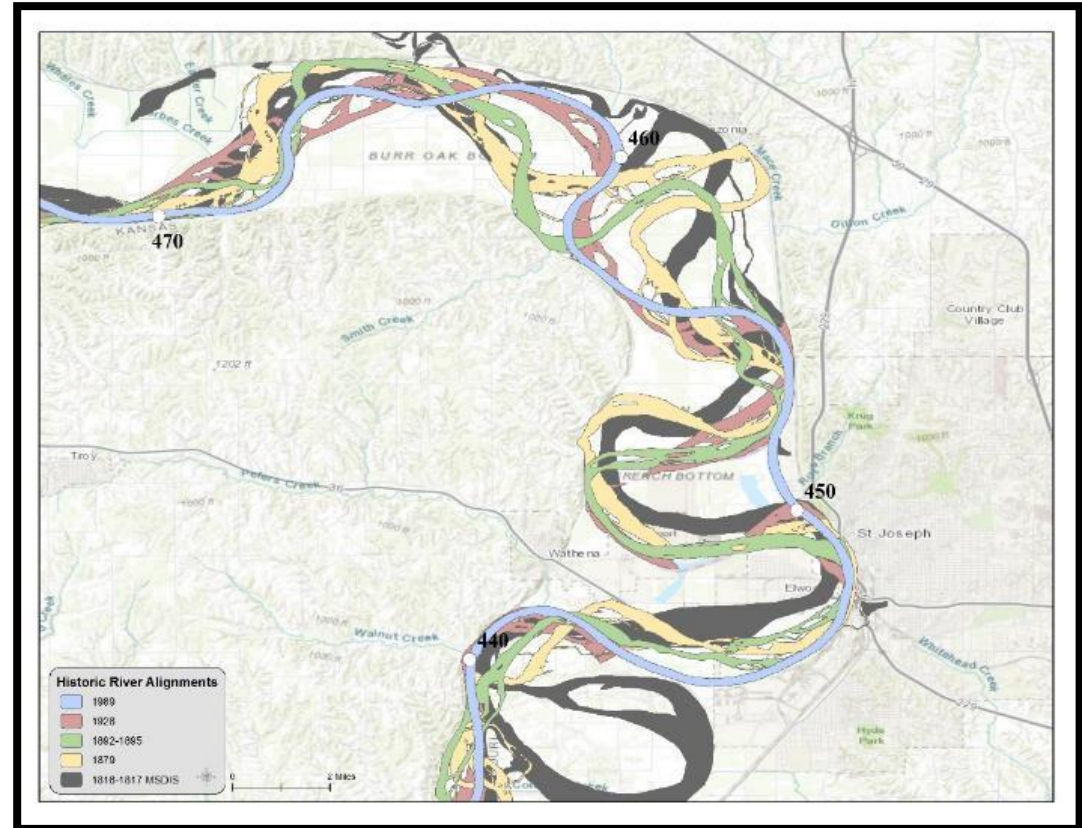


River of Thirds



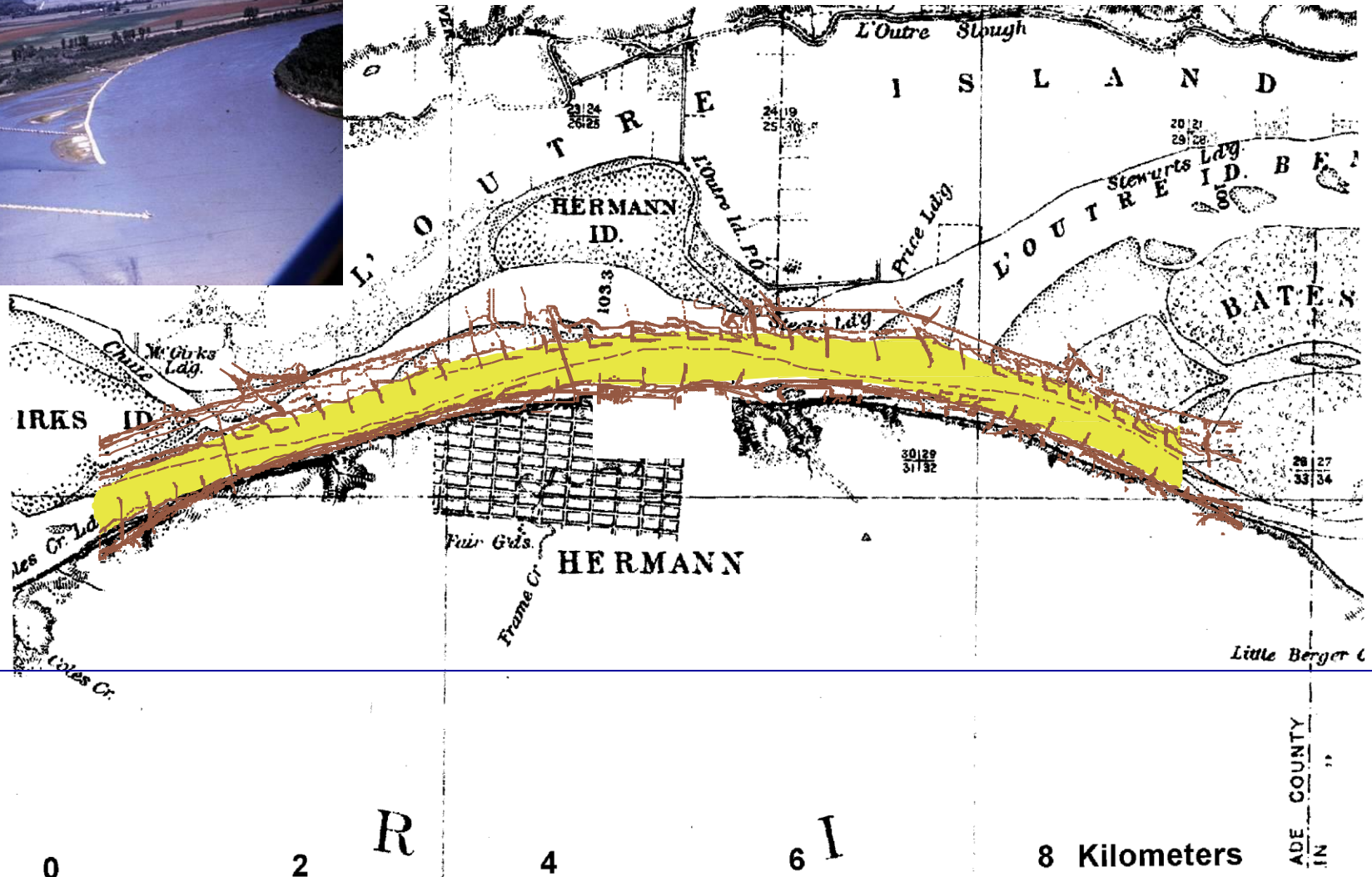
MISSOURI RIVER BEFORE CORPS PROJECTS

- Missouri River is a sand bed river that historically changed locations on the floodplain frequently
- The Mainstem Reservoir System captures floodwaters and provides reliable flows for navigation and other purposes
- The Band Stabilization/Navigation Project (BSNP) structures keep the main river channel stationary to create a self scouring navigation channel; also allowed levee construction

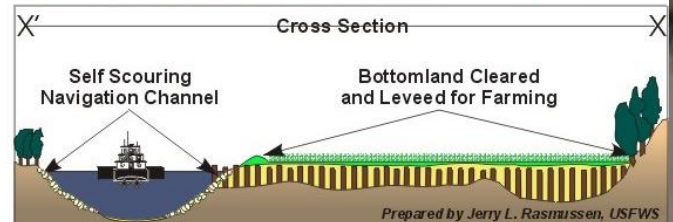
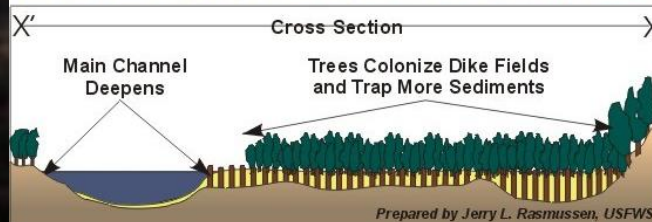
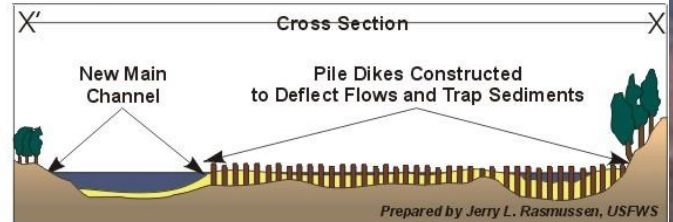
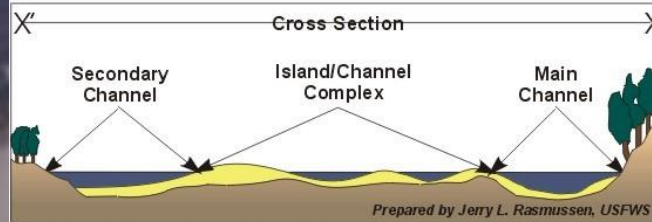


Lower Missouri River at Hermann, Missouri

Missouri River Commission Maps - 1894



Bank Stabilization and Navigation Project





Identified Natural Resource Concerns

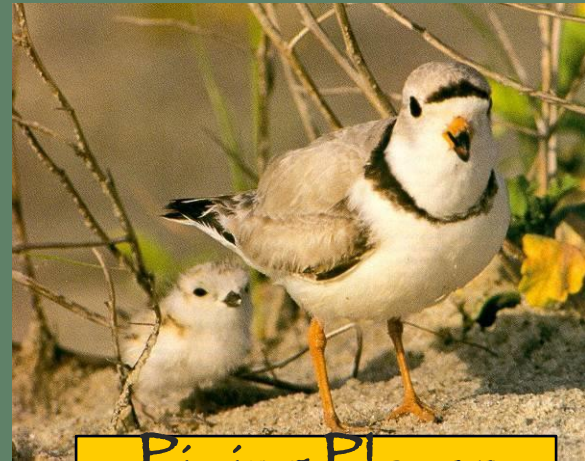
2002 National Research Council findings:

- Nearly 3 million acres of natural habitat altered
- Nonnative fish dominate many river reaches
- 51 of 67 native fish species listed as rare or decreasing
- Native fish food resources reduced by about 70%

Threatened and Endangered Species



Interior Least Tern



Piping Plover



Pallid Sturgeon



US Army Corps
of Engineers



Achelous and Hercules
1947

tempera and oil on canvas

Thomas Hart Benton
born Neosho, MO 1889–
died Kansas City, MO 1975

Intense colors and writhing forms evoke the contest of muscle and will between Hercules and Achelous, the Greek god who ruled over the rivers. In flood season, Achelous took on the form of an angry bull, tearing new channels through the earth with his horns. Hercules defeated him by tearing off one horn, which became Nature's cornucopia, or horn of plenty. Thomas Hart Benton saw the legend as a parable of his beloved Midwest. The Army Corps of Engineers had begun efforts to control the Missouri River, and Benton imagined a future when the waterway was tamed and the earth swelled with robust harvests.



One River - One Vision

Preparing For The Future

EARLY DIRECTIVES

Economic Development

- Dam & Levee Construction
- Navigation Channel Construction

EVOLUTION OF RECENT DIRECTIVES

① Mitigation

~32% Habitat
Lost to BSNP

② Recovery
3 Federally
Listed
Species

③ Restoration
Systems
Native Species



MISSOURI RIVER RECOVERY PROGRAM UPDATE

Briefing of Missouri River Biological Opinion Requirements



"The views, opinions and findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."



**US Army Corps
of Engineers®**





BOTTOM LINE

1. **No Jeopardy** Biological Opinion received in 2018 (previous BiOp (2003) Jeopardy Opinion with RPA).
2. Failure to meet requirement of the No Jeopardy BiOp will result in a need for a new plan, potentially resulting in actions which are more controversial, expensive, and challenging to implement
3. Current BA commitments/BiOp requirements developed in conjunction with Missouri River stakeholders and implementation of the requirements occurs in close collaboration with stakeholders (especially the Missouri River Recovery Implementation Committee)

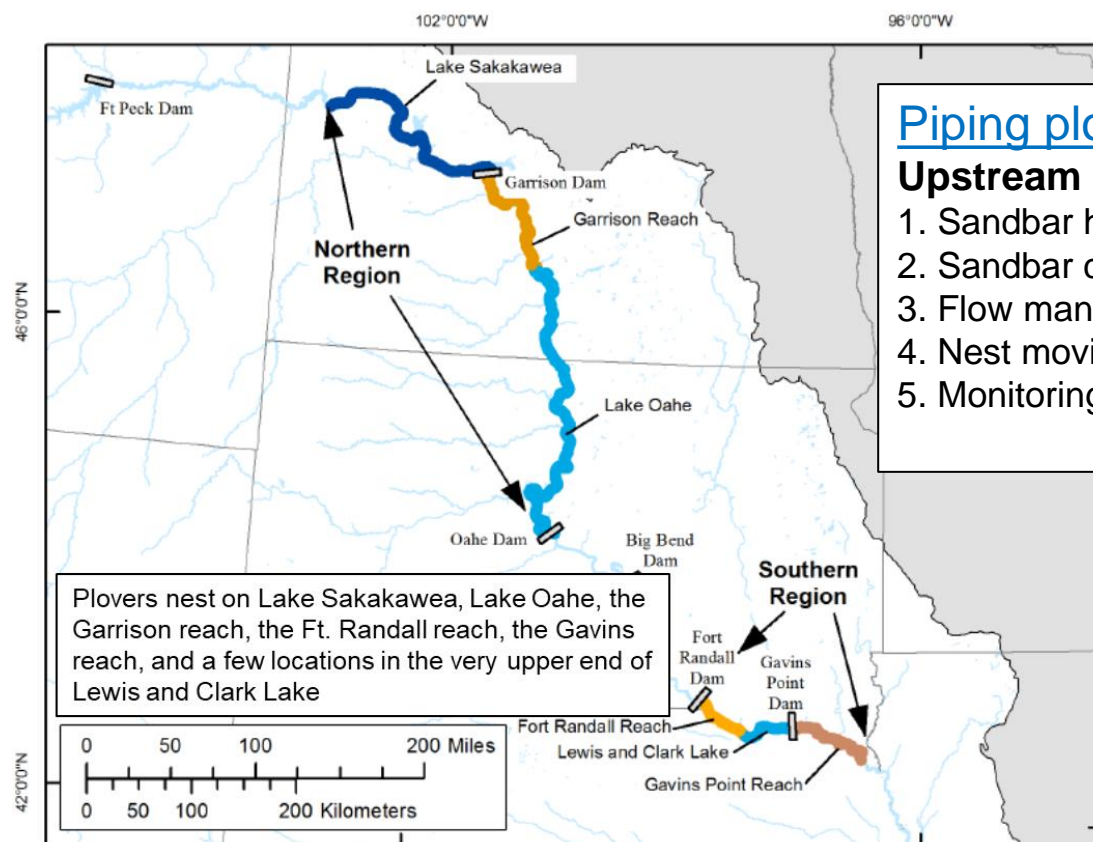


PROGRAM OVERVIEW: WHY DO WE HAVE THE MISSOURI RIVER RECOVERY PROGRAM (MRRP)?

- **Allows USACE to meet environmental compliance requirements to operate and maintain the Missouri River Mainstem Reservoir System and the Bank Stabilization and Navigation Project (BSNP) for their authorized purposes**
- **Three components of MRRP**
 1. ESA Compliance – Actions to comply with the “No Jeopardy” 2018 Biological Opinion (BiOp) and associated EIS & Record of Decision (Missouri River Recovery Management Plan)
 2. Fish and Wildlife Mitigation – BSNP Fish and Wildlife Mitigation Project
 3. Missouri River Recovery Implementation Committee (MRRIC) – WRDA 2007
 - USACE - coordinated Stakeholder Committee (FACA Exempt)
 - Represents States, Tribal Governments, User Groups, etc...
 - Critical in developing 2018 Management Plan EIS & associated Proposed Action for ESA compliance



LEGAL REQUIREMENTS- LOCATION



Piping plover

Upstream of the BSNP in two regions

1. Sandbar habitat management
2. Sandbar construction when needed
3. Flow management to reduce Incidental Take
4. Nest moving, signing, predator management
5. Monitoring

Source: U.S.G.S. digital basemap data
Universal Transverse Mercator, Zone 15

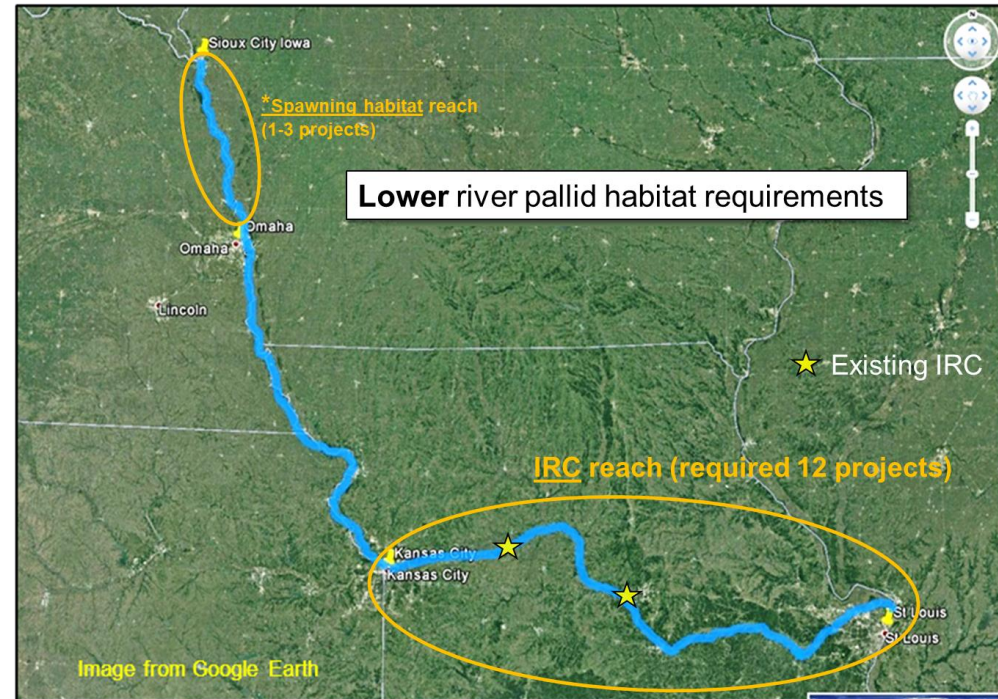
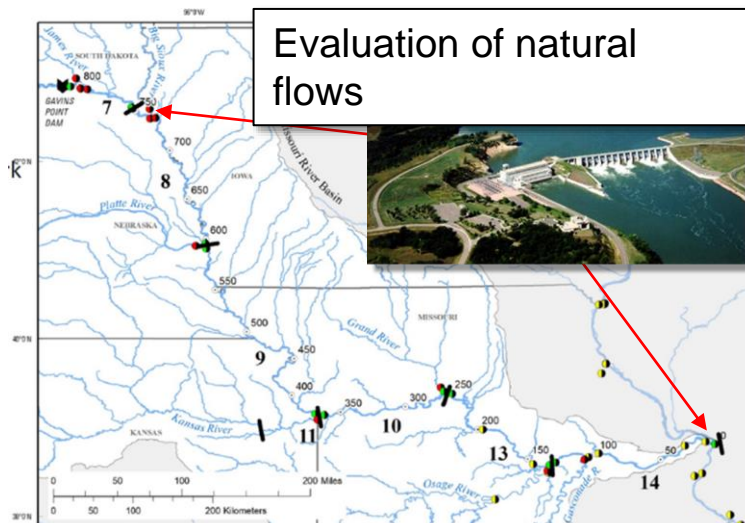
LEGAL REQUIREMENTS - LOCATION



PALLID STURGEON

Lower river

1. Interception and rearing complexes
2. Spawning habitat (*on hold*)
3. Evaluation of natural flows
4. Pallid sturgeon propagation and stocking
5. Monitoring



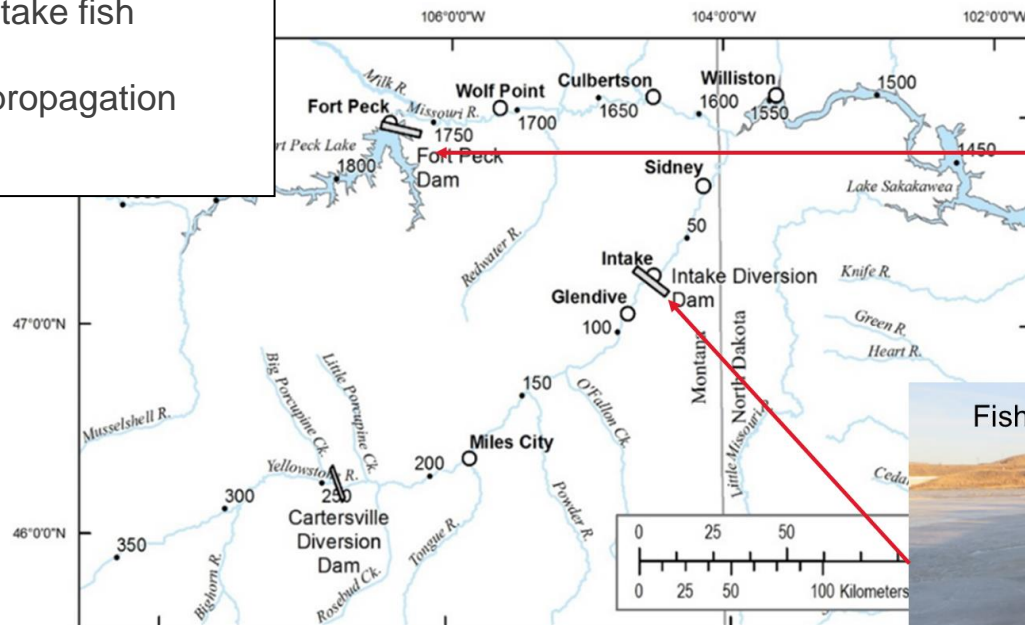


LEGAL REQUIREMENTS- LOCATION

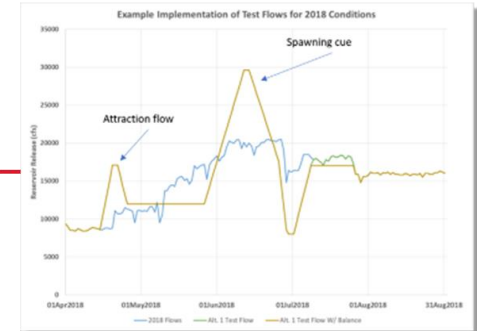
PALLID STURGEON

Upper river

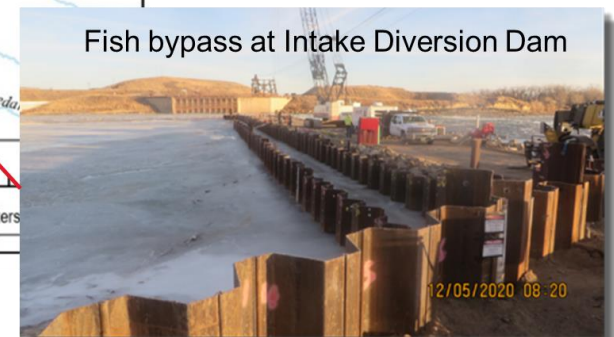
1. Ft. Peck test flows
2. Completion of Intake fish bypass
3. Pallid sturgeon propagation
4. Monitoring

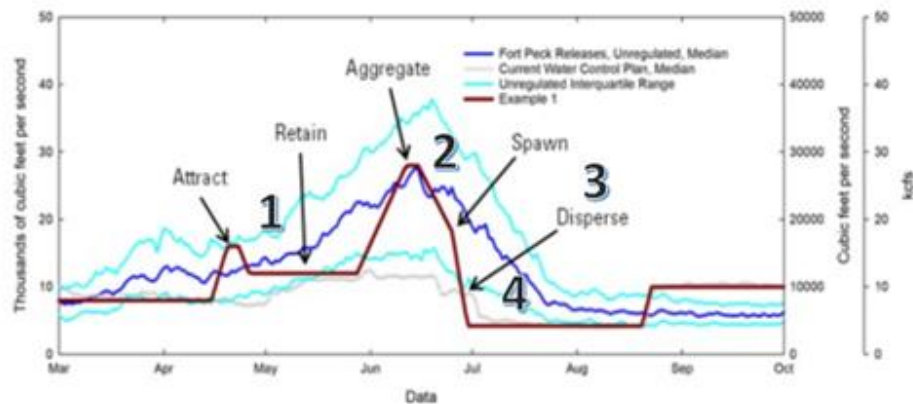


Evaluation of Ft. Peck test flows

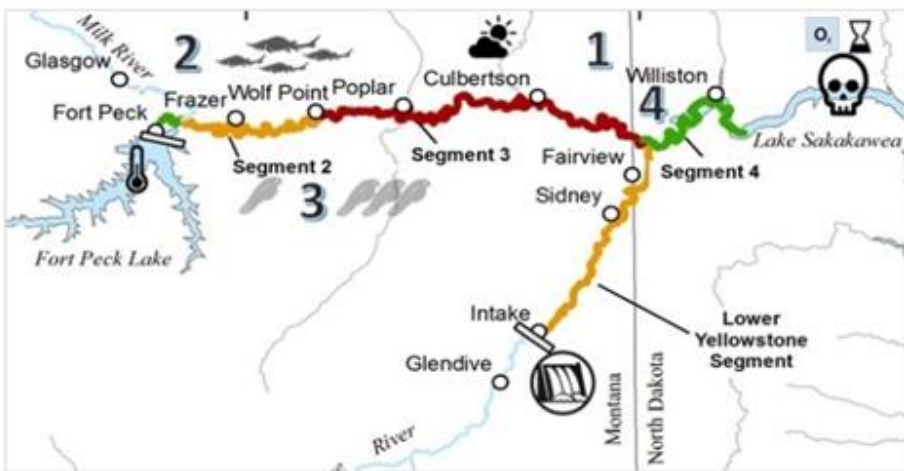
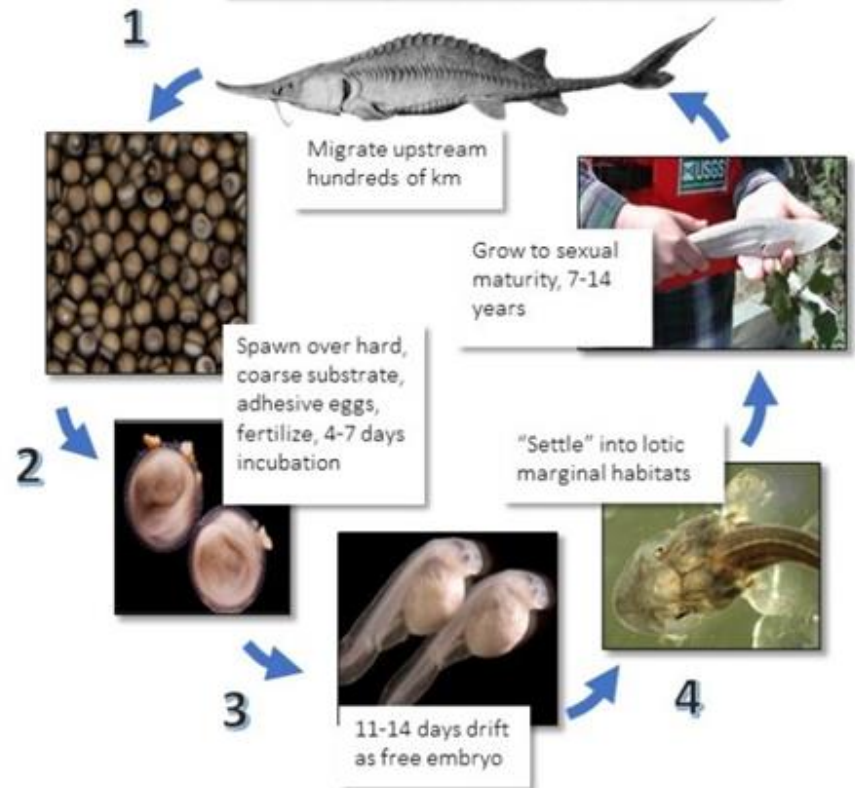


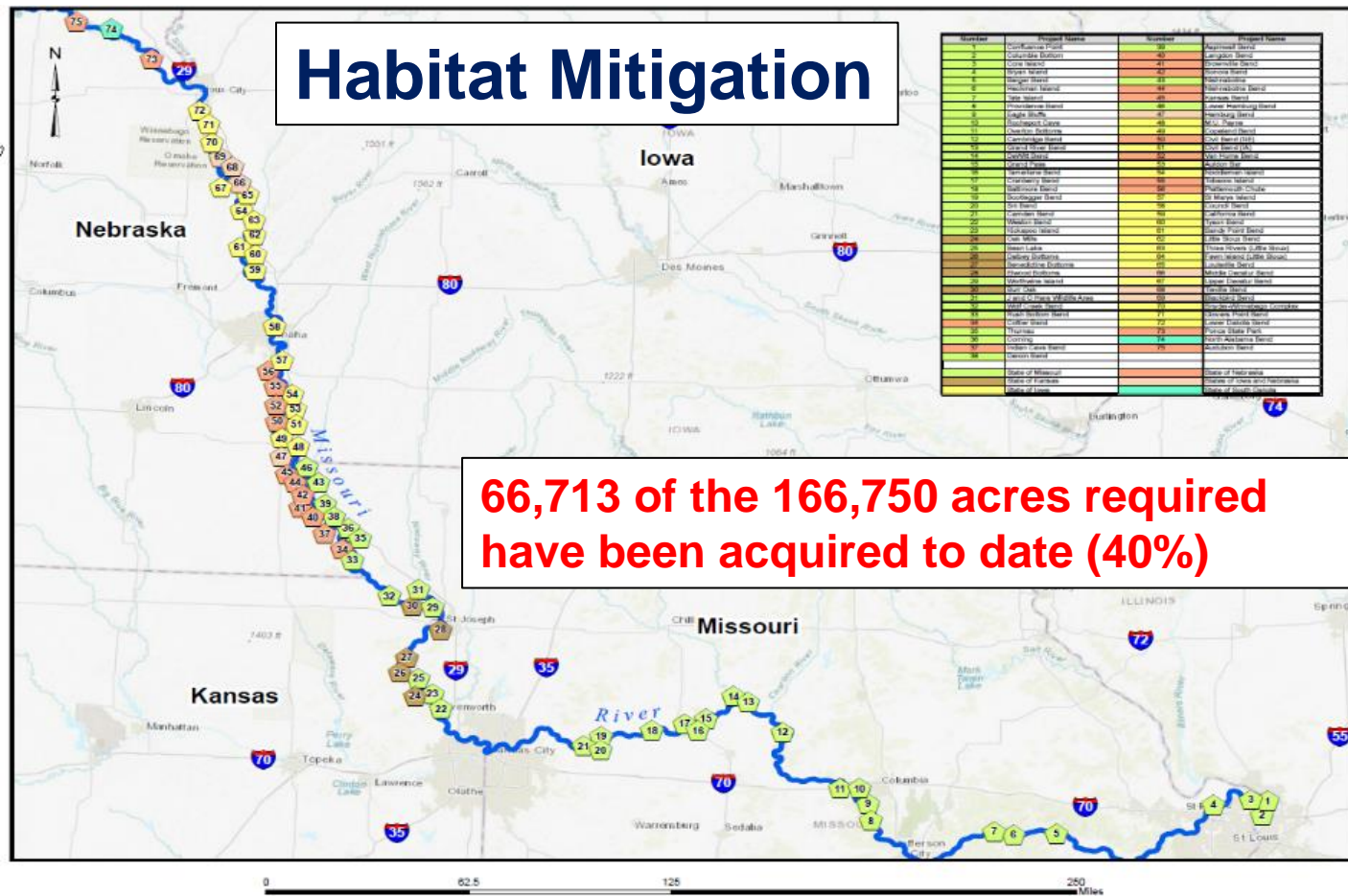
Fish bypass at Intake Diversion Dam





Pallid Sturgeon (*Scaphirhynchus albus*)

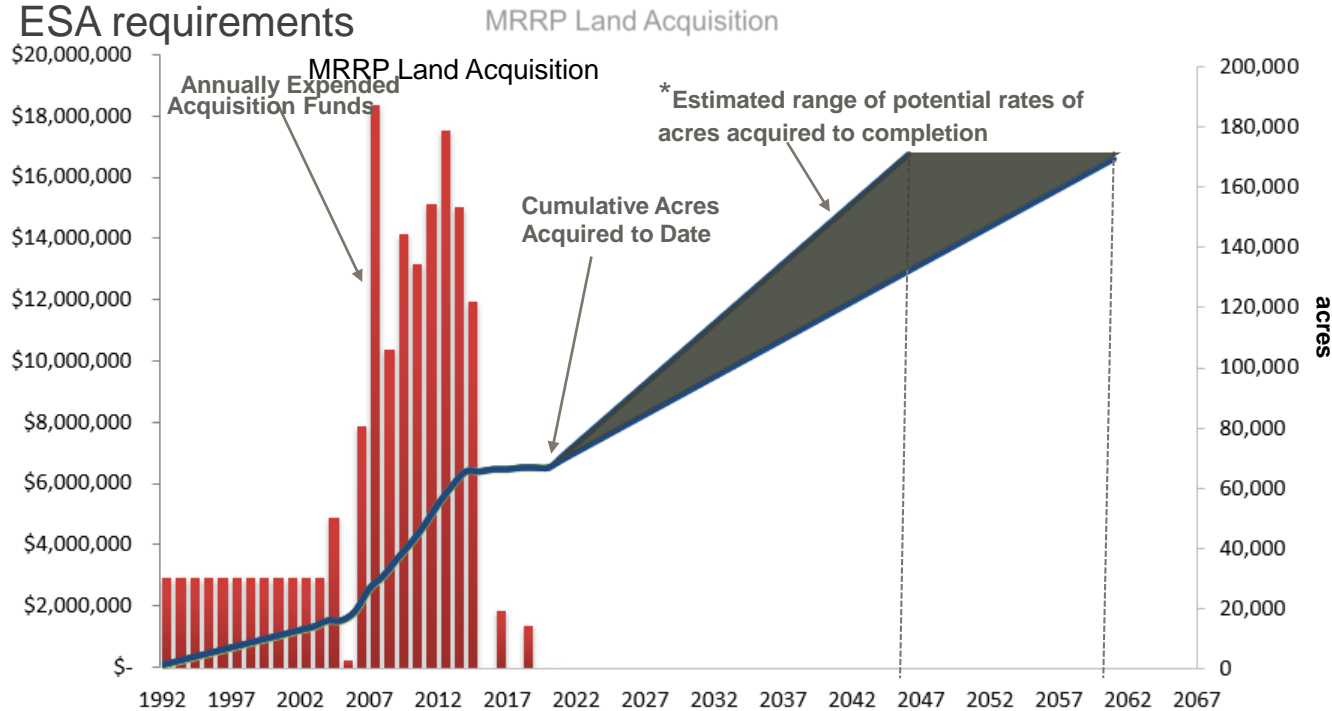




Map of Existing Fish and Wildlife Mitigation Project Locations

MITIGATION PROJECT TIMELINE

- Began expending measurable costs on fish & wildlife mitigation in 1992.
- Funding significantly increased in 2003 for BiOp & ESA requirements



*1992-2003 represents average for those years

- No required completion date or reliable timeline for completion
- Based on the rate of historic funding and land acquisition, estimated time to complete acquisition of 166,750 ac is 25 to 40 years from now.
- * Will depend on levels of funding received and willing sellers available.



REMAINING LEGAL REQUIREMENTS



- Only 2 of the required 12 pallid habitat projects on the lower river have been constructed, none have been constructed since 2018. WRDA language and lack of funding delaying implementation.
- Nearly **100,000 acres of land acquisition/restoration** remains to meet the Congressional BSNP Habitat Mitigation Authorization
- **ESA requirements can change** based on results of monitoring
- Must meet the conditions of the BiOp to maintain the NO JEOPARDY Opinion
- Working with stakeholders to overcome challenges to implementation (e.g. pallid habitat projects on the lower river and test flows at Ft. Peck Reservoir from upper river)



MRRIC MEMBERS

➤ 29 Tribes

➤ 29 Stakeholders (16 categories)

Agriculture (2)
Conservation Districts
Environmental/Conservation Orgs (2)
Fish and Wildlife (2)
Flood Control (2)
Hydropower (2)
Irrigation
Local Government (2)

Major Tributaries (2)
Navigation (2)
Recreation (2)
Thermal Power (2)
Water Quantity (2)
Water Supply (2)
Water Industries
At Large (2)

➤ 15 Federal Agencies

Bureau of Indian Affairs
BLM
USFWS
WAPA
Fed Hwy Admin

USACE
USFS
USGS
NWS/NOAA
Maritime Admin

BOR
NRCS
NPS
EPA
US Coastguard

➤ 8 States (IA, NE, KS, MO, MT, ND, SD, WY)

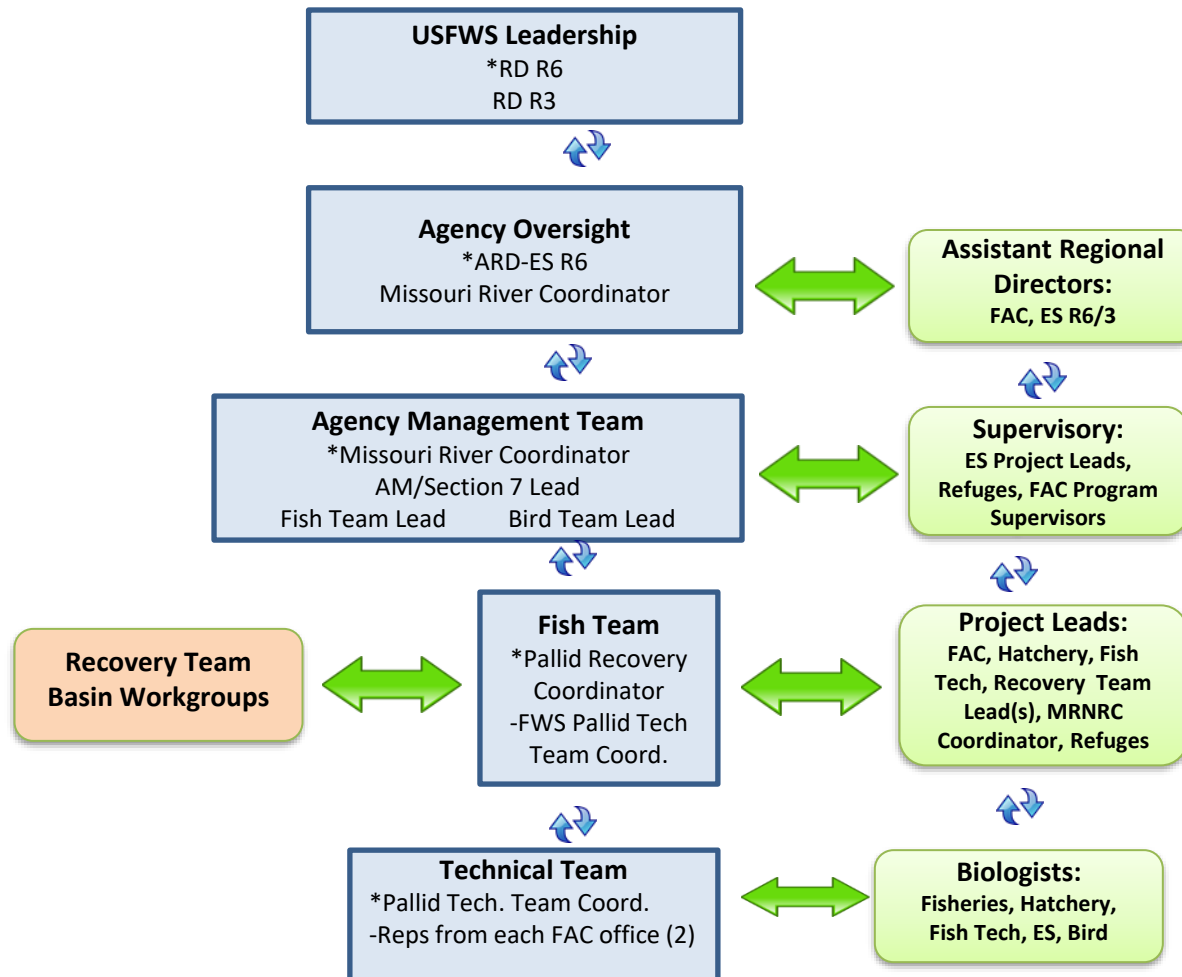


MRRIC

Missouri River Recovery Implementation Committee



USFWS Missouri River Organizational Structure for the MRRP Adaptive Management Plan



MRRP Adaptive Management Plan Process

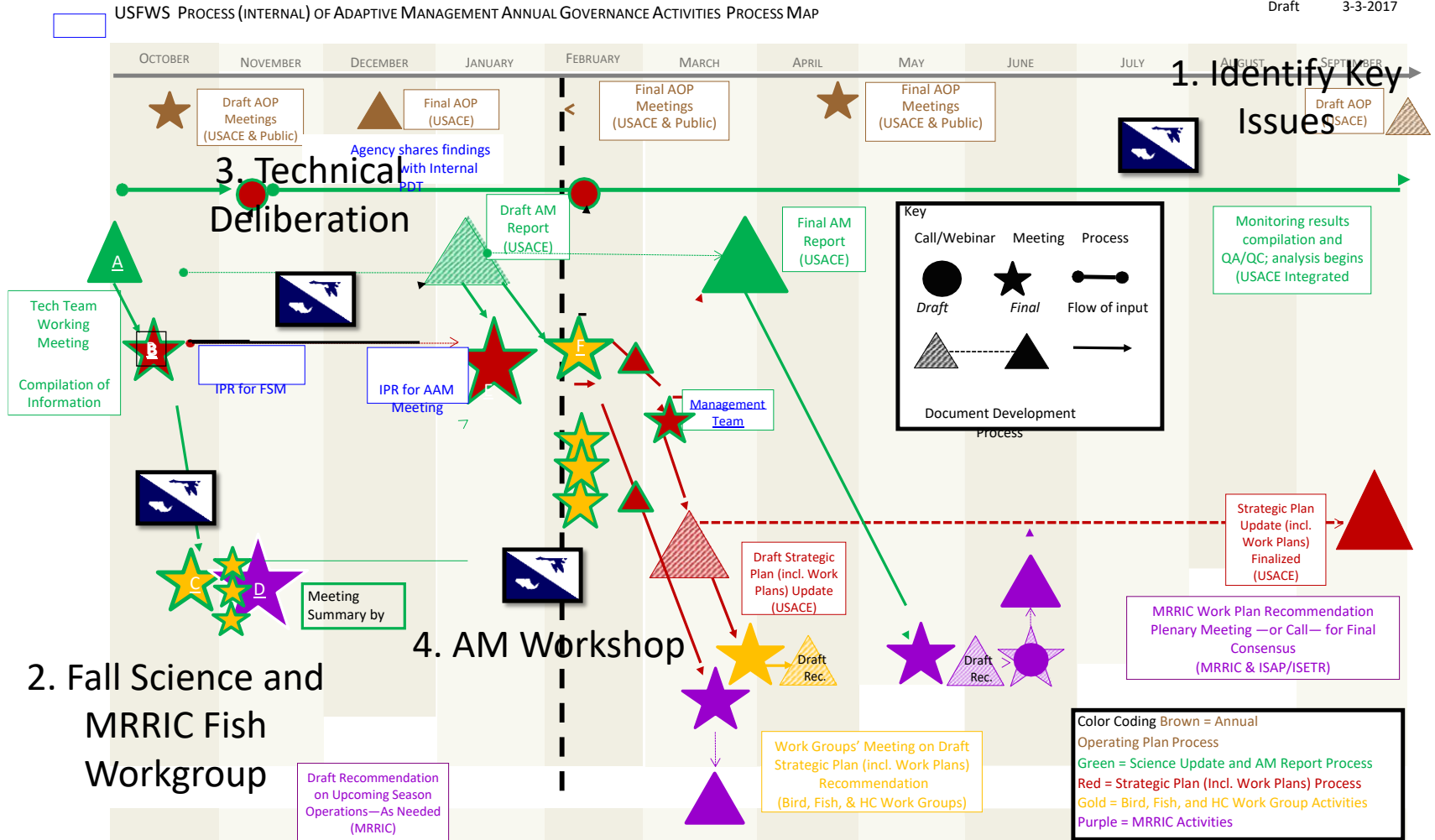
Key Pallid Sturgeon Workgroup Engagement Points

Draft

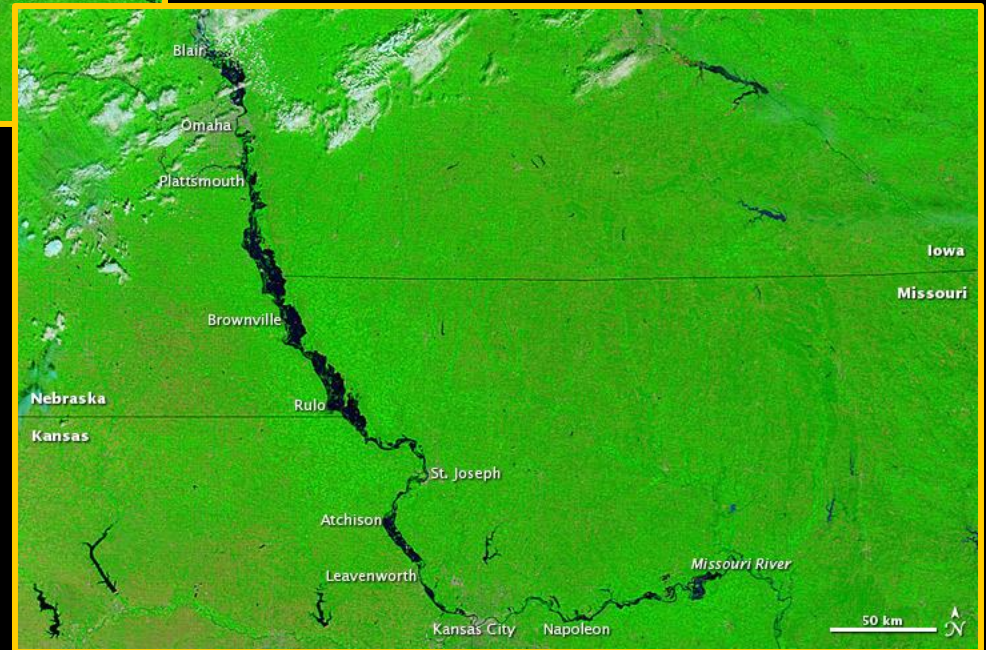
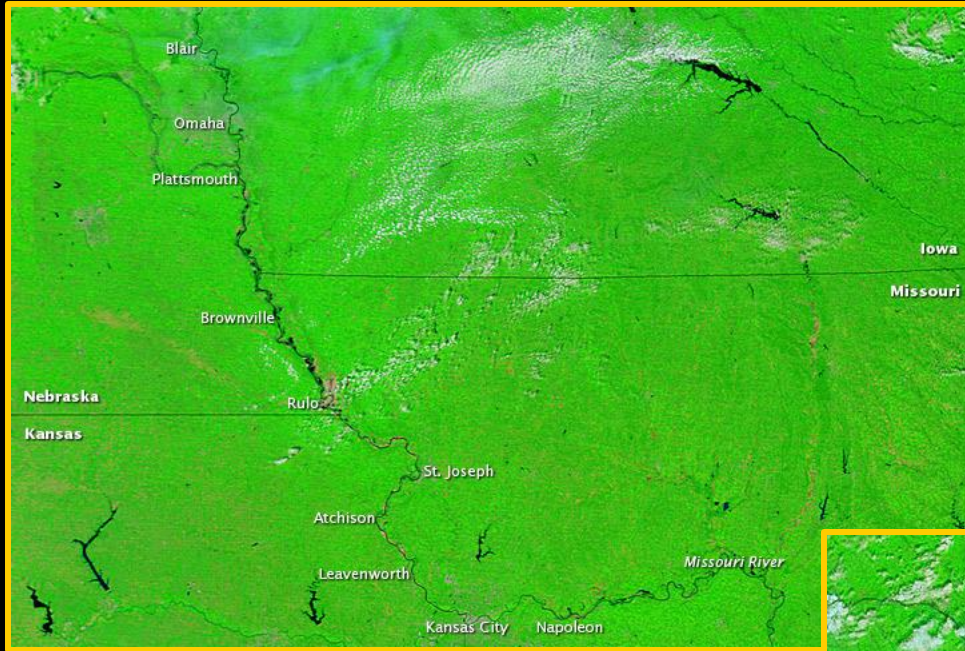
January 15, 2018

Draft

3-3-2017



2011 Missouri River Flood



LOWER MISSOURI RIVER FLOOD RISK & RESILIENCY



US Army Corps
of Engineers®

Emergency Breach Repair at MRLS 550A,
2019 Flood

LOWER MISSOURI RIVER FLOODING

- Three record 500-yr level floods within a 30-year period: 1993, 2011, 2019
- 1993 Flood - flood of record in lower basin, \$ billions in damages, 1 million acres inundated
- 2011 Flood – Over 700,000 acres inundated, massive impact to infrastructure and agriculture

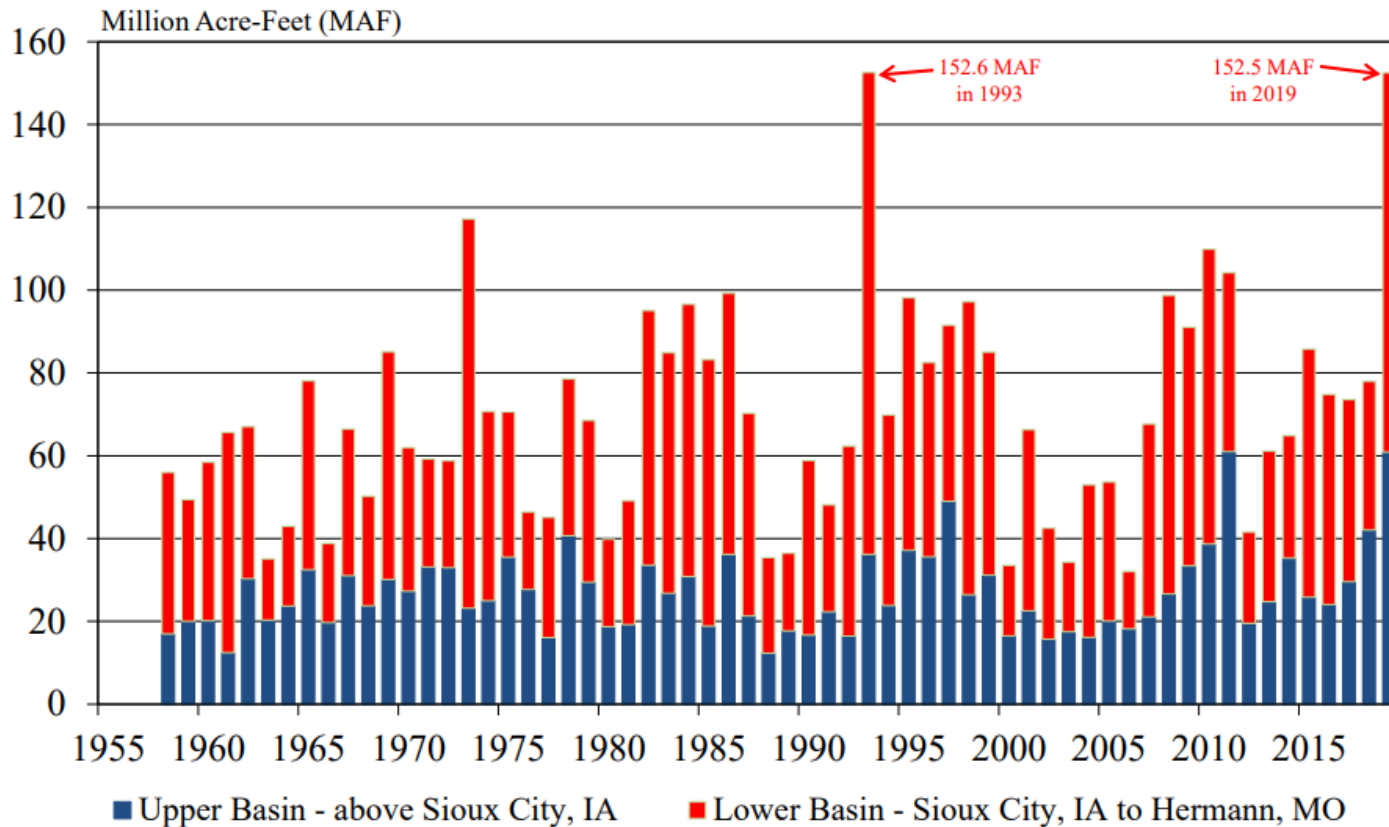
2019 Flood

- March heavy rain on snowpack; May-June record rainfall
- Longest declared flood in history - 278 days
- 83 levees overtopped, 55 levees breached
- 16 federal levees overtopped, 11 breached
- \$1.2 billion in repair costs to levees



**Overtopping of L-550 Federal
Levee System on March 16, 2019**

Missouri River Basin Annual Runoff

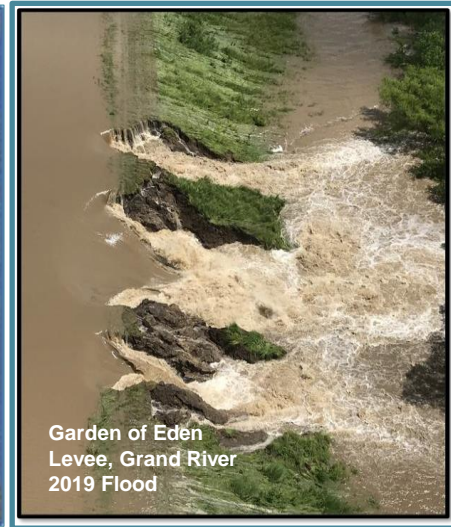




L488 emergency repairs in Missouri, 2011 Flood



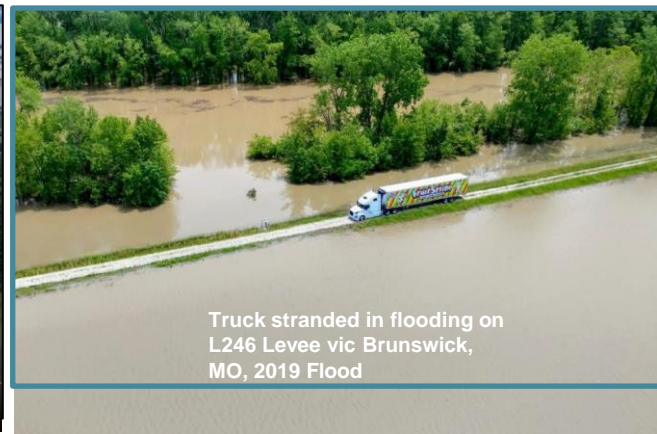
I-29 NW of Glenwood, IA 2019 Flood



Garden of Eden Levee, Grand River 2019 Flood



Missouri River flooding near Fort Calhoun nuclear plant, Blair, NE 2011 Flood



Truck stranded in flooding on L246 Levee vic Brunswick, MO, 2019 Flood

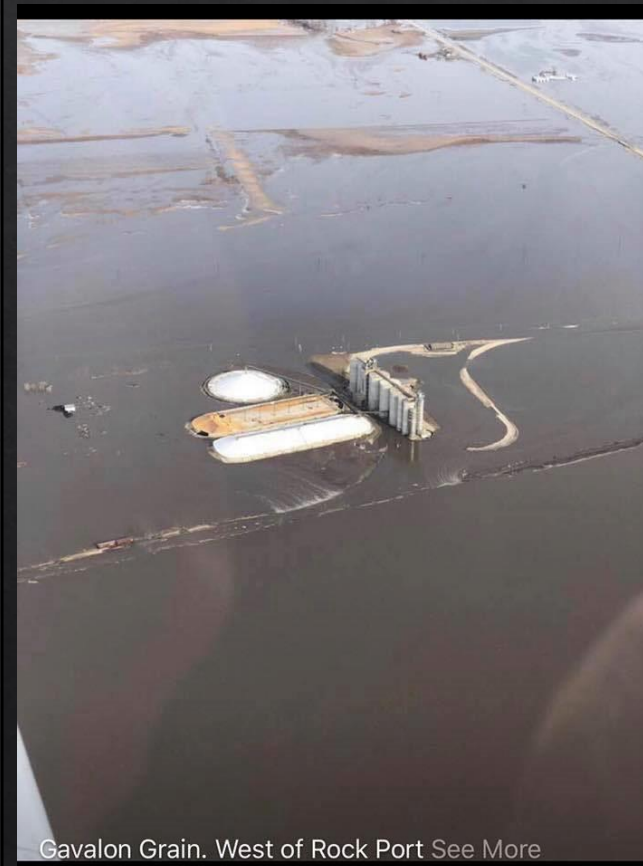


BACKGROUND & FOCUS

- Governors formed 4 state coalition – Flood Recovery Advisory Working Group
- Mandate to act in aftermath of 2019 Flood to reduce systemic risk, recurring damages, vulnerability & improve system resiliency for the future
- States & local communities take more responsibility in flood risk management
- Improve interagency collaboration, communications and strategic messaging
- States look to USACE & other federal agencies to partner in an innovative approach focused on construction planning in conjunction with systems based planning
- Consideration of improvements in policy and procedures for the future

2019 Flood Impact on Atchison County

- ◆ 56,000 acres under water
- ◆ 121 miles of road destroyed in the county
- ◆ 14 commercial businesses underwater
- ◆ 166 homes flooded
- ◆ 278 citizens forced to evacuate
- ◆ 1,295 agricultural buildings flooded
- ◆ Estimated \$25 million in lost agricultural revenue



Gavalon Grain. West of Rock Port See More



Atchison County Levee District #1



- ◆ 1952, 1984, 1993, 2010, 2011, and 2019
- ◆ General Approach: fix breaches in place, if possible, as the least cost alternative.
- ◆ Levee realignment and benefits:
 - ❑ Relieve known pinch points.
 - ❑ Adjust alignment based on more recent hydraulic data from the Corps.
 - ❑ Update 67-year-old levees that have experienced several high-water events.
 - ❑ Change landside slope from 3H to 1V to 5H to 1V.



www.nature.org/moriverlevee



STORIES IN MISSOURI

Reconnecting the Missouri River Floodplain


The construction of a levee setback will reduce flooding impacts on the community and restore a more natural floodplain.

November 02, 2020

The Nature
Conservancy 

**MANY THANKS TO THE MANY PEOPLE THAT MADE THIS POSSIBLE
OVER THE YEARS!**

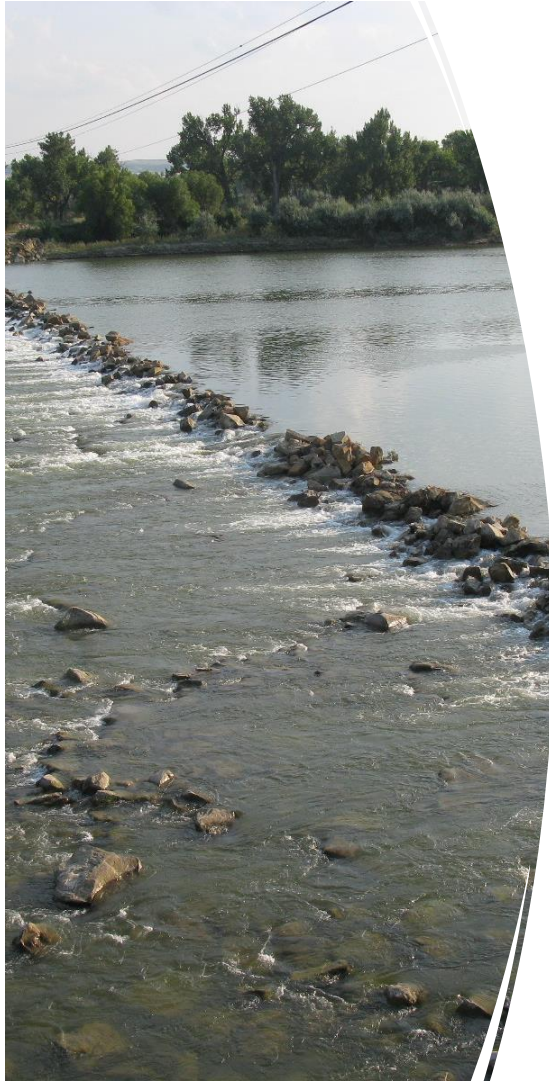




Lower Yellowstone Fish Passage Project



BUREAU OF
RECLAMATION

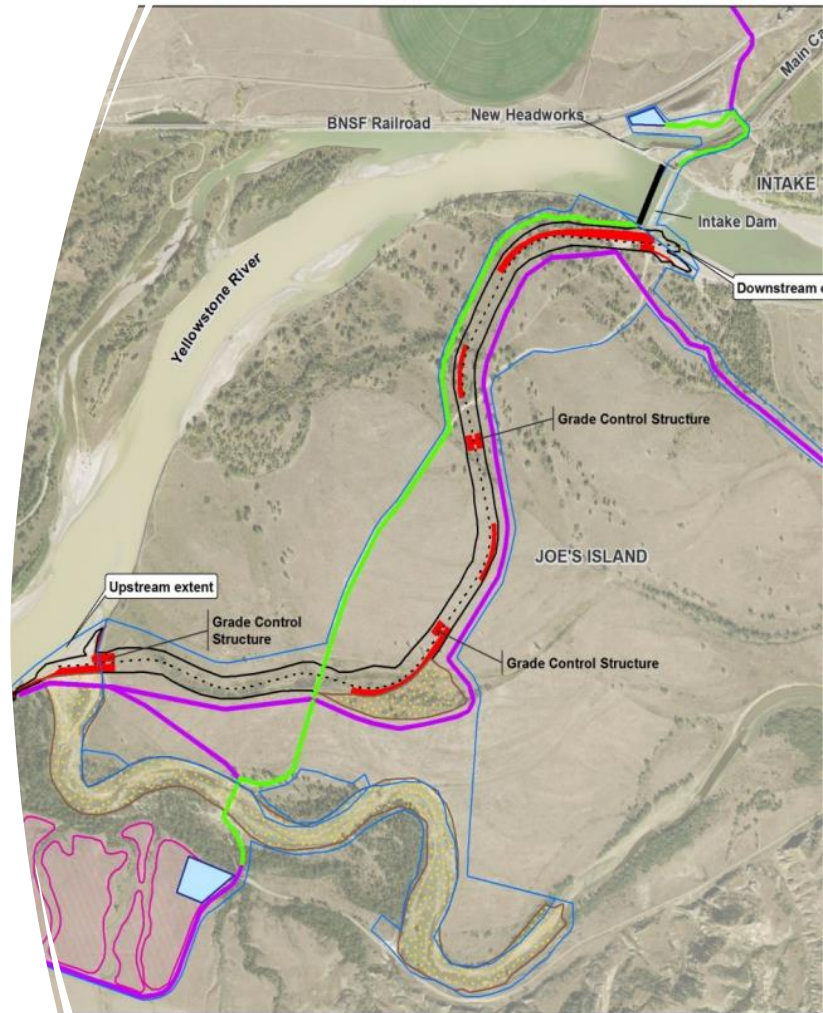


MRRP Science and Adaptive Management Plan

- **Big Question 5 - Drift Dynamics:** Can combinations of flow manipulation from Fort Peck, drawdown of Lake Sakakawea, and fish passage at Intake Dam on the Yellowstone River increase probability of successful dispersal of free embryos and retention of exogenously feeding larvae?
- **Hypothesis #7:** Fish passage at Intake Diversion Dam on the Yellowstone River will allow access to additional functional spawning sites, increasing spawning success and effective drift distance, and decreasing downstream mortality of free embryos and exogenously feeding larvae.

Lower Yellowstone - Bypass Channel

- 11,150 ft long bypass channel
- Replacement weir structure
- Adaptive Management and Monitoring Plan
- New Headworks completed in 2012



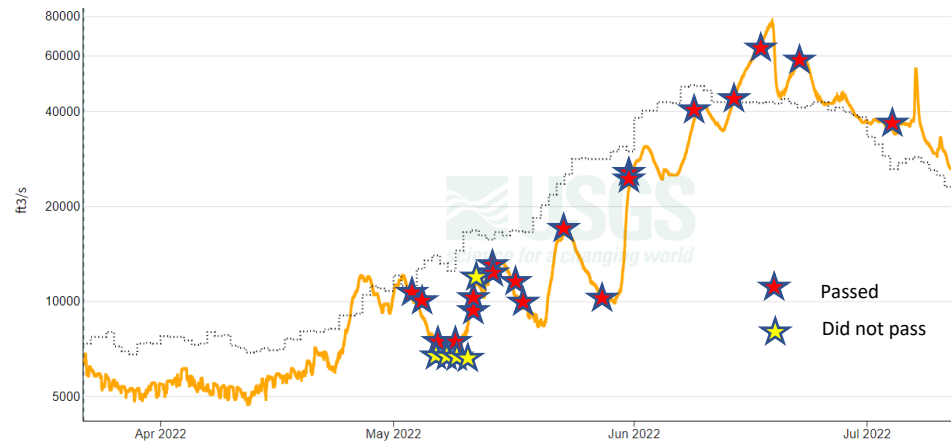
USBR and USACE 2015; USDA NAIP 2016.



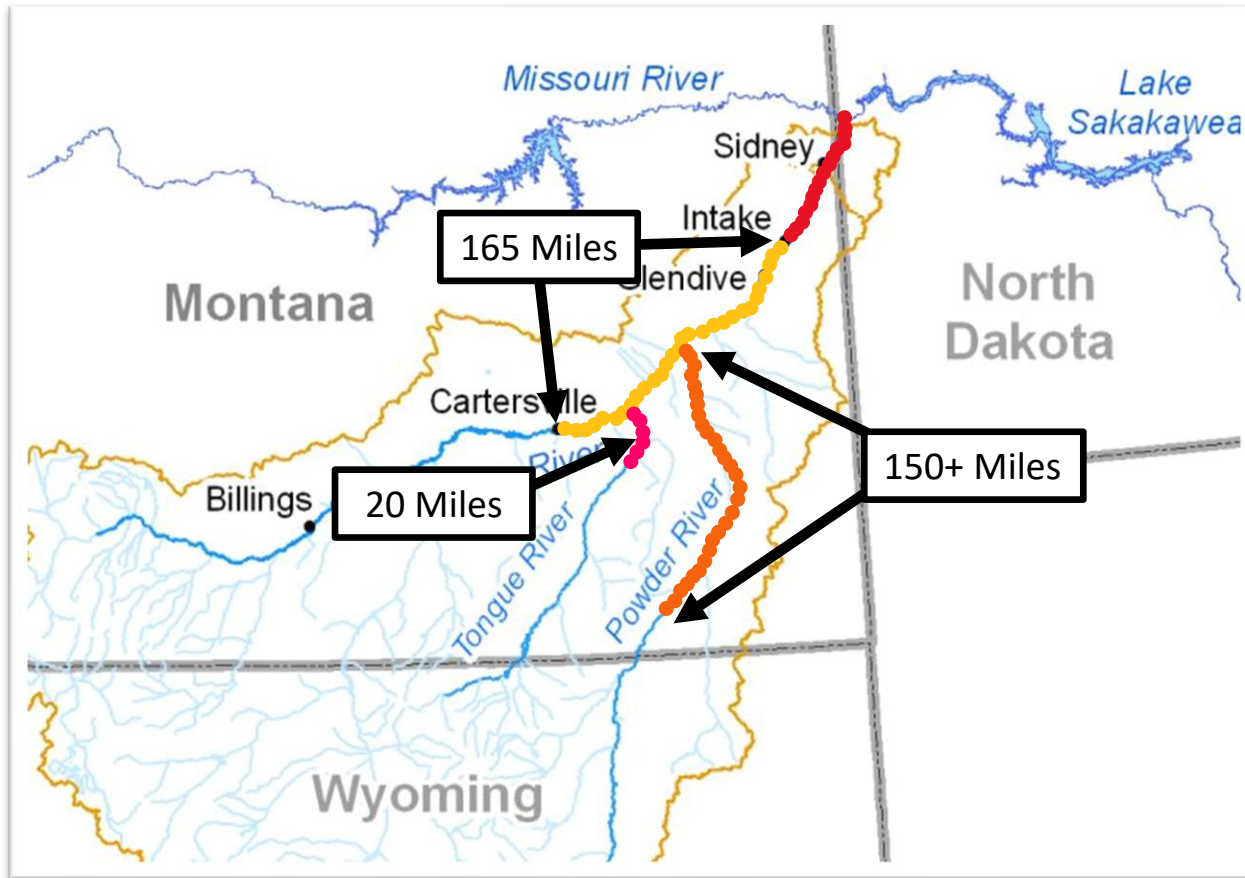
Bypass Channel Results

- 20 radio-tagged pallid sturgeon successfully passed upstream through the bypass channel in 2022
- 5 radio tagged pallid sturgeon did not pass. Motivation unknown.
- Passage Dates: May 4 – July 3rd
- Flow Range: 7,200 – 77,000 cfs

Origin	Sex	Passed Upstream	Did Not Pass Upstream
Wild	Male	6	1
	Female	0	0
HOPS	Male	5	0
	Female	3	1
	Unknown	6	3

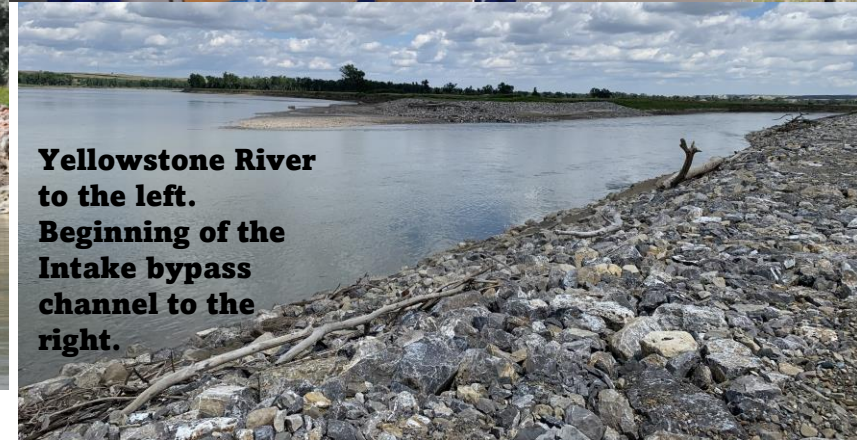
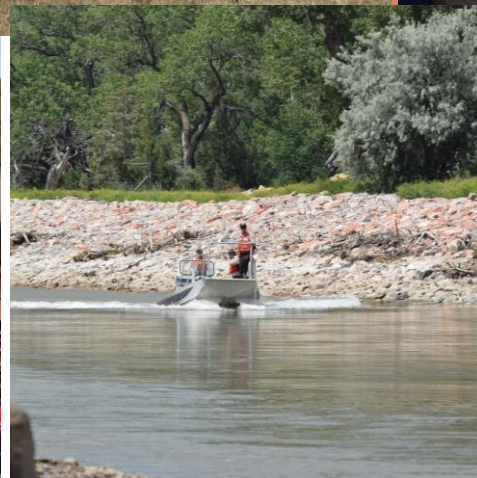


Lower Yellowstone - Increased Access





Lower Yellowstone Project - Fish Passage & Entrainment Protection History



**Yellowstone River
to the left.
Beginning of the
Intake bypass
channel to the
right.**



10 pallid sturgeon released



**ES ARD
Steve Small**



**DOI
Assistant
Secretary
for Water
and
Science
Tanya
Trujillo**



Reclamation Commissioner



Col. Van Epps



**Retired
ES ARD
Mike T.**



On the Horizon

**Considerations and Analysis for Flood Risk
Resiliency for the
Lower Missouri River
(Nebraska, Iowa, Kansas, and Missouri)
Section 22
Planning Assistance to States**



February 2022

- Piping Plover Recovery Planning
- Fort Peck Flow Test
- Pallid Sturgeon Hybridization in the Lower Missouri River
- Leveraging Federal resources
- Nature Based Solutions

From the River

I am the Missouri, cousin to the sky, the mountains and the prairie.

I'm not raging. I'm not angry. I intend no harm.

I am a two million year-old river.

Here before man, today's dams and berms and channels
are like weak-rooted willows on a granite peak.

In a blink of time they'll be gone. Centuries are seconds to a river.

So Dam me. Damn me.

I'll still flow southward, draining the plains. This valley would be a sea without me.

Man will learn to live with rivers. But When?



That is a question of Time.

South Dakota Magazine - 2011





“We shall greet one another as kindred...
And henceforth, as kindred,
Talking kindly to one another,
We shall always live”
Zuni Sahlako prayer



“What cannot be achieved
in one lifetime will happen
When one lifetime
is joined to another.”
H. Kushner

