History of Changes in the Illinois River Watershed
"Implications for Management"

Illinois River Conference

October 4-6. 2011

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Our Fascination with Streams Often Starts at an Early Age

Boys Playing in a Relatively Healthy, Naturally Flowing River


Upper Mississippi River Basin
N
W
E
S
0 100 200 400
Kilometers
Minnesota
Michigan
Wisconsin
Mississippi River
Saint Paul
South Dakota
Madison
Chicago
Michigan
Iowa
Illinois
Des Moines
Illinois River
Indiana
Saint Louis
Missouri

The Illinois River

"We have seen nothing like this river that we enter, as regards its fertility of soil, its prairies and woods; its cattle (buffalo), elk, deer, wildcats, bustards, swans, ducks, parroquets, and even beaver..."

(Pere Jacques Marquette 1673)

Map of Illinois - 1718

Peoria ~1855

Even 200 years ago, the Illinois River was subject to both point and non-point source pollution, much of this a consequence of its geology.

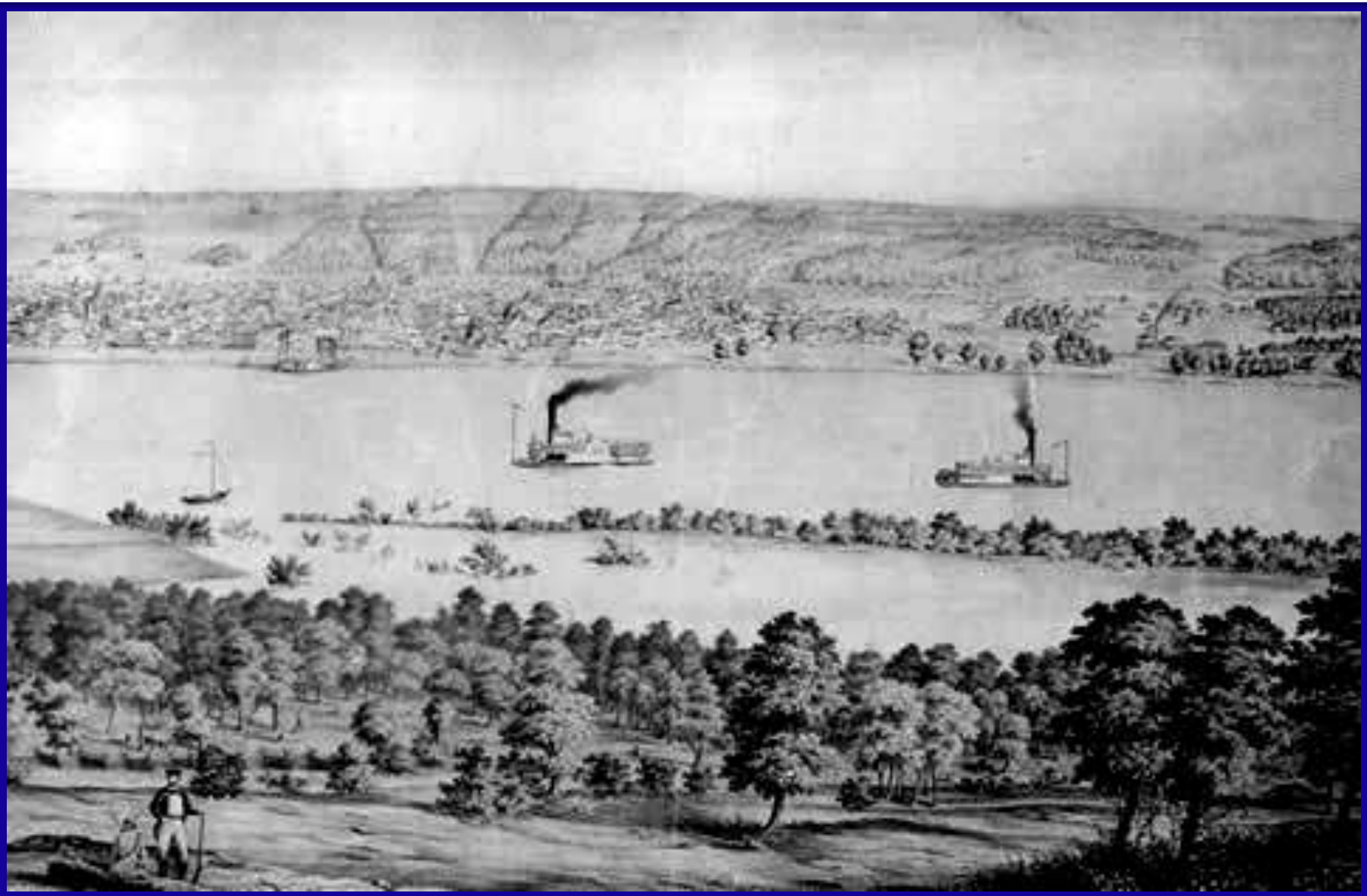


Photo Courtesy of Charles Peck - Chicago Historical Society - www.chicagohs.org

I & M Canal

The original six-foot canal is deepened to nine feet in 1871 in order to increase the current and to dispose of the city's sewage. With this deepening, the Chicago River begins to flow southwest down the canal, and someone observes that the "black river" will soon be "clean enough for fish to swim in" (Chicago Public Library).

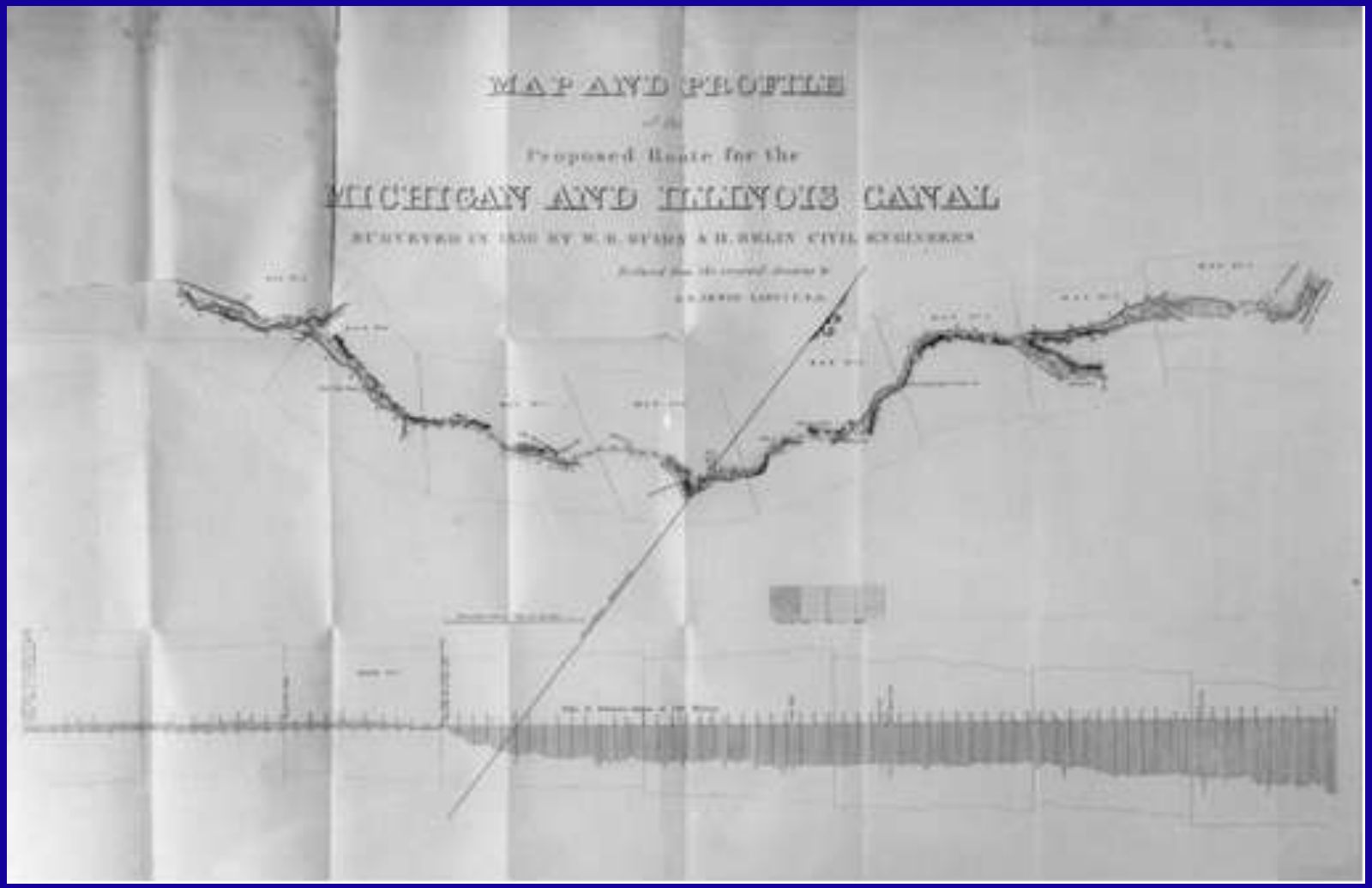
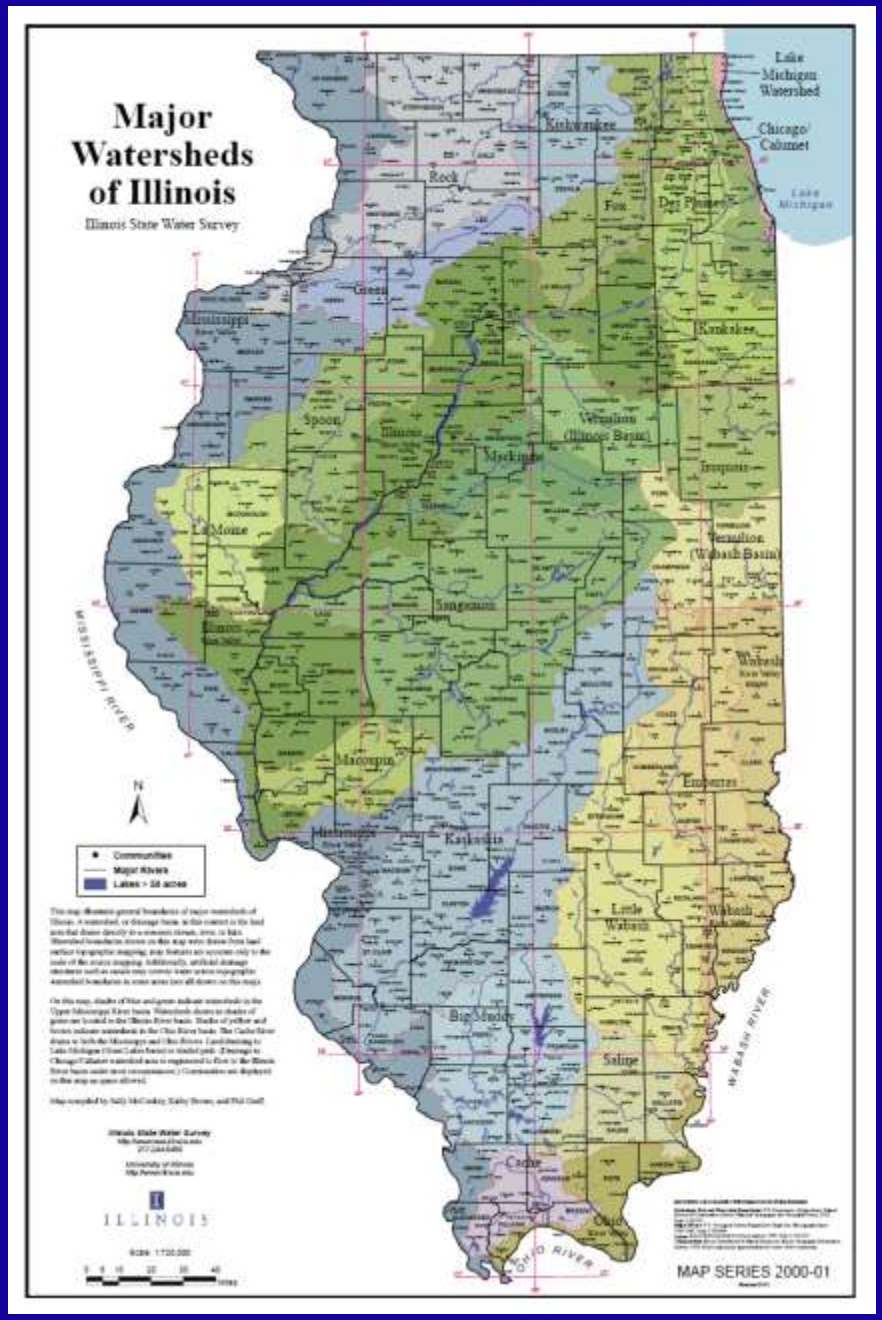


Photo Courtesy of Newberry Library, Chicago: www.newberry.org

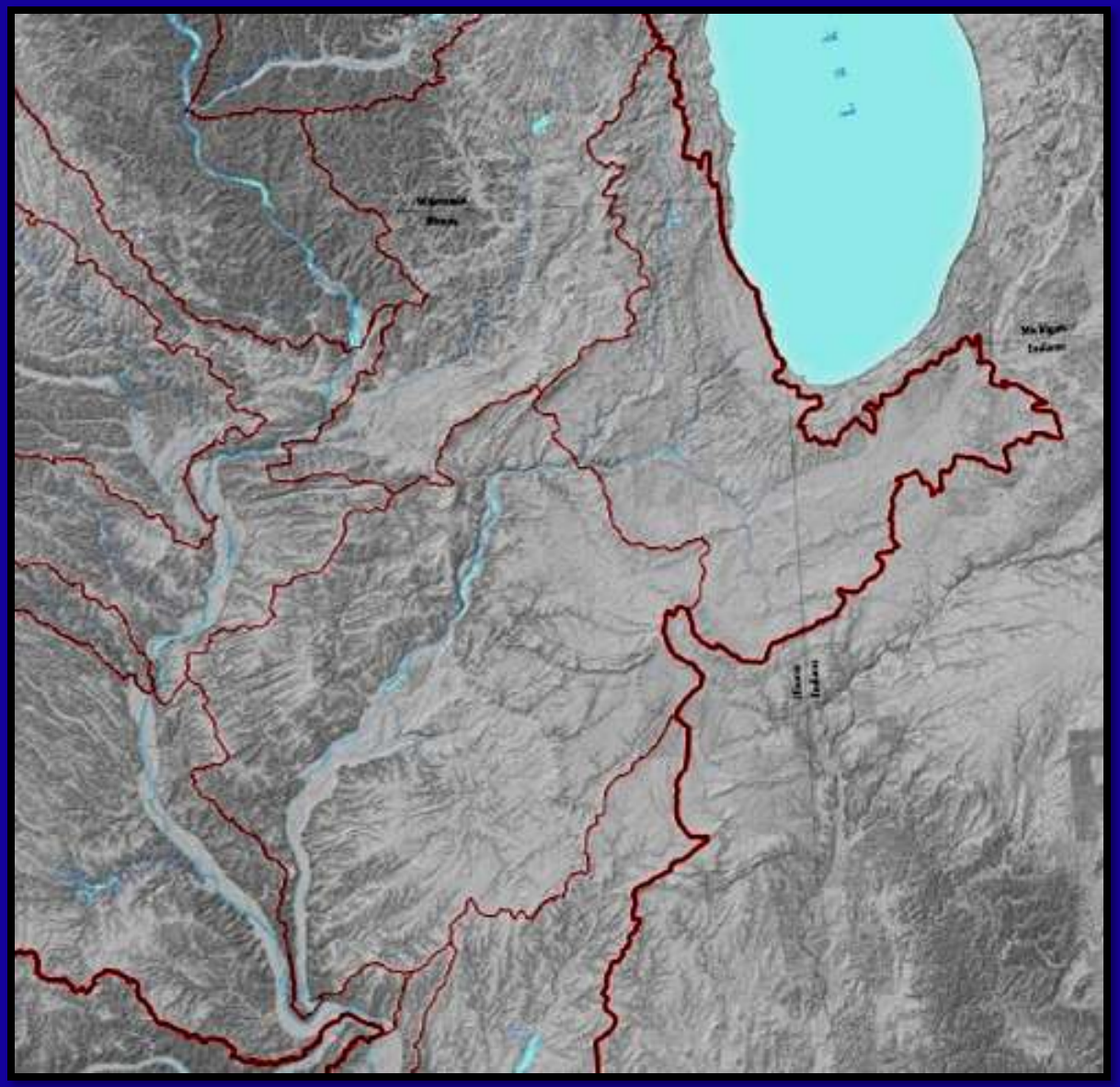
Fishermen hauling in catch on the Illinois River Near Havana ~ 1910 (Photo Courtesy of the INHS)

“Of Time and the River”
Covers 12,000 years of Human Use of the Illinois River

Photo Courtesy of Illinois State Museum:“Of Time and the River”


Major Watersheds of Illinois
Illinois State Water Survey
Lake Michigan Watershed
Chicago/ Calumet
Lake Michigan
Kishwaukee
Rock
Fox
Des Plaines
Green
Mississippi
Kankakee
Spoon
Illinois
Vermilion (Illinois Basin)
Mackinaw
Iroquois
LaMoine
Vermilion (Wabash Basin)
Sangamon
Wabash
MISSISSIPPI RIVER
Macoupin
Embarras
Kaskaskia
Little Wabash
Big Muddy
Saline
WABASH RIVER
Cache
Ohio
OHIO RIVER
N
Communities
Major Rivers
Lakes > 10 acres
ILLINOIS
MAP SERIES 2000-01

Illinois River Watershed Within the Upper Mississippi River Basin



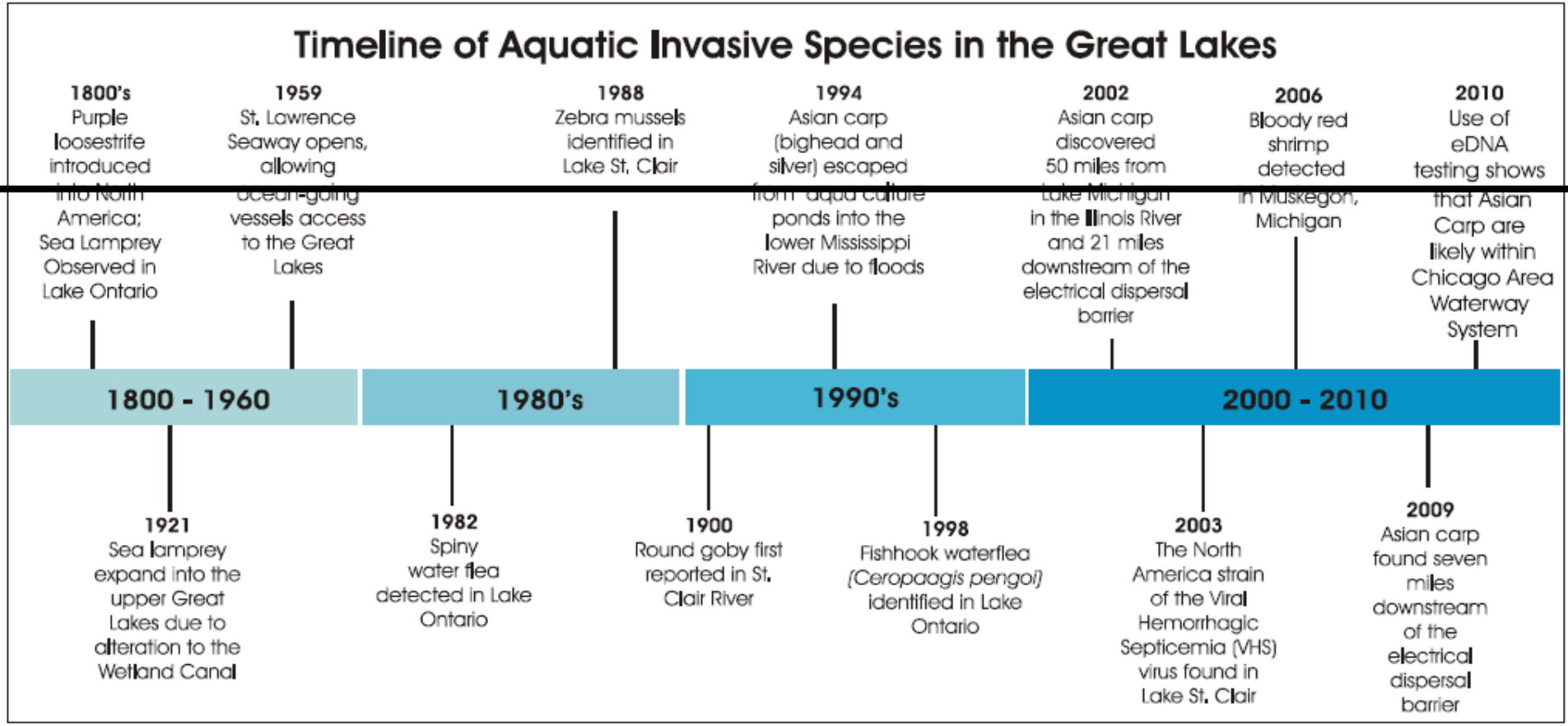
Rivers of the Chicago Area

Building the Chicago Sanitary & Ship Canal

(AP Photo/Metropolitan Water Reclamation District of Greater Chicago)

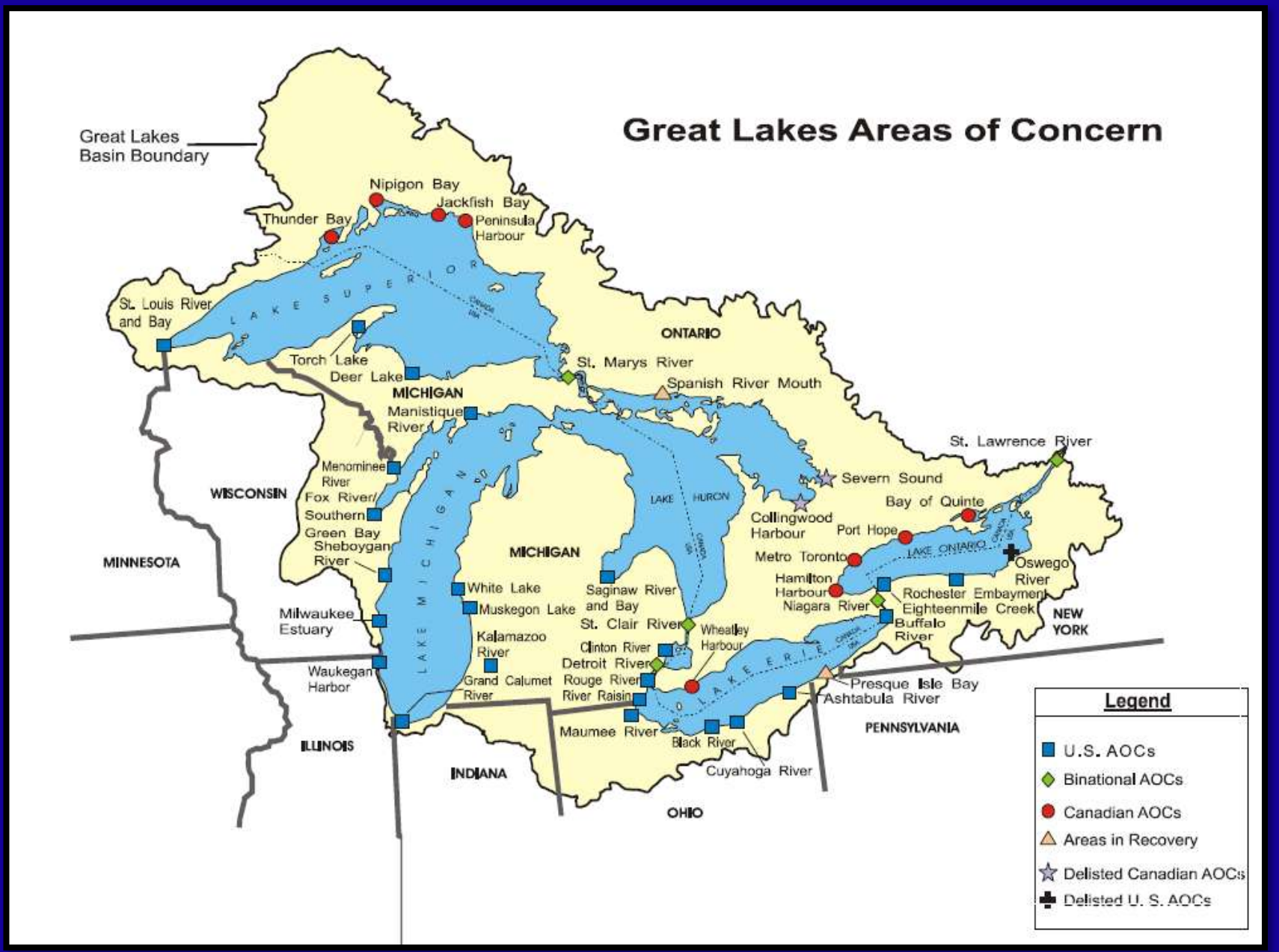
In this undated photo provided by the Metropolitan Water Reclamation District of Greater Chicago work takes place on the building of the Chicago Sanitary and Ship Canal.

Timeline of Aquatic Invasive Species in the Great Lakes

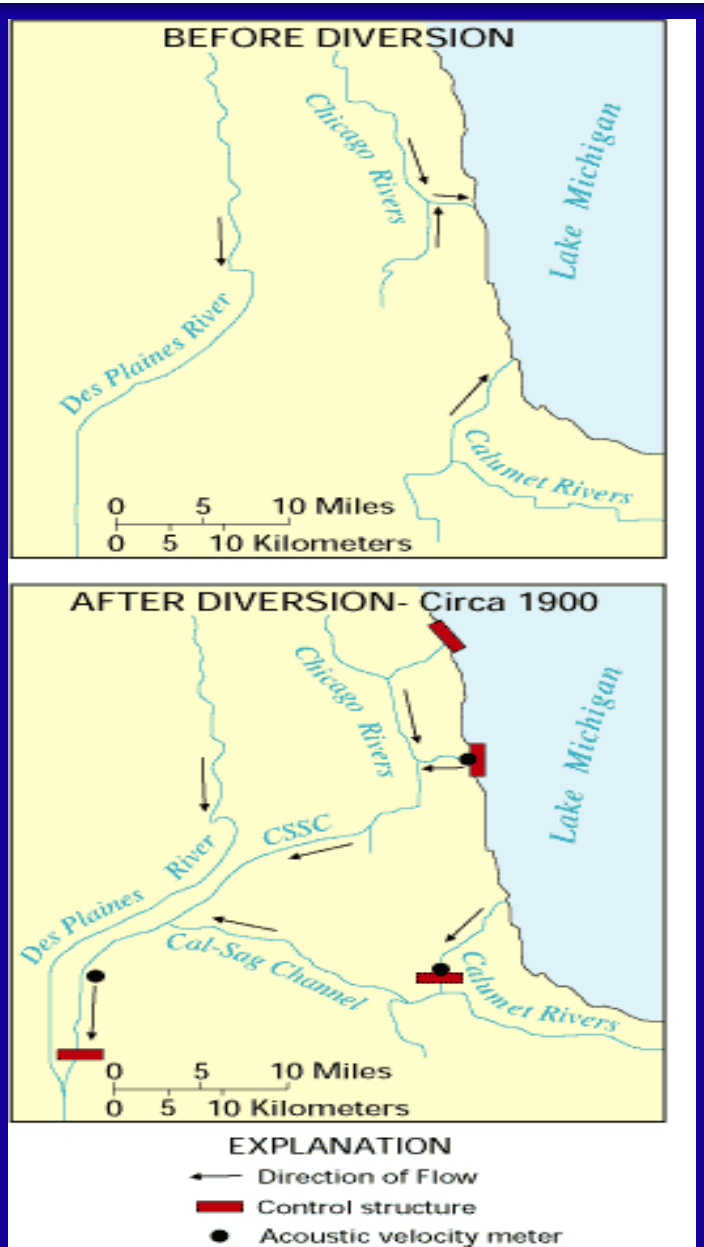


Silver Carp on the Illinois River

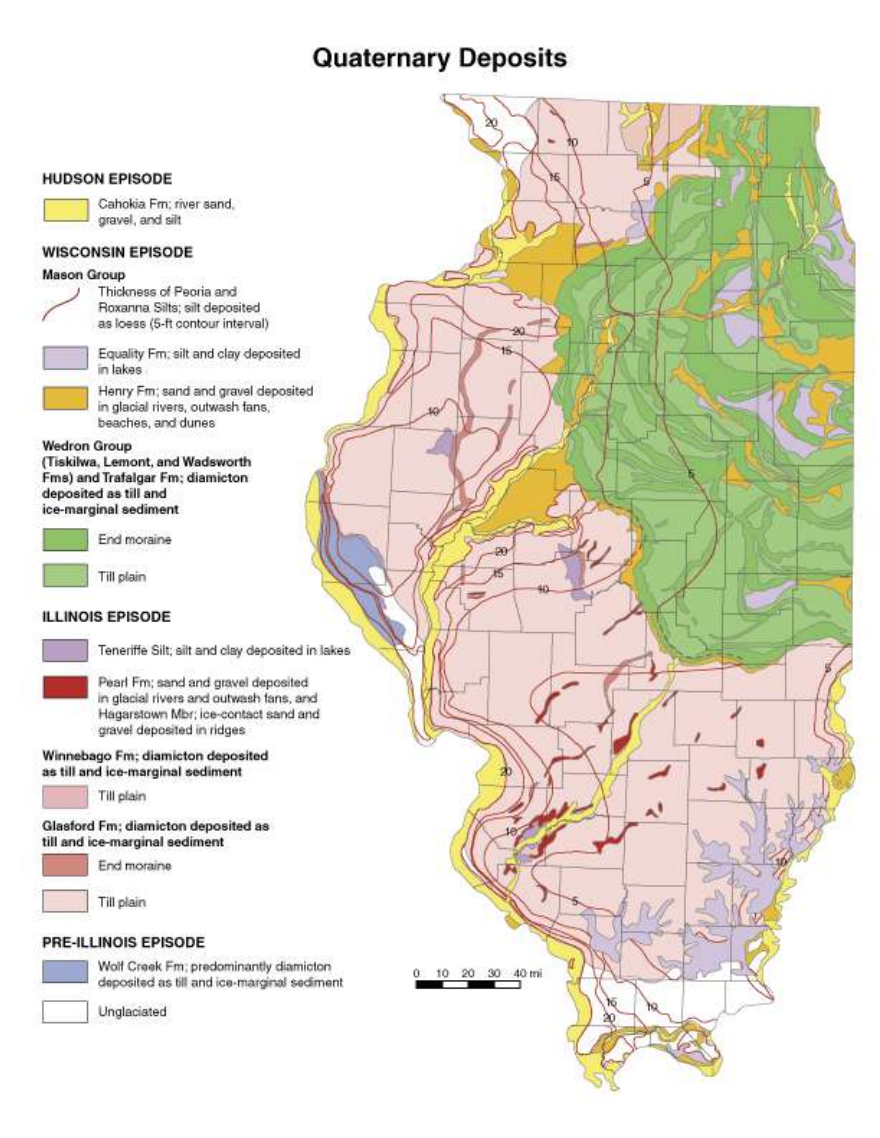
(Photo Courtesy of U.S. Fish and Wildlife Service)


Great Lakes Areas of Concern
Great Lakes Basin Boundary
Nipigon Bay
Jackfish Bay
Thunder Bay
Peninsula Harbour
St. Louis River and Bay
Torch Lake
Deer Lake
MICHIGAN
Manistique River
Menominee River
Fox River/ Southern Green Bay
Sheboygan River
WISCONSIN
MINNESOTA
Milwaukee Estuary
Waukegan Harbor
ILLINOIS
White Lake
Muskegon Lake
Kalamazoo River
Grand Calumet River
INDIANA
ONTARIO
St. Marys River
Spanish River Mouth
LAKE HURON
Saginaw River and Bay
St. Clair River
Clinton River
Detroit River
Rouge River
River Raisin
Maumee River
Wheatley Harbour
Black River
Cuyahoga River
OHIO
Severn Sound
Collingwood Harbour
Bay of Quinte
Port Hope
Metro Toronto
Hamilton Harbour
Niagara River
LAKE ONTARIO
St. Lawrence River
Oswego River
Rochester Embayment
Eighteenmile Creek
Buffalo River
NEW YORK
Presque Isle Bay
Ashtabula River
PENNSYLVANIA
Legend
U.S. AOCs
Binational AOCs
Canadian AOCs
Areas in Recovery
Delisted Canadian AOCs
Delisted U. S. AOCs

Diversion of the Chicago River



Quaternary Deposits in Illinois



Known as the "Father of Waters", the Mississippi River drains 32 US States and 2 Canadian provinces.

Illinois River Watershed

Background

- The Illinois River is one of the major tributaries of the Mississippi River and currently connects the Atlantic Ocean to the Gulf of Mexico.
- The Illinois River valley (that includes the main river, backwater lakes, side channels, and floodplain) is a significant NATIONAL ecological resource.
- Many bottomland lakes along the river valley have lost much of their capacity due to sediment accumulation.
- Erosion and sedimentation has long been recognized as the principal causes for most of the environmental and ecological problems in the Illinois River valley.

Background (Concluded)

- **The sediment budget analysis is one of the most critical data-sets used for identifying and prioritizing projects in the basin.**
- **At the present there are many initiatives including the Illinois Rivers 2020, Illinois River Conservation Enhancement Program (CREP), and several other state and national programs that are addressing the erosion and sedimentation problem in the Illinois River watershed. More resources are needed of course, and**
- We need to **TARGET and PRIORITIZE restoration work based on sound scientific data. This is an important management step that supplements and compliments existing efforts.**

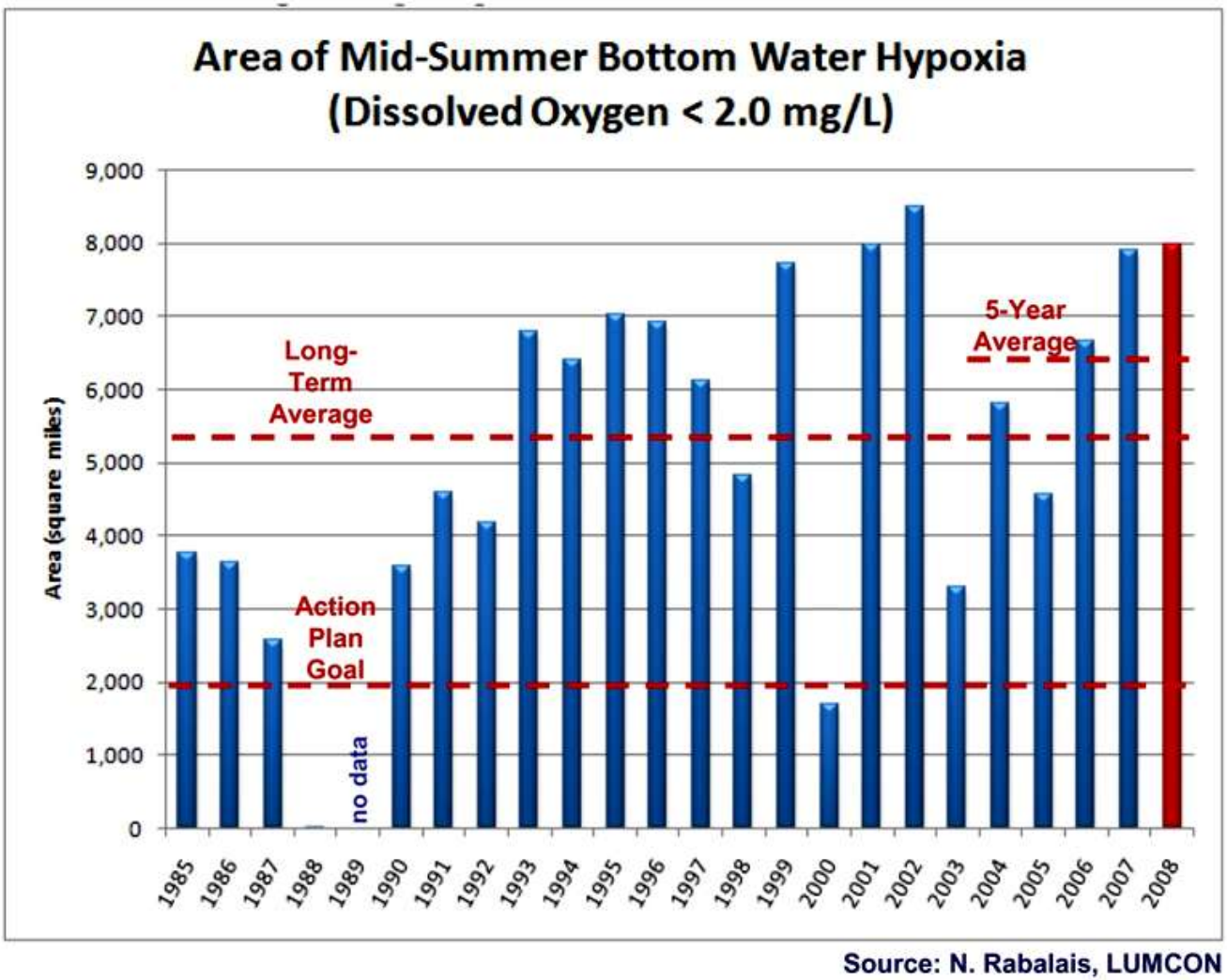
Sediment passes into the Mississippi River Delta and the Gulf of Mexico

Mississippi River Delta – Photo Courtesy of the U.S. Geological Survey - www.usgs.gov

MISSISSIPPI RIVER DELTA

This following image was acquired on May 24, 2001 by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite. With its 14 spectral bands from the visible to the thermal infrared wavelength region, and its high spatial resolution of 15 to 90 meters (about 50 to 300 feet), ASTER will image Earth for the next 6 years to map and monitor the changing surface of our planet.

Mississippi River Delta From Space



The average size of the Dead Zone over the past 5 years has been 6,600 square miles, much larger than the interagency Gulf of Mexico/Mississippi River Watershed Nutrient Task Force goal of 2,000 square miles. The long-term average is 5,300 square miles.

Early Dredging in Illinois Using Horses

Early Dredging Machines in Illinois

Spoon River Before Drainage Modification
May 2003

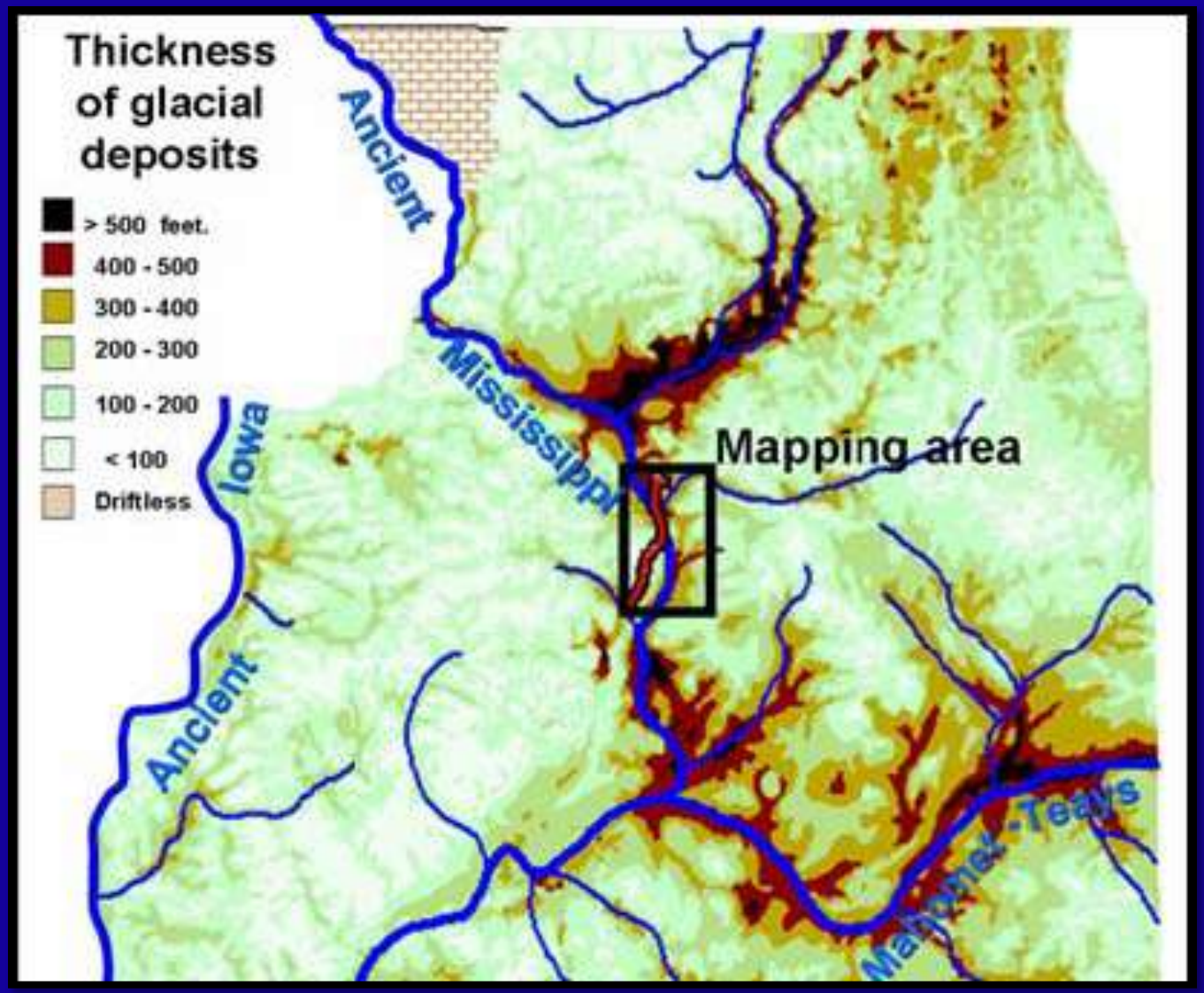
Spoon River After Drainage Modification
April 2005

Bank Erosion along the Right Side (Looking Downstream) of Richland Creek

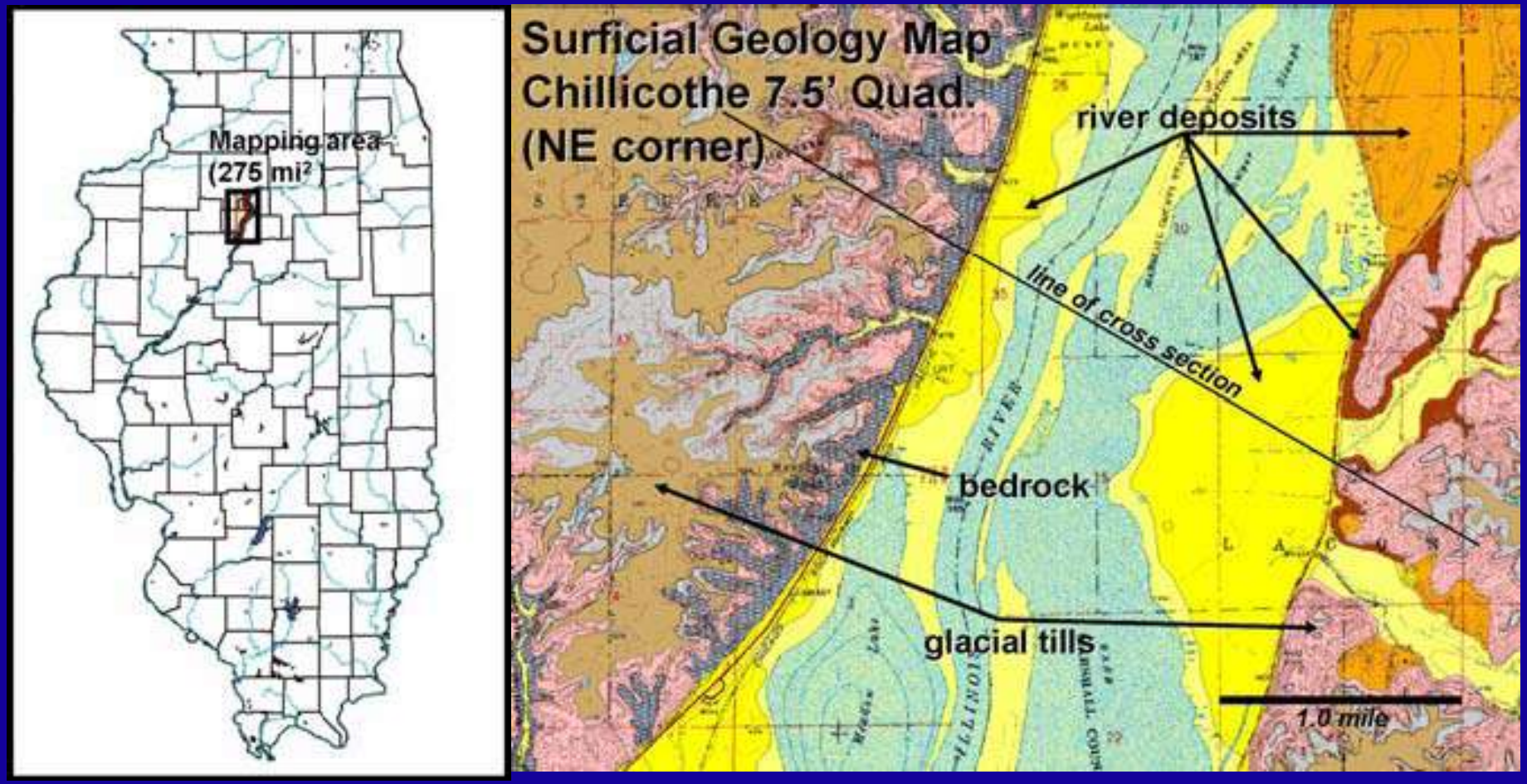
Illinois Surface Topography

Produced by the ISGS

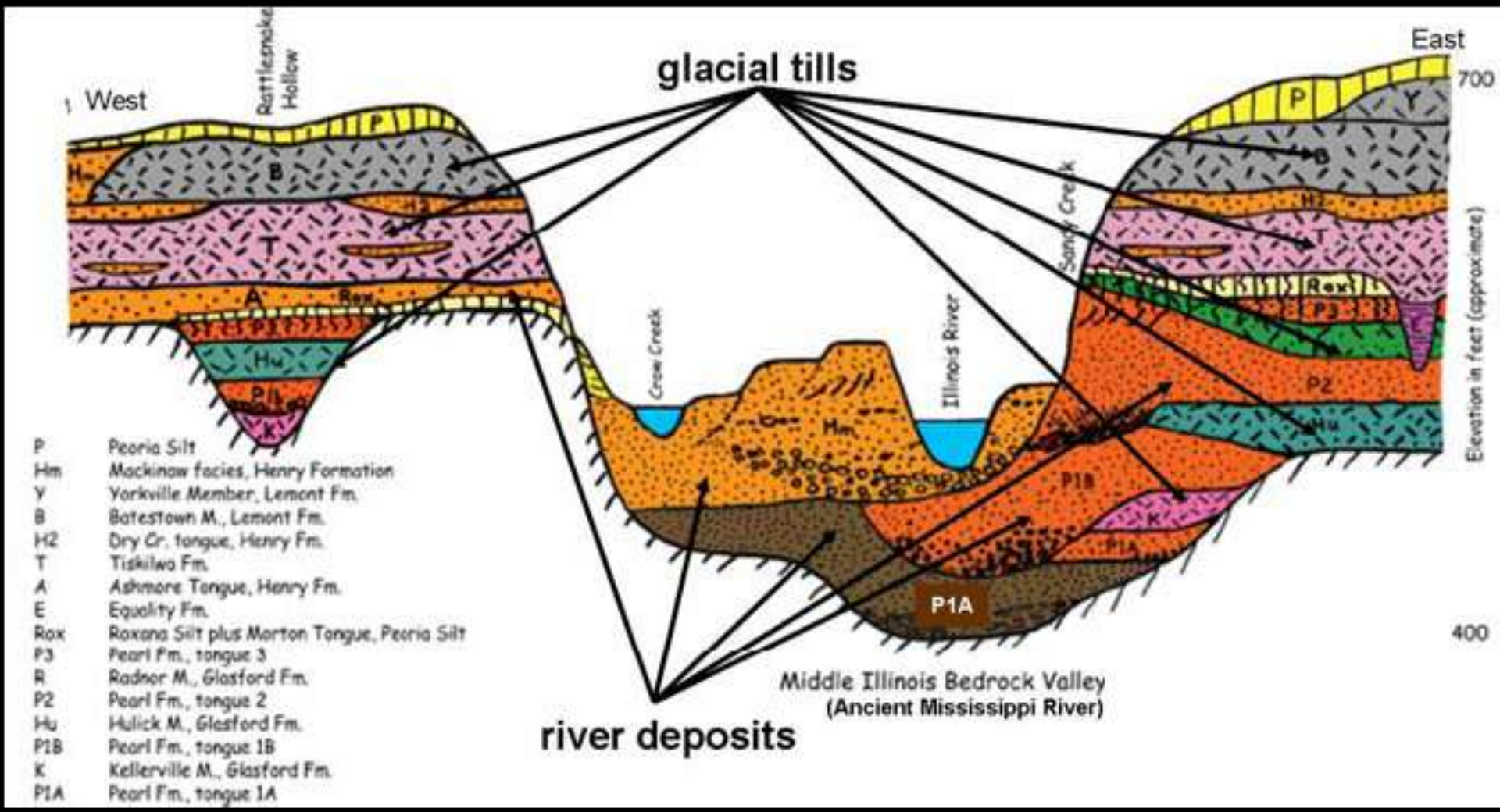
Thickness of glacial deposits in northern Illinois (McKay, ISGS, 2007).



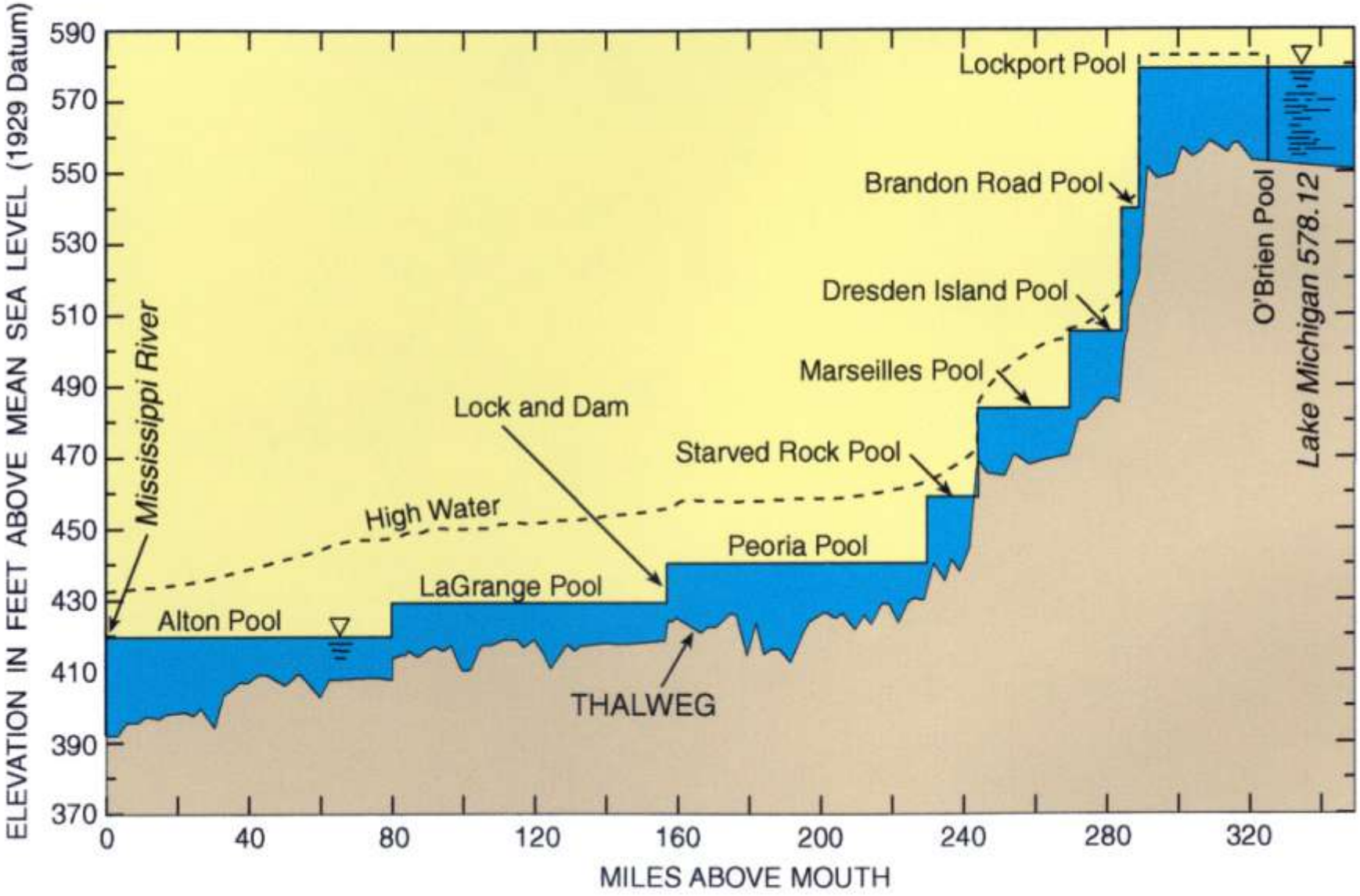
Location of recent and ongoing geologic mapping area in the Middle Illinois River Valley region of north-central Illinois (left) and northeastern portion of the Chillicothe 7.5-minute surficial geology map (right) showing areas of river deposits, glacial tills, and bedrock where they occur at land surface. (McKay, ISGS, 2007)

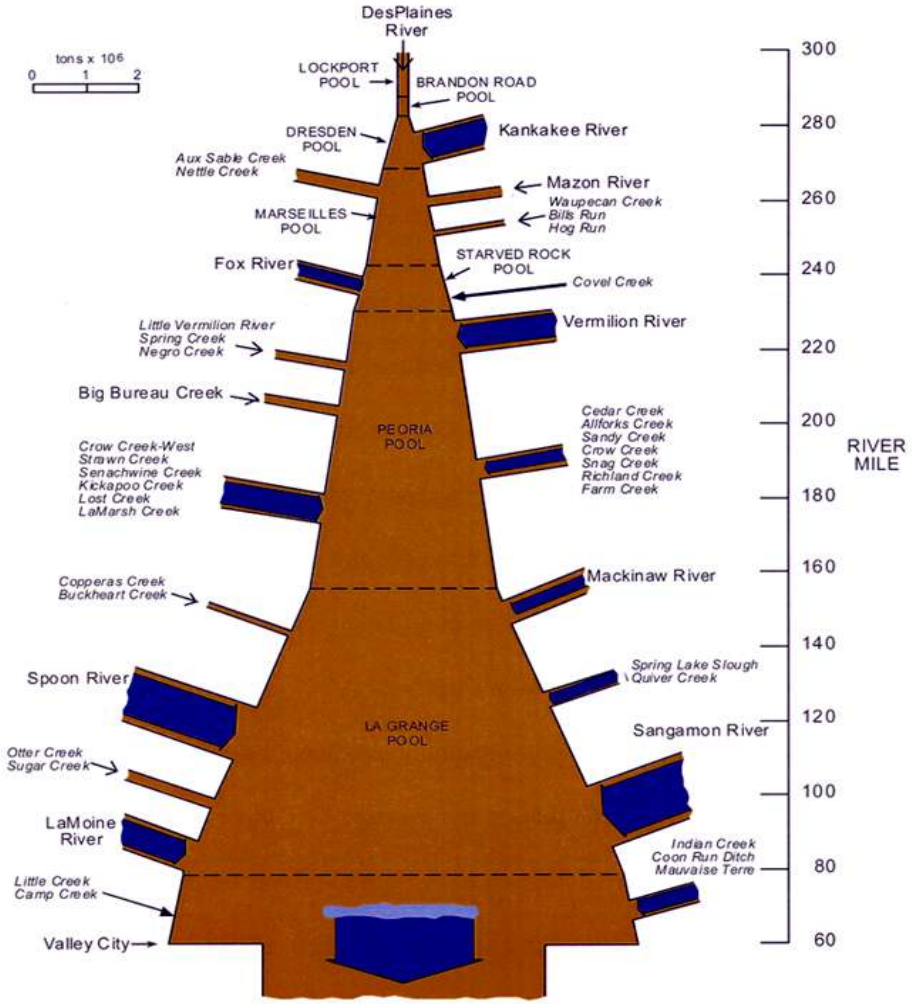


Geologic Cross-Section Showing the Principal Geologic Units Mapped in the Middle Illinois River Valley and Vicinity (McKay, ISGS, 2007).



PROFILE OF THE ILLINOIS RIVER WATERWAY





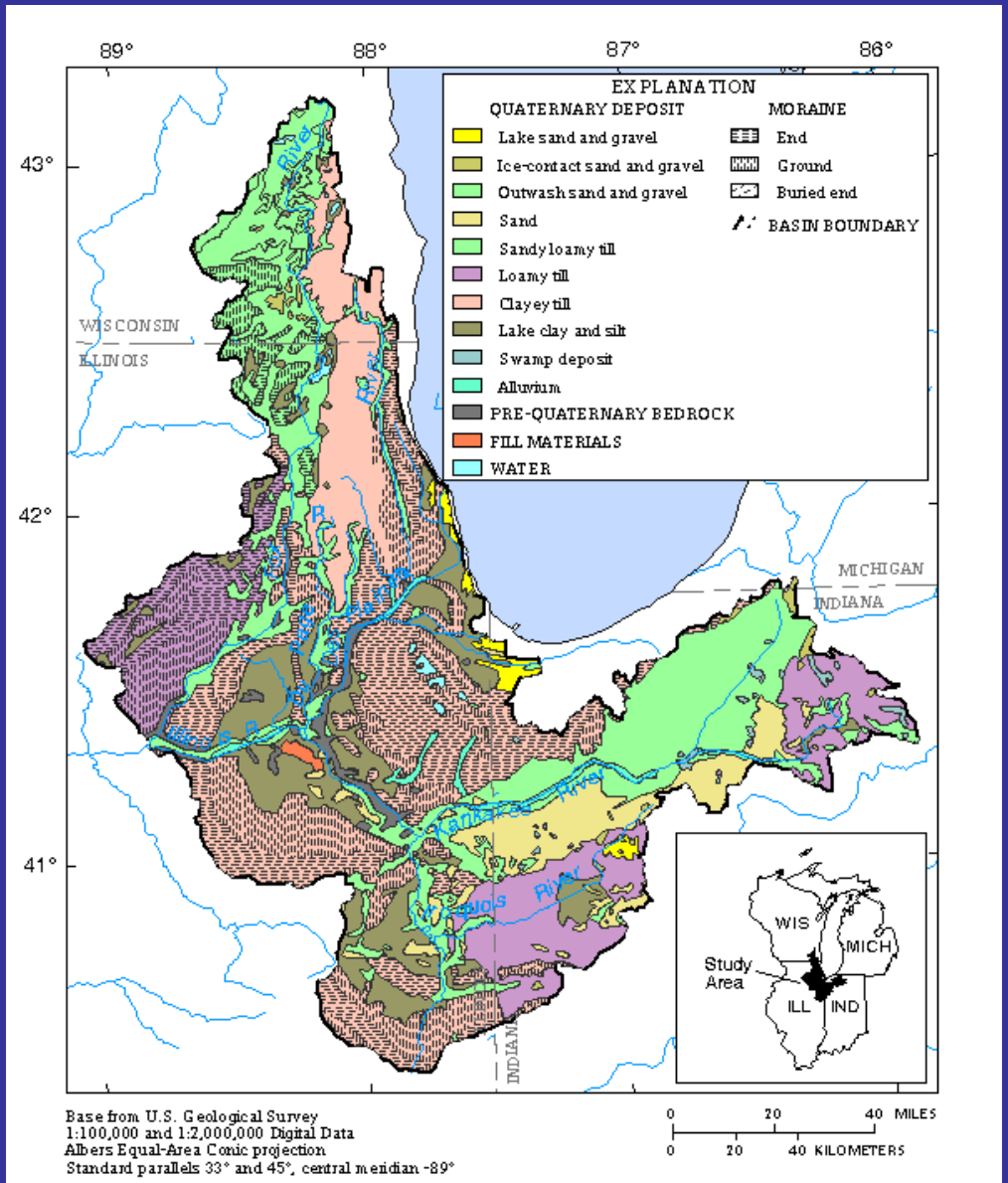
Average Annual Illinois River Basin Sediment Budget

Source: M. Demissie: Illinois State Water Survey

Illinois River Sediment Budget Facts

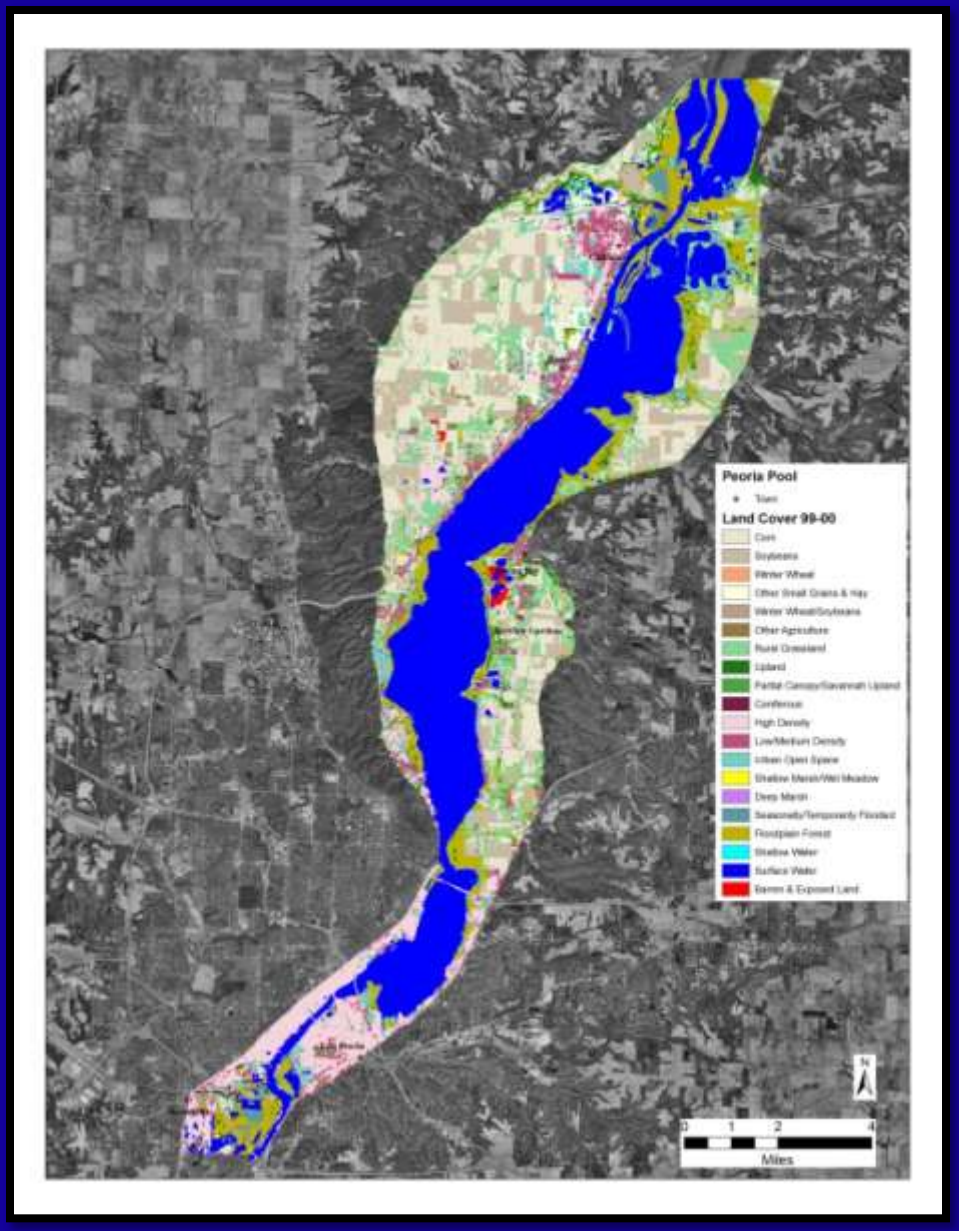
- Average annual sediment delivery to the Illinois River valley – 12.1 million tons
- Average annual sediment discharge at Valley City – 5.4 million tons
- Average annual sedimentation – 6.7 million tons
- Percent deposited – 55 percent
- The Spoon and LaMoine Rivers had the highest sediment yield rates for the period of analysis.
- The sediment budget for the 1980-2000 period serves as a basis for measuring our progress towards reducing the sediment delivery to the Illinois River valley.
- Significant additional sources of sediment must be targeted for stabilization and restoration.

Quaternary Deposits of the Upper Illinois River Basin



Quaternary deposits in the upper Illinois River Basin (from U.S. Geological Survey, 1983. Quaternary Geologic Map of the Chicago 4°x6° Quadrangle, United States).

Peoria Pool


Peoria Pool
Land Cover 99-00
Corn
Soybeans
Winter Wheat
Other Small Grains & Hay
Winter Wheat/Soybeans
Other Agriculture
Rural Grassland
Upland
Partial Canopy/Savannah Upland
Coniferous
High Density
Low/Medium Density
Urban Open Space
Shallow Marsh/Wet Meadow
Deep Marsh
Seasonally/Temporarily Flooded
Floodplain Forest
Shallow Water
Surface Water
Barren & Exposed Land
0 1 2 4
Miles

Soil loss contributes to non-point source pollution as sedimentation and turbidity

Photo Courtesy of State of Washington Water Research Center - www.swwrc.wsu.edu

Dam on the Fox River

Photo Courtesy of Friends of the Fox River – www.friendsofthefoxriver.org

Confluence of the Kankakee and Vermilion Rivers

Court Creek West Bridge Washes Out Due to Aggradation of Bed and Loss of Channel Drainage Capacity

Logjams

Critical Erosion of a Railroad

Midwest Rivers Swell

From Colleagues in Wisconsin

2008 Wilson Creek Flood

From Colleagues in Wisconsin
2008 Wilson Creek Flood

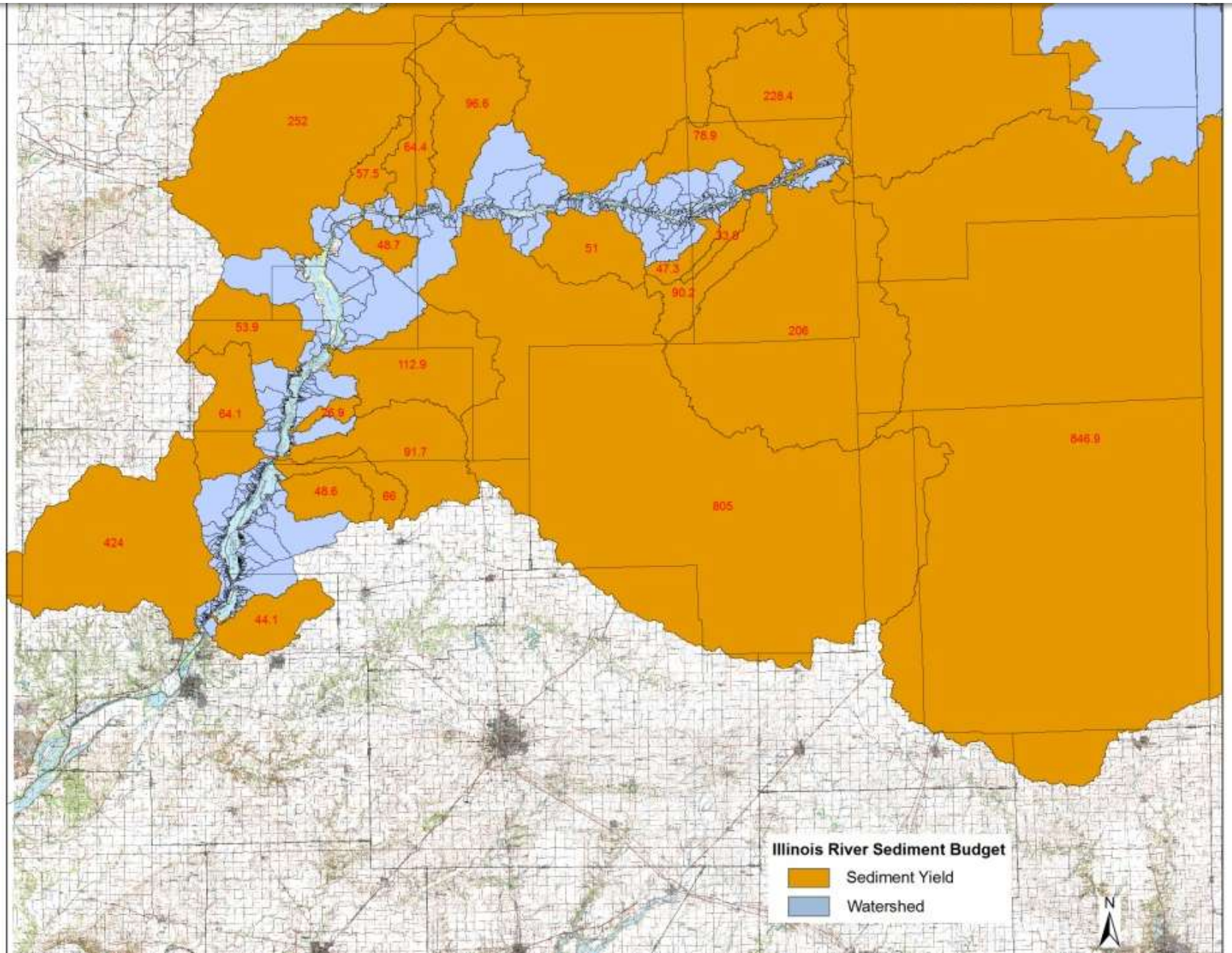
RR Bridge at Lower End of Crow Creek West

Partridge Creek Delta in 1985

Urban Flooding

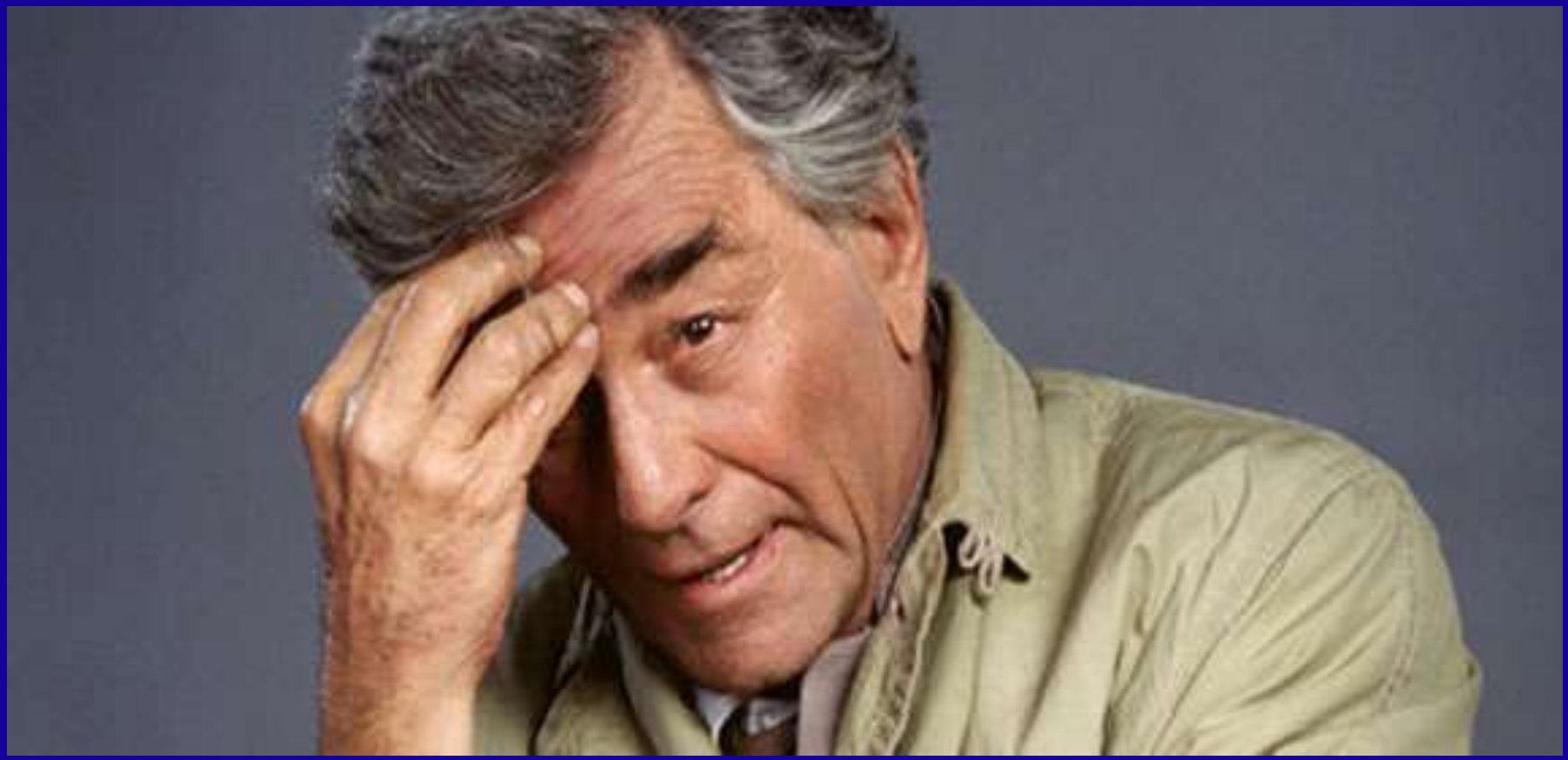
Ten Mile Creek Watershed

Critical Sediment Producing Target Areas Along the Upper Illinois River Valley

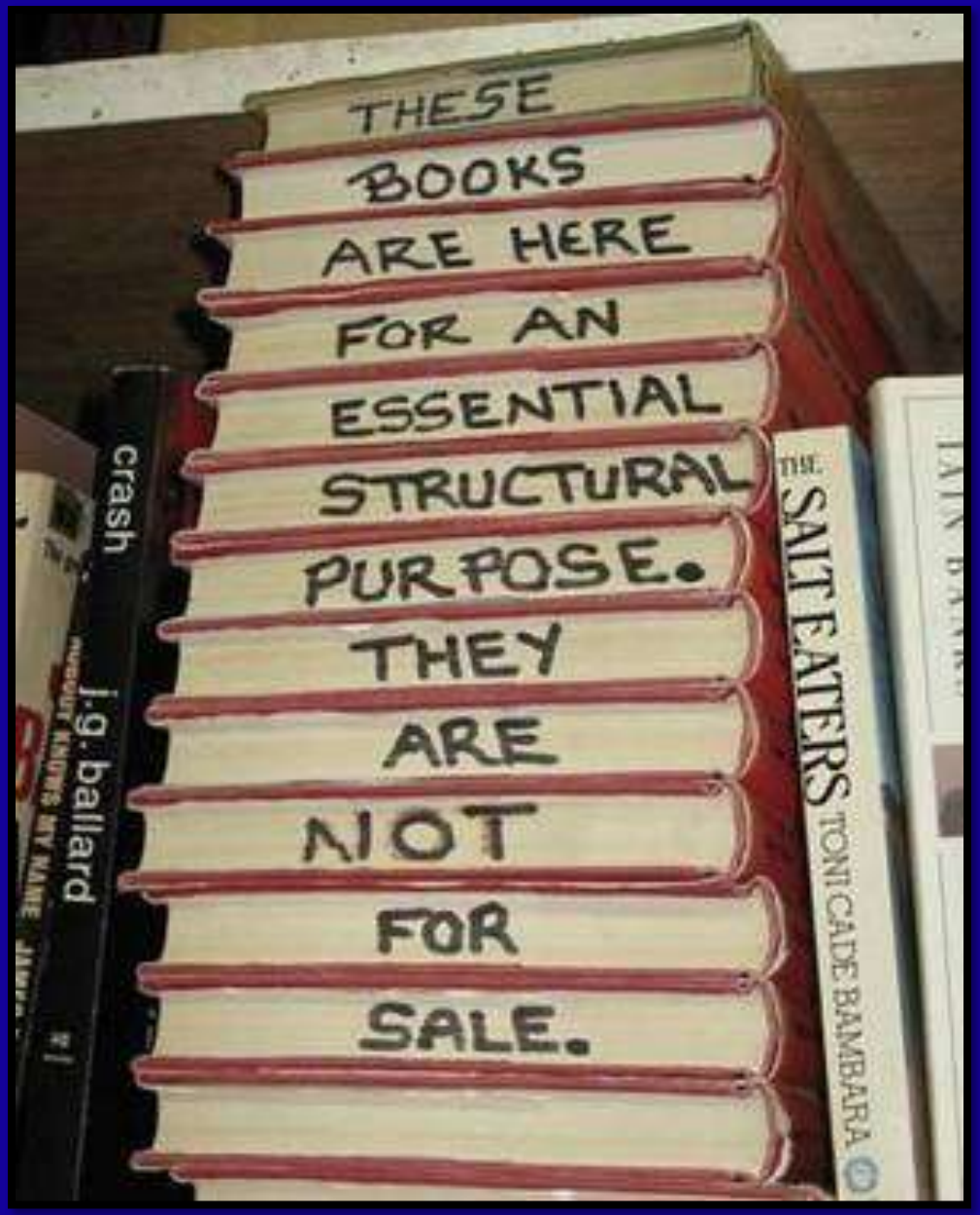


WE NEED COLUMBO ON THIS JOB!

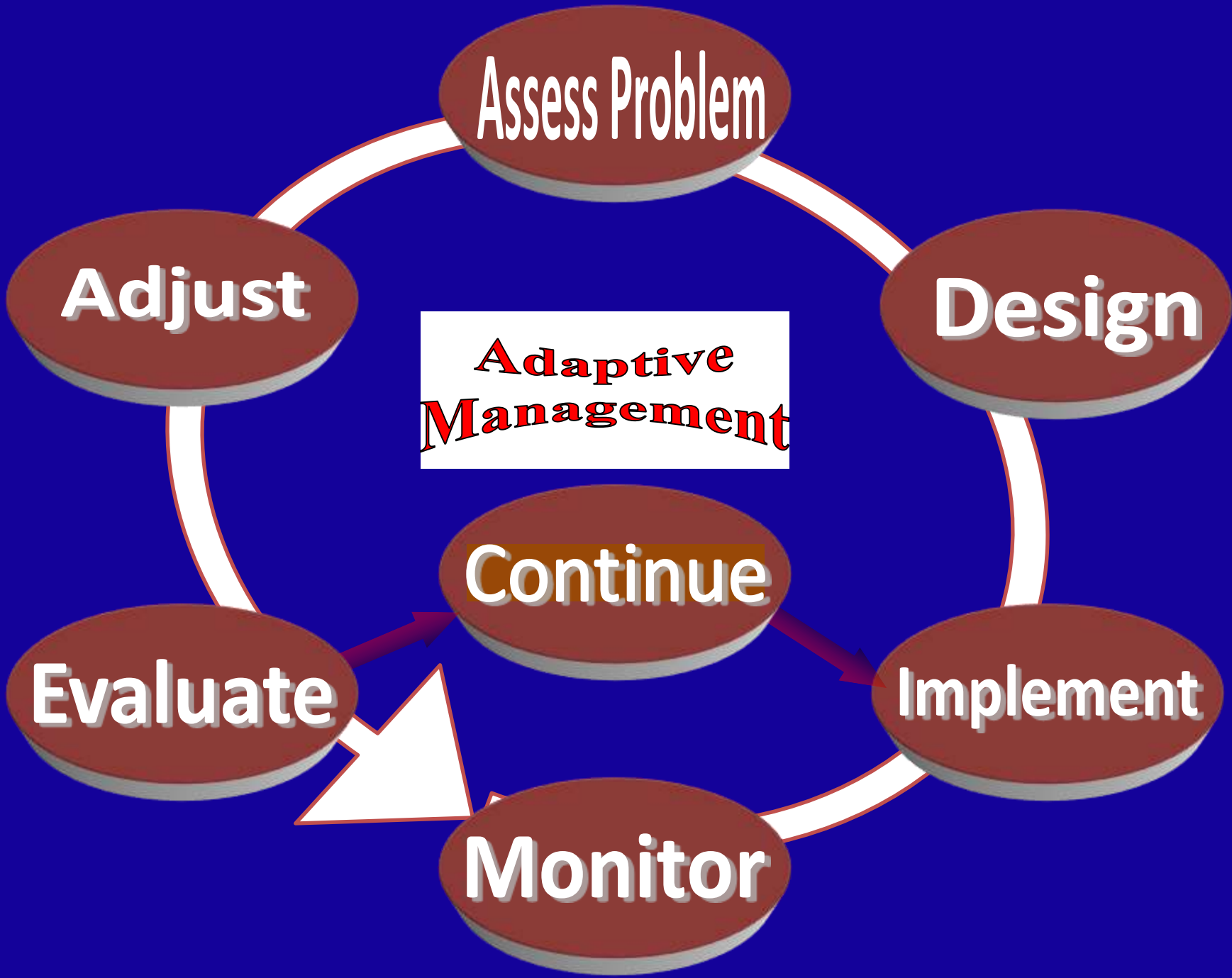
LIEUTENANT COLUMBO, the finest fictional detective in the history of the Los Angeles Police Department. He had a knack for identifying the culprit and were he investigating this issue he would assess geomorphological conditions, collect more water quality samples, minimize hydrologic extremes , plant more native vegetation, use green development principles, etc…



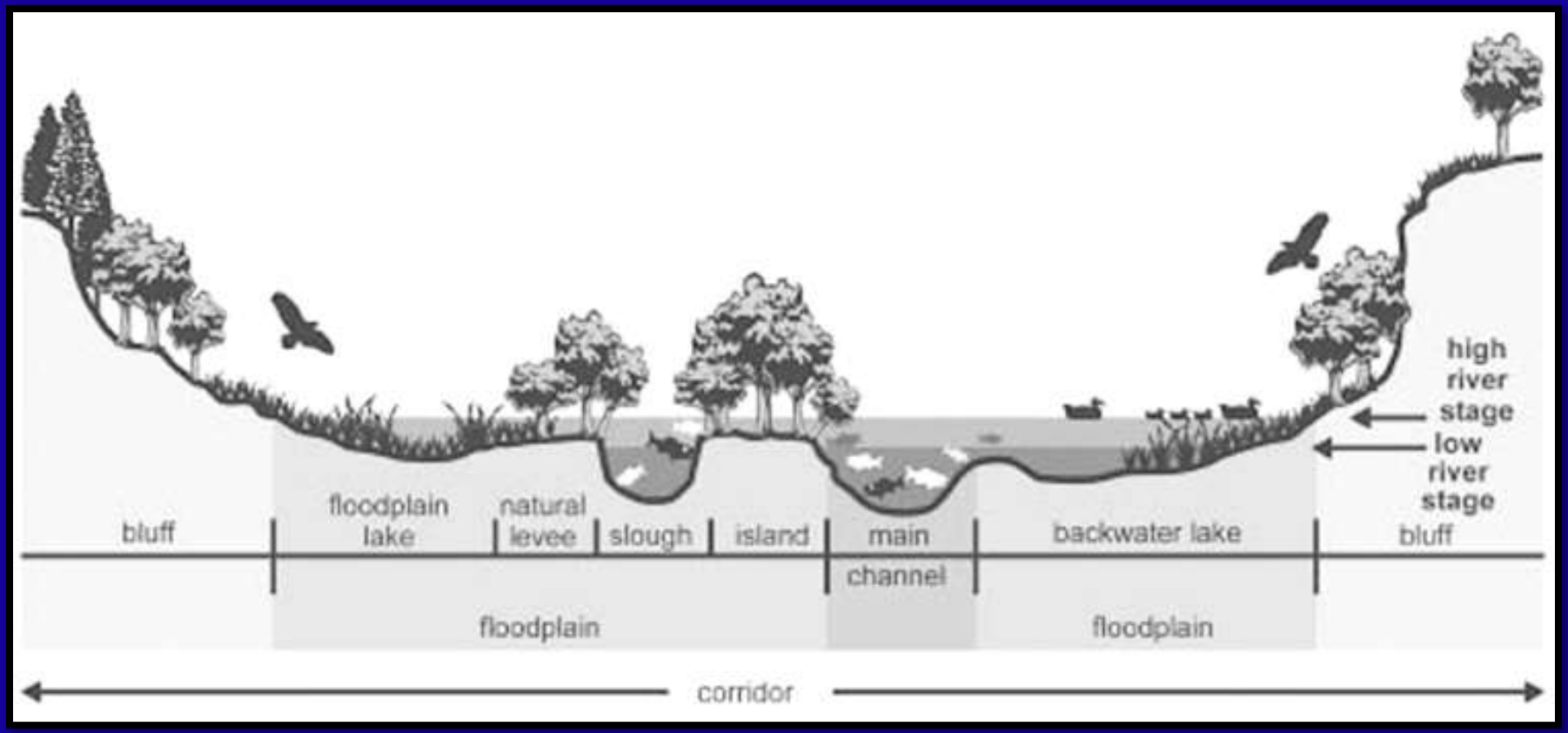
Where are the Plans?

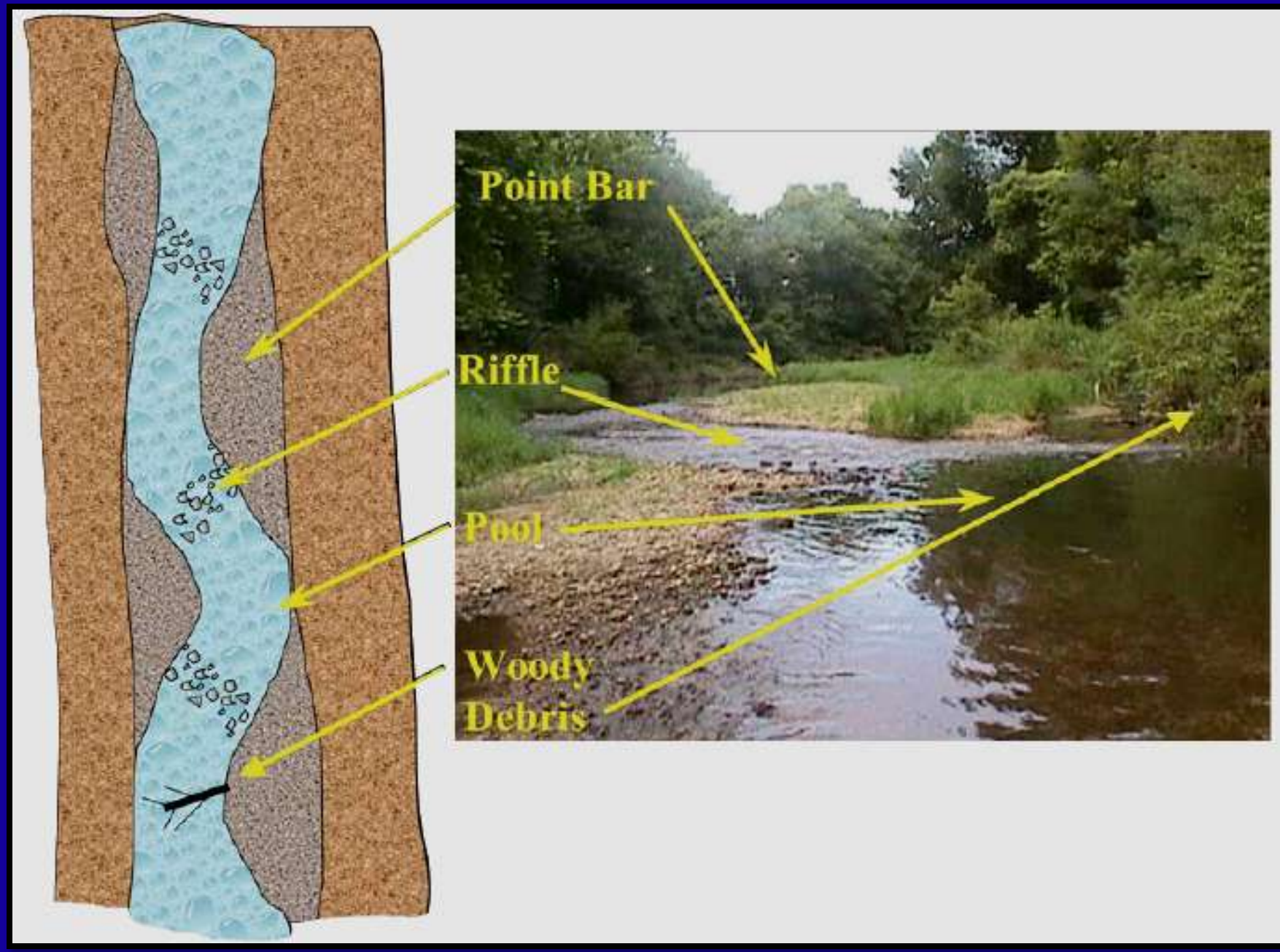


Adaptive Management


Assess Problem
Design
Implement
Monitor
Evaluate
Adjust
Adaptive Management
Continue

Common Features of A River Corridor




Point Bar
Riffle
Pool
Woody
Debris

The Sustainable World

The complexity of the modern world presents new challenges to scientists and engineers that requires finding interdisciplinary solutions. Any problem solving carried out in the isolation of a particular field of expertise may give rise to a series of damaging effects which can create new and unintentional environmental and ecological problems.

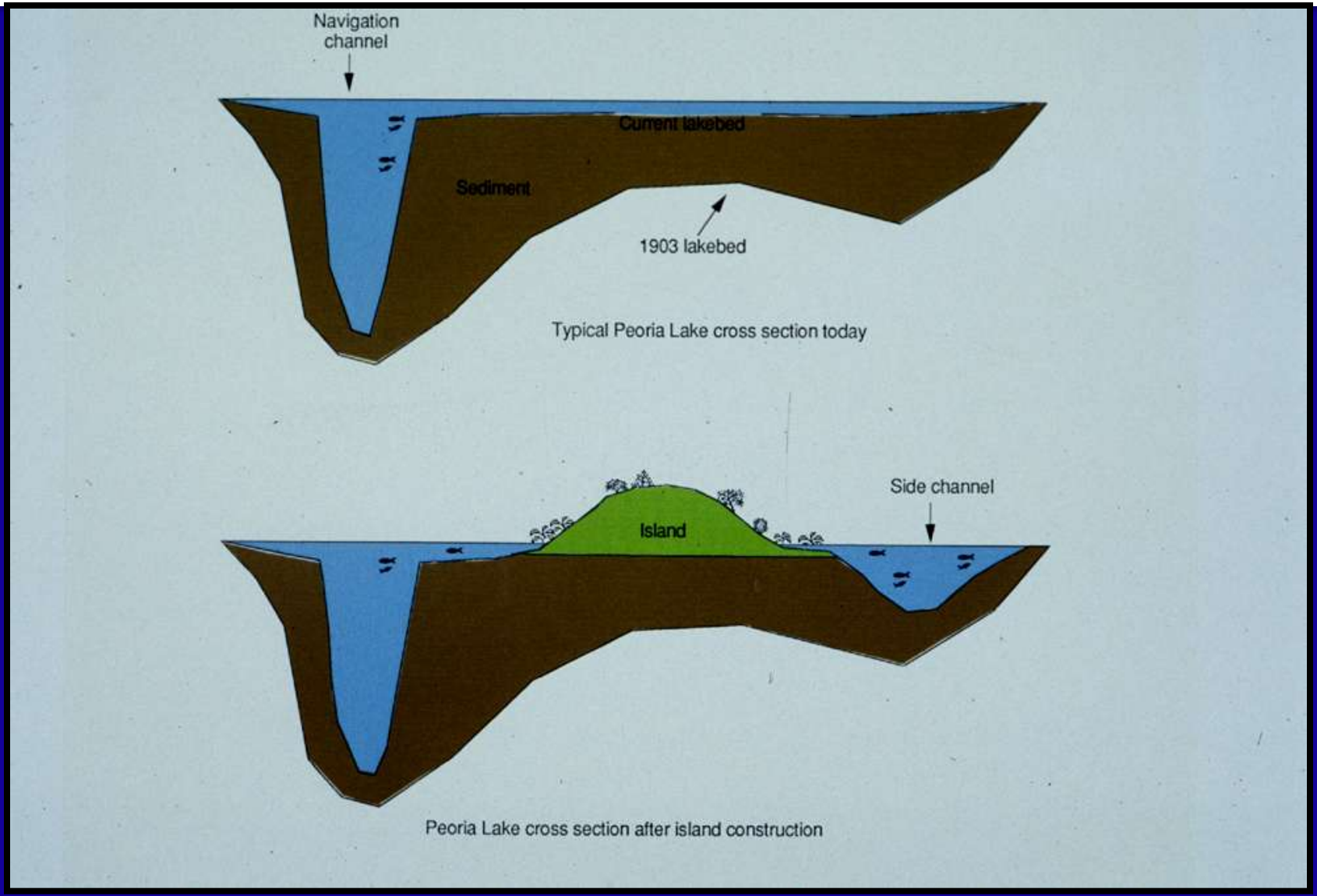
Specialization, while required in our culture, needs to be kept under control by the understanding of the whole, which leads to the need of relying on interdisciplinary teams.

This collaboration needs to be effective and to produce results that will lead to a better world. For this to happen, it is necessary that different groups of scientists and engineers acquire the necessary skills to be able to talk to each other. Furthermore, they need to understand the social and economic aspects of a given problem, in addition to the scientific and engineering issues involved.

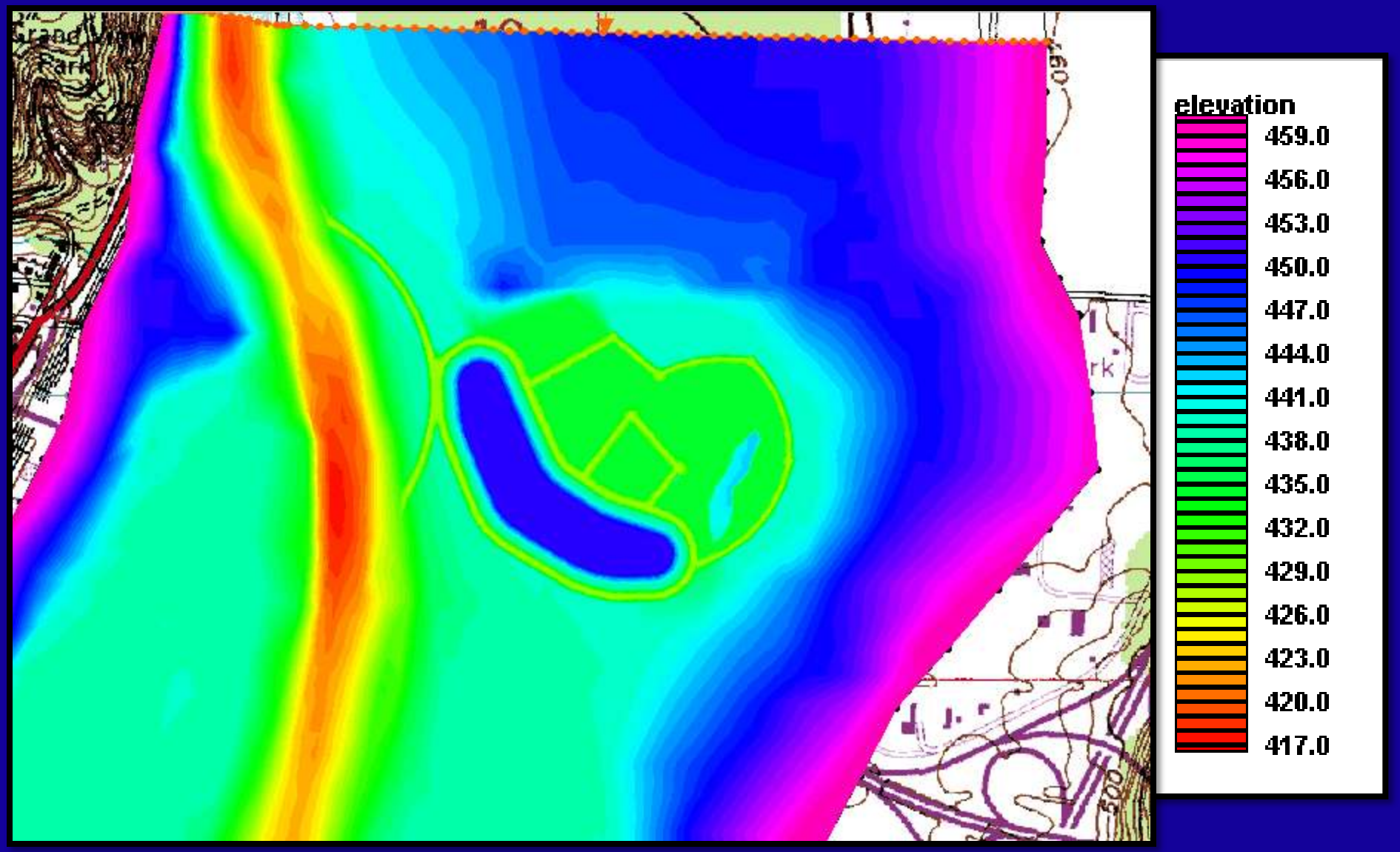
Solutions

Peoria Lake Restoration

With Man-Made Islands and Side Channels



Preferred Island Location



Benefits of Islands and Side Channels

- Providing improved and diversified aquatic and riparian habitats
- Serving as dredged material disposal sites for both navigation channel maintenance and selective dredging
- Reducing wind- and navigation-induced resuspension of sediment and turbidity
- Reducing sedimentation rates in the areas where islands are constructed
- Providing more suitable water-based recreational sites in Peoria Lake
- Providing a side channel away from the navigation channel for safe recreational boating

Current Projects of the Illinois River Ecosystem Restoration Effort

Island Construction

Senachwine Creek

McKee Creek Sediment Gage (Being re-located to Senachwine Creek)

Ten Mile Creek

Crow Creek (West)

Pekin Unit (North)

Pekin Unit (South)

Blackberry Creek

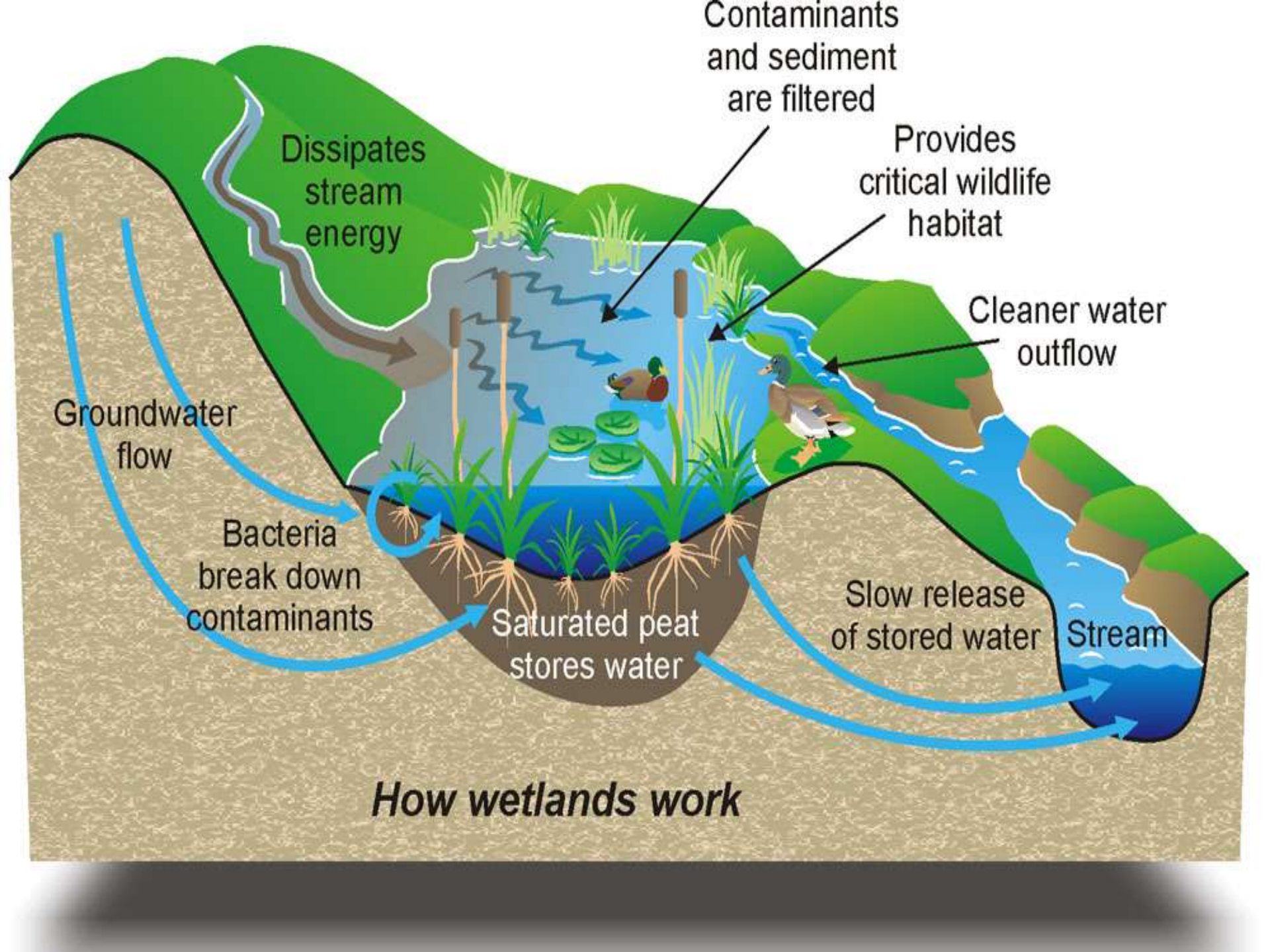
Fox River Batavia/Yorkville Dams

Waubonsee (real estate)

Starved Rock Pool

Alton Pool

Yellow River, Indiana


Contaminants and sediment are filtered
Dissipates stream energy
Provides critical wildlife habitat
Cleaner water outflow
Groundwater flow
Bacteria break down contaminants
Saturated peat stores water
Slow release of stored water
Stream
How wetlands work

Removal of a Dam on Wabaunsee Creek in Kendall County

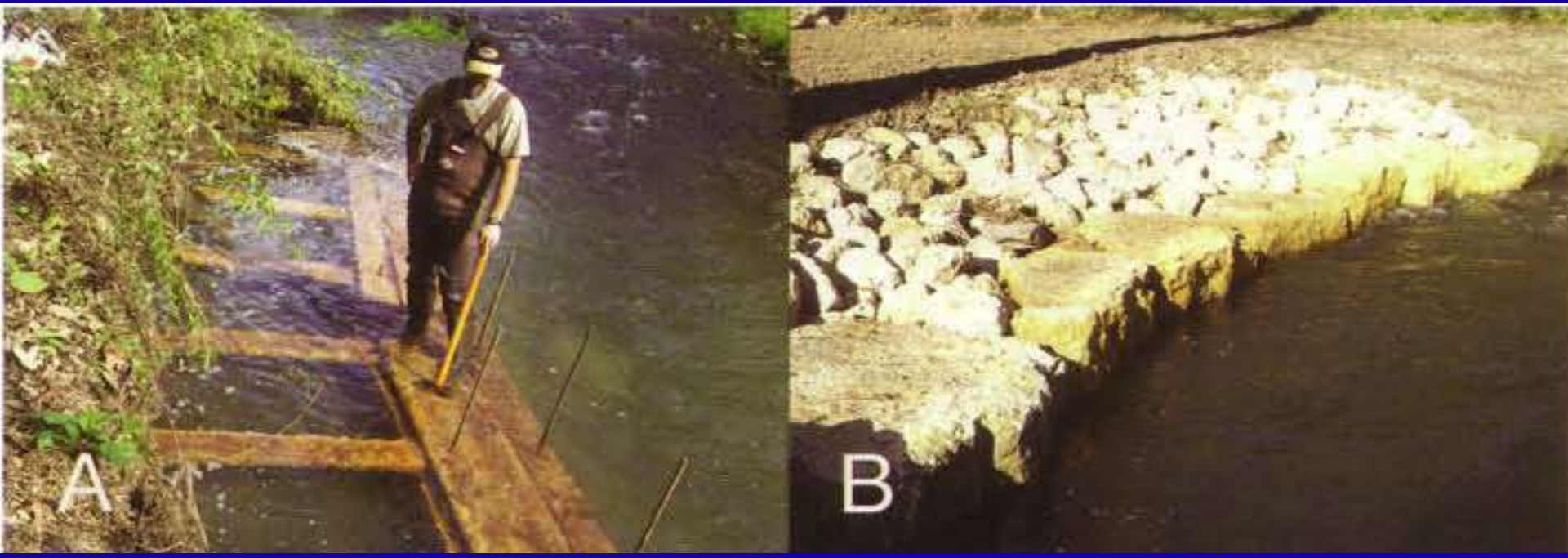
Replacement of the Dam with a constructed riffle allows fish passage

Before

After

Dormant Willow Post and Set-Aside in Court Creek, Knox County

Example of a Bank Stabilization and In-Stream Habitat Project in northwestern Illinois



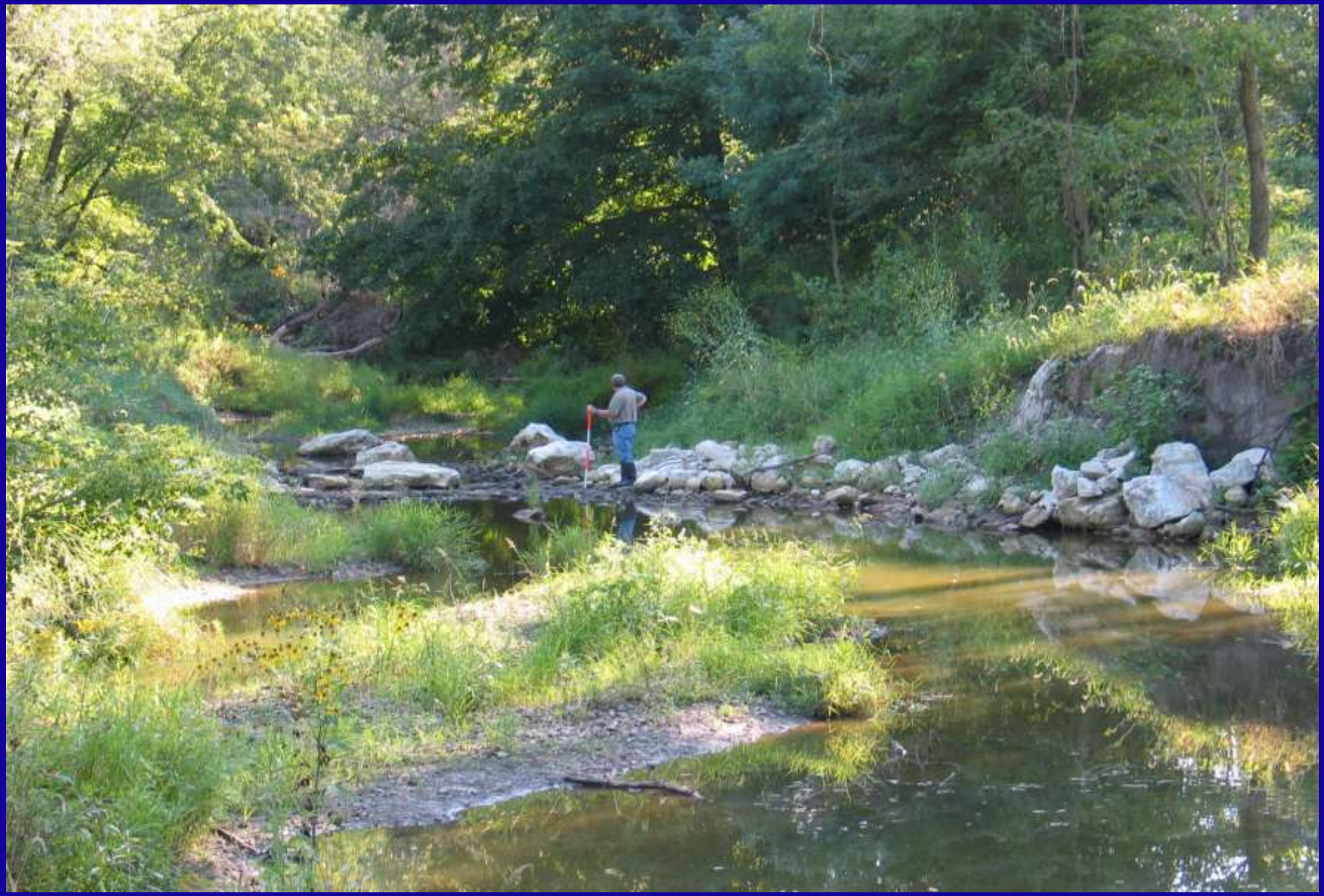
The wood structure is A) Lunker Structure, which creates an overhanging bank for fishes. B) Lunker Structure with rock placed on top.

Bioengineering

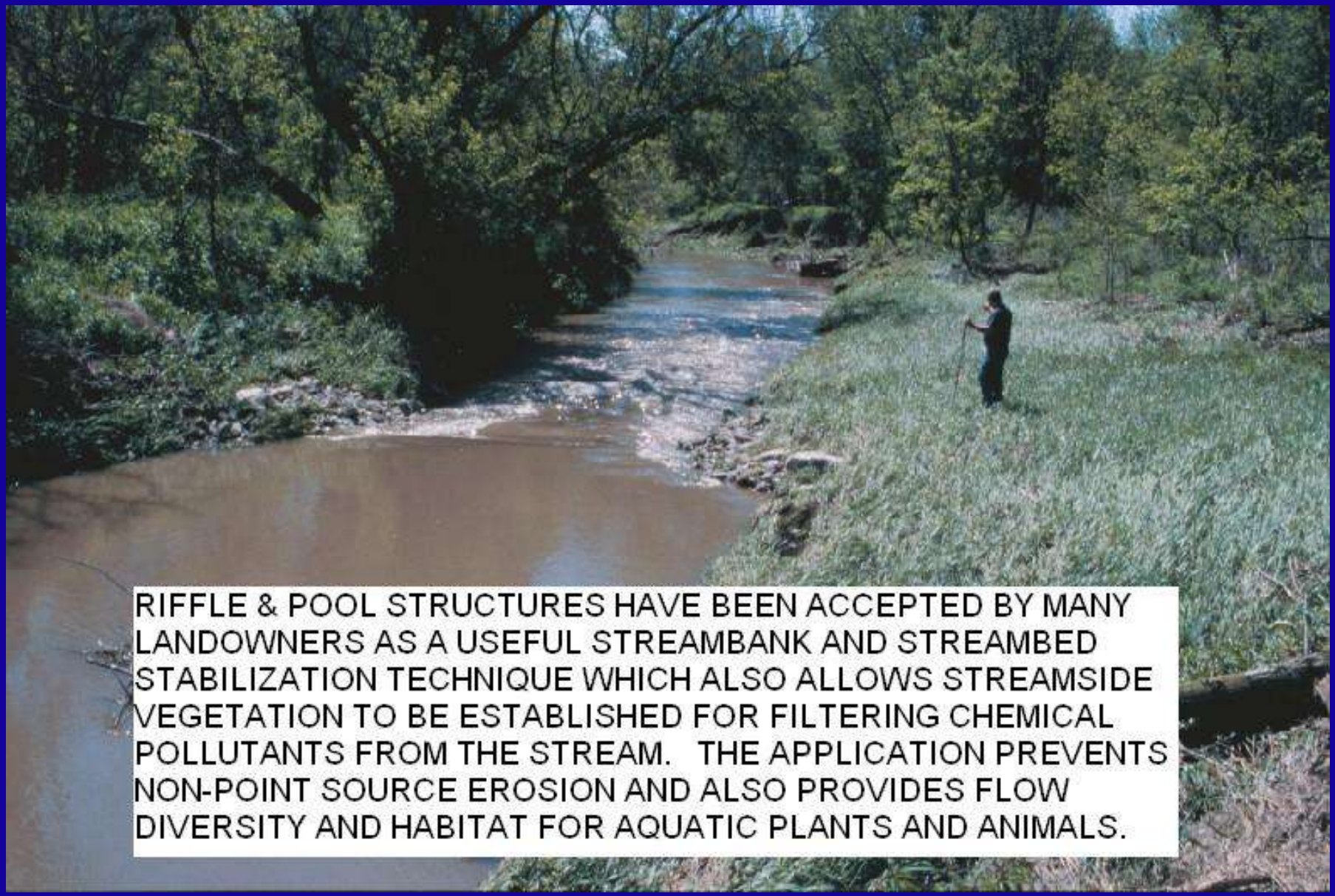
Flexible Dredger

Riffle/Pool Structure (Before)

Riffle/Pool Structure (After)



Riffle/Pool Structures



Riffle/Pool Structure

Healthy Water

History of Changes in the Illinois River Watershed
"Implications for Management"

Illinois River Conference

October 4-6. 2011

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