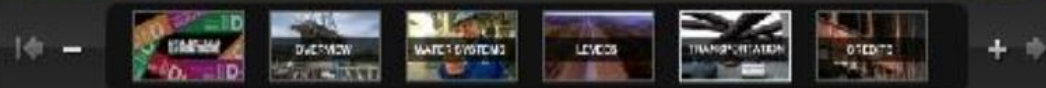


U.S. Water Resources Challenges: Water Resources Infrastructure and Policy

Jeffrey Jacobs, National Research Council

REPORT CARD for 2009 America's INFRASTRUCTURE

★ HOME ★ REPORT CARDS ★ STATES ★ CATEGORIES ★ SOLUTIONS ★ TAKE ACTION ★ NEWSROOM ★

 SEARCH


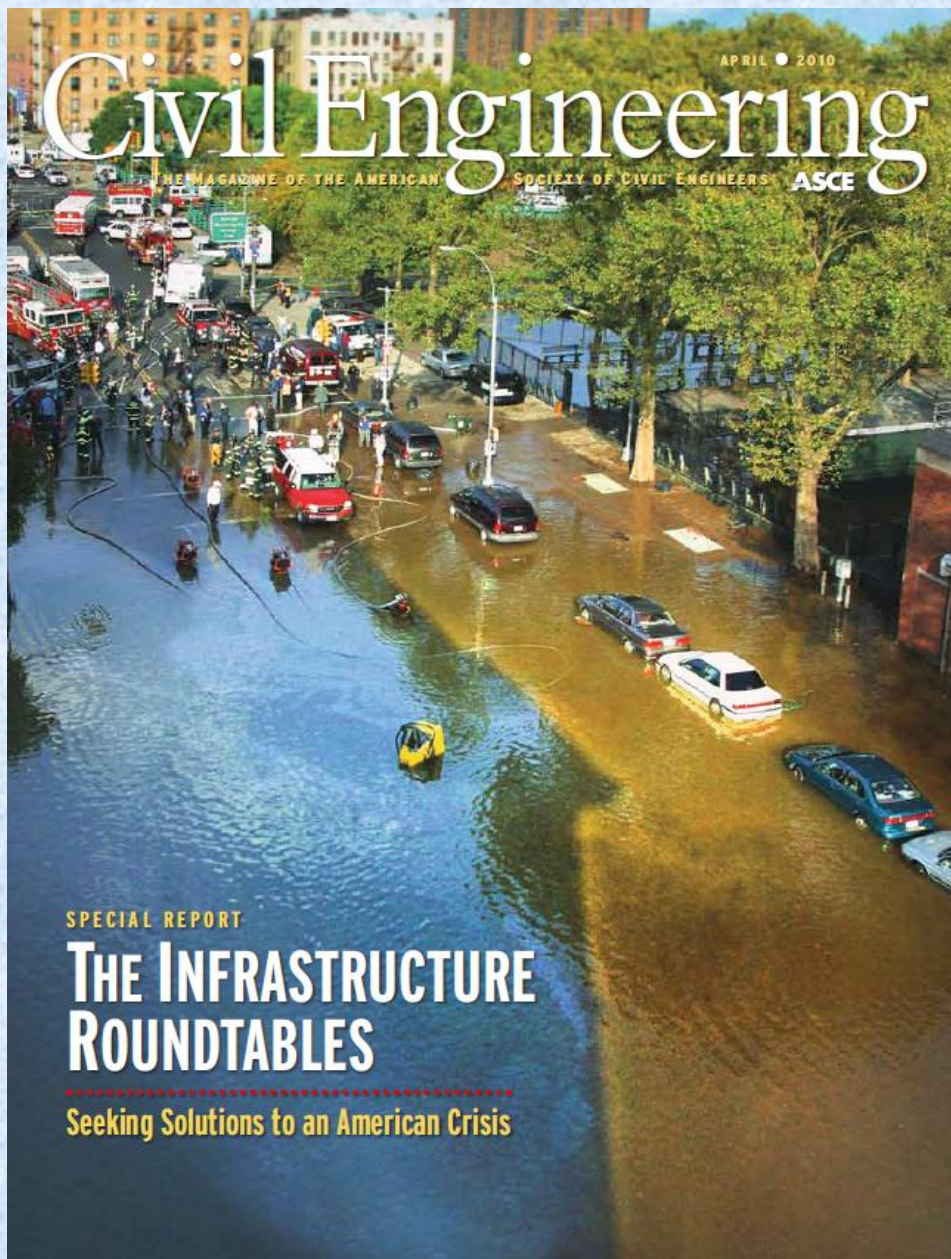
2009 Grades

Aviation	D
Bridges	C
Dams	D
Drinking Water	D-
Energy	D+
Hazardous Waste	D
Inland Waterways	D-
Levees	D-
Public Parks and Recreation	C-
Rail	C-
Roads	D-
Schools	D
Solid Waste	C+
Transit	D
Wastewater	D-

America's Infrastructure GPA: **D**

Estimated 5 Year Investment

Need: **\$2.2 Trillion**



THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

RUNNING OUT OF WATER

THE LOOMING CRISIS AND SOLUTIONS TO
CONSERVE OUR MOST PRECIOUS RESOURCE

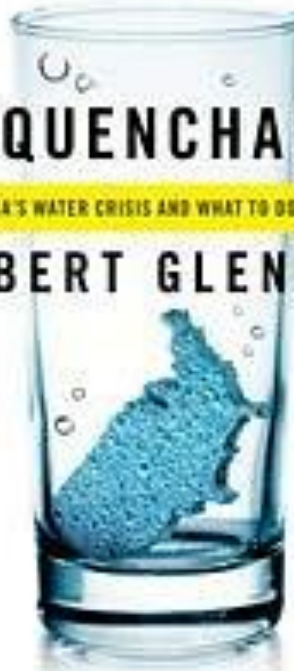


PETER ROGERS AND SUSAN LEAL
Foreword by CONGRESSMAN EDWARD J. MARKEY

UNQUENCHABLE

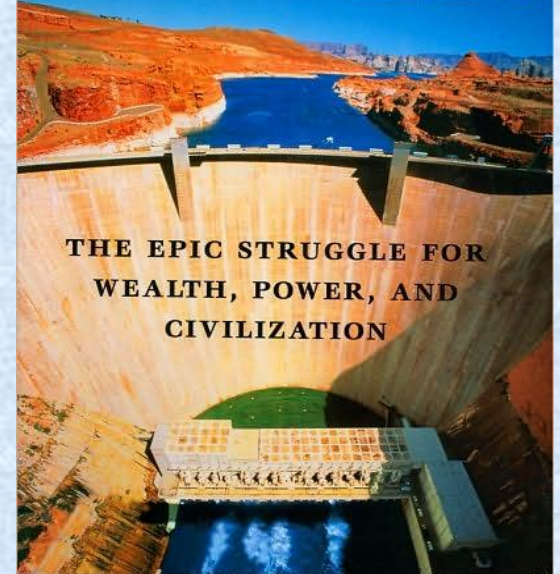
AMERICA'S WATER CRISIS AND WHAT TO DO ABOUT IT

ROBERT GLENNON



STEVEN SOLOMON

WATER



THE EPIC STRUGGLE FOR
WEALTH, POWER, AND
CIVILIZATION

THE NATIONAL ACADEMIES
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National Water Infrastructure

- Dams (multipurpose, navigation, hydropower)
- Locks
- Levees
- Ports and harbors
- Irrigation canals and aqueducts
- Wastewater treatment works
- Stormwater runoff
- Drinking water distribution systems
- Ecological restoration
- Revetments, bank stabilization

THE NEW ORLEANS HURRICANE PROTECTION SYSTEM



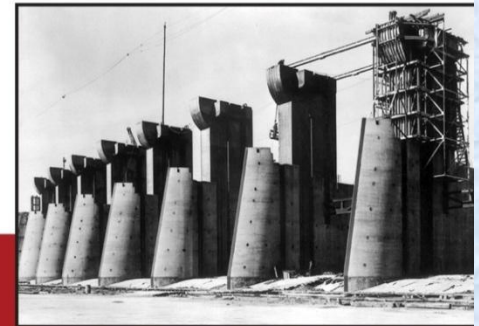
Assessing Pre-Katrina Vulnerability
and Improving Mitigation and Preparedness

NATIONAL ACADEMY OF ENGINEERING AND
NATIONAL RESEARCH COUNCIL

Water Resources Planning for the Upper Mississippi River and Illinois Waterway



NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES



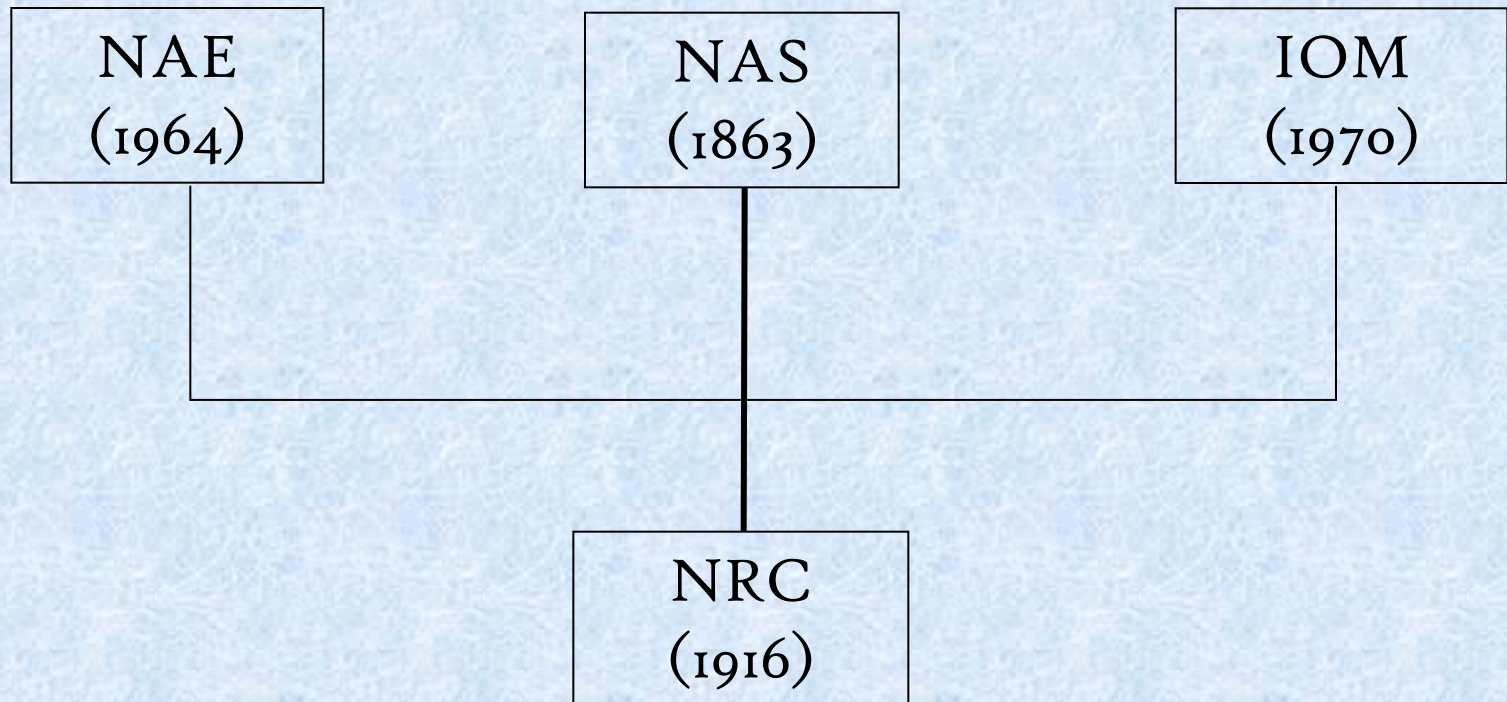
NATIONAL WATER RESOURCES
CHALLENGES FACING THE U.S.
ARMY CORPS OF ENGINEERS

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES



THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

The National Academies



THE NEW ORLEANS HURRICANE PROTECTION SYSTEM



**Assessing Pre-Katrina Vulnerability
and Improving Mitigation and Preparedness**

NATIONAL ACADEMY OF ENGINEERING AND
NATIONAL RESEARCH COUNCIL

BUILDING A STRONGER FORTRESS

HURRICANE
THE FORTRESS
DEADLINE
6.1.11

After Katrina, Congress gave the Army Corps of Engineers \$14.6 billion to repair and improve hurricane and flood protection in New Orleans. About \$8 billion later, a significant goal will be reached June 1: Most south shore communities have been enclosed within a 130-mile system of levees, walls and gates that are designed to keep out a 100-year storm surge. Work will continue for the next few years, but the corps says the city is safe from flooding in a storm that has a 1 percent chance of hitting in any year.

St. Charles Parish levee

Project: The levee had been breached during earlier west Indian storms, and the Corps is repairing the breach and strengthening the levee to prevent future breaches.

Levee feature: The new levee is about 10 feet higher than the old one and will flow from the east through the Louisiana coastline to the river and then east to Jefferson Parish.

Left to be done: Armoring.



New Orleans drainage canals

Project: Temporary gates and pumps will allow Lake Pontchartrain storm surge from the lake to the city.

Levee feature: The Katrina evacuation water of the 17th Street Canal has been strengthened by injecting concrete into the foundations. It will allow the canal to take more rainfall than the other canals.

Left to be done: Permanent gates and pumping stations will be built at the head of each canal to replace temporary gates built in 2006.



Seabrook Floodgate

Project: Since Lake Pontchartrain water, up to 10 feet, flows into the Mississippi Delta, to improve the levee system.

Levee feature: When the gates close, the water will flow into the Lake George surge barrier during hurricanes.

Left to be done: To meet the 100-year storm surge, the temporary outfall must be closed and the surge barrier must be closed to keep the surge out of the city.



HOW IT WILL WORK:



MAP KEY:

- Existing levees and floodwalls (subject to improvement)
- New levees and floodwalls (subject to improvement)
- Levee under construction
- Levee under construction

Note: Levees are not required to be 100-year storm surge protection in all areas. Levees are required to be 100-year storm surge protection in all areas.

River to Lake Cataouatche levee

Project: Storm surge before Katrina, the levee was breached, and the Corps is repairing the breach and strengthening the levee to prevent future breaches.

Levee feature: The new levee is about 10 feet higher than the old one and will flow from the east through the Louisiana coastline to the river and then east to Jefferson Parish.

Left to be done: A new permanent gate gate at the mouth of the river will be built to prevent surge from the river.



West Closure Complex

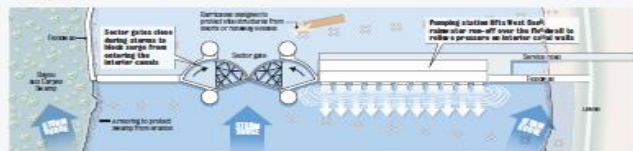
Project: The West Closure Complex, including the West Closure Complex, is a major project to protect the city from surge from the river to the lake.

Levee feature: The new levee is about 10 feet higher than the old one and will flow from the east through the Louisiana coastline to the river and then east to Jefferson Parish.

Left to be done: A new permanent gate gate at the mouth of the river will be built to prevent surge from the river.



HOW IT WORKS:



St. Bernard levee floodwalls

Project: The St. Bernard levee floodwalls, including the St. Bernard levee floodwalls, are a major project to protect the city from surge from the river to the lake.

Levee feature: The new levee is about 10 feet higher than the old one and will flow from the east through the Louisiana coastline to the river and then east to Jefferson Parish.

Left to be done: A new permanent gate gate at the mouth of the river will be built to prevent surge from the river.



Lake Borgne surge barrier

Project: A heavy 100-mile-long, 50-foot-tall wall will be constructed to block the surge from Lake Borgne and the surge from the river to the lake.

Levee feature: The new levee is about 10 feet higher than the old one and will flow from the east through the Louisiana coastline to the river and then east to Jefferson Parish.

Left to be done: A new permanent gate gate at the mouth of the river will be built to prevent surge from the river.

HOW IT WORKS:



Scale of 100-year protection requirements





MRGO Levees















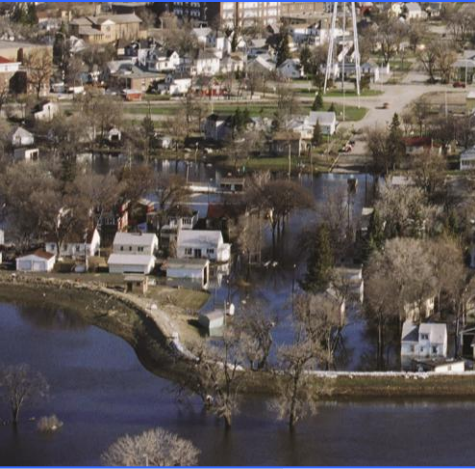


Lessons from Katrina

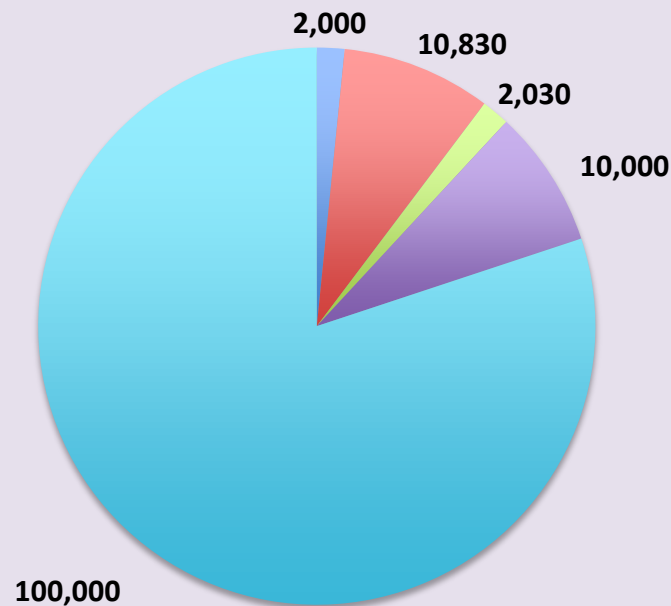
- Limits of protective structures
- Future footprint of hurricane protect. system (?)
- Relocations can improve public safety
- Re-consider 100-year flood protection standard
- Re-think evacuation plans and protocols
- Disseminate info. from inundation depth maps

*** top down, federal-led emphasis on structures must be complemented by local and state land use plans, zoning, evacuation, education, etc.*

National Levee Safety Issues



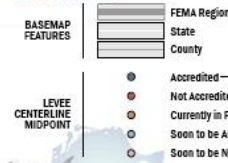
**Estimated
Miles of
Levees in
the U.S.**



- Federally owned & operated (Army Corps of Engineers)
- Federally constructed (Army Corps), locally operated
- Local levees enrolled in Rehabilitation & Inspection Program
- Estimated other federal levees
- Estimated other state, local, and private levees

FEMA Levee Accreditation Status

MAP SYMBOLY

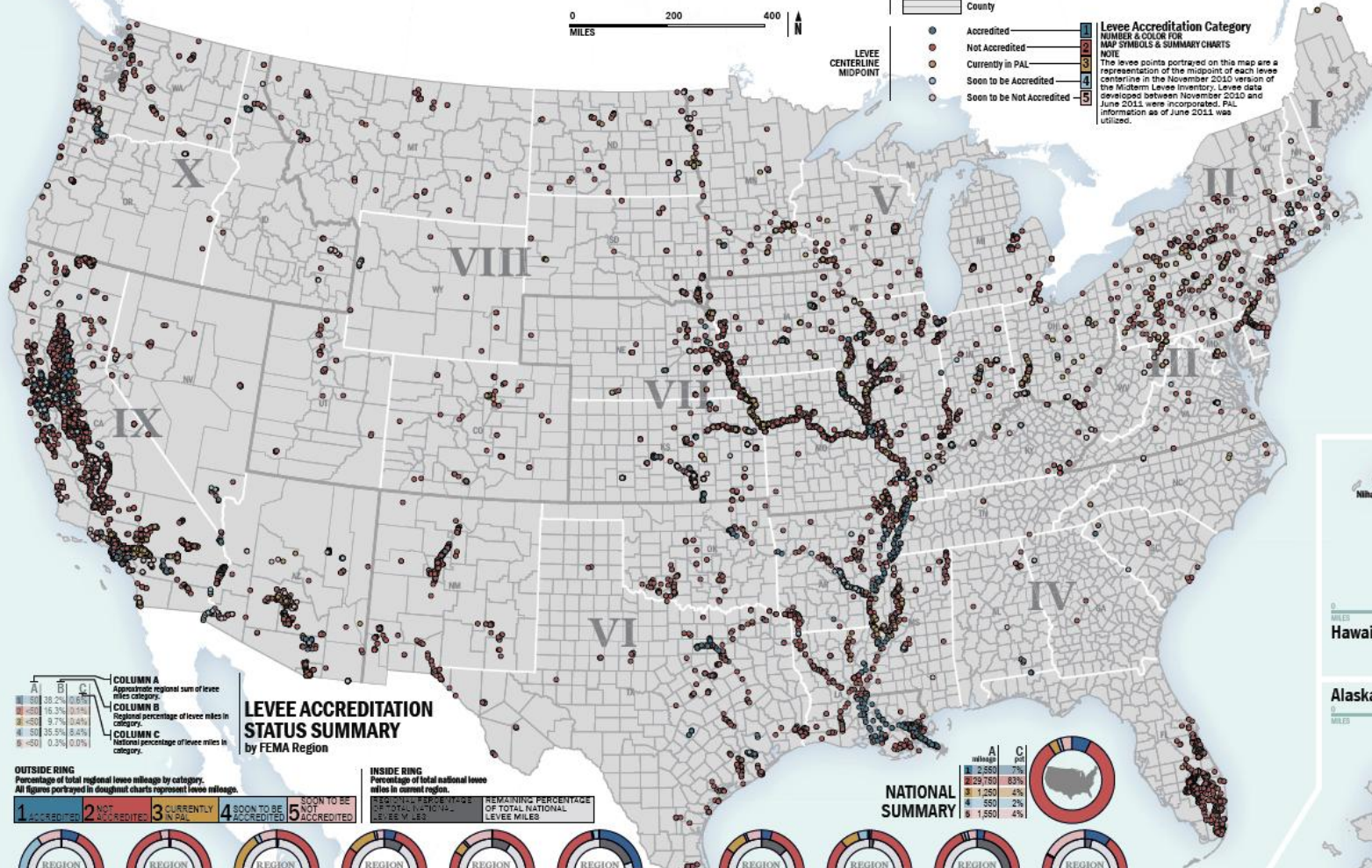


Levee Accreditation Category

NUMBER & COLOR FOR MAP SYMBOLS & SUMMARY CHARTS

NOTE
The levee points portrayed on this map are a representation of the midpoint of each levee centerline in the November 2010 version of the Midterm Levee Inventory. Levee data developed between November 2010 and June 2011 were incorporated. PAL information as of June 2011 was utilized.

FOR MORE INFORMATION CONTACT
DAVID BASCOM David.Bascom@dhs.gov
BILL BLANTON Bill.Blanton@dhs.gov



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National Levee Issues

“...costs of inspection of levees are high, and costs of rehabilitation and bringing levees to standards are even higher, both at the federal state and local level.

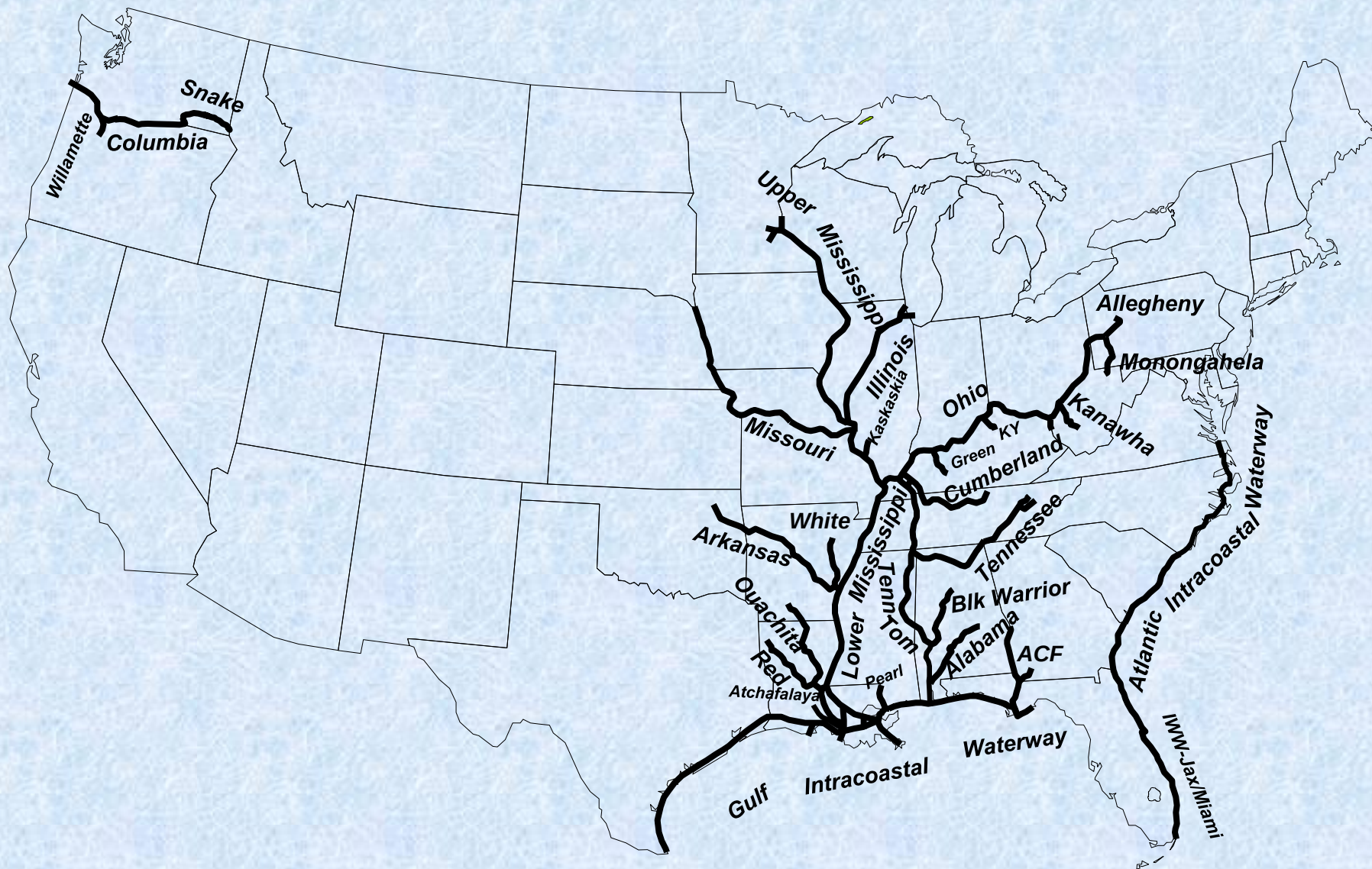
“ASCE estimates the 5-year need is in excess of \$5 billion...today hundreds of levees, whose integrity is in question, are in place in front of communities and properties with little realistic hope of funding for inspection, repair or upgrade.”

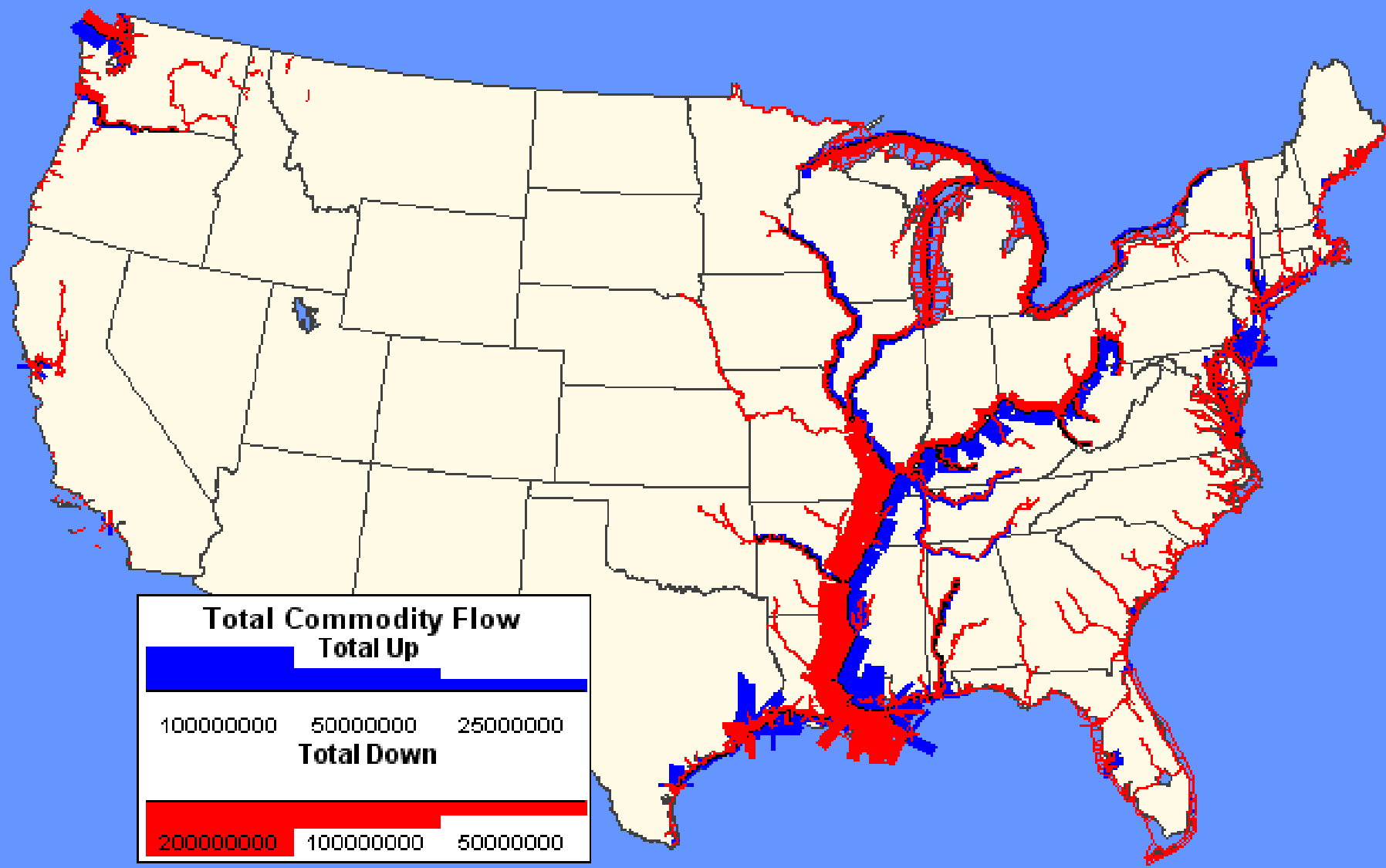
Gerald Galloway, PhD, Oct 2011



U.S. Inland Navigation System

U.S. Fuel-Taxed Inland Waterway System







Upper Mississippi River—Illinois Waterway System

Navigation



New Chamber
Goes Here

single lock chamber
sized for the last
century



Mel-Price Locks and Dam, Mississippi River, Constructed in 1994



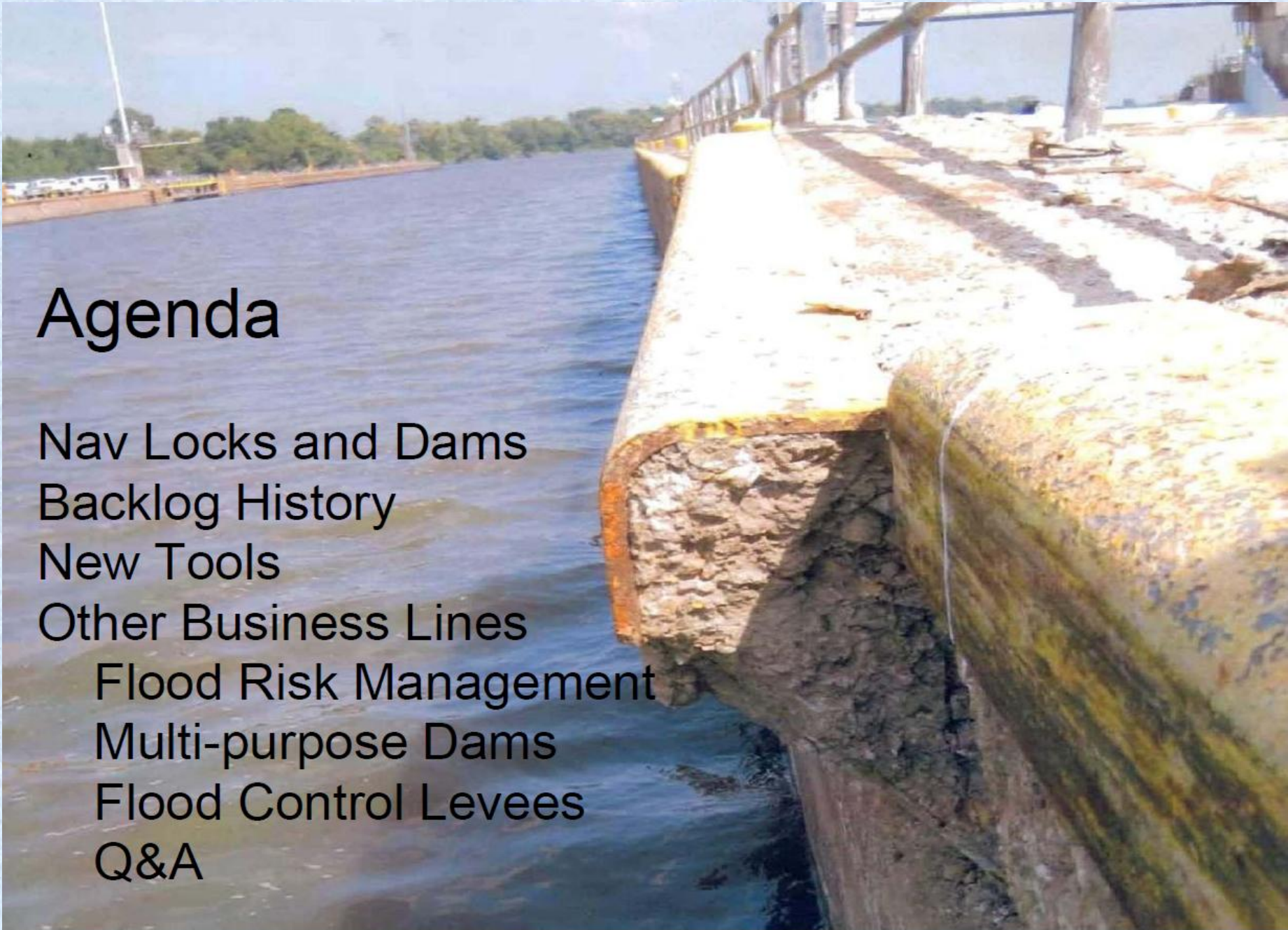
Locks and Dam 53, Ohio River, Constructed in 1929 and 1979



LaGrange Lock, IWW, Constructed in 1938



BUILDING STRONG®



Agenda

Nav Locks and Dams

Backlog History

New Tools

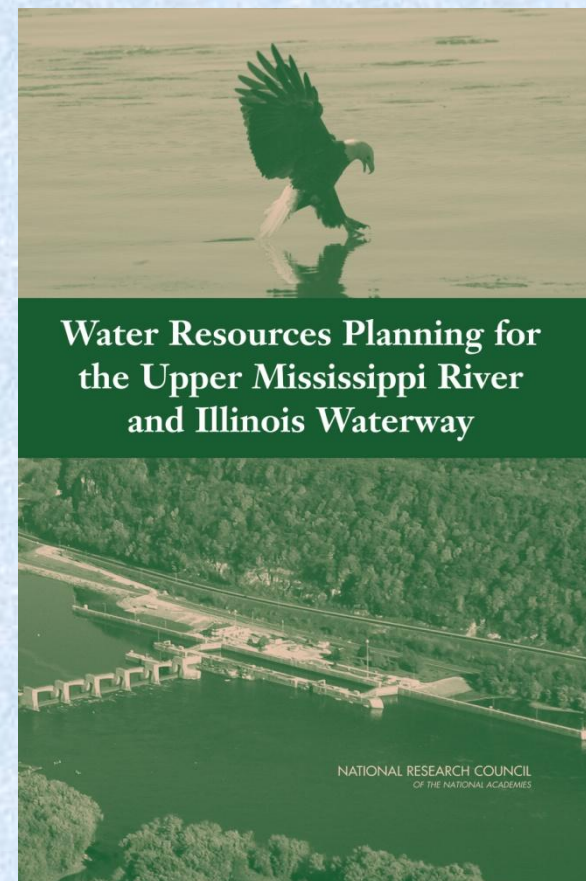
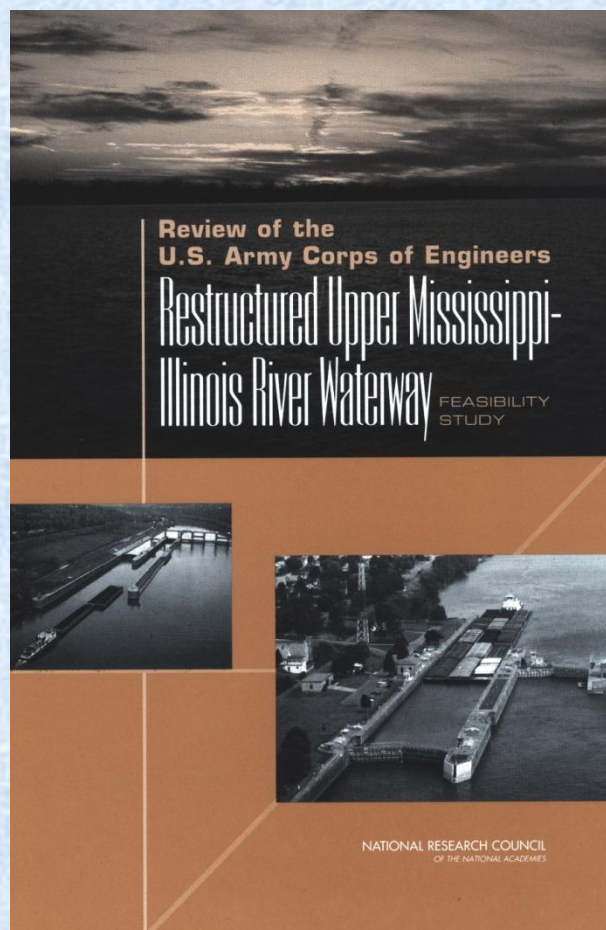
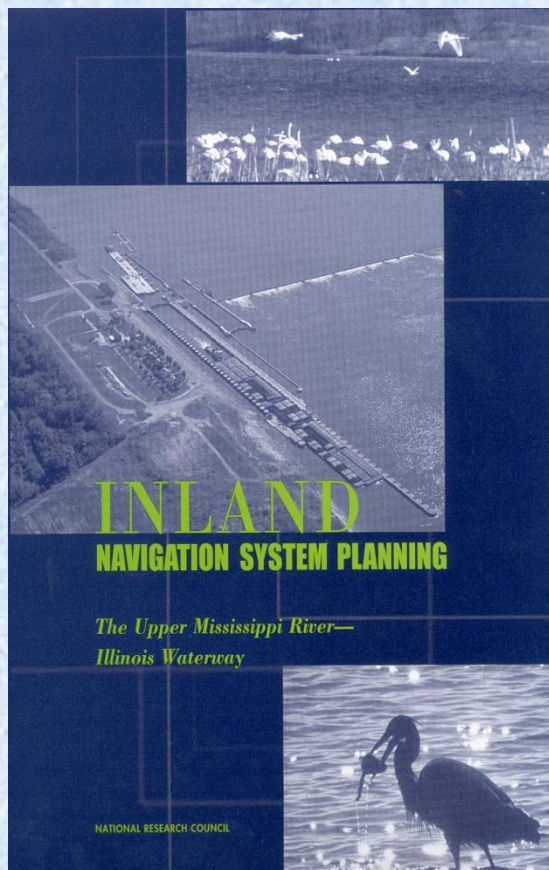
Other Business Lines

- Flood Risk Management

- Multi-purpose Dams

- Flood Control Levees

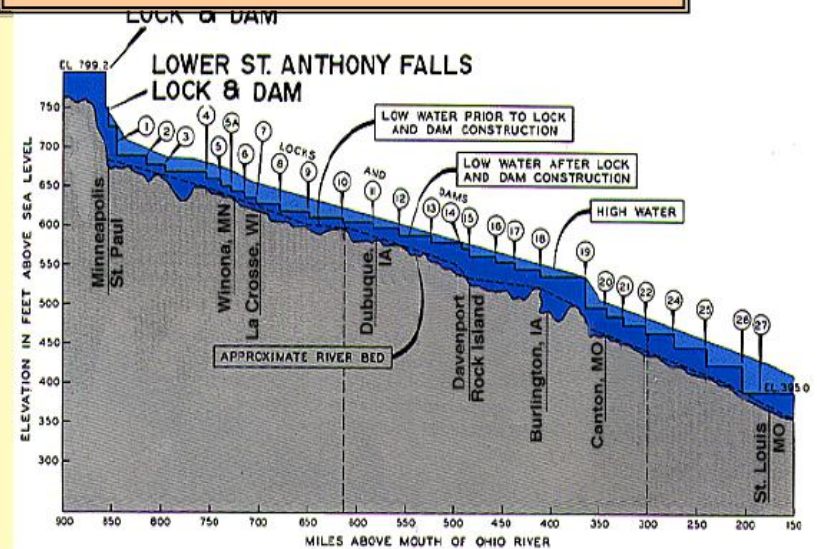
- Q&A



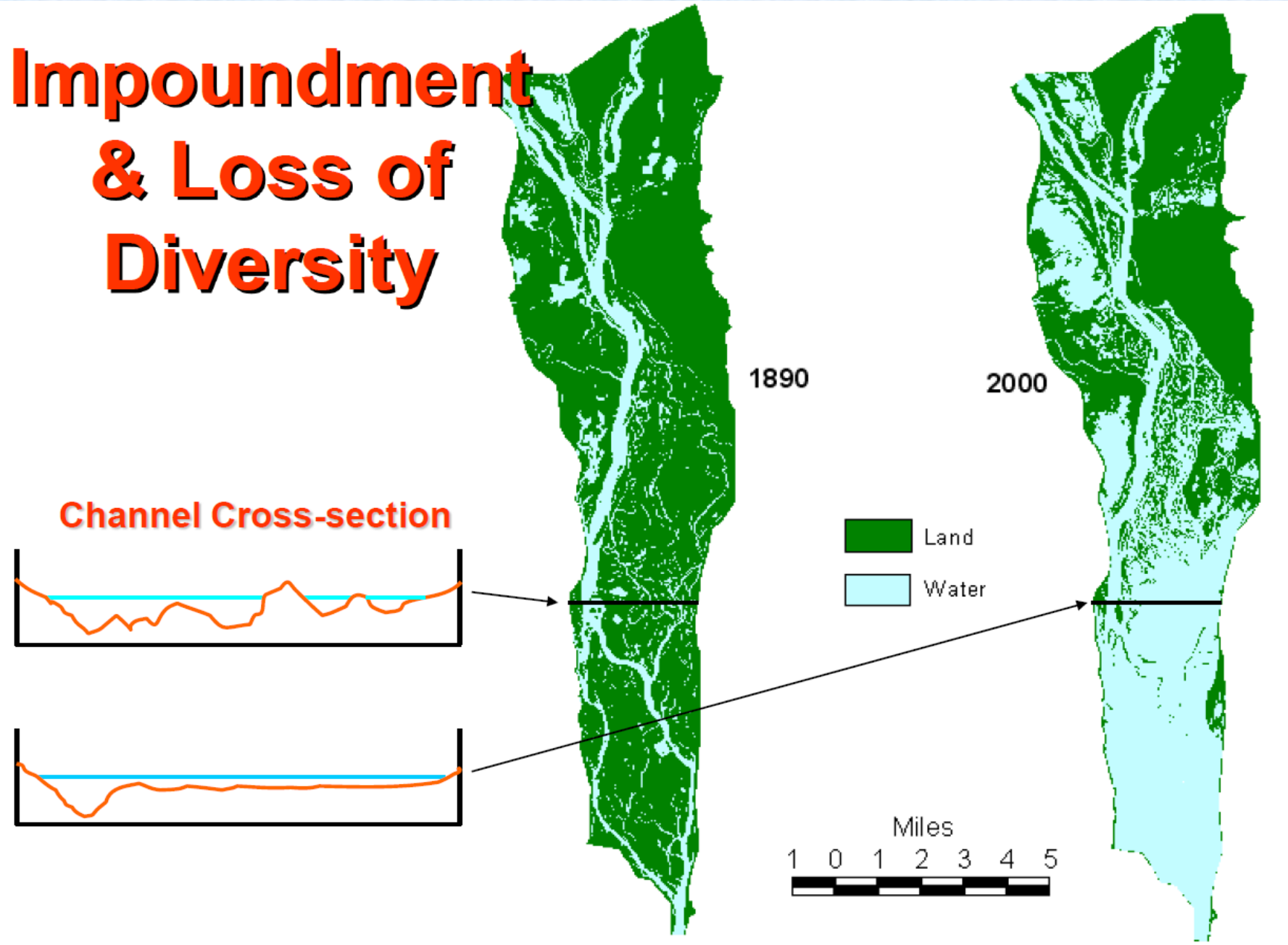
UMR-IWW NAVIGATION SYSTEM



- 37 Lock Sites
- 1,200 Miles of River
- 226,000 refuge acres
- Significant Ecosystem (2.5 million acres)
- Constructed 1930-45



Impoundment & Loss of Diversity



1986 Upper Mississippi River Management Act

- Designated the river “*a nationally significant ecosystem and a nationally significant commercial navigation system.*”



Stay Off
Hillside !!





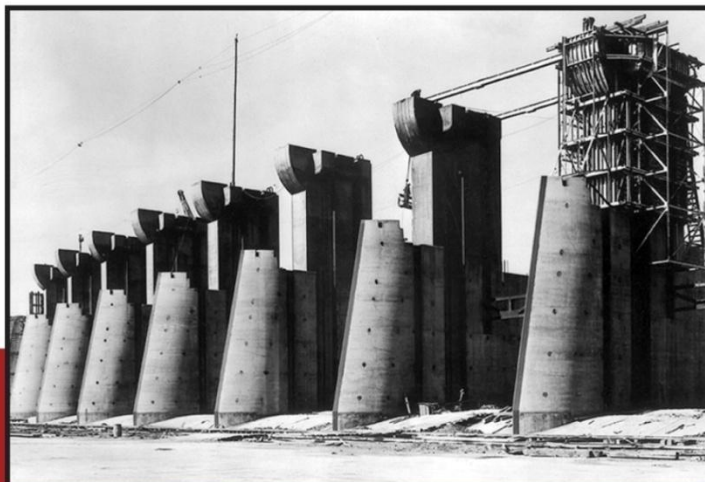


- “Congress should instruct the Corps to explore fully nonstructural options for improving waterway traffic management...which could reduce congestion, reduce shipping costs, and use the existing waterway more efficiently.”
- “Future grain shipments...could be affected by factors such as U.S. farm policy, increasing domestic demand for corn (e.g., ethanol production), changes in international terms of trade, rising grain production in other countries, or rail competition...”
- “The Corps should aim for a more comprehensive and integrated treatment of the navigation system’s environmental effects...”

Vision for UMR-IWW System



To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System



**NATIONAL WATER RESOURCES
CHALLENGES FACING THE U.S.
ARMY CORPS OF ENGINEERS**

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

21st Century Water Resources Management

The Corps' work program has changed markedly since the 1950s and 1960s. Less construction of new civil infrastructure, more responsibilities (e.g., restoration and water-based recreation).

Future Corps activities will be less dedicated to construction of new civil works and more focused on

- 1) operations, maintenance, rehabilitation,
- 2) re-allocating reservoir storage and flows, and
- 3) ecosystem restoration.

National Water Management Infrastructure and Investments

There have been declining investments in water resources infrastructure owned and operated by the Corps.

Deferred maintenance costs of nation's flood & hurricane protection, and navigation infrastructure are considerable.

Nevertheless, the nation continues to rely upon the Corps for emergency response activities, along with periodic new civil works (e.g., New Orleans levee reconstruction).

Net Capital Stock

Billions of 2009 dollars

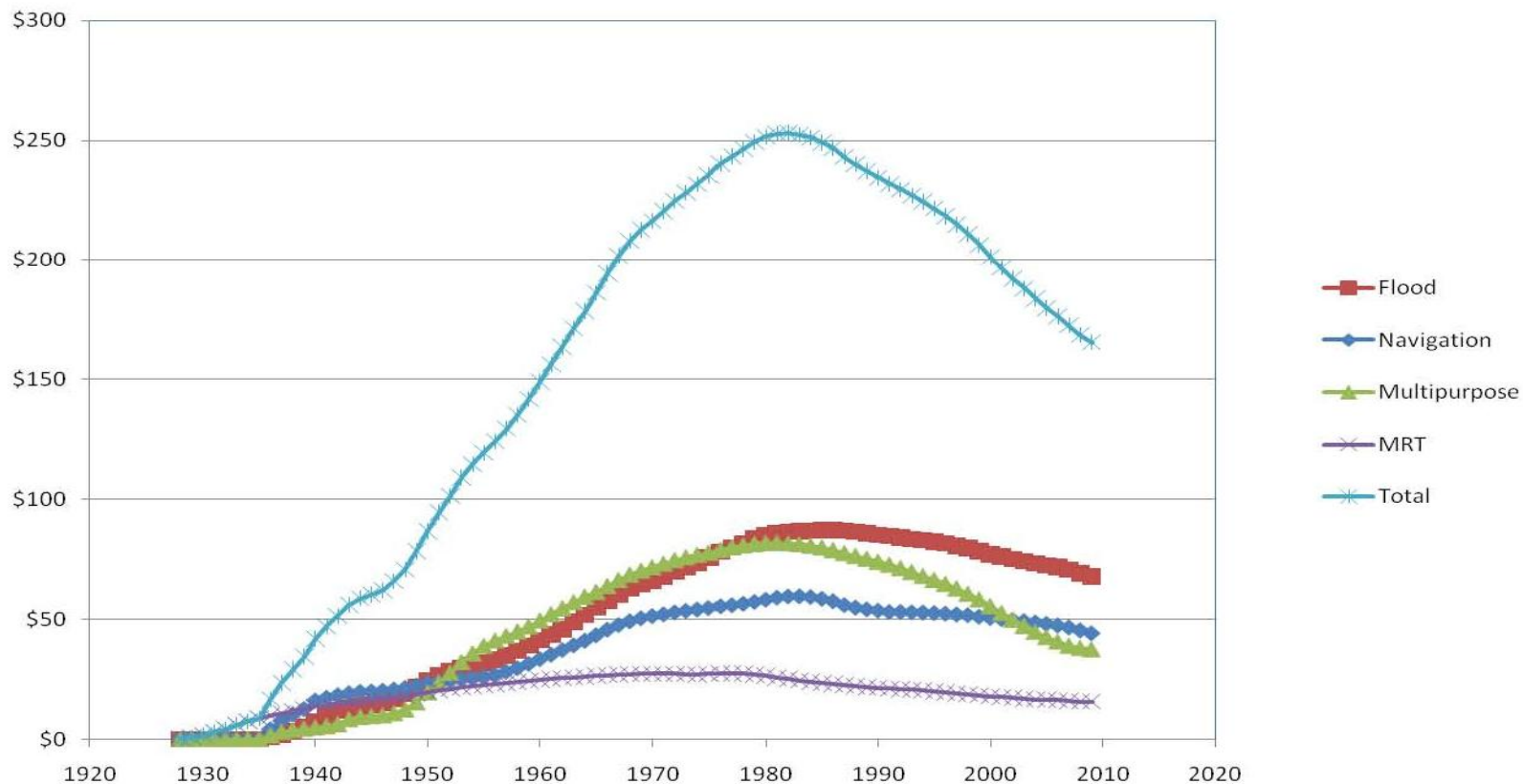


FIGURE 1 Net Capital Stock Estimates of Corps Civil Works Projects, 1928-2009 (2009 dollars)¹.
SOURCE: Steven Stockton, U.S. Army Corps of Engineers, personal communication, 2010.

¹ Investments made prior to 1928 are not included in the figure. The MRT acronym refers to “Mississippi River and Tributaries.”

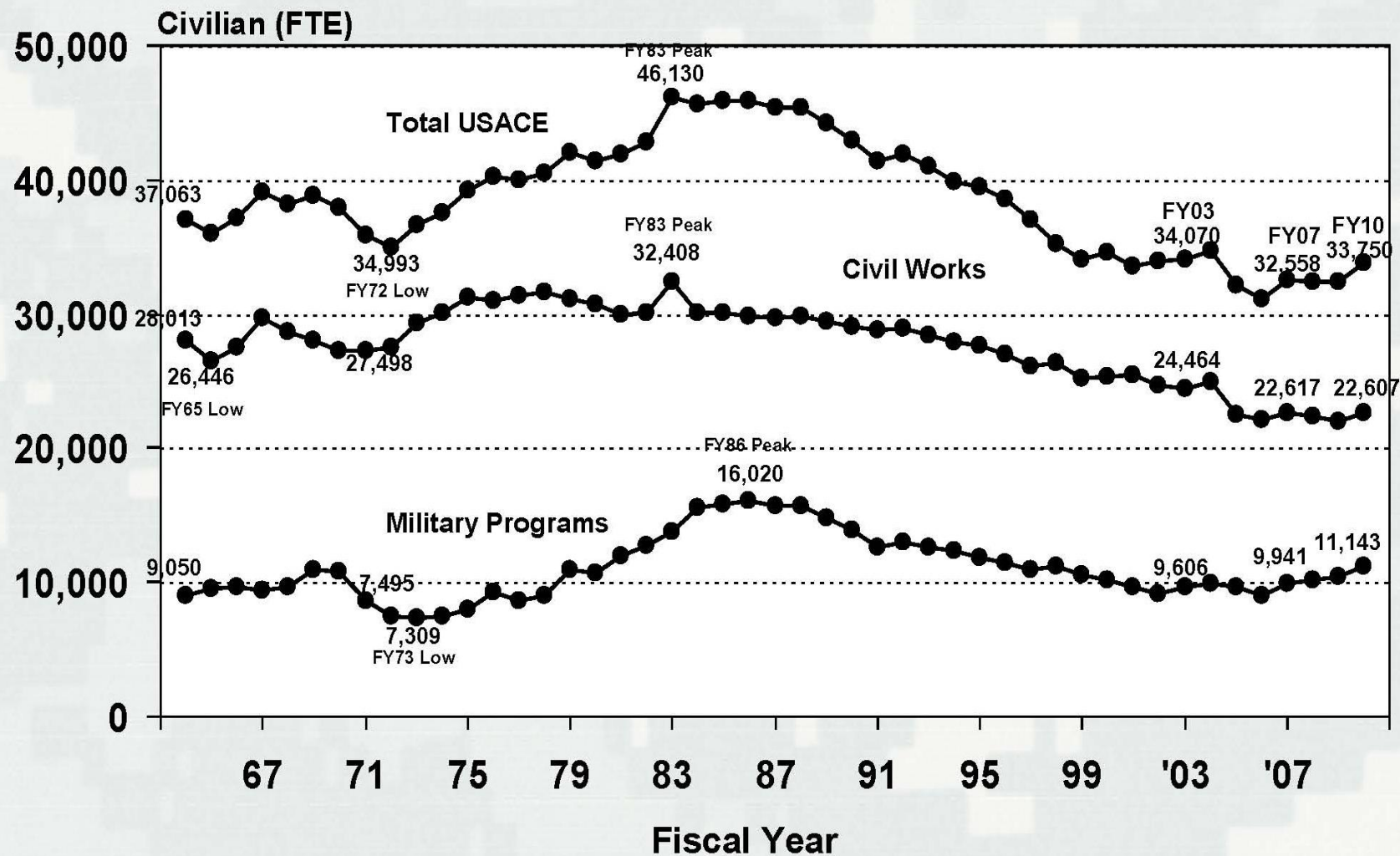
Corps Capacities and Planning

In a previous era, primary disciplines within the Corps were hydrology, hydraulics, engineering, economics.

Over time, Corps projects have changed (e.g., env. restoration), and demands from Corps projects have broadened.

~25% decline in the number of personnel since the mid-1980s (with an uptick in recent years).

Declining investments, declining number of staff, & demands for expanding services create expectations that the Corps cannot meet consistently.



Corps of Engineers Staffing Trends, 1964-2010.

Authorization and Appropriations

There is a large number of federal water projects that have been authorized, but have received no or only partial appropriations. The value of this “backlog” is estimated to be roughly \$60 billion.

This backlog of unfinished work leads to projects being delayed, conducted in a stop-start manner, and to overall inefficient project delivery.

Traditional Responsibilities, Expanding Missions

The Corps is governed by laws and regulations that include the Clean Water Act, the ESA, and more recent legislation. Reconciling inconsistencies within this large body that constitutes de facto national water policy is a considerable challenge.

The Corps also is challenged to resolve conflicts over water in heavily-stressed systems with limited water availability. The Corps is increasingly involved in controversies over shared water resources that are beyond the agency's authorities and resources to fully resolve.



Missouri River Basin, Tributaries, Mainstem Dams and Reservoirs

MISSOURI RIVER PLANNING

Recognizing and Incorporating
Sediment Management



NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Decision Making and Trade-offs

“Future trade-offs among Missouri River users will be inevitable. . . Effective resolution of these trade-offs will require explicit acknowledgement of their existence, possible sources of conflict, as well as the limits of the Missouri River’s goods and services.

National Research Council, 2011

Future Prospects

- National water planning challenges:

Water resources demands are increasing and becoming more complex;

National investments in water resources infrastructure are declining

The Corps work program is becoming increasingly unsustainable (which goes beyond the Corps and includes the U.S. Congress)

Future Prospects

The Corps of Engineers has experienced many changes to its authorities, resources, and staffing.

At the same time, the Corps retains a leadership role in most of the nation's major riverine and aquatic systems.

There will be an increasing need for an innovative and responsive Corps of Engineers.

Future Prospects

- Increasing focus on options that do not require large structures built with federal resources
- Corps will increasingly look to inter-agency collaboration, and local stakeholder partnerships; moving away from top down
- Local interests and other beneficiaries will be increasingly looked to for resources
- Trade-offs and priorities need to be explicitly considered