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

Jeffrey Jacobs, National Research Council

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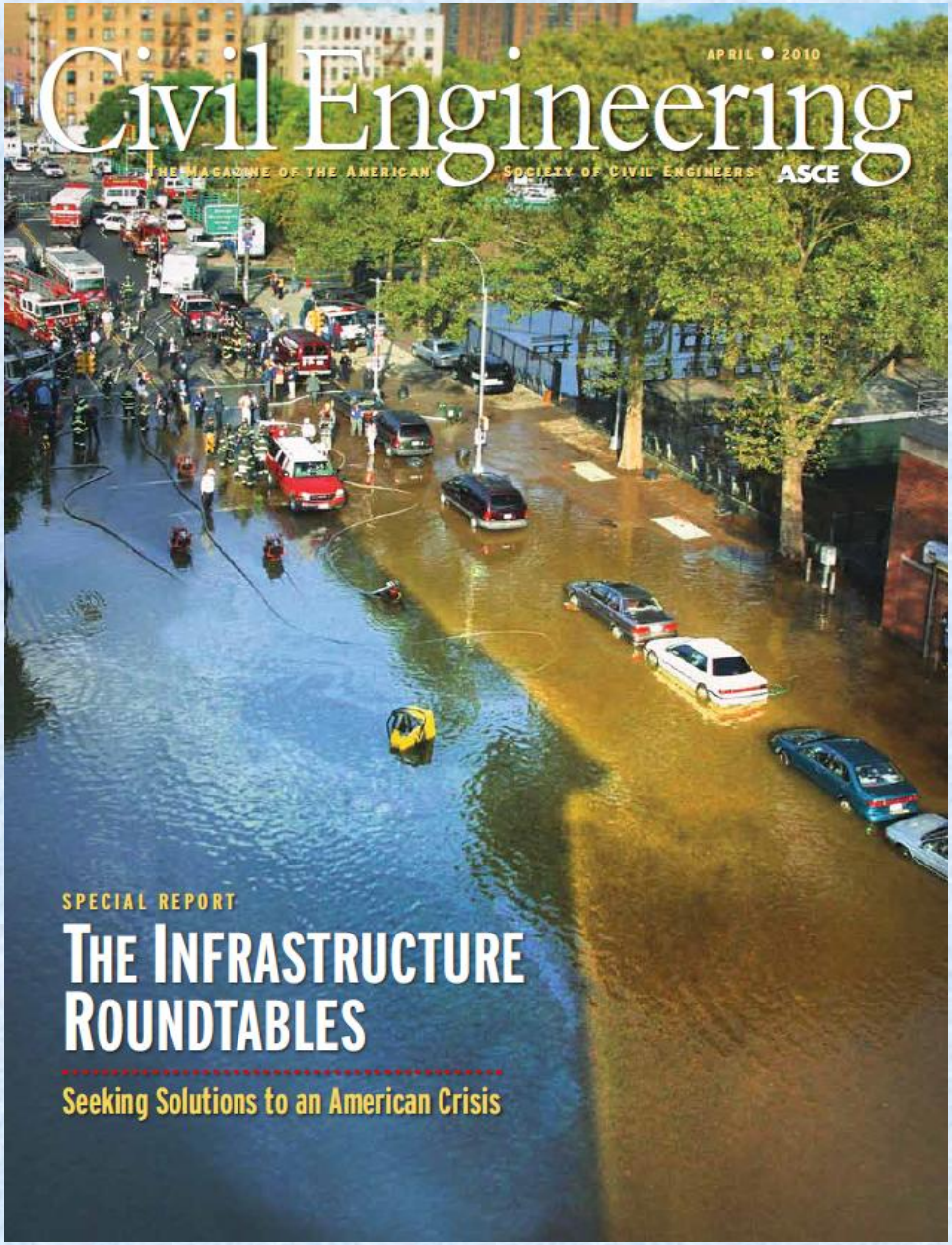
2009 Grades

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**



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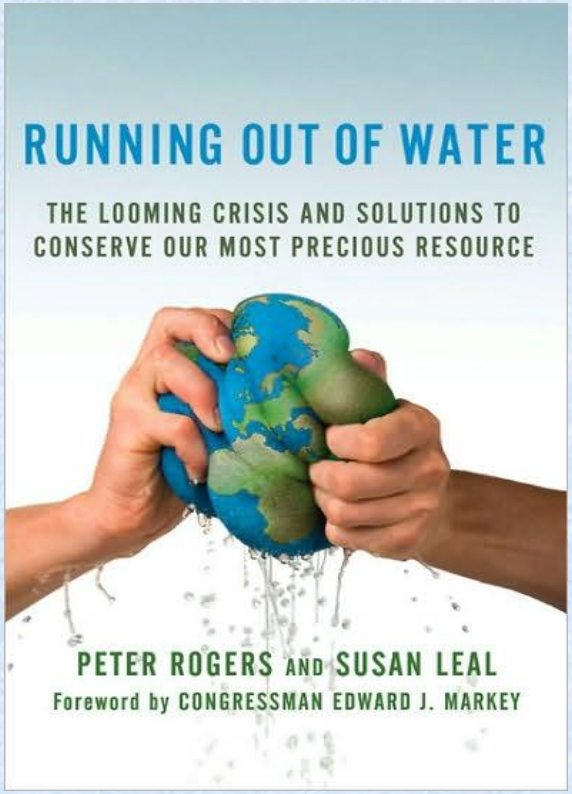

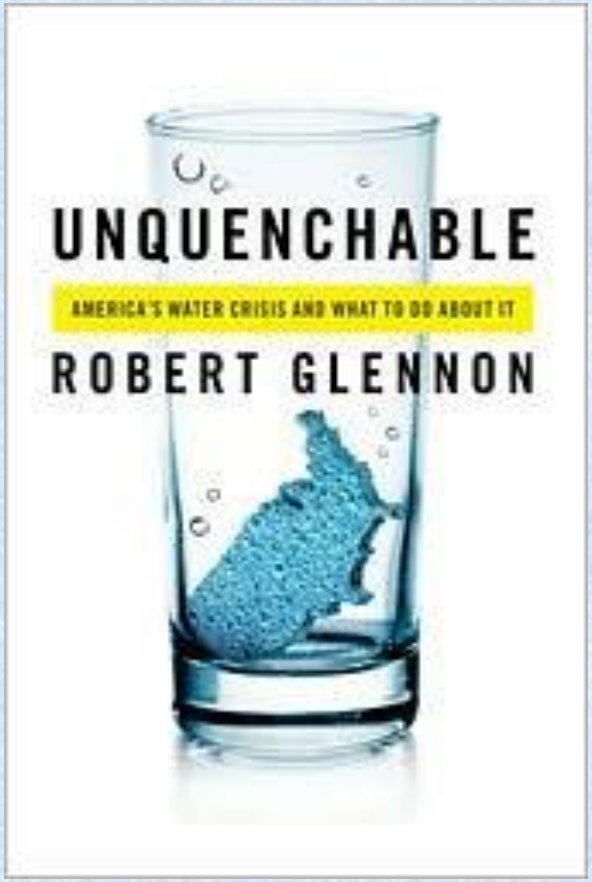

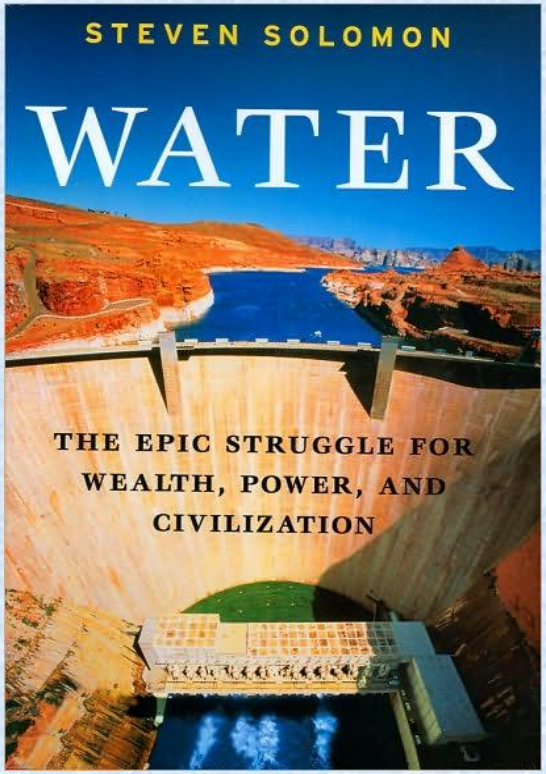

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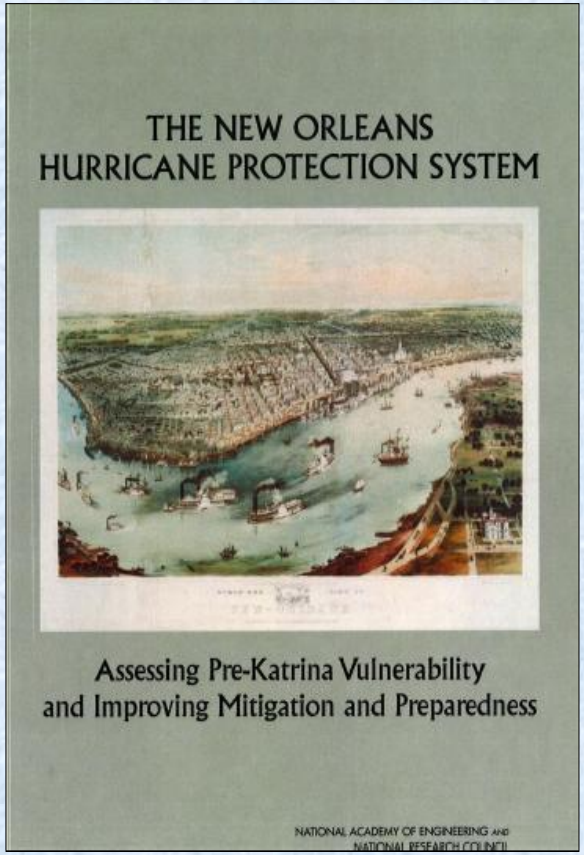
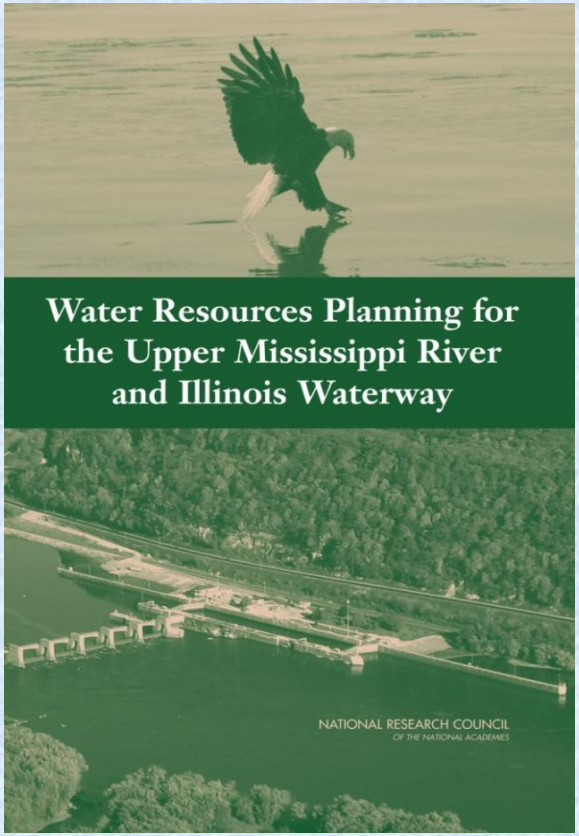
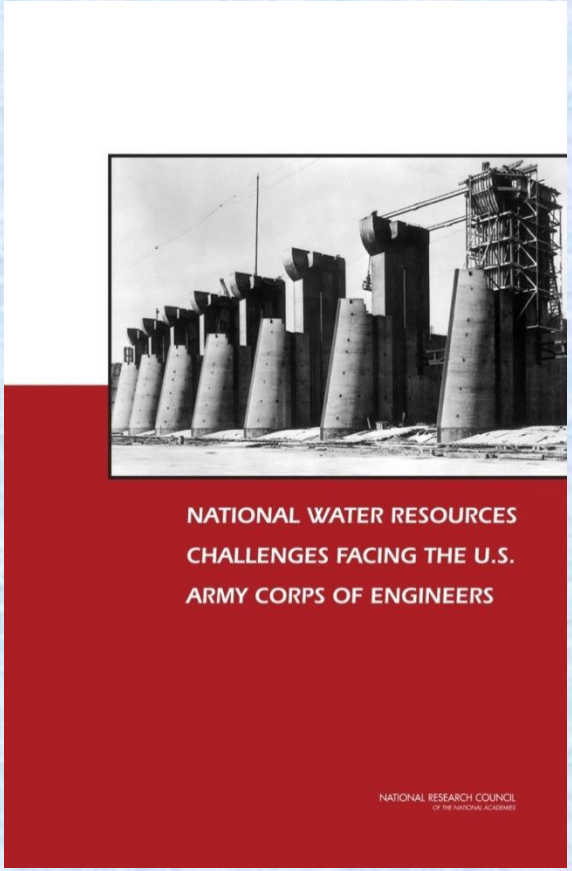
National Water Infrastructure

- 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







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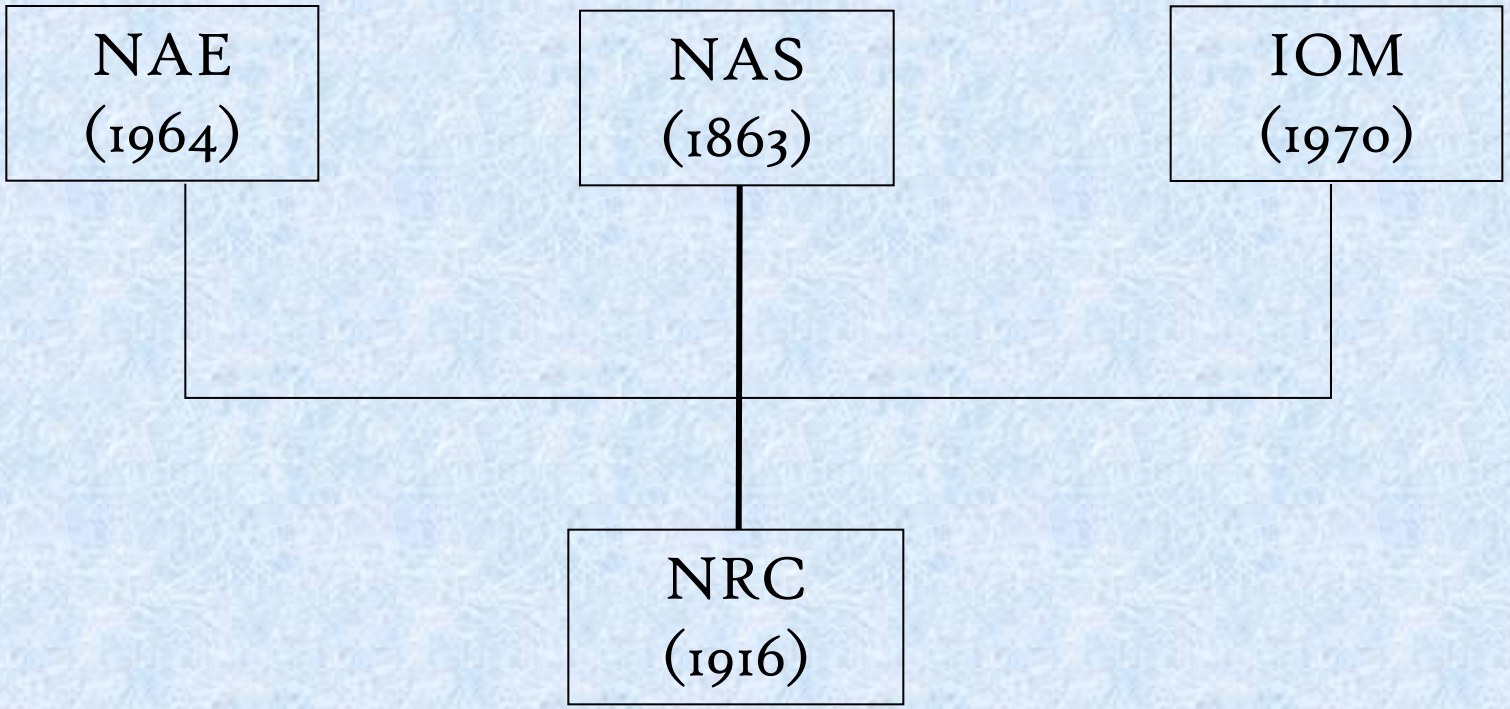
The National Academies



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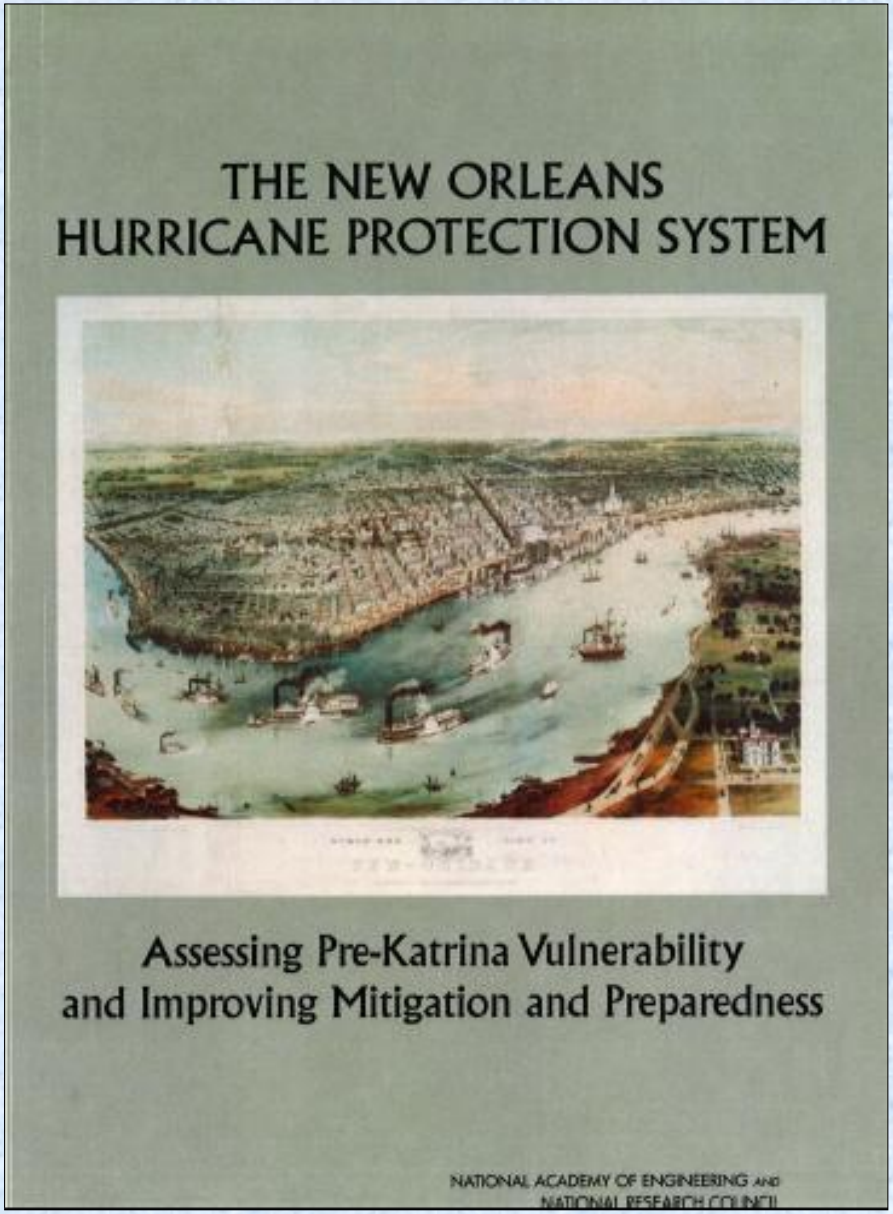

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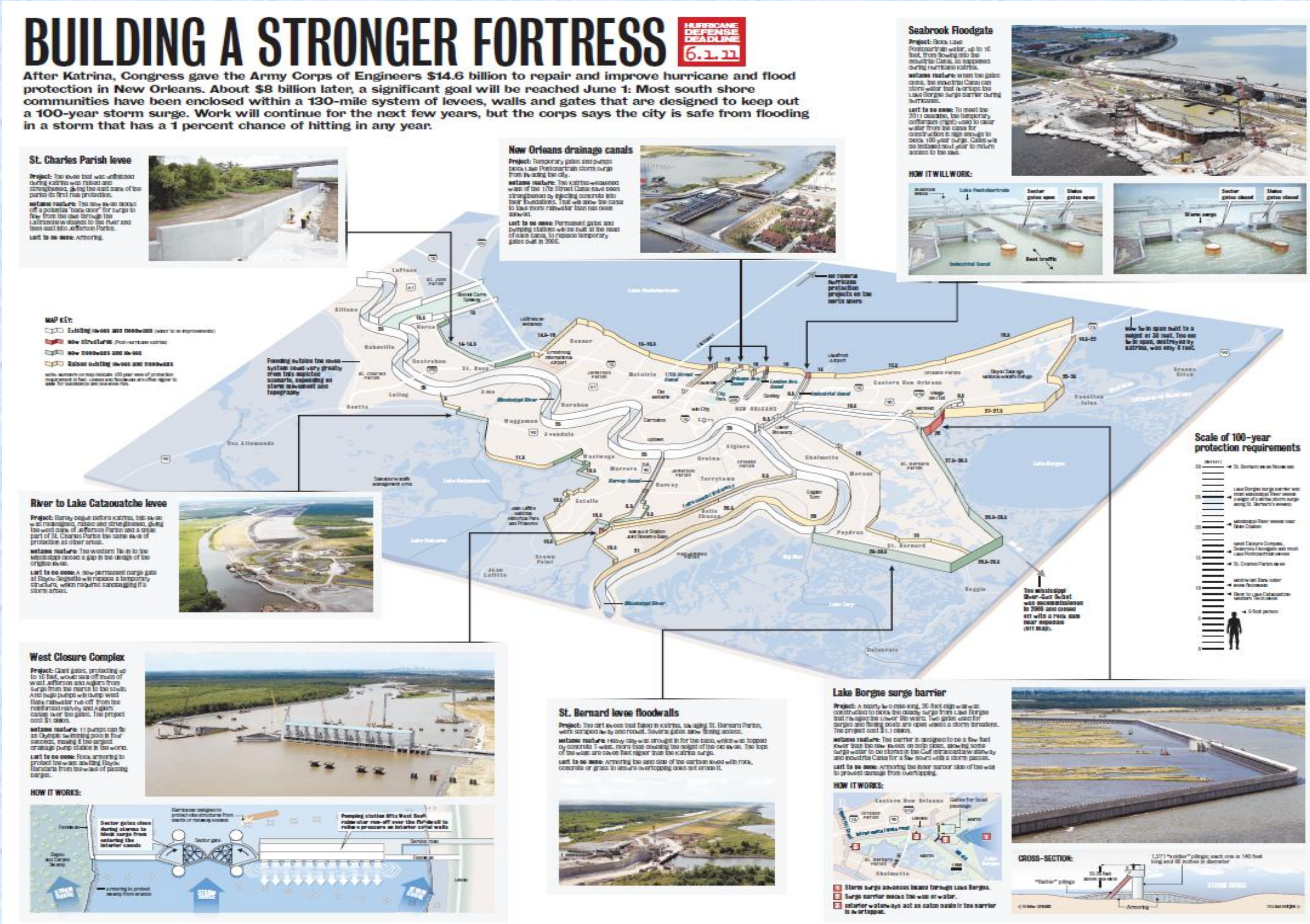

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London Ave. Canal
17th St. Canal
Industrial Canal
USGS

MRGO Levees


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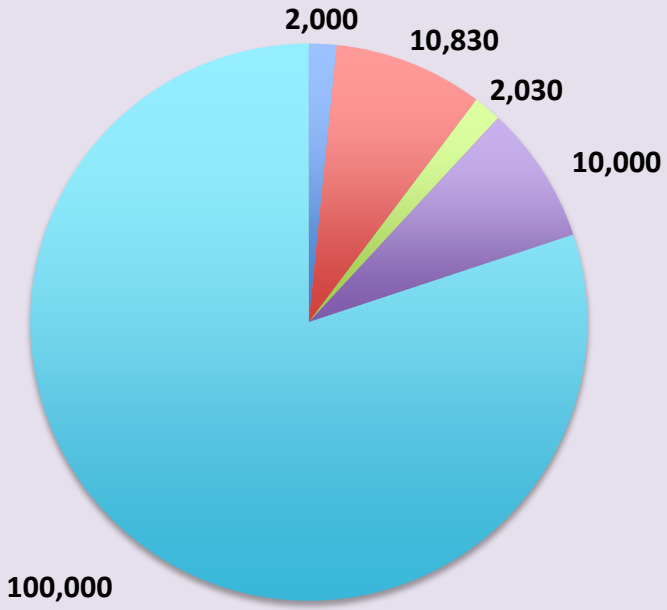
Lessons from Katrina

- 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

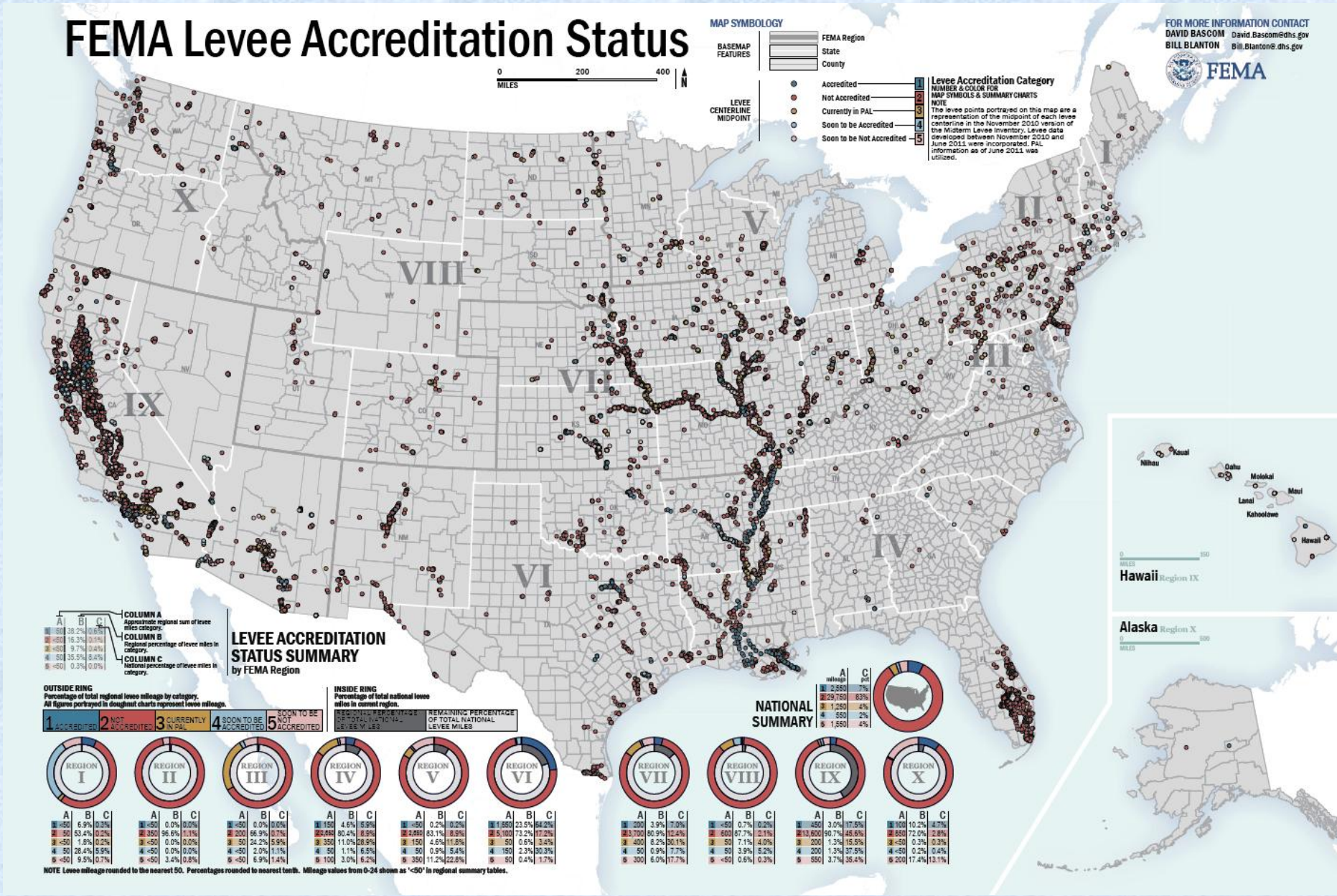
*** top down, federal-led emphasis on structures must be complemented by local and state land use plans, zoning, evacuation, education, etc.*

National Levee Safety Issues

Estimated Miles of Levees in the U.S.



FEMA Levee Accreditation Status



NOTE Levee mileage rounded to the nearest 50. Percentages rounded to nearest tenth. Mileage values from 0-24 shown as '<50' in regional summary tables.

National Levee Issues

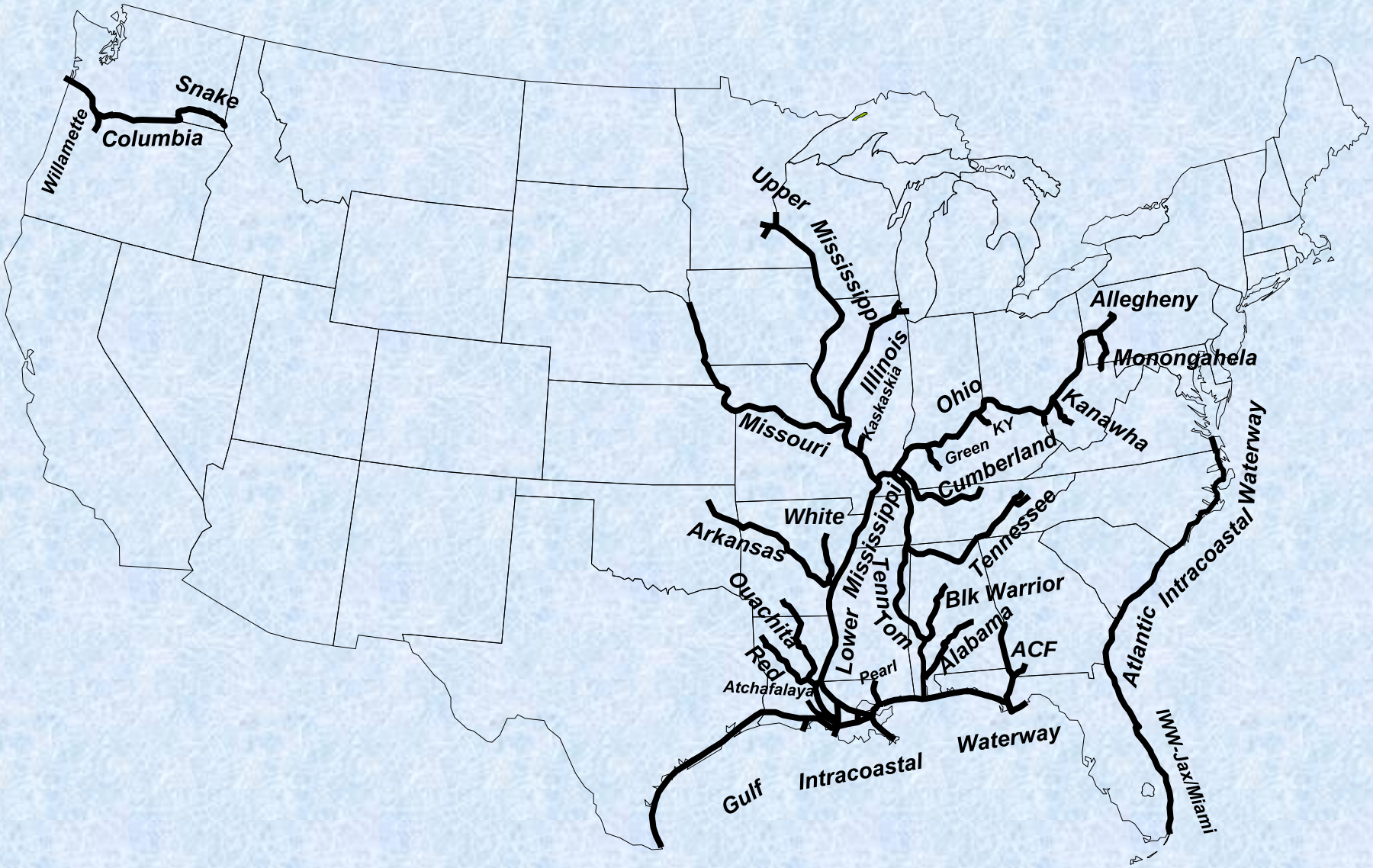
"…costs of inspection of levees are high, and costs of rehabilitation and bringing levees to standards are even higher, both at the federal state and local level.

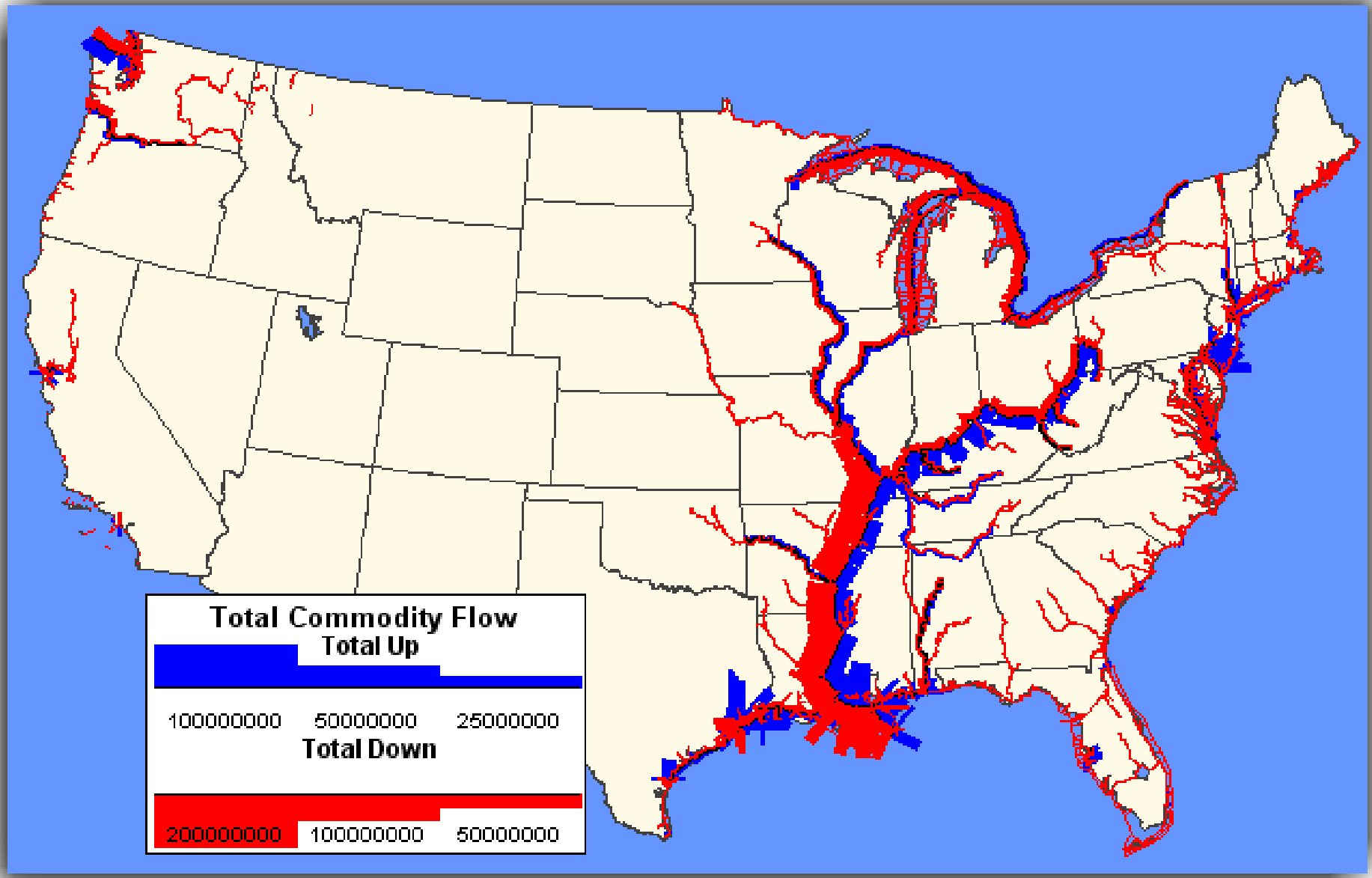
"ASCE estimates the 5-year need is in excess of $5 billion…today hundreds of levees, whose integrity is in question, are in place in front of communities and properties with little realistic hope of funding for inspection, repair or upgrade."

Gerald Galloway, PhD, Oct 2011

U.S. Inland Navigation System

U.S. Fuel-Taxed Inland Waterway System

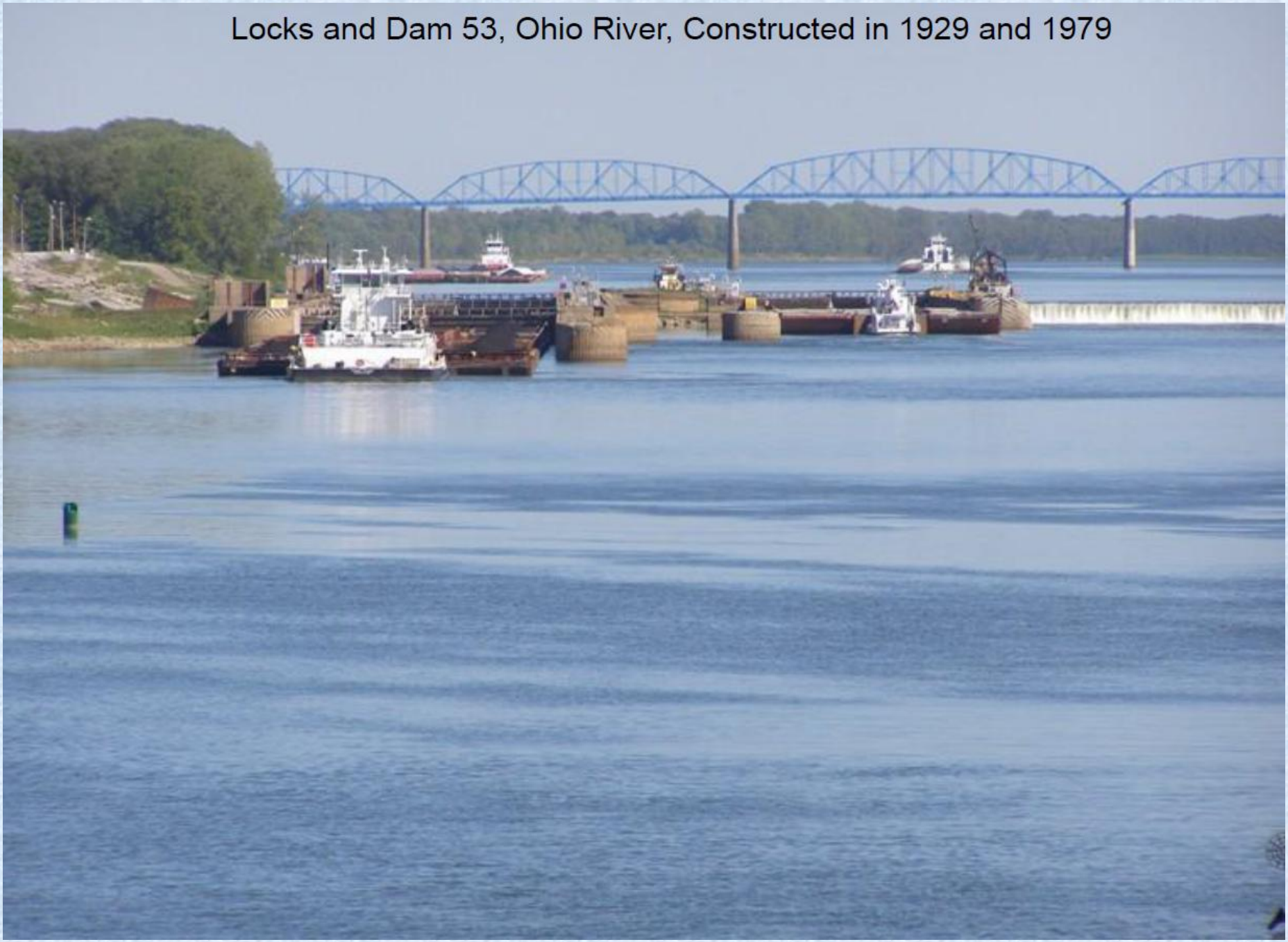



Total Commodity Flow
Total Up
100000000
50000000
25000000
Total Down
200000000
100000000
50000000

Upper Mississippi River—Illinois Waterway System

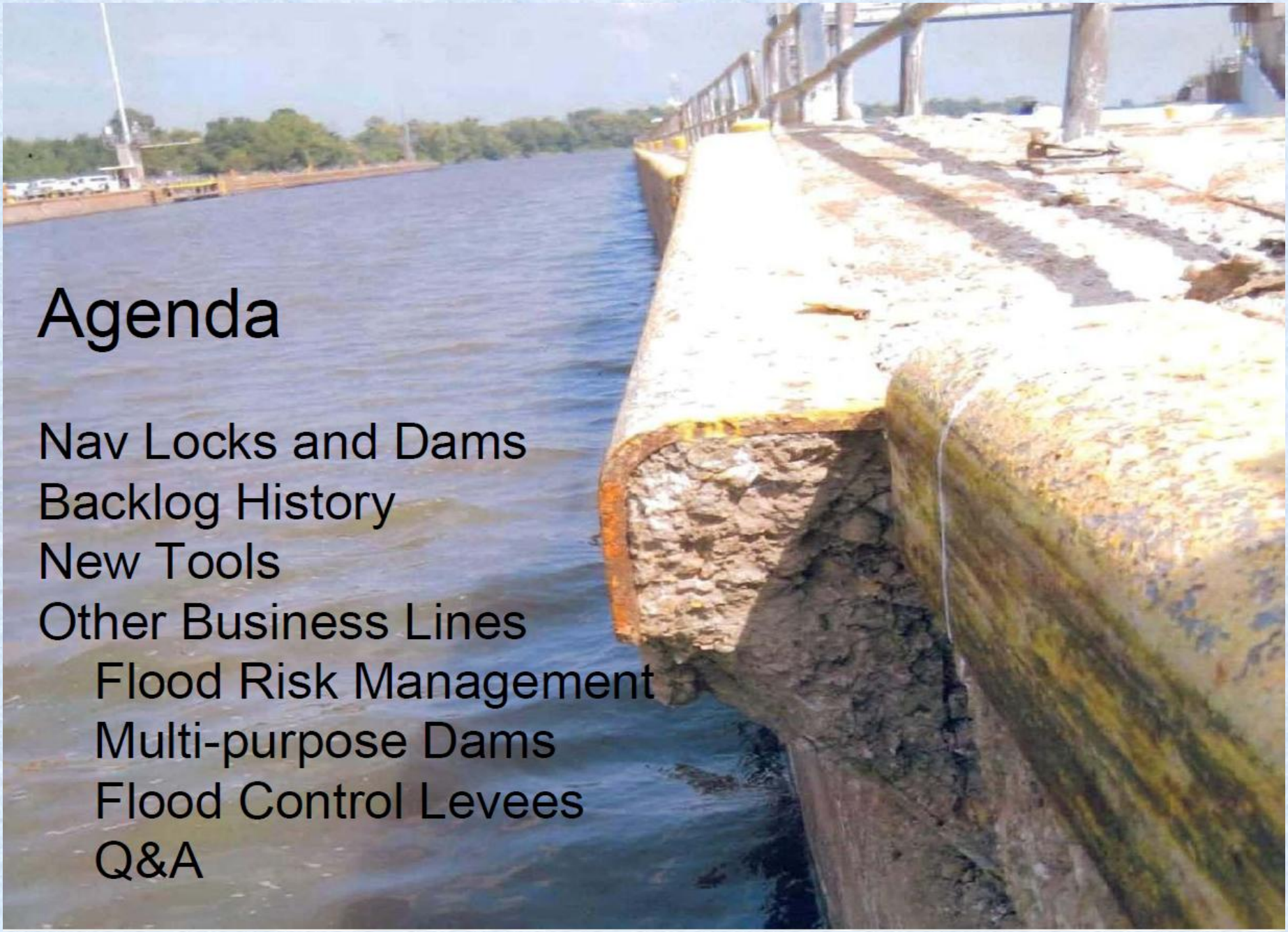

Navigation
New Chamber Goes Here
single lock chamber sized for the last century


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


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

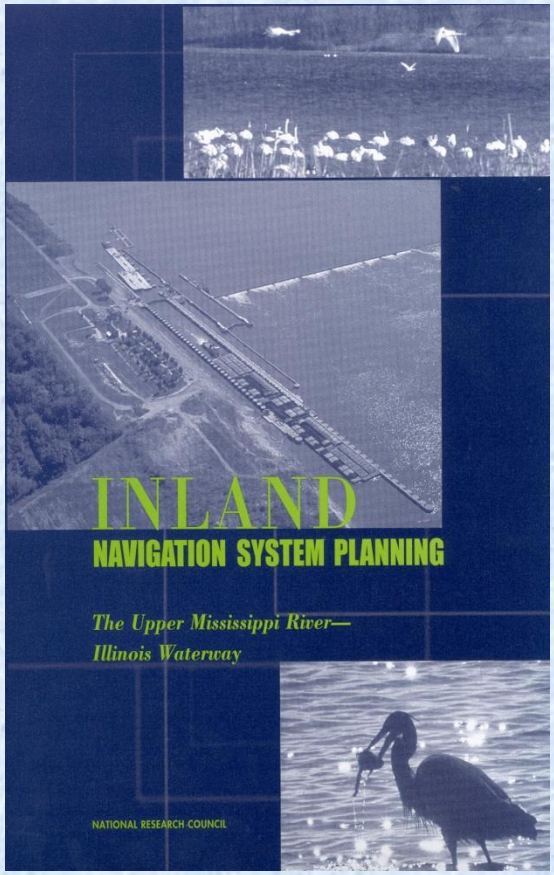
LaGrange Lock, IWW, Constructed in 1938

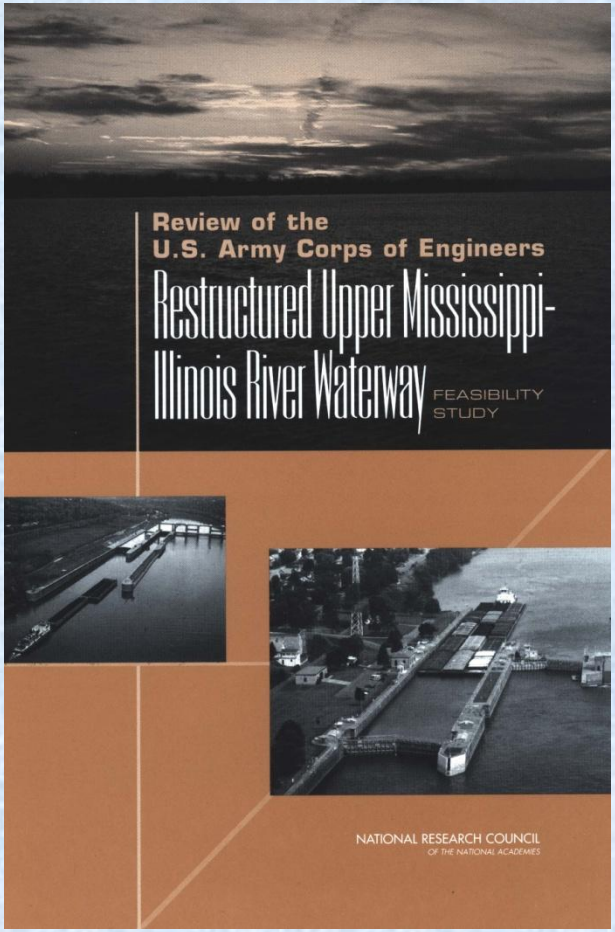
BUILDING STRONG®

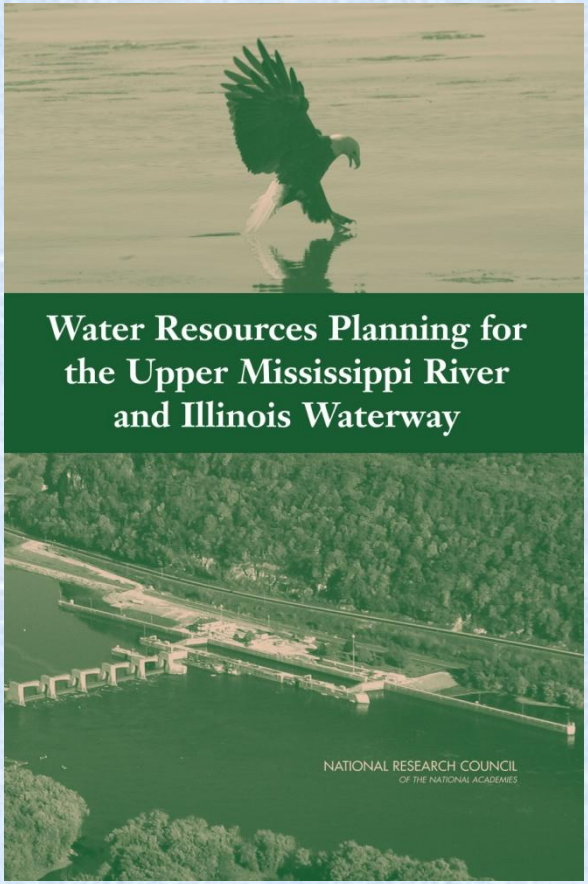


Agenda

- Nav Locks and Dams
- Backlog History
- New Tools
- Other Business Lines
  - Flood Risk Management
  - Multi-purpose Dams
  - Flood Control Levees
  - Q&A







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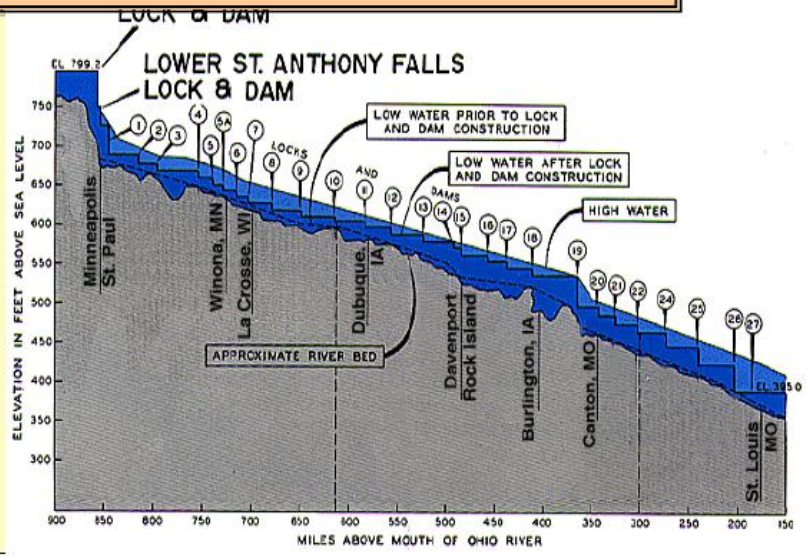
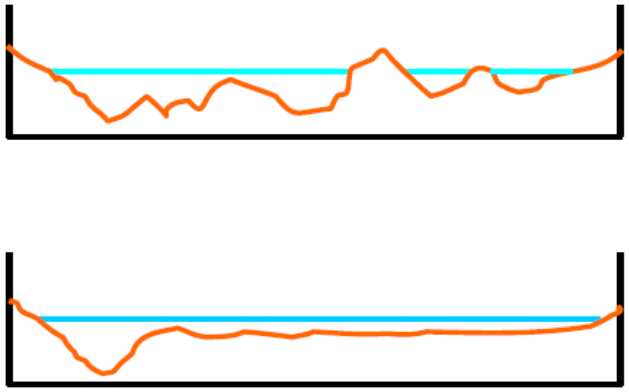
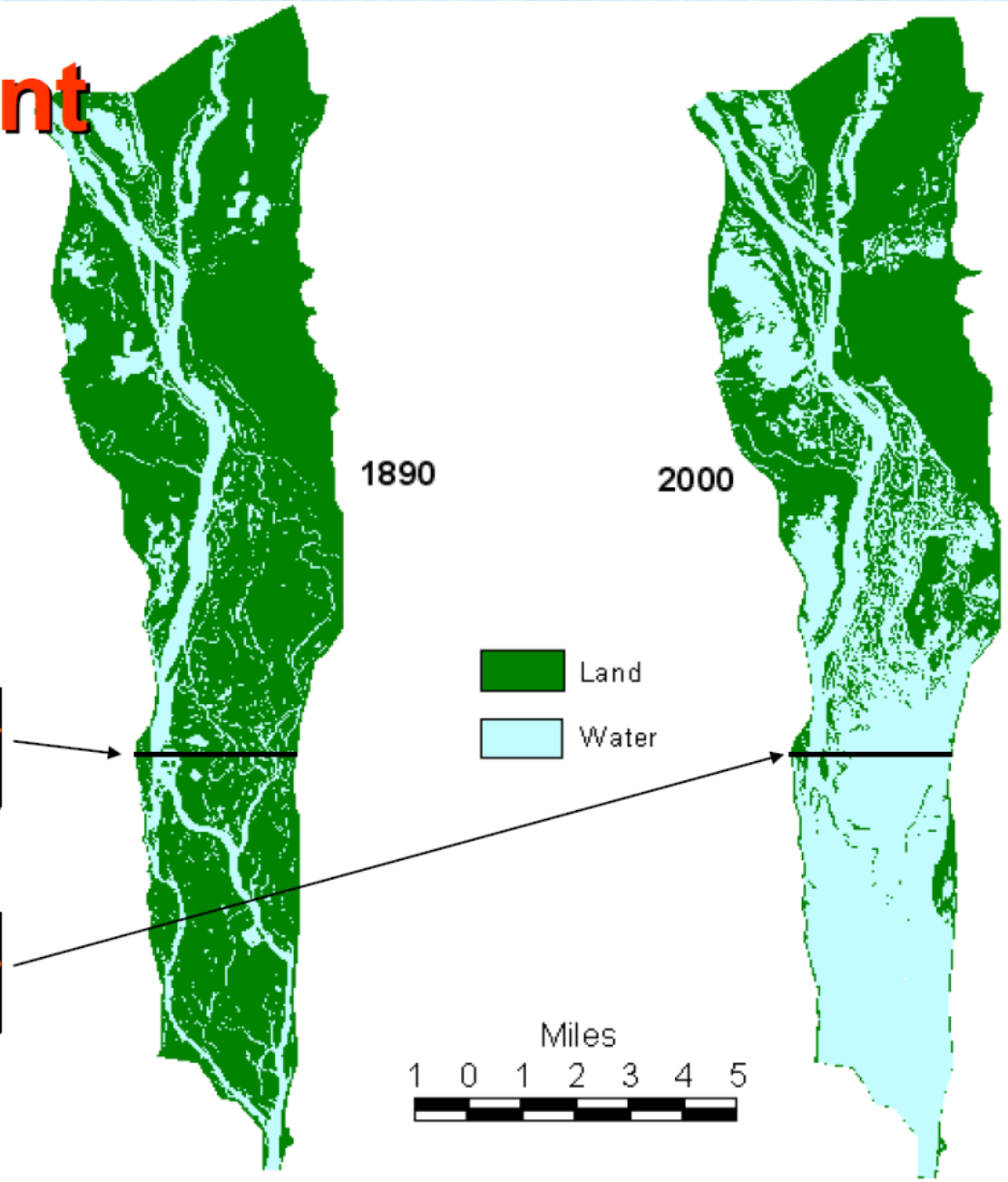
UMR-IWW NAVIGATION SYSTEM

- 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 !!

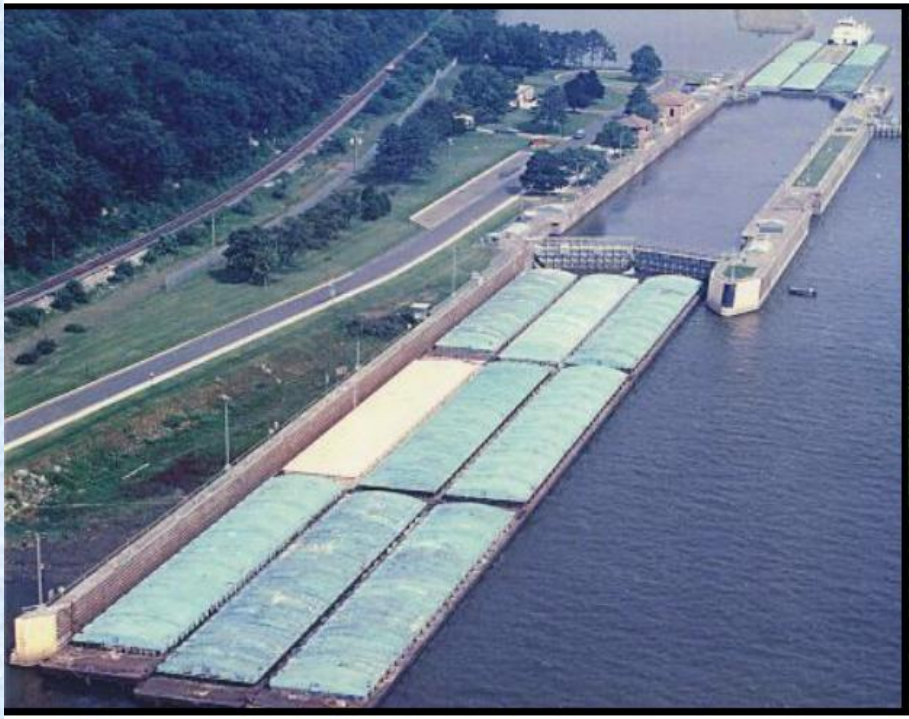

PHILIP M. PFEFFER

- “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

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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).

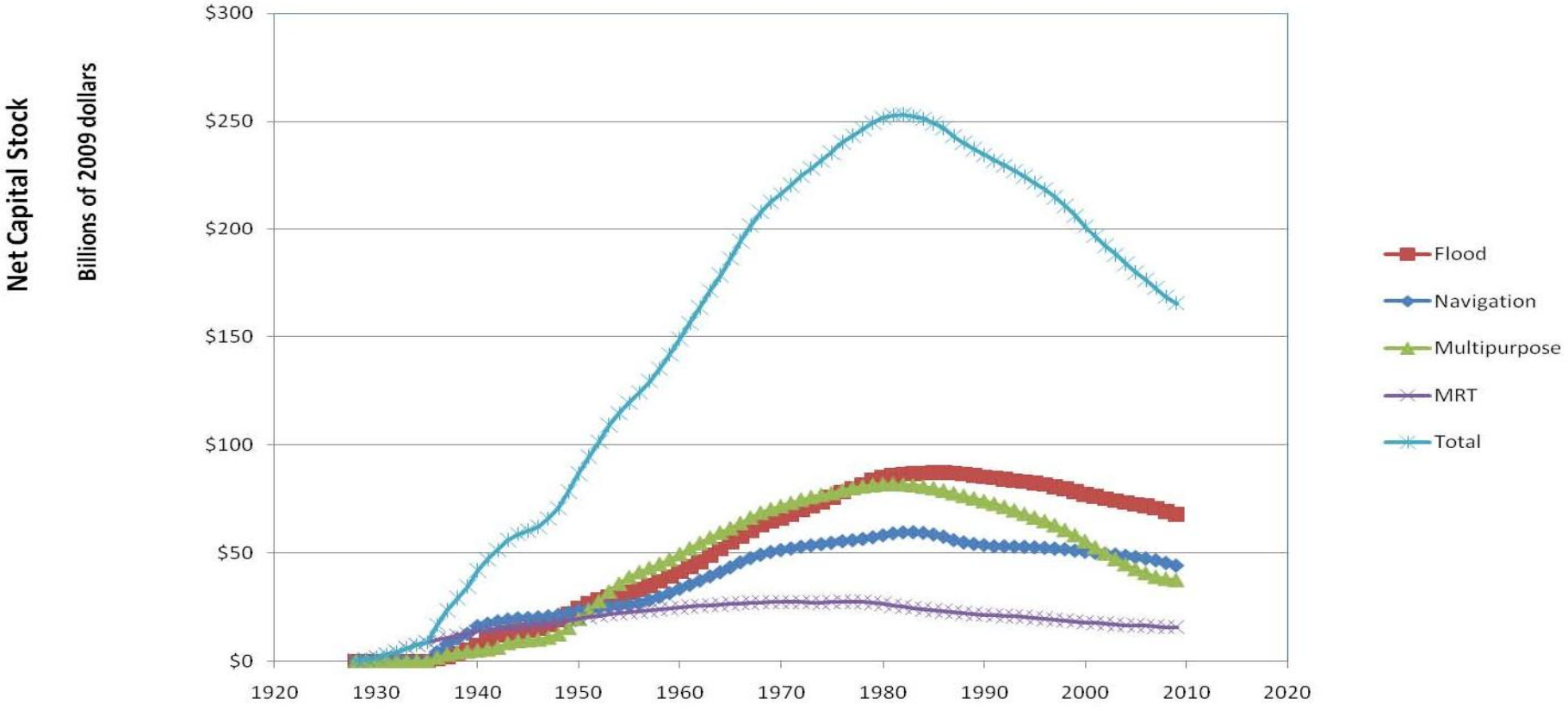


FIGURE 1 **Net Capital Stock Estimates of Corps Civil Works Projects, 1928-2009 (2009 dollars)[1].**
SOURCE: **Steven Stockton, U.S. Army Corps of Engineers, personal communication, 2010.**

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

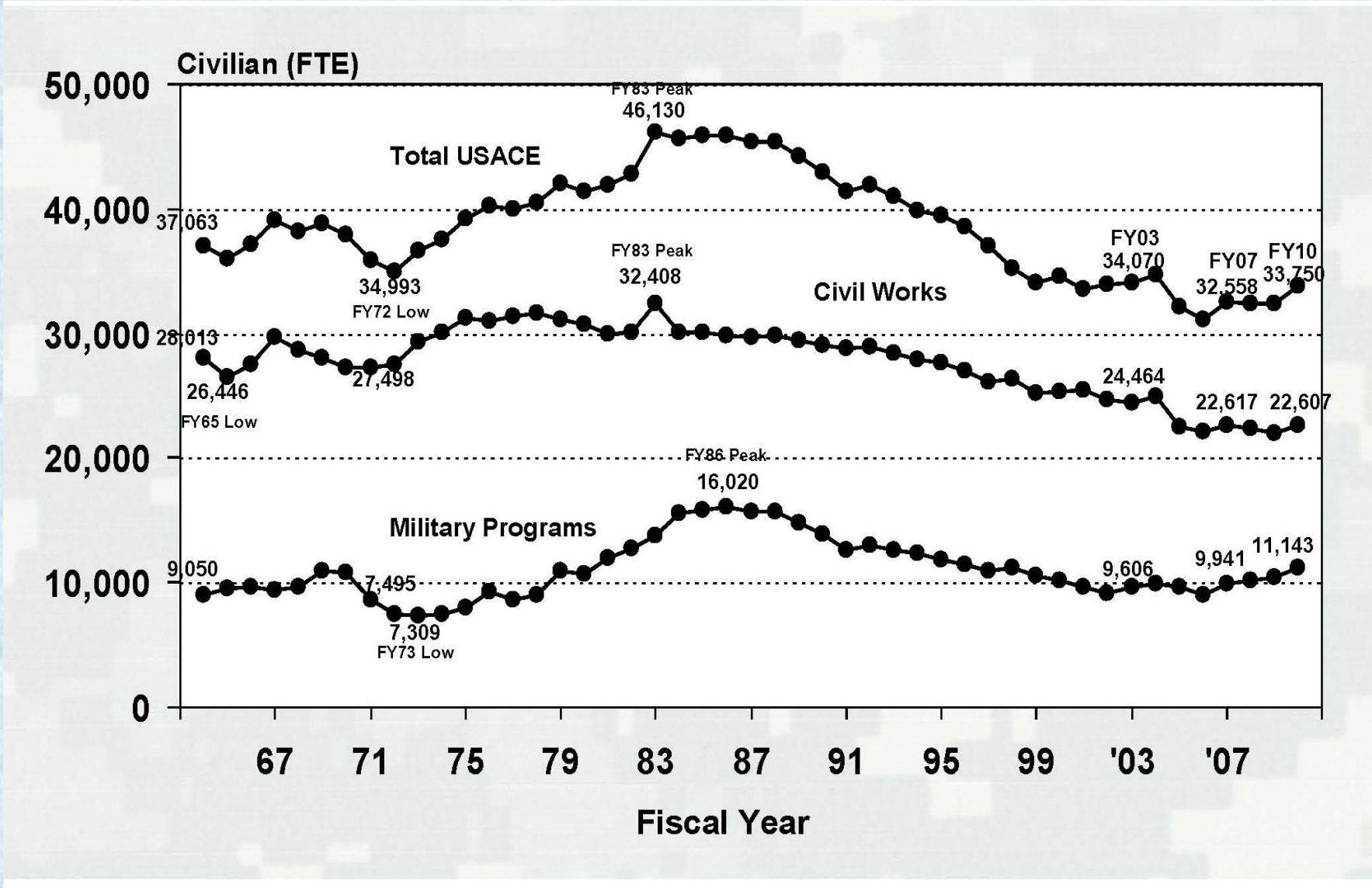
Corps Capacities and Planning

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

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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