



# Reflections of a “Thinking Practitioner”: Crafting Collaborative Holistic Solutions

## *America’s Watershed Initiative*

**MG John Peabody, P.E.**  
**Deputy Commanding General**  
**Civil and Emergency Operations**  
**U.S. Army Corps of Engineers**

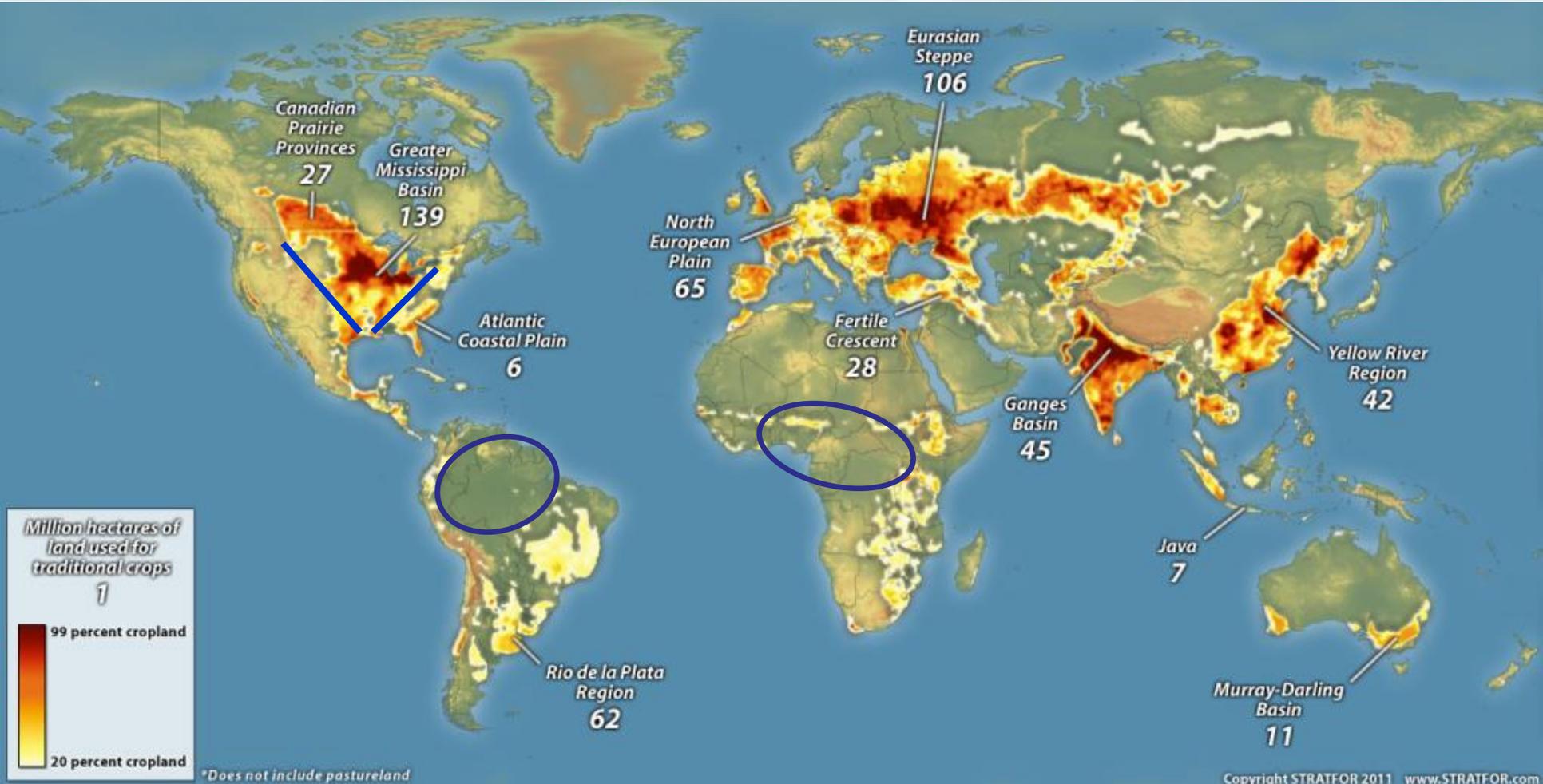
*1 October, 2014*



US Army Corps of Engineers  
**BUILDING STRONG®**



# The United States: The Inevitable Empire?



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# Infrastructure Value - a matter of Perspective



**Imagine a time and place where:**

- Over 1/3 have no toilets or outhouses
  - Over 3/4 have no access to clean water
  - Over 95% have no electricity
  - Over 90% don't even own radios
  - More than 2/3 don't read newspapers
  - More than 75% don't own cars or trucks
  - Over 60% of the energy is provided from animals, mostly horses
  - More than 90% of households have no lighting and no refrigeration
  - Most people survive on subsistence farming
- Flooding is serious and repetitive** to both rural and urban areas cities.



***This was the Tennessee Valley in 1935.***



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# A Visionary Challenge



Franklin Delano Roosevelt asked Congress to create ***“a corporation clothed with the power of government but possessed of the flexibility and initiative of a private enterprise.”***

On May 18, 1933, Congress created the **Tennessee Valley Authority** to harness the region’s rivers to: control floods, improve navigation, and to generate electricity.





Settlers on the Ohio River



1927 Headlines



Hurricane Katrina



1787

1824

1927

1956

2005

“America’s history of development and progress is a history of *Infrastructure.*”

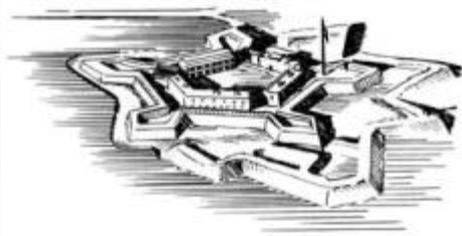
1812

1853

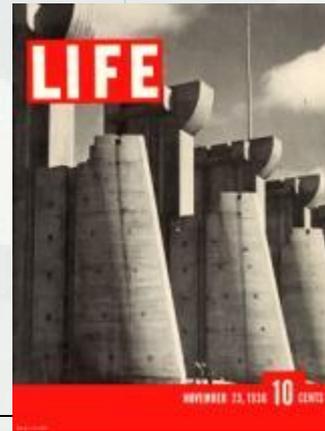
1933

1970

2013



Fort Mifflin



Fort Peck Dam

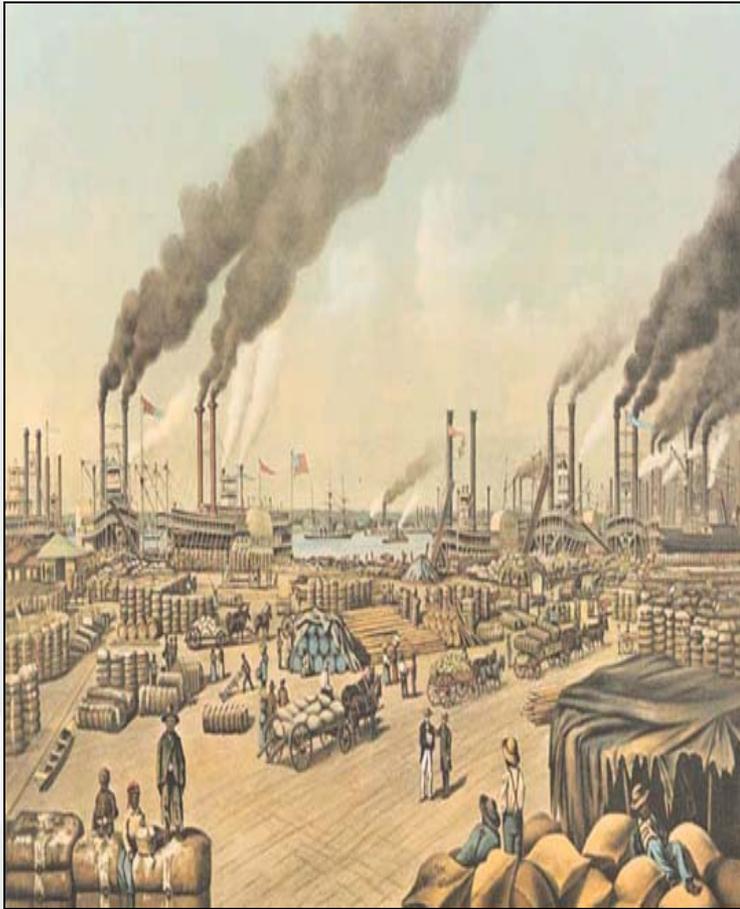


Florida Everglades



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# Historic Perspectives on Infrastructure



**Early 1800's Westward Expansion** Water Transport Central to Nation building

**1850 – Early 1900s - Evolution of Federal Roles** - Navigation, Flood Control, Municipal Water Supply

**1920's Reaction to Public Roles;** 1927 Flood Control Act

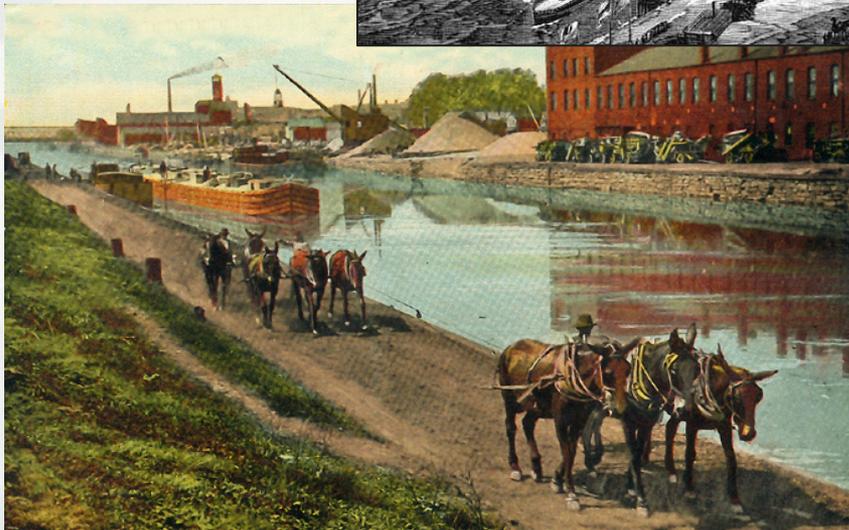
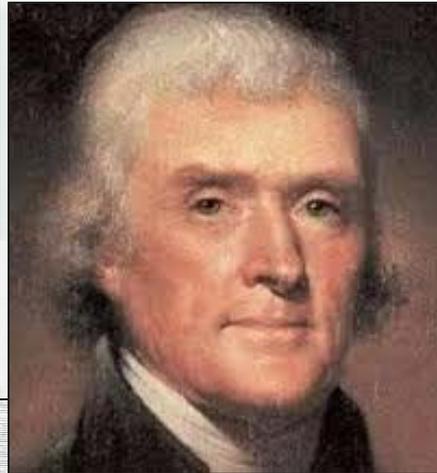
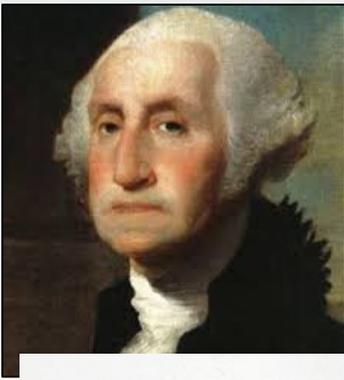
**1930 -1940s Depression and New Deal** Massive Public Infrastructure investments ( e.g. TVA..)

**1940 - 1970 Post War Struggle over National Policy Coordination** - planning, commissions, continued supply focus

**1970's - NEPA Clean Water Act** Preservation - Demand management, pricing, waste treatment, reuse, regulation



# 1) Nation Building: Pre-1900s



## Analysis

- **1808 Gallatin Report** (economic justification of projects)

## Key Legislation

- **1826 Omnibus Rivers and Harbors Act**
- 1877 Desert Land Act

## Institutions Formed

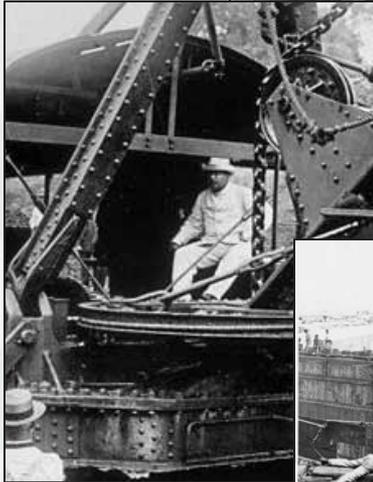
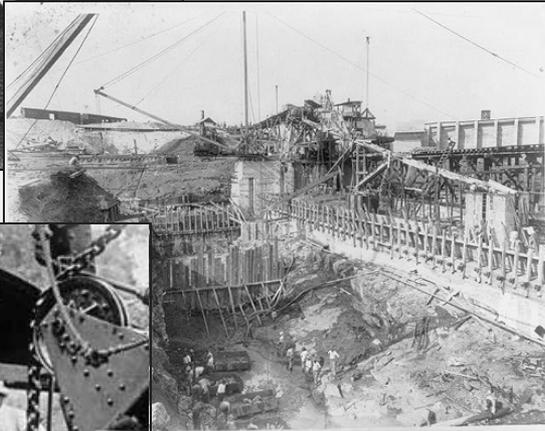
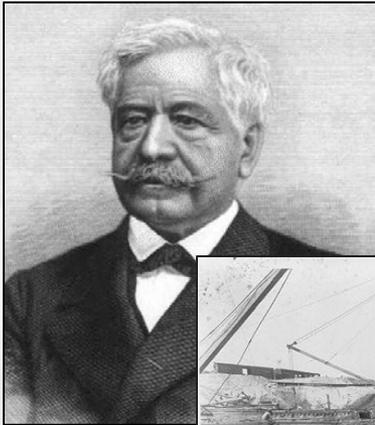
- 1802 US Army Corps of Engineers
- **1871 US Commission on Fish and Fisheries**
- 1879 Mississippi River Commission

## Key Events

- Westward expansion
- Recognized value of navigation (Mississippi and Missouri Rivers)
- **1817 Start of construction of the Erie Canal**
- 1828 Start of construction of the Chesapeake and Ohio Canal
- 1859 Start of construction of Suez Canal



# Nation Building: Early 1900s



## Key Legislation

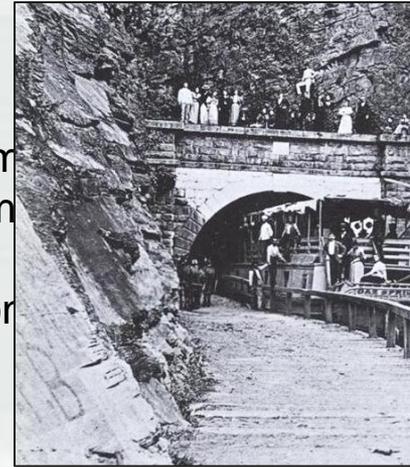
- 1902 Reclamation Act
- **1917 Flood Control Act (first)**
- 1920 Federal Water Power Act
- 1927 Rivers and Harbors Act
- **1928 Boulder Canyon Project Act**

## Institutions Formed

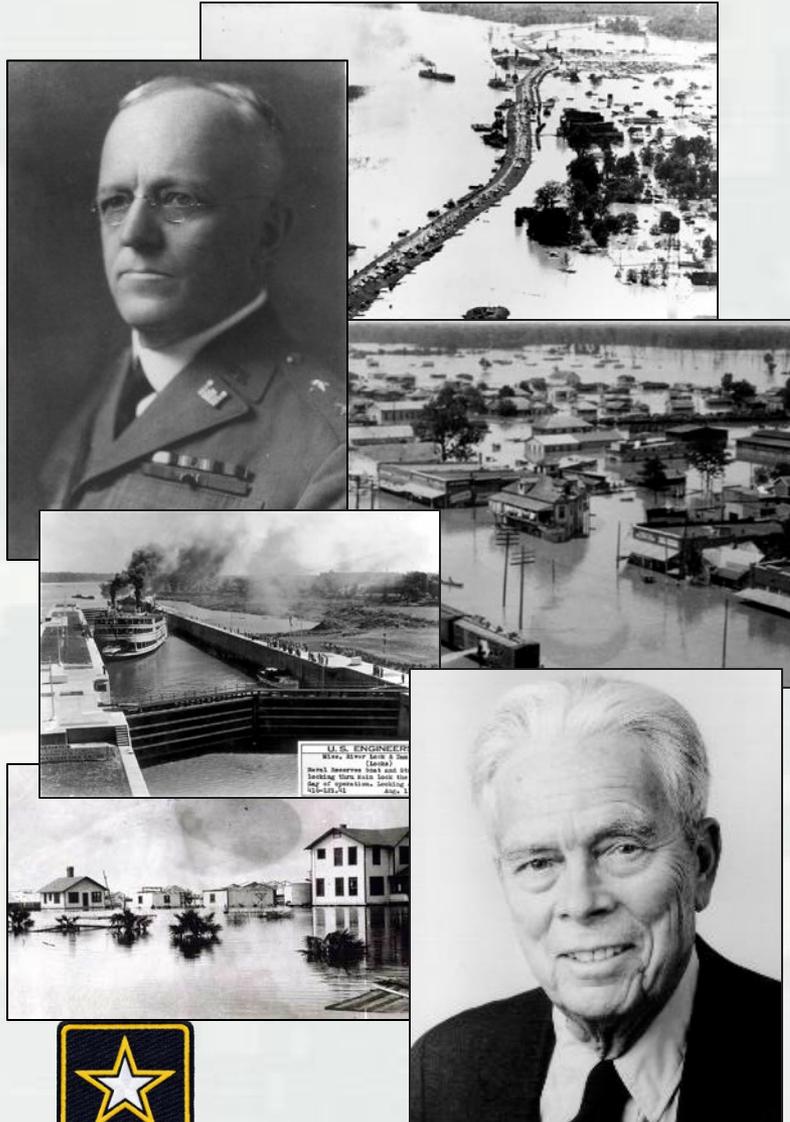
- 1902 National Board of Engineers for Rivers and Harbors
- 1902 Reclamation Service
- **1905 National Forest Service**
- 1909 National Conservation Commission
- 1912 National Waterways Commission
- **1916 National Park Service**
- 1920 Federal Power Commission

## Key Events

- **1914 Panama Canal completed**
- 1927 Reports on navigation and power development



## 2) Economic Efficiency: Mid 1900s



### Key Legislation

- 1936 and 1938 Flood Control Acts

### Institutions Formed

- **1933 Tennessee Valley Authority**
- 1933 National Planning Board (became National Resources Board in 1934)
- 1935 National Resources Committee (became National Resources Planning Board in 1939)
- 1939 Executive Office's Bureau of the Budget
- 1939 Public Works Administration
- 1916 National Park Service
- **1940 National Fish and Wildlife Service**

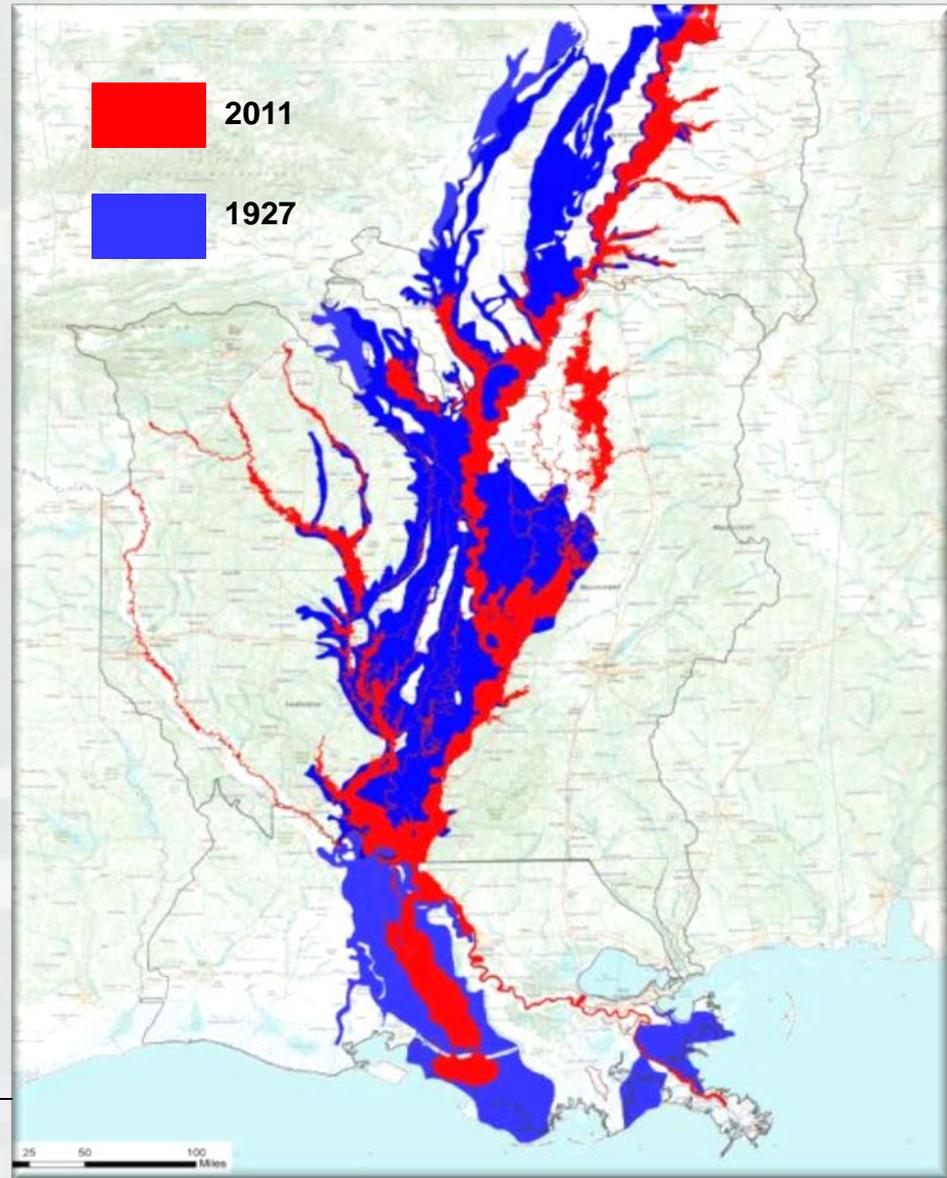
### Analysis

- 1933 National Planning Board multi-purpose plans for ten rivers
- 1935 Authorization to supplement 308 Reports on the economy
- **1936 Flood Control act with benefit-cost language**
- 1942 Gilbert White's analysis of human adjustments to floods

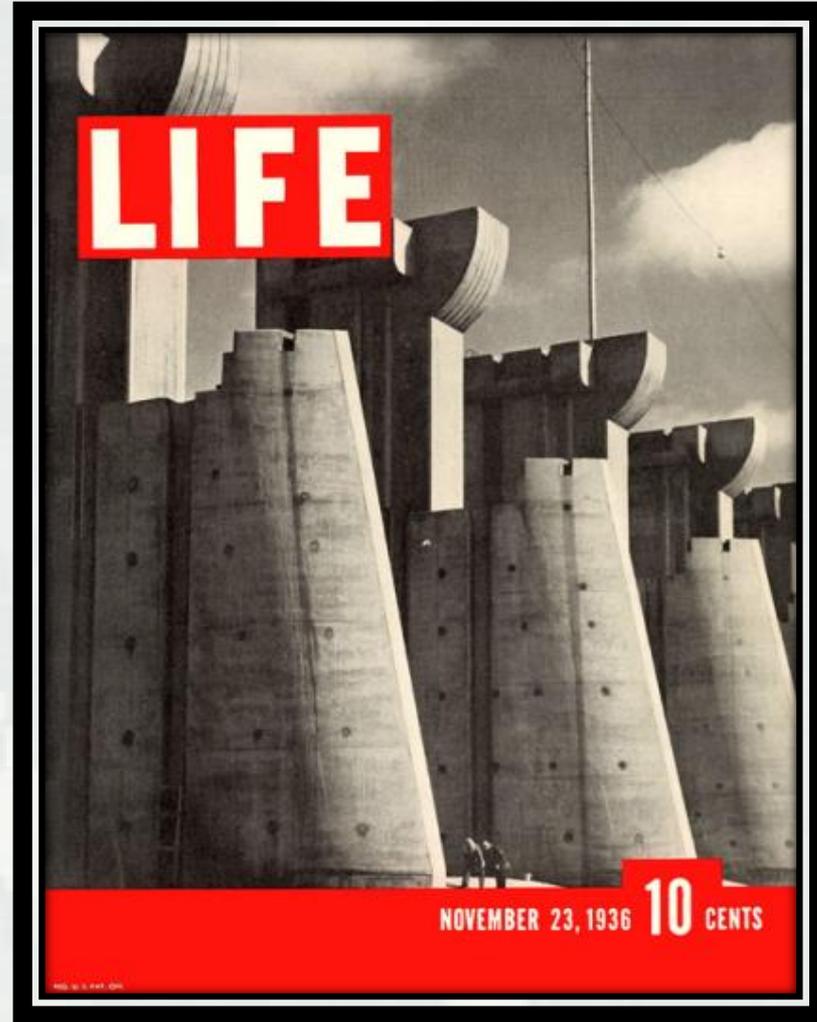
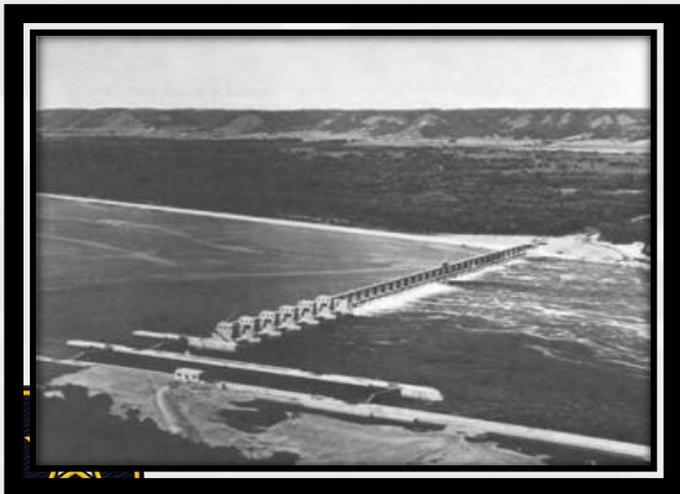


# 1927 vs. 2011 Mississippi River Record Flood: From “Levees Only” to “Room for the River”

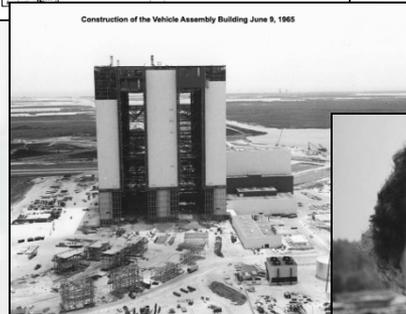
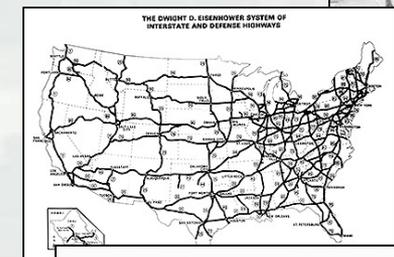
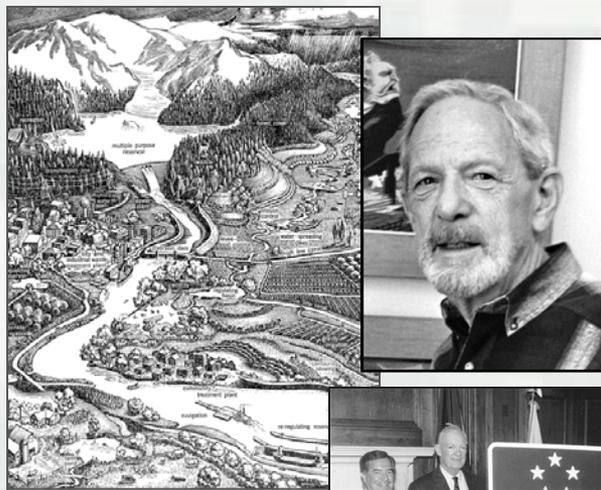
- 1927 Flood = 16.8 M acres (Challenge)
- 2011 Flood = 6.35 M acres (Response)
- \$230 B damages prevented
  - \$612 B since 1928
  - 44 to 1 ROI
- \$7 B in crop damages prevented
- 4.5 million people protected
- \$3B Annual Transportation Rate Savings



# The 20<sup>th</sup> Century “Golden Age” of Infrastructure Construction



# Economic Efficiency: Post-War Mid 1900s



## Key Legislation

- 1944, 1956, 1965 Flood Control Act
- 1948 and 1956 Water Pollution Control Acts
- 1955 and 1965 Rivers and Harbors Act
- 1965 Water Resources Planning Act
- 1966 Clean Rivers restoration Act
- 1968 Wild and Scenic Rivers Act
- 1968 Flood Insurance Act

## Institutions Formed

- 1950 Presidential Water Resources Policy Cmsn
- 1952 House Subcommittee to Study Civil Works
- 1955 Pres. Commission on Water Resources Policy
- 1965 Water Resources Council

## Analysis

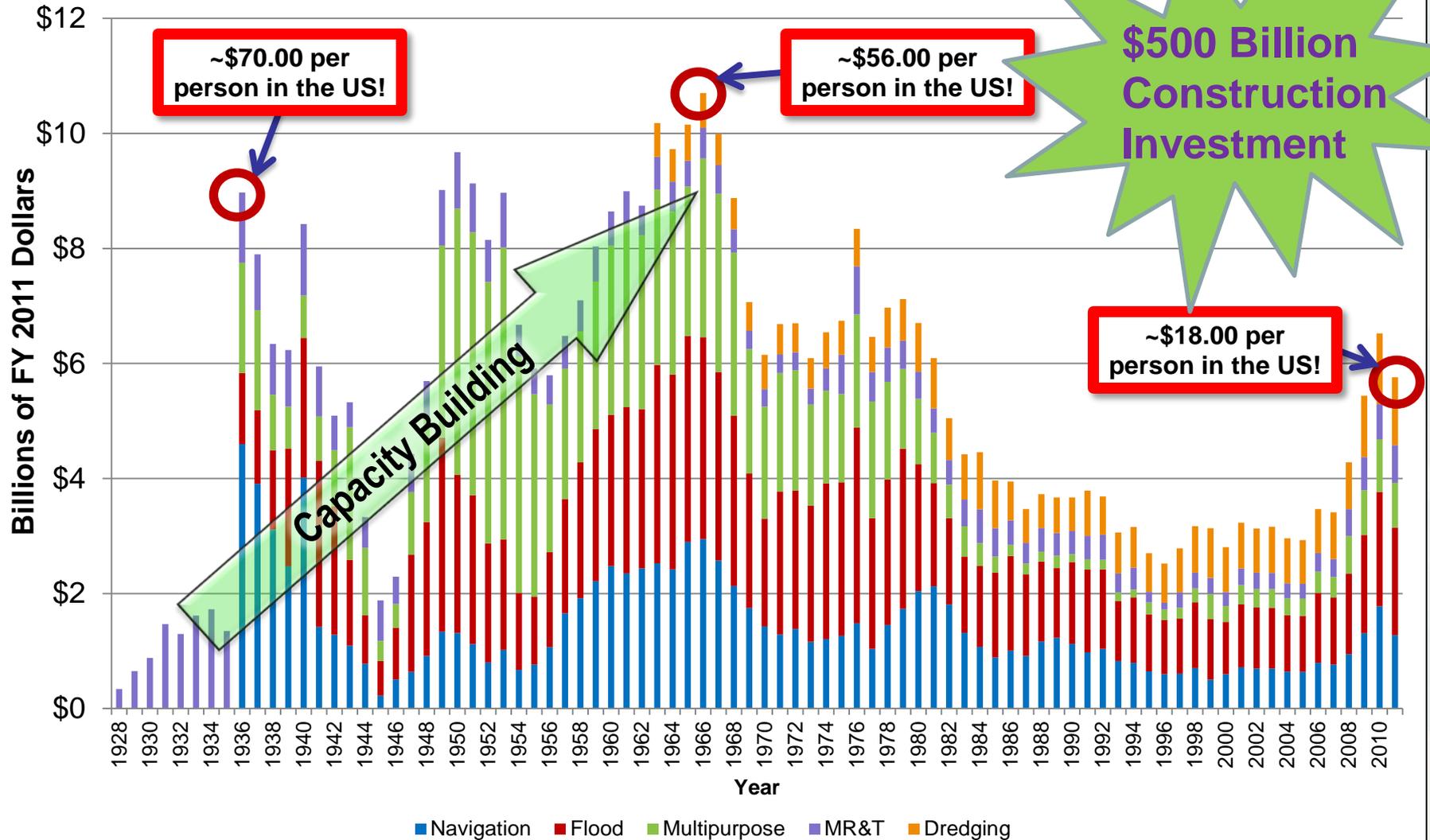
- 1950 Green Book and 1952 Circular A-47 Econ Analys.
- 1958 Multiple-Purpose River Development
- 1962 Senate Document 97 replaces Circular A-47
- 1962 Design of Water Resources Systems

## Key Events

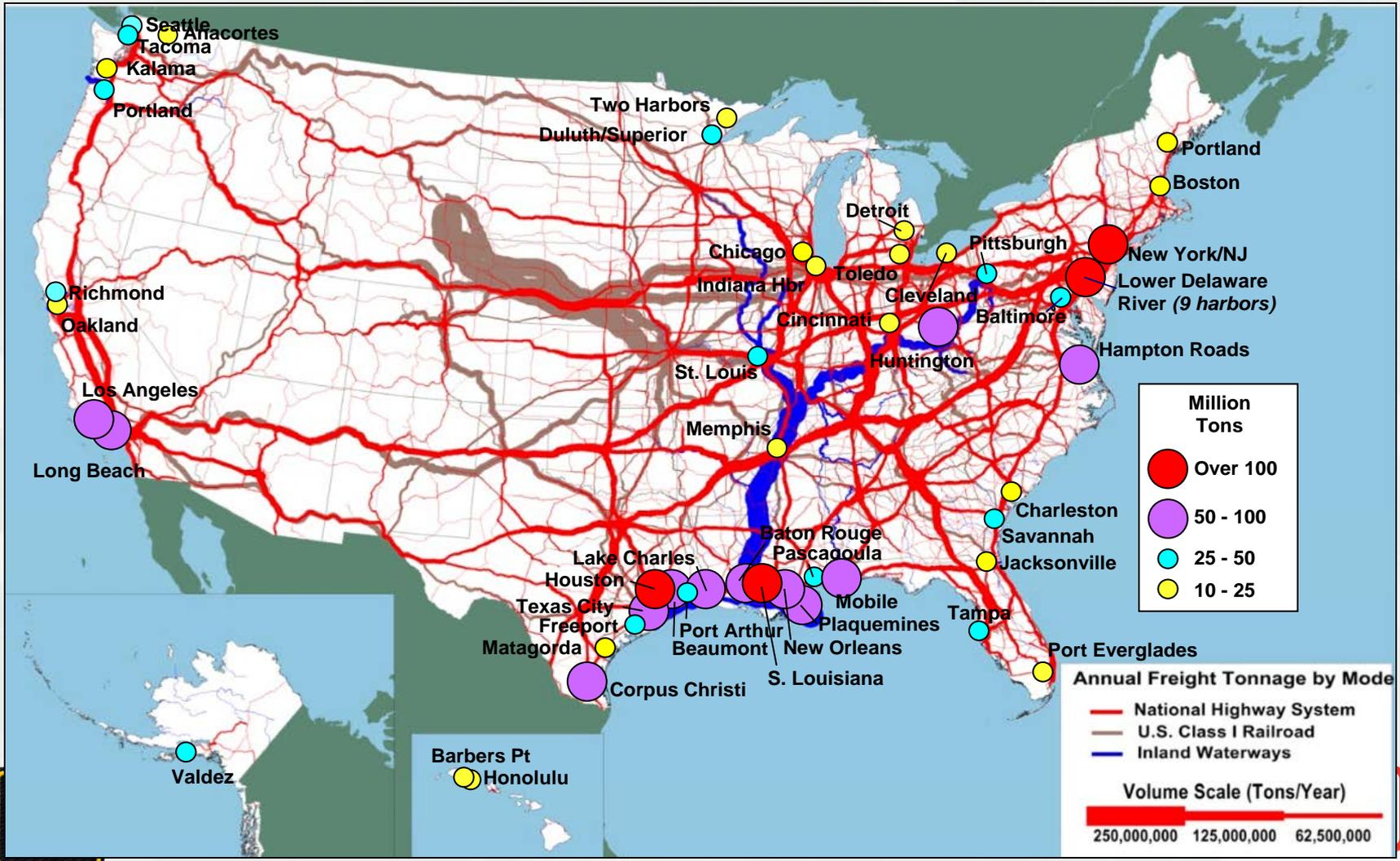
- 1956 Construction started Interstate Hwy
- 1961 Corps const spt to NASA
- 1962 Silent Spring published



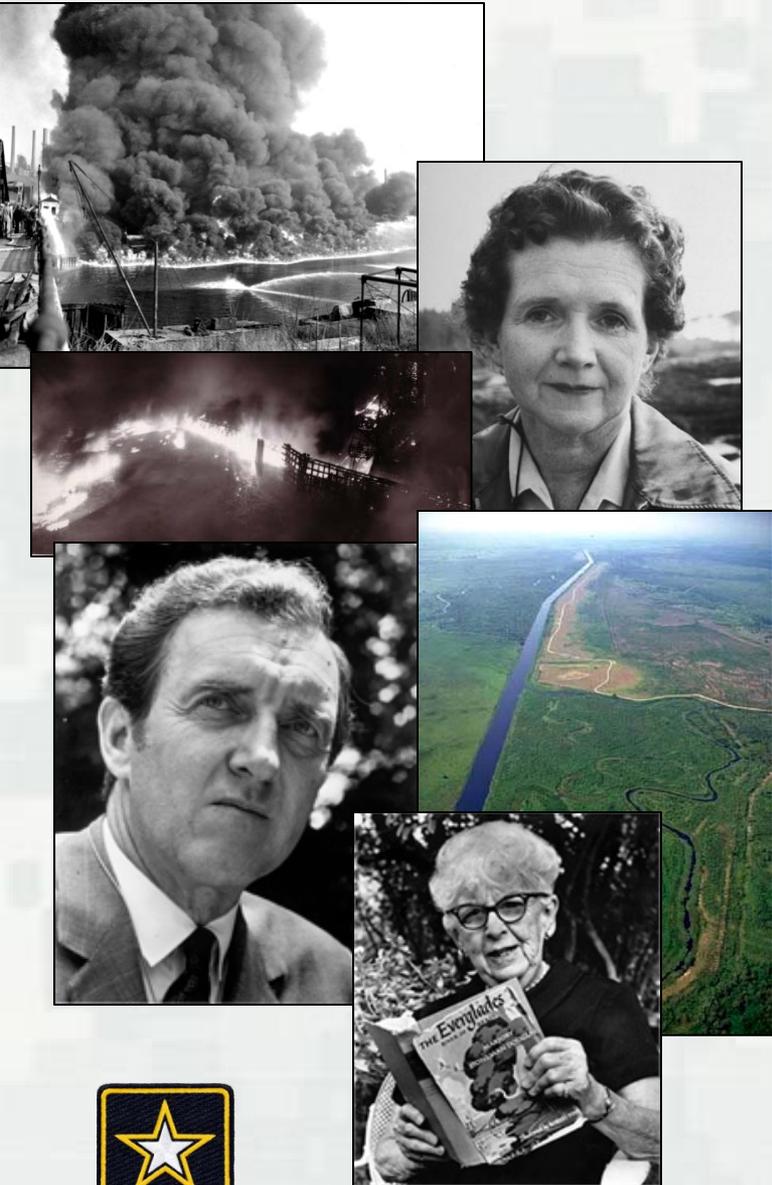
# Historical Investments by USACE Functional Category 1928 to 2011



# U.S. Ports and Inland Waterways: Vital to intermodal transport



# Environmental Enlightenment: Late 1900s



## Key Legislation

- 1969 National Environmental Policy Act
- 1972 Federal Water Pollution Control Act and 1977 Clean Water Act
- 1973 Endangered Species Act
- 1974, 1986, and 1996 Safe Drinking Water Acts
- 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- 1986 Federal Power Act
- 1986, Water Resources Development Act
- 1990, 1992, and 1996 Water Resources Development Acts

## Institutions Formed

- 1970 Council on Environmental Quality
- 1972 National Commission on Water Quality
- 1973 Principles and Standards
- 1973 National Water Commission report

## Key Events

- 1986 FEMA takes over Interagency Flood Management Task Force
- 1989 Escalating Federal involvement in Everglades restoration





# 2013 Report Card for America's Infrastructure

by the American Society of Civil Engineers

# D+

America's  
Cumulative G.P.A.

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

A = Exceptional  
B = Good  
C = Mediocre  
D = Poor  
F = Failing

Estimated investment needed by 2020 =

# \$3.6 Trillion

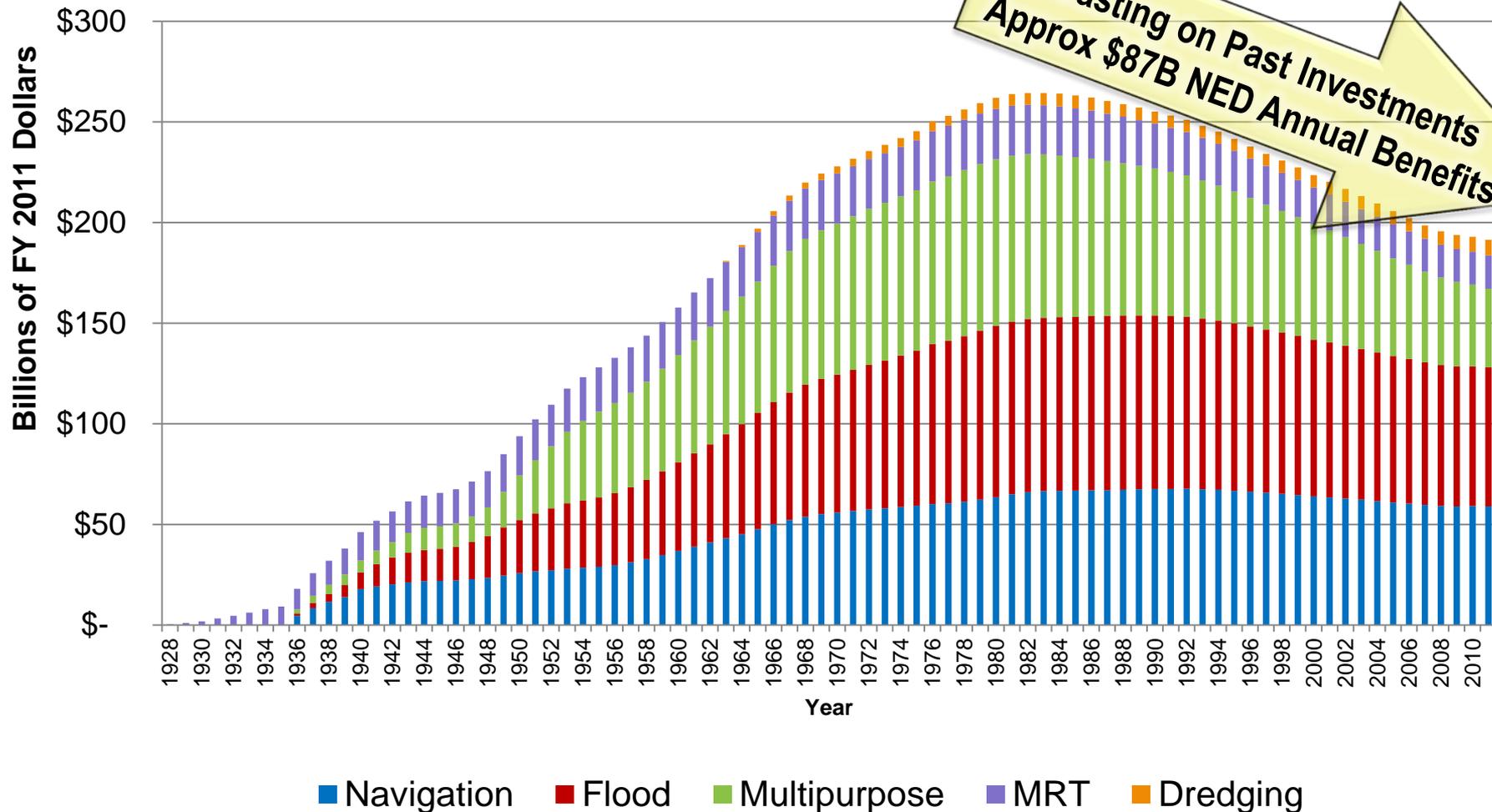


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# USACE Capital Stock Value by Functional Category, 1928 to 2011



# USACE CW's Economic Benefits & Revenues to the Treasury

## (2010-2012 Average)

Each dollar spent on the USACE Civil Works program generated ~ \$16 in economic benefits and \$5 in revenues to the U.S. Treasury.

Program	NED Benefits (Billions of Dollars)	Net NED Benefits (Billions of Dollars)	U.S. Treasury Revenues (Billions of Dollars)
Flood Risk Management	\$59.47	\$58.84	\$18.90
Coastal Navigation	\$9.47	\$8.70	\$3.70
Inland Navigation	\$8.10	\$7.51	\$2.07
Water Supply	\$7.00	\$6.98	\$0.09
Hydropower	\$2.30	\$2.11	\$1.37
Recreation	\$3.20	\$2.91	\$1.13
Leases and Sales			\$0.03
<b>Total Annual NED</b>	<b>\$89.54</b>	<b>\$87.05</b>	<b>\$27.29</b>

Notes:



Net NED benefits are defined as NED benefits less the costs of operations, maintenance, and investigations. Since the costs associated with expenses and oversight by the Assistant Secretary of the Army (ASA) serve all Corps programs, including those we did not calculate benefits for in this report, this report does not account for those costs."

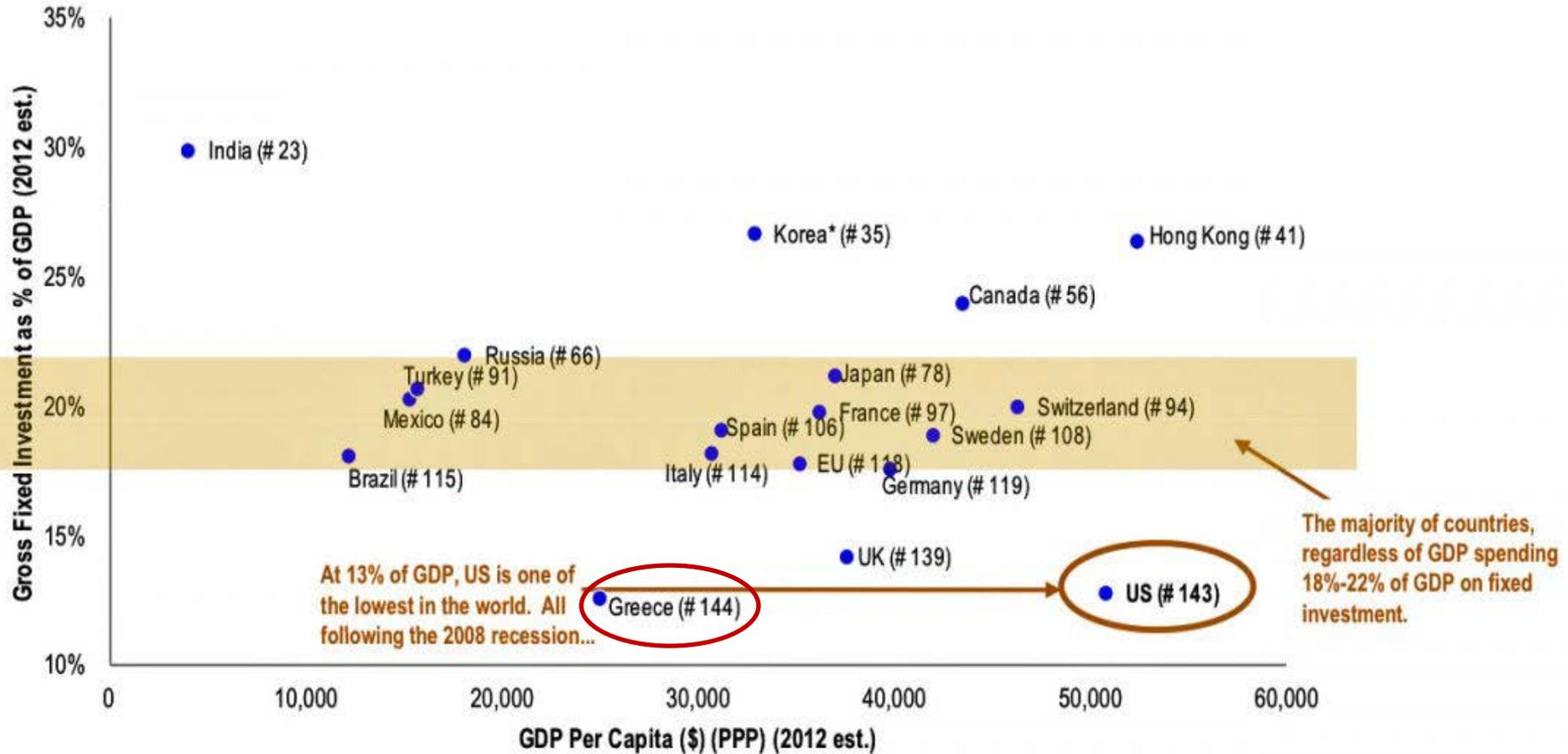


The Benefits and Revenues numbers are not additive.

# Gross Fixed Investment (Public & Private Sectors): United States Relative to Other Nations

Figure: GDP Per Capita versus Gross Fixed Investment as a % of GDP: Underinvestment in the US

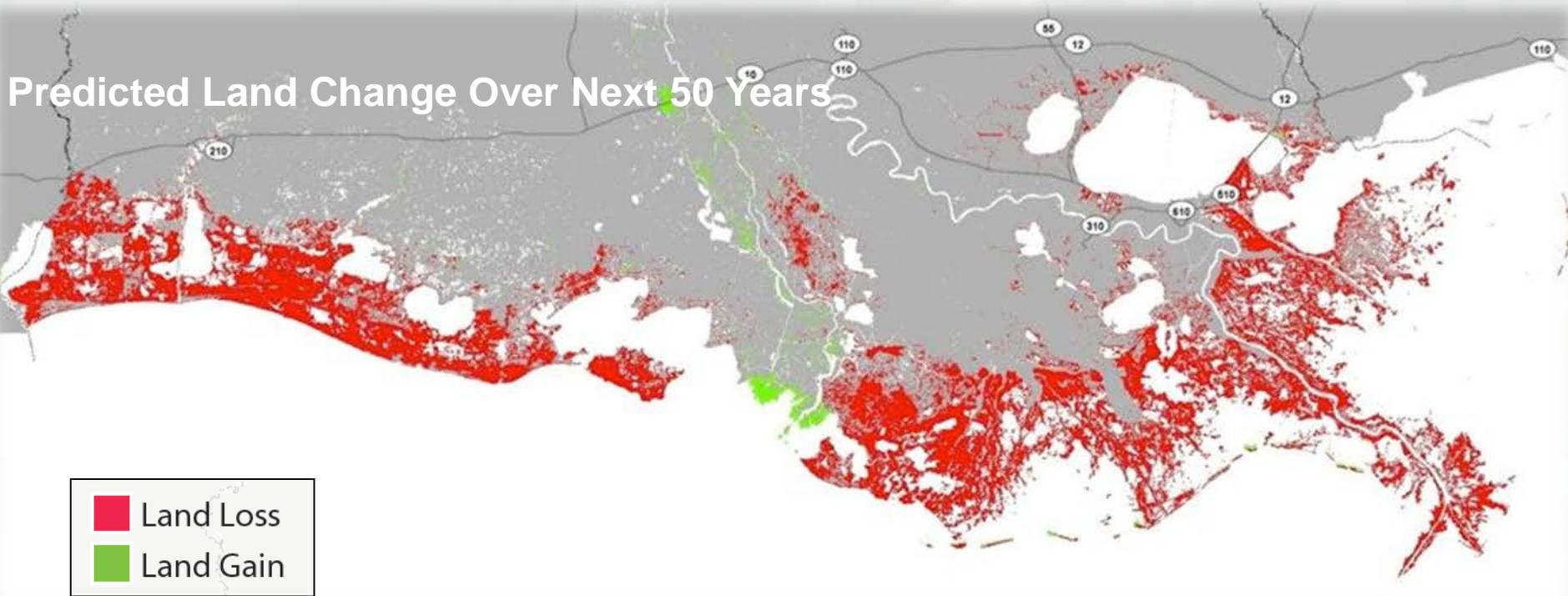
Estimates for 2012 The rank of Gross fixed investment as % of GDP is in the parenthesis.



**One Step Ahead of Greece!**



# The Nation is Experiencing a Coastal Crisis in Louisiana



- **Potential Loss:** 1,750 sq. mi. over next 50 years
- Largest Port Complex in US:
  - ▶ 60% of Agricultural products
  - ▶ 22% of Energy capacity
- Largest Fishery in the Lower 48

# ***Emerging Focus on Recapitalization and Resilience?***

## **White House Initiatives:**

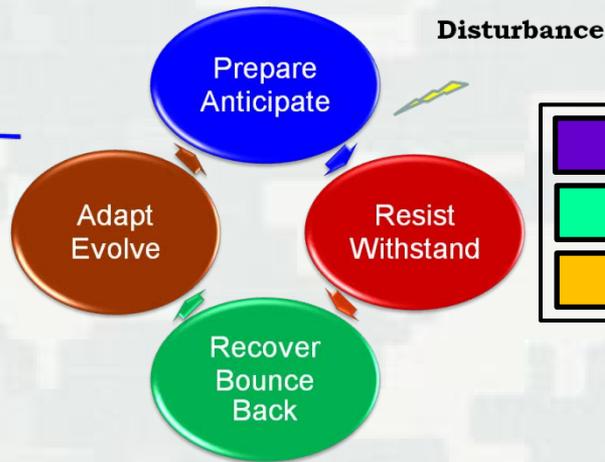
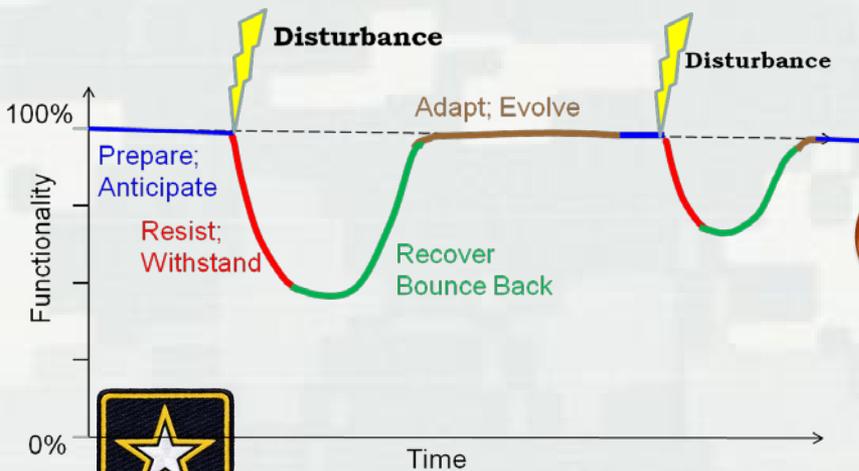
- “We Can’t Wait” Port Permitting
- Build America Investment
- Infrastructure Task Force
- Building a 21<sup>st</sup> Century Infrastructure
- Climate Action Plan
- Strengthen Global Resilience to Climate Change



# Concepts for Coastal Resilience

**Resilience:** the ability of a *system* to **Prepare for**, **Resist**, **Recover**, and **Adapt** to achieve functional performance under the stress of disturbances through time.

Study	Definition
NAS (2012)	"Resilience is the ability to <b>prepare and plan for</b> , <b>absorb</b> , <b>recover from</b> , and more successfully <b>adapt</b> to adverse events."
E.O. 13653 (2013)	"resilience means the ability to <b>anticipate</b> , <b>prepare for</b> , and <b>adapt</b> to changing conditions and <b>withstand</b> , respond to, and <b>recover</b> rapidly from disruptions."



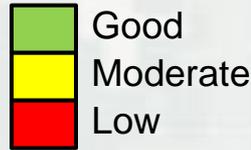
	Engineering
	Environmental
	Community



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# Integrated Management: *Resilience Matrix Approach*

## Jamaica Bay



Ecosystem Health	Prepare	Resist	Recover	Adapt
Physical System	Yellow	Yellow	Green	Red
Data & Analysis	Green	Green	Green	Green
Decision Support	Green	n/a	Green	Green
Communication	Yellow	Yellow	Yellow	Yellow

Housing and Shelter	Prepare	Resist	Recover	Adapt
Physical System	Yellow	Green	Red	Green
Data & Analysis	Yellow	Yellow	Red	Red
Decision Support	Yellow	Red	Red	Red
Communication	Green	Green	Red	Green

### Goal:

Provide baseline assessment for intercomparing project alternatives

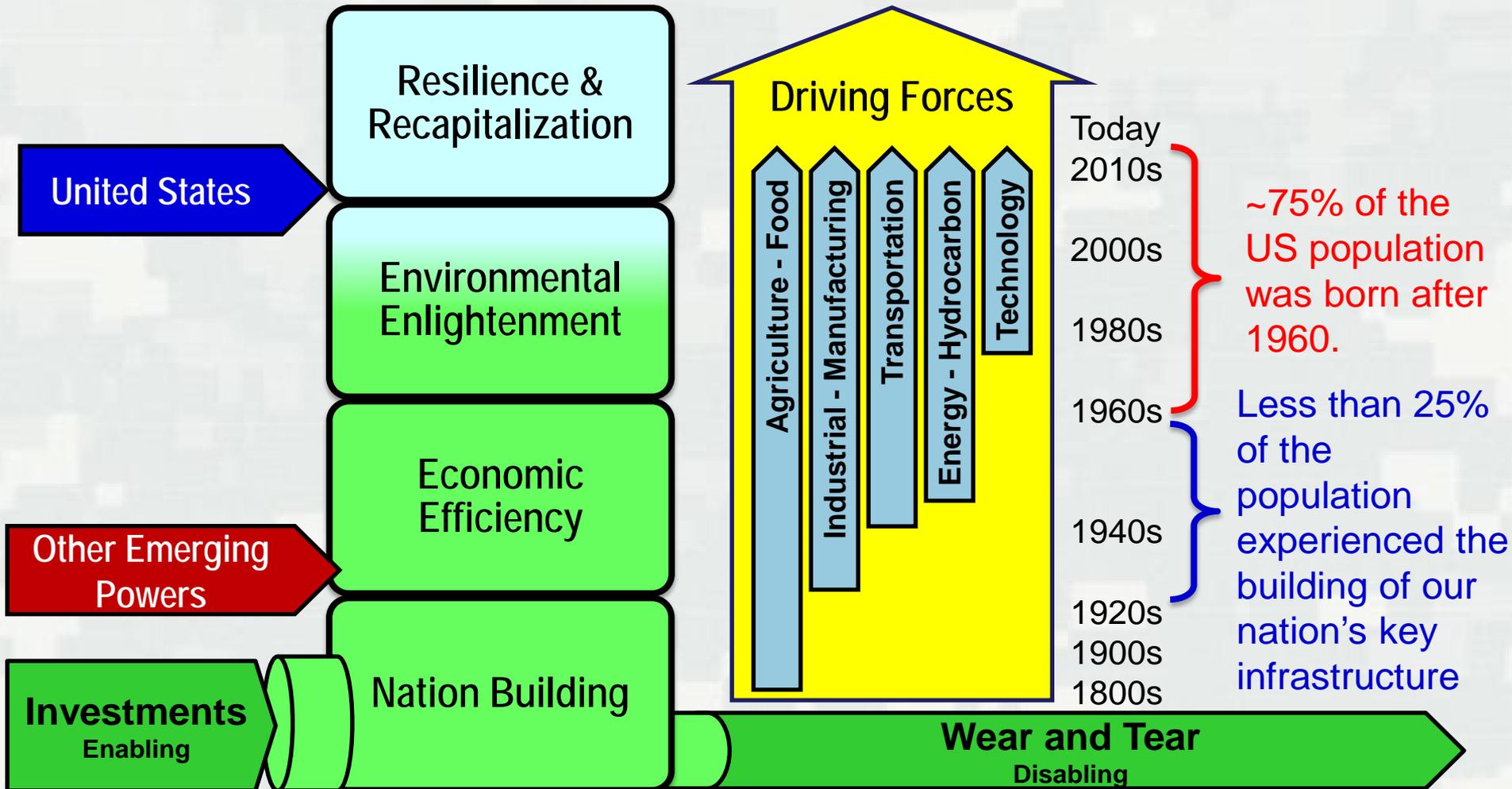
### Approach:

- Define extent of system & potential disturbances
  - Identify function(s) to be evaluated; for Jamaica Bay:
    - Ecosystem health
    - Housing/shelter
  - Assess via expert elicitation\* capacity of each cell in matrix
  - Results indicate:
    - Gaps in system resilience
    - Project needs
    - Partner roles
- Detailed assessment focused on Housing & Shelter

\*Query experts; review literature; examine historical record



# Changing Perspectives on Infrastructure

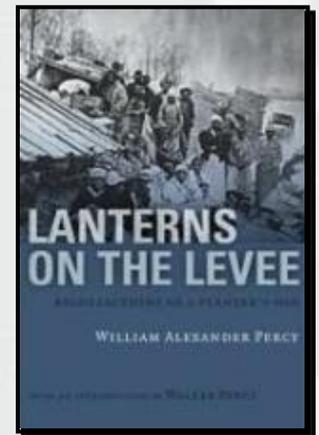
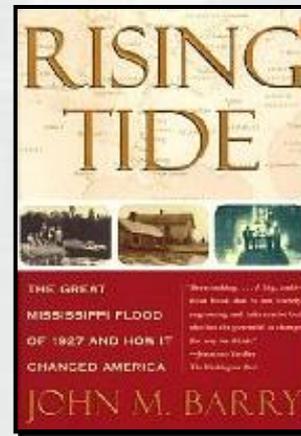
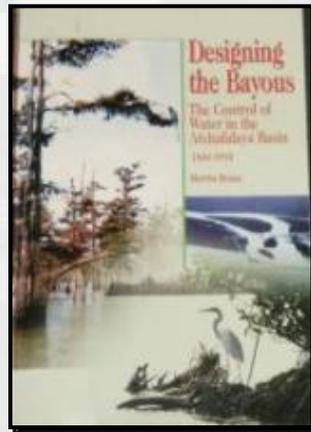
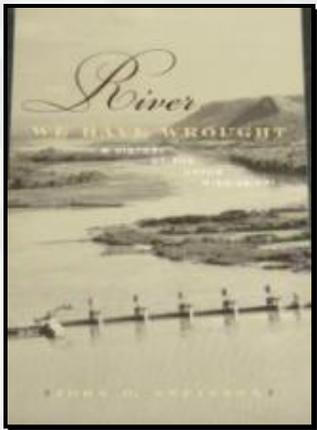
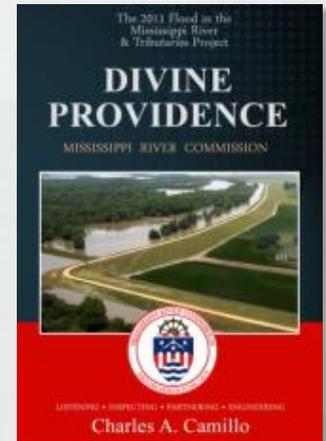
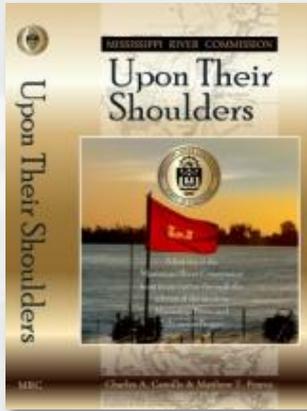


*Hierarchy of Public Works Needs*



# Challenge and (Provisional) Response

- Gather insights and lessons from the Past
- Identify *Challenges*, *Provisional Responses*, and Longer Term *Impacts*
- Build a *Vision* for the Future



# CIVIL WORKS TRANSFORMATION

**Deliver enduring & essential water resource solutions by applying effective transformation strategies.**



***“One of the great mistakes is to judge policies and programs by their intentions rather than their results.”***



# Transforming Civil Works



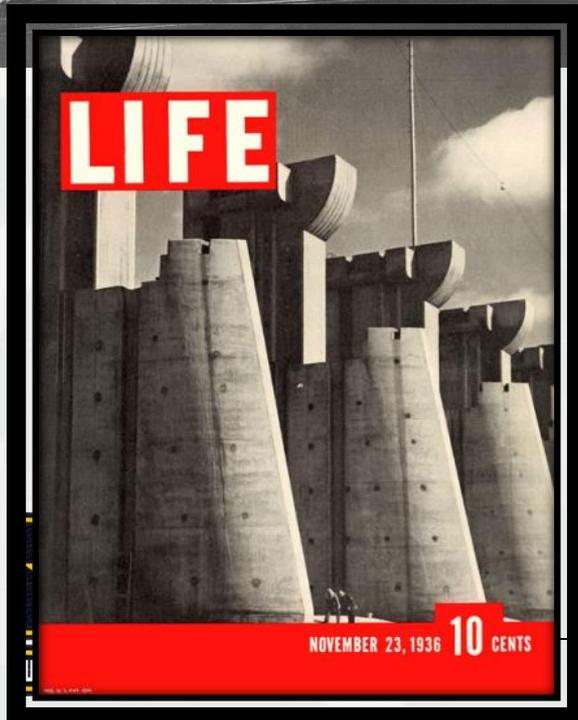
# The Power of Leadership and Vision

corbis.



**“It is because *we have undertaken this gigantic task* that will take us more than a generation to complete, because we have undertaken it now, and *the people of the United States understand the objective of the idea, that I feel very certain we are going to carry it through to a successful completion.*”**

- President Franklin Delano Roosevelt,  
at Fort Peck Dam, 1934



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# America's Watershed: A 200-year working vision

## *An Intergenerational Commitment*

**Our people enjoy a quality of life unmatched in the world. We ...**

- **Lead secure lives along the river or tributary.**
- **Enjoy fresh air and the surrounding fauna, flora and forests while hunting, fishing and recreating.**
- **Travel easily, safely and affordably.**
- **Drink from and use the abundant waters of any river, stream or aquifer.**
- **Choose from an abundance of affordable basic goods and essential supplies that are grown, manufactured and transported along and by the river to local and world markets.**

*Leveraging local citizens' input, international dialogue, science, engineering, technology and public policy*



*The Mississippi watershed is 41% of the US, 31 states, 1.25 million square miles, over 250 tributaries*

### *Balancing needs for ...*

- ❖ **National security & flood damage reduction**
- ❖ **Environmental sustainability & recreation**
- ❖ **Infrastructure & energy**
- ❖ **Water supply & water quality**
- ❖ **Movement of goods; agriculture & manufacturing**

*Join the dialogue, visit:*  
[www.mvd.usace.army.mil/mrc](http://www.mvd.usace.army.mil/mrc)  
*or email:*  
[cemvd-ex@usace.army.mil](mailto:cemvd-ex@usace.army.mil)

# Developing Partner Shared Vision



- Respect – Listen & Learn (Check Biases)



Meridian Institute  
Connecting People to Solve Problems

- Science and Fact-Based Analysis



- Accept History

- Think in Geologic Time ... on a Watershed Scale



- Good Will - Give Up BIG THINGS



US Army Corps of Engineers



Upper Mississippi River Basin Association



The National Great Rivers Research & Education Center

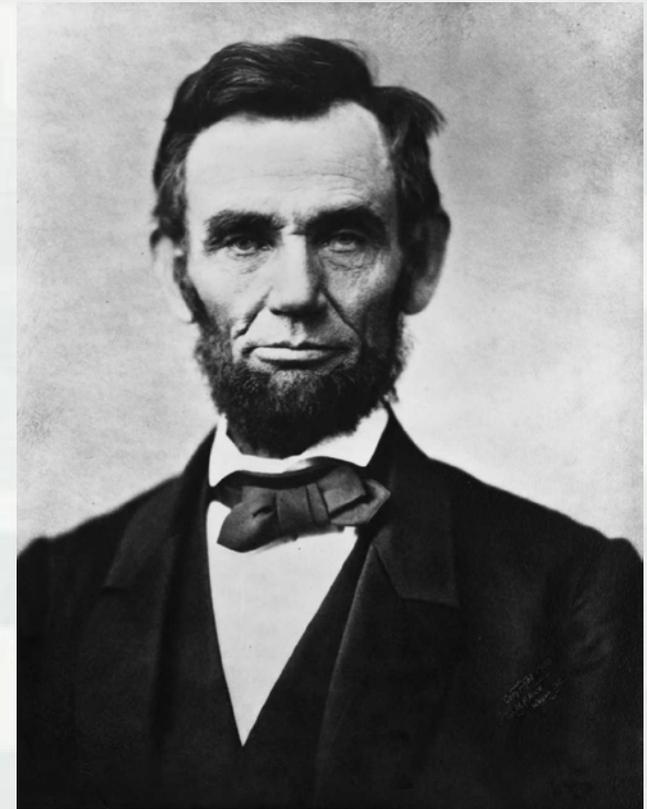
# Lincoln's Anguish: A Lesson in Humility

In great contests each party claims to act in accordance with the will of God.

Both may be, and one must be, wrong. God cannot be for and against the same thing at the same time.

In the present civil war, it is quite possible that God's purpose is something different from the purpose of either party;

and yet the human instrumentalities, working just as they do, are of the best adaptation to effect His purpose."



# Some "Inevitable" Empires



Egypt



Charlemagne



Napoleon's  
French Empire



British  
Empire



Roman Empire

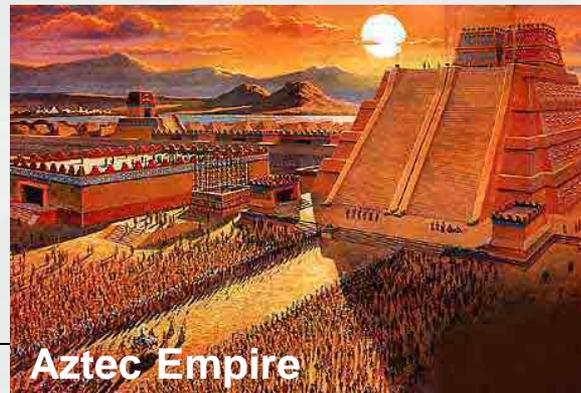


Philip of  
Macedon

Ming  
Dynasty



Ottoman  
Empire



Aztec Empire

Soviet Union





# What will be *Your* Legacy?



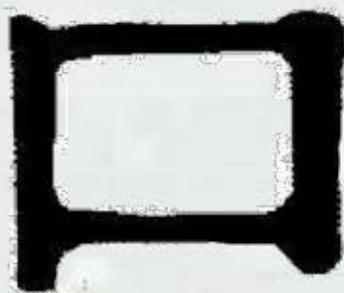
US Army Corps of Engineers  
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# Water management (and water reform) is ALWAYS political.....

Ancient Chinese Characters:



+



=



River +

Dike

=

Political  
Order