Vulnerabilities
Flood Risk Reduction and Inland Navigation

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US Army Corps of Engineers
BUILDING STRONG®

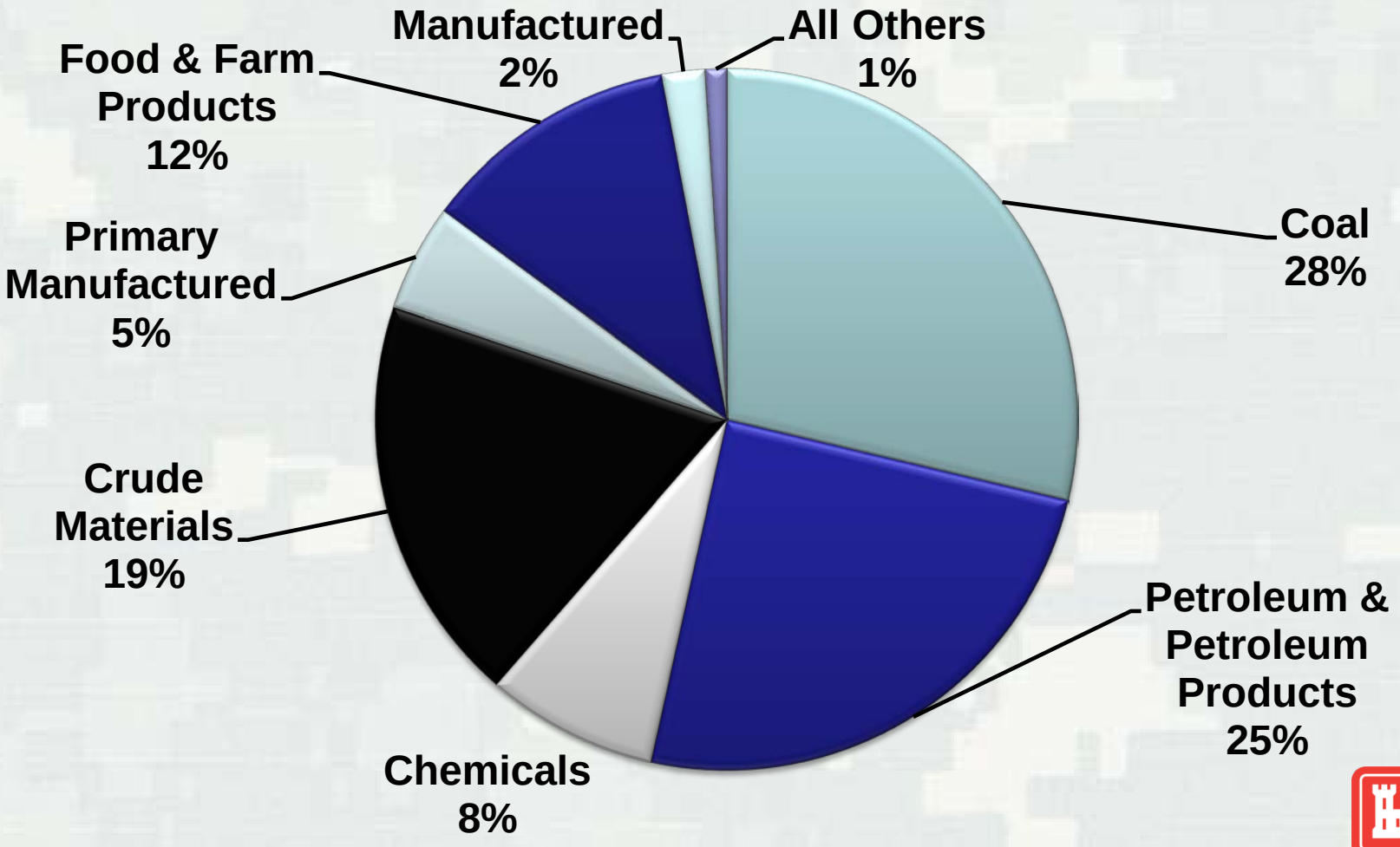
USACE Civil Works Primary Mission Areas

- Creating and maintaining navigable channels
- Reducing flood and storm damage, and
- Restoring aquatic ecosystems

Inland & Intracoastal Waterways

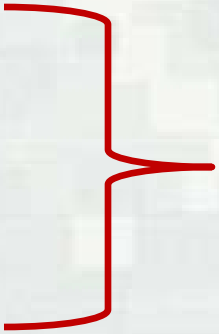
- ~ 24,000 miles in US
- Carries 1/6 of cargo between US cities
- Barges particularly well suited for movement of bulk commodities

Inland Waterways Commodities
(Share by Ton)



Inland and Intracoastal Waterway Statistics

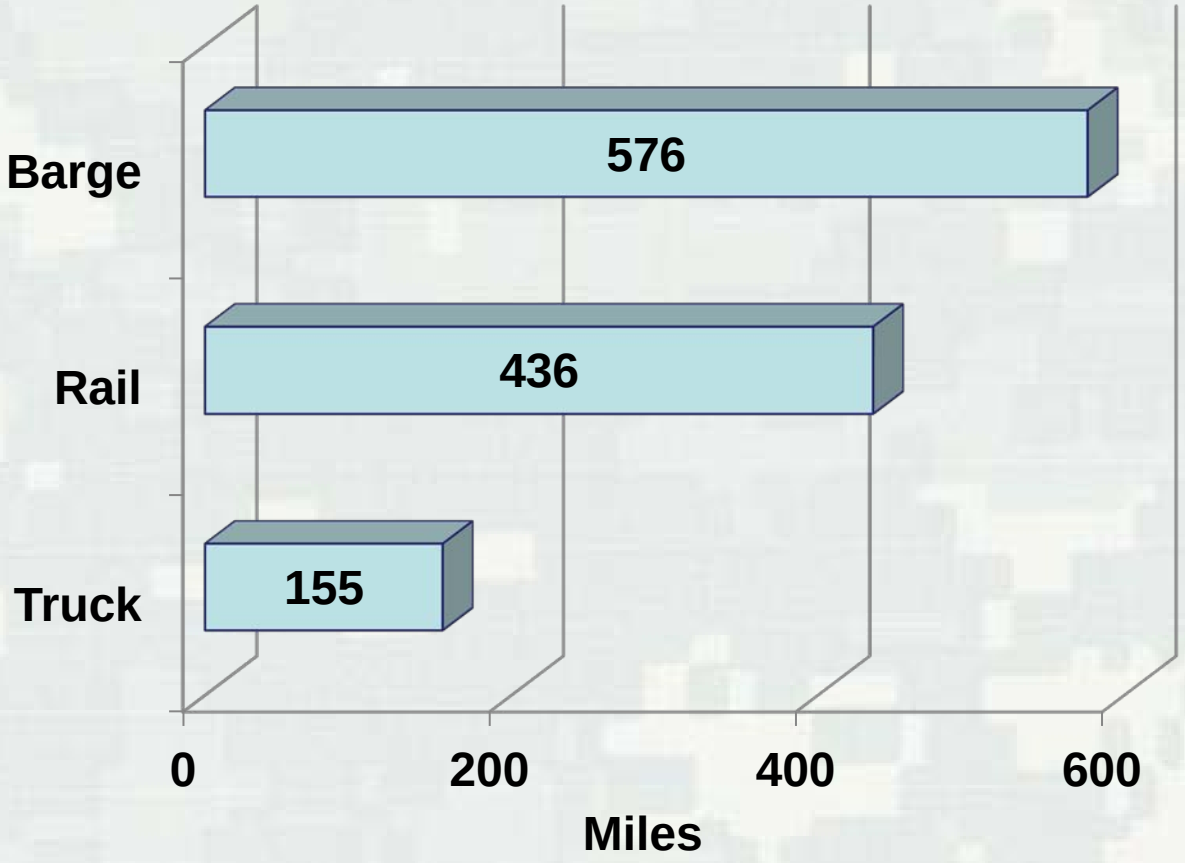
- **Directly serve 38 states**
  - ▸ Nation's heartland
  - ▸ Atlantic
  - ▸ Gulf Coast
  - ▸ Pacific Northwest

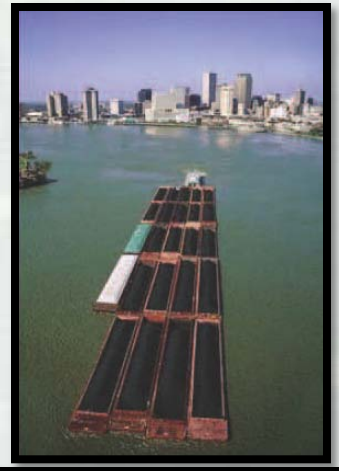


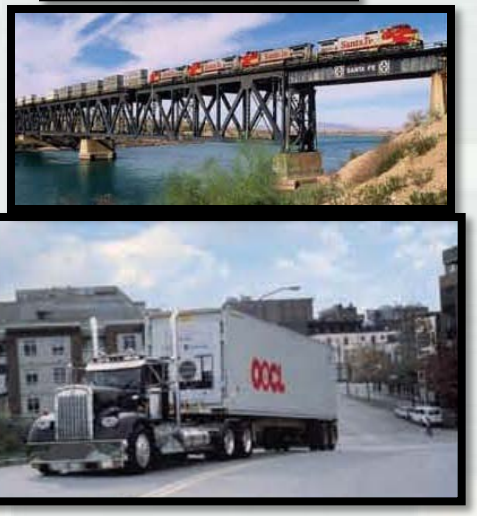
622 Million tons Cargo (2007)

- **All domestic waterborne commerce (inland, coastal and Great Lakes)**
  - ▸ > 1Billion tons
  - ▸ > $380 B (2007)
- **TX, LA and AK > $20 B annually**
- **IL, NY, CA & WA $10 B -> $20 B annually**
- **8 other states $5B -> $10B annually**

Average Miles per Gallon Fuel per Ton





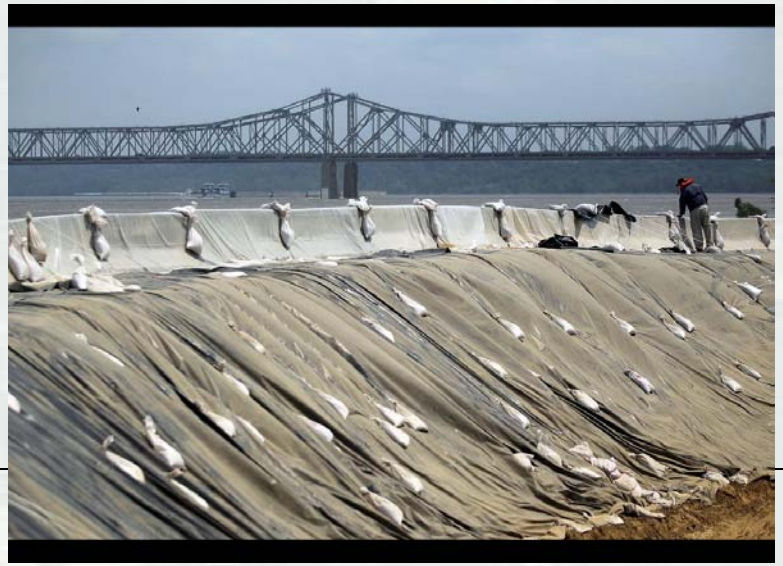


Consequences

New Orleans - 2005

Nebraska- 2012

Mississippi- 2011



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US Levee System

- Est. 100,000 miles of levees in US
- USACE maintains
  - ▸ 2000 levee systems
  - ▸ ~ 14,000 miles of levees

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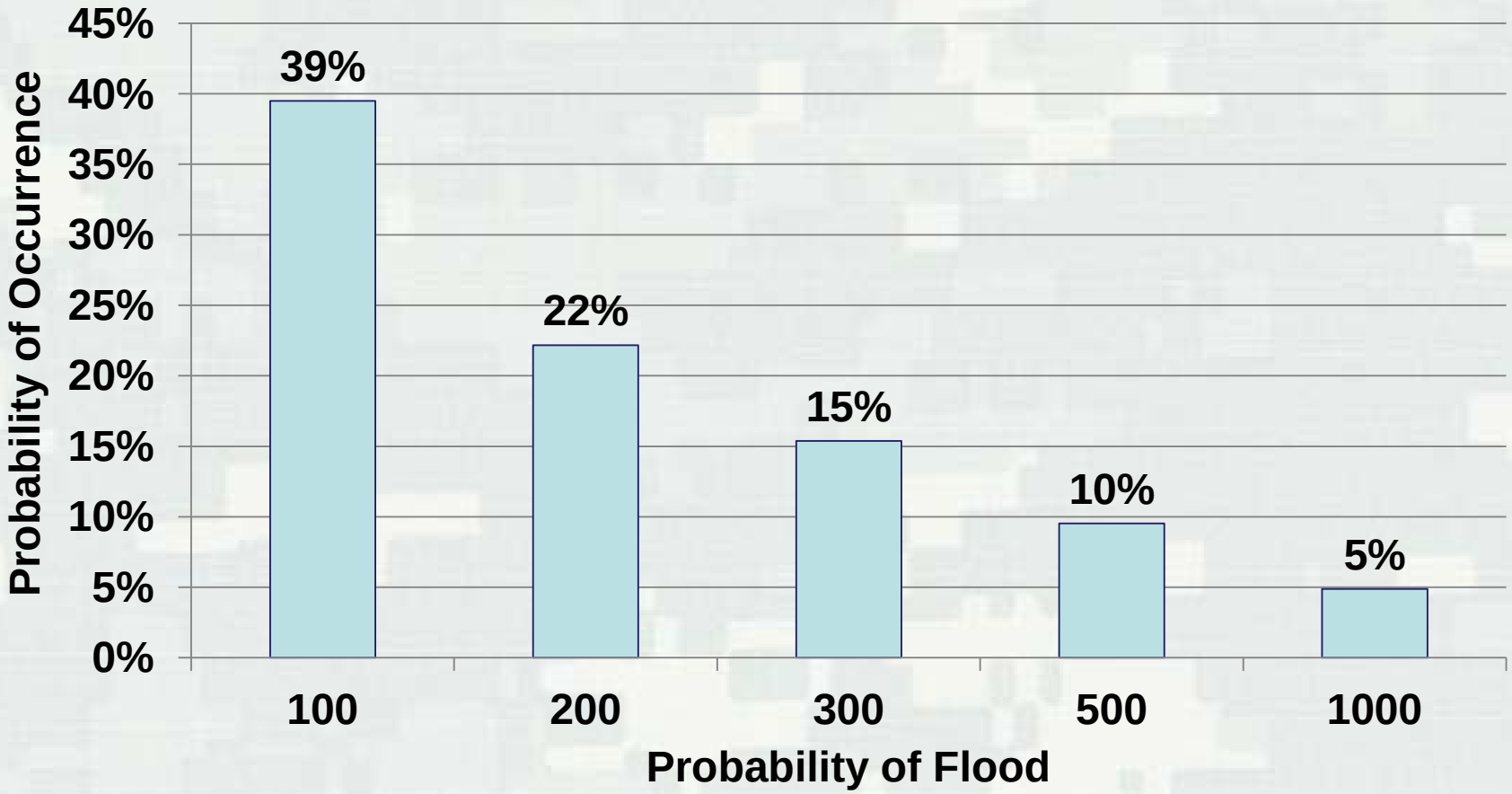
Chance of Flood Occurring in 50-Year Period

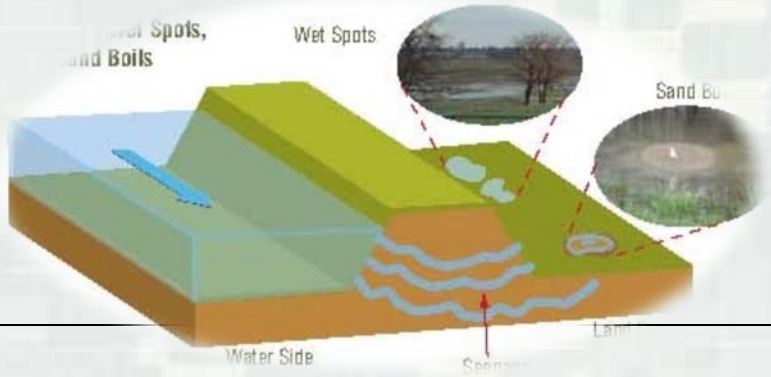


US Lock System

- 257 Locks
  - 122 locks > 60 years old
  - 30 locks built before 1900
  - American Society of Civil Engineers graded the condition of US inland waterways as “D-” (2012)

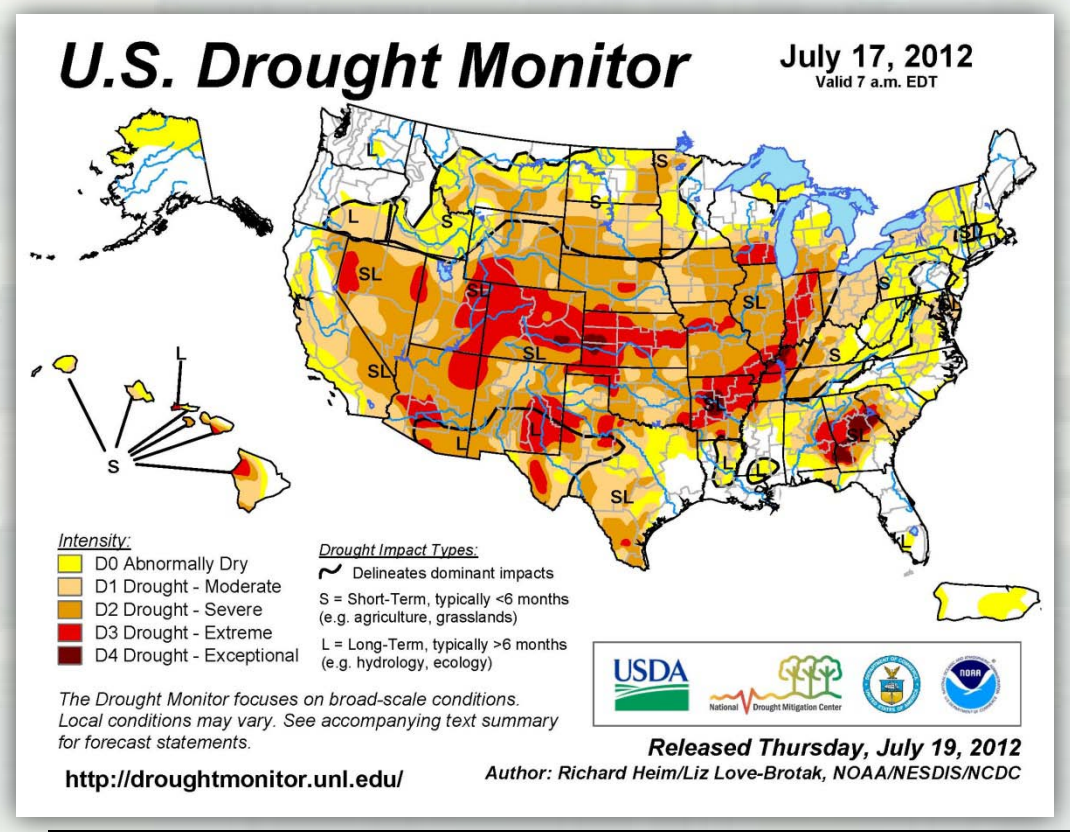
Climate Change Impacts

- **Greater intensity and frequency of storms**
  - ► **Coastal areas**
    - Greater probability of storm run-up "overtopping" levees and coastal structures (typically built to 1% probability storm event)
    - Increased rates of levee erosion
  - ► **Riverine areas**
    - Increased depth of flood events
    - Decreased warning of flood events



Climate Change Impacts

- **Decreases in preciptation -> decreases in available navigation flows**



Risk

- Risk = Probability x Consequence
- Risk is a function of;
  - Quantification
  - Communication
  - Management

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