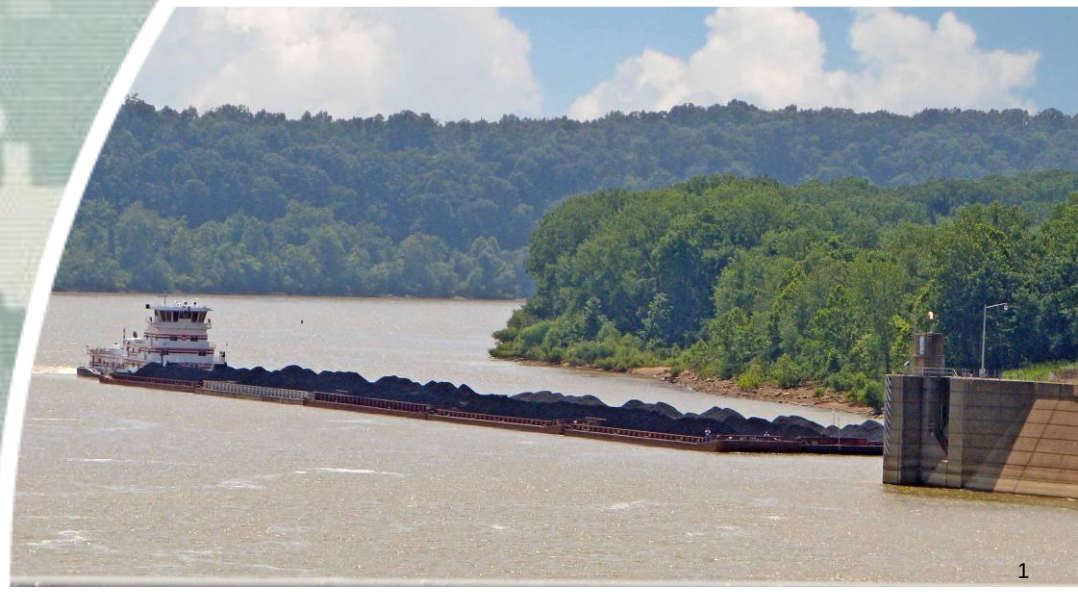
Ohio River Navigation: Economic Impacts and Engineering Reliability

KSPE Annual Convention
29 April 2011
Covington, KY



Mark Hammond
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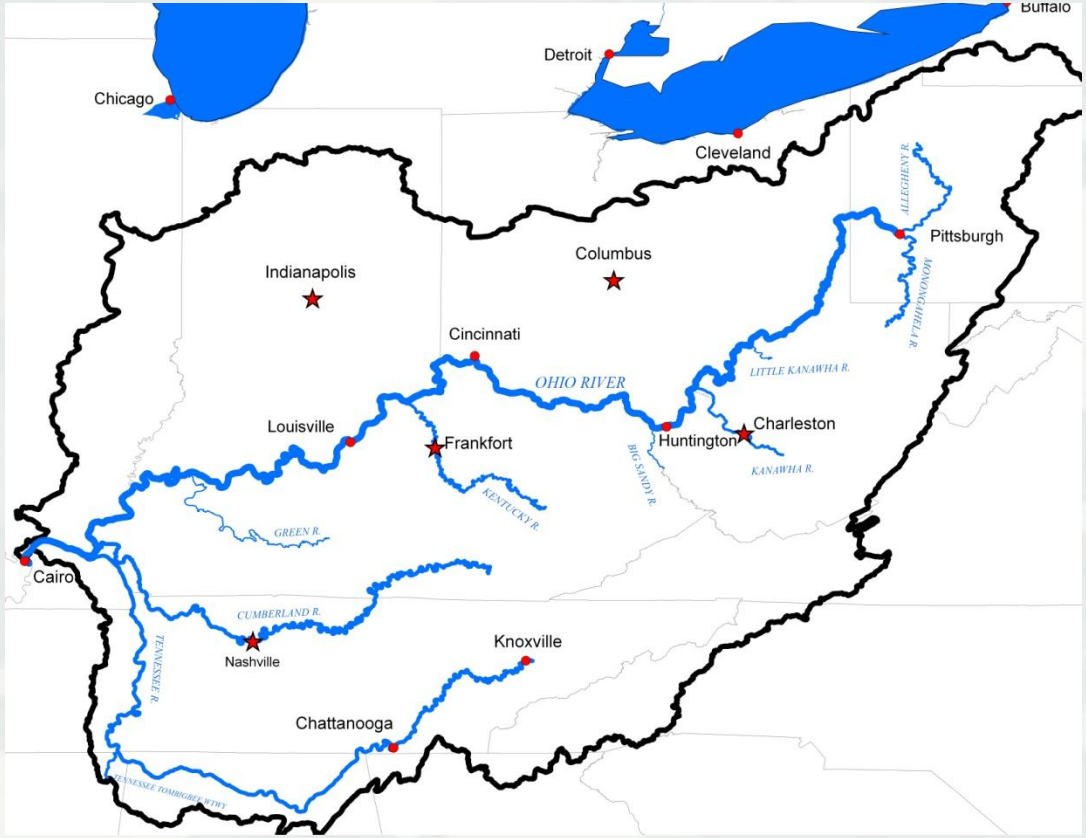
for Inland Navigation (PCXIN)

US Army Corps of Engineers
BUILDING STRONG®

Ohio River Basin

- 204,000 sq miles
- all or part of 14 states
- 25 million people
- Six major population centers
- 2,600 miles of navigable waterways
- year-round navigation
- extensive coal deposits, limestone reserves, fertile soils, natural gas, woodlands
- industrial water supply



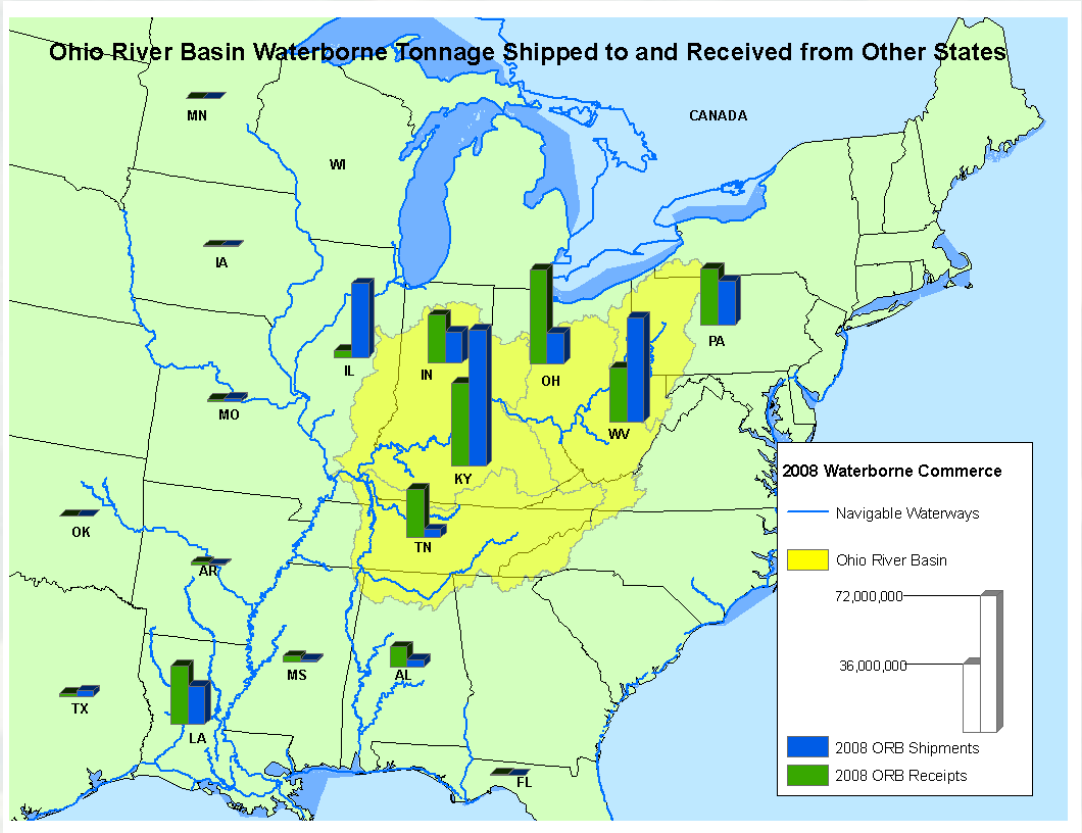
How is the Inland Waterway System being used now?

- **Primarily used for moving bulk and break-bulk commodities regionally and nationally:**
  - Coal
  - Aggregates
  - Petroleum
  - Chemicals
  - Steel products
  - Minerals and ores
  - Fertilizer
  - Grains
  - Machinery
  - Cement
- **Some containers**

Ohio River Basin

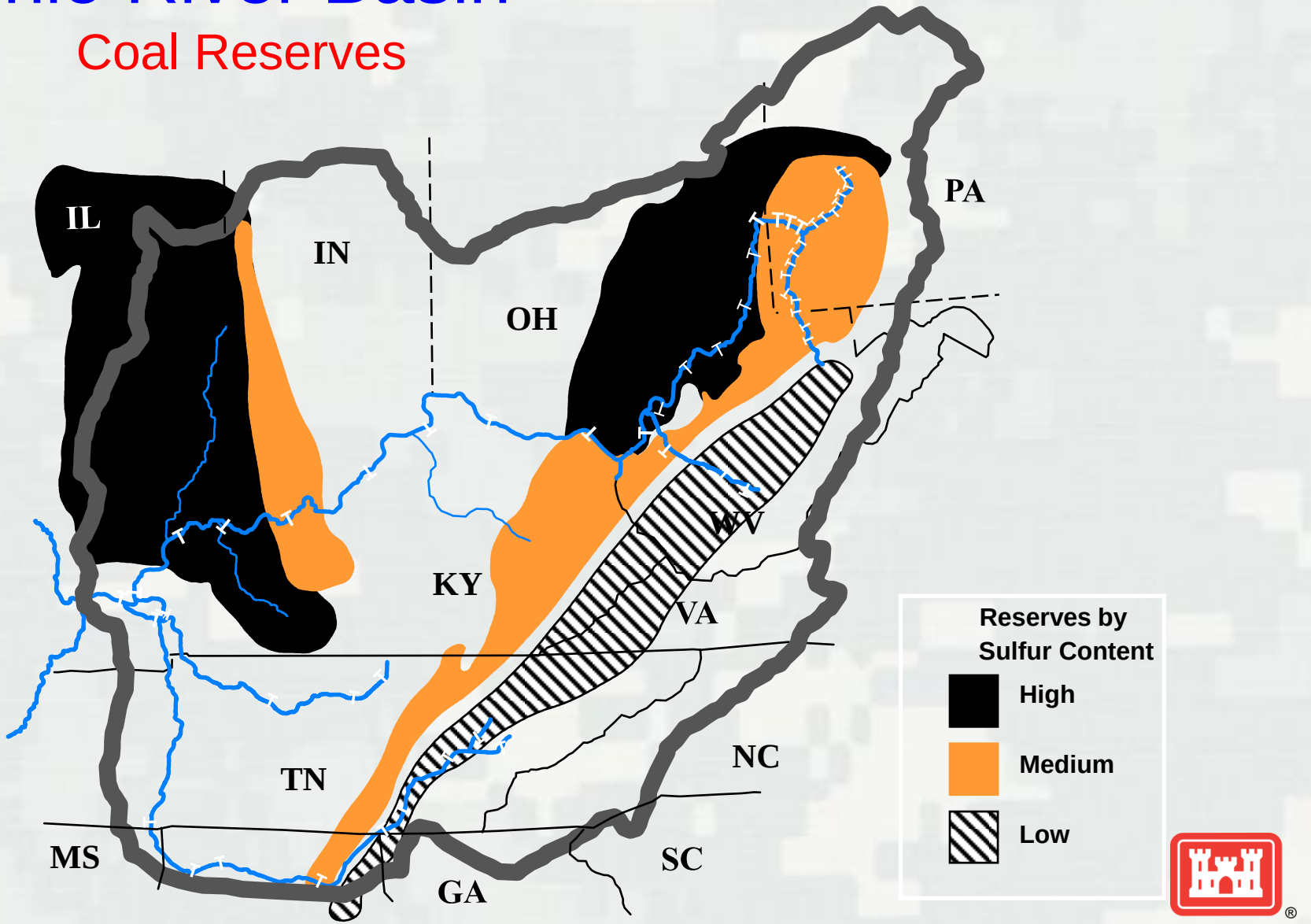
Tonnage Shipped/Received from Other States

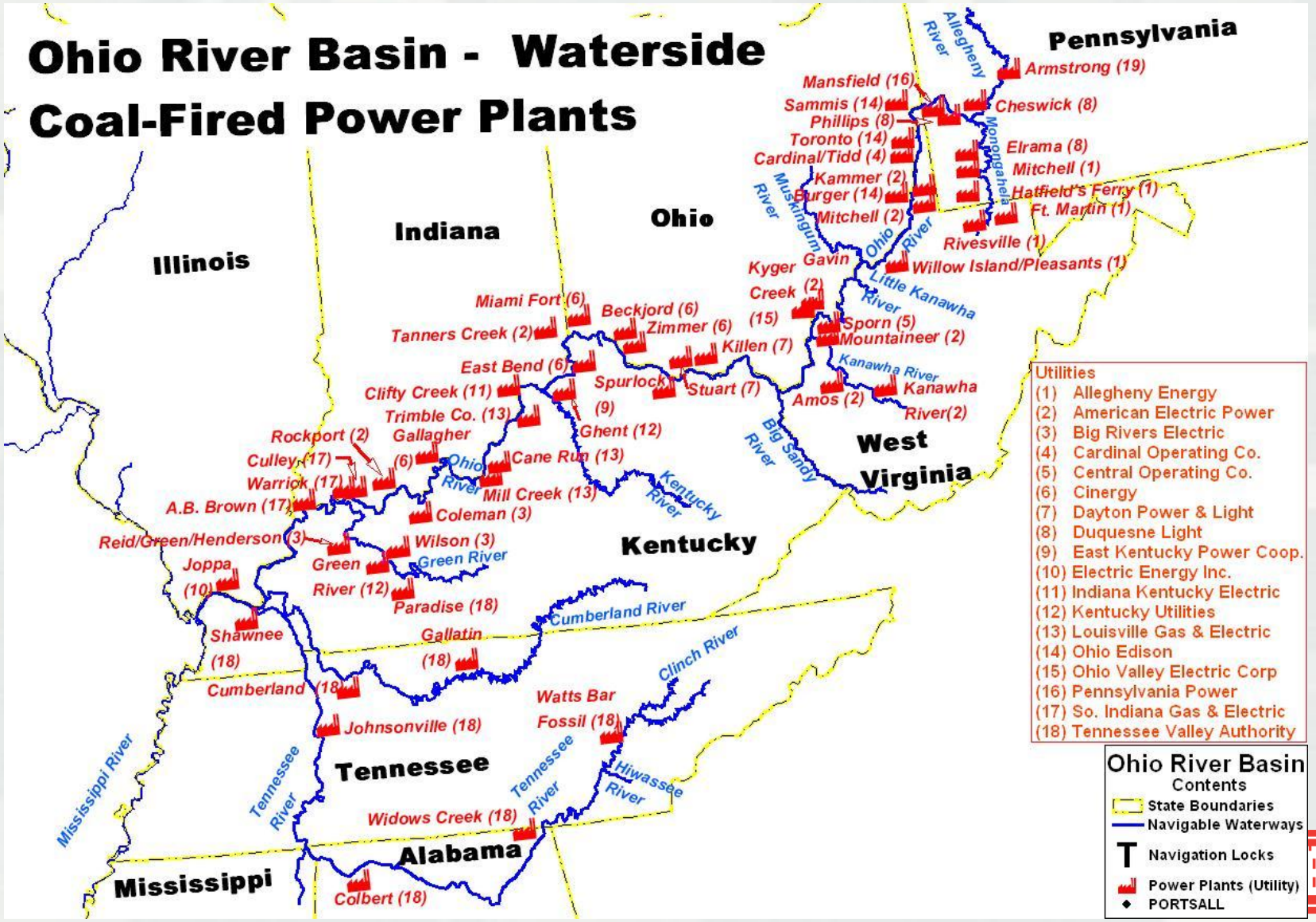
- 2008 Basin Traffic
  - 260 million tons valued at $30 billion
  - Coal Primary (55%)
  - Stone Secondary (20%)
  - Ores, Steel, Petrol & Chemical
- Basin Coal Reserves
  - 230 billion tons
- Basin Electric Power Plants
  - Fuel cost savings
  - Cooling



Ohio River Basin

Coal Reserves




Ohio River Basin - Waterside
Coal-Fired Power Plants
Pennsylvania
Illinois
Indiana
Ohio
West Virginia
Kentucky
Tennessee
Alabama
Mississippi
Allegheny River
Monongahela River
Muskingum River
Ohio River
Little Kanawha River
Kanawha River
Big Sandy River
Kentucky River
Cumberland River
Clinch River
Tennessee River
Hiwassee River
Mississippi River
Armstrong (19)
Cheswick (8)
Elrama (8)
Mitchell (1)
Hatfield's Ferry (1)
Ft. Martin (1)
Rivesville (1)
Willow Island/Pleasants (1)
Mansfield (16)
Sammis (14)
Phillips (8)
Toronto (14)
Cardinal/Tidd (4)
Kammer (2)
Burger (14)
Mitchell (2)
Kyger Creek (2) (15)
Gavin
Sporn (5)
Mountaineer (2)
Amos (2)
Kanawha River(2)
Miami Fort (6)
Beckjord (6)
Zimmer (6)
Tanners Creek (2)
Killen (7)
East Bend (6)
Spurlock (9)
Stuart (7)
Clifty Creek (11)
Trimble Co. (13)
Ghent (12)
Rockport (2)
Gallagher (6)
Culley (17)
Warrick (17)
Cane Run (13)
Mill Creek (13)
A.B. Brown (17)
Coleman (3)
Reid/Green/Henderson (3)
Wilson (3)
Green River (12)
Green River
Joppa (10)
Paradise (18)
Shawnee (18)
Gallatin (18)
Cumberland (18)
Johnsonville (18)
Watts Bar
Fossil (18)
Widows Creek (18)
Colbert (18)
Utilities
(1) Allegheny Energy
(2) American Electric Power
(3) Big Rivers Electric
(4) Cardinal Operating Co.
(5) Central Operating Co.
(6) Cinergy
(7) Dayton Power & Light
(8) Duquesne Light
(9) East Kentucky Power Coop.
(10) Electric Energy Inc.
(11) Indiana Kentucky Electric
(12) Kentucky Utilities
(13) Louisville Gas & Electric
(14) Ohio Edison
(15) Ohio Valley Electric Corp
(16) Pennsylvania Power
(17) So. Indiana Gas & Electric
(18) Tennessee Valley Authority
Ohio River Basin
Contents
State Boundaries
Navigable Waterways
Navigation Locks
Power Plants (Utility)
PORTSALL

Ohio River Navigation System Value

Economic Impacts of the Ohio River

Commercial Navigation

20 navigation locks and dams

Energy conservation, reduced emissions

Over $3 billion annual transportation savings

Over $100 billion invested in electric utility construction and industrial capital investment

Water Supply ($1 billion annual value)

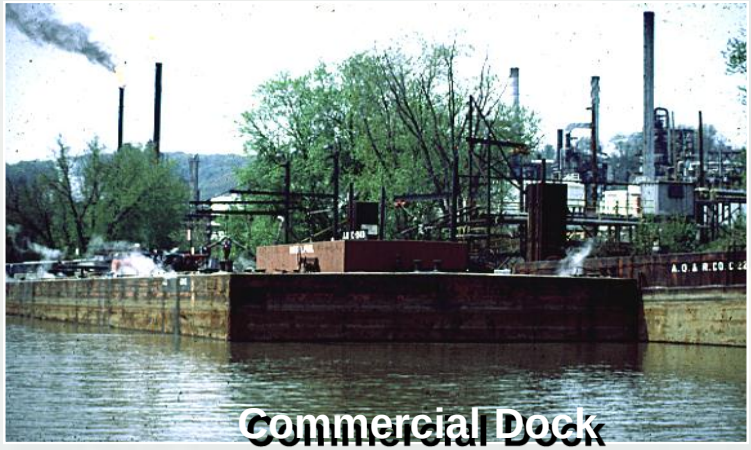
Municipal, Industrial - Electric Utilities

Recreation - Tourism

Boating, Swimming, Fishing, Camping

Shore-side Development

Ports, Docks, Public/Private Terminals


Commercial Dock


Fleeting Facility

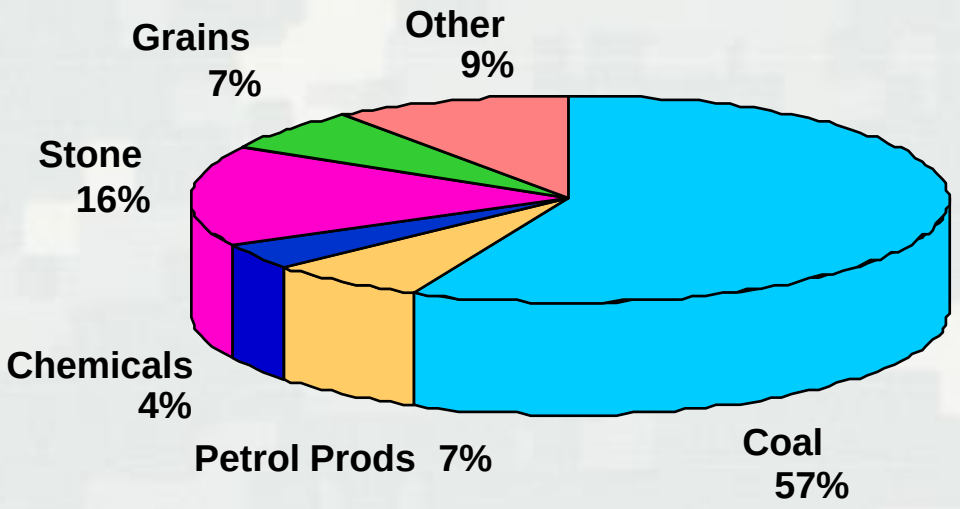
Ohio River Navigation System Value

Important Nationally

Employment - 100,000 jobs

Business Activity - $11.5 billion

Tax Revenue - $3.0 billion



- **150 million tons of coal a year**
  - electric utilities
  - steel industry
- **110 million tons of other**
  - refining
  - aluminum
  - chemicals
  - paper
  - agriculture
  - construction/cement

Ohio River Navigation System Value

ORS Agriculture

- Over 13.5 million tons of grain shipped in 2008
- Valued at $3.0 billion
- Over 2.5 million tons of fertilizer in 2008
- Valued at $850 million

Ohio River Navigation System Value

ORS Chemicals

- Numerous waterside chemical plants, docks and terminals
- Over 9.3 million tons shipped in 2008
- Almost $6.0 billion in value

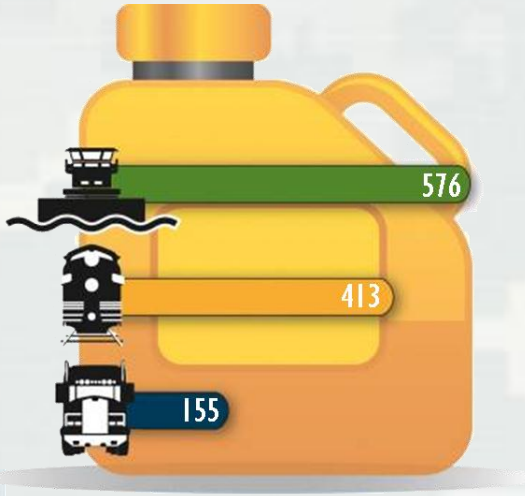
Ohio River Navigation System Value

ORS Petroleum Products

- Barge as alternative mode to Gulf pipeline nearing capacity
- Over 17.2 million tons shipped in 2008
- Valued at over $3.0 billion

Ohio River Navigation System Value

- Transportation Rate Savings
- Fuel efficiency and safety
- Jobs to regional economies
- Supports industrial development
- Critical component of regional infrastructure
- Water Supply
- Reliable water transportation improves US balance of trade
- Enhance national security



Ton-miles Traveled per Gallon of Fuel

Ohio River Ports

- Huntington – 69.3 m tons in 2008
  - Largest inland river port
  - 7th largest overall
- Pittsburgh - 42 m tons
- Louisville and Cincinnati -21 m tons

Ohio River Lock Configuration

Two Lock Chambers

Main Lock – 1200’ x 110’

Aux Lock – 600’ x 110’

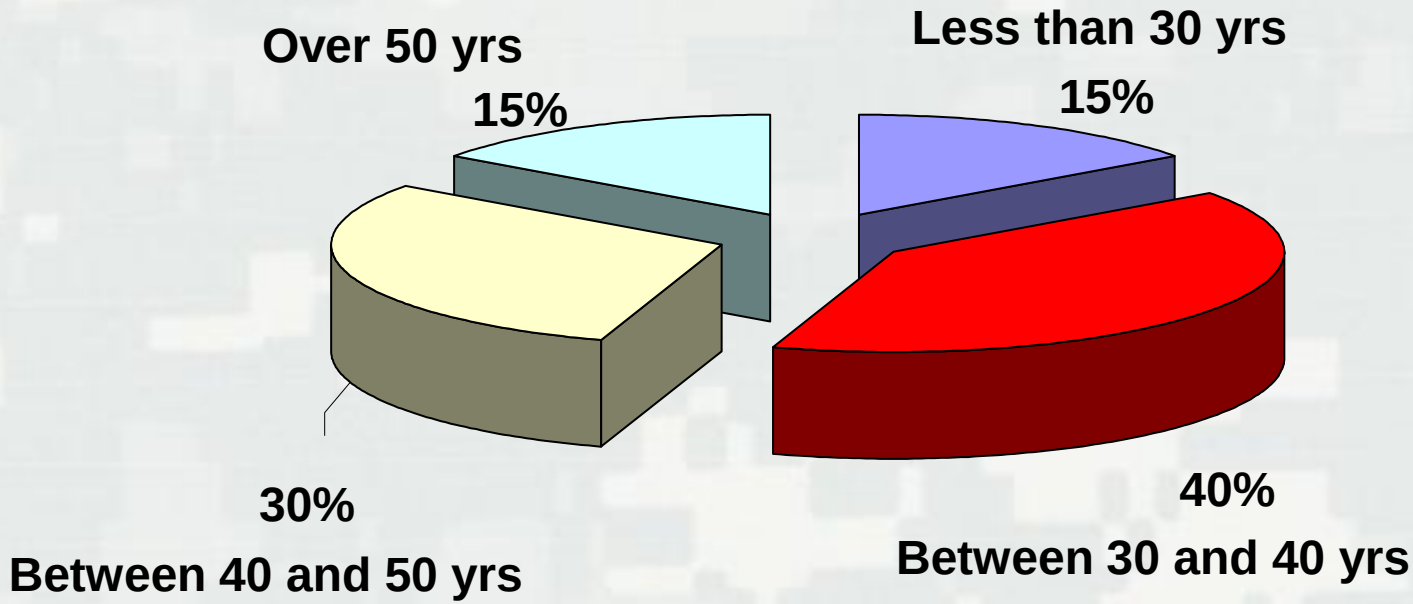
Upper Ohio Configuration

Main Lock – 600’ x 110’

Aux Lock – 360’ x 56’

Problem: Aging Infrastructure

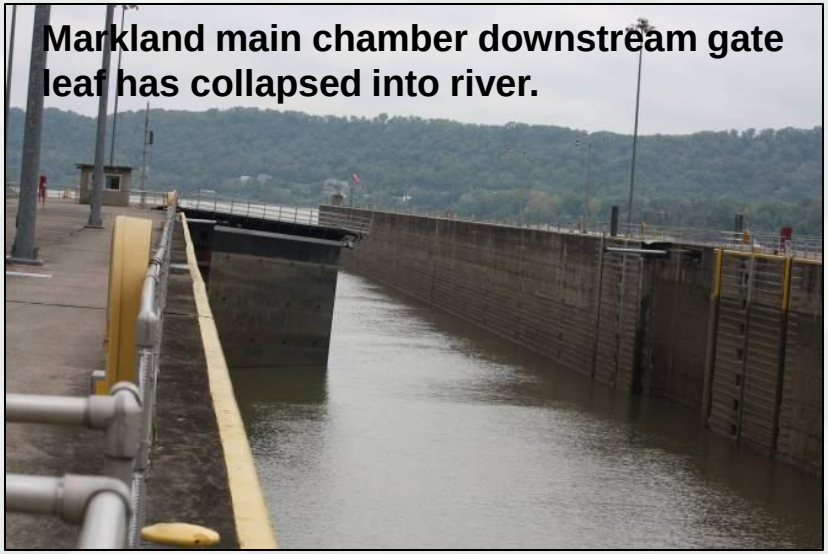
Ohio River Lock Ages



Reliability Challenges

Markland and Greenup Gate Failures

Sep 27, 2009: “Catastrophic” gate failure downstream end of 1200’ main chamber at Markland. One leaf collapses into river. Chamber closed until end Feb 2010. Delays exceeded 14 hours per tow by late October.



Markland main chamber downstream gate leaf has collapsed into river.

Greenup main chamber downstream gate drops 1.2 feet when anchorage fails.

Jan 27, 2010: Anchorage failure of Greenup main chamber downstream gate. Tow stuck in chamber for 3 days and chamber was closed for nearly a month.

Recent Ohio River

Main Chamber Closures Cost Money

Lock	Closure		Delay (hrs)		Number of Tows Delayed	Delay Costs ($)
	Dates	Duration	Max	Avg		
Emsworth	May 3 - 24, 2010	21 days 16 hrs	75.6	28.1	154	$ 1,540,000
Greenup	Jan 30 - Feb 22, 2010	22 days 23 hrs	115.0	33.9	298	$ 5,600,000
Markland	Sep 27, 2009 - Mar 1, 2010	155 days 7 hrs	52.5	10.7	1,720	$ 10,500,000
Greenup	Oct 8 - Dec 4, 2009	57 days 12 hrs	43.1	8.8	797	$ 3,920,000
Cannelton	Jun 1 - Jul 11, 2009	40 days 4 hrs	42.0	10.9	509	$ 3,280,000
Markland	May 31 - Jun 13, 2007	15 days 2 hrs	31.3	12.7	179	$ 1,370,000
L/D 52	Aug 8 - Oct 3, 2006	45 days 0 hrs	174.4	56.8	766	$ 22,200,000

Source: Lock Performance Monitoring System (LPMS) and Institute for Water Resources (IWR) cost data.

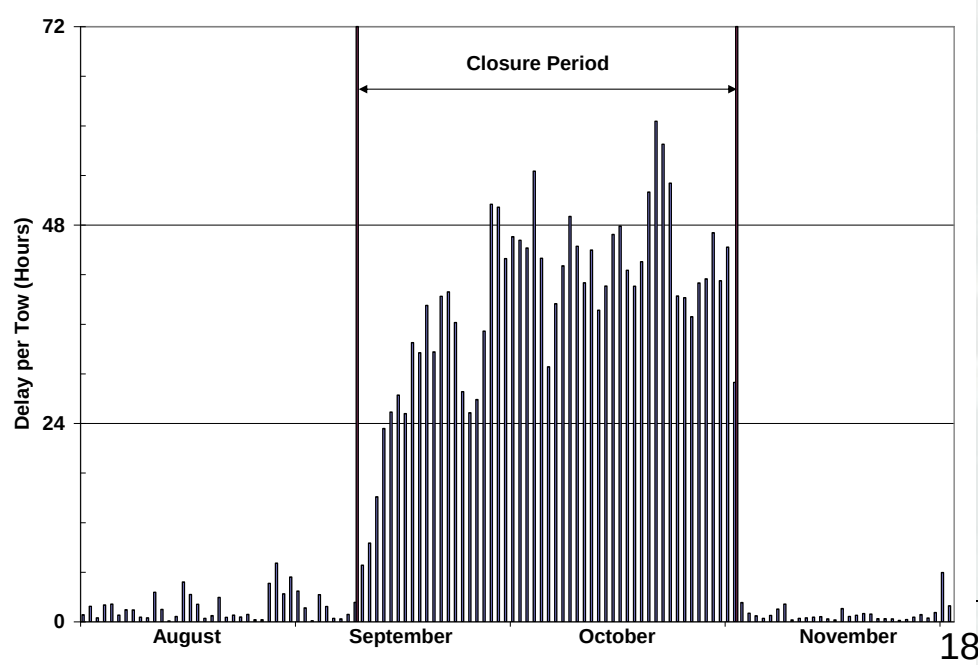
FY08 Equipment Cost and $2.50/gal Diesel Prices, Tows Maneuvering

Greenup Main Chamber Closure

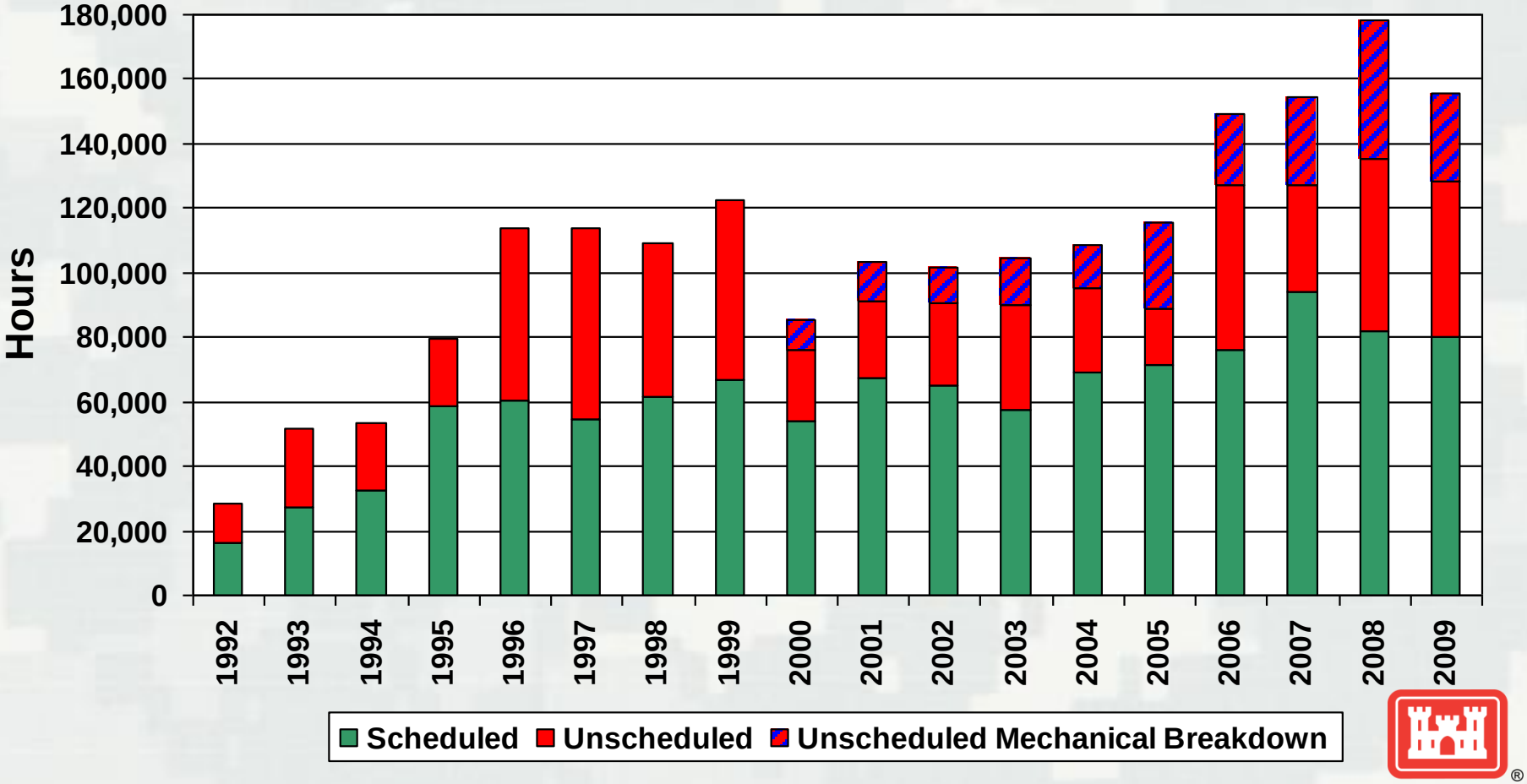
Sep 8 – Oct 31 2003

- **18 day scheduled → 52 day closure**
- **718 tows delayed**
- **27,000 hrs accumulated delay**
- **$13.2 million in delay costs**
- **Other industry costs estimated at over $30 million***

***unofficial study results**



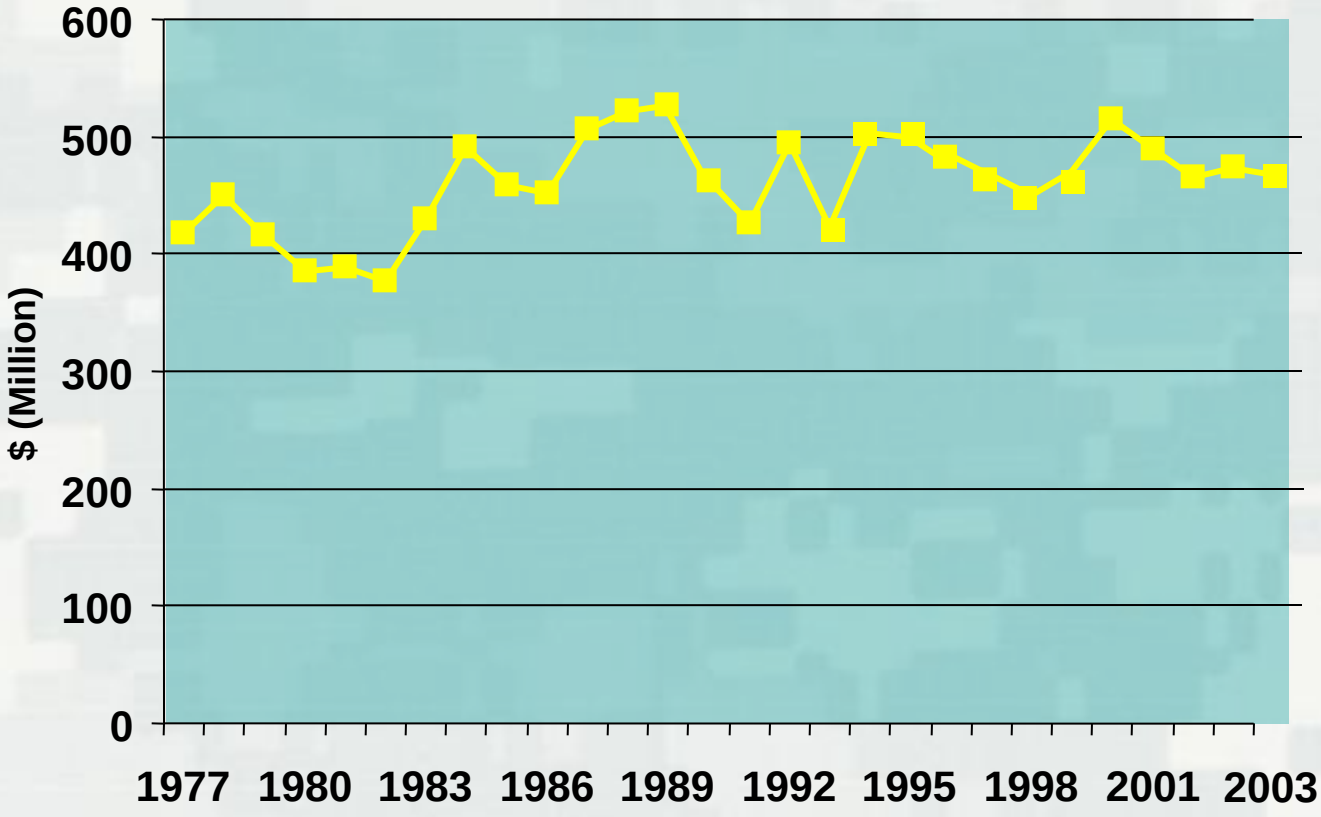
Challenge: Aging Infrastructure + O&M Backlog = Increasing "Downtime" at Locks



Challenge: Inland Waterway O&M Trend

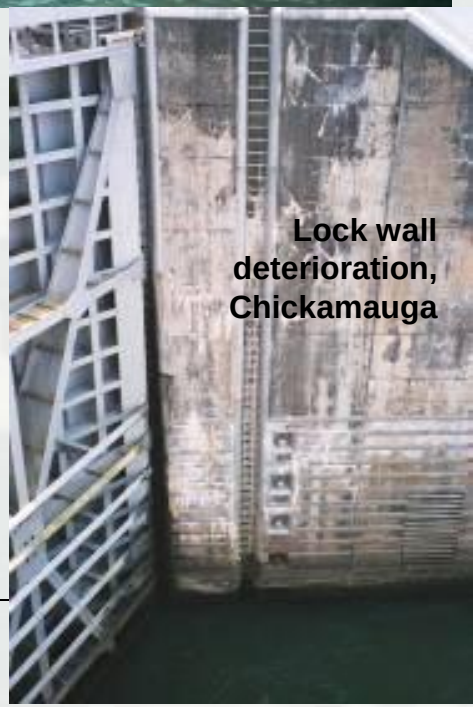
1977-2004 (1996 Constant $) *

Challenge: Flat O&M funding in constant dollars, even as project portfolio grows and ages…



* Fuel-Taxed Waterways Only

Lock wall, Lower Mon 3



Lock wall deterioration, Chickamauga

Challenge: Inefficiency and Lock Delays

Multiple lockages to pass a tow through smaller, auxiliary chambers result in long queues that are costly and inefficient.

Lock Reliability

Risk of not being open when tow shows up

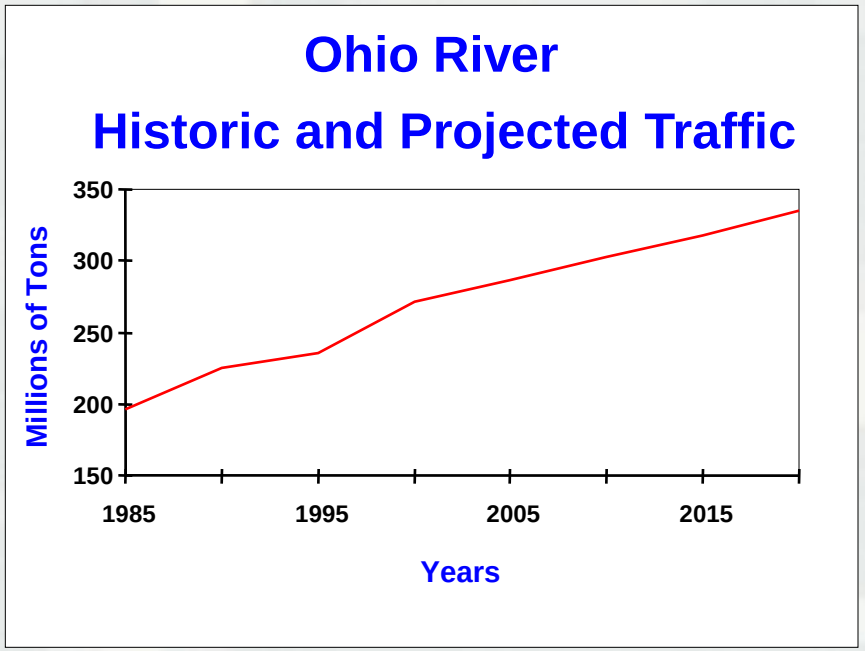
Probability of Lock Failure

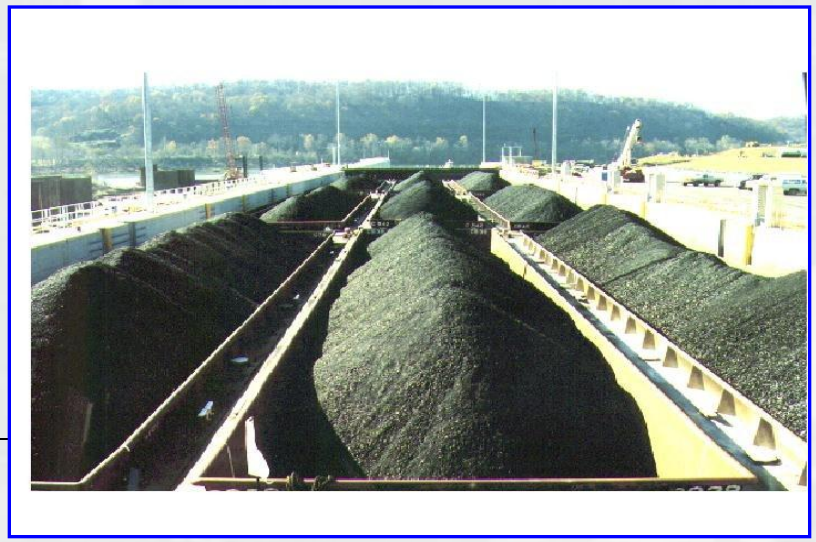
X Consequence of Failure

= Expected Economic Loss (Risk)

Ohio River Navigation - Growth

- Basin population of 25 million
- Rich in natural resources
- Served by a transportation system that has allowed for economic development
- River traffic projected to grow 1.0 percent annually through 2060





National Freight Forecasts

- **Most forecasts suggest substantial increases** in freight traffic
- The greatest increase will likely be in international containers arriving in 6,000+ TEU vessels or larger (Panama Canal to Gulf ports).
- Already stressed transportation corridors will be hard-pressed to handle increases in truck and rail traffic
- Multiplied effects of air pollution and congestion at the coastal ports
- Can the waterways help to relieve overland congestion?

National Transportation System

Sustainable national freight policy?

Driving Forces

- What “driving forces” may shape our use of the inland waterways in the future?
  - Climate - global changes……droughts/floods – navigability of the system, competing water supply needs or irrigation needs
  - Technology - energy options, new vessel designs, VTS/GPS
  - Economics - **fuel prices**, foreign and domestic market conditions, commodity flows, national economy
  - Environment - Clean Air & Clean Water Acts, transportation safety,
  - Social - national security (terrorism), green vs. corporate directions
  - Political - national/foreign investment, transportation policies
- How will we incorporate these forces in our planning for the nation’s waterways?

Should We Move the Nation's Cargo Like This?

Or Should We Move More Cargo Like This?

200 trucks off the road

Common Scene in Europe

This exists because of European Union mandates – not purely a market decision

Other Possibilities on the Waterways

- Hauling by-product or waste materials (glass, paper, plastics, milled metals) to regional recycling centers.
- Redistribution of empty containers - deadheading.
- On-barge manufacturing or de-manufacturing of products.
- Tourism/excursion traffic – ecotourism.
- Floating warehouse space.
- Moving military assets – national guard equipment.

Questions?