

NEW APPROACHES FOR U.S. LOCK AND DAM MAINTENANCE AND FUNDING

DIAGNOSING THE MARINE TRANSPORTATION SYSTEM: MEASURING
PERFORMANCE AND TARGETING IMPROVEMENT

June 26 – June 28, 2012



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Study Geographic Area

- Upper Mississippi River: Locks 1-27, Upper and Lower St. Anthony Falls, Melvin Price, and Chain of Rocks Locks.
- Illinois River: Peoria Lock, LaGrange Lock.
- Ohio River: entire lock system from Pittsburgh, PA, to Cairo, Illinois.



Task 1: Lock Volumes/Values and Modal Splits for Future Flows

Volume of Commodity Flow (In Descending Order)

- OHIO
- UPPER MISS
- ILLINOIS



Dominant Commodities

OHIO

- Coal and petroleum
- Grain in lower reaches



UPPER MISS

- Grain (corn and soybeans)
- Petroleum in the lower reaches



ILLINOIS

- Coal and petroleum in upper reaches
- Corn and soybeans from middle reach south



Corn and soybeans make up anywhere from 82% to 92% of total ag volume, depending on river

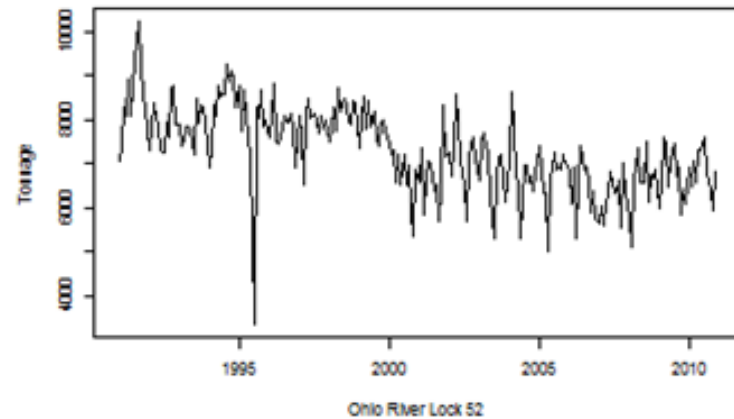
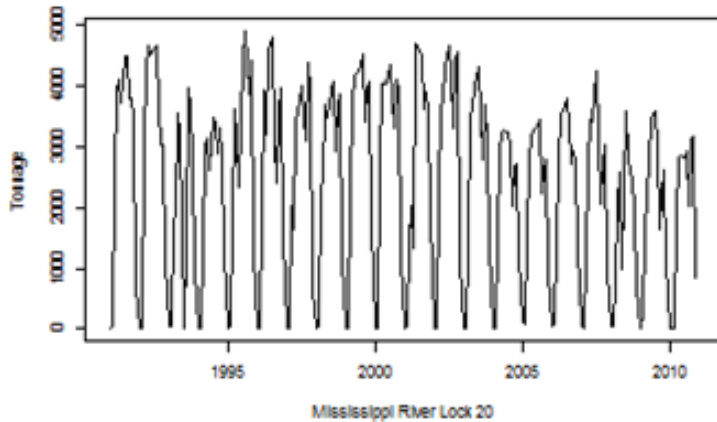
Direction of Flow

- ✎ Grain: downstream on all 3 rivers
- ✎ Coal: Upstream on Upper Miss, downbound on Illinois, slightly more upbound on Ohio
- ✎ Petroleum: 50/50



Variability

- Upper Miss highest because of dominance of ag products
- Ohio lowest because of dominance of energy commodities



Forecast

- ∞ Persistent increase in freight values, particularly for Ohio and Upper Miss
- ∞ Grain volumes will rise, but barge volumes will fall
 - High percentage of decrease is in corn
- ∞ Primarily due to climate change effects
 - Warming climate → more agricultural production in northern areas
 - Warming climate improves river navigability during winter months
 - New producing regions better served by rail



Task 2: Lock Operational Statistics and Wait Times

Average Total Volume per Month

- ∞ Ohio: 4.1 million tons
- ∞ Upper Miss: 1.7 million tons
- ∞ Illinois: 1.6 million tons

** average per lock*

Average Corn & Soybean Volume per Month

- ∞ Upper Miss: 817,000 tons/month
- ∞ Illinois: 273,000 tons/month
- ∞ Ohio: 141,000 tons/month

** average per lock*

Wait Times

- Highly variable
- Average of 150 minutes in 2000, 50 minutes in 2004, back to 200 minutes in 2010
- Worst bottleneck effect is at Lock 52 on the Ohio
 - To be replaced by Olmsted



Task 3: Lock Condition Information and Potential Modal Diversion Impacts

Overall Condition

- ∞ 54% > 50 Years old
- ∞ 36% > 70 Years old
- ∞ Outages on Ohio have tripled in last decade

1962

Average Income per year **\$5,556**

Gas per Gallon **28 cents**

Average Cost of new house **\$12,500**

Cuban Missile Crisis

First Wal-Mart discount store is opened

First Kmart opens in Garden City, MI

First live trans-Atlantic television signal

1942

Average Income per year **\$1,880**

Gas per Gallon **15 cents**

Average Cost of new house **\$3,770**

26 countries agree to create United Nations
Alaska Highway from Alaska through Canada
is completed

Born: Paul McCartney, Harrison Ford, Joe
Biden

Inland Waterways User Board

CAPITAL PROJECTS BUSINESS MODEL

Inland Marine Transportation Systems (IMTS)
Capital Projects Business Model

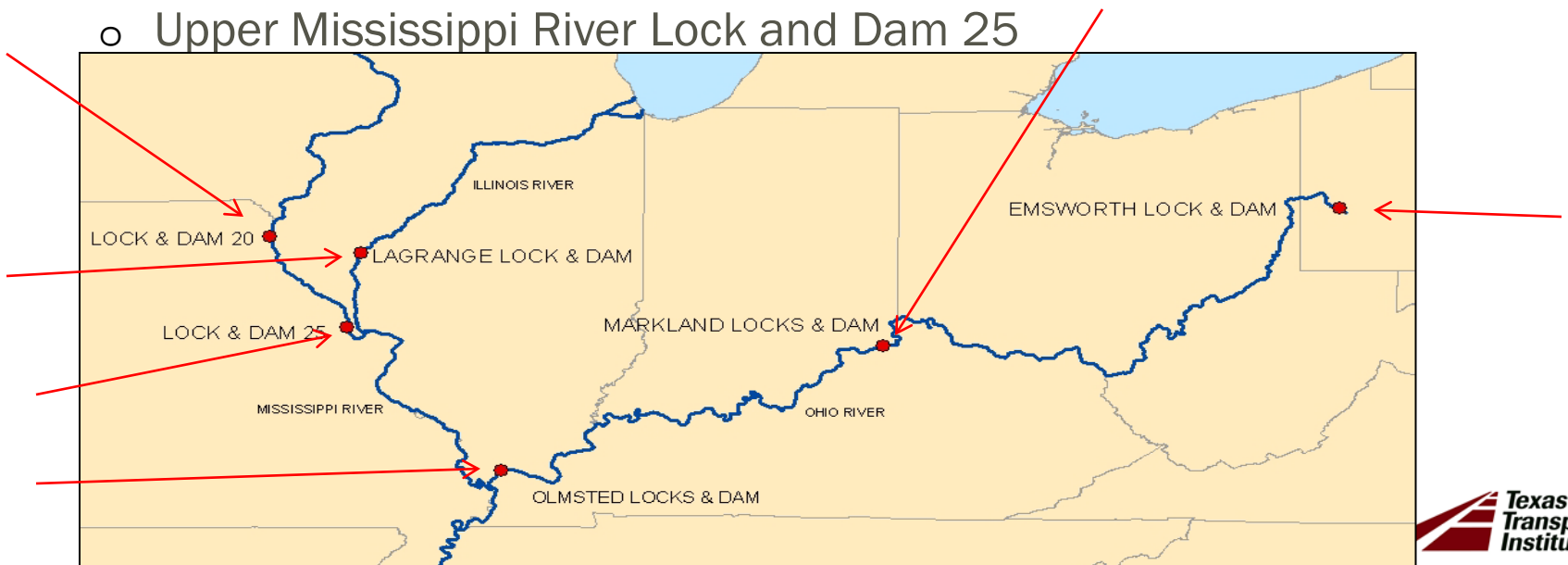
Final Report
Revision 1

April 13, 2010



Top 6 locks of interest for present study

- Illinois River LaGrange Lock and Dam
- Ohio River Emsworth Lock and Dam
- Ohio River Markland Lock and Dam
- Ohio River Olmsted Lock and Dam (replacement for L&D 52 and 53)
- Upper Mississippi River Lock and Dam 20
- Upper Mississippi River Lock and Dam 25



Estimated Maintenance and Repair Costs

- ∞ Total Estimated Cost: \$4 billion
- ∞ Amount funded: \$1.8 billion

Lock Closure Time Horizons

- ☞ 2 weeks
- ☞ 1 month
- ☞ 1 quarter
- ☞ 1 year



Results for Modal Split

- ∞ In **all scenarios, closures reduce volume** of domestic transportation of grain
- ∞ In 23 of 24 scenarios, barge volumes decrease
- ∞ Most scenarios: Rail increases, truck and barge decrease

Cost per Unit Will Rise



- ✎ Rail increases offset barge decreases
- ✎ Rail rates are higher (and will be even higher without barge competition)
- ✎ Rail congestion overall will worsen, affecting ag shipments
- ✎ Greater than 50% of federal-aid highways are in poor condition
- ✎ 1/4 of bridges are structurally deficient or functionally obsolete

Task 4: Economic Impact at Congressional District/Regional Level

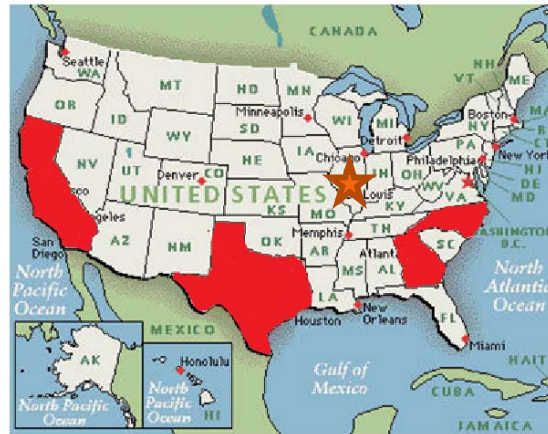
Cost of Closures

- ⌘ For 6 locks, anywhere from \$900,000 to \$45 million for agricultural producers
- ⌘ \$2.2 million to \$162.9 million for barge companies



Reach of Effects

- ∞ Include more than just adjacent congressional districts
- ∞ Example: LaGrange Lock affects North Carolina, Texas, California, and Georgia



Major Effects (Nationally):

- ∞ International consumers have the most to lose.
- ∞ Barge companies lose significant revenue.
- ∞ Barge use is reduced and replaced by rail and small ship.
- ∞ The U.S. loses a small amount of export share.
- ∞ Cost of closure is about \$1.50 per ton that traverses a lock.

Effect on Energy Prices

- ∞ None for up to 60 days
 - Long term contracts
 - Coal stock practices
- ∞ Most likely minimal after that (estimated max of 2.29%)



Effects on Farmers, Elevators, and Grain Consumers

- ∞ Calculated for 3 most vulnerable CRDs at each of the 6 locks
- ∞ Estimates based on optimal responses to various closure scenarios
- ∞ Actual loss can be larger because of deviations of actual responses from assumed/theoretical/optimal responses

Additional Study Objectives

- ∞ Analyze possibility of transitioning from “build and expand” to “repair and sustain”
 - Funding Requirements
 - Necessity for Major Rehabilitations and Capacity Expansions
 - Cost to User
- ∞ Explore transitioning from current funding approach to a bonding-style (lump sum up front) approach
 - Possible debt finance approaches
 - Case Studies
 - McAlpine
 - Panama Canal
 - Deurganck Lock (Antwerp)

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