Economic Risk of USACE's Maintenance of Navigation Assets

Innovative Technologies for a Resilient Marine Transportation System

USACE Waterborne Commerce Statistics Center
US Chamber of Commerce

- 56% of Crude Petroleum refined into gasoline and sold at your neighborhood gas station.
- 22% of basic chemicals used in hundreds of consumer products from appliances to toys, from soaps to cosmetics.
- 19% of nonmetallic minerals including construction materials and coal used to power our homes, businesses, and factories.
- 19 % of agricultural products destine for American supermarkets.
- 60% of our nations grain exports.

USDA United States Department of Agriculture

Agricultural Marketing Service
June 2014

A Reliable Waterway System Is Important to Agriculture

Effects of Temporary Closures on Costs, Receipts, and the Federal Budget

- Temporary closures and restrictions on traffic in harbors and channels due to flooding, drought, sedimentation, groundings, natural disasters, man-made disasters, strikes, and lockouts can lead to delays, spoilage, diversion to other modes and ports, higher transportation costs, and lost sales.

- Higher transportation costs can result in lower cash bids in interior markets. As cash prices fall, USDA loan deficiency payments may increase.

- U.S. exporters may be unable to pass on higher transportation costs, as customers can purchase similar products from other countries.

- Users of railroads and highways face congestion, constrained capacity, and driver and equipment shortages.

- Authorized channel depths and widths, and locks and dams maintained by the U.S. Army Corps of Engineers moderate the effects of congestion, provide resiliency, and enhance recovery after transportation disruptions.

USDA United States Department of Agriculture

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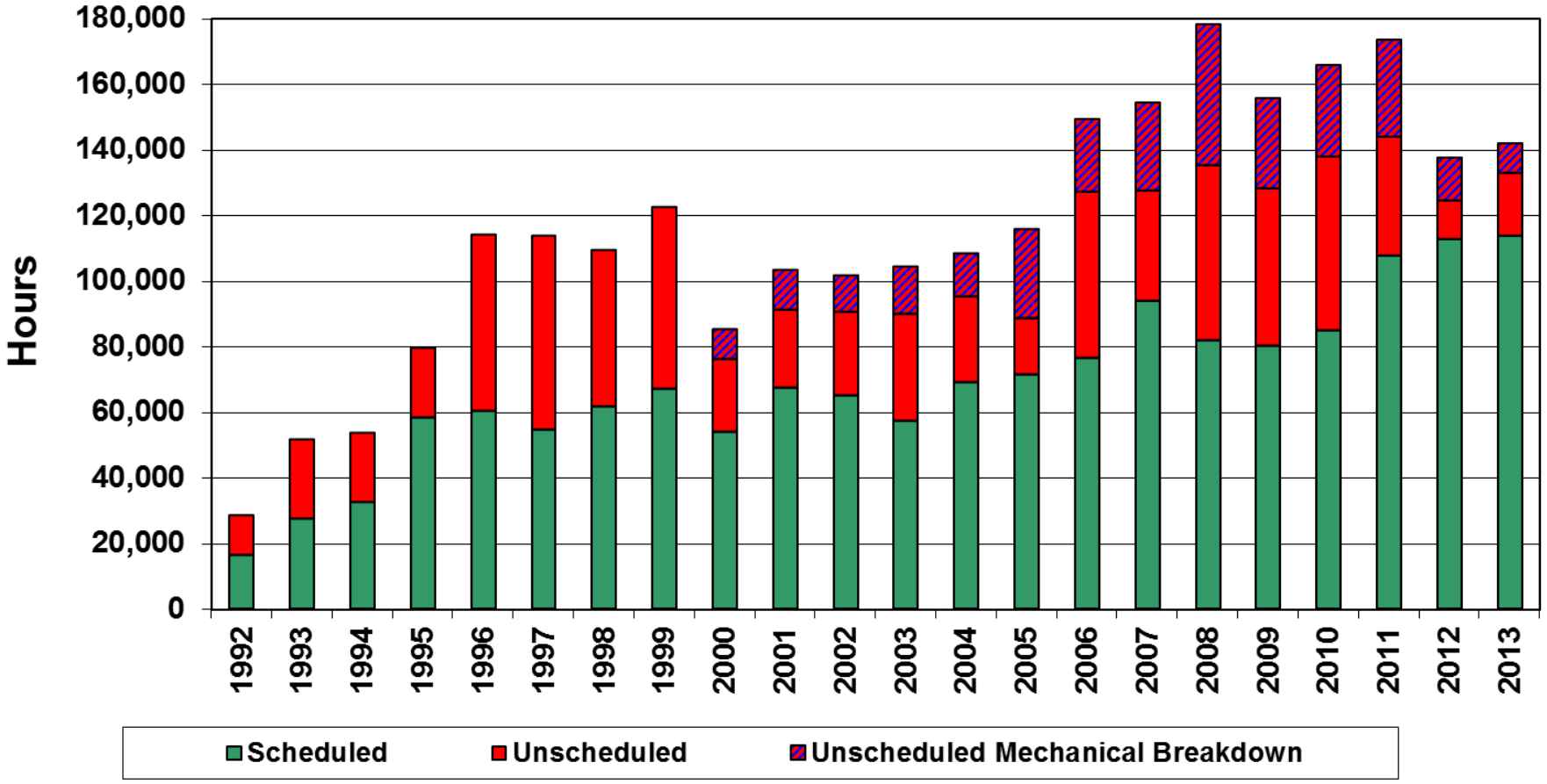
A Reliable Waterway System Is Important to Agriculture

Barge and Rail Competition

- In 2013, 15,634 down bound grain barges passed through Locks 27, 52, and 1, with over 23.9 million short tons of grain.
- In comparison, 26,997 grain barges were unloaded in the New Orleans region during the period, a difference of 11,363 barges.
- Railroads take into account barge rates and the spread between U.S. Gulf and Pacific Northwest ocean vessel freight rates, and price their services accordingly.
- USDA Transportation of U.S. Grains, A Modal Share Analysis, 1978-2011 Update, shows that barges moved 43 percent and railroads moved 41 percent of all grain exports in 2011.
  - Barges moved 54 percent of corn to ports and 1 percent of corn to processors, feed lots, and dairies in 2011. Rail shares were 34 percent for exports and 20 percent for domestic moves.
  - Barges moved 49 percent of soybeans to ports and 2 percent of soybeans to processors in 2011. Rail shares were 31 percent for exports and 14 percent for domestic moves.
  - Barges moved 26 percent of wheat to ports and 2 percent of wheat to processors in 2011. Rail shares were 63 percent for exports and 63 percent for domestic moves.
  - Barges moved 11 percent of sorghum to ports in 2011. Rail shares were 21 percent for exports and 8 percent for domestic moves.
- Additional studies have shown that without barge competition, agricultural shippers pay higher rail transportation costs, the farther they are from an inland waterway.

Hours out of Service



Examples of the cost to Consumers for Lock Outages

Greenup Locks January 27 through February 22 2010

- **$5,200,000 In Delay Costs**

Markland Locks July 2011 through August 2012

- **$40,0000,000 In Delay Costs**

Algiers Lock March through July 2013

- **$146,000,000 In Delay Costs**

Lock 52 August through November 2013

- **$28,000,000 In Delay Costs**

Mel Price January through June 20, 2014

- **$12,700,000 In Delay Costs**

Dashields May through June 2014

- **$1,400,000 In Delay Costs**

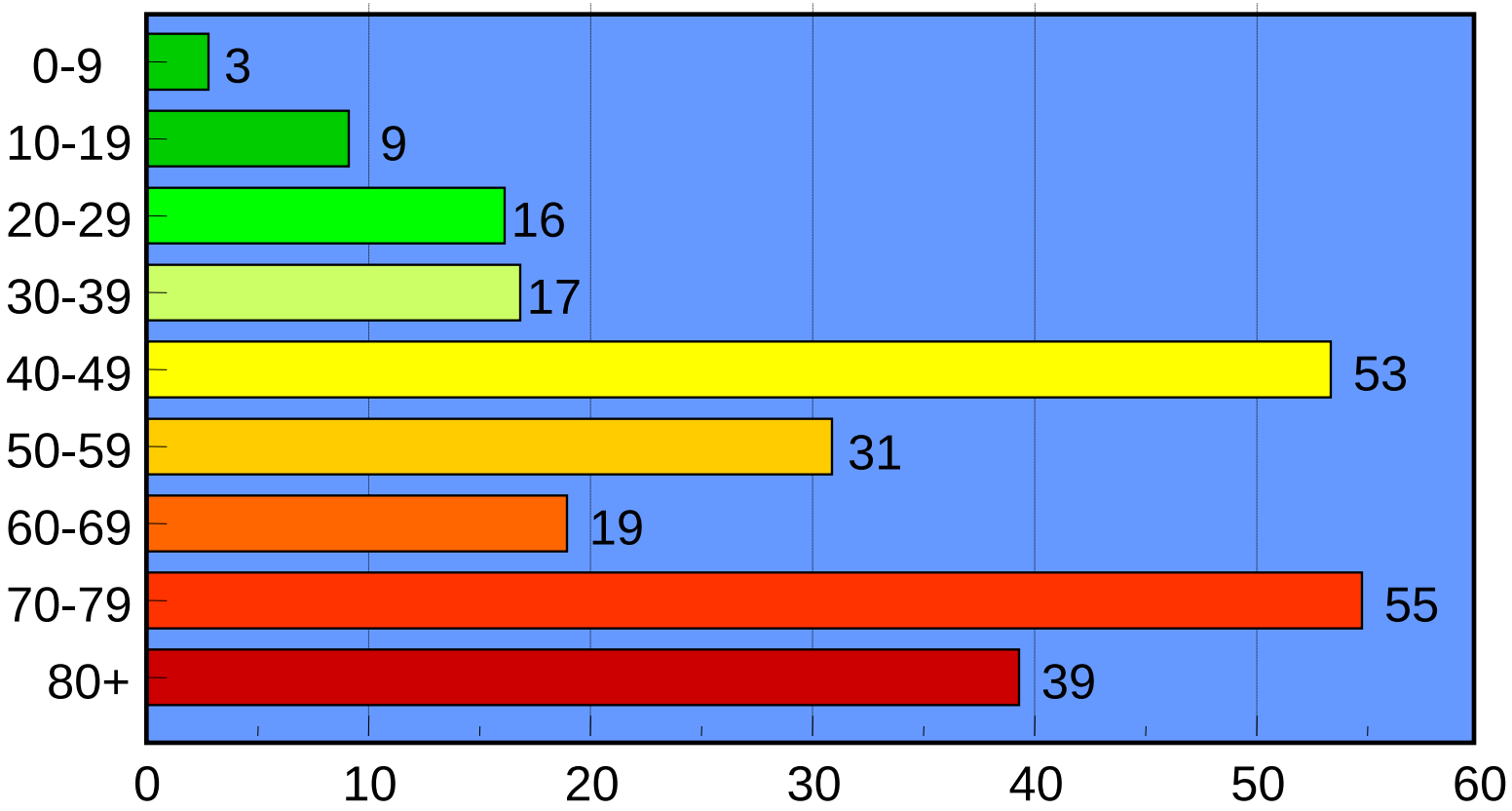
R. C. Byrd May through June 20, 2014

- **$1,200,000 In Delay Costs**

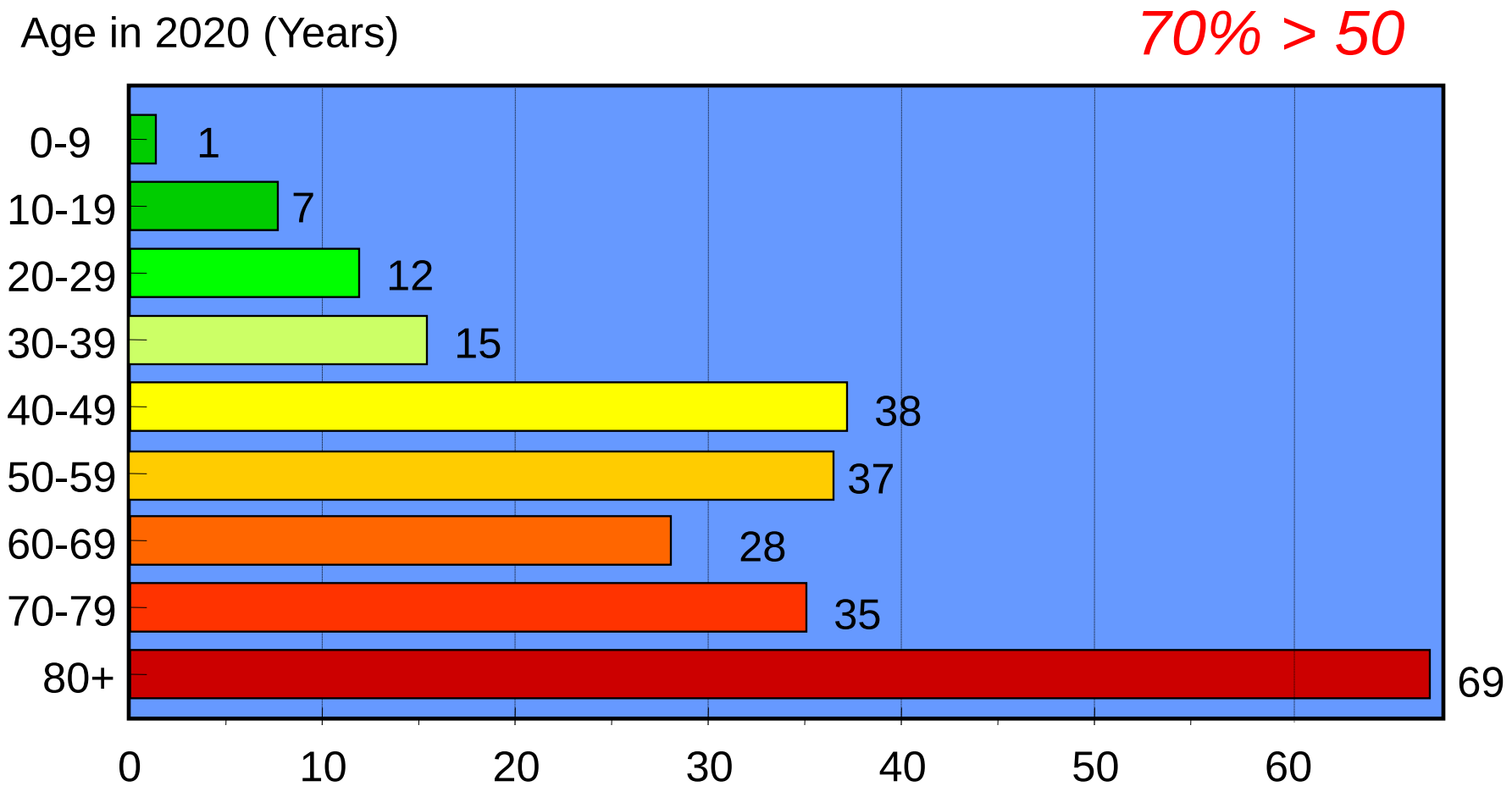
Challenge:
Aging Lock Inventory

Age in 2012 (Years)

60% > 50



Challenge:
Age of Corps Locks in 2020



USACE

Risk Informed Life Cycle Asset Management Approach

The Basics ("critical non-routine maintenance"):

- Need to repair the most mission critical assets/components that…
- Are in the worst shape/condition that…
- Have the highest likelihood of failing and causing an unscheduled outage that…
- Causes the highest economic impact on the USACE customers

…Inherently Extends Productive Service Life and Improves IMTS Reliability…

Then → Now

CPBM 2010

1. Single Condition – *only* at Lock and Dam "top level"
2. "Risk of Failure" *not* considered
3. SCC Model *only* used for *Annual* Transportation Rate Savings

Life Cycle Asset Management

1. Condition assessments for 166,000 components across entire IMTS!
2. Baseline Failure Curves!
3. Economic impacts from SCC Model considering various intervals of unscheduled outages from 1 to 365 days!

Currently using all of the above to ***inform annual critical non-routine maintenance and repair investments*** and can now determine the ***Total Risk Exposure*** for EACH Site in IMTS!!

"Best IMTS" = Lower "Total Risk Exposure" (TRE)

“Risk Exposure”

- **Total Risk Exposure** – the summation of the various types of risk(s) that have a non-zero probability of causing a loss, or impact on stakeholders, due to Unscheduled Outages/ Closures. It has two key pieces:
  1. **Operational Risk Exposure** – Risk associated with assets/components that *currently* show impacts on mission performance and
  2. **Residual Risk Exposure** – Risk associated with assets/components that *currently* do NOT impact mission performance.

Delivering for the Present While Preparing for the Future

Original Capital Projects Business Model

- Single "Top Level" Condition
- No Probabilities
- Only Annual Econ Impact

Risk Exposure Screening

- OCA Condition on 166K components
- Baseline Failure Curves
- Annual Econ Impact on Shipper and Carriers for Unsch Outages (1-365 days)

Same Analytics that Inform Annual Maint. Budget and can provide Insights at COMPONENT level

Interim Step Improvements

- Continued collaboration and integration with Planning CX for Inland Navigation and Risk Management Center

Life Cycle Portfolio AM

- OCA Ver 2.0
- Mature Failure Curves tied to Actual M&R Investments
- Reliability Event Trees
- Full IMTS "Systems" Analysis (Supply and Demand)
- Optimal Life Cycle Investment Strategies, PM to Recapitalization

Strategic Internal and External Communications

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Economic Risk of USACE's Maintenance of Navigation Assets

AEP RIVER OPERATIONS