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A Real Time Assessment of the
Columbia-Snake River Extended Lock
Outage: Process and Impacts

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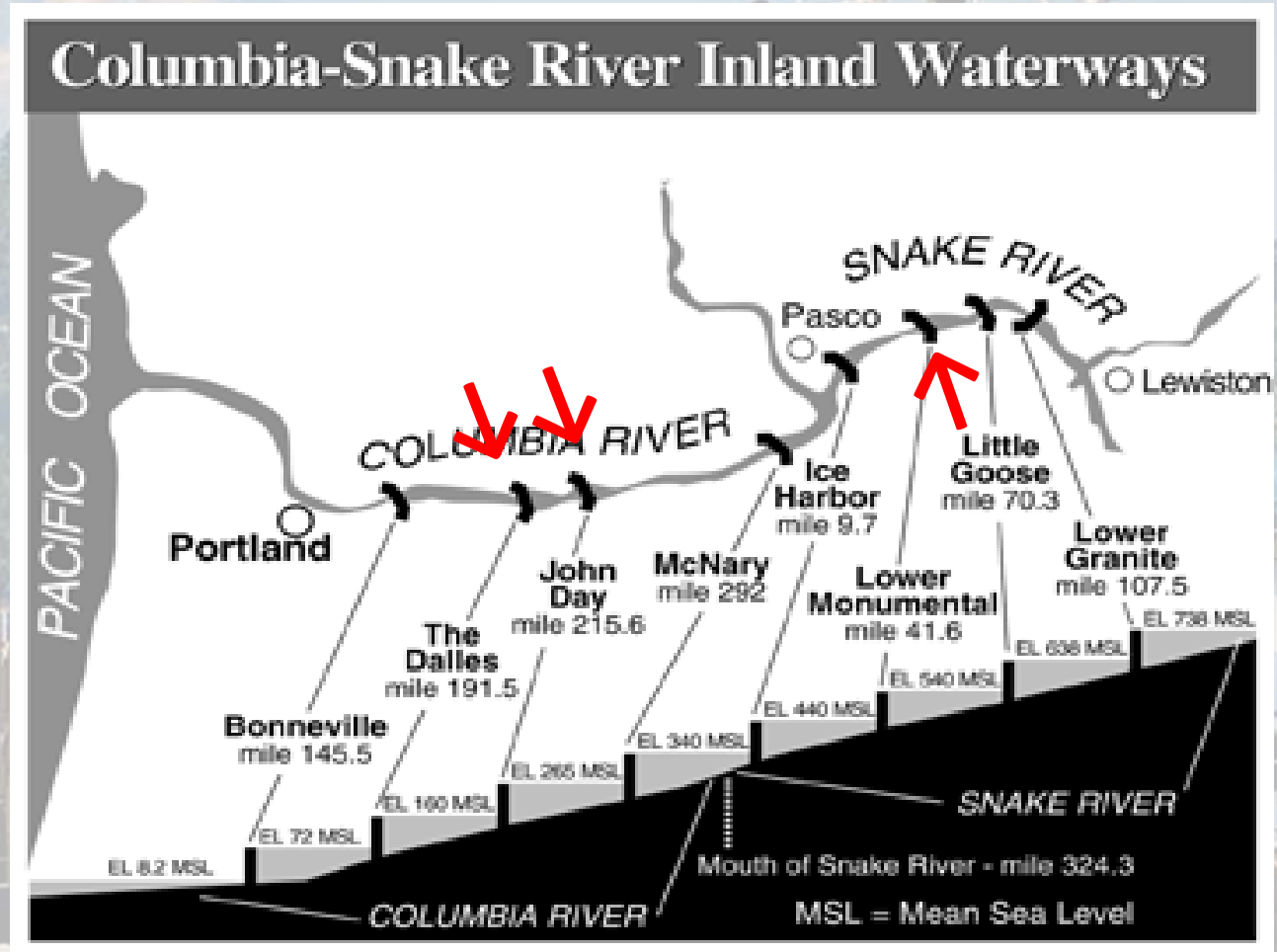
Washington State University

Freight Policy Transportation Institute



The Issue

- 15 weeks
- December 2010 to March 2011
- Replace and rehabilitate an aging infrastructure
- Replaced downstream gates for three locks

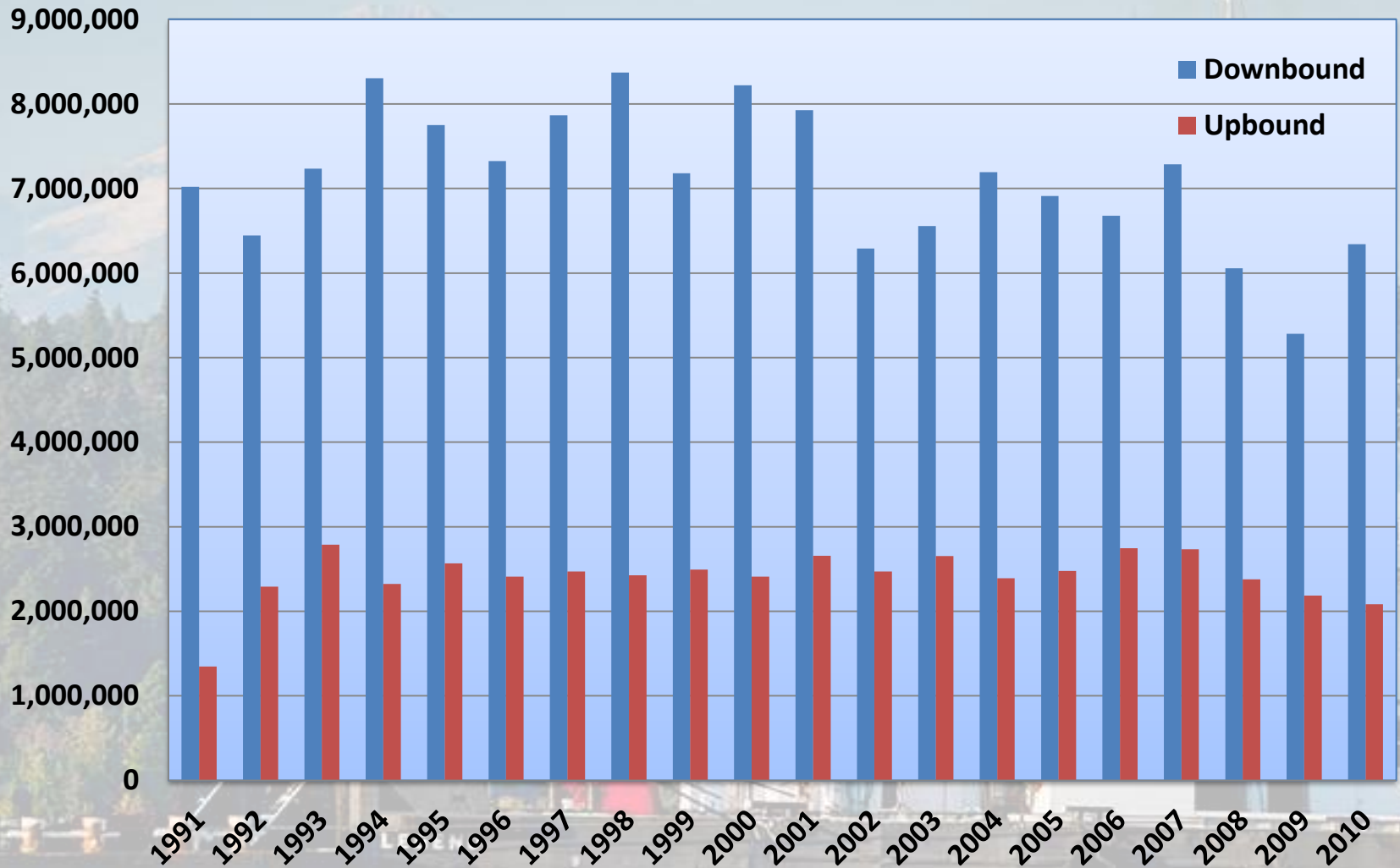


Transportation Study and Approach

- Purpose and Phases
 - Determine
 - Historical use of the river system (Phase I)
 - Preparations of shippers, industries and governments (Phase II)
 - Impacts of the outage (Phase III)
 - Return of traffic to the river system (Phase IV)
 - Evaluate the economic and environmental impacts (Phase V)



Phase I



Total Annual Downriver and Upriver Tonnage, 1991-2010

Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports



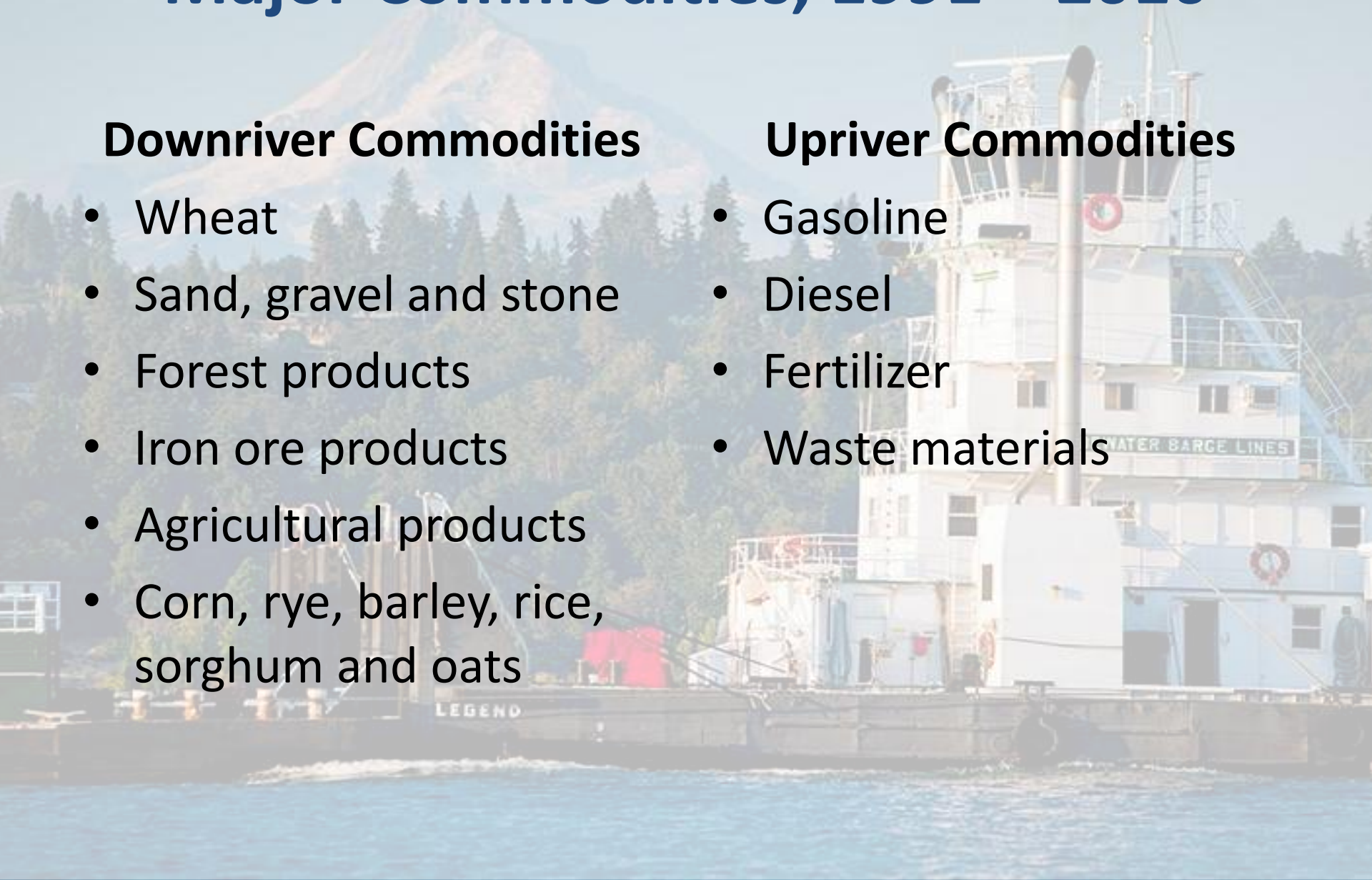
Major Commodities, 1991 – 2010

Downriver Commodities

- Wheat
- Sand, gravel and stone
- Forest products
- Iron ore products
- Agricultural products
- Corn, rye, barley, rice, sorghum and oats

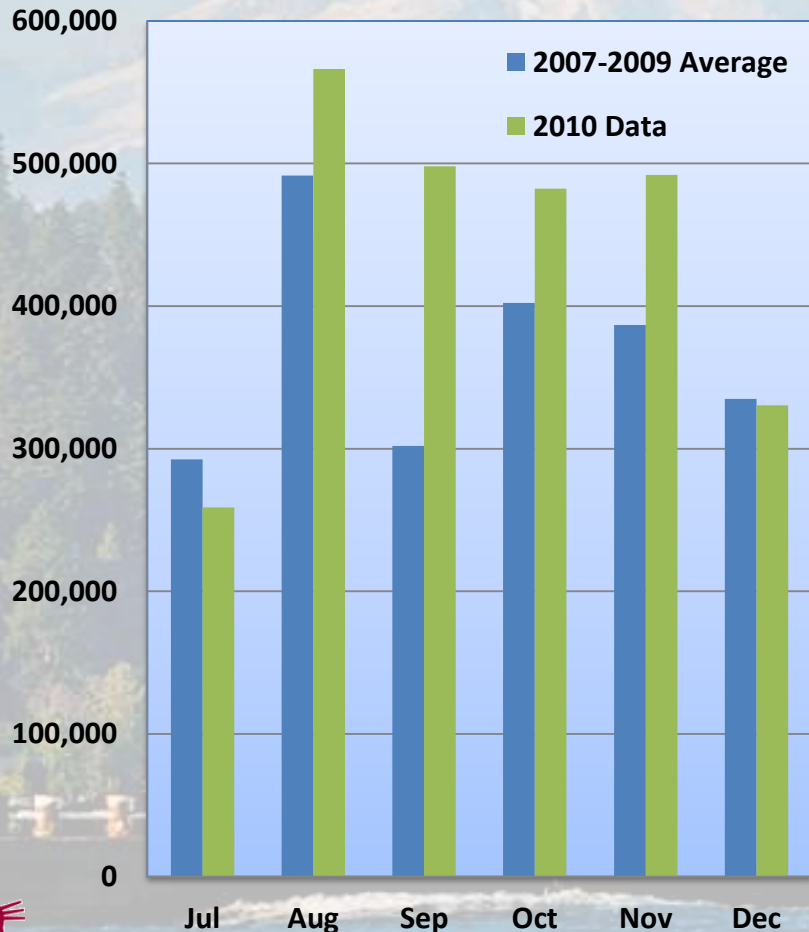
Upriver Commodities

- Gasoline
- Diesel
- Fertilizer
- Waste materials



Phase II

Above Average Downriver Wheat Shipments, July – Dec 2010

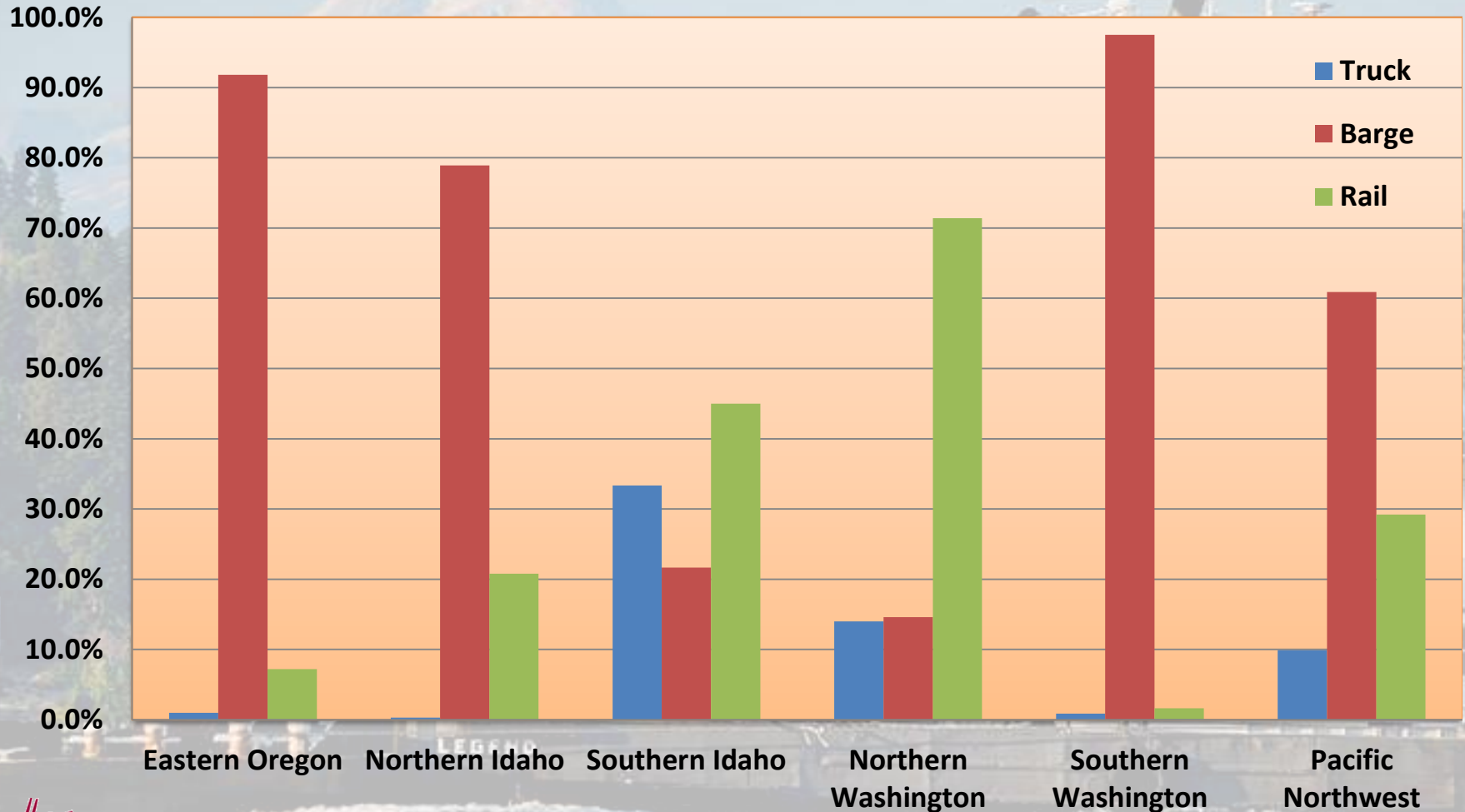


- Above average months: August – November
 - Increased wheat production
- To preposition and fill early international orders
- Historic wheat prices and surge in international demand
 - Russian drought and export ban on wheat

Note: December 2010 data only includes the first nine days of the month.

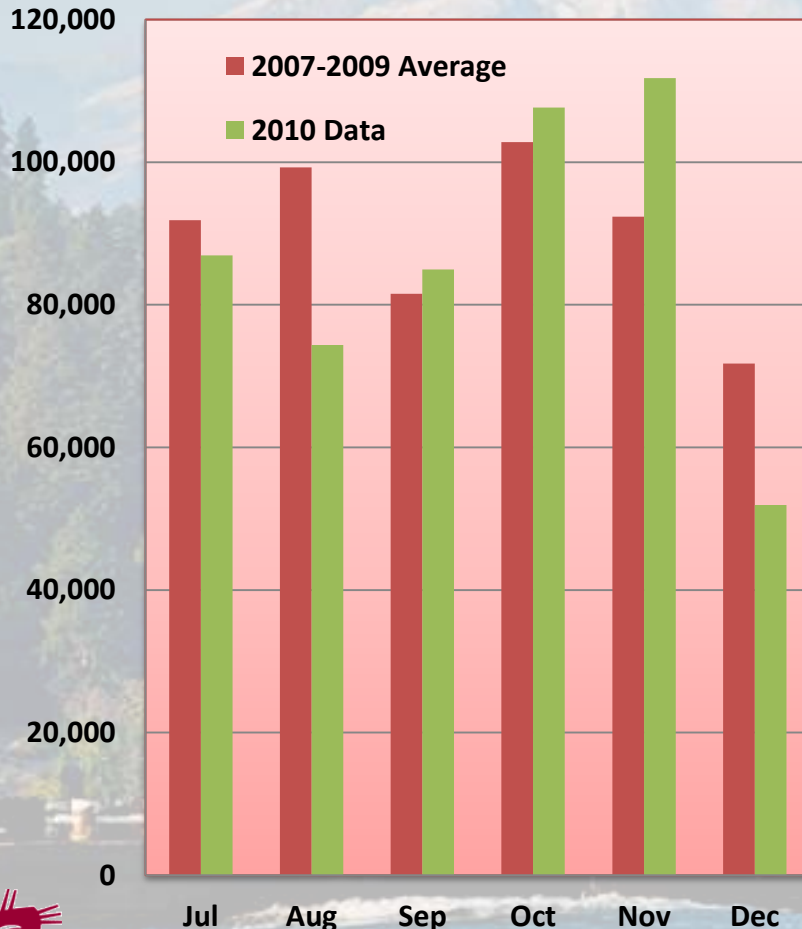


Typical Percentage of Wheat Shipped via Various Modes



Phase II

Above Average Upriver Diesel Shipments, July – Dec 2010



- Above average months: September – November
- 9 days of December 2010: shipped almost as much as an average December
- Prepositioning and storing prior to outage
- Strong demand from farming community

Note: December 2010 data only includes the first nine days of the month.



Industrial and Regional Preparations

Barge Line Preparations

- Expected to take the brunt of the economical impact
- Implementation of a “business interruption surcharge”
- Prepared customers and employees

Rail Line Preparations

- Prepared for an increase in cargo loads and locomotives
- Helped industries in continuing shipments through the outage
- Advertised, identified inland markets and partnered with local ports to aid in the movement of products



Phase III

Rail and Truck Movements During Lock Outage

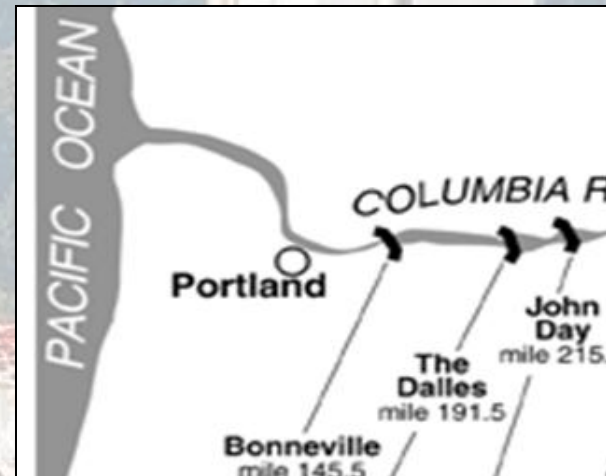
- Most products were transported by truck or a combination of truck and rail
 - Most industries planned to only use rail
 - Inexpensive and can transport large volumes
 - Short distances and small loads
 - Industries chose to send their goods to alternative markets



Phase III

Barge Movements, December 2010 – March 2011

- **A portion of the river worked:** from the pool west of The Dalles to Portland
 - Bonneville Lock and Dam
- Downriver:
 - Movements were 79% below average
 - 4 major commodities
- Manufactured equipment and machinery traveled upriver
 - Gate leaves constructed for The Dalles Lock and Dam



Pacific Northwest Wheat Survey

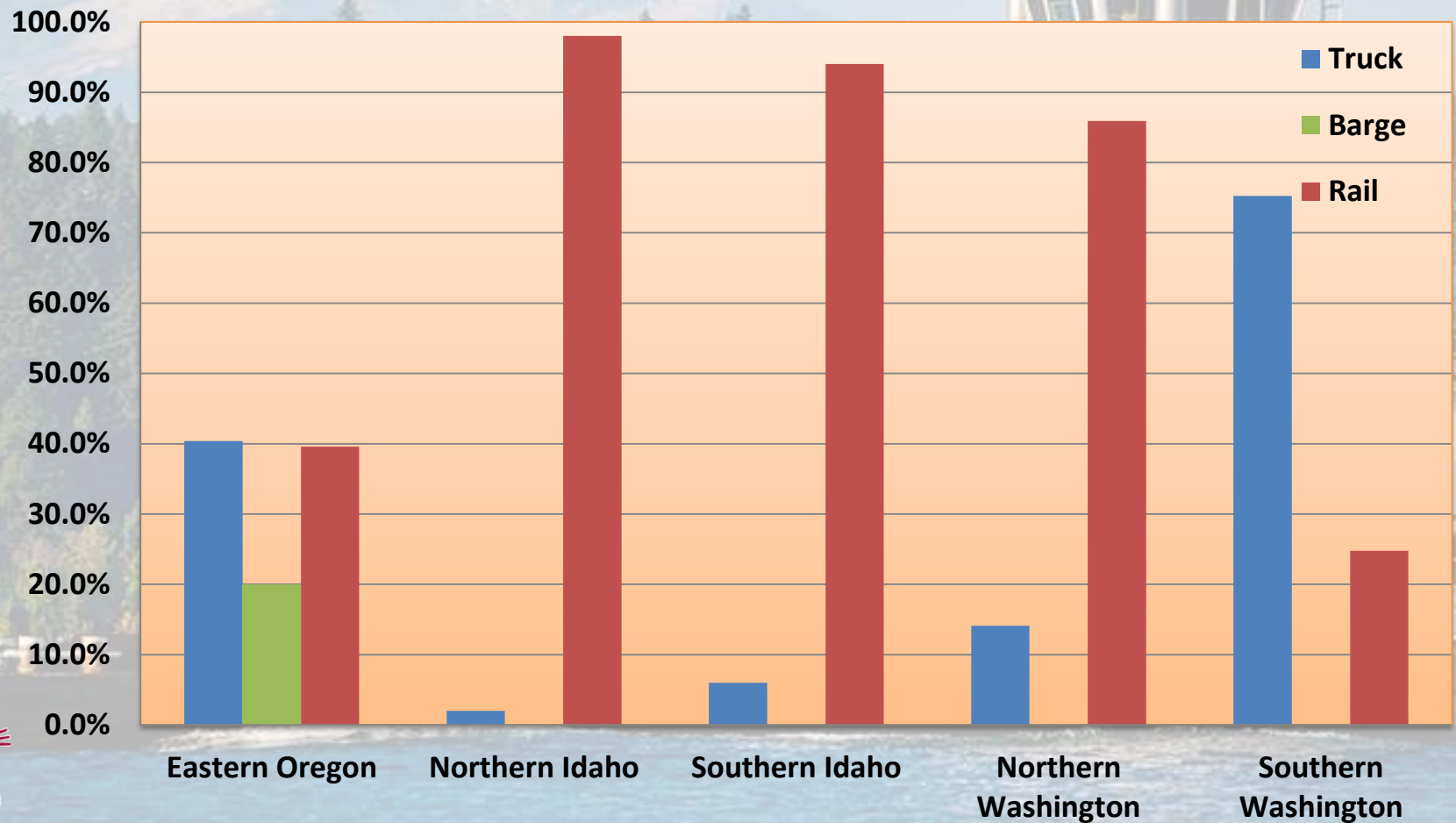
Wheat Tonnage Shipped, Dec 2010 - Mar 2011

Region	Tonnage Shipped in Bushels	Typical Total Tonnage Shipped	Lock Outage Total Tonnage Shipped
Eastern Oregon	9,681,700	12.68%	27.29%
Northern Idaho	2,428,000	15.69%	6.84%
Southern Idaho	1,620,000	2.90%	4.57%
Northern Washington	20,315,826	33.98%	57.26%
Southern Washington	1,433,200	34.75%	4.04%
Pacific Northwest	35,478,726	100.0%	100.0%



Phase III

Percentage of Wheat Shipped via Various Modes, Dec 2010 – Mar 2011



Shipping Rates for Wheat by Survey Respondents, Dec 2010 – Mar 2011

Region	Number of Firms	Average Rate in Cents per Bushel (to Portland)		
		Direct Truck to Final Market	Truck-Barge	Rail
Eastern Oregon	5	\$0.56	\$0.30	\$0.54
Northern Idaho	5	\$1.50	-	\$0.74
Southern Idaho	3	\$0.76	-	\$0.90
Northern Washington	5	\$0.45	-	\$0.55
Southern Washington	8	\$1.34	-	\$0.58
Pacific Northwest	26	\$0.92	\$0.30	\$0.66

Rates before the lock outage: Truck - \$0.89 (4% ↑)
and Rail - \$0.65 (2% ↑)



Shipping Impacts and Activities

Barge Line Impacts

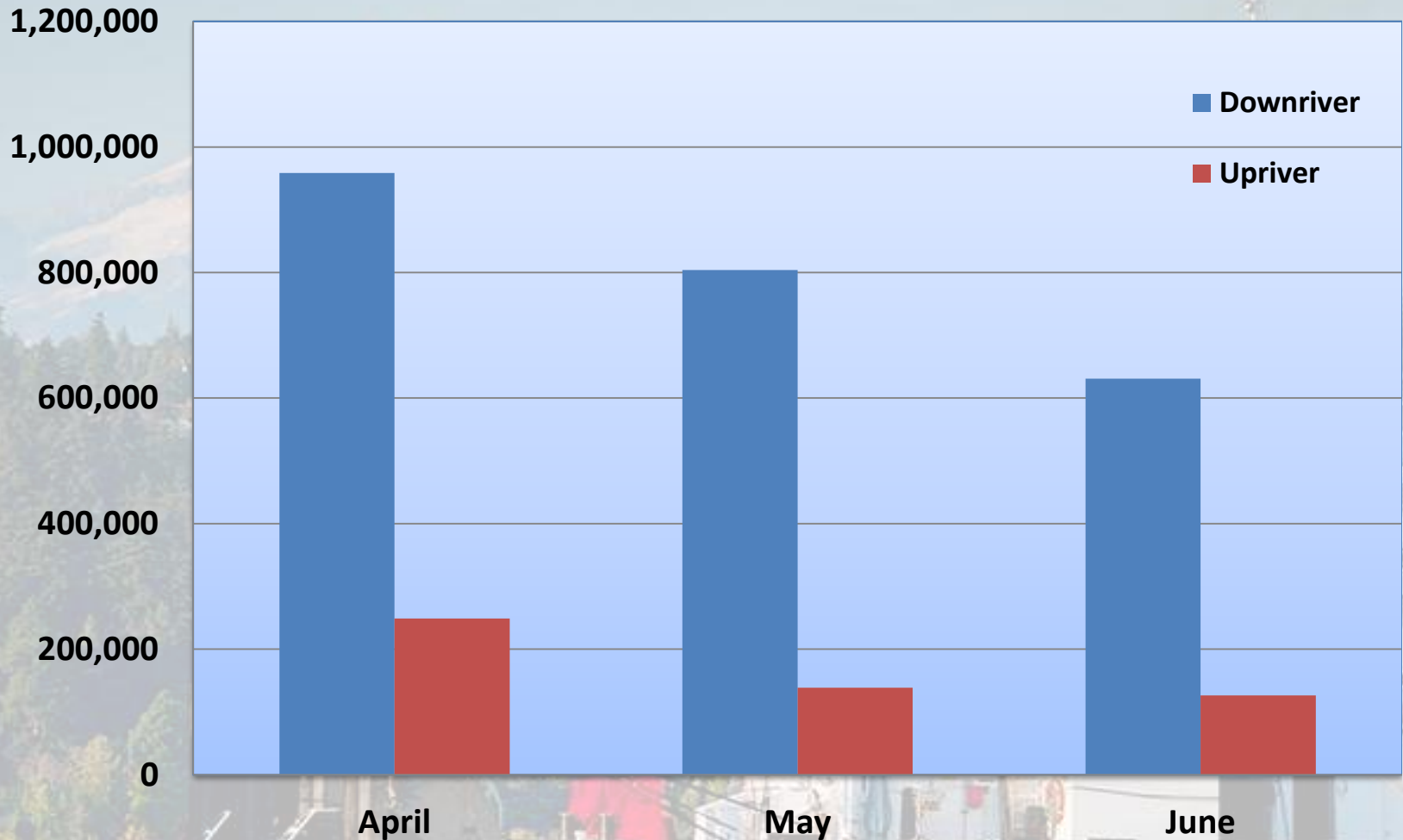
- Laid off employees
- Reduced employees' work hours
- Continued service below The Dalles
- Barging tugs were called to Portland

Rail Line Impacts

- Increased cargo loads
- Increased employees' hours to handle large loads and increased railcar numbers
- Increased fuel and employees' costs



Phase IV



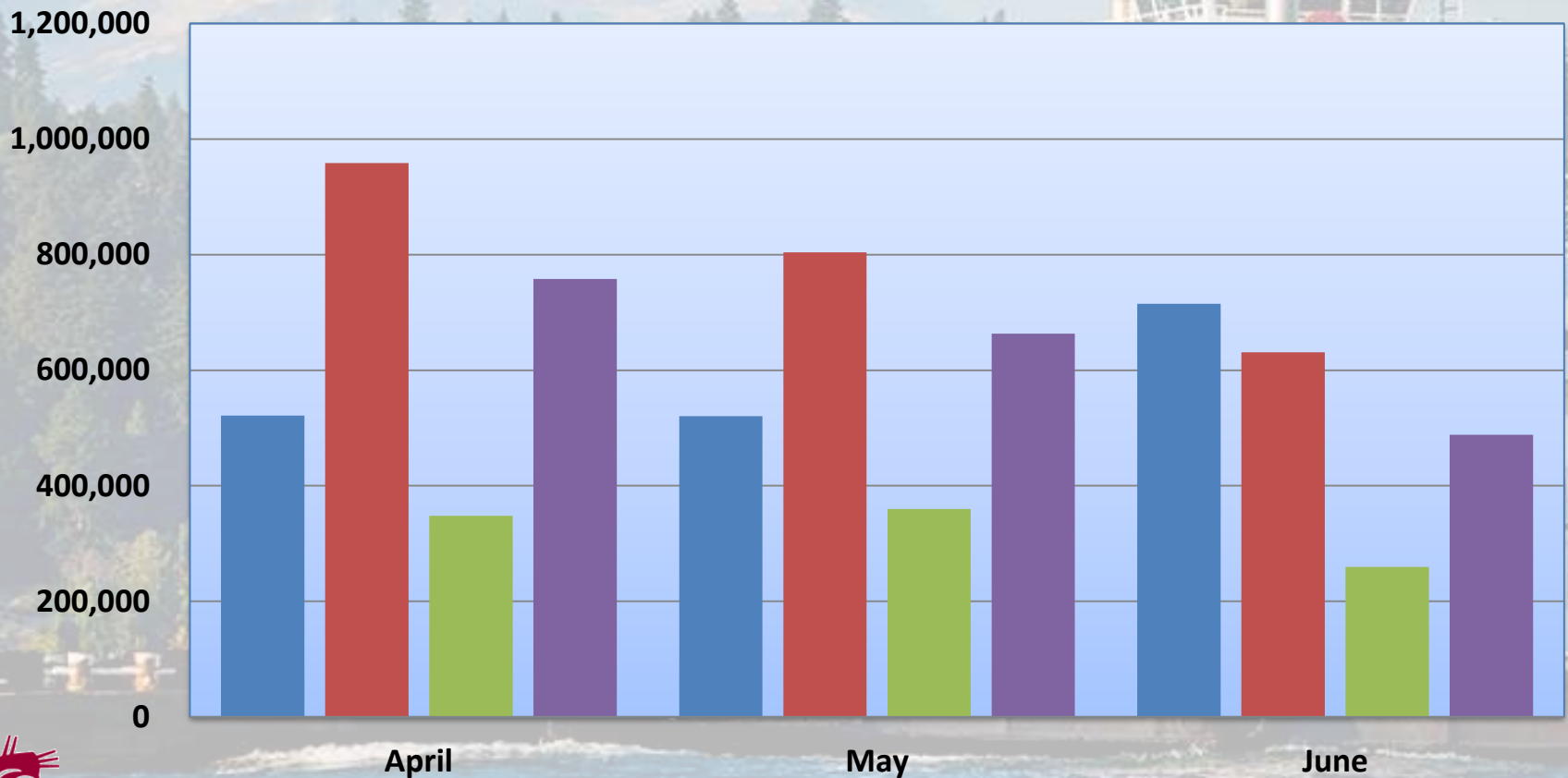
Monthly Downriver and Upriver Tonnage, April – June 2011

Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports



Phase IV

Monthly Tonnage Shipped Downriver Post Lock Outage



■ Historical Total Average ■ Post Outage Total ■ Historical Wheat Average ■ Post Outage Wheat



Phase V

Economic Impacts

- Exact rates and costs were only recorded and/or available for the commodities wheat, forest products and vegetable products
- To calculate costs, a Shipping Cost Model was developed



Phase V

Economic Impacts – Wheat

- Wheat industry shipped an unusually above average amount of grain during the year of the lock outage
 - Russian drought and ban on wheat exports
 - Wheat prices reached historic highs
 - Extensive planning for the lock outage

Year	Time Period			Total Annual Bushels
	Aug - Nov	Dec - Mar	Apr - Jul	
Typical August - July	171,352,480	132,586,318	85,787,202	389,726,000
August 2010 - July 2011	208,906,375	161,644,157	104,588,468	475,139,000
Percentage Difference	21.92%	21.92%	21.92%	21.92%



Phase V

Economic Impacts – Wheat

Total Shipping Costs (in Millions)					
Year	Time Period			Total Cost	Cents per Bushel
	Aug - Nov	Dec - Mar	Apr - Jul		
Typical August - July	\$82.6	\$63.2	\$40.5	\$186.3	\$0.48
August 2010 - July 2011	\$100.7	\$105.8	\$49.3	\$255.9	\$0.54
Difference	\$18.1	\$42.6	\$8.9	\$69.6	\$0.06
Percentage Difference	21.95%	67.38%	21.92%	37.36%	12.67%



Environmental Impacts – Emissions Produced

Emissions Component	Emissions in Pounds (Typical Year)	Emissions in Pounds (Lock Outage Year)	Percent Change in Emissions
HC	271,634	503,039	85.19%
CO	599,956	627,415	4.58%
NOx	4,646,348	4,964,671	6.85%
PM	107,663	131,145	21.81%
SOx	714,131	672,842	-5.78%
Total	6,339,732	6,899,114	8.82%
Emissions per Ton	0.43	0.41	-5.89%



Conclusions

- Stakeholders were well prepared
- Prior to outage, commodities moved in large and above average quantities
 - Forest products, iron ore, wheat, vegetables and processed grains
- Barge lines increased rates to capture additional revenue
- Rail lines prepared for possible increases in carloads and advertized to barge customers



Conclusions, Cont.

- During the outage, wheat producers shipped wheat heavily by truck even though rates increased
- Barge lines temporarily laid off 1/3 – 2/3 of staff
- Rail lines incurred additional costs
- Traffic returned to barge in above average levels
 - Especially wheat



Conclusions, Cont.

- Transportation costs increased 37.4%
 - Tonnage increased
 - Global demand for wheat increased
 - Modal shifts
- Truck and rail rates increased 4% and 2%
- Energy consumption increased 10%, but Btu's per ton decreased 5% due to heavy use of rail, which is more energy efficient
- Emissions production increased as well
- Result: “fears not realized”



Thank you!
Questions?



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