Freight Policy Transportation Insitute

Return to the River: Columbia- Snake River Extended Lock Outage April – June 2011

Washington State University

FPTI

Return to the River: Columbia-Snake River Extended Lock Outage, April – June 2011

FPTI Research Report Number 10
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By

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Transportation and Environmental Assessment of the Impact of Extended Lock Outages: the Columbia-Snake River System
Interim Report #4

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FPTI Research Reports:
Background and Purpose

This is the tenth of a series of reports prepared by the Freight Policy Transportation Institute (FPTI). The reports prepared as part of this Institute provide information to help advance knowledge and analytics in the area of transportation policy. This specific analysis in this first report was partially funded by Transportation Northwest (TransNow).

FPTI is funded by the United States Department of Transportation (USDOT). Dr. Ken Casavant of Washington State University is Director of the Institute. A Technical Advisory Committee (TAC) comprised of Federal, State and local representatives has been assembled in order to identify relevant and pressing issues for analysis, apply rigorous theoretical and analytical techniques and evaluate results and reports. The TAC includes Jerry Lenzi (WSDOT) as Chair, Ed Strocko (USDOT), Carol Swerdloff (USDOT), Bruce Blanton (USDA), Timothy Lynch (American Trucking Association), Rand Rogers (MARAD), John Gray (AAR) and Daniel Mathis (FHWA – Washington State). The following are key goals and objectives for the Freight Policy Transportation Institute:

- Improve understanding of the importance of efficient and effective freight transportation to both the regional and national economy

- Address the need for improved intermodal freight transportation, as well as policies and actions that can be implemented to lower operating costs, increase safety and lower environmental impacts of freight transportation nationwide

- Improve freight transportation performance to specific industries and sectors of the economy

For additional information about the Freight Policy Transportation Institute or this report, please contact Ken Casavant at the following address:

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The contents of this report reflect the views of the various authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the United States Department of Transportation. This report does not constitute and standard, specification or regulation.

FPTI PREVIOUS REPORTS NOW AVAILABLE

1. Simmons, Sara and Ken Casavant. FPTI Research Report #1. "Historical Waterborne Commerce on the Columbia-Snake River System: Commodity Movements Up and Down River, 1991-2010." November 2010.

2. Simmons, Sara and Ken Casavant. FPTI Research Report #2. "Industry Preparations for the Columbia-Snake River Extended Lock Outage, July – December 2010." February 2011.

3. Khachatryan, Hayk, Jeff Poireman, and Ken Casavant. FPTI Research Report #3. "Determinants of Consumer Choice for Biofuels." March 2011.

4. Khachatryan, Hayk, Ken Casavant, Eric Jessup, Jie Chen, Shulin Chen, and Craig Frear. FPTI Research Report #4. "Biomass Inventory Technology and Economics Assessment." March 2011.

5. Khachatryan, Hayk and Ken Casavant. FPTI Research Report #5. "Spatial and Temporal Differences in Price-Elasticity of Demand for Biofuels." March 2011.

6. Casavant, Ken. FPTI Research Report #6. "The Critical Status of Agricultural Transportation in the Pacific Northwest." March 2011.

7. Casavant, Ken. FPTI Research Report #7. "Issues Affecting Barge Transportation in the Pacific Northwest." March 2011.

8. Casavant, Ken. FPTI Research Report #8. "Rail to Rail Competition and its Importance to Agriculture." April 2011.

9. Simmons, Sara and Ken Casavant. FPTI Research Report #9. "Industry Reactions to the Columbia-Snake River Extended Lock Outage, December 2010 – March 2011." June 2011.

ACKNOWLEDGEMENTS

This study was partially funded by a grant from Transportation Northwest.

Background and Purpose of Overall Study

The Columbia-Snake River System in the Pacific Northwest has just undergone a massive and sustained lock outage, which eliminated barge transportation on much of the upper Columbia River and all of the Snake River. A shutdown of this length is unprecedented in the United States. The impact of this loss of a major mode of transportation and the impact on the demands of other modes of transportation were significant.

The goal of the outage was to make necessary major maintenance repairs for continued operation in the future. Such extended lock closures are not normal but this river system, as many facilities throughout the nation, required massive investments to maintain the integrity of the system and to continue to generate the acknowledged long term benefits of the navigation system.

The economic value of this transportation link is apparent from the commerce that flows up and down the system. This river system is the #1 U.S. wheat export gateway, #1 U.S. barley export gateway, #1 West Coast paper and forest products gateway, #1 in West Coast mineral bulk exports and #1 in West Coast auto imports. This inland system supports 10 million tons of cargo and is connected to the deep draft channel and ocean shipping which supports over 45 million tons of cargo.

The closure of these locks, which occurred from December 10, 2010 to March 24, 2011, had impacts on shippers, river carriers, roads, alternative modes, ports, communities, economic development decisions, energy and the environment as these entities reacted to the temporary loss of this transportation alternative.

This is the fourth interim report by the Freight Policy Transportation Institute (FPTI) for the Transportation and Environmental Assessment of the Impact of Extended Lock Outages: the Columbia-Snake River System.

The overall study includes the following objectives:

- Empirically determine current use of the transportation system surrounding and including the inland navigation mode in typical periods of time, by inventorying and describing the shippers, carriers, ports, cities/counties, etc. and attendant river flows by timing, commodity and location on the river
- In months leading up to actual lock closure on the Columbia-Snake River System, determine changes and impacts of changes in the usage of the river navigation mode and attendant modes/functions
- During actual lock closure, collect and analyze rates and modal costs to determine incidence and magnitude of increased marketing costs
- Following the lock closure, evaluate the timing and volume of shipments and impacts as the river traffic returns to its pre-lock closure condition

- Determine the impacts on the environment in the form of energy consumption and emissions production during the study
- Develop and describe a methodology useful for evaluating and understanding the dynamic nature of disruptions, industry reactions and responses

The four specific work phases identified for this study were:

- Phase 1 – Historical Documentation of River Movements Prior to the Closure
- Phase 2 – Documentation, Modeling and Interviews Prior to the Closure
- Phase 3 – Documentation, Modeling and Interviews During the Closure
- Phase 4 – Documentation, Modeling and Interviews After the Closure

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ACKNOWLEDGEMENTS

This study was partially funded by Transportation Northwest (TransNow). We would like to thank the United States Army Corps of Engineers for providing data used in this study. In addition, we would like to thank those who provided information regarding industries and organizations affected by the recent lock outage.

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Executive Summary

This report's main objective is to describe the general characteristics of waterborne movements by barge during the three month period after the Columbia-Snake River extended lock outage, from April to June 2011 as the traffic returned to the river. It is evident that traffic, especially wheat, has returned to the river in a dramatic fashion.

Waterborne movements are one of the more economical and cost-efficient methods of transport among all modes of transportation, comprising a key component of the Pacific Northwest multimodal transportation system. Commodity shipments moving through this river system were recently halted for 15 weeks during the winter of 2010-2011 for an unprecedented extended lock outage.

The specific research objectives and methodology are first reviewed in Section 1. Monthly tonnage for major commodities shipped from April 2010 to June 2010, the period following the locks opening, is compared to corresponding average monthly movements over the past four years in Section 2. Historical averages and actual data from the three months prior to and after the lock outage are compared at the end of Section 2.

The most notable characteristic is that the traffic has returned with major surges above past movement levels; this is especially true in movements downriver. Between April 2011 and June 2011 about five times more tonnage traveled downriver than upriver, compared to the typical three to one movement. Monthly total tonnage traveling both downriver and upriver gradually decreased from April to June; shippers and industries were ready and eager to return commodity movements to the river. The downriver high in April is mostly due to wheat elevators' commodity shipments following the lock outage as many managers chose to ship wheat after the lock outage was complete and barge transportation was an option again.

A total of 2.4 million tons were shipped downriver between April and June 2011. The commodities with the largest volume of downriver shipments over the three month period have been wheat; forest products; sand, gravel and stone products; iron ore products; and vegetable products. During this time period, wheat comprised 80 percent or 1.9 million tons, of the total 2.4 million tons.

Around 514,000 tons were shipped upriver between April and June 2011. The commodities with the largest volume of upriver shipments over the three month span have been distillate, residual and other fuel oils; gasoline products; waste materials; fertilizers; and sand, gravel and stone products. The highest proportion of total upriver shipments, 43 percent or 219,000 tons of the total 514,000 tons, was distillate, residual and other fuel oils. The second highest

proportion of total upriver shipments was gasoline, jet fuel and kerosene products, comprising 150,000 tons (about 29 percent) of the total upriver tonnage for April through June.

Major commodities in general moved in near and above average quantities on the Columbia-Snake River during the months of April through June 2011 in order to ship products that had been halted by extended lock outage. Those major commodities moving downriver from April to June 2011 that rose above average levels for at least two months include forest products and wheat. Those major commodities moving upriver that rose above average levels for at least two months during this time period include fertilizers and primary non-ferrous metallic products.

These large shipments in the months following the extended lock outage, which ended in March, reveals that commodity industries chose to delay shipment of products that normally would have traveled by barge during the winter, until after the closure date. Sending shipments later allowed industries to fill orders that would have shipped during the winter and avoid increased costs of alternate modes of transportation while barge transportation was curtailed.

During the months of April through June 2011, monthly total shipments downriver were significantly above average for April and May, but below average for the month of June. Total monthly wheat movements made downriver, however, were above average for all three months following the lock outage. This surge in shipments during the two months after the lock outage is evidence that industries waited to transport their goods until after the lock outage rather than during; traffic immediately and heavily took advantage of the river reopening and this mode of transportation being available.

Introduction

Waterborne movements are one of the more economical and cost-efficient methods of transport among all modes of transportation, comprising a key component of the Pacific Northwest multimodal transportation system. More than 35 commodities travel up and down the Columbia-Snake River daily. These commodity shipments move through eight separate locks and dams, including the Snake River dams: Lower Granite, Little Goose, Lower Monumental and Ice Harbor; followed downriver by the Columbia River dams: McNary, John Day, The Dalles and Bonneville. A map of the Columbia-Snake River System and its locks are available in Appendix A. Commodity shipments moving through this river system were recently halted for 15 weeks during the winter of 2010-2011 for an unprecedented extended lock outage.

This specific interim report's main objective is to describe the general characteristics of waterborne movements by barge during the three month period after the Columbia-Snake River extended lock outage, from April to June 2011.

The specific research objectives and methodology are first reviewed in Section 1. Monthly tonnage for major commodities shipped from April 2010 to June 2010, the period following the locks reopening, is compared to corresponding average monthly movements over the past four years in Section 2. Historical averages and actual data from the three months prior to and after the lock outage are compared at the end of Section 2.

Note: the monthly commodity movements provided in all sections are based on upriver and downriver waterborne transportation reports collected at the Bonneville Lock and Dam because it is the lowest lock on the river system. All upriver shipments first pass through Bonneville and, likewise, all downriver shipments leave the river system through this lock. Thus, to avoid double counting the same shipment across multiple locks, the research team has analyzed data based on Bonneville collections.

1. Research Objectives and Analysis Approach

The primary objective of interim report #4 is as follows:

- To describe in detail the major commodity movements along the Columbia-Snake River for the three month period following the extended lock outage (April – June 2011)

Information provided in this report regarding commodity movements on the Columbia-Snake River is based on data available from the U.S. Army Corps of Engineers Waterborne Commerce Statistics Center. Data are collected as part of the Lock Performance Monitoring System (LPMS) for the locks owned or operated by the U.S. Army Corps. This report focuses only on the data collected for the months April through June of 2011 as these are the months following the extended lock outage. For an evaluation of commodity movements on the Columbia-Snake River prior to April 2011, please refer to FPTI Research Report #1, #2 and #3 at http://www.fpti.wsu.edu/reports.htm.

The data analyzed in this report capture fourteen major commodity types shipped over the Columbia-Snake River and include detailed information by month, year, direction, total commodity tonnage and total number of barges transported during each month. These commodities were selected as they were the highest volume movements over the last twenty years. Some of these commodity volumes have decreased in the months of April, May and June 2011. Despite this fact, historically, these fourteen major commodities mentioned are consistently included in the largest volume movements and therefore received the authors' attention.

2. Waterborne Commodity Movements Following the Locks' Reopening, April – June 2011

The commodity movements in the three months following the extended lock outage reveal how shippers and carriers instantly responded to the reopening of the lock system. Three alternative options were available to move products with the absence of barge transportation: 1) increase barge movements prior to December 2010, 2) ship products by truck and rail during the lock outage and/or 3) increase barge movements after March 2011. The third alternative is evident in the data discussed below.

The most notable characteristic is that the traffic has returned with major surges above past movement levels; this is especially true in movements downriver. Between April 2011 and June 2011 about five times more tonnage traveled downriver than upriver, compared to the typical three to one movement (Tables 2.1 and 2.2). Analyses for the last 30 years (see references) of Columbia-Snake River transportation found that three times more tonnage consistently traveled downriver than upriver. The fact that downriver traffic increased relative to upriver traffic during this three month period suggests that industries that ship products downriver were more impacted by the lock outage as these entities chose to heavily transport commodities after the lock outage rather than during. Also, monthly total tonnage traveling both downriver and upriver gradually decreased from high tonnages in April to mostly below average volumes in June. The downriver high in April was likely due to wheat elevators' commodity shipments following the lock outage as many managers chose to immediately ship wheat after the lock outage was complete and barge transportation was an option again.

Downriver Movements: A total of 2.4 million tons were shipped downriver between April and June 2011. This large tonnage indicates that industries returned to the river immediately and with large volumes after the lock outage ended. The commodities with the largest volume of downriver shipments over the three month period were (in *descending* order of tonnage):

- Wheat
- Forest products, lumber, logs and woodchips
- Sand, gravel and stone; limestone flux and calcareous stone; phosphate rock
- Iron ore, iron steel waste and scrap
- Vegetable products

During this time period, wheat comprised 80 percent or 1.9 million tons, of the total 2.4 million tons (Table 2.1). The second highest commodity by total tonnage was forest products which comprised 11 percent of the three month period's volume. Sand, gravel and other stone products accounted for more than 106,000 tons of total downriver movements, while the total downriver shipment of iron ore, iron steel waste and scrap measured around 28,000 tons. The total tonnage of vegetable products was over 20,000 tons for the three month period (Table 2.1).

Table 2.1 Monthly Tonnage Shipped Downriver on the Columbia-Snake River, April - June 2011				
Commodity by Ton	**Month**			
	April	May	June	Total
Empty	0	0	0	**0**
Coal, Lignite and Coke	0	0	0	**0**
Petroleum Products (General)	0	1,323	0	**1,323**
Crude Petroleum	0	0	0	**0**
Gasoline, Jet Fuel and Kerosene	1,326	10,535	0	**11,861**
Distillate, Residual and Other Fuel Oils	7,742	0	6,788	**14,530**
Petroleum Pitches, Asphalt and Naptha	0	0	0	**0**
Chemicals and Related Products (General)	2,823	0	0	**2,823**
Fertilizer (Nitrogenous, Potassic, Phosphoric)	0	0	0	**0**
Organic Industrial Chemicals	0	0	0	**0**
Crude Materials and Inedibles, Except Fuels	0	0	0	**0**
Forest Products (Lumber, Logs, Woodchips)	131,732	58,911	72,139	**262,782**
Pulp and Waste Products	96	0	0	**96**
Sand, Gravel, Stone and Crushed Rock	16,910	54,273	35,107	**106,290**
Iron Ore, Iron Steel Waste and Scrap	15,900	3,600	8,400	**27,900**
Marine Shells (Unmanufactured)	0	0	0	**0**
Non-Ferrous Metallic Ores	0	1,800	2,800	**4,600**
Sulfur (Liquid and Dry), Clay and Salt	0	0	66	**66**
Primary Manufactured Goods	0	0	0	**0**
Paper and Allied Products	1,790	2,362	2,181	**6,333**
Building Cement, Concrete, Lime and Glass	0	0	0	**0**
Primary Iron and Steel Products	0	0	0	**0**
Primary Non-Ferrous Metal Products	3,045	2,878	2,844	**8,767**
Primary Wood Products, Veneer and Plywood	128	0	0	**128**
Food and Farm Products (General)	1,350	320	1,900	**3,570**
Fresh Fish and Other Marine Products	0	0	1,010	**1,010**
Wheat	758,085	663,230	488,100	**1,909,415**
Corn	0	0	0	**0**
Rye, Barley, Rice, Sorghum and Oats	0	0	0	**0**
Oilseeds (Soybean, Flaxseed, and Others)	824	0	0	**824**
Vegetable Products	9,340	3,005	7,772	**20,117**
Animal Feed, Grain Mill Products and Flour	3,289	1,348	1,030	**5,667**
Other Agricultural Products, Including Food	68	0	0	**68**
Barged Fish	20	315	46	**381**
All Manufactured Equipment and Machinery	1,055	0	900	**1,955**
Waste Material (Garbage, Landfill, Sewage)	3,000	0	0	**3,000**
Commodity Unknown	0	0	0	**0**
Total	**958,523**	**803,900**	**631,083**	**2,393,506**

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

Up River Movements: As mentioned above, about five times less tonnage traveled upriver than downriver. Around 514,000 tons were shipped upriver between April and June 2011. The commodities with the largest volume of upriver shipments over the three month span were:

- Distillate, residual and other fuel oils; lubricating oils and greases
- Gasoline, jet fuel and kerosene
- Waste material; garbage, landfill, sewage sludge and waste water
- Fertilizer (nitrogenous, potassic, phosphatic and others)
- Sand, gravel and stone; limestone flux and calcareous stone; phosphate rock

The highest proportion of total upriver shipments, 43 percent or 219,000 tons of the total 514,000 tons, was distillate, residual and other fuel oils (Table 2.2). The second highest proportion of total upriver shipments was gasoline, jet fuel and kerosene products, comprising 150,000 tons (about 29 percent) of the total upriver tonnage for April through June. Sixty-six thousand tons of waste materials, 39,000 tons of fertilizer and 19,000 tons of sand, gravel and stone were transported upriver during the period (Table 2.2).

Table 2.2 Monthly Tonnage Shipped Upriver on the Columbia-Snake River, April - June 2011				
Commodity by Ton	**Month**			
	April	May	June	Total
Empty	0	0	0	**0**
Coal, Lignite and Coke	0	0	0	**0**
Petroleum Products (General)	0	0	0	**0**
Crude Petroleum	0	0	0	**0**
Gasoline, Jet Fuel and Kerosene	80,045	45,759	23,921	**149,725**
Distillate, Residual and Other Fuel Oils	96,468	52,625	69,959	**219,052**
Petroleum Pitches, Asphalt and Naptha	0	0	0	**0**
Chemicals and Related Products (General)	0	0	0	**0**
Fertilizer (Nitrogenous, Potassic, Phosphoric)	25,999	3,519	9,244	**38,762**
Organic Industrial Chemicals	0	0	0	**0**
Crude Materials and Inedibles, Except Fuels	0	0	0	**0**
Forest Products (Lumber, Logs, Woodchips)	9,600	0	0	**9,600**
Pulp and Waste Products	0	0	0	**0**
Sand, Gravel, Stone and Crushed Rock	6,500	12,686	0	**19,186**
Iron Ore, Iron Steel Waste and Scrap	0	0	0	**0**
Marine Shells (Unmanufactured)	0	0	0	**0**
Non-Ferrous Metallic Ores	0	0	0	**0**
Sulfur (Liquid and Dry), Clay and Salt	0	0	0	**0**
Primary Manufactured Goods	2,015	0	0	**2,015**
Paper and Allied Products	0	0	0	**0**
Building Cement, Concrete, Lime and Glass	0	0	0	**0**
Primary Iron and Steel Products	0	0	0	**0**
Primary Non-Ferrous Metal Products	4,456	1,061	3,032	**8,549**
Primary Wood Products, Veneer and Plywood	0	0	0	**0**
Food and Farm Products (General)	0	0	0	**0**
Fresh Fish and Other Marine Products	0	0	0	**0**
Wheat	0	0	0	**0**
Corn	0	0	0	**0**
Rye, Barley, Rice, Sorghum and Oats	0	0	0	**0**
Oilseeds (Soybean, Flaxseed, and Others)	0	0	0	**0**
Vegetable Products	0	0	0	**0**
Animal Feed, Grain Mill Products and Flour	0	0	0	**0**
Other Agricultural Products, Including Food	0	0	0	**0**
Barged Fish	7	0	0	**7**
All Manufactured Equipment and Machinery	850	0	0	**850**
Waste Material (Garbage, Landfill, Sewage)	22,719	22,948	20,348	**66,015**
Commodity Unknown	0	0	0	**0**
Total	**248,659**	**138,598**	**126,504**	**513,761**

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

2.1 General Trends in Major Commodity Movements

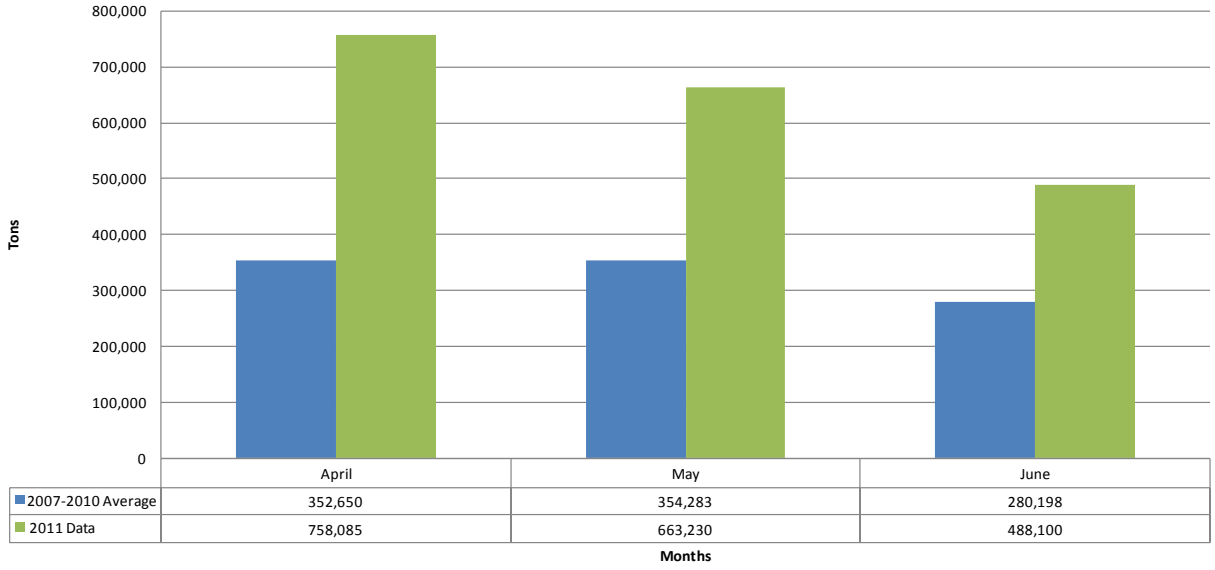
The following section provides a comparison of the major commodity movements after the locks reopening to corresponding average movements from the past four years. Many industries did in fact increase commodity movements by barge from April to June 2011 as evident in the following evaluations.

Note: in the following graphs, blue bars represent average downriver tonnage, red bars represent average upriver tonnage and green bars represent actual downriver or upriver tonnage for 2011 (depending on the title of the graph). Four year average tonnages are always on the left side and 2011 data are always on the right side of each monthly column.

Wheat

Downriver shipments of wheat from April to June 2011 were well above the 2007-2010 averages; shipments ranged from 75 to 115 percent above corresponding averages (Figure 2.1). It is apparent that the wheat industry immediately returned shipment to the river after the lock outage concluded, with large volumes due to pent up demand. Very little wheat that would have normally been barged was moved during the lock outage, only about 45,500 tons, and above average shipments from August to December 2010 were made earlier to lessen the impact of the loss of barge transportation (Interim Report #2 and #3).

Fig. 2.1 Monthly and Average Tonnages of Wheat Barged Downriver for April - June 2011

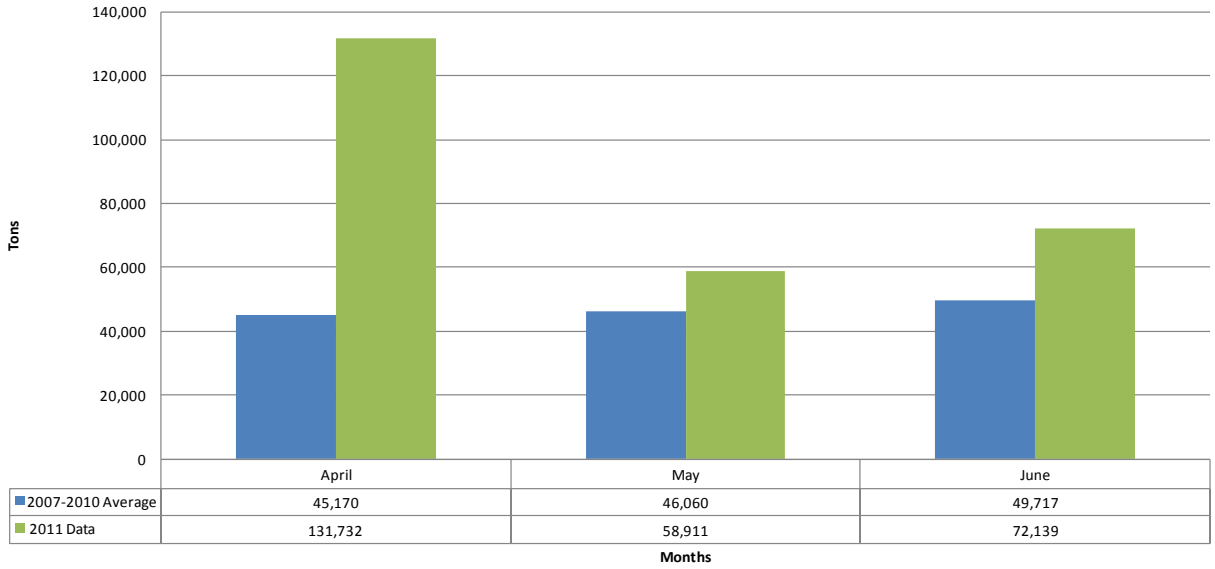


Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports

Forest Products, Lumber, Logs and Woodchips

Downriver shipments of forest products for the months April through June 2011 were all well above their equivalent 2007-2010 averages. The largest volume shipped in April 2011 was 192 percent above the 2007-2010 April downriver average (Figure 2.2). The surge in shipments during the three months after the lock outage suggests that forest products were in high demand from April to June 2011 since the forestry industry shipped over 58,000 tons by truck during the lock outage and above average shipments had been made prior to the lock outage from July to November 2010 (Interim Reports #2 and #3).

Fig. 2.2 Monthly and Average Tonnages of Forest Products, Lumber, Logs and Woodchips Barged Downriver for April - June 2011

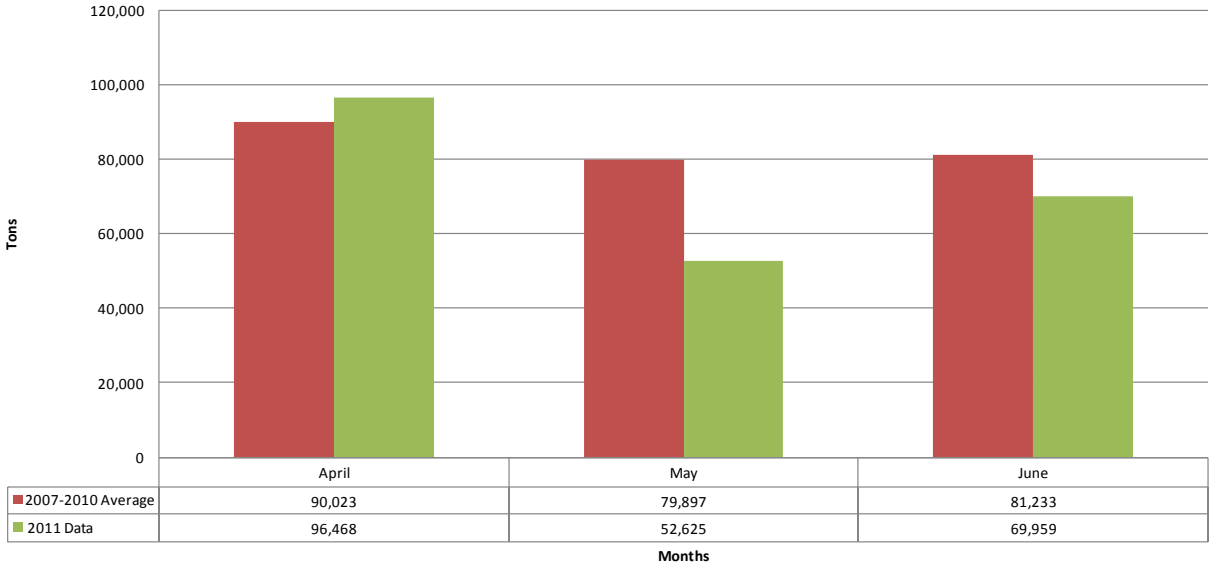


Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports

Distillate, Residual and Other Fuel Oils, Lubricating Oils and Grease

When compared to corresponding averages from 2007-2010, upriver distillate, residual and other fuel oil (including diesel) shipments from April to June 2011 were above average in April and below average for the last two months of the period. The April average for upriver distillate oil shipments was seven percent above average (Figure 2.3). Since average volume shipments of this commodity were transported during the lock outage by other modes, the petroleum industry did not have to return to the river immediately with large barge loads. The lack of above average fuel shipments is evidence of this fact. Also, the low tonnages for the months of May and June are just below par and might be due to the fact that demand for distillate fuel oils may have decreased during these months.

Fig. 2.3 Monthly and Average Tonnages of Distillate, Residual and Other Fuel Oils; Lubricating Oils; and Greases Barged Upriver for April - June 2011



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

Gasoline, Jet Fuel and Kerosene

Monthly upriver movements of gasoline, jet fuel and kerosene in April 2011 were above the historical monthly average, whereas shipments in May and June 2011 were well below average. Although the petroleum industry shipped gasoline during the lock outage via truck and rail, the above average shipments of gasoline in April suggest that the industry was making up for the disruption in barge transportation. Like shipments for distillate fuel oils, average volume shipments of gasoline products were transported during the lock outage by other modes and the petroleum industry did not have to return to the river immediately with above average barge loads. Also, the low tonnages for the months of May and June might be due to the fact that the petroleum industry was satisfied with the service of alternative modes and decided to increase the use of rail, truck and/or pipeline. Also, demand for gasoline products may have decreased during these months.

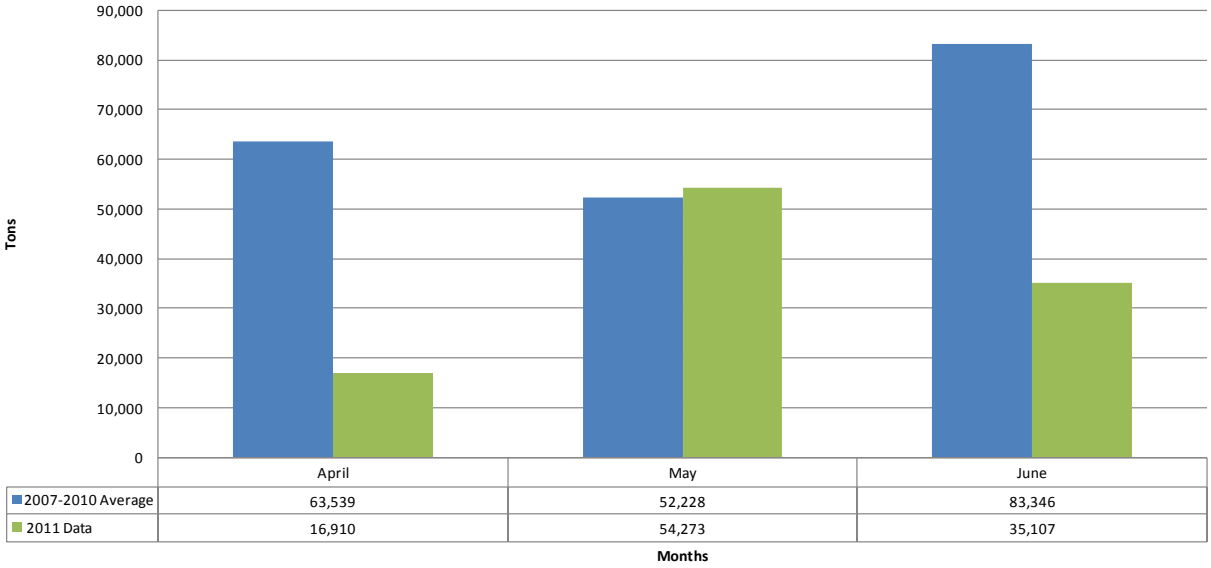
Fig. 2.4 Monthly and Average Tonnages of Gasoline, Jet Fuel and Kerosene Barged Upriver for April - June 2011

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

Sand, Gravel, Stone, Limestone Flux, Calcareous Stone and Phosphate Rock

Shipments of sand, gravel and stone products moving downriver in 2011 were far below their 2007-2010 averages in April and June, but slightly above average in May 2011. In April and June 2011, downriver movements were 73 and 58 percent less than average (Figure 2.5). Demand for sand, gravel and stone was likely generally diminished during this three month period as is evident from the graph below. No sand products were shipped during the lock outage and below average shipments were made prior to the lock outage (Interim Reports #2 and #3).

Fig. 2.5 Monthly and Average Tonnages of Sand, Gravel, Stone, Limestone Flux, Calcareous Stone and Phosphate Rock Barged Downriver for April - June 2011



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

Waste Material, Garbage, Landfill, Sewage Sludge and Waste Water

Waste material, garbage, landfill, sewage sludge and waste water tonnages moving upriver from April to June 2011 were just below the 2007-2010 averages for those months. This could be due to the fact that the Vancouver area, where this waste material is produced, could be creating less waste, recycling more and/or continue to send garbage material to an alternative landfill site as was done during the lock outage.

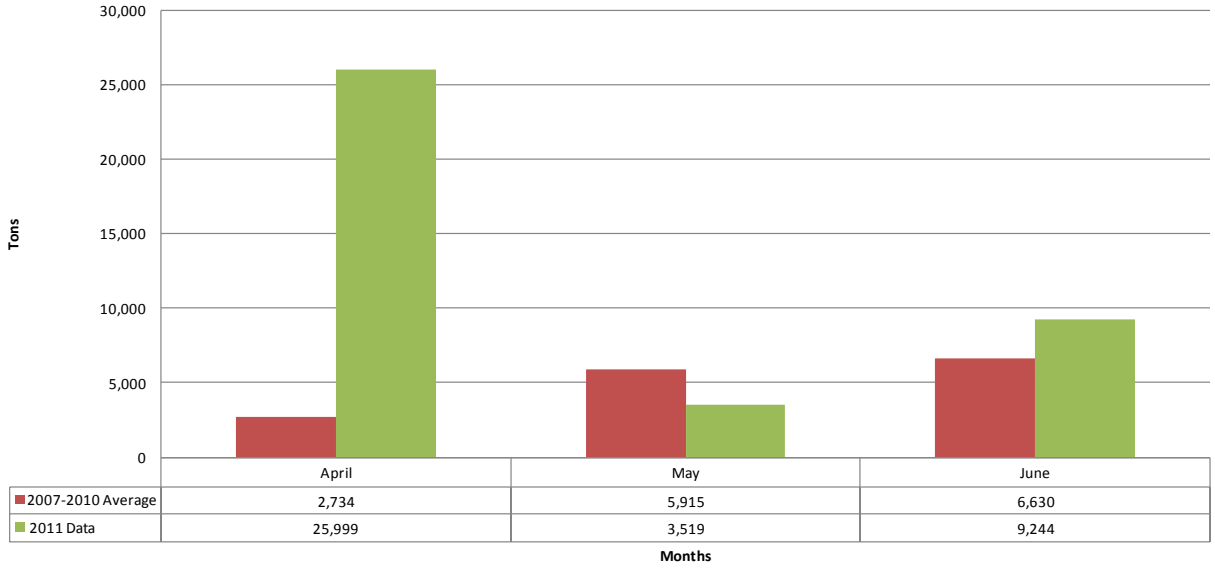
Fig. 2.6 Monthly and Average Tonnages of Waste Material, Garbage, Landfill, Sewage Sludge and Waste Water Barged Upriver for April - June 2011

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

Fertilizer – Nitrogenous, Potassic, Phosphatic and Others

Upriver shipments of fertilizer from April to June 2011 were above 2007-2010 averages with the exception of shipments in May 2011. In April 2011, upriver shipments dramatically surpassed the average of 3,000 tons by an impressive 851 percent (Figure 2.7). The dramatic increase in upriver shipments of fertilizer in April and June 2011 confirms that the fertilizer industry shipped very little during the winter and waited until the locks reopened to ship their product. Industry representative stated that only 1,500 tons of fertilizers were shipped by rail during the lock outage due to the seasonal decrease in demand (Interim Report #3). However, by April Pacific Northwest farmers were in need of fertilizer for the late planting season. Therefore, the fertilizer industry was not heavily impacted by the lock outage due to the late spring.

Fig. 2.7 Monthly and Average Tonnages of Fertilizer (Nitrogenous, Potassic, Phosphatic and Others) Barged Upriver for April - June 2011

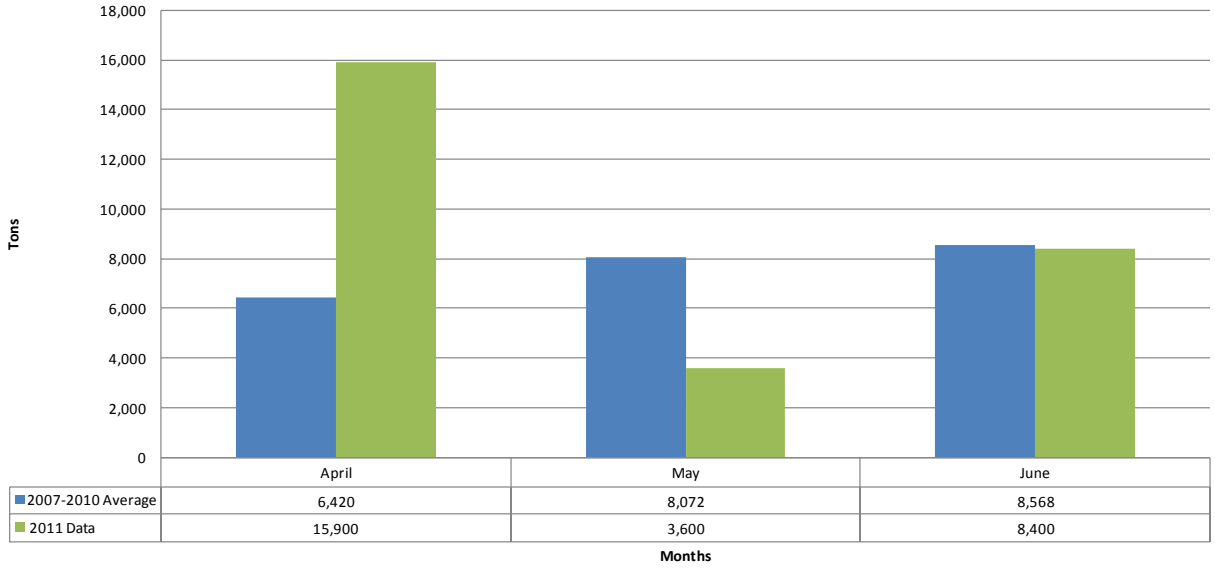


Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports

Iron Ore, Iron Steel Waste and Scrap

Downriver shipments of iron ore, iron steel waste and scrap barged in 2011 were below their 2007-2010 averages with the exception of extremely large shipments right after the lock outage. In April 2011, downriver shipment volumes were about 148 percent above the average (Figure 2.8) and June 2011 volumes only missed the average by two percent. According to barge representatives, the iron ore industry was dissatisfied with the rail service during the lock outage by which they shipped 9,000 tons from December 2010 to March 2011 (Interim Report #3). Therefore, the iron ore industry decided to ship at least two additional barges following the lock outage to make up for decreased shipments during the winter. The dissatisfaction in rail service experienced by the iron ore industry is evident in the significant volumes shipped in April 2011.

Fig. 2.8 Monthly and Average Tonnages of Iron Ore, Iron Steel Waste and Scrap Barged Downriver for April - June 2011

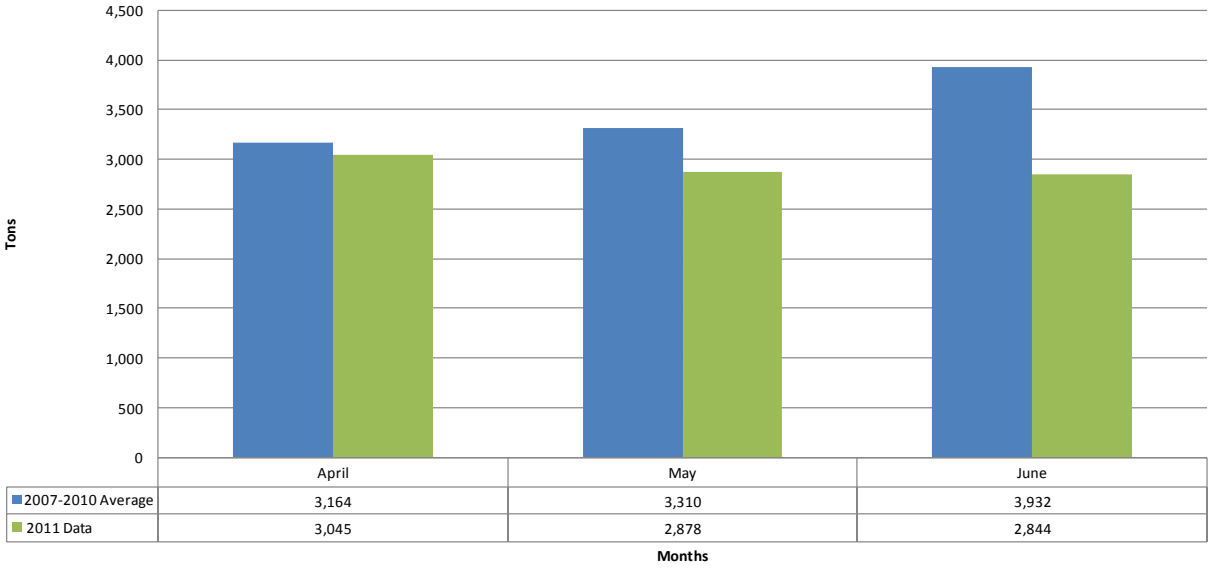


Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports

Primary Non-Ferrous Metallic Products and Fabricated Metal Products

Downriver movements of primary non-ferrous metallic and fabricated metal products (including smelted products) were slightly below 2007-2010 averages. Downriver movements during this three month period only missed corresponding monthly averages by four to 28 percent. The slightly below average tonnages of primary non-ferrous metallic products shipped after the lock outage, along with evidence that below average shipments were made prior to the lock outage and no movements were recorded during indicates that this industry showed a decrease in transportation demand prior, during and after the lock outage (Interim Reports #2 and #3). However, since shipments of these products during the lock outage were untraceable, there is the chance that movements of smelted products were shipped by rail and/or truck during the winter.

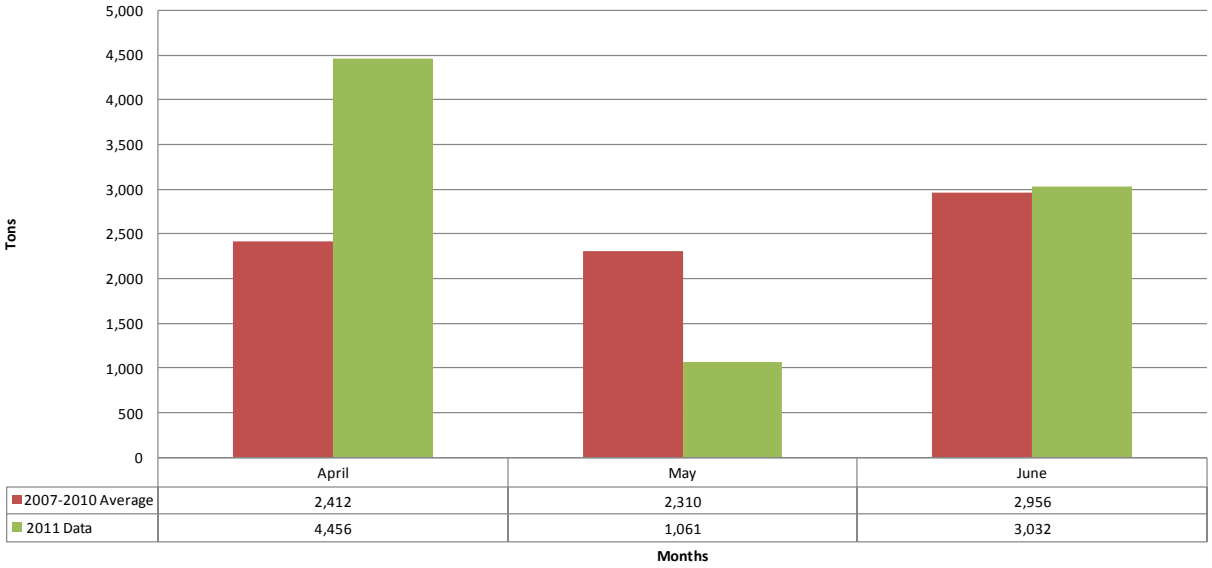
Fig. 2.9 Monthly and Average Tonnages of Primary Non-Ferrous Metallic and Fabricated Metal Products Barged Downriver for April - June 2011



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

Monthly upriver shipments of primary non-ferrous metallic products in April and June 2011 were above average based on data from the past four years. Tonnages moving upriver in April 2011 were about 85 percent higher than the average from 2007-2010 (Figure 2.10). The large increase in April 2011 was likely owing to the absence of large shipments being made prior to the lock outage and pent up demand (Interim Report #2).

Fig. 2.10 Monthly and Average Tonnages of Primary Non-Ferrous Metallic and Fabricated Metal Products Barged Upriver for April - June 2011

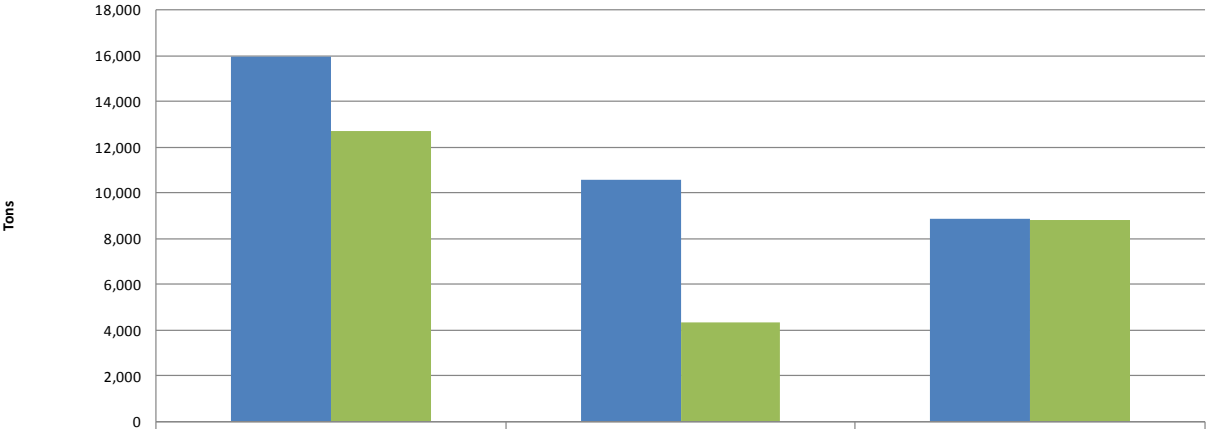


Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports

Vegetable Products, Animal Feed, Grain Mill Products, Flour and Other Processed Grains and Other Agricultural Products

Downriver shipments of vegetable products; animal feed, grain mill products, flour and other processed grains; and other agricultural products were below 2007-2010 averages from April to June 2011. However, movements made downriver in June 2011 were only 0.4 percent below average. The low volume of agricultural products shipped after the lock outage may be a result of several factors. Agricultural products were shipped in above average volumes during September and October 2011 (prior to the lock outage) and over 33,000 tons were shipped during the lock outage (Interim Reports #2 and #3). Also, agricultural products may have not been in high demand during the months of April, May or June 2011. In any case, this industry did not return to the river with large volumes immediately following the lock outage.

Fig. 2.11 Monthly and Average Tonnages of Vegetable Products; Animal Feed, Grain Mill Products, Flour and Other Processed Grains; and Other Agricultural Products Barged Downriver for April - June 2011



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

2.2 Surges in Commodity Movements Prior to and After Extended Lock Outage

Commodity movements prior to and after the extended lock outage are examined in this section as to determine whether industries were able to effectively reconfigure commodity shipments that would have shipped by barge during the extended lock outage. Historic monthly averages for the three months prior to and after the lock outage, September through November and April through June, respectively, are compared to the actual monthly tonnage for those months in 2010 and 2011.

The information presented in this section only examines downriver movements since shipments in the westward direction make up over 75 percent of annual waterborne shipments in both directions. In addition, monthly total tonnages and monthly wheat tonnages will be the only volumes examined in order to simplify discussion.

Note: in the following graphs, blue bars represent the 2007-2009 average downriver total tonnages, red bars represent pre lock outage monthly total tonnages, green bars represent the 2007-2009 average downriver wheat tonnage and purple bars represent post lock outage monthly wheat tonnages. Three year average tonnages are always on the left side and pre and post lock outage data are always on the right side of each monthly column.

Commodity Movements Prior to the Lock Outage

During the three months before the lock outage on the Columbia-Snake River, monthly total shipments downriver were significantly higher than corresponding historic averages. In September 2010, total shipments made downriver were 37 percent above the historical average (Table 2.3). Total shipments downriver in October 2010 were 23,000 tons more than, or four percent higher than, the October average from 2007-2009. Lastly, total downriver movements in November 2010 were 12 percent above the corresponding historical average (Figure 2.12).

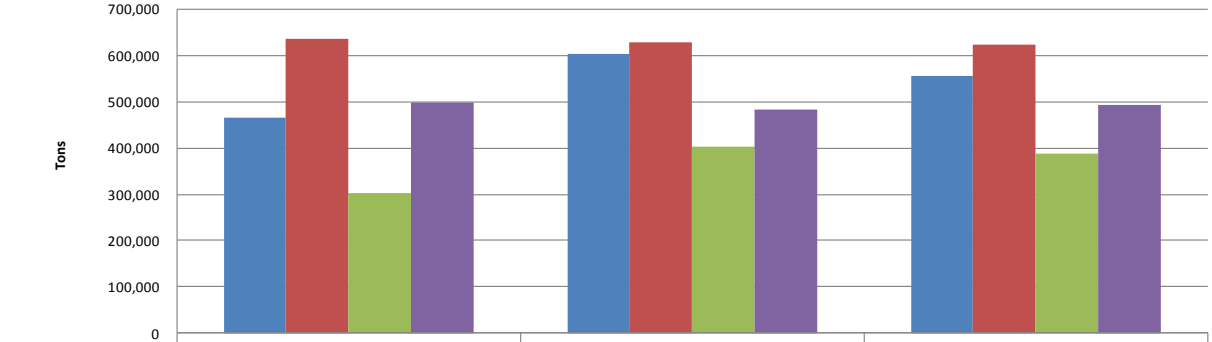
Likewise, total monthly downriver wheat shipments were significantly higher than their corresponding historic averages. September 2010 downriver shipments of wheat were a remarkable 65 percent above average (Table 2.3). Shipments of wheat in October 2010 were 80,000 tons above average or an increase of 20 percent. Lastly, downriver wheat movements in November 2010 were 27 percent above average (Figure 2.12).

These significantly above average movements show that industries and shippers were prepared to ship their products prior to the lock outage as to avoid additional time and expenses to ship commodities by rail or truck during the lock outage. The wheat industry in particular shipped considerably larger and above average shipments prior to the lock outage; during this time wheat producers experienced high wheat prices due to increased demand for wheat. This increase was partially the result of a ban on Russian wheat exports due to a massive drought in Eastern Europe. Wheat producers in the Pacific Northwest jumped at the opportunity to sell their wheat at historically high prices. Barge transportation in this industry is the most economical mode of transportation and overseas buyers expected wheat shipments to be on time despite the transportation disruption; these three factors lead to many wheat elevators' decision to ship early and often prior to December 2010 as to build up inventories in exporters' houses and to satisfy wheat orders overseas.

Table 2.3 Monthly Wheat and Total Tonnage Shipped Downriver Prior to the Extended Lock Outage

	September		**October**		**November**	
Year	*2007-2009 Average*	*2010*	*2007-2009 Average*	*2010*	*2007-2009 Average*	*2010*
Total	464,998	635,894	604,044	627,164	555,725	623,601
Wheat	301,995	498,162	402,270	482,300	386,875	491,955

Fig. 2.12 Monthly Wheat and Total Tonnage Shipped Downriver Prior to the Extended Lock Outage, September - November



	September	October	November
Historical Total Average	464,998	604,044	555,725
Pre Outage Total	635,894	627,164	623,601
Historal Wheat Average	301,995	402,270	386,875
Pre Outage Wheat	498,162	482,300	491,955

Commodity Movements Following the Lock Outage

After the lock outage, during the months of April through June 2011, monthly total shipments downriver were significantly above average for April and May, but below average for the month of June. In April 2011, total downriver shipments reached 958,500 tons and were a noteworthy 84 percent above average (Table 2.4). May 2011 total shipments were 55 percent above the 2007-2009 May average. Total downriver shipments in June 2011 were the only monthly movements marginally below average; shipments during this month were 12 percent below average (Figure 2.13).

Total monthly wheat movements made downriver, however, were above average for all three months following the lock outage. In April 2011, total wheat shipments moving downriver reached 758,000 tons and were a significant 118 percent above the 2007-2009 April average (Table 2.4). Total wheat shipments during the month of May were 84 percent above average. Finally, June 2011 shipments of wheat downriver were also above average by 88 percent (Figure 2.13).

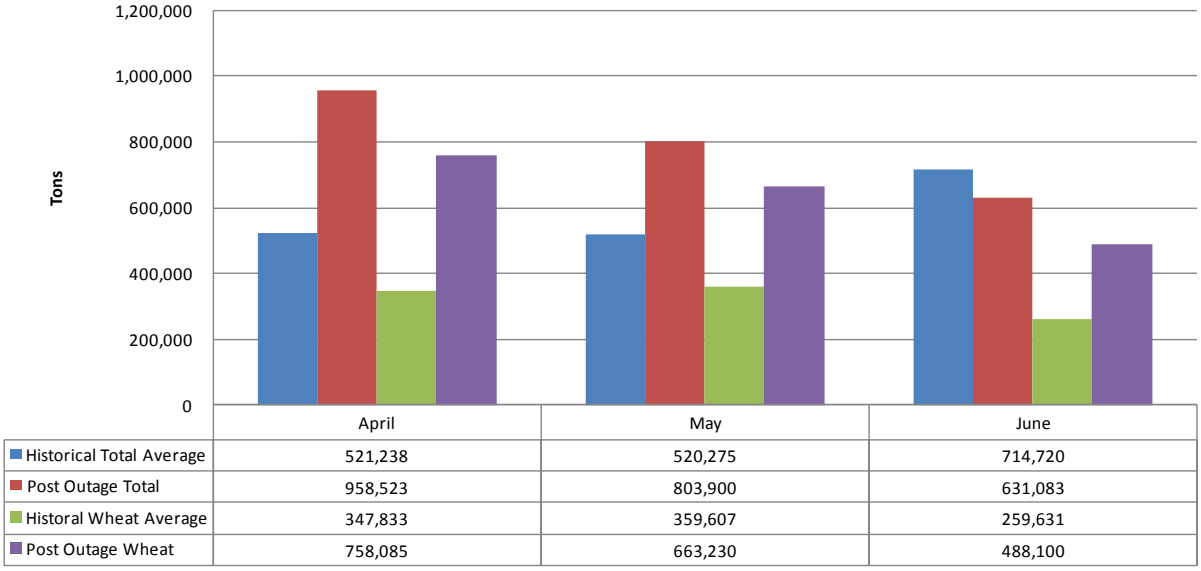
Like commodity movements downriver prior to the lock outage, total monthly shipments immediately following the reopening of the lock system were significantly above average during the months of April and May. This surge in shipments during the two months after the lock outage is evidence that industries waited to transport their goods until after the lock outage rather than during. This is likely due to the fact that barge transportation is more economical and more convenient for those industries that regularly use waterborne transportation. In addition, wheat shipments following the lock outage were notably larger than normal; this shows that the wheat industry chose to either ship prior to the lock outage, as is evident in Figure 2.12, or to transport goods after the lock outage ended (Figure 2.13). This is logical as barge transportation is substantially less expensive than rail or truck. During the lock outage,

those elevators in the wheat industry that regularly use barge shipped an insignificant volume by truck and rail; these volumes totaled about 45,500 tons (Interim Report #3). It appears that since the wheat industry prepared so well for the lock outage, as is evident from the above average monthly tonnages in Figure 2.12, elevator managers did not need to ship as much grain during the lock outage and were able to wait until the lock system reopened.

Table 2.4 Monthly Wheat and Total Tonnage Shipped Downriver After the Extended Lock Outage

	April		May		June	
Year	*2007-2009 Average*	*2011*	*2007-2009 Average*	*2011*	*2007-2009 Average*	*2011*
Total	521,238	958,523	520,275	803,900	714,720	631,083
Wheat	347,833	758,085	359,607	663,230	259,631	488,100

Fig. 2.13 Monthly Wheat and Total Tonnage Shipped Downriver After the Extended Lock Outage, April - June



	April	May	June
Historical Total Average	521,238	520,275	714,720
Post Outage Total	958,523	803,900	631,083
Historal Wheat Average	347,833	359,607	259,631
Post Outage Wheat	758,085	663,230	488,100

References

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Simmons, Sara and Ken Casavant. “Industry Preparations for the Columbia-Snake River Extended Lock Outage, July – December 2010.” FPTI Report Number 2. Pullman, WA: February 2011.

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Appendix A: Map of the Columbia-Snake River System