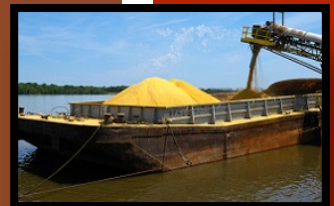


# FREIGHT POLICY TRANSPORTATION INSITUTE



Industry Reactions to the  
Columbia- Snake River  
Extended Lock Outage  
December 2010 – March 2011

# **Industry Reactions to the Columbia-Snake River Extended Lock Outage, December 2010 – March 2011**

FPTI Research Report Number 9  
June 2011

By

Sara Simmons  
Research Assistant

Ken Casavant  
Principal Investigator  
Director, Freight Policy Transportation Institute

## **Transportation and Environmental Assessment of the Impact of Extended Lock Outages: the Columbia-Snake River System Interim Report #3**

Freight Policy Transportation Institute  
Washington State University  
School of Economic Sciences  
301C Hulbert Hall  
Pullman, WA 99164-6210

## **FPTI Research Reports: Background and Purpose**

This is the ninth 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.

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), Randolph Resor (WSDOT), 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:

Dr. Ken Casavant, Director  
Freight Policy Transportation Institute  
School of Economic Sciences  
Washington State University  
301C Hulbert Hall  
Pullman, WA 99164-6210  
(509) 335 1608

Or go to the following Web Address:  
[www.fpti.wsu.edu](http://www.fpti.wsu.edu)

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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.

## **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 are discussed in the following report.

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. The actual extent and form of some of these impacts is discussed in the following report.

This is the third of four interim reports 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 scope of this 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 road damage, energy consumption and emissions production during the three major phases of the study
- Develop and describe the methodology useful for evaluating and understanding the dynamic nature of disruptions, industry reactions and responses
- Identify the value of the river option

The four specific work phases identified for this study are:

- 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

For additional information about the FPTI or this report, please contact Ken Casavant at the following address:

Dr. Ken Casavant  
 Freight Policy Transportation Institute  
 School of Economic Sciences  
 Washington State University  
 301C Hulbert Hall  
 Pullman, WA 99164-6210  
 (509) 335-1608

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## **ACKNOWLEDGEMENTS**

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# **Industry Reactions to the Columbia-Snake River Extended Lock Outage, December 2010 – March 2011**

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# **Industry Reactions to the Columbia-Snake River Extended Lock Outage, December 2010 – March 2011**

## **Executive Summary**

The Columbia-Snake River System in the Pacific Northwest recently underwent a massive and sustained lock outage, eliminating barge transportation on much of the upper Columbia River and all of the Snake River. The impact of this loss of a major mode of transportation was significant and the impact on demands of other modes of transportation noteworthy.

The overall purpose of this report is to capture the effects on shippers, river carriers, government entities, ports and communities during the extended lock outage. The report's secondary objective is to describe the general characteristics of transportation movements by barge, rail and truck during the 15 week period lock outage between December 2010 and March 2011.

Since most shippers, carriers and industries did not have barge transportation available, these entities used two alternatives to transport commodities: rail and truck. Between December 2010 and March 2011 most products were transported by truck. This is interesting to note since most industry representatives stated prior to the lock outage that products transported normally by barge would move by rail as it is typically more inexpensive than truck. The convenience of truck in transporting goods short distances or by routes in which rail does not exist partially influenced the decision to shift more heavily to rail. Many industries, including wheat, forestry and waste sanitation, chose to send their goods to different markets during the lock outage which involved rerouting commodities to different areas, many of which were away from rail track.

Of those shippers and industries with access to the Columbia River below The Dalles Lock and Dam, a total of 377,000 tons were shipped downriver between December 10, 2010 and March 24, 2011; the tonnage shipped downriver during the lock outage decreased by 79 percent when compared to an average tonnage of 1.8 million tons for the last three winters. The commodities with the largest volume of downriver shipments, which traveled through Bonneville Lock and Dam only, were wheat; forest products, lumber, logs and woodchips; sand, gravel and stone products; and primary non-ferrous metallic products. During this time period, wheat comprised 62 percent, or 233,500 tons, of the total 377,000 tons moving below the lock outage; normally downriver movements during any time period make up at least 75 percent of shipments flowing through entire lock system.

Around 10,500 tons were shipped upriver between December 10, 2010 and March 24, 2011 through Bonneville to The Dalles area; this is a 98 percent decrease in tonnage shipped during the winter when compared to the typical 608,500 tons. The commodity with the largest volume of upriver shipments over the 15 week span was manufactured equipment and machinery. Ninety nine percent of the upriver shipments during the lock outage consisted of

this commodity; manufactured equipment and machinery volumes were 250 percent above the typical 3,000 tons shipped during the winter. This surge in upriver shipments of this commodity is due to the U.S. Army Corps of Engineers' construction and assembly of lock gates and repairs. The Corps reported that during the month of February, two gate leaves constructed for The Dalles Lock and Dam originated in Portland and passed through Bonneville hence explaining the large movement of manufactured equipment and machinery during this month.

The continuation of the Pacific Northwest Wheat Case Study compared normal volumes, rates and modal choices for wheat elevators to those values during the extended lock outage. This survey allowed the authors to determine how the outage impacted wheat shipments and sales in the Pacific Northwest.

Survey results revealed that all wheat shipment volumes declined during the lock outage. Southern Washington firms experienced the greatest change; shipments decreased by 95 percent during the lock outage in this region. Eastern Oregon firms experienced a decline in shipments of only 20 percent. Northern Idaho and Southern Idaho suffered declines in shipments of 86 percent and 32 percent, respectively.

Most wheat firms in the Pacific Northwest moved the majority of their product, an average of 68.5 percent, by rail during the lock outage. This compares to the average of 29 percent during a typical winter. However, Eastern Oregon and Southern Washington firms heavily employed trucking services to transport wheat from December 2010 to March 2010, about 40 to 75 percent of shipments, respectively.

Twenty percent of wheat coming from Eastern Oregon was shipped via truck-barge. This was because of one wheat elevator's access to the Columbia River, below The Dalles Lock and Dam and the rest of the lock outage, and Bonneville Lock and Dam. This lock was open 11 weeks during the 15 week outage.

On average, truck-barge rates were at least 36 cents per bushel less than rail and truck during the lock outage, as compared to at least 10 cents per bushel less during the typical year. Direct truck to final market continues to be the most expensive form of transportation in the Pacific Northwest. Northern Washington and Southern Idaho were the only regions in which rail was more costly than truck.

Shipping rates for truck and rail increased slightly in the Pacific Northwest during the lock outage four percent and two percent, respectively. Truck-barge rates were not included since only one firm in Eastern Oregon was able to use barge transportation during the extended lock outage.

Additional costs, such as investment in storage expansion and shipping from alternative sources, were incurred by several firms in varying amounts. Railcars were considered unreliable for some elevators during the lock outage, leading to unforeseen costs, delays and potentially lost business.

Due to the fact that barge transportation, for the most part, was halted for the four months of the extended lock outage, most barge companies temporarily laid off a significant number (from 35 percent to 67 percent) of their employees, including boat crews, in order to reduce costs. Some barge companies offered job sharing and reduced employees' work hours rather than lay off their entire staff. Some barge employees chose to be laid off during the winter months to pursue schooling and/or extended vacations that would not normally have been possible. This allowed employees at certain firms who desired to stay on staff during the outage to do so. All of the barge lines were able to continue benefit packages for employees during the extended lock outage. None of the barge lines located on the Columbia-Snake River lost any employees to the outage by either discouragement or lack of funds.

Although the bulk of the Columbia-Snake River was closed to barge traffic from December 2010 to March 2011, Bonneville Lock and Dam remained open during a large portion of the outage. This allowed a few barge lines to continue service to areas below The Dalles Lock and Dam and within pools. Commodities shipped by barge during the extended lock outage included select sources of wheat, forest products, paper and rock products (see Section 2.2).

In contrast to barge companies, which lost business for the majority of the lock outage, rail lines experienced an increase in cargo loads during the lock outage. Rail lines in the Pacific Northwest dealt with greater than normal volumes, additional products that would have moved by barge, increased crew numbers, additional days of operation and several extra trains per week. Part of this experience included rail lines reaching out to industries that needed transportation during the outage and partnering with local ports to aid in the movement of products that would normally travel by barge.

Petroleum companies have been reserved about their procedures during the extended lock outage. When a petroleum representative was asked about specific impacts and volumes shipped from December 2010 to March 2011, he gave this statement: "Regrettably, much of the information you have requested is company propriety information and we will not release it." However, according to the Oregon Department of Energy, petroleum companies shipped more than half of their product by tanker truck during the lock outage. In addition, six petroleum barges were stored at Pasco during the beginning of the lock outage to supply Eastern Washington and Oregon with enough fuel for about three weeks, which gave fuel companies time to arrange rail and truck transportation for the remaining lock outage.

Paper companies in the Pacific Northwest moved 58,000 tons of forest products from December 2010 to March 2011 by truck. One paper firm stated that woodchip shipments were being brought in by five trucks per day over the 15 week period. However, not all forest products were transported from the typical origin of Lewiston, Idaho and Boardman, Oregon. One paper company trucked local logs and woodchips, from a firm that is not normally utilized, to their facility in order to mitigate transit time and costs. Additional costs were incurred during the extended lock outage including an increase in inventory costs, storage costs and transportation costs.

Pacific Northwest Waterways Association's activities during the lock outage included being a main contact for the media regarding questions and concerns surrounding the extended lock closure, providing members with updates and information concerning the lock outage and meeting with district and federal Congressional staff to emphasize the importance of the Columbia-Snake River System and provide rehabilitation updates.

U.S. Army Corps of Engineers' activities during the lock outage included hosting several teleconferences for stakeholders discussing progress made and projects completed, documenting all progression in lock rehabilitation made during to the lock outage on the USACE website, making plans for potential disruptions of the lock outage including bad weather and unexpected delays in construction and traffic and hosting several tours at various Columbia-Snake River locks.

## 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. 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 report's main objective is to capture the effects on, and decisions made by, shippers, river carriers, government entities, ports and communities during the extended lock outage. The report's secondary objective is to describe the general characteristics of transportation movements by rail and truck during the 15 week period between December 10, 2010 and March 24, 2011.

The specific research objectives and methodology are first reviewed in Section 1. Section 2 reviews major commodities shipped west and east by alternative modes, specifically rail and truck, in the Pacific Northwest from December 10, 2010 to March 24, 2011. An evaluation of monthly tonnage for major commodities shipped up and downriver during the lock outage follows at the end of Section 2. Section 3 looks at the impacts of the lock outage on the Pacific Northwest wheat industry, including the results of a survey conducted of participants of the wheat industry in Washington, Oregon and Idaho. A copy of the survey is included in Appendix A. Industry impacts on other major commodities are discussed in Section 4. The final segment, Section 5, describes the activities and procedures of governments and institutions in the Pacific Northwest during the extended lock outage.

**Note:** Since Bonneville Lock and Dam was the only lock open during the majority of the extended lock outage (11 of the 15 weeks), commodity industries and carriers were able to transport only four major commodity products downriver between Portland and The Dalles, Oregon from December 10, 2010 through February 28, 2011 (See Appendix C for a map of the Columbia-Snake River System). Waterborne movements provided are based on barge reports collected at the Bonneville Lock and Dam.

## **1. Research Objectives and Analysis Approach**

The primary objectives of interim report #3 are as follows:

- To identify the general impacts on, and decisions by, individuals relative to the recent extended lock outage, including those of governments, industries, carriers and private entities
- To describe in detail the major commodity movements by rail and truck in the Pacific Northwest for the 15 week period of the extended lock outage (December 10, 2010 – March 24, 2011)

Information regarding impacts on industries and alternative modes (rail and truck) was provided by shippers, river carriers, government divisions, industry personnel, ports and community leaders. Information was drawn through interviews, a survey of the wheat industry in the Pacific Northwest, transportation conferences, meetings, interviews and government and industry websites. A list of those interviewed and surveyed is available in Appendix B.

Information provided in this report regarding commodity movements on the Columbia-Snake River is partly 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 locks owned or operated by the U.S. Army Corps. This report focuses only on the data collected for the Bonneville Lock and Dam during the time period from December 10, 2010 through March 24, 2011 as these are the months of the extended lock outage. For an evaluation of commodity movements on the Columbia-Snake River historically and prior to December 10, 2010, please refer to the FPTI Research Report #1 and #2 at <http://www.fpti.wsu.edu/reports.htm>.

The barge data analyzed in this report captures commodities 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. However, this interim report focuses on the fourteen major commodity types discussed below. These commodities were selected as they were the highest volume movements over the last twenty years. Most of these commodity volumes decreased in the months of December 2010 through March 2011. For previous major commodity shipment volumes and other related data, refer to FPTI Research Report #1 and #2.



## **2. The Extended Lock Closure: Commodity Movements**

Commodity shipments which traveled by rail and truck during the extended lock outage of the Columbia-Snake River are discussed in this section. The commodity movements in the 15 weeks of the extended lock outage allow the researchers and readers to determine how shippers and carriers were affected during this interruption in transportation. Most shippers and carriers were left with only rail and truck transportation and no option for waterborne movements; these transportation impacts are evident in the following data and findings.

Bonneville Lock and Dam remained open for 11 of the 15 weeks of the extended lock outage allowing one barge line and some commodity industries to utilize the lower portion of the Columbia River to ship products, including wheat, to Portland to be exported.

This section begins with a thorough coverage of commodity movements that were transported by alternative modes, namely truck and rail, which would have normally moved by barge during this time period. These data were provided by industry and shipping representatives. Section 2.2 follows with a brief description of commodity movements by barge that occurred below The Dalles Lock and Dam during the extended lock outage. Only five major commodity types actually traveled by barge along the Columbia River; these products travelled solely in the downriver direction. After the presentation of these data, a summary of all commodity movements during the lock outage are provided in Section 2.3.

### **2.1 Major Commodity Movements by Rail and Truck, December 2010 – March 2011**

Since the large majority of shippers, carriers and industries did not have barge transportation available during the lock outage (and would have used barge transportation had the river been navigable) these entities used two alternatives to transport commodities: rail and truck. The information discussed below came about through structured interviews and conversations with industry and shipping representatives in the Pacific Northwest affected by the lock outage. Petroleum figures were approximated using government and industry sources, as information regarding tonnage was considered confidential information by the petroleum firms in the region. Specific transportation costs are not included in this section as this information is also proprietary, but comments regarding fluctuation in costs during the lock outage are provided in Section 4.2 for each major commodity.

Notably, products were transported by truck or a combination of truck and rail (Table 2.1). This is interesting to note since most industry representatives stated prior to the lock outage that products transported normally by barge would move solely by rail as it is inexpensive and can haul larger loads than truck. But the actual usage of truck was higher, most likely due to the convenience of truck in transporting goods short distances or by routes in which rail track does not exist. Many industries, including wheat, forestry and waste management, chose to partially send their goods to different markets during the lock outage, which involved rerouting

commodities to different areas, most of which were not conveniently located near rail track. Also, many products only traveled a short distance (100 miles or less) or in small amounts; loading and unloading commodities from railcars was deemed by shippers to be inconvenient in these small quantities of weight.

The largest volume of tonnage transported by truck and rail instead of by barge during the lock outage was petroleum (gasoline and diesel fuels). The volume of these commodities shipped from December 2010 to March 2011 was an estimated 460,500 tons (Table 2.1). The second largest volume to travel by truck rather than barge during the lock outage was waste materials, over 68,000 tons. Forest product volumes transported by truck and rail reached a tonnage of over 58,000 and wheat shipments by truck and rail were over 45,500 tons (Table 2.1). These volumes would have normally moved by barge.

<b>Table 2.1 Rail and Truck Movements, December 2010 - March 2011</b>		
<b>Commodity</b>	<b>Transportation Mode</b>	<b>Total Tonnage</b>
Gasoline, Jet Fuel and Kerosene	Truck and Rail	184,192
Distillate, Residual and Other Fuel Oils	Truck and Rail	276,287
Fertilizer (Nitrogenous, Potassic, Phosphoric and Others)	Rail	1,500
Forest Products (Lumber, Logs and Woodchips)	Truck and Rail	58,283
Sand, Gravel, Stone and Crushed Rock	-	0
Iron Ore, Iron Steel Waste and Scrap	Rail	9,000
Primary Non-Ferrous Metal Products	-	-
Wheat	Truck and Rail	45,648
Corn, Rye, Barley, Rice, Sorghum and Oats	Truck	212
Vegetable Products, Animal Feed and Other Agricultural Products	Truck and Rail	33,978
Waste Material (Garbage, Landfill, Sewage and Waste Water)	Truck	68,250
<b>Total</b>		<b>677,349</b>

**Source:** Industry and shipping interviews, Washington State University

## **Wheat**

Over 45,500 tons of wheat was shipped by rail and truck from the east of the Pacific Northwest to Portland (Table 2.1). This tonnage was calculated from the data provided by a wheat elevator survey of Washington, Oregon and Idaho (see Section 3). This wheat shipment volume was calculated as the difference between the amount normally shipped by rail and truck and the amount shipped by rail and truck during the extended lock outage. That difference would normally move by barge, but during the lock outage, this volume was rerouted to rail and trucking lines.

### **Petroleum: Gasoline, Jet Fuel and Kerosene; Distillate, Residual and Other Fuel Oils; and Lubricating Oils and Grease**

Petroleum products (gasoline and diesel fuels) were the largest volume commodity moved by truck or rail during the extended lock outage. Since precise values were not available, the authors used information from the Washington State Department of Commerce (WSDC), Tidewater Barge Lines and the average tonnage from December to March for the last three years, 2007 to 2010, to formulate the tonnage listed below. The average was used because there were no identified fuel shortages or price increases (as a direct effect of the lock outage) during the winter months, indicating that the “normal” amount of petroleum traveled from west to east. The amount barged upriver and stored on river near Pasco refineries and fuel storage facilities was then subtracted from the total. This stored fuel would have normally moved during the winter months, but fuel companies used barge transportation to plan ahead of the lock outage. About 184,000 tons of gasoline products and 276,000 tons of diesel fuels traveled from west of the Cascade Mountain Range in Washington and Oregon to the eastside of these states and Idaho (Table 2.1). No petroleum products were shipped by pipeline as volume capacities were already subscribed. About 60 percent of the tonnage of these two products was transported by truck and the other 40 percent by rail (Oregon Department of Energy and British Petroleum).

### **Fertilizer – Nitrogenous, Potassic, Phosphatic and Others**

Only 1,500 tons of fertilizer was transported by rail during the lock outage (Table 2.1). An industry representative commented that a very small amount of fertilizer is transported during the winter months. This is due to the fact that fertilizer is mainly shipped upriver for two wheat planting seasons: spring and early fall.

### **Forest Products, Lumber, Logs and Woodchips**

A substantial amount of forest products were trucked and railed during the lock outage; over 58,000 tons moved westward from December 2010 to March 2011 (Table 2.1). In addition, over 127,000 tons were shipped downriver (westward) by barge through Bonneville Lock and Dam from December 2010 through March 2011 (Table 2.2). This was due to the fact that Bonneville Lock and Dam was open for the majority of the lock outage and forest products load onto barge below The Dalles Lock and Dam, hence uninterrupted by the closure. These products were used as inputs for paper firms in the Portland area. Regardless of extensive planning and stock piling of woodchips and pulp, these firms needed additional volumes of forest products during the lock outage, hence the large volume shipped via truck and rail.

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

Sand, gravel and stone products were not shipped during the lock outage. The barge line that normally ships rock products decided not to ship the product during the lock outage. It was stated that truck and rail costs were too expensive and the demand for rock was not strong enough. This industry will continue to ship rock products after the Columbia-Snake River reopens.

### **Iron Ore, Iron Steel Waste and Scrap**

Iron ore products were shipped by rail during the lock outage. Nine thousand tons moved in a westward direction during the winter months of 2010-2011 (Table 2.1). About 7,000 tons more would have moved by rail, but a representative from the firm that ships steel by barge stated that the rail service was unreliable and therefore contracted at least two barges to ship steel products downriver in late March and early April. The volume to be moved by these barges would have been shipped by rail during the lock outage.

### **Primary Non-Ferrous Metallic Products and Fabricated Metal Products**

The authors were unable to find specific industries that transport primary non-ferrous metallic and fabricated metal products. However, 3,000 tons of this commodity moved downriver by barge during the lock outage from below The Dalles Lock and Dam through to Portland. About 3,000 more moved during the first nine days of December 2010 and the last seven days of March 2011 from the Boardman, Oregon area through to Portland. If there were additional volumes of this commodity moved during the lock outage it most likely moved by truck or rail, but again, the authors were unable to locate industries or firms that handled this commodity.

### **Agricultural Products: Corn, Rye, Barley, Rice, Sorghum and Oats; Vegetable Products, Animal Feed, Grain Mill Products, Flour and Other Processed Grains; and Other Agricultural Products**

Over 34,000 tons of agricultural products were shipped downriver by rail and truck from December 2010 to March 2011 (Table 2.1). The volume noted for corn, rye, barley, rice, sorghum and oats was estimated using data from the Port of Portland. The Port subsidized truck and rail costs of barge clients during the lock outage in order to maintain their customer base during the slowdown of shipments. The Port of Portland's subsidy program during the lock outage is explained in further detail in Section 4.1. In addition, corn, barley, rice, sorghum and oat production has significantly decreased in recent years. These commodities are also moving by truck and rail throughout the year to different markets other than Portland (Washington Grain Commission).

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

Waste material was shipped by truck to eastern Oregon during the extended lock outage; 68,250 tons of garbage and waste water moved during this time period (Table 2.1).

## **2.2 Major Waterborne Commodity Movements, December 2010 – March 2011**

To capture the major commodity shipments barged upriver and downriver during the extended lock outage, a description is provided of the major waterborne commodity movements from December 10, 2010 through March 24, 2011. This section includes discussion of only four major commodities that traveled up or downriver during the lock outage in significant volumes. This allowed assessment of changes in waterborne commodity movements during the winter of 2010-2011 and to determine how shippers and carriers were impacted by the outage. For example, a surge in waterborne commodity movements during the extended lock outage would be an indication that industries' products were in high demand during the outage and/or that barge transportation was a viable and economical option for particular industries.

**Note:** waterborne commodity movements commenced in the pool just east of Bonneville Lock and Dam and west of The Dalles Lock and Dam and continued downriver through Bonneville to Portland and Vancouver, Washington. Bonneville was only operational for 11 of the 15 weeks of the lock outage; all other locks were shut down for the entire 15 weeks. Therefore, barge movements could not operate east of The Dalles during the lock outage.

### **Downriver Waterborne Movements:**

A total of 377,000 tons were shipped downriver below The Dalles Lock and Dam, or below the extended lock outage, through Bonneville between December 10, 2010 and March 24, 2011 (Table 2.2). During a typical winter (December through March), over 1.75 million tons of commodities travel downriver; during the lock outage, commodity movements by barge were 79 percent below average. The major commodities with the largest volume of downriver shipments over the 15 week 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
- Primary Non-Ferrous Metallic Products and Fabricated Metal Products

The total downriver tonnage of each of these commodities exceeded or equaled 3,000 tons (Table 2.2). During this time period, wheat comprised 62 percent, or 233,500 tons, of the total 377,000 tons; these wheat shipments came from elevators west of The Dalles Lock and Dam. The second highest commodity by total tonnage was forest products at 127,000 tons or 34

percent of the 15 week volume. Forest products were shipped downriver from Bingen, Washington, where a local lumber firm is located. Sand, gravel and other stone products accounted for more than 5,000 tons (one percent) of total downriver movement (shipped from a firm at The Dalles, Oregon, just west of The Dalles Lock and Dam) and primary non-ferrous metallic products totaled 3,000 tons or less than one percent of the total movement west (Table 2.2). The exact origin of barges containing primary non-ferrous metallic products is unknown during this time, but these products were shipped from a location west of The Dalles.

**Table 2.2 Monthly Tonnage Shipped Downriver, December 10, 2010 - March 24, 2011**

<b>Commodity by Ton</b>					
	<b>December</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>Total</b>
Empty	0	0	0	0	<b>0</b>
Coal, Lignite and Coke	0	0	0	0	<b>0</b>
Petroleum Products (General)	0	0	0	0	<b>0</b>
Crude Petroleum	0	0	0	0	<b>0</b>
Gasoline, Jet Fuel and Kerosene	0	0	0	0	<b>0</b>
Distillate, Residual and Other Fuel Oils	0	0	0	0	<b>0</b>
Petroleum Pitches, Asphalt and Naptha	0	0	0	0	<b>0</b>
Chemicals and Related Products (General)	0	0	0	0	<b>0</b>
Fertilizer (Nitrogenous, Potassic, Phosphoric)	0	0	0	0	<b>0</b>
Organic Industrial Chemicals	0	0	0	0	<b>0</b>
Crude Materials and Inedibles, Except Fuels	0	0	0	0	<b>0</b>
Forest Products (Lumber, Logs, Woodchips)	25,430	41,300	54,800	5,800	<b>127,330</b>
Pulp and Waste Products	0	0	0	3,500	<b>3,500</b>
Sand, Gravel, Stone and Crushed Rock	5,295	0	0	0	<b>5,295</b>
Iron Ore, Iron Steel Waste and Scrap	0	0	0	0	<b>0</b>
Marine Shells (Unmanufactured)	0	0	0	0	<b>0</b>
Non-Ferrous Metallic Ores	0	0	0	0	<b>0</b>
Sulfur (Liquid and Dry), Clay and Salt	0	0	0	0	<b>0</b>
Primary Manufactured Goods	0	0	3,000	0	<b>3,000</b>
Paper and Allied Products	32	0	0	0	<b>32</b>
Building Cement, Concrete, Lime and Glass	0	0	0	0	<b>0</b>
Primary Iron and Steel Products	0	0	0	0	<b>0</b>
Primary Non-Ferrous Metal Products	0	0	3,000	0	<b>3,000</b>
Primary Wood Products, Veneer and Plywood	0	0	0	0	<b>0</b>
Food and Farm Products (General)	0	0	0	0	<b>0</b>
Fresh Fish and Other Marine Products	0	0	0	0	<b>0</b>
Wheat	92,050	65,700	72,300	3,600	<b>233,650</b>
Corn	0	0	0	0	<b>0</b>
Rye, Barley, Rice, Sorghum and Oats	0	0	0	0	<b>0</b>
Oilseeds (Soybean, Flaxseed and Others)	0	0	0	0	<b>0</b>
Vegetable Products	0	0	0	0	<b>0</b>
Animal Feed, Grain Mill Products and Flour	596	0	0	0	<b>596</b>
Other Agricultural Products, Including Food	0	0	0	0	<b>0</b>
Barged Fish	0	0	0	0	<b>0</b>
All Manufactured Equipment and Machinery	515	130	0	0	<b>645</b>
Waste Material (Garbage, Landfill, Sewage)	0	0	0	0	<b>0</b>
Commodity Unknown	0	0	0	0	<b>0</b>
<b>Total</b>	<b>123,918</b>	<b>107,130</b>	<b>133,100</b>	<b>12,900</b>	<b>377,048</b>

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

\* December 2010 data only includes the last twenty two days of the month and  
March 2011 data only includes the first twenty four days of the month.

### **Upriver Waterborne Movements:**

About ten times less tonnage traveled upriver than downriver during the extended lock outage. Around 10,500 tons were shipped upriver between December 10, 2010 and March 24, 2011 (Table 2.3). Since over 608,000 tons are usually shipped upriver during the winter months, upriver shipments between Portland and The Dalles Lock and Dam were 98 percent below average during the extended lock outage. The major commodity with the largest volume of upriver shipments over the 15 week span was (in *descending* order of tonnage):

- Forest products, lumber, logs and woodchips

Between December 10, 2010 and March 24, 2011 the total upriver tonnage of this commodity totaled 135 tons or one percent of the total (Table 2.3). These forest products moved from the Portland area to The Dalles. The second highest proportion of total upriver shipments was manufactured products, not considered a major commodity, comprising 10,500 tons (99 percent) of the total upriver tonnage during the extended lock outage (Table 2.3).

Manufactured equipment and machinery were shipped in mass quantity during the month of February 2011. This surge in upriver shipments of this commodity is due to the U.S. Army Corps of Engineers' construction and assembly of lock gates and repairs. The Corps reported that during the month of February, two gate leaves constructed for The Dalles Lock and Dam originated in Portland and passed through Bonneville hence explaining the large movement of manufactured equipment and machinery during this month.



**Table 2.3 Monthly Tonnage Shipped Upriver, December 10, 2010 - March 24, 2011**

<b>Commodity by Ton</b>					
	December	January	February	March	Total
Empty	0	0	0	0	0
Coal, Lignite and Coke	0	0	0	0	0
Petroleum Products (General)	0	0	0	0	0
Crude Petroleum	0	0	0	0	0
Gasoline, Jet Fuel and Kerosene	0	0	0	0	0
Distillate, Residual and Other Fuel Oils	0	0	0	0	0
Petroleum Pitches, Asphalt and Naptha	0	0	0	0	0
Chemicals and Related Products (General)	0	0	0	0	0
Fertilizer (Nitrogenous, Potassic, Phosphoric)	0	0	0	0	0
Organic Industrial Chemicals	0	0	0	0	0
Crude Materials and Inedibles, Except Fuels	0	0	0	0	0
Forest Products (Lumber, Logs, Woodchips)	0	135	0	0	135
Pulp and Waste Products	0	0	0	0	0
Sand, Gravel, Stone and Crushed Rock	0	0	0	0	0
Iron Ore, Iron Steel Waste and Scrap	0	0	0	0	0
Marine Shells (Unmanufactured)	0	0	0	0	0
Non-Ferrous Metallic Ores	0	0	0	0	0
Sulfur (Liquid and Dry), Clay and Salt	0	0	0	0	0
Primary Manufactured Goods	0	0	0	0	0
Paper and Allied Products	0	0	0	0	0
Building Cement, Concrete, Lime and Glass	0	0	0	0	0
Primary Iron and Steel Products	0	0	0	0	0
Primary Non-Ferrous Metal Products	0	0	0	0	0
Primary Wood Products, Veneer and Plywood	0	0	0	0	0
Food and Farm Products (General)	0	0	0	0	0
Fresh Fish and Other Marine Products	0	0	0	0	0
Wheat	0	0	0	0	0
Corn	0	0	0	0	0
Rye, Barley, Rice, Sorghum and Oats	0	0	0	0	0
Oilseeds (Soybean, Flaxseed and Others)	0	0	0	0	0
Vegetable Products	0	0	0	0	0
Animal Feed, Grain Mill Products and Flour	0	0	0	0	0
Other Agricultural Products, Including Food	0	0	0	0	0
Barged Fish	0	0	0	0	0
All Manufactured Equipment and Machinery	400	0	10,100	0	10,500
Waste Material (Garbage, Landfill, Sewage)	0	0	0	0	0
Commodity Unknown	0	0	0	0	0
<b>Total</b>	<b>400</b>	<b>135</b>	<b>10,100</b>	<b>0</b>	<b>10,635</b>

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

\* December 2010 data only includes the last twenty two days of the month and  
March 2011 data only includes the first twenty four days of the month.

## **2.3 Summary of Rail, Truck and Barge Movements, December 2010 – March 2011**

Since most shippers, carriers and industries did not have barge transportation available, these entities used two alternatives to transport commodities: rail and truck. The most notable characteristic of alternative commodity movements between December 2010 and March 2011 is that most products were transported by truck or a combination of truck and rail (Table 2.1). This is interesting to note since most industry representatives stated prior to the lock outage that products transported normally by barge would move by rail as it is typically more inexpensive than truck. The convenience of truck in transporting goods short distances or by routes in which rail does not exist is most likely the reason behind this movement during the lock outage. Many industries, including wheat, forestry and waste management, chose to send their goods to different markets during the lock outage which involved rerouting commodities to different areas, most of which were far off from rail track.

Petroleum products (gasoline and diesel fuels) were the largest volume commodity moved by truck or rail during the extended lock outage. About 184,000 tons of gasoline products and 276,000 tons of diesel fuels traveled from the Westside of Washington and Oregon to the Eastside of these states and Idaho (Table 2.3). The second largest volume to travel by truck rather than barge during the lock outage was waste materials at over 68,000 tons.

However, firms and facilities below The Dalles Lock and Dam had access to barge transportation to Portland for 11 of the 15 week lock outage. During that time, 377,000 tons were shipped downriver (Table 2.2); this volume is 79 percent below normal for tonnage shipped downriver during the winter months. The major commodities with the largest volume of downriver shipments over the 15 week period were wheat; forest products; and sand, gravel and rock products. Between December 2010 and March 2011 the total downriver tonnage of each of these commodities exceeded 3,000 tons (Table 2.2). Wheat comprised 62 percent, or 233,500 tons, of the total 377,000 tons.

Around 10,500 tons were shipped upriver by barge between December 10, 2010 and March 24, 2011 (Table 2.3). This volume is 98 percent the normal shipment tonnage of 608,000 during winter months. The commodity with the largest volume of upriver shipments over the 15 week span was manufactured equipment and machinery. Between December 10, 2010 and March 24, 2011 the total upriver tonnage of this commodity was 10,500 tons (Table 2.3).

Manufactured equipment and machinery were shipped in mass quantity during the month of February 2011. This surge in upriver shipments of this commodity is due to the U.S. Army Corps of Engineers' construction and assembly of lock gates and repairs. The Corps reported that during the month of February, two gate leaves constructed for The Dalles Lock and Dam passed through Bonneville hence explaining the large movement of manufactured equipment and machinery during this month.

### 3. Pacific Northwest Wheat Case Study

In order to capture the transportation options and decisions of wheat producers, elevators and shippers during the extended lock outage, a second survey of wheat elevators in the Pacific Northwest was conducted. Throughout Section 3.1, the recent survey will be compared to the baseline survey or scenario, from Interim Report #2, so that changes brought on by the extended lock outage can be evaluated. The same survey methodology was used to conduct the second study described below. For an explanation of the methodology, please refer to Interim Report #2, Section 3.



Image 1: Grain elevator, ship and barge docked at Cargill Louis Dreyfus Pacific Grain in Portland, Oregon (Columbia River)  
Photo provided by Portland Ground (Portland Oregon Photograph)

#### 3.1 Wheat Industry Structure and Operations

Of the survey respondents, Northern Washington elevators shipped about 20.3 million bushels<sup>1</sup> during the extended lock outage, the largest volume from any of the regions in the Pacific Northwest during that time period. This region moved 57 percent of the 37.5 million bushels

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<sup>1</sup> One bushel of wheat is equal to 60 pounds and 2,000 pounds is equal to one U.S. ton, so one bushel is equal to 0.03 U.S. tons.

shipped from the tri-state area during the winter months (Table 3.1). Eastern Oregon elevators shipped the second highest volume during the lock outage, 9.7 million bushels or 27 percent of all Pacific Northwest wheat shipments. Northern Idaho firms shipped 2.4 million bushels or seven percent of all wheat movements, Southern Idaho elevators shipped 1.6 million bushels or five percent of all wheat shipments and Southern Washington firms shipped 1.4 million bushels or four percent of all wheat movements during the extended lock outage (Table 3.1).

<b>Table 3.1 Wheat Tonnage Shipped by Survey Respondents, Dec 2010 - Mar 2011</b>				
<b>Region</b>	<b>Number of Firms</b>	<b>Tonnage Shipped in Bushels</b>	<b>Percentage of Total Tonnage Shipped, Dec 2010 - Mar 2011</b>	<b>Typical Percentage of Total Tonnage Shipped, Dec - Mar</b>
<b>Eastern Oregon</b>	5	9,681,700	27.29%	12.68%
<b>Northern Idaho</b>	5	2,428,000	6.84%	15.69%
<b>Southern Idaho</b>	3	1,620,000	4.57%	2.90%
<b>Northern Washington</b>	5	20,315,826	57.26%	33.98%
<b>Southern Washington</b>	8	1,433,200	4.04%	34.75%
<b>Pacific Northwest</b>	26	35,478,726	100.0%	100.0%

**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

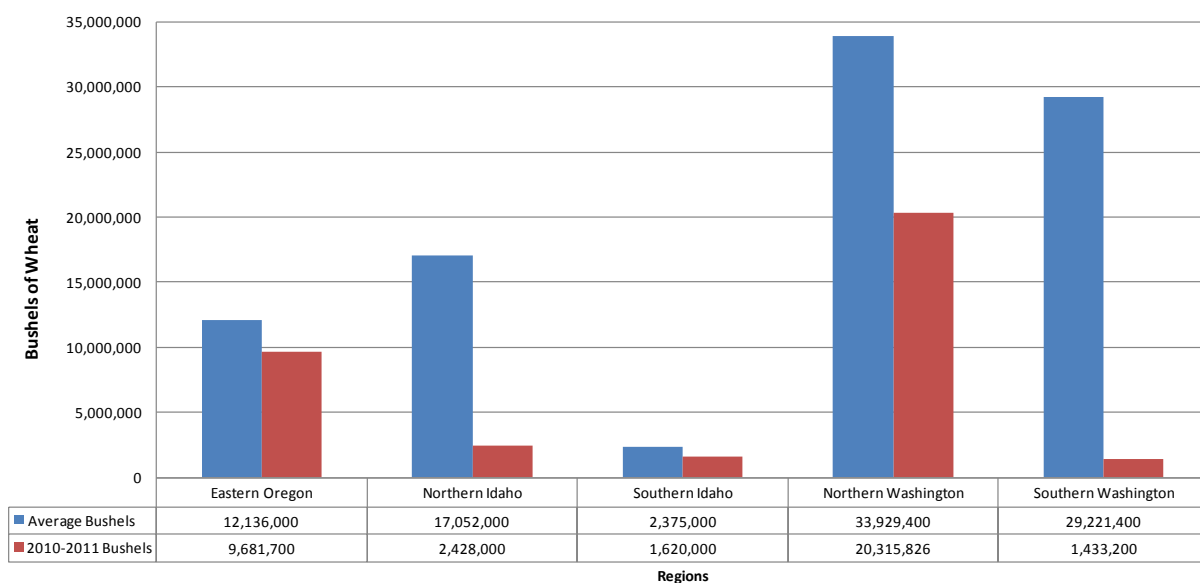
All regions experienced a dramatic decline in tonnage shipped during the extended lock outage. For Southern Washington elevators, who normally ship the majority of the wheat from the Pacific Northwest, barge transportation halted for 15 weeks during the extended lock outage. This mode of transportation combined with another, usually truck, is normally used to ship 97.5 percent of wheat coming from Southern Washington throughout the year (Interim Report #2). Due to the lock outage and the isolated nature of Southern Washington, elevators in this area only moved 1.4 million bushels of all Northwest wheat transported during the extended lock outage either by rail or truck (Figure 3.1). That is a 95% decrease in wheat shipments during the extended lock outage period, reflecting prepositioning of some grains and a great dependence on barge transportation in typical years.

Eastern Oregon firms, which usually ship over 12 million bushels from December to March, shipped only 9.7 million bushels, a 20 percent decrease in tonnage shipped during the extended lock outage; this drop in shipments was the smallest in the Pacific Northwest from December 2010 to March 2011 (Figure 3.1). The small decrease in shipments from Eastern Oregon was due to a major elevator's location near The Dalles Lock and Dam; this river elevator had barge access for 11 weeks of the 15 week outage as it is located west of The Dalles. Therefore barges only needed to travel through Bonneville Lock and Dam during the lock outage.

Northern Idaho elevators experienced an 86 percent decrease in wheat tonnage shipped out of the region from December 2010 to March 2011. Normally, 17 million tons is shipped from this area. This large decrease is due to the fact that four of the five firms surveyed in Northern Idaho are located in or near Lewiston, Idaho; elevators in Lewiston almost solely rely on barge transportation. During a typical time period, 79 percent of wheat shipments originating from

Lewiston elevators travel by barge (Interim Report #2). Southern Idaho firms saw a decline in shipments of 32 percent, or about 755,000 bushels; these firms did not experience a large decline in shipments as they typically use rail (45 percent of all shipments) or truck (33.3 percent of all shipments) to transport wheat. Finally, Northern Washington firms' shipments dropped by 40 percent or decreased by 13.6 million bushels (Figure 3.1). During the lock outage, Northern Washington elevators relied heavily on rail due to conveniently located rail loading facilities in the region; these facilities allowed firms in Northern Washington to continue shipments, although decreased, during the lock outage.

**Figure 3.1 Average and 2010-2011 Bushels of Wheat Shipped by Survey Respondents, December - March**



**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

The decrease in wheat shipments in all regions is also due to movement around the dates of the lock outage. During the six months prior to the lock outage, wheat shipments by barge were above average by 65 percent in September 2010, 20 percent in October 2010 and 30 percent in November 2010. It remains to be seen if wheat firms return to shipments by barge after the lock outage. Wheat elevators may have chosen to wait until the lock outage was over to barge the majority of their wheat to Portland.

The heart of this interim report is to determine what modes of transportation wheat firms utilized during the extended lock outage. In the Pacific Northwest, a combination of modes is generally used to transport commodity goods. Combinations of transportation modes include truck-barge<sup>2</sup>, rail-barge<sup>3</sup> and truck-rail. Although rail-barge and truck-rail were not exclusively

<sup>2</sup> Truck-barge is the combination of trucking a commodity to a barge-loading facility and then shipping the product by barge to its destination.

designated in the survey and in the figures below, survey respondents included rail-barge shipments in the category of truck-barge and truck-rail movements in the category of rail.

According to survey respondents, most of the regions in the Pacific Northwest experienced a decrease in use of truck for the transportation of wheat during the lock outage. The use of truck transportation decreased by five percent for Northern Idaho firms (Figure 3.2); however, only 48,500 bushels of wheat were moved by truck during the winter of 2010-2011 (down slightly from 51,000 bushels during the average winter). Northern Idaho firms relied on rail during the lock outage as the Great Northwest Railroad line runs through Lewiston, Idaho which connects to the Union Pacific and Burlington Northern Santa Fe lines. However, during the lock outage, of the Northern Idaho firms surveyed, three firms shipped less than 300,000 bushels and one firm did not ship any wheat. Therefore, the decrease in bushels trucked during the winter of 2010-2011 is understandable as these firms barged above average amounts prior to the lock outage and plan to ship more wheat after the lock outage that would have moved in the winter by barge.

Southern Idaho elevators also decreased their use of truck transportation by 88 percent, the largest decrease in bushels shipped by truck for all surveyed elevators in the Pacific Northwest. Truck use dropped to 97,000 bushels in this region during the extended lock outage, from 792,000 bushels during the average winter (Figure 3.2). Elevators in this region increased rail movements during this time period due to the convenience of rail lines near the firms, which partially explains the decrease in trucking.

Truck use by Northern Washington elevators decreased during the lock outage by 40 percent; bushels shipped by truck went from 4.75 million during the average winter period to 2.9 million during the winter of 2010-2011 (Figure 3.2). This down shift in trucking is likely due to the large and well-located multicar rail loading facilities near Ritzville and Rosalia. Since fuel prices were up during the lock outage and trains have the capacity to carry large amounts of grain, elevators in this region chose to shift movements to rail. Also, many of these firms shipped above average quantities prior to the lock outage due to increased wheat prices and demand. Therefore, shipments by truck and rail from this area were lessened during the lock outage.

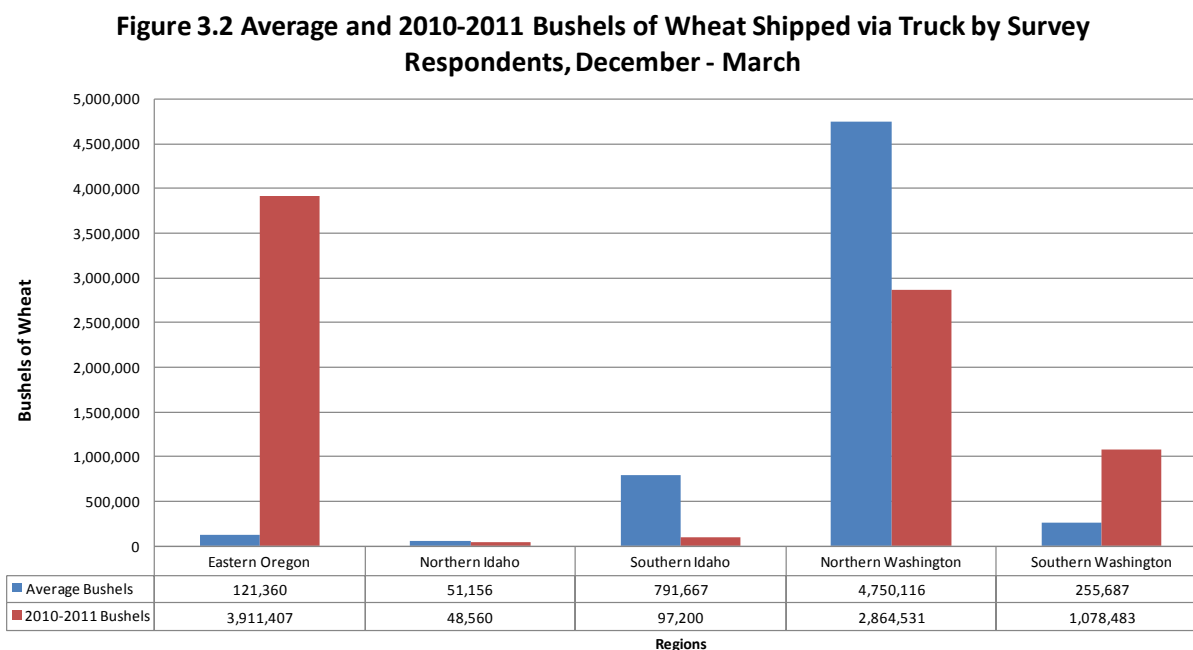
The two regions that experienced an increase in truck usage were Eastern Oregon and Southern Washington. Eastern Oregon elevators moved 3.9 million bushels of wheat by truck from December 2010 to March 2011 (Figure 3.2). Truck use increased by about 3,100 percent for this region during the extended lock outage; this is the highest increase in truck use of all regions. The increase in trucking in Eastern Oregon is due to the fact that two of these firms are located within two hours driving time of Portland and not located on a rail line. These two firms used only truck transportation. Two other firms in Eastern Oregon used solely rail transportation as they were located near the Burlington Northern Santa Fe and Union Pacific Rail lines. The last firm of the five used barge transportation as it is located below The Dalles

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<sup>3</sup> Rail-barge has recently made an appearance in the Pacific Northwest. Currently, only two elevators transport wheat by this mode.

Lock and Dam and had lock access for 11 weeks during the lock outage. All of these factors account for the decrease in trucking in this region.

Southern Washington firms, who were essentially cut off from barge transportation, increased their trucked shipments by 322 percent. During the typical winter, 256,000 bushels of wheat are shipped by truck compared to the over one million bushels transported by truck during the winter of 2010-2011. The shift to trucking was likely due to the isolated nature of many of these firms. Most elevators in Southern Washington are not near a rail line and with the absence of barge transportation; trucking was the only other option.



**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

According to the survey results, three regions in the Pacific Northwest decreased the use of rail to transport wheat during the lock outage. Northern Idaho firms decreased their use of rail by 33 percent from 3.55 million bushels moved by rail during the typical winter to 2.4 million bushels during the lock outage (Figure 3.3). As mentioned above, this was due to the lack of volume shipped during the lock outage from this area. Although one firm did ship more than 1.8 million bushels during the lock outage via a rail line in Lewiston, shipments by rail were below normal during the winter of 2010-2011. The decrease in bushels shipped by rail during the winter of 2010-2011 is also justified by the fact that firms barged above average amounts prior to the lock outage and plan to ship more wheat that would have moved in the winter by barge after the lock outage.

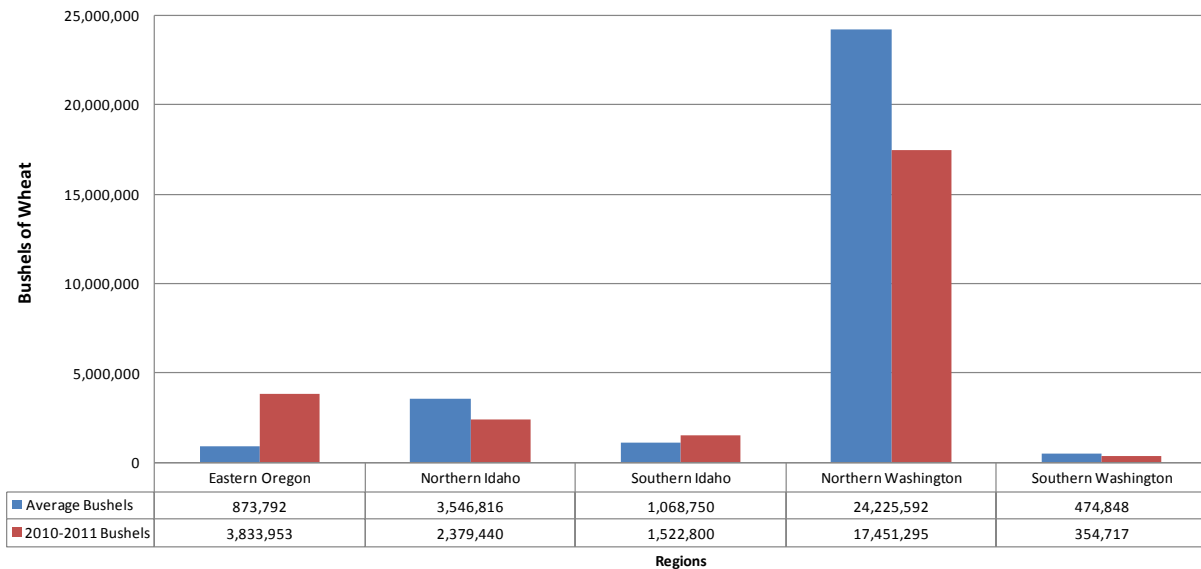
A decrease in the use of rail transportation of 28 percent occurred in Northern Washington; about 24.2 million bushels of wheat normally move by rail as opposed to the 17.5 million bushels shipped by rail during the lock outage (Figure 3.3). Along with many other regions in the Pacific Northwest, Northern Washington shipped above average volumes prior to the lock outage due to the increased price and international demand for wheat. Since fuel prices were up during the lock outage, elevators in this region chose to either hold off on average rail shipments and/or ship wheat to closer markets rather than Portland. Therefore, shipments by truck and rail were deflated during the lock outage.

Southern Washington elevators also decreased their rail use by 25 percent; these wheat elevators decreased wheat volumes sent by rail from about 475,000 bushels during the average winter to 355,000 bushels during the lock outage (Figure 3.3). Firms in this area did not ship much wheat during the lock outage as they lost waterborne transportation and had no conveniently located rail lines.

Eastern Oregon firms transported 3.8 million bushels of wheat by rail from December 2010 to March 2011, an increase of 339 percent from 874,000 bushels shipped by rail during the average winter to 3.8 million bushels shipped during the lock outage (Figure 3.3). This is the highest increase in rail usage for the tri-state area. This large increase was due to the location of the firms near rail lines which shipped to Portland. Two of the five firms surveyed moved all of their wheat by rail rather than inaccessible barge transportation, which caused the increase in rail transportation. Southern Idaho elevators also increased rail usage by 42 percent; 1.5 million bushels were transported by rail during the lock outage compared to 1.1 million during the average winter (Figure 3.3). The increase in rail transportation for this region is because of the convenience of a multicar rail loading facility near the firms and the increase in fuel prices for trucking companies.



**Figure 3.3 Average and 2010-2011 Bushels of Wheat Shipped via Rail by Survey Respondents, December - March**



**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

Barge transportation is not included in this discussion because only one firm surveyed had access to the Columbia-Snake River. This elevator is located west or downriver of The Dalles Lock and Dam. Therefore, this firm shipped all of its wheat through Bonneville Lock and Dam to Portland for exportation. No other firms surveyed were able to use barge transportation during the extended lock outage. Barge shipments of wheat moving to Portland during the lock outage were well below 2007-2009 monthly averages. December barge volumes of wheat were one percent below average; January movements were 85 percent below normal; February shipments were 82 percent lower than the 2007-2009 February average and March volumes were below normal movements by 72 percent.

The most obvious finding is that three of the five regions (Northern Idaho, Southern Idaho and Northern Washington) in the Pacific Northwest moved the majority of their product, an average of 93 percent, by rail during the lock outage. This is due to the relatively low cost and convenience of rail when compared to trucking, the only other option during the lock outage (see references). Since barge transportation was not an option for Southern Washington firms and trucking and rail were not always convenient or economical, they were impacted by increased transportation costs (see Figures 3.4 and 3.5).

Of the three regions that shipped the majority of their product by rail, Northern Idaho is the only one which normally uses barge transportation rather than rail. This is evident by the dramatic increase in rail usage. Firms in this region do have access to rail loading facilities in Lewiston, Idaho, but these elevators normally use barge transportation from the same city as it is more economical to do so.

Forty percent of wheat coming from Eastern Oregon and 75 percent of wheat coming from Southern Washington was shipped via truck to a final market (Figure 3.2). Some firms in these areas chose to ship to different markets during the lock outage with trucking being more convenient or more economical than rail or storing wheat. For example, a wheat firm in Southern Washington decided to ship most of their wheat to mills, breweries and other facilities in need of the grain, rather than ship the wheat to Portland or Seattle for exportation.

On average during the lock outage Eastern Oregon wheat elevators paid \$0.56 per bushel for trucking and an average of \$0.54 per bushel for rail; the one firm in Eastern Oregon that could use truck-barge paid \$0.30 per bushel (Table 3.2). Northern Idaho wheat firms paid \$1.50 per bushel for trucking and \$0.74 per bushel for rail from December 2010 through March 2011. Southern Idaho wheat elevators had available rates of \$0.76 per bushel for trucking and \$0.90 per bushel for rail. Northern Washington wheat firms paid \$0.45 per bushel for trucking and \$0.55 per bushel for rail. Finally, Southern Washington wheat firms paid \$1.34 per bushel to truck wheat and \$0.58 to rail wheat (Table 3.2).

The only two regions in which rail transportation was more costly than truck during the lock outage were Southern Idaho and Northern Washington (Table 3.2). According to findings from Interim Report #2 and previous Northwest transportation studies by Dr. Ken Casavant, the opposite is normally true; rail is more economical than trucking. However, during the lock outage, rail service was in high demand for the wheat producing community and railways may have capitalized on this demand and lack of supply by increasing the price of shipping. In addition, trucking firms may have wished to compete with the large demand for rail service and hence, lowered their trucking prices. Of those elevators surveyed in Northern Washington and Southern Idaho, many switched markets during the extended lock outage. These firms decided to truck wheat to nearby businesses in need of the grain, such as mills and breweries. Since these companies were closer in vicinity to the elevators, trucking was probably the most economical and convenient. Railcars are difficult to load and unload and rail service may have not been available near these businesses.

Eastern Oregon firms have the lowest rate for truck-barge, \$0.30 per bushel (Table 3.2); this region includes the only firm in which barge transportation was available; this firm is located below (west of) The Dalles Lock and Dam. Since Bonneville, the most western lock and dam on the Columbia, was open throughout most of the lock outage, barges were able to transport goods for 11 of the 15 weeks of the lock outage. Northern Washington had the lowest truck rate of \$0.45 per bushel during the lock outage, reasons for which were discussed above. Finally, Eastern Oregon elevators who participated in the survey also experienced the lowest rate for rail transportation at \$0.54 per bushel. This is most likely due to the fact that all of the wheat firms in Eastern Oregon are located in close proximity to a major railway.

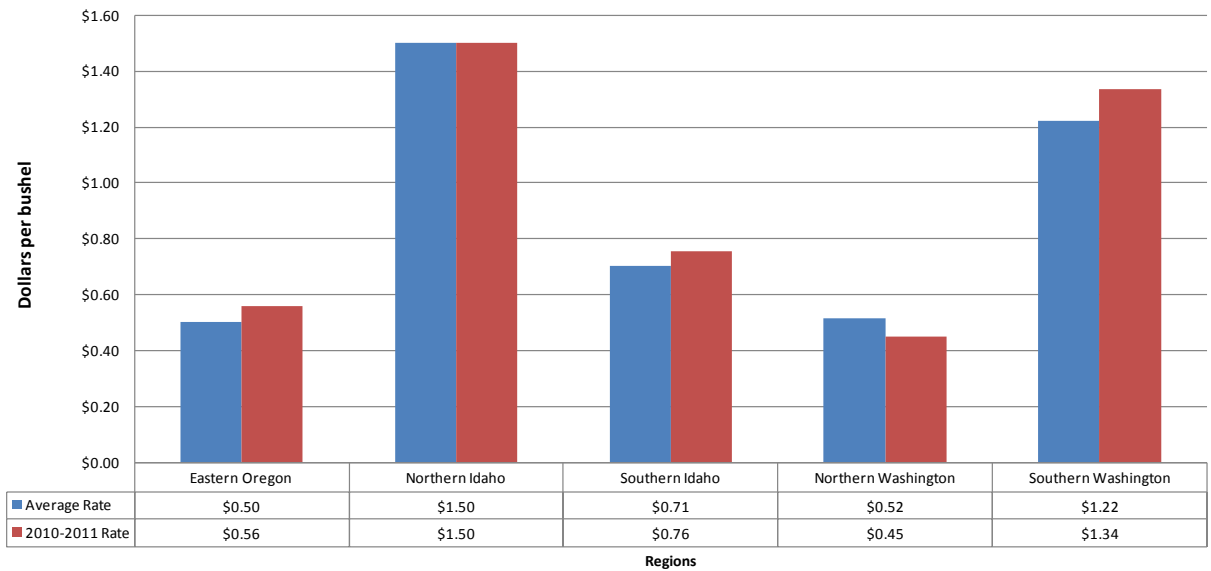
<b>Table 3.2 Shipping Rates for Wheat by Survey Respondents, Dec 2010 - Mar 2011</b>				
<b>Region</b>	<b>Number of Firms</b>	<b>Average Rate in Cents per Bushel (to Portland)</b>		
		<b>Direct Truck to Final Market</b>	<b>Truck-Barge</b>	<b>Rail</b>
<b>Eastern Oregon</b>	5	\$0.56	\$0.30	\$0.54
<b>Northern Idaho</b>	5	\$1.50	-	\$0.74
<b>Southern Idaho</b>	3	\$0.76	-	\$0.90
<b>Northern Washington</b>	5	\$0.45	-	\$0.55
<b>Southern Washington</b>	8	\$1.34	-	\$0.58
<b>Pacific Northwest</b>	26	\$0.92	\$0.30	\$0.66

**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

It is also important to note the percentage differences in shipping rates during the lock outage. Among survey participants and broken down in to regions, trucking rates increased by 12 percent in Eastern Oregon, remained unchanged in Northern Idaho, increased seven percent in Southern Idaho, decreased by 13 percent in Northern Washington and increased 10 percent in Southern Washington during the lock closure (Figure 3.4).

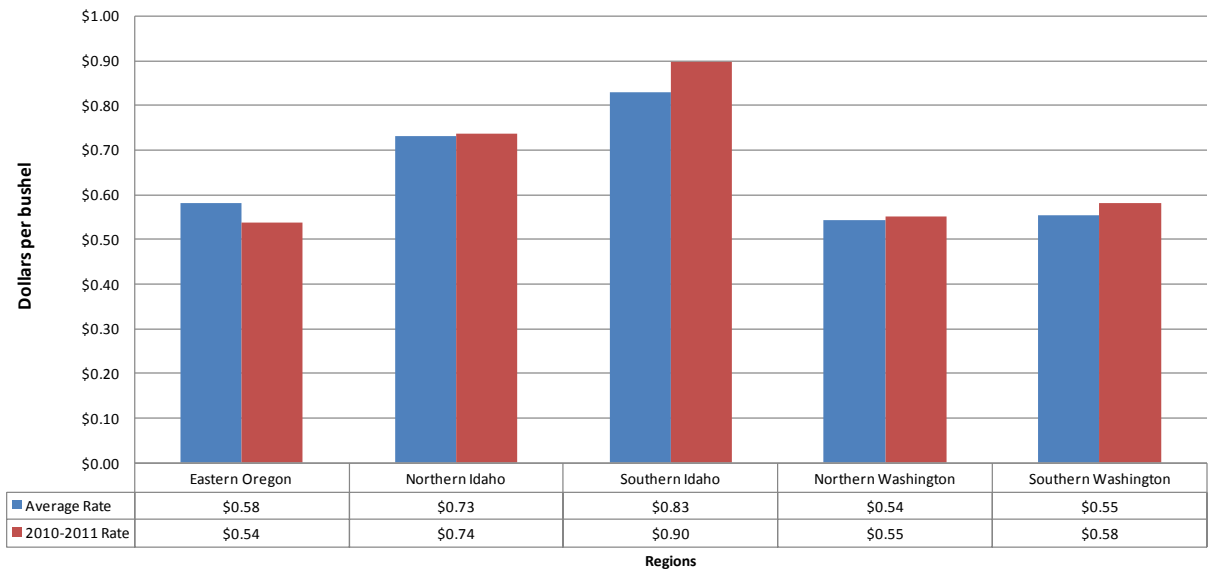
Eastern Oregon experienced a seven percent decrease in the cost of rail; Northern Idaho saw an increase of one percent in rail costs during the lock outage, Southern Idaho an increase of eight percent, Northern Washington an increase of two percent and Southern Washington five percent (Figure 3.5). These are fairly insignificant percentages, although it is interesting that Eastern Oregon rail rates were the only ones to decrease in the Pacific Northwest. Likewise, Northern Washington trucking rates were the only ones to decrease as well.

**Figure 3.4 Average and 2010-2011 Wheat Rates Per Bushel for Truck by Survey Respondents, December - March**



**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

**Figure 3.5 Average and 2010-2011 Wheat Rates Per Bushel for Rail by Survey Respondents, December - March**



**Source:** Elevator Firm Survey (Washington, Oregon and Idaho) – Washington State University

### 3.2 Additional Comments from the Wheat Industry

Elevator managers were asked to offer their thoughts and opinions on the inaugural extended lock outage. The comments are listed below; however any identifying information including firm names and locations have been removed. The authors decided to leave the comments in the general format in which they were received as to capture the tone of the firms.

- Had export market demand conditions come to some unknown extreme level, we would more likely have had to make sales to local rail delivery-points owned by competitors (with a likely loss of revenue). However, such a situation did not arise. It remains to be seen if there was any long term unapparent damage to export markets.
- In our opinion, the general hype about the extended closure presented to our producing customers had led many of them to accelerate their normal seasonal shipping pace (and also the selling pace) resulting in relatively low amounts of physical wheat needing to move from farm storage during the closure.
- Rail performance was terrible. Cars were ten days early in December and over 30 days late by the end of February and continuing through March.
- Some of the highest market prices of the season to-date were had during the closure, due to world events and the extreme world commodity price volatility of the past two months. Our firm was able to complete all of these purchases and make the corresponding sales for deferred shipment in April and May. We funded the purchases with normal capital resources while we await payment on shipment. Of course it has been fortuitous for us and others affected by the closure that prime interest rates are at historic lows. This company is also fortunate to have a prime financial rating.
- We are happy to have the river open again, with healthier dams, but it wasn't cheap. I guess the cost of doing business elevates itself every year and this was no exception.
- We really didn't see a huge impact on our business due to the outage. The cost of freight was adjusted up at harvest to cover the outage therefore it was factored in for the whole marketing year accordingly.
- We rely on the river system entirely. The rail was removed in the 1980s and Central Ferry is our only outlet to Portland. Trucking wheat is not a competitive option, especially when fuel is so expensive. Our real costs of the river closure have been staggering. We invested \$500,000 in improving our outside storage before the river closure and our expenses during the closure will approach that number due to a staggering loan balance at the bank, interest expense, a little lost business and other related expenses.
- We were able to hold the crop this long (during the duration of the extended lock outage) but until I ship it I don't know what the quality will be (bug damage, heat damage, etc.).
- We were able to ship more wheat earlier than thought and it was all truck to barge. The barge line had equipment for us for the majority of the closure (11 of 15 weeks). We incurred added freight cost of approximately \$450,000 to haul 4,500,000 bushels of wheat 20 miles further than we normally would have during that time of year.

- We could not wait for the river to open as there was lots of grain that needed to be moved. Trains were backed up quite a ways and/or arrived late in Portland.

### **3.3 Conclusions of Survey Results**

The original survey from Interim Report #2 served as a benchmark for volumes, rates and modal choices for wheat elevators in the Pacific Northwest during times in which barge, rail and truck transportation are all available. This second survey allowed comparison of normal volumes, rates and modal choices for wheat elevators to those during the extended lock outage.

During this period, Northern Washington shipped the highest percentage of wheat in the Pacific Northwest, over 57 percent. This represents a shift in volume shipped; Southern Washington, including the county of Whitman, normally ships the highest percentage of wheat from the Northwest, about 35 percent. However, Northern and Southern Washington wheat elevators together moved 61 percent of all shipments from the three states during the lock outage, compared to 69 percent during a typical time period.

Eastern Oregon firms experienced a decline in shipments during the lock outage of 20 percent when compared to a typical winter's movements. Northern Idaho suffered a decline in shipments of 86 percent during the lock outage, whereas Southern Idaho experienced a 32 percent decline in shipment volumes.

Most wheat firms in the Pacific Northwest moved the majority of their product, an average of 93 percent, by rail during the lock outage. However, Eastern Oregon and Southern Washington firms mostly employed trucking services to transport wheat from December 2010 to March 2010, about 40 to 75 percent, respectively.

Twenty percent of wheat coming from Eastern Oregon was shipped via truck-barge. This was because of one wheat elevator's access to the Columbia River and Bonneville Lock and Dam to head to Portland. This lock was open 11 weeks during the 15 week outage.

Shipping rates for truck and rail increased slightly in the Pacific Northwest during the lock outage. Additional costs, such as investment in storage expansion and shipping from alternative sources, were incurred by several firms in varying amounts. Railcars were unreliable for some elevators during the lock outage which led to unforeseen costs, delays and potentially lost business; the magnitude was uncertain.

## **4. Industrial and Regional Impacts from the Extended Lock Outage**

Since an extended lock outage of this magnitude was unprecedented, the experiences of and impacts on shippers, carriers, government institutions and private entities for the Columbia-Snake River lock outage were also unique. As in previous sections, this section discusses only the major commodities that typically move by barge transportation, upriver and downriver.

### **4.1 Regional Carrier Impacts**

This section not only examines the impacts on commodity industries that use barge transportation, but also the coordination and experiences of regional shippers. The authors conducted a broad survey and interviews concerning the activities of and impacts on the actors in the region, both state and regional, for the recent lock outage. These actors include carriers, shippers, associations and industries. The experiences of these entities are discussed below.

#### **Barge Line Impacts**

Of all transportation modes and industries involved in the extended lock outage, barge lines took the brunt of the economical impact since the Columbia-Snake River locks are essential to barge transportation. However, most of the barge lines were able to continue harbor work and shipping movements on the Lower Columbia River during the lock outage.

Most barge companies temporarily laid off a significant number (from 35 percent to 67 percent) of their employees, including boat crews, in order to reduce costs. Some barge companies offered job sharing and reduced employees' work hours rather than lay off their entire staff. Some barge employees chose to be laid off during the winter months to pursue schooling and/or extended vacations that would not normally have been possible. This allowed employees at certain firms who desired to stay on staff during the outage to do so. All of the barge lines were able to continue benefit packages for employees during the extended lock outage. None of the barge lines located on the Columbia-Snake River lost any employees to this short term outage by either discouragement or lack of funds.

Although the bulk of the Columbia-Snake River was closed to barge traffic from December 10, 2010 to March 24, 2011, Bonneville Lock and Dam remained open during a large portion of the outage and the Lower Columbia River, the portion of the river west of Bonneville, was navigable for the entire outage. This allowed a few barge lines to continue service to areas below The Dalles Lock and Dam and within pools. Commodities shipped by barge during the extended lock outage included wheat, forest products, paper and rock products (see Section 2.1).

In addition, barge lines continued to operate below Bonneville Lock and Dam in the Portland and Vancouver, Washington areas. Two barge lines continued to ship movements of forest

products, paper and wheat on the Lower Columbia River, west of Bonneville Lock and Dam. These lines also performed harbor work in this area. According to a barge line representative, harbor work is “switching grain, petroleum, freight or container barges into or out of a marine facility to allow loading or discharging.” This work also included shifting barges, or moving barges in and out of storage locations or maintenance facilities, which allowed boat crews and barging employees to continue to work and remain busy. Upriver barging tugs that were idle due to the lock outage were called into service to handle the large cargo volumes in the Portland area. These two barge lines were surprised by the volume transported on the Lower Columbia River during the lock outage and the consequential need for their services. These extra services helped dampen the revenue and job loss of the interruption of service on much of the Columbia and all of the Snake Rivers.

One barge line also prepositioned petroleum barges upriver, which allowed consumers to have access to this supply for a portion of the outage without having to contend with alternative modes of transportation. Six petroleum barges or about 250,000 gallons were prepositioned upriver in the Pasco, Washington area for fuel consumers in eastern Washington, eastern Oregon and Idaho. Such prepositioning allowed barge lines to charge a fee for the service of storage of commodities, creating a source of replacement revenue during the outage.

The specific costs to barge lines on the Columbia-Snake River are unavailable at this time. If available during the summer of 2011, this information will be included in Interim Report #4.





Image 2: A towboat pushes a barge containing the three sections of the Lower Monumental navigation lock downstream gate upriver  
Photo provided by U.S. Army Corps of Engineers, 2010

## Rail Line Impacts

In contrast to barge companies, which lost business for the majority of the lock outage, rail lines experienced an increase in cargo loads during the lock outage. Rail lines stepped forward to aid customers, producers and industries in continuing shipments through the extended lock outage. Rail lines in the Pacific Northwest dealt with greater than normal volumes, additional products that would have moved by barge, increased crew numbers, additional days of operation and a few extra trains per week. Part of this experience included rail lines reaching out to industries that needed transportation during the outage and partnering with local ports to aid in the movement of products that would normally travel by barge.

Class I rail lines in the Pacific Northwest added an average of 1.5 additional trains per week during the outage; this extra cargo was made up of tonnage that would normally move by barge. Each additional train hauled 110 railcars or the same cargo as 440 trucks, which helped avoid pressure on the roadways of the region. The majority of these additional trains moved from east to west and carried wheat, forest products, barley, paper, peas and lentils. Additional trains moving upriver (from west to east) moved empty containers, petroleum, diesel and fertilizer.

Besides moving extra cargo, rail companies experienced increased costs due to fuel and labor to provide additional days of service to those industries and ports in need. One railroad line in Eastern Washington shuttled empty containers for the Port of Lewiston, which involved constant contact with the Port and the ability to be flexible with train schedules. Employees of rail lines faced long shifts, large train loads and overtime hours (Washington & Idaho Railway).

### **General Carrier Impacts**

In addition to coordinating shipments and storage of commodities during the outage, the Port of Portland rewarded shippers for their continued support and patronage by subsidizing rail and truck transportation for industries that normally use barge to ship commodities to the Port. A Port of Portland employee stated that the port paid carriers \$400 per container for rail and truck shipments from Lewiston, Idaho and \$250 per container for rail or truck shipments from Umatilla and Boardman, Oregon. The container size was not taken into account, so, for example, a shipper moving a twenty-foot equivalent unit was subsidized the same amount as a carrier shipping a forty-foot equivalent unit. Port commissioners intended that this subsidy would encourage carriers and industries to continue business with Portland during and after the outage, instead of seeking commerce with other local ports. No carriers or industry customers of the Port of Portland were lost to other local ports.

The Port of Portland set aside \$800,000 to subsidize patrons' alternative transportation modes and only 48 percent of this total, or about \$380,000 was used for continued transportation. This is evidence that most customers of the Port, both industries and carriers, either shipped goods prior to the lock outage or waited until the river was once again open to barge commodities.

## **4.2 Regional Industry Impacts**

Major commodity industries that use the Columbia-Snake River were impacted in various ways by the extended lock outage. The early announcement by the U.S. Army Corps of Engineers of the planned outage in 2009 allowed industries, carriers, shippers and customers of barge lines to effectively eliminate some economical and logistical impacts, but obviously not all. Below are the specific impacts and experiences of the industries of major commodities that use barge transportation in the Pacific Northwest, which was revealed in public documents, discussions and interviews during the lock outage. Total tonnages moved by alternative modes are mentioned in this section, however, for a more thorough description of movements of major commodities by rail and truck, see Section 2.2.

## **Petroleum: Gasoline, Jet Fuel and Kerosene; Distillate, Residual and Other Fuel Oils; and Lubricating Oils and Grease**

Petroleum companies have been reserved about their procedures during the extended lock outage. When a petroleum representative was asked about specific impacts and volumes shipped from December 2010 to March 2011, he gave this statement: “Regrettably, much of the information you have requested is company propriety information and we will not release it.”

However, the Washington State Department of Ecology (WSDE), the Washington State Department of Commerce (WSDC) and Oregon Department of Energy (ODE) have researched some of the impacts and the actual activities of petroleum companies during the lock outage and have produced a number of reports and statements including information on the impact of the extended lock outage, alternative transportation used to ship gasoline, diesel, jet fuel and bio fuels and graphs depicting petroleum prices in various cities around the Pacific Northwest.

According to the ODE, petroleum companies shipped more than half of their product by tanker truck during the lock outage. It was stated that tanker truck is far more economical and convenient than transporting the commodity by rail. The WSDE also confirmed the heavy use of truck for fuel transportation. Tanker trucks used two routes; fuel was transported from refineries near the Seattle area to Eastern Washington via Interstate 90, a major highway system running through the middle of the state, and by way of highways on both sides of the Columbia-Snake River from Portland to various towns in Eastern Washington and Oregon. The ODE representative also stated that transportation of fuels to Eastern Washington and Oregon was “smooth sailing” since shippers, carriers and the petroleum industry had ample time to plan ahead. In addition, there were no reported fuel shortages, price gouging or price hikes due to the lock outage.

As mentioned above, less than half of petroleum product from Western Washington and Oregon was transported to the east by rail. Based on a conversation with an experienced former lock operator, Burlington Northern Santa Fe Railway (BNSF), a Class I railroad, transported fuels from Anacortes, Washington (a town north of Seattle) to a transfer point, probably at Pasco, Washington. The fuels were then interchanged from BNSF to another smaller rail system and hauled to Lewiston for dispersion by tanker truck. According to WSDE, Union Pacific Railway (UP) also added additional tanker railcars to handle fuel loads from Portland to Spokane, Washington.

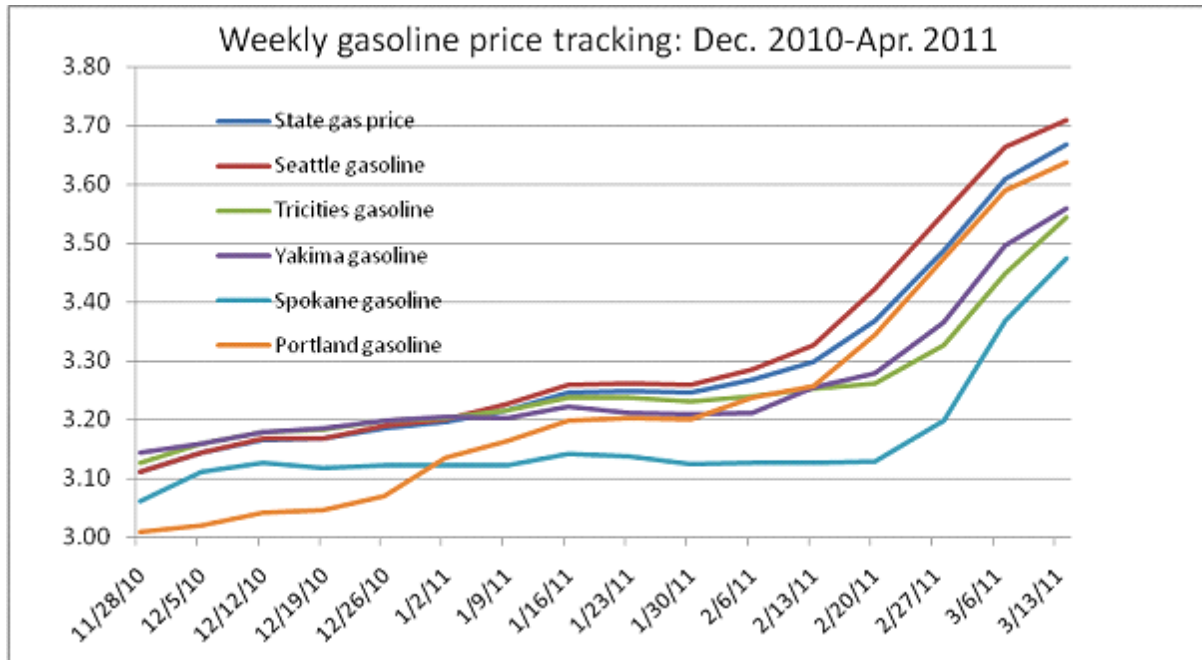
It has been opined by ODE that about 60 percent of fuels shipped during the lock outage, which would have been transported by barge, were transported by tanker truck and the other 40 percent by rail. The exact tonnage shipped during the lock outage is not available as it is proprietary information for the rail lines and petroleum companies. The authors used the average petroleum tonnage barged upriver from the last four years (2007 through 2010) to estimate the total amount that was transported during the lock outage. This average was confirmed with the WSDC. A thorough explanation of the calculation of the average is provided

in Section 2.2. The average was utilized since there were no shortages or price hikes, indicating a fairly “normal” winter supply. Fuel that would have normally moved by pipeline continued to do so during the lock outage. Pipeline transportation for fuels that normally move by barge was not available as all volume space was previously subscribed. These pipeline facilities that were unavailable include the Chevron pipeline from Utah to Pasco and the Conoco-Phillips pipeline from Montana to Spokane. Before the lock outage began, these pipelines were thought to be able to transport some of the excess barge fuel.

In addition to these strategies, Tidewater Barge Lines prepositioned six fuel barges containing about 250,000 barrels of petroleum product at the Pasco terminal prior to the beginning of the lock outage. Terminals in eastern Washington, eastern Oregon and Idaho were filled to capacity in anticipation of the outage. These actions helped supply eastern Washington and Oregon with fuel for a limited amount of time and allowed petroleum companies more time to move their product around the lock outage.

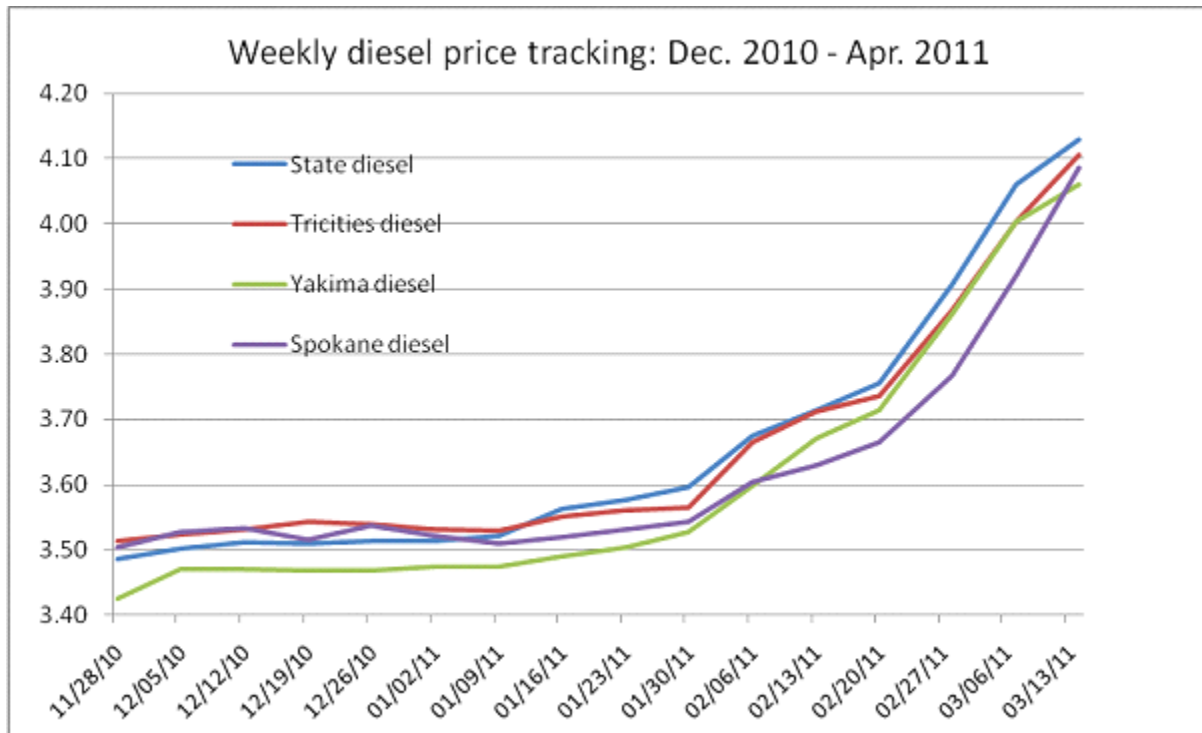
The WSDC evaluated fuel, both diesel and gasoline, prices during the lock outage and discovered an unexpected finding. A WSDC representative of the Energy Policy Division stated, “All the [gasoline and diesel] prices went up, pretty much together, due to world events affecting the price of crude. The good thing is that we didn’t have a lot of discrepancies or switching of prices. What we thought would happen (the west side [of the region] would be flush with supply, so lower prices and the east side would have a tight supply, so higher prices) didn’t. In fact the opposite – Seattle and Portland [experienced] higher prices than cities east.” More explanation on this topic and commodity will be included in the final report as information regarding the rationalization of this trend has not yet come to light. Below are two graphs depicting the gasoline and diesel prices in the Pacific Northwest (Figure 4.1 and 4.2). All of the prices in the various cities and states seem to move together, which was not expected as the eastern side of the region, including the cities of Spokane, Yakima and the Tri Cities, is isolated and is typically supplied with fuel almost completely by barge transportation.

**Figure 4.1 Weekly Gasoline Prices during the Extended Lock Outage,  
December 2010 – March 2011**



Source: Washington State Department of Commerce, Energy Policy Division

**Figure 4.2 Weekly Diesel Prices during the Extended Lock Outage,  
December 2010 – March 2011**



Source: Washington State Department of Commerce, Energy Policy Division

### **Fertilizer – Nitrogenous, Potassic, Phosphatic and Others**

Fertilizer generally moves prior to the two planting seasons of wheat. One of the mass movements of fertilizer occurs from March to May, prior to the planting of spring wheat and the other occurs from September to October, prior to the planting of winter wheat. Some additional fertilizer moves throughout the year during the “off-seasons” for the industry. Therefore, the portion of the fertilizer industry that uses barge transportation was minimally affected by the extended lock outage since the two fertilizer seasons do not occur in the winter months (December through March).

According to industry interviews, only 1,500 tons of fertilizer that would have moved by barge was diverted to alternative modes. This volume traveled by rail and truck from the Portland area to various locations in eastern Washington and Oregon.

The majority of fertilizer in the region is normally delivered by rail. Class I and short line railroad companies deliver fertilizer from the Portland and Vancouver area to Eastern Washington, Oregon and Idaho.

Fertilizer is purchased on a delivered basis to various terminals. Whether the fertilizer is transported by barge, rail or truck, the difference in transportation costs is not made transparent. Suppliers do not typically share freight rates with fertilizer companies, which is common in many commodity industries. Therefore, the impact on the cost of transportation in the fertilizer industry cannot be calculated.

The only concern expressed by fertilizer industry representatives was the possibility that the extended lock outage would not successfully open up on its announced date, March 18, 2011. This in fact did occur; the lock outage was extended to March 25, 2011. However, fertilizer companies in the Pacific Northwest did not need to find alternative transportation to deliver their product to agricultural producers during the month of March for the spring planting season. In addition, the Pacific Northwest did not have an early spring which would have greatly increased the impact on the fertilizer industry.

### **Forest Products, Lumber, Logs and Woodchips**

The forestry industry used truck and rail transportation as an alternative to barge during the extended lock outage. Woodchips, lumber, logs and pulp were shipped by these modes from December 10, 2010 through March 24, 2011.

Transportation of forest products was primarily for industries that use forest products as an input. Various paper companies in the Pacific Northwest moved almost 58,000 tons of forest products from December 2010 to March 2011 by truck and rail; less than 15 percent of this volume moved by rail. Most of these paper firms shipped forest products to their original destination during the lock outage, mainly to the Portland and Vancouver, Washington areas.

One paper firm stated that woodchip shipments were being brought in by five trucks per day over the 15 week period. However, not all forest products were transported from the typical origin of Lewiston, Idaho and Boardman, Oregon. One paper company trucked local logs and woodchips, from the Portland area, to their facility in order to mitigate transit time and costs. Additional costs were incurred during the extended lock outage including an increase in inventory costs, storage costs and transportation costs despite a 66 percent decrease in shipments during the lock outage period.

Two barge lines were able to continue forest product shipments throughout most of the extended lock outage. Over 125,000 tons of woodchips, logs and lumber were shipped from The Dalles Lock and Dam to Portland from December 2010 to March 2011. This allowed paper companies and other consumers of forest products continued access to this commodity. Also, by barging forest products during the lock outage, shippers and customers of the forestry industry could eliminate cost increases from moving their products by alternative modes and routes.

According to industry interviews, another paper company that barges forest products upriver to its inland location also barges its finished product, paper and paperboard, downriver to the Port of Portland. This firm worked around the extended lock outage by trucking its paper products to Vancouver and then trans-loading<sup>4</sup> containers to be delivered to the Port of Portland. In addition to deliveries to Portland, this company also transported its product via truck and rail to its warehouse in Tacoma, Washington for trans-loading into containers and shipment to the Ports of Seattle and Tacoma.

As mentioned in Interim Report #2, the forestry industry increased movements prior to December 2010 to build up inventories. From July to December, forest product shipment volumes moving downriver were consistently about 75 percent above 2007-2009 averages. The forestry industry suggests it took this route of action in order to satisfy customers' orders and inventories prior to the lock outage instead of foregoing all commerce that would usually ship from December to March.

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

Sand, gravel and stone movements were expected to slow down during the extended lock outage, but actually stopped altogether. There were no shipments of rock products by alternative modes during the lock outage that would have been shipped by barge. This was due to several factors. 1) rail and trucking rates were very expensive during the lock outage as both industries tried to capitalize on the loss of barge transportation; 2) rock products are difficult to

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<sup>4</sup> Trans-loading is the process of transferring a load of goods from one mode of transportation to another. Trans-loading is most commonly used when one mode cannot be used for the entire journey. In the case of the Pacific Northwest, trans-loading often refers to a containerized shipment moving by truck and then being loaded onto and shipped via railcar.

load onto railcars and trucks and often cannot be loaded in great capacity due to weight and shape; and 3) demand for rock products shipped by barge during the lock outage was nonexistent.

Sand, gravel and stone shipments by truck barged shipment volumes were above average prior to the lock outage. This large volume of shipments prior to the lock outage is unusual. Industry interviews revealed that rock products do not generally move in large quantities in the late fall due to the lack of construction during the winter months in the Pacific Northwest.

### **Iron Ore, Iron Steel Waste and Scrap**

Iron ore and steel products moved by rail from Pasco, Washington to Portland, Oregon during the extended lock outage. Rail was more economical and more convenient than truck due to the fact that the steel firm which uses barge transportation also has a rail spur<sup>5</sup> at their loading facility.

Large amounts of steel were not transported during the outage since the rail service was unfavorable according to an industry representative. During the lock outage, only about 9,000 tons moved west by rail compared to the average 16,000 tons for December through March. This particular steel firm has arranged to transport two more steel barges after the lock outage, perhaps to catch up with business forgone during the lock outage.

### **Primary Non-Ferrous Metallic Products and Fabricated Metal Products**

The authors were unable to find the specific industries that transport primary non-ferrous metallic and fabricated metal products. However, shipments of primary non-ferrous metallic products moving downriver and upriver were on par or well above average during the six months prior to the beginning date of the extended lock outage. This suggests that industries that ship this commodity, which includes copper, aluminum and smelted products, prepositioned and filled orders early in anticipation of the extended lock outage. Another alternative is that this industry was waiting for the lock outage to end to barge their products that would have moved on the river during the winter. In addition, no primary non-ferrous metallic and fabricated metal products were shipped by barge during the lock outage and no one from the local rail industry mentioned movement of these products.

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<sup>5</sup> A spur is a railroad track on which cars are left for loading and unloading. They are also sometimes used for railcar storage.



## Wheat<sup>6</sup>

Since 70 percent of downriver barge shipments consist of wheat, this industry was impacted, especially in Southern Washington, by the extended lock outage despite careful and methodical planning since 2009 on the part of regional wheat commissions, U.S. Wheat Associates, exporters, elevators and producers. Although most firms were able to work around the lock outage without too much difficulty, some firms called the outage a “nightmare.”

During the months of December 2010 through March 2011, wheat firms in the Pacific Northwest shipped about 28 percent of wheat by truck (up from the normal 10 percent), 68 percent by rail and only 4 percent by barge<sup>7</sup>. Seven wheat firms increased their shipments by truck and 11 elevators increased their shipments by rail during the lock outage. In addition, four firms in Southern Washington and one in Northern Idaho did not ship any wheat during the lock outage. These firms normally use barge transportation and the switch to truck or rail would have been too expensive.

Despite the large amount of wheat shipped by rail in the Pacific Northwest, elevators and exporters were not particularly happy with the service. One elevator manager commented, that “rail performance was terrible. Cars were ten days early in December and over 30 days late by the end of February and continuing through March.” Another manager echoed this thought: “We could not wait for the river to open as there was lots of grain that needed to be moved. Trains were backed up quite a ways and/or arrived late in Portland [during the lock outage].”

Total shipment volumes in the Pacific Northwest decreased by about 1.6 million bushels during the extended lock outage from previous winters. However, during the summer and fall of 2010, 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 and therefore, an above average volume of wheat was shipped by barge from August to November. September 2010 shipments downriver were 65 percent above 2007-2009 averages. Due to high prices and the need to move around the lock outage, many wheat elevators took the opportunity to ship prior to the outage.

Other wheat firms, especially in Southern Washington and Northern Idaho have chosen to wait until the lock outage is complete to ship their volumes by barge. Rates for trucking and rail transportation were too expensive in these areas and shipping prior to and after the lock outage was all around more economical.

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<sup>6</sup> More information on wheat shipped during the lock outage is available in Section 3.

<sup>7</sup> Only one wheat elevator in Eastern Oregon was able to transport all of its grain by barge. This facility is located west of The Dalles Lock and Dam and was able to move through Bonneville Lock and Dam for 11 of the 15 week lock outage.

Wheat commissions and agencies in the region continued to “voice strong support for the work being done that would enhance reliability of the navigation/delivery system.” These entities stayed in contact with producers, elevators and exporters to keep them updated on the condition of the lock closure and to provide any support needed. The U.S. Wheat Associates was also a voice in support of the rehabilitation of the Columbia-Snake River System and were a contact for overseas customers.

Exporters, mainly located in Portland, increased elevator storage prior to the lock outage and held a surplus of wheat in the new storage during the lock outage. This surplus was shipped by barge prior to and by rail and truck during the renovations on the river as to prepare for the lock outage and supply exporters with wheat to ship internationally during the winter months. Sales of wheat were not stymied by the lock outage due to the high demand for U.S. wheat. Sales of wheat were not stymied during the lock outage as previously anticipated. A few fortunate events for the U.S. wheat market occurred during 2010. As mentioned, Russian experienced a severe drought during the spring that caused the government to ban wheat exports; Australia’s floods caused the wheat harvest to be of poor quality; and Canada’s wheat harvest also had its share of quality issues. This lack of supply, or at least lack of quality supply, caused the demand for U.S. wheat to heavily increase.

However, despite the increase in demand and sales, a few exporters also complained of the rail service that delivered the necessary wheat supplies. One exporter commented “on how far trains were backed up or late in arriving [to] Portland ... He said they could wait for the river to open as there was lots of grain that needed to move.” In addition, another exporter in Portland, according to the Washington Wheat Commission, did not to make certain offers on international sales during the lock outage since the ability to obtain wheat supplies by rail was uncertain.

Willamette Valley<sup>8</sup> agricultural producers chose to plant wheat in 2009 and 2010 due to a rise in price and demand for wheat. This region normally produces grass seed for golf courses and housing developments, but due to a weakened economy and a decline in price and demand for grass seed, producers planted increased wheat acreage in the fall of 2009 and the spring of 2010. Since Willamette Valley producers have not grown wheat for about ten years, rail car loading and storage are not conveniently located. In fact, previously used storage for wheat are either too dilapidated to use or filled with grass seed and therefore unable to house wheat stores. Due to the lack of storage, Willamette Valley wheat producers trucked and railed wheat to either an elevator below The Dalles Lock and Dam and directly to exporters in Portland. The wheat that was trucked to the elevator below The Dalles was barged to Portland.

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<sup>8</sup> Willamette Valley is located in western Oregon.

## **Agricultural Products: Corn, Rye, Barley, Rice, Sorghum and Oats; Vegetable Products, Animal Feed, Grain Mill Products, Flour and Other Processed Grains; and Other Agricultural Products**

During the extended lock outage, most agricultural products from the Pacific Northwest were shipped in containers by truck; the remaining tonnage moved by truck-rail or rail. These products that normally move by barge include, hay, alfalfa, grass seed, onions, rye, barley, oats, corn, soybeans, peas and lentils. In particular, agricultural goods from the Port of Morrow that usually move by barge transportation, including onions, hay and grass seed, were transported by truck with subsidies from the Port of Portland from December 2010 to March 2011. Rail costs for the Port of Morrow were three times the cost of barge; therefore, this mode was not utilized. Trucking costs were higher than usual, but not high enough to halt agricultural shipments in the Pacific Northwest.

Rye, barley, rice, sorghum and oats were shipped by truck to localized markets during the extended lock closure. According to the Washington Grain Commission, the decrease in tonnage of barley and oats moving downriver for the last ten years has been due to less production. Therefore, it is more convenient and economical to simply truck these small volume commodities to their destination. Grain industries, excluding the wheat industry, were not greatly impacted by the lock outage as these grains usually move by truck.

Peas, lentils and beans were mostly shipped in containers by rail and truck to either Portland or Seattle from December 2010 to March 2011 according to pulse<sup>9</sup> exporters and processors in the Pacific Northwest. A majority of these firms' transportation costs were subsidized by the Port of Portland. Peas, lentils and beans were loaded into twenty foot containers, transported to either Seattle or Portland and then trans-loaded into ocean vessels for international delivery. However, most processors shipped a majority of their product prior to the lock outage as to ensure deliveries and revenue.

The majority of pulse exporters and processors in the Pacific Northwest shipped their product by truck to Seattle rather than to Portland during the lock outage. This was because trucking rates were less expensive from Eastern Washington and Idaho to Seattle rather than to Portland during the extended lock outage. Also, shippers felt highways from Eastern Washington and Idaho to Seattle have a larger capacity, more conveniences and are safer than Interstate 84 in Oregon and State Highway 14 in Washington that follow the Columbia-Snake River to Portland.

Other processors and exporters of pulse products used truck-rail transportation during the outage. For some firms in the Pacific Northwest, this was a financial burden since truck-barge is the most economical transportation option. Many pulse processors and exporters complained of the unreliable rail service (delayed deliveries, slow moving trains, etc.) and high costs.

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<sup>9</sup>A pulse is an annual legume crop and used for food and animal feed. This term includes dry beans (e.g. kidney beans), dry broad beans (e.g. field beans), dry peas, chickpeas, garbanzo beans, black-eyed peas and lentils. This term excludes green beans and green peas, which are considered vegetable crops.

However, other processors, especially in Northern Washington, regularly use the truck-rail option and did not need to make alternate plans for the lock outage.

Experiences with changes in costs for pulse exporters and processors were varied across the region during the extended lock outage. One firm called the extended lock outage a “nightmare.” According to industry interviews, a firm manager stated that truck transportation was \$1.50 per 100 pounds more than barge transportation and rail transportation \$1.00 per 100 weight more than waterborne transportation. The only exact value regarding costs the authors were given was an estimate from a firm in Eastern Washington; this firm’s truck costs were \$850 per truck load including a trans-load from truck to ocean vessel in Seattle. This amount is larger than normal, but more cost effective than rail according to him. Other reasons for choosing truck transportation over rail were the high fees required to order railcars and many pulse firms had to light load some of their rail containers due to rail weight limits. Rail lines have limited capacity and one firm missed a few ocean vessels due to weight limits which caused delays in shipments to foreign countries. Also, one pulse exporter complained that his loads did not always fit into one trucking container (TEU), which meant higher costs for additional trucks.

According to various pulse exporters and processors in Washington and Idaho, fewer vessels have recently been calling to Portland to transport goods overseas. Therefore, processors and exporters have been transporting their products by rail and truck to Seattle since more vessels have been calling on this port. So, these pulse exporters and processors continued this trend during the outage. These products include lentils, green peas and beans.

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

Waste materials from Vancouver, Washington, which normally move by barge, moved by truck during the extended lock outage, according to the waste management company in this area. This product is normally transported from Vancouver to two landfills in eastern Oregon. However, during the lock outage, the closer of the two landfills (closer to Portland by 70 miles), was utilized so that trucking costs, which are much greater than those for barge transportation, could be mitigated. Clark County and the City of Vancouver authorized this repositioning of waste.

On average, about 22,000 tons of refuse per month are barged upriver by Tidewater Barge Lines. Industry representatives stated that about 35 containers of waste material moved by truck per day, five days per week along major Oregon and Washington highways from December 10, 2010 through March 24, 2011. This amounted to more than 68,000 tons trucked during the winter of 2010-2011. A minimal amount of additional traffic was produced on a few major Pacific Northwest highways due to this commodity movement.

## **5. Governmental and Institutional Experiences during the Extended Lock Outage**

Two main stakeholders of the Columbia-Snake River System led the preparations and efforts surrounding the extended lock outage. The U.S. Army Corps of Engineers operates all eight lock and dams on the Columbia-Snake River and led the plans, construction and rehabilitation efforts on the locks during the extended lock outage. Pacific Northwest Waterways Association led the effort to inform other stakeholders and fielded questions from constituents and the media. Below are the individual lock outage experiences of and impacts on government departments and institutions that are stakeholders in the Columbia-Snake River.

### **Pacific Northwest Waterways Association (PNWA)**

PNWA is a non-profit organization that “advocates for federal policies and funding in support of regional economic development” (PNWA). This group also “led the way for Congressional authorization and funding to build the locks and dams on the Columbia and Snake Rivers.”

#### **Activities and Impacts**

- Were a main contact for the media regarding questions and concerns surrounding the extended lock closure
- Were cited in 29 separate media articles around the Pacific Northwest
- Provided members and Columbia-Snake River stakeholders with updates and information concerning the lock outage
- Met with district and federal Congressional staff to emphasize the importance of the Columbia-Snake River System and provide rehabilitation updates
- Attended lock tours during the outage to provide information about the grain industries and barge community to tour participants
- Continued to work with the U.S. Wheat Associates to ensure buyers overseas of the importance and benefits of the extended lock outage

### **U.S. Army Corps of Engineers (USACE)**

#### **Activities and Impacts**

- Hosted several teleconferences (on the first Tuesday of every month) for stakeholders discussing progress made, projects completed and plans for the future for each Columbia-Snake River lock
- Documented the progression in lock rehabilitation made during to the lock outage on the USACE website
- Made plans for potential disruptions during the lock outage including bad weather and unexpected delays in construction and traffic

- Announced delays and revisions in construction and opening dates via email, telephone and website postings
- Hosted several tours at various Columbia-Snake River locks inviting the public to view construction and rehabilitation and to emphasize the importance of major lock repairs to the Pacific Northwest economy and community



Image 3: A section of the old downstream gate being lifted out of the John Day Lock  
Photo provided by George Grady, 2011

## **Wheat and Grain Commissions in Washington, Oregon and Idaho**

### **Activities and Impacts**

- Continued to voice support for the rehabilitation of the extended lock outage that would enhance reliability of the navigation and delivery system
- Participated in U.S. Army Corps of Engineers' teleconferences
- Updated wheat elevators, buyers in international markets, exporters and other stakeholders on lock rehabilitation progress
- Continued communication with wheat exporters and elevator managers and fielded comments and complaints regarding alternative modes of transportation and the need for the river system

## **U.S. Wheat Associates**

### **Activities and Impacts**

- Continued to voice support for the rehabilitation of the extended lock outage that would enhance reliability of the navigation and delivery system
- Participated in U.S. Army Corps of Engineers' teleconferences
- Continued communication with wheat exporters and grain commissions and fielded comments and complaints regarding alternative modes of transportation and the need for the river system

## **Washington and Oregon Ports**

### **Activities and Impacts**

- Upgraded container storage and improved port facilities
- Provided subsidies to patrons (industries and shippers) to mitigate truck and rail cost increases
  - Provided \$250 per unit (any size container) for products shipped from Umatilla, Oregon and Boardman, Oregon
  - Provided \$400 per unit (any size container) for products shipped from Lewiston, Idaho
- Updated patrons and shippers on the status of the lock outage
- Participated in U.S. Army Corps of Engineers' teleconferences
- Provided storage for some products halted by the extended lock outage

## **Washington State Department of Commerce and Oregon Department of Energy**

### **Activities and Impacts**

- Released situation reports warning residents of fuel price increases, shortages and availability of fuel from alternative sources
- Provided weekly and monthly reports of gasoline and diesel prices around the Pacific Northwest and updates on fuel deliveries
- Fielded the publics' and media's questions, comments and complaints surrounding fuel impacts related to the extended lock outage.

## Summary

The preceding analysis identified the impacts on and activities of shippers, carriers, industries, government departments and institutions for the recent extended lock outage on the Columbia-Snake River. In addition, waterborne, rail and truck movements between December 10, 2010 and March 24, 2011 were also analyzed.

Since most shippers, carriers and industries did not have barge transportation available, these entities used two alternatives to transport commodities: rail and truck. The most notable characteristic of alternative commodity movements between December 2010 and March 2011 is that most products were transported by truck. This is interesting to note since most industry representatives stated prior to the lock outage that products transported normally by barge would move by rail as it is typically more inexpensive than truck. Many industries, including wheat, forestry and waste management, chose to send their goods to different markets during the lock outage which involved rerouting commodities to different areas, most of which were far off from rail track.

However, a small portion of wheat; forest products, lumber, logs and woodchips; sand, gravel and stone products; and primary non-ferrous metallic products travelled downriver from below The Dalles Lock and Dam, through Bonneville and on to Portland. During this time period, wheat comprised 62 percent, or 233,500 tons, of the total downriver tonnage (377,000 tons).

The second Pacific Northwest Wheat Case Study allowed the authors to compare normal volumes, rates and modal choices for wheat elevators to those values during the extended lock outage. All but one wheat firms in the region shifted transportation from barge to truck and rail. Southern Washington elevators depended heavily on truck transportation to move wheat. Throughout the Northwest, transportation rates for truck increased by about four percent from the typical winter; rail rates increased by two percent across the Pacific Northwest during the lock outage.

Most barge companies temporarily laid off a significant number (from 35 percent to 67 percent) of their employees, including boat crews, in order to reduce costs. Some barge companies offered job sharing and reduced employees' work hours rather than lay off their entire staff. All of the barge lines were able to continue benefit packages for employees during the extended lock outage.

In contrast to barge companies, which lost business for the majority of the lock outage, rail lines experienced an increase in cargo loads during the lock outage. Rail lines responded to customers, producers and industries by increasing shipments through the extended lock outage. Rail lines in the Pacific Northwest dealt with greater than normal volumes, additional products that would have moved by barge, increased crew numbers, additional days of operation and a few extra trains per week.



Pacific Northwest Waterways Association's activities during the lock outage included being a main contact for the media regarding questions and concerns surrounding the extended lock closure. PNWA also provided members with updates and information concerning the lock outage. A main goal of the organization was to emphasize the importance of the Columbia-Snake River System and they did so by meeting with district and federal Congressional staff to provide information and rehabilitation updates regarding the lock outage.

U.S. Army Corps of Engineers' activities during the lock outage included hosting several teleconferences for stakeholders discussing progress made and projects completed, documenting all progression in lock rehabilitation made during to the lock outage on the USACE website, making plans for potential disruptions of the lock outage including bad weather and unexpected delays in construction and traffic and hosting several tours at various Columbia-Snake River locks.

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## Appendix A: Pacific Northwest Wheat Elevator Survey

Below is a copy of the authors' wheat elevator survey that was distributed via email to 26 elevators around the Pacific Northwest. The previous responses (in red) for a hypothetical survey are fictitious.

*As you know, the Columbia Snake River System just opened from a massive and sustained lock outage, which eliminated waterborne transportation. The closure of these locks is expected to have 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 study by Washington State University's Freight Policy Transportation Institute will provide guidance to policy makers and action agents in instances whenever major planned disruptions in the transportation system occur.*

*Now, we need to find out what actually happened. You have already given us a base line for rates, seasonality and tonnage from our last survey and now we need to evaluate the changes and impacts that actually occurred from the lock closure. Please answer the questions taking into account all elevators within your firm. Simply hit the reply button and you can fill out the survey in your email viewer and return the email to us.*

**We have attached *your answers and comments from the previous survey from October 2010 in red* on the left as a benchmark as needed.**

*Questions, comments or concerns? Please call or email Sara Simmons or Dr. Ken Casavant.*

*Sara Simmons  
Research Assistant  
School of Economic Sciences, WSU  
svsimmons@wsu.edu  
(509) 335-5536*

*Dr. Ken Casavant  
Closure Study Principal Investigator  
School of Economic Sciences, WSU  
casavantk@wsu.edu  
(509) 335-1608*

## EXTENDED LOCK CLOSURE STUDY

### ELEVATOR FIRM SURVEY: MARCH 2011

*Please note that this is a confidential and anonymous study. Specific names, firms, quantities and rates will NOT be mentioned. Subsequent reports will simply include average rates and quantities along with a list of interviewees to express our gratitude.*

**NAME OF THE FIRM:**

**HEADQUARTERS LOCATION:**

**NAME OF PERSON RESPONDING:**

*In regards to the time period in which the lock outage occurred (December 2010 – March 2011), we are interested in the type of transportation services used; the flow of WHEAT out of each location; and the rates for various modes of transportation. We are contacting each major grain company in Washington, Idaho and Oregon.*

1. Please estimate the tonnage of WHEAT shipped by your entire firm **during the extended lock outage** (December 2010 to March 2011).

**WHEAT**  
2,000,000 bu.

**WHEAT**  
\_\_\_\_\_ bu.

2. Please estimate the approximate percentage of WHEAT shipped from your overall firm for each of the following transportation modes **from December 2010 to March 2011**.

<b>WHEAT</b>	<b>Average Percent <u>Shipped</u></b>
Truck to Final Market	10%
Truck-Barge	50%
Rail	40%
<b>TOTAL</b>	100%

<b>WHEAT</b>	<b>Average Percent <u>Shipped</u></b>
Truck to Final Market	_____ %
Rail	_____ %
<b>TOTAL</b>	100%

3. What were the approximate rates available to your overall firm for the following transportation modes **from December 2010 to March 2011**:

<b>Lower Columbia Terminals</b>	<b>Average <u>Rate</u> for Firms</b>	<b>Lower Columbia Terminals</b>	<b>Average <u>Rate</u> for Firms</b>
Truck to Final Market	\$1.10/bu.	Truck to Final Market	\$____/bu.
Rail	\$0.70/bu.	Rail	\$____/bu.

4. Comment: Just how did it go for you and your firm during the extended lock outage?

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**Again, thank you again for your contribution.**

## **Appendix B: Industrial, Regional, Governmental and Institutional Representatives**

Below is a list of Columbia-Snake River barge transportation stakeholders, including firms, government departments and private entities, which were interviewed for this report.

ADM Milling Limited  
AgVentures Northwest, LLC  
Almota Elevator Company  
Bernert Barge Lines, Incorporated  
Blue Mountain Seed, Incorporated  
BNP Lentil Company  
British Petroleum  
Burlington Northern Santa Fe Railway  
Central Washington Grain Growers, Incorporated  
Chevron Corporation  
CLD Pacific Grain, LLC  
Clearwater Paper  
Columbia County Grain Growers  
Columbia Grain International, Incorporated  
Connell Grain Growers (a division of Cenex Harvest States)  
Cooperative Agricultural Producers, Incorporated  
Evans Grain, Feed and Seed Company  
General Feed and Grain, Incorporated  
Great Northwest Railroad (Watco Companies, Incorporated)  
Idaho Wheat Commission  
Kelley Bean Company  
Lewis-Clark Terminal, Incorporated  
Longview Fibre Paper and Packaging, Incorporated  
Maviga N.A., Incorporated U.S.A.  
Mid Columbia Producers, Incorporated  
Morrow County Grain Growers, Incorporated  
Northwest Grain Growers, Incorporated  
Northwest Pea & Bean Company  
Oregon Department of Energy  
Oregon Wheat Commission  
Pacific Northwest Farmers Cooperative  
Pacific Northwest Waterways Association  
Palouse River and Coulee City River Railroad (Watco Companies, Incorporated)  
Pendleton Grain Growers  
Pomeroy Grain Growers, Incorporated  
Port of Lewiston

Port of Morrow County  
Port of Portland  
Port of Whitman County  
Premier Pulses International, Incorporated  
Primeland Cooperatives (a division of Cenex Harvest States)  
Ririe Grain and Feed Cooperative, Incorporated  
Ritzville Warehouse Company  
SDS Lumber Company  
Shaver Transportation Company  
The McGregor Company  
Tidewater Barge Lines, Incorporated  
U.S. Army Corps of Engineers  
U.S. Wheat Associates  
U.S.A. Dry Pea and Lentil Council  
Washington and Idaho Railway  
Washington Grain Commission  
Washington State Department of Commerce  
Washington State Department of Ecology  
Washington State Potato Commission  
Waste Connections  
Weiser Feed and Storage, Incorporated  
Weyerhaeuser  
Whitgro, Incorporated

## Appendix C: Map of the Columbia-Snake River System

