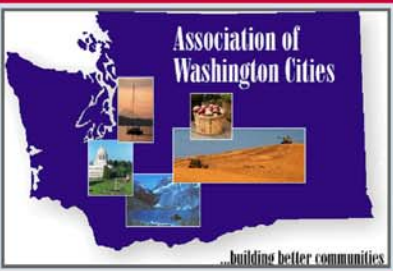




Strategic Freight Transportation Analysis



Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State

Michael L. Clark
Research Associate

Eric L. Jessup
SFTA Project Director

and

Kenneth L. Casavant
SFTA Principal Investigator



SFTA Research Report # 5

September 2003

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Washington State University
Department of Agricultural and Resource Economics
101 Hulbert Hall
Pullman, Washington 99164-6210

SFTA Research Reports: Background and Purpose

The Strategic Freight Transportation Analysis (SFTA) is a six year, \$1.8 million comprehensive research and implementation analysis that will provide information (data and direction) for local, state and national investments and decisions designed to achieve the goal of seamless transportation.

The overall SFTA scope includes the following goals and objectives:

- Improving knowledge about freight corridors.
- Assessing the operations of roadways, rail systems, ports and barges – freight choke points.
- Analyze modal cost structures and competitive mode shares.
- Assess potential economic development opportunities.
- Conduct case studies of public/private transportation costs.
- Evaluate the opportunity for public/private partnerships.

The five specific work tasks identified for SFTA are:

- Work Task 1 - Scoping of Full Project
- Work Task 2 - Statewide Origin and Destination Truck Survey
- Work Task 3 - Shortline Railroad Economic Analysis
- Work Task 4 - Strategic Resources Access Road Network (Critical State and Local Integrated Network)
- Work Task 5 - Adaptive Research Management

For additional information about this report or SFTA, please visit <http://www.sfta.wsu.edu/> or contact Eric Jessup or Ken Casavant at the following address:

Washington State University
Department of Agricultural and Resource Economics
101 Hulbert Hall
Pullman, Washington 99164-6210

Or go to the following Web Address:

www.sfta.wsu.edu

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PREVIOUS SFTA REPORTS NOW AVAILABLE

1. Casavant, Kenneth L. and Eric L. Jessup. "SFTA Full Scope of Work." SFTA Research Report Number 1. December 2002.
2. Clark, Michael L., Eric L. Jessup and Kenneth L. Casavant. "Freight Truck Origin and Destination Study: Methods, Procedures and Data Dictionary." SFTA Research Report Number 2. December 2002.
3. Casavant, Kenneth L. and Eric L. Jessup. "Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables." SFTA Research Report Number 3. December 2002.
4. Ripplinger, Toby, Kenneth L. Casavant and Eric L. Jessup. "Transportation Usage of the Washington Wine Industry." SFTA Research Report Number 4. May 2003.

Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State

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Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State

INTRODUCTION

Wheat and barley are essential commodities produced in Washington. Eastern Washington, one of the major grain producing regions in the United States, has an ideal combination of soils, climate and supporting industries suitable for dry land and irrigated grain production. Whitman County is the largest wheat-producing county in the nation, with 33 million bushels produced in 2002 (USDA-NASS, 2002).

Transportation is the dynamic link between production areas and consumers. In any agricultural based economy, marketing and transportation of crops is vital to the existence and survival of those who rely upon income generated from those crops. Land throughout the United States is dedicated to the production of essential crops to sustain not only people in the U.S., but also people all around the world. In addition to the heavy concentration of land allocated to production activities, significant economic activity and transportation demands are generated from production, harvesting and marketing of large grain volumes (Jessup, 1998). The grain system, which evolves in any grain-producing region, is heavily dependent upon and shaped by the transportation network serving that region. The presence of an efficient multi-modal transportation system plays a very important role in the movement of crops from the field to the consumer's table. Changes in the transportation system shape and affect the overall grain merchandising system.

The grain industry in Washington State is one of the major wheat and barley producers in the U.S. During 2002, over 129 million bushels of wheat were harvested in Washington State, with Washington ranking third in the U.S. for wheat production (USDA-NASS, 2002). Washington also ranked fourth in the U.S. for barley production, with over 18.3 million bushels of barley produced in 2002. In 2001, wheat was the fifth-highest valued agricultural commodity in Washington, worth over 442 million dollars. Barley ranked nineteenth at 40.95 million dollars (Washington Agriculture Statistics Service, 2002).

Grain producers and handlers in the State of Washington are able to benefit from a multimodal transportation network of county and state roads, highways, railroads, and the Columbia-Snake river system to effectively move large amounts of grain in a timely and economic manner. Dependence on this system is the result of the continual use of this infrastructure for movement of commodities. Interruption or shifts in the infrastructure effect producers, marketers and consumers of grain and agricultural products. Current, but changing, modal choices generate many effects on the complex Washington grain industry. Effects include changes in the number of firms and houses, turnover rates, and mergers due to the competitive environment of the grain industry. Additionally, impacts on marketing strategies occur because choices of available transportation modes reflect the decision process of a warehouse or firm manager. Modal choices traditionally available to managers are rail, from 1 to 25/26 cars, trucks, barges and the various combinations of these modes. The introduction of 110 car loading facilities, shuttle trains, unit

trains and continued rail abandonment can be expected to have implications on the decision process of warehouse managers when deciding how to transport grain.

STORAGE CHARACTERISTICS

There are several characteristics of grain storage that play an important role in the choice of terms within this report. Grain warehouses are licensed by the State of Washington, Commodity Inspection Division, as Terminal/Sub-Terminals or Country Warehouses. Terminal/sub-terminals represent large export facilities and or river terminals that collect grain as it moves through to its final destination. Country warehouses are facilities that are the intermediate step between production areas and terminal/sub-terminals, or in some cases, final destinations.

Storage capacity within these two warehouse types fall into two basic categories. The first category is the traditional grain storage structure. This is usually a permanent structure, constructed of cement or metal walls. Within such a structure, grain is stored in bulk. The second type of storage is outside storage. A minor amount of inside storage (1.6%) is sacked grain storage. Outside storage can be one of three different types. There is basic outside storage, temporary outside storage and emergency outside storage. All of these storage types contribute to the total storage capacity licensed in Washington. Therefore, in this report, all types are included for analysis.

The total grain storage capacity available in Washington State for the licensing period of July 1, 2001-June 30, 2002 was 208,418,000 bushels. In addition to the total capacity licensed under the State of Washington, warehouses may alternatively be licensed at the federal level. For the purposes of this report, the scope is restricted to only those warehouses licensed through the State of Washington, while recognizing there is additional storage capacity within Washington, licensed at the federal level.

Storage facilities are located in 21 of the 38 Washington counties. Two Idaho counties, Benewah and Latah, have capacity licensed through Washington State. Of the 21 Washington Counties, 4 are Western Washington counties and the remaining 17 are on the Eastern side of the state. While the two Idaho counties are not in Washington, they represent 695,000 bushels of capacity, or 0.3% of the total Washington licensed capacity and 0.4% of the capacity in the region in and surrounding Eastern Washington. With regards to results involving total storage capacities, the capacities of Benewah and Latah counties will be included.

The breakdown of the licensed storage capacity by warehouse and storage type is provided in Table 1.1. Terminal/Sub-Terminals and Country Warehouses represent 9.2% and 90.8% of the total state licensed capacity, respectively.

Table 1.1: 2001/2002 Licensed Capacities by Warehouse and Storage Type.

Warehouse Type	Storage Type	Licensed Capacity (bu)	Percent of Total Licensed Capacity
Terminal/Sub-Terminal	Traditional Storage	17,874,000	8.6%
Terminal/Sub-Terminal	Outside Emergency	1,200,000	0.6%
Terminal/Sub-Terminal	Outside Storage	0	0.0%
	Sub-Total	19,074,000	9.2%
Country Warehouse	Traditional Storage	156,069,000	74.9%
Country Warehouse	Sacked	3,250,000	1.6%
Country Warehouse	Outside Emergency	11,900,000	5.7%
Country Warehouse	Outside Temporary	18,100,000	8.7%
Country Warehouse	Outside Storage	25,000	0.0%
	Sub-Total	189,344,000	90.8%
	Statewide Total	208,418,000	100.0%

The number of houses within each category of warehouse and storage type is presented in Table 1.2. Each house is licensed separately within Washington. Due to the licensing requirements, a house may be a traditional storage facility with an associated capacity for outside storage and/or sacked grain storage. The type of storage at a house is defined by how it is primarily licensed. The information in Table 1.2 is based on the primary licensing of a house. Many of the traditional storage facilities have outside storage capacity associated with them, but the outside storage is not licensed separately.

Table 1.2: 2001/2002 Number of Storage Sites and Houses by Warehouse and Storage Types.

Warehouse Type	Storage Type	Number of Houses	Percent of Total Houses
Terminal/Sub-Terminal	Traditional Storage	5	1.3%
	Sub-Total	5	1.3%
Country Warehouse	Traditional Storage	372	94.4%
Country Warehouse	Sacked	10	2.5%
Country Warehouse	Outside Emergency	2	0.5%
Country Warehouse	Outside Temporary	5	1.3%
	Sub-Total	389	98.7%
	Statewide Total	394	100.0%

Traditional storage represents the majority and most common classification of licensed storage type for country warehouses. With 379 of 394 houses classified as traditional storage, they represent 83.5% of the total state licensed capacity. Stacked storage represents 2.5% of the total number of houses, but only provides 1.6% of the total storage capacity in the state. The second largest classification of storage type, by capacity, is outside temporary. Outside temporary represents 18.1 million bushels of capacity (8.7% of the total storage capacity).

SURVEY AREA CHARACTERISTICS

House Characteristics:

Grain storage facilities within the five counties of Whitman, Lincoln, Walla Walla, Adams and Grant represent 78.5% of the total storage capacity in the 17 Eastern Washington and two Idaho counties (Table 2.1). Whitman County, with just over 53 million bushels of storage capacity, or 27.5%, has over one and a half times the capacity as the next largest county, Lincoln. Furthermore, Whitman, Lincoln and Walla Walla counties' total capacity exceeds the remaining fourteen counties' capacity. Whitman and Walla Walla have direct river access while Lincoln and Adams counties do not.

Table 2.1: 2001/2002 Total Licensed Capacities of the 17 Eastern Washington and 2 Idaho Grain Producing Counties.

County	Total Licensed Capacity (bu)	Percent of Study Area Capacity	Average Capacity per House (bu)
Whitman	53,139,000	27.53%	462,078
Lincoln	33,009,000	17.10%	507,831
Walla Walla	23,397,000	12.12%	709,000
Adams	22,051,000	11.42%	490,022
Grant	19,978,000	10.35%	407,714
Spokane	11,440,000	5.93%	476,667
Columbia	9,497,000	4.92%	633,133
Douglas	6,890,000	3.57%	574,167
Benton	4,406,000	2.28%	1,101,500
Franklin	4,340,000	2.25%	868,000
Garfield	1,610,000	0.83%	268,333
Klickitat	998,000	0.52%	998,000
Benewah, ID	682,000	0.35%	113,667
Chelan	506,000	0.26%	506,000
Okanogan	412,000	0.21%	412,000
Stevens	307,000	0.16%	102,333
Yakima	266,000	0.14%	88,667
Kittitas	90,000	0.05%	90,000
Latah, ID	13,000	0.01%	13,000
Total	193,031,000	100.00%	-

The number of houses per county for the survey region is provided in Table 2.2. To aid in comparisons, houses were classified into 6 categories based on the total capacity per house.

Storage capacity of individual houses ranges from 10,000 to 6,800,000 bushels. Over 32% of the houses in Eastern Washington are less than 200,000 bushels in size while 10.7% exceed 1,000,000 bushels in size. Houses exceeding 1,000,000 bushels in capacity represent 40.4% of the total capacity in the survey region. Of those houses over 1,000,000 bushels in capacity, 31 are less than 2 million bushels in capacity, six are between 2 million and 3 million bushels

capacity, one is between 3 and 4 million bushels of capacity and four are greater than 4 million bushels of storage capacity.

Whitman County has the largest number of houses, 115 (29.5%), followed by Lincoln County with 65 houses or 16.7% of the total houses in the survey region. Adams County has the fourth largest number of houses in the region with 45 houses.

Table 2.2: 2001/2002 Size Distribution of Storage Sites by County.

County	Number of Houses						Total
	Licensed Capacity (Bu)						
	Less than 200,000	200,001- 400,000	400,001- 600,000	600,001- 800,000	800,001- 1,000,000	Greater than 1,000,001	
Adams	11	13	11	2	3	5	45
Benewah, ID	3	2	0	0	0	0	5
Benton	3	0	0	0	0	1	4
Chelan	0	0	1	0	0	0	1
Columbia	5	6	1	1	0	2	15
Douglas	3	1	4	2	1	1	12
Franklin	0	2	1	0	1	1	5
Garfield	2	4	0	0	0	0	6
Grant	17	11	11	4	2	4	49
Kittitas	1	0	0	0	0	0	1
Klickitat	0	0	0	0	1	0	1
Latah, ID	1	0	0	0	0	0	1
Lincoln	18	20	7	6	5	9	65
Okanogan	0	0	1	0	0	0	1
Spokane	5	7	7	2	2	1	24
Stevens	3	0	0	0	0	0	3
Walla Walla	12	6	9	1	0	5	33
Whitman	41	32	14	11	4	13	115
Yakima	3	0	0	0	0	0	3
Total	128	104	67	29	19	42	389

Response Rates:

This report provides information on the storage, handling and transportation of wheat and barley produced in the 17 Eastern Washington grain producing counties during a three-year period ending June 30, 2001. Data was collected through a comprehensive survey of grain warehouses licensed through Washington State, during the 2000/2001 licensing period. 50 of the 52 licensed firms were surveyed, covering 386 of the total 394 individually licensed houses.

Thirty-three (66.0%) of the 50 firms surveyed responded with information related to wheat and barley. The responding firms comprised 316 (81.9%) of the 386 houses surveyed. These responses covered 67.1% of the total licensed grain storage capacity in Washington State and

72.5% of the licensed capacity in the 17 Eastern Washington and two Idaho grain-producing counties. The response rate covered 80.2% of the total individual houses licensed in the state and 81.0% of the total number of houses (390) within the region.

As is shown in Tables 2.3 and 2.4, the response rate within each of the 17 Eastern Washington counties ranged from 6.3% to 100.0% of the total licensed capacity in each county and from 59.2% to 100.0% of the total houses within each county. The capacities and number of houses for Benewah, ID and Latah, ID counties are included to accurately represent the total licensed total storage available in the region. The houses in these two counties were not surveyed.

Table 2.3: Response Rates by Total State Licensed Capacity

County	Licensed Capacity (bu)		Response Rate
	Total	Surveyed	
Garfield	1,610,000	1,610,000	100.0%
Klickitat	998,000	998,000	100.0%
Chelan	506,000	506,000	100.0%
Okanogan	412,000	412,000	100.0%
Yakima	266,000	266,000	100.0%
Kittitas	90,000	90,000	100.0%
Adams	22,051,000	19,331,000	87.7%
Columbia	9,497,000	7,888,000	83.1%
Douglas	6,890,000	5,690,000	82.6%
Stevens	307,000	247,000	80.5%
Whitman	53,139,000	40,566,000	76.3%
Lincoln	33,009,000	24,087,000	73.0%
Walla Walla	23,397,000	17,063,000	72.9%
Grant	19,978,000	12,678,000	63.5%
Spokane	11,440,000	6,534,000	57.1%
Franklin	4,340,000	1,642,000	37.8%
Benton	4,406,000	277,000	6.3%
Benewah, ID	682,000	0	0.0%
Latah, ID	13,000	0	0.0%
Total	193,031,000	139,885,000	72.5%

Table 2.4: 2001/2002 Response Rates by Number of Houses

County	Total Houses by State License Book	Total Houses Surveyed	Response Rate
Douglas	12	12	100.0%
Garfield	6	6	100.0%
Yakima	3	3	100.0%
Chelan	1	1	100.0%
Kittitas	1	1	100.0%
Klickitat	1	1	100.0%
Okanogan	1	1	100.0%
Columbia	15	14	93.3%
Walla Walla	33	30	90.9%
Adams	45	40	88.9%
Lincoln	65	56	86.2%
Whitman	115	96	83.5%
Spokane	24	18	75.0%
Benton	4	3	75.0%
Stevens	3	2	66.7%
Franklin	5	3	60.0%
Grant	49	29	59.2%
Benewah, ID	6	0	0.0%
Latah, ID	1	0	0.0%
Total	390	316	81.0%

Turnover Rates:

The turnover rate for a house is calculated by dividing the total volume shipped in a year by the capacity of the house. The turnover rate is one indication of storage capacity utilization relative to handled volume. The greater the turnover rate for a region means more grain is shipped sooner and, therefore, is not held in long-term storage.

The average turnover rate, by county, for all houses in the study region was 0.90 (Table 2.5). The average turnover rate in each county, based on survey returns, varied from 0.26 in Franklin County to 2.43 in Klickitat County. The total grain reported received in each county, and the associated total capacity at the responding houses were used.

Table 2.5: Reported Average Turnover Rate per County.

County	Licensed Capacity (bu)	Total Grain Received (bu)	Turnover Rate
Klickitat	998,000	2,430,000	2.43
Walla Walla	17,063,000	22,234,090	1.30
Whitman	40,412,000	47,089,433	1.17
Kittitas	90,000	100,000	1.11
Okanogan	412,000	384,000	0.93
Stevens	247,000	222,754	0.90
Garfield	1,461,000	1,265,000	0.87
Benton	277,000	235,616	0.85
Lincoln	23,587,000	17,453,100	0.74
Columbia	7,582,000	5,341,879	0.70
Douglas	5,690,000	3,995,015	0.70
Adams	19,331,000	13,540,324	0.70
Spokane	6,534,000	4,325,000	0.66
Chelan	506,000	278,000	0.55
Grant	12,678,000	5,844,332	0.46
Yakima	266,000	75,000	0.28
Franklin	1,642,000	427,000	0.26
Total	138,776,000	125,240,543	0.90

The average annual volume of wheat and barley reported as received by surveyed grain warehouses over the survey period for the three marketing years was 104,645,248 bushels of wheat and 20,595,295 bushels of barley (Table 2.6). Houses in Whitman, Walla Walla, Lincoln and Adams received over 80% of the total reported grain received. Wheat and barley receipts by responding surveyed houses, accounted for 83.6% and 16.4% of the total, respectively.

Table 2.6: Average Amount of Wheat and Barley Reported as Received in the 17 Eastern Washington Counties.

County	Wheat (bu)	Barley (bu)	Total Grain Received (bu)	Percent of Total Grain Received
Whitman	35,205,681	11,883,752	47,089,433	37.6%
Walla Walla	20,154,076	2,080,014	22,234,090	17.8%
Lincoln	14,812,488	2,640,612	17,453,100	13.9%
Adams	12,756,205	784,119	13,540,324	10.8%
Grant	5,760,946	83,386	5,844,332	4.7%
Columbia	4,337,039	1,004,840	5,341,879	4.3%
Spokane	2,860,000	1,465,000	4,325,000	3.5%
Douglas	3,929,999	65,016	3,995,015	3.2%
Klickitat	2,325,000	105,000	2,430,000	1.9%
Garfield	875,000	390,000	1,265,000	1.0%
Franklin	427,000	0	427,000	0.3%
Okanogan	369,000	15,000	384,000	0.3%
Chelan	258,000	20,000	278,000	0.2%
Benton	230,200	5,416	235,616	0.2%
Stevens	174,614	48,140	222,754	0.2%
Kittitas	100,000	0	100,000	0.1%
Yakima	70,000	5,000	75,000	0.1%
Total	104,645,248	20,595,295	125,240,543	100.0%

Draw Area:

Warehouse operators were asked to identify the approximate percentage of grain receipts coming from various distances to their warehouses. As shown in Table 2.7, more than 63% of grain, on average, is received from within 10 miles of a house. Warehouse operators identified 84.9% of grain as coming from within a 20-mile radius of their facility. This and subsequent discussions begin to illustrate how grain is more likely to be transported from the field to a conveniently close house during harvest time, in order to minimize travel time for grain trucks.

Table 2.7: Percent of Received by Distance from Warehouse.

Distance from House (mi)	Percent of Received Grain
Less than 5	38.39%
5 to 10	25.26%
11 to 20	21.27%
21 to 50	11.95%
Over 50	3.13%

SEASONALITY OF WHEAT AND BARLEY RECEIPTS

Harvest season is the time when a majority of grain is delivered from production areas to storage facilities. On average, 76.94% of wheat and 71.4% of barley is delivered to houses during July-August (Tables 3.1 and 3.2). Percentages of grain received at all houses during September and October drops off sharply to 12.48% and 15.17% for wheat and barley, respectively. Receipts of wheat during the remainder of the year are relatively low, varying between 0.95% during May-June to 5.20% during November-December. The reduction in barley receipts is similar.

Table 3.1 also lists the seasonality of wheat receipts for houses based on direct access to river and rail transportation systems. The table also includes the number of houses responding to the applicable sections of the survey and the total amount of grain reported received for each category. Specific attention should be paid to up-country houses, as this category does not include river facilities. A greater percentage of wheat is delivered to up-country houses during harvest time, than to the other categories. This further indicates producers try to reduce the amount of travel time between fields and their chosen storage facilities. Additionally, a smaller percentage of wheat is delivered to facilities using bulk rail during harvest time, reflecting transshipments occurring during the remainder of the year to those houses. Comparing houses with bulk rail access and up-country houses, up-country houses receive 6% more of their grain in July-August. Conversely, bulk rail users receive 4.59% more of their wheat than the up-country houses for the September-October time period.

Table 3.1: Annual Wheat Receipts by Time-Period.

Time Period	Percent of Wheat Received			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
July-August	76.94%	87.35%	80.97%	75.63%
September-October	12.48%	10.78%	15.37%	11.54%
November-December	5.20%	0.84%	1.72%	6.33%
January-February	2.56%	0.59%	1.33%	2.96%
March-April	1.87%	0.25%	0.32%	2.38%
May-June	0.95%	0.26%	0.29%	1.17%
Total Houses Responding	300	286	86	214
Total Volume Received (bu)	104,645,248	70,742,202	25,739,836	78,905,412

¹Excludes river facilities.

Seasonality of barley receipts to houses varies little from the seasonal pattern for wheat (Table 3.2). The largest variation from the seasonal receipt pattern is the July-October time period for houses without bulk rail access. This time period has an average of 6.5% more receipts of barley, than compared to the percentage of wheat delivered during the same time. Similar to wheat, barley deliveries to up-country houses are most heavily concentrated in the July-August harvest season.

Table 3.2: Annual Barley Receipts by Time-Period.

Time Period	Percent of Barley Received			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
July-August	71.43%	85.12%	82.96%	69.10%
September-October	15.17%	13.71%	14.48%	15.31%
November-December	5.41%	0.63%	0.55%	6.39%
January-February	3.97%	0.37%	1.68%	4.43%
March-April	2.65%	0.01%	0.00%	3.18%
May-June	1.37%	0.16%	0.32%	1.59%
Total Houses Responding	223	211	35	188
Total Volume Received (bu)	20,108,295	13,354,912	3,383,344	16,724,951

¹Excludes river facilities.

There is considerable variation among counties as to when houses receive wheat (Table 3.3). On average, houses in 13 counties receive 90% or more of their wheat during the July through October time period. The remaining four counties, Benton, Klickitat, Whitman and Yakima, receive between approximately 20% and 40% percent of their wheat during July to October, reflecting greater on-farm storage and shipments to river facilities.

Table 3.3: Seasonality of Wheat Receipts by County.

County	Percent of Wheat Received					
	July-August	September-October	November-December	January-February	March-April	May-June
Adams	96.42%	3.12%	- ¹	0.40%	0.02%	0.04%
Benton	60.03%	19.98%	19.98%	-	-	-
Chelan	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Columbia	95.08%	4.92%	-	-	-	-
Douglas	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Franklin	94.68%	0.56%	0.95%	-	-	3.81%
Garfield	97.14%	2.00%	-	0.86%	-	-
Grant	81.32%	15.47%	1.21%	0.66%	0.71%	0.63%
Kittitas	100.00%	-	-	-	-	-
Klickitat	50.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Lincoln	81.41%	16.41%	1.33%	0.28%	0.28%	0.28%
Okanogan	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Spokane	64.41%	27.20%	2.80%	2.80%	1.40%	1.40%
Stevens	43.35%	56.65%	-	-	-	-
Walla Walla	85.54%	6.37%	3.97%	2.19%	1.93%	-
Whitman	62.11%	16.78%	11.13%	4.99%	3.35%	1.64%
Yakima	60.00%	20.00%	20.00%	-	-	-

¹An omission means that no grain receipts were reported during that time period.

Houses in 11 of the 17 counties receive over 93% of barley during July to October (Table 3.4). Only houses in Benton, Klickitat, Whitman and Yakima counties receive barley in noticeable amounts throughout the rest of the year. The houses from Franklin and Kittitas counties reported no barley receipts.

Table 3.4: Seasonality of Barley Receipts by County.

County	Percent of Barley Received					
	July-August	September-October	November-December	January-February	March-April	May-June
Adams	89.41%	3.77%	1.12%	5.70%	- ¹	-
Benton	9.37%	1.08%	-	-	-	89.55%
Chelan	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Columbia	100.00%	-	-	-	-	-
Douglas	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Franklin	-	-	-	-	-	-
Garfield	97.00%	2.00%	-	1.00%	-	-
Grant	92.31%	7.67%	0.02%	-	-	-
Kittitas	-	-	-	-	-	-
Klickitat	10.00%	50.00%	-	20.00%	20.00%	-
Lincoln	82.87%	16.19%	0.94%	-	-	-
Okanogan	80.00%	16.00%	1.00%	1.00%	1.00%	1.00%
Spokane	60.41%	39.59%	-	-	-	-
Stevens	63.38%	36.62%	-	-	-	-
Walla Walla	87.29%	11.25%	1.22%	0.24%	-	-
Whitman	63.13%	14.70%	8.96%	6.38%	4.50%	2.32%
Yakima	2.00%	1.00%	-	-	-	97.00%

¹An omission means that no grain receipts were reported during that time period.

All house size classes receive over 80% of wheat receipts in the July-October period. Houses with less than 200,000 bushels of licensed capacity received the greatest amount (98.6%) during that time (Table 3.5). This supports the data that producers are more likely to move grain to more accessible (and usually smaller) houses during harvest. Houses of greater than 1,000,000 bushels of capacity, on average, have a greater distribution of wheat receipts throughout the year than the other size classes. This reflects trans-shipments received from other houses throughout the year.

Table 3.5: Seasonality of Wheat Receipts by House Size.

Licensed Capacity (bu)	Percent of Wheat Received					
	July-August	September-October	November-December	January-February	March-April	May-June
Less than 200,000	87.87%	10.77%	0.97%	0.18%	0.11%	0.11%
200,001-400,000	79.55%	12.16%	3.25%	2.13%	1.92%	1.00%
400,001-600,000	86.16%	10.88%	2.03%	0.36%	0.26%	0.32%
600,001-800,000	87.64%	9.47%	0.92%	1.01%	0.50%	0.46%
800,001-1,000,000	67.29%	15.81%	4.48%	4.31%	4.05%	4.06%
Greater than 1,000,001	65.61%	14.38%	10.60%	4.92%	3.33%	1.16%

SEASONALITY OF WHEAT AND BARLEY SHIPMENTS

Grain is shipped from most houses throughout the course of the year. Average wheat shipments, for all houses, remained relatively constant from July through February, varying between 23.7% in September-October to 17.1% in January-February. Prior to harvest, the percentage of wheat shipped dropped to 12.3% and 6.6% in March-April and May-June, respectively (Table 4.1).

Houses with bulk rail access ship the largest percentage (27.1%) of their wheat, relative to all groups and all time periods, during September-October. Houses without bulk rail access were most consistent in their pattern of shipments throughout year, a difference of only 16.8% between their heaviest and lightest periods. Overall, shipments were concentrated in periods following harvest, tapering off until immediately prior to harvest. This shows a tendency for houses to ship wheat from their location to other houses or river facilities in order to free up capacity in anticipation of grain receipts during harvest.

Table 4.1: Annual Wheat Shipments by Time-Period.

Time Period	Percent of Wheat Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
July-August	20.17%	18.01%	15.96%	21.62%
September-October	23.72%	25.19%	27.07%	22.56%
November-December	20.26%	20.46%	19.92%	20.37%
January-February	17.05%	15.77%	16.13%	17.37%
March-April	12.25%	12.95%	12.12%	12.29%
May-June	6.56%	8.31%	8.79%	5.78%
Total Houses Responding	286	273	86	200
Total Volume Shipped (bu)	100,309,851	67,906,805	25,739,836	74,570,015

¹Excludes river facilities.

Barley shipments show less overall variation during the year than wheat, for all house combinations (Table 4.2). Shipments vary between 23.6% in November-December to 9.1% in May-June. Barley shipments from September to December are consistently between 44% and 47% of shipments for all house categories. As with wheat, those houses with bulk rail access had the least amount of variation between their heaviest and lightest shipment periods, with only an 11.68% difference.

Table 4.2: Annual Barley Shipments by Time-Period.

Time Period	Percent of Barley Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
July-August	17.89%	13.61%	13.37%	18.80%
September-October	20.64%	20.99%	19.66%	20.84%
November-December	23.62%	25.43%	24.18%	23.51%
January-February	15.56%	14.42%	15.59%	15.55%
March-April	13.18%	15.01%	14.70%	12.87%
May-June	9.12%	10.55%	12.50%	8.43%
Total Houses Responding	220	209	35	185
Total Volume Shipped (bu)	20,080,295	13,631,912	3,383,344	16,696,951

¹Excludes river facilities.

The seasonality of wheat shipments by county is presented in Table 4.3. There is considerable seasonal variation of shipments between counties. Columbia County showed the least variation between periods with a difference of 14.69% between September-October and May-June. Garfield County showed the greatest variation by shipping all wheat during January through April.

Table 4.3: Seasonality of Wheat Shipments by County.

County	Percent of Wheat Shipped					
	July-August	September-October	November-December	January-February	March-April	May-June
Franklin	26.65%	19.89%	18.99%	13.46%	12.60%	8.41%
Grant	25.00%	10.00%	15.00%	25.00%	10.00%	15.00%
Lincoln	22.78%	24.74%	21.19%	15.35%	8.55%	7.40%
Columbia	20.98%	22.17%	22.06%	17.72%	9.58%	7.48%
Benton	20.00%	20.00%	20.00%	30.00%	10.00%	-
Yakima	20.00%	20.00%	20.00%	20.00%	20.00%	-
Walla Walla	20.00%	40.00%	15.00%	10.00%	8.00%	7.00%
Chelan	20.00%	40.00%	15.00%	10.00%	8.00%	7.00%
Douglas	20.00%	40.00%	15.00%	10.00%	8.00%	7.00%
Okanogan	20.00%	-	20.00%	20.00%	20.00%	20.00%
Kittitas	19.98%	20.07%	19.98%	29.97%	9.99%	-
Whitman	17.64%	32.63%	32.23%	9.16%	1.73%	6.61%
Spokane	17.60%	29.04%	18.21%	16.31%	8.34%	10.49%
Klickitat	15.51%	35.19%	20.26%	13.56%	9.81%	5.66%
Adams	4.73%	17.84%	20.00%	30.62%	26.04%	0.77%
Garfield	-	-	-	31.43%	68.57%	-
Stevens	-	29.16%	30.00%	30.00%	5.42%	5.42%

¹An omission means that no grain receipts were reported during that time period.

The seasonality of barley shipments from houses by county is shown in Table 4.4. All counties have shipments reported in at least one time period except for Franklin and Kittitas. Thirteen of

the seventeen counties reported shipping over 70% of their barley from July to December. Additionally, six of those counties shipped 84% or more of their grain in the same time span. Fourteen of the 17 counties ship their highest percentage of barley during July-August.

Table 4.4: Seasonality of Barley Shipments by County.

County	Percent of Barley Shipped					
	July-August	September-October	November-December	January-February	March-April	May-June
Klickitat	100.00%	-	-	-	-	-
Stevens	56.72%	18.29%	18.05%	3.30%	0.78%	2.86%
Whitman	54.96%	45.04%	-	-	-	-
Spokane	52.96%	12.91%	6.48%	4.50%	15.21%	7.94%
Lincoln	52.18%	11.96%	11.96%	11.96%	11.96%	-
Garfield	51.21%	15.08%	8.43%	8.43%	8.43%	8.43%
Chelan	50.00%	25.00%	9.38%	6.25%	5.00%	4.38%
Douglas	50.00%	25.00%	9.38%	6.25%	5.00%	4.38%
Okanogan	50.00%	25.00%	9.38%	6.25%	5.00%	4.38%
Grant	49.24%	-	-	10.15%	40.61%	-
Walla Walla	46.25%	12.82%	14.32%	12.22%	7.89%	6.50%
Adams	46.18%	15.08%	15.08%	-	8.06%	15.60%
Benton	43.47%	14.26%	17.67%	11.65%	6.67%	6.28%
Columbia	38.79%	14.78%	18.36%	18.36%	4.85%	4.85%
Yakima	9.09%	-	54.55%	-	36.36%	-
Franklin	-	-	-	-	-	-
Kittitas	-	-	-	-	-	-

¹An omission means that no grain receipts were reported during that time period.

Wheat is shipped from houses throughout the year from all warehouse size classes (Table 4.5). One of the most evident patterns for wheat shipments is that the majority of shipments occur during the September-October time period for all size classes of houses. Warehouses, with capacities between 800,001 and 1,000,000 bushels have the least amount of variation for wheat shipments throughout the year.

Table 4.5: Seasonality of Wheat Shipments by House Size.

Capacity	Percent of Wheat Shipped					
	July-August	September-October	November-December	January-February	March-April	May-June
Less than 200,000	22.83%	24.08%	20.00%	16.75%	10.89%	5.45%
200,001-400,000	23.28%	23.82%	18.14%	14.42%	13.34%	7.00%
400,001-600,000	18.45%	24.08%	20.18%	16.61%	13.53%	7.15%
600,001-800,000	16.65%	27.98%	21.41%	12.82%	10.53%	10.61%
800,001-1,000,000	21.59%	21.47%	18.41%	17.59%	10.99%	9.96%
Greater than 1,000,001	20.40%	23.10%	21.72%	19.50%	11.06%	4.20%

Concentrations for barley shipments differ somewhat from wheat. Overall, the shipment pattern is more consistent than wheat, with the largest concentration of shipments occurring in the November-December time period. The smallest variation in shipments occurs in the 200,001-400,000 bushel size class. Each size class ships at least 58% of their barley between July and December.

Table 4.6: Seasonality of Barley Shipments by House Size.

Capacity	Percent of Barley Shipped					
	July- August	September- October	November- December	January- February	March- April	May- June
Less than 200,000	10.08%	23.05%	29.34%	14.76%	12.46%	10.31%
200,001-400,000	19.64%	19.31%	19.34%	12.73%	18.26%	10.72%
400,001-600,000	14.49%	19.43%	25.53%	16.64%	13.23%	10.68%
600,001-800,000	11.98%	31.23%	33.44%	7.81%	7.37%	8.16%
800,001-1,000,000	19.74%	14.62%	25.48%	2.11%	23.57%	14.49%
Greater than 1,000,001	21.95%	21.15%	21.69%	18.46%	10.44%	6.31%

DESTINATIONS FOR WHEAT AND BARLEY SHIPPED FROM HOUSES

Although wheat is shipped from Eastern Washington houses to a number of destinations, it is predominantly shipped to Columbia River ocean terminals located between Portland, Oregon and Kalama, Washington. Of the wheat shipped from houses in Eastern Washington, 91.5% goes to Columbia River ocean terminals, 0.37% to Puget Sound terminals and 6.2% is shipped to other houses as shown in Table 5.1. In-state and out-of-state flourmills receive 1.79% of wheat shipped from Eastern Washington warehouses. The percentage of wheat trans-shipped to other houses is slightly greater for up-country houses and lower with respect to Columbia River ocean terminals. Trans-shipping is movement of grain to another warehouse, from which it is then shipped to its final destination. The other houses receiving this grain are usually river facilities or houses with bulk rail access.

Table 5.1: Wheat Shipments by Destination

Destination	Percent of Wheat Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
Columbia River Ocean Terminals:				
Washington	62.42%	63.98%	56.59%	64.40%
Columbia River Ocean Terminals:				
Oregon	29.09%	27.30%	37.86%	26.12%
Puget Sound Terminals	0.37%	0.13%	0.68%	0.26%
Trans-shipment to Other Houses	6.16%	6.42%	0.87%	7.95%
In-State Flour Mills	1.52%	1.67%	3.29%	0.92%
Out-of-State Flour Mills	0.27%	0.29%	0.65%	0.14%
Feedlots	0.03%	0.04%	0.06%	0.03%
Other	0.14%	0.16%	0.00%	0.19%
Total Houses Responding	291	275	86	205
Total Volume Shipped (bu)	101,881,249	92,643,621	25,739,836	76,141,413

¹Excludes river facilities.

Columbia River ocean terminals in Washington and Oregon are the destination for 66.36% of barley shipped from Eastern Washington (Table 5.2). Feedlots are the next largest barley destination with 21.13%, followed by trans-shipments with 7.21%. A slightly greater percentage (0.03%) of barley is shipped feedlots than wheat. This trend reflects the fact that barley is readily used as feed for livestock, compared to wheat, which is more commonly destined for human consumption.

Table 5.2: Barley Shipments by Destination

Destination	Percent of Barley Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
Columbia River Ocean Terminals:				
Washington	44.78%	34.54%	31.91%	47.59%
Columbia River Ocean Terminals:				
Oregon	21.58%	15.32%	33.69%	18.94%
Puget Sound Terminals	0.00%	0.00%	0.00%	0.00%
Trans-Shipment to Other Houses	7.21%	10.74%	0.56%	8.67%
In-State Flour Mills	0.25%	0.38%	0.00%	0.31%
Out-of-State Flour Mills	0.00%	0.00%	0.00%	0.00%
Feedlots	21.13%	31.40%	25.45%	20.19%
Vancouver, Wa	2.98%	4.51%	8.40%	1.80%
Other	2.05%	3.10%	0.00%	2.50%
Total Houses Responding	217	205	36	181
Total Volume Shipped (bu)	19,974,879	13,221,496	3,583,344	16,391,535

¹Excludes river facilities.

The average percentage of wheat shipped to various destinations from the 17 Eastern Washington counties is reported in Table 5.3. Eleven of the 17 counties ship at least 90% of their wheat to Columbia River Ocean terminals in Washington or Oregon. Four out of the remaining 6 counties ship over 85% of their wheat to Columbia River ocean terminals. Columbia County most likely ships almost all of its wheat to ocean terminals because a majority of the 50.6% of wheat reported as trans-shipments to other houses is most likely the movement of grain by truck to a barge facility for export. Spokane County, the location of multiple flourmills, has the highest percentage of wheat being shipped to in-state flour mills at 11.7%. Walla Walla, Klickitat, Garfield, Benton, Kittitas and Yakima County houses ship all of their wheat to Columbia River ocean terminals.

As indicated by Table 5.2, barley shipments from counties are predominantly to ocean terminals or feed lots. Six counties ship 100% of their barley to these two locations. Eight more counties ship between 57% and 94% of their barley to ocean terminals or feedlots.

Table 5.3: Destinations of Wheat Shipments by County.

County	Percent of Wheat Shipped							
	Columbia River Terminals Washington	Columbia River Terminals Oregon	Puget Sound Terminals	Trans-shipment to Other houses	In-State flour mills	Out-of-State Flour Mills	Feedlots	Other
Adams	27.59%	59.11%	0.41%	12.61%	0.28%	- ¹	-	-
Benton	99.96%	0.04%	-	-	-	-	-	-
Chelan	47.00%	47.00%	-	-	4.00%	2.00%	-	-
Columbia	26.56%	22.83%	-	50.61%	-	-	-	-
Douglas	47.00%	47.00%	-	-	4.00%	2.00%	-	-
Franklin	72.68%	24.03%	-	3.29%	-	-	-	-
Garfield	60.00%	40.00%	-	-	-	-	-	-
Grant	45.33%	42.85%	1.62%	5.79%	2.53%	1.70%	-	0.17%
Kittitas	-	100.00%	-	-	-	-	-	-
Klickitat	100.00%	-	-	-	-	-	-	-
Lincoln	55.67%	32.23%	1.96%	6.10%	3.48%	0.56%	-	-
Okanogan	47.00%	47.00%	-	-	4.00%	2.00%	-	-
Spokane	70.66%	1.05%	-	16.57%	11.71%	-	-	-
Stevens	89.16%	-	5.42%	5.42%	-	-	-	-
Walla Walla	100.00%	-	-	-	-	-	-	-
Whitman	60.04%	35.30%	-	3.08%	0.99%	-	0.11%	0.49%
Yakima	100.00%	-	-	-	-	-	-	-

¹An omission means that no grain shipments were reported during that time period.

Table 5.4: Destinations of Barley Shipments by County.

County	Percent of Barley Shipped								
	Columbia River Terminals Washington	Columbia River Ocean Terminals Oregon	Puget Sound Terminals	Trans-shipment to Other houses	In-State flour mills	Out-of-State Flour Mills	Feedlots	Vancouver, Washington	Other
Adams	- ¹	15.12%	-	27.83%	0.64%	-	56.41%	-	-
Benton	-	-	-	-	-	-	100.00%	-	-
Chelan	47.00%	47.00%	-	-	4.00%	2.00%	-	-	-
Columbia	13.51%	18.24%	-	9.71%	-	-	28.64%	-	29.90%
Douglas	-	23.93%	-	-	6.91%	-	69.16%	-	-
Franklin	-	-	-	-	-	-	-	-	-
Garfield	59.10%	39.10%	-	-	-	-	1.79%	-	-
Grant	-	-	-	11.99%	-	-	88.01%	-	-
Kittitas	-	-	-	-	-	-	-	-	-
Klickitat	90.00%	-	-	-	-	-	10.00%	-	-
Lincoln	9.56%	-	-	17.97%	2.14%	-	70.32%	-	-
Okanogan	-	-	-	-	100.00%	-	-	-	-
Spokane	39.02%	1.10%	-	13.32%	10.26%	-	17.86%	18.44%	-
Stevens	26.62%	-	-	-	-	-	73.38%	-	-
Walla Walla	79.60%	-	-	-	-	-	20.40%	-	-
Whitman	50.77%	33.13%	-	3.58%	0.78%	-	6.98%	2.54%	2.23%
Yakima	-	-	-	-	-	-	100.00%	-	-

¹An omission means that no grain shipments were reported during that time period.

MODAL CHOICE FOR WHEAT AND BARLEY SHIPMENTS

Grain is shipped from houses to market destinations via rail, truck, and combinations of truck-barge and rail-barge. Warehouse managers were asked to identify percentages of their grain shipped by each of the modes currently available at their house. Information on rail modal shipments was collected according to whether the grain moved using single-car, 3-car, 25/26-car (bulk rail) or 52-car (unit train) shipments.

Truck-barge was the modal choice for 51.10% of wheat produced in Eastern Washington (Table 6.1). Additionally, 25/26-car rail accounts for 18.51% of wheat shipments from all houses. No respondents, indicated grain being moved by anything greater than 25/26-car shipments at the time of the study.

Up-country houses shipped 48.83% of their wheat via truck-barge and 26.29% via bulk rail (Table 6.1). Houses without bulk rail access shipped over 60% via truck-barge and 13.41% was shipped via truck to other houses. Just over 29% of all houses have access to bulk rail. Those houses using bulk rail shipped over 73% of their grain via their bulk rail loading facilities and 21.93% via truck-barge. Minor amounts of wheat are moved using the remaining available modes.

Single-car and 3-car rail shipments accounted for only 1.63% of wheat shipped from all houses, 0.37% and 1.26% respectively. Rail-barge accounted for over 4% of wheat shipments from houses in Eastern Washington. Trucking wheat to final markets represents only 0.68% of wheat shipped from all houses, with up-country houses trucking the greatest percentage of wheat to its final destination at 1.01%.

Table 6.1: Modes Used to Ship Wheat.

Mode	Percent of Wheat Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
Truck to Other Houses	10.68%	15.70%	2.62%	13.41%
Truck to Final Market	0.68%	1.01%	0.20%	0.84%
Truck-Barge	51.10%	48.83%	21.93%	60.96%
Rail-Barge	4.13%	5.73%	1.64%	4.98%
Single-Car-Rail	0.37%	0.54%	0.23%	0.41%
3-Car Rail	1.26%	1.87%	0.14%	1.64%
25/26 Car Rail	18.51%	26.29%	73.24%	- ²
52-Car Rail	-	-	-	-
Other	13.26%	0.01%	-	17.75%
Total Houses Responding	300	286	88	212
Total Volume Shipped (bu)	136,402,000	115,860,000	51,919,000	84,483,000

¹Excludes river facilities.

² An omission means that mode was not utilized to ship wheat.

Feed and malting barley are produced in Eastern Washington. Local markets such as dairies, cattle feeders and breweries play a much more important role in barley marketing than is true for

wheat. As a result, the modal mix for barley shipments is very different from that of wheat shipments (Table 6.2). Truck-barge is still the predominant mode for barley shipments with 21.76% of all barley shipments. Truck to final market is a close second, representing 17.67%. Combined rail shipments were 17.52%, with the more barley shipped via bulk rail. Rail-barge shipments made up just over 5% of barley shipments.

Table 6.2: Modes Used to Ship Barley.

Mode	Percent of Barley Shipped			
	All	Up-Country ¹	Bulk Rail User	Bulk Rail Non-User
Truck to Other Houses	10.66%	15.57%	1.27%	13.61%
Truck to Final Market	17.67%	25.80%	32.25%	13.09%
Truck-Barge	21.76%	26.30%	3.52%	27.50%
Rail-Barge	5.36%	7.07%	4.16%	5.73%
Single-Car-Rail	1.96%	2.92%	7.04%	0.37%
3-Car Rail	8.11%	11.77%	12.46%	6.74%
25/26 Car Rail	9.41%	10.49%	39.31%	- ²
52-Car Rail	-	-	-	-
Other	25.08%	0.07%	-	32.96%
Total Houses Responding	227	215	68	159
Total Volume Shipped (bu)	99,964,000	82,087,000	35,308,000	64,656,000

¹Excludes river facilities.

² An omission means that mode was not utilized to ship barley.

Considerable variability in modal choice exists among counties (Table 6.3). Nine out of the 17 Eastern Washington counties used truck-barge as a primary mode of shipment for wheat. This especially shows up when looking at counties bordering Columbia or Snake River system. Other counties that are not directly bordering a river system shipped wheat primarily by truck-barge. This could be due to the producer's ability to haul longer distances with larger trucks and competitive pricing by barge operators. Trucks are more likely to be used for barley shipments than for wheat because barley is more often shipped directly to a final market. In Garfield and Walla Walla counties, truck-barge is the predominant mode of barley shipment with over 98% and 45%, respectively (Table 6.4). In ten counties, shipping by truck to the final market is the predominant mode of shipment with a range of 30.67% to 100% shipment by this mode. Houses in nine of the counties did not use rail for barley shipments.

Table 6.3: Modes of Wheat Shipments by County.

County	Percent of Wheat Shipped								
	Truck to Other Houses	Truck to Final Market	Truck-Barge	Rail-Barge	Single-Car Rail	3-Car Rail	25/26 Car Rail	52-Car Rail	Other
Adams	13.66%	- ¹	64.78%	-	0.47%	-	21.09%	-	-
Benton	-	-	100.00%	-	-	-	-	-	-
Chelan	-	-	1.00%	-	-	-	99.00%	-	-
Columbia	15.33%	-	73.23%	11.44%	-	-	-	-	-
Douglas	58.53%	-	41.47%	-	-	-	-	-	-
Franklin	3.31%	-	96.69%	-	-	-	-	-	-
Garfield	-	-	100.00%	-	-	-	-	-	-
Grant	17.15%	0.27%	18.53%	-	2.57%	-	61.30%	-	0.18%
Kittitas	-	-	-	-	100.00%	-	-	-	-
Klickitat	-	-	-	-	-	-	-	-	100.00%
Lincoln	21.46%	0.73%	32.87%	-	-	-	44.93%	-	-
Okanogan	-	-	-	-	-	-	100.00%	-	-
Spokane	21.47%	11.19%	12.73%	-	-	10.98%	43.64%	-	-
Stevens	-	-	47.49%	-	-	9.16%	43.35%	-	-
Walla Walla	-	-	86.56%	13.44%	-	-	-	-	-
Whitman	4.80%	0.76%	42.38%	3.16%	0.23%	2.81%	13.14%	-	32.72%
Yakima	-	-	100.00%	-	-	-	-	-	-

¹ An omission means that mode was not utilized to ship wheat.

Table 6.4: Modes of Barley Shipments by County.

County	Percent of Barley Shipped								
	Truck to Other Houses	Truck to Final Market	Truck-Barge	Rail-Barge	Single-Car Rail	3-Car Rail	25/26 Car Rail	52-Car Rail	Other
Adams	27.98%	54.67%	0.21%	- ¹	1.93%	-	15.21%	-	-
Benton	-	-	-	-	-	-	-	-	100.00%
Chelan	-	100.00%	-	-	-	-	-	-	-
Columbia	11.46%	30.67%	30.35%	4.53%	-	22.99%	-	-	-
Douglas	-	90.77%	-	-	-	-	9.23%	-	-
Franklin	-	-	-	-	-	-	-	-	-
Garfield	-	1.79%	98.21%	-	-	-	-	-	-
Grant	32.98%	67.02%	-	-	-	-	-	-	-
Kittitas	-	-	-	-	-	-	-	-	-
Klickitat	-	100.00%	-	-	-	-	-	-	90.00%
Lincoln	21.25%	54.56%	6.48%	-	14.59%	-	3.11%	-	-
Okanogan	-	100.00%	-	-	-	-	-	-	-
Spokane	14.85%	25.02%	4.85%	-	-	38.81%	16.48%	-	-
Stevens	-	63.38%	4.15%	-	7.92%	16.62%	7.92%	-	-
Walla Walla	-	20.40%	45.63%	33.97%	-	-	-	-	-
Whitman	8.87%	3.99%	21.86%	2.95%	-	7.26%	12.49%	-	42.58%
Yakima	-	-	-	-	-	-	-	-	100.00%

¹ An omission means that mode was not utilized to ship barley.

As expected, the percentage of wheat shipped via bulk rail increases as the percentage of wheat shipped via truck-barge decreases, although a small amount of wheat is still shipped truck-barge even when the percentage of wheat moving bulk rail is over 80%, (Table 6.5). A very similar pattern exists when comparing the use of bulk rail by a house that heavily ships truck-barge. Houses that ship between 61% and 80% of their wheat via truck-barge still ship 6.74% of their wheat by bulk rail (Table 6.6). The heaviest users of the truck-barge mode, those shipping more than 80%, ship virtually no wheat (0.15%) via bulk rail.

Table 6.5: Percentages of Wheat Shipped via Truck-Barge by Percent of Wheat Shipped via 25/26 Car Rail.

Percent of Wheat Shipped via 25/26 Car Rail	Number of Houses Surveyed	Total Capacity Surveyed	Percent of Wheat Shipped via Truck-Barge
0 - 20	5	4,640,000	86.71%
21 - 40	6	2,183,000	49.18%
41 - 60	19	11,135,000	35.78%
61 - 80	18	7,940,000	25.06%
81 - 100	38	25,019,000	6.25%

Table 6.5: Percentages of Wheat Shipped via 25/26 Car Rail by Percent of Wheat Shipped via Truck-Barge.

Percent of Wheat Shipped via Truck-Barge	Number of Houses Surveyed	Total Capacity Surveyed	Percent of Wheat Shipped via 25/26 Car Rail
0 - 20	54	31,630,000	65.80%
21 - 40	17	6,066,000	24.64%
41 - 60	41	16,899,000	16.43%
61 - 80	16	5,877,000	6.74%
81 - 100	119	48,487,000	0.15%

Truck-barge is the predominant modal choice among houses. Over 83% of all responding houses used truck-barge as a modal choice. The next two most used modal choices were truck only and bulk rail, with approximately 30% of all houses using each mode. The least used modes were rail-barge, single car and three-car rail. Use of these modes ranged between 2.37% and 7.46% of all houses (Table 6.6).

Table 6.6: Modal Intensity for Wheat Shipments.

Percent of Wheat Shipped per House	Percent of Total Houses¹					
	Truck-Barge	Truck Only	Rail-Barge	Single-Car Rail	3-Car Rail	25- or 26-Car Rail
Did not Ship	16.27%	70.51%	92.54%	97.63%	95.25%	70.85%
1-20%	18.31%	5.76%	0.68%	1.36%	2.37%	1.69%
21-40%	5.76%	3.39%	1.02%	0.34%	0.00%	2.03%
41-60%	13.90%	8.81%	1.69%	0.34%	1.36%	6.44%
61-80%	5.42%	5.76%	0.00%	0.00%	0.68%	6.10%
80-100%	40.34%	5.76%	4.07%	0.34%	0.34%	12.88%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Number of Houses Shipping per Mode	247	87	22	7	14	86
Shipped Volume Surveyed (bu)	53,374,444	11,871,626	4,319,166	384,393	1,318,501	19,337,683

¹Total number of houses responding was 295.

STORAGE AND HANDLING RATES

The average storage rate for wheat and barley was 2.3 cents per bushel per month (c/bu/mo). Storage rates for wheat ranged from a low of zero (no charge) to a high of 10 c/bu/mo, with the lowest rate, other than no charge, of 1.5 c/bu/mo (Table 7.1). Over 69% of the houses charged in the 0.1 to 2.0 c/bu/mo range for wheat storage. Barley storage rates followed a similar pattern as the wheat. The range of storage rates for barley was zero to 6.7 c/bu/mo, with the lowest non-zero rate of 1.5 c/bu/mo. Fifty percent of houses charged between 0.1 and 2.0 c/bu/mo for barley storage.

Table 7.1: Wheat and Barley Storage Rates.

Storage Charge (c/bu/mo)	Number of Houses	
	Wheat	Barley
0	1	2
0.1-2	209	108
2.1-2.5	61	92
2.6-3	12	7
3.1-3.5	6	- ¹
3.6-10	11	7
Maximum Storage Rate	\$0.100	\$0.067
Minimum Storage Rate²	\$0.015	\$0.015
Average Storage Rate	\$0.023	\$0.023
Total Number of Houses Responding	300	216

¹ An omission indicates no houses reported rates within that range.

² Minimum Rate excludes those houses with no-charge storage.

The weighted average handling rate for wheat was 8.8 cents per bushel (Table 7.2). Almost 48% of reporting houses had handling rates that ranged from 9.1 to 11 cents per bushel. The weighted average handling rate for barley was 9.2 cents per bushel, which is slightly more than wheat. Over 57% of reporting houses had a barley storage rate that ranged from 8 to 10 cents per bushel.

Table 7.2: Wheat and Barley Handling Rates.

Handling Charge (c/bu)	Number of Houses	
	Wheat	Barley
0	6	7
0.1-5	3	- ¹
5.1-6	6	4
6.1-7	-	4
7.1-8	82	22
8.1-9	38	58
9.1-10	101	72
10.1-11	42	39
11.1-12	1	5
12.1-13	14	-
13.1-14	2	2
14.1-17	3	14
Maximum Handling Rate	\$0.170	\$0.170
Minimum Handling Rate²	\$0.050	\$0.060
Average Handling Rate	\$0.088	\$0.092
Total Number of Houses Responding	298	227

¹ An omission indicates no houses reported rates within that range.

² Minimum Rate excludes those houses with no-charge handling.

TRANSPORTATION RATES

The average truck, barge, and rail rates to the Columbia River ocean terminals for the shipment of wheat and barley are presented in Tables 8.1 and 8.2. Rates to Columbia River ocean terminals are used for comparison since a large volume of wheat and barley grown in Washington moves down the network of dams on the river system.

In general, the closer a county is to the river system, the greater the differential between rail rates for 1-25 cars and 26-109 cars (Table 8.1). This suggests that truck-barge rates create a downward pressure on bulk rail rates. Okanogan, Stevens and Spokane counties had the highest 1-25 car rail rates ranging from just below 44 c/bu in Okanogan County to just above 37 c/bu in Spokane County. Franklin County had the lowest bulk rail rates for wheat and barley with 28.46 and 27.85 c/bu for wheat and barley, respectively.

Table 8.1: Wheat and Barley Rail Rates by County

County	Cents per Bushel				
	Wheat ¹			Barley ²	
	1-25 Car	26-109 Car	110-120 Car	1-25 Car	26-109 Car
Adams	31.73	28.76	24.71	31.57	29.17
Benton	29.90	- ³	-	29.07	35.32
Chelan	37.21	34.26	-	32.74	29.79
Columbia	-	-	-	-	-
Douglas	-	-	-	-	-
Franklin	31.27	28.46	-	30.79	27.85
Grant	37.30	34.37	-	35.61	33.45
Kittitas	30.88	-	-	27.79	-
Klickitat	27.94	-	-	23.91	-
Garfield	-	-	-	-	-
Lincoln	36.29	33.39	-	36.13	33.78
Okanogan	43.91	40.97	-	41.56	38.62
Spokane	37.35	34.05	-	35.35	32.16
Stevens	42.91	-	-	46.56	43.62
Walla Walla	30.88	-	-	27.23	-
Whitman	35.88	32.94	-	31.83	30.03
Yakima	30.88	-	-	29.58	31.18

¹ Wheat rates are based on 3400bu per 268,000lb GWOR car.

² Barley Rates are based on 3400bu per car for loads less than 5000ft³.

³ An omission indicates no rate information was available.

On average, barley was 1.65 c/bu cheaper to transport by barge than wheat, most likely due to differences in densities (Table 8.2). Barley was also 0.98 c/bu cheaper than wheat to ship to its destination using trucks. Franklin County had the lowest combined truck-barge rate at 27.85 c/bu for wheat. Walla Walla had the lowest truck-barge rate for barley at 22.99 c/bu.

Table 8.2 Wheat and Barley Truck and Barge Rates by County.

County	Cents per Bushel			
	Wheat		Barley	
	Barge Rate	Truck Rate	Barge Rate	Truck Rate
Adams	18.09	12.39	16.34	11.77
Benton	16.59	12.00	15.02	- ¹
Chelan	16.59	30.00	15.02	-
Columbia	19.26	9.35	17.45	7.05
Douglas	16.59	29.19	15.02	14.00
Franklin	17.34	10.51	15.68	-
Garfield	20.34	8.25	18.46	7.20
Grant	16.59	20.35	15.02	23.61
Kittitas	16.59	-	15.02	-
Klickitat	15.87	-	14.40	-
Lincoln	18.09	20.96	16.34	18.97
Okanogan	16.59	-	15.02	-
Spokane	20.34	17.12	18.46	16.98
Stevens	18.09	39.77	16.34	40.00
WallaWalla	17.21	10.72	15.59	7.40
Whitman	20.69	13.68	18.77	13.63
Yakima	16.59	12.00	15.02	-
Average²	17.60	14.45	15.95	13.47

¹ An omission indicates no data was provided by respondents in those counties.

² The average was calculated using the rates at each of the ports located within the study area.

ORIGINS OF GRAIN RECEIPTS

Although the majority of the counties surveyed received all of their grain from in-state sources, there were five counties with receipts from out-of-state sources. These counties ranged from a high of 10.34% in Walla Walla County to a low of 0.74% in Adams County (Table 9.1.).

Table 9.1: Origination of Grain Receipts by County

County	Percent	
	In-State Receipts	Out of State Receipts
Adams	99.26%	0.74%
Benton	100.00%	0.00%
Chelan	100.00%	0.00%
Columbia	100.00%	0.00%
Douglas	100.00%	0.00%
Franklin	100.00%	0.00%
Garfield	100.00%	0.00%
Grant	98.30%	1.70%
Kittitas	100.00%	0.00%
Klickitat	100.00%	0.00%
Lincoln	100.00%	0.00%
Okanogan	100.00%	0.00%
Spokane	90.06%	9.94%
Stevens	100.00%	0.00%
Walla Walla	89.66%	10.34%
Whitman	91.29%	8.71%
Yakima	100.00%	0.00%

A better overall picture is gained by breaking up houses into the categories of river terminals, up-country houses and all houses. Out-of-state receipts ranged from 10.12% to 3.27 for river terminals and country houses, respectively (Table 9.2). Overall, 5.55% of grain was received by all houses from out-of-state sources.

Table 9.2: Origin of Grain Receipts by Up-Country and River Terminals

	Percent		Total Grain Received (Bu)
	In-state Receipts	Out of State Receipts	
River Terminals	89.88%	10.12%	40,656,429
Up-Country Houses	96.73%	3.27%	81,595,543
All Houses	94.45%	5.55%	122,251,972

MODAL SHIFTS

A warehouse manager has many of decisions to make in a day. One of these decisions managers continually reevaluate is which mode should be used to ship grain. Short line railroads are just one of many modal choices available to ship grain. The survey asked warehouse managers what the impact of successful improvements to short line railroads would be to grain receipts at their facilities. Responses were put into three categories, relative to the effects upon rates, short line volumes and local road volumes.

Tables 10.1 through 10.3 show that a majority of respondents felt that improvements to short line railroads would produce no change upon rates or volumes on short line or local road systems. Over 30% of respondents expressed an expectation of short line rail rates decreasing between 1-30% with successful short line improvements. Slightly less than 21% of respondents showed an expectation of an 1-60% increase in short line volumes, with a majority of those expectations in the 1-30% range (Table 10.2). Additionally, in Table 10.3, a small percentage of respondents (16.35%) indicated an expectation of a decrease of traffic on local road systems.

Table 10.1: Expected Effects of Short Line Railroad Improvements Upon Short Line Rail Rates.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	1.26%	30.19%	-
31-60%	0.00%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	3.14%	0.00%	-
Percent Responding	4.40%	30.19%	65.41%
Number of Respondents¹	7	48	104

¹Total number of responses to these questions was 159.

Table 10.2: Expected Effects of Short Line Railroad Improvements Upon Short Line Rail Volume.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	11.95%	0.00%	-
31-60%	8.18%	0.00%	-
61-90%	0.63%	0.00%	-
90-100%	0.00%	0.00%	-
Percent Responding	20.75%	0.00%	79.25%
Number of Respondents¹	33	0	126

¹Total number of responses to these questions was 159.

Table 10.3: Expected Effects of Short Line Railroad Improvements Upon Local Road Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	0.00%	9.20%	-
31-60%	0.61%	6.75%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	0.00%	-
Percent Responding	0.61%	16.35%	83.44%
Number of Respondents¹	1	26	136

¹Total number of responses to these questions was 163.

Tables 10.4 through 10.6 summarize the responses from managers regarding the effects of successful improvements to main line railroads. Similar to the responses regarding short line railroads, a majority of respondents indicated there would be no change to main line rail rates or volumes on main line or local roads resulting from improvements to main lines. Over 20% of respondents indicated an expectation of main line rates to increase between 1-30% due to improvements. Effects upon main line and local road volumes were also overwhelmingly not affected by improvements. Slightly less than 8% expressed an expectation that main line volumes would increase and 2.98% said that local road volumes would decrease. The belief that local road volumes would be greatly unchanged indicates that grain would still have to be trans-shipped from those houses without main line access to a house with rail access.

Table 10.4: Expected Effects of Main Line Railroad Improvements Upon Main Line Rail Rates.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	20.37%	8.64%	-
31-60%	0.00%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	0.00%	-
Percent Responding	20.37%	8.64%	70.99%
Number of Respondents¹	33	14	115

¹Total number of responses to these questions was 162.

Table 10.5: Expected Effects of Main Line Railroad Improvements Upon Main Line Rail Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	5.92%	0.59%	-
31-60%	1.78%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	0.00%	-
Percent Responding	7.69%	0.59%	91.72%
Number of Respondents¹	13	1	155

¹Total number of responses to these questions was 169.

Table 10.6: Expected Effects of Main Line Railroad Improvements Upon Local Road Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	0.00%	2.98%	-
31-60%	1.79%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	0.00%	-
Percent Responding	1.79%	2.98%	95.24%
Number of Respondents¹	3	5	160

¹Total number of responses to these questions was 168.

Respondents were also asked about the effects of losing short line railroads upon their modal choices. Respondents were grouped according to their currently available rail choices. In Table 10.7, over 76% of the respondents with short line rail access would shift their modal choice to truck-barge with the loss of short line railroads. As expected, 60.53% of respondents with main line rail access indicated there would be no change in their choice of modes. Those with access to both main and short line rail, indicated a shift to truck-barge, similar to the short line rail group.

Table 10.7: Next Modal Choice due to Loss of Short Line Rail Roads.

Current Rail Modal Choice	Total Respondents	Percent of Each Modal Choice Group			
		Main Line Train	Truck-Barge	Combination of Modes ¹	No Change
Short Line	73	1.37%	76.71%	10.96%	10.96%
Main Line	38	0.00%	21.05%	18.42%	60.53%
Short and Main Line	4	0.00%	75.00%	0.00%	25.00%
None	98	5.10%	67.35%	5.10%	22.45%
All Respondents	213	2.82%	62.44%	9.39%	25.35%

¹ Main line train and Truck-Barge.

Table 10.8 shows the expectations related to changes in truck shipping rates for wheat, due to the loss of short line railroads. Responses were broken into categories based upon their current truck rates. The greatest number of respondents had a rate between 21 and 30 c/bu. Overall, 62.16% of the respondents expressed an expectation of wheat shipping rates increasing due to the loss of short line rail roads. This could show a reasonable reliance upon short line railroads with regards to shipping wheat.

Table 10.8: Effects of Loss of Short Line Rail Roads Upon Wheat Shipping Rates.

Wheat Shipping Rates (Truck) ¹	Number of Respondents	Percent of Respondents		
		Increase	Decrease	No Change
No Rate	11	2.70%	-	7.21%
.01-.1	14	-	-	12.61%
.11-.2	35	15.32%	6.31%	9.91%
.21-.3	49	42.34%	-	1.80%
Greater than .31	2	1.80%	-	-
Total Respondents	111	62.16%	6.31%	31.53%

¹ No Rate indicates those responses that did not provide a shipping rate.

Managers were also asked to indicate the effects of larger trucks upon grain receipts at their facility. Responses were group according to the licensed capacity of the house. Over 16% expect to realize a decrease in receipts. Twelve percent of the respondents who expected a decrease in receipts were from houses with smaller capacities (less than 400,000bu). This expectation may be based in a belief that producers would be willing to use larger trucks to haul grain farther distances. Overall, 82.28% expected there would be no change. Comments from surveys indicated many producers were currently using larger trucks to transport grain crops.

Table 10.9: Effects of Larger Truck Use by Producers Upon Volume Received at Warehouses.

Capacity	Number of Respondents	Percent Responding		
		Increase	Decrease	No Change
Less than 200,000	47	0.00%	5.70%	24.05%
200,001-400,000	39	0.63%	6.96%	17.09%
400,001-600,000	30	0.00%	1.90%	17.09%
600,001-800,000	17	0.00%	1.27%	9.49%
800,001-1,000,000	5	0.63%	0.00%	2.53%
Greater than 1,000,001	20	0.00%	0.63%	12.03%
All Respondents	158	1.27%	16.46%	82.28%

Tables 10.10 through 10.14 summarize responses related to impacts from changes in shuttle and unit train loading technologies. In addition to changes to shuttle and unit train rates and volumes for shuttle/unit trains and local roads, managers were also asked about their expectations of effects on river and rail line volumes. A majority of respondents expected no changes to occur in any of the areas due to shuttle and unit train loading technologies.

In Table 10.10, the 37.95% indicated an expectation that rates for shuttle and unit trains would decrease with greater loading technology for shuttle and unit trains. Only 11.05% expected an increase in shuttle and unit train volumes, while 7.18% expected a decrease in local road volumes

10.10: Effects of Shuttle and Unit Train Loading Technology Upon Shuttle and Unit Train Rates.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	0.00%	18.07%	-
31-60%	0.00%	19.28%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	0.60%	-
Percent Responding	0.00%	37.95%	62.05%
Number of Respondents¹	0	63	103

¹Total number of responses to these questions was 166.

10.11: Effects of Shuttle and Unit Train Loading Technology Upon Shuttle and Unit Train Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	11.05%	0.00%	-
31-60%	0.00%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	1.58%	-
Percent Responding	11.05%	1.58%	87.37%
Number of Respondents¹	21	3	166

¹Total number of responses to these questions was 190.

10.12: Effects of Shuttle and Unit Train Loading Technology Upon Local Road Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	2.76%	6.08%	-
31-60%	0.55%	0.00%	-
61-90%	0.55%	0.00%	-
90-100%	0.00%	1.10%	-
Percent Responding	3.87%	7.18%	80.66%
Number of Respondents¹	7	13	146

¹Total number of responses to these questions was 181.

Table 10.13 shows that 16.29% of respondents expected river volumes to decrease. Table 10.14 shows 18.24% expect rail line volumes to increase with greater loading technology for shuttle and unit trains. This would indicate that facilities with the technology to load shuttle and unit trains, draw grain away from river facilities.

10.13: Effects of Shuttle and Unit Train Loading Technology Upon River Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	2.25%	13.48%	-
31-60%	0.00%	1.69%	-
61-90%	0.00%	0.00%	-
90-100%	0.00%	1.12%	-
Percent Responding	2.25%	16.29%	74.72%
Number of Respondents¹	4	29	133

¹Total number of responses to these questions was 178.

10.14: Effects of Shuttle and Unit Train Loading Technology Upon Rail Line Volumes.

Expected Change	Percent Responding		
	Increase	Decrease	No Change
1-30%	14.47%	0.00%	-
31-60%	2.52%	0.00%	-
61-90%	0.00%	0.00%	-
90-100%	1.26%	0.63%	-
Percent Responding	18.24%	0.63%	81.13%
Number of Respondents¹	29	1	129

¹Total number of responses to these questions was 159.

SUMMARY

The wheat and barley industry in Eastern Washington relies heavily on truck-barge, predominantly ships to Columbia River ocean terminals, and is relatively consistent regarding seasonality of shipments throughout the year, except for May-June. Grain receipts at houses are concentrated in four, out of 17 counties, within the study area. Houses in those four counties, received over 80% of grain receipts. These counties were Whitman, Walla Walla, Lincoln and Adams.

Licensed storage capacity of houses within the study region varied widely from 10,000 bushels to over 6,000,000 bushels. Houses less than 1,000,000 bushels in capacity, account for almost 60% of the total storage capacity in the survey region. The average turnover rate for houses in the study area was 0.90.

Warehouse managers reported over 84.93% of wheat and barley received at their facility comes from farms that are within a 20-mile radius. This shows grain moves relatively short distances following harvest season. Wheat and barley are shipped from houses throughout the year. The percentage of wheat shipped is distributed more evenly throughout the year, where a high of 23.72% is shipped September-October and only 6.56% is shipped during May-June. Grain is shipped at all times through the year, from all sizes of houses. Grain is shipped year round from 11 of the 17 Eastern Washington counties. While houses receive most wheat and barley during harvest season, houses with over 800,000 bushels of capacity receive grain on a consistent basis throughout the year. It is likely that most of these houses are either rail sub-terminals or river terminal facilities. Thus, the continuous receipt of grain is reflective of trans-shipment of grain occurring throughout the year.

The modal combination of truck and barge is responsible for 51.10% of the wheat and 21.76% of the barley shipped from Eastern Washington houses. Bulk rail or 25/26-car rail shipments, the main competitor to truck-barge, and accounts for 18.51% of wheat shipped. Total rail shipments of barley were 24.83%. Trucks play a more vital role in the shipment of barley from houses than in the shipment of wheat. In addition to up-country houses moving barley via truck-barge, truck to final market is responsible for 25.80% of barley shipments and truck to other houses was 10.66%.

The primary destination for wheat and barley shipped from houses in Eastern Washington is the Columbia River ocean terminals. There was over 62% of wheat and 44.78% of barley shipped to ocean terminals in Washington and almost 30% of wheat and just over 21% of barley was shipped to ocean terminals in Oregon. In addition to the large amount of barley shipped to the ocean terminals, 21.13% is shipped to feedlots and 2.98% is shipped to breweries in Vancouver, Washington.

COMPARISONS AND CHANGES; 1993-1994 TO 2001-2002

Comparisons; 1993-1994 and 2001-2002:

The following section highlights significant changes between 1993-1994 and 2001-2002. Comparisons are first made based upon an overall view of the Washington State grain storage industry. Comparisons of turnover rates, seasonality, destinations and modes follow. All figures are aggregated values for wheat and barley.

The overall industry structure and characteristics has experienced significant change between 1993-1994 and 2001-2002 as illustrated in Table 12.1. The percent change is calculated using the 1993-1994 values as the base. As shown, there was a 36.6% reduction in the total number of firms and a 20.4% reduction in the number of licensed houses. Total storage capacity was 7.4% less in 2001-2002 and the average size of firms and houses increased 46.1% and 16.4% respectively. The reduction in the number of firms and licensed houses suggests a certain degree of consolidation occurring over the 8-year period. The degree of consolidation is difficult to pinpoint because federally licensed houses within Washington are not included in these figures. Because houses have the option of licensing under the federal or state systems, but not both, the 30 fewer firms may or may not have exited or have been consolidated.

Table 12.1: Number of Firms, Houses and Total and Average Capacities; 1993/1994 and 2001/2002.

	1993/1994	2001/2002	Percent Change
Number of Firms	82	52	-36.6%
Number of Houses	495	394	-20.4%
Total Storage Capacity	224,991,000	208,418,000	-7.4%
Average Capacity per Firm	2,743,793	4,008,038	46.1%
Average Capacity per House	454,527	528,980	16.4%

The 20.4% reduction in number of licensed houses is further explained by examining how the size distribution of houses was affected. Table 12.2 lists the number of houses by size category for both 1993-1994 and 2001-2002. There was almost a 25% reduction in the number of houses having capacities of less than 800,000 bushels. The number of smallest houses (less than 200,000 bushels) was reduced by a third. The number of houses with greater than 800,000 bushels of capacity increased 8.5%. This shift in the size distribution indicates a movement towards utilizing houses with larger capacities, possibly capturing economies of scale within the industry.

Table 12.2: Size Distribution of Houses; 1993/1994 and 2001/2002.

Year	Number of Houses						Total
	Licensed Capacity Classification						
	Less than 200,000	200,001- 400,000	400,001- 600,000	600,001- 800,000	800,001- 1,000,000	Greater than 1,000,001	
1993/1994	194	123	81	38	16	43	495
2001/2002	130	104	67	29	19	45	394
Percent Change	-33.0%	-15.4%	-17.3%	-23.7%	18.8%	4.7%	-20.4%

Table 12.3 shows the turnover rates for the grain producing counties in Eastern Washington. Most counties exhibited little or no change in the rate of turnover. Kittitas and Yakima counties saw a reduction in turnover rates of 1.33 and 1.96, respectively. These relatively dramatic changes may be attributable to the few houses licensed in those counties and the resulting few observations from the surveys. All other counties saw changes to their turnover rates of between a 0.49 decrease and an increase of 0.75. The overall average turnover rate increased 0.01 from 0.89 to 0.90.

Table 12.3: Turnover Rates and Changes; 1993/1994 and 2001/2002.

County	Turnover Rate		Change
	1993/1994	2001/2002	
Adams	0.61	0.70	0.09
Benton	0.10	0.85	0.75
Chelan	1.04	0.55	-0.49
Columbia	0.70	0.70	0.01
Douglas	0.52	0.70	0.18
Franklin	0.54	0.26	-0.28
Garfield	1.96	0.87	-1.10
Grant	0.57	0.46	-0.11
Kittitas	2.44	1.11	-1.33
Klickitat	- ¹	2.43	-
Lincoln	0.76	0.74	-0.02
Okanogan	0.83	0.93	0.10
Spokane	1.01	0.66	-0.35
Stevens	1.10	0.90	-0.20
Walla Walla	1.53	1.30	-0.22
Whitman	1.09	1.17	0.08
Yakima	2.25	0.28	-1.96
Total	0.89	0.90	0.01

¹ No houses were licensed in 1993/1994.

The seasonality of receipts and shipments changed very little over the course of 8 years, as illustrated in Table 12.4. In 2001-2002, receipts were slightly more concentrated in July through October. The pattern of shipments remained virtually unchanged.

Table 12.4: Seasonality of Grain Receipts and Shipments; 1993/1994 and 2001/2002.

Time-Period	Total Wheat and Barley			
	1993/1994		2001/2002	
	Receipts	Shipments	Receipts	Shipments
July-August	76.69%	19.56%	76.05%	19.79%
September-October	7.77%	19.48%	12.92%	23.20%
November-December	4.99%	22.15%	5.23%	20.82%
January-February	3.60%	16.80%	2.78%	16.80%
March-April	2.99%	15.22%	1.99%	12.40%
May-June	3.95%	6.78%	1.02%	6.98%

Changes in the destination of grain shipments exhibited slightly more variation than seasonality. In Table 12.5, over 10% more of the total grain was shipped to Columbia River ocean terminals in 2001-2002. This seems to account for the marked decreases in the percentages being trans-shipped to other houses and moved to other destinations.

Table 12.5: Grain Shipments by Destination; 1993/1994 and 2001/2002.

Destination	1993-1994	2001-2002	Change
Columbia River Ocean Terminals	76.75%	87.39%	10.64%
Puget Sound Terminals	2.19%	0.31%	-1.88%
Trans-Shipment to Other Houses	11.00%	6.33%	-4.67%
Flour Mills	0.80%	1.54%	0.74%
Vancouver, Wa	1.64%	3.49%	1.85%
Feedlots	2.38%	0.49%	-1.89%
Other	5.24%	0.46%	-4.78%

Shipment of grain by various modal choices demonstrated a shift between modes. Table 12.6 shows over 16% less grain being moved via truck-barge in 2001-2002. While there were minor decreases in most other modal choices, the category for other modes showed a 15.05% increase in grain shipments.

Table 12.6: Grain Shipments by Mode; 1993/1994 and 2001/2002.

Mode	1993-1994	2001-2002	Change
Truck to Other Houses	12.68%	10.68%	-2.00%
Truck To Final Market	3.02%	3.48%	0.46%
Truck-Barge	62.84%	46.26%	-16.58%
Rail-Barge	- ¹	4.34%	-
Single Car Rail	0.85%	0.63%	-0.22%
3-Car Rail	2.94%	2.39%	-0.55%
25/26 Car Rail	17.50%	17.01%	-0.48%
Other	0.16%	15.21%	15.05%

¹ The 1993-1994 survey did not request details regarding rail-barge usage.

Summary of Changes; 1993-1994 to 2001-2002:

Overall, changes to the grain industry between 1993-1994 and 2001-2002 were seen most prominently in the structure and characteristics of the industry. A slight reduction (7.4%) in total state licensed storage capacity and 30 fewer (36.6%) firms indicate possible industry consolidation. The exact reason behind the reduction in the number of firms is not known. Consolidation within the industry and variances in licensing options are both viable explanations. Shipping and receiving patterns remained relatively constant between the two periods, with a minor shift to slightly more concentrated activity during and immediately following harvest. Destination and modal choices also exhibited minor changes. There was a 10.64% increase in shipments to Columbia River ocean terminals, with minor reductions to shipments to the remaining destinations. Modal choices saw a reduction (16.58%) in the use of Truck-Barge, with a positive shift (15.05%) towards those modal options encompassed by the other category.