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Transportation Logistics and Supply Chain Characteristics of Washington Hay and Livestock Movements

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ABSTRACT

The local and regional hay and livestock industries have experienced considerable growth over the past few years generating multiple economic benefits and multiplier effects throughout Washington's economy. The total value of production for livestock products (\$1.35 billion) and hay (\$414 million) collectively totals over \$1.76 billion. Growth in these agricultural and natural resource industries and continued success depends upon access to markets and an efficient multimodal transportation system to bridge production supply sources with destination demand markets. The value of hay and livestock products to regional producers and the state's economy is substantially diminished without an efficient transportation system.

This paper investigates those transportation characteristics and requirements necessary for efficient movement of hay and livestock products to domestic and international markets. This is accomplished through the evaluation and analysis of data collected and compiled from a variety of sources, including industry level surveys to hay and livestock producers, processors and brokers.

Detailed analysis regarding statewide geographic concentration and intensity of hay and livestock production is provided. In addition, the unique seasonality of shipments from production supply locations to intermediate processing locations is provided, by product form and transportation mode choice. Specific hay and livestock processing facilities are geographically identified in addition to the degree of product transformation that occurs between production and consumption. Destination demand markets are identified by product type and by season, revealing inherent transportation efficiencies associated with different product forms and the demand opportunities to international markets. This is especially noticeable for dense cubed-hay products utilizing container transport to

Asia. Finally, key freight corridors and highways supporting hay and livestock shipments are geographically identified by level of intensity and type of movement.

Key findings and implications were summarized, highlighting both challenges and opportunities. State transportation officials and policy makers will be better equipped to prioritize investment decisions with a more thorough understanding of the relationship between improvements in transportation efficiency and impact on the hay and livestock industry in Washington.

INTRODUCTION

The local and regional hay and livestock industries have experienced considerable growth over the past few years generating multiple economic benefits and multiplier effects throughout Washington's economy. The total value of production for livestock products (\$1.35 billion) and hay (\$414 million) collectively totals over \$1.76 billion. Growth in these agricultural and natural resource industries and continued success depends upon access to markets and an efficient multimodal transportation system to bridge production supply sources with destination demand markets. The value of hay and livestock products to regional producers and the state's economy is substantially diminished without an efficient transportation system.

The transportation system serving the Washington hay and livestock industries is an integral requirement for future growth and prosperity. The value of production for cattle ranks fifth and hay at sixth in Washington among the Top 40 Agricultural commodities. Hay and livestock production is heavily concentrated in the central part of the state, also known as the Columbia Basin. There are many factors contributing to the heavy concentration in this area. The climate plays the dominant role in determining the optimal locations for producing premium quality hay and cattle. The Columbia Basin has very mild weather in comparison to the rest of the state, receiving the least amount of rainfall and reducing the amount of disease and sickness for livestock operations. The accessibility to livestock feed is a major contributing factor in the Columbia Basin due to the fact it is also the leading area in hay production (both irrigated and dry-land)¹.

This study offers a detailed analysis regarding statewide geographic concentration and intensity of hay and livestock production. In addition, the unique seasonality of shipments from production supply locations to intermediate processing locations is provided, by product form and transportation mode choice. Specific hay and livestock processing facilities are geographically identified in addition to the degree of product transformation that occurs between production and consumption. Destination demand markets are identified by product type and by season, revealing inherent transportation efficiencies associated with different product forms and the demand opportunities to international markets. This is especially noticeable for dense cubed-hay products utilizing container transport to Asia. Finally, key freight corridors and highways supporting hay and livestock shipments are geographically identified by level of intensity and type of movement.

DATA AND INFORMATION SOURCES

In order to obtain more specific and detailed information on Washington Hay and livestock movements and transportation characteristics, a statewide survey of all producers, processors and brokers was conducted. The Washington State Hay Growers Association and Washington State Department of Agriculture (Licensed Livestock Dealers) provided a list of producers throughout the state. Processing facilities were obtained similarly, based on interviews with area producers and industry experts. Surveys were sent to producers, processors and brokers in Washington State gathering transportation and shipment characteristic information for the statewide hay and livestock industries. The questionnaire asked producers, processors and brokers for the volume of inbound and outbound shipments, seasonality of shipments, local and state roads being used, vehicle type, and destination of shipments.

This paper investigates those transportation characteristics and requirements necessary for efficient movement of hay and livestock products to domestic and international markets. This is accomplished through the evaluation and analysis of data collected and compiled from a variety of sources, including industry level surveys to hay and livestock producers, processors and brokers.

SURVEY RESULTS AND ANALYSIS

Producers: Seasonality of Hay Shipments

Hay is harvested throughout the summer with the first cutting beginning in May. On average, 31.03% of hay is delivered from producers to various destinations during October-December time period (Table 1). This time period coincides with the period prior to the harsh winter months and immediately following the last harvest. Thus, livestock operations are securing anticipated feed requirements and hay producers are less constrained by harvest to ship during this time period. Percentages of hay delivered are lowest during April-June at 19.30%. The low percentage of hay distribution reflects the abundance of lush pasture grass that is used for grazing in the later spring months. The percentages of hay shipped during the four seasons do not have extreme variations. The largest variation from the seasonal transportation pattern is the July-September time period. This time period has an average of 10.28% more hay delivered than the April-June time period. The increase of hay distribution from spring to summer months is due to the increase in consumption from cattle. July-September is an important time period for producers to fatten their cattle for slaughter. The cattle are gaining weight by consuming more roughage which increases the distribution during this time period.

The percentage of alfalfa, grass and other hay shipped varies slightly throughout the year. There is a pattern with alfalfa, grass, and other hay having a greater volume of shipments in the July-September and October-December time period, reflecting the abundance of hay being supplied after the summer's cuttings. The January-March and April-June time periods are relatively low percentages, reflecting the lower volume of hay available prior to harvest. Alfalfa shipments show less overall variation during the year than grass and other hay, for all shipment combinations (Table 1). Shipments vary between 18.87% in April-June to 29.87% in July-September.

Table 1. Hay Shipments by Time-Period

Time Period	Percent of Hay Distributed			
	Alfalfa	Grass	Other	All
January-March	22.47%	20.53%	17.29%	20.10%
April-June	18.87%	19.87%	19.16%	19.30%
July-September	29.78%	32.33%	26.64%	29.58%
October-December	28.88%	27.28%	36.92%	31.03%
Total	100.00%	100.00%	100.00%	100.00%

Producers: Seasonality of Livestock Shipments

There is little variation in the seasonality of livestock shipments into production operations (feedlots) throughout the state of Washington. This reflects the consistent year-round demand for beef products by consumers and regional livestock markets. The largest proportion of livestock shipments occur during October-December, with 29% of annual shipments occurring during this time period (Table 2). At this time, cattle are being transported to slaughter facilities after being fatten up at feedlots or livestock farms. Cattle are distributed all over the state of Washington. Two primary processing facilities are located in the central southern portion of the state. Efficient accessibility to these two processing facilities is pertinent for further distribution of processed meats to final destination markets. The time period with the second largest volume of livestock shipments from producer operations is April-June, accounting for 26.29% of annual shipments. The two peak time periods for livestock shipments (October-December and April-June) reflect the biological nature of cow-calf production and the two seasons most producers opt to market cattle (spring and fall). The time period with the lowest volume of shipments is the July-September time period. Cattle remain at feedlots and livestock farms during the summer months to gain the necessary body mass that is required for ideal slaughter weight resulting in a lower volume of shipments during this time.

Table 2. Annual Livestock Shipped by Time-Period, Into Production Operations

Time Period	Livestock Received
	Percent
January-March	23.07%
April-June	26.29%
July-September	21.64%
October-December	29.00%
Total	100.00%

The October-December time period, for shipments into and out of livestock production operations, represents the heaviest shipment period (Table 2 and 3). A livestock farm or feedlot commonly receives cattle during this time period. This follows the process of slaughtering that occurs later in the July-September time period or early on in the October-December time period. There is very little variation between time periods for shipments leaving producer operations between January-September (Table 3). However, there are some differences between the seasonality of shipments when comparing inbound and outbound movements for livestock producers. Outbound shipments are more heavily concentrated in the October-December time period and less variation of shipments throughout the remaining time periods.

Table 3. Annual Livestock Shipped by Time-Period, From Production Operations

Time Period	Percent
January-March	22.20%
April-June	21.07%
July-September	22.40%
October-December	34.33%
Total	100.00%

Destination of Shipments**Hay Shipment Destinations: Producer**

Hay is transported from locations throughout the state of Washington to various destinations regionally and internationally, but predominantly shipped to livestock farms within the state. The secondary location of hay shipments is to one of two destinations; to the coast (Port of Seattle and Port of Tacoma) or the Port of Pasco. When reaching these locations, hay is loaded into containers that are then placed on barges or ships for further destinations. These locations are destined for export markets in Asia, predominately Japan. Of the hay shipped from Washington producers, 67.22% stays in Washington and is transported to various livestock operations, 3.74% goes to Oregon, 25.51% is shipped to Foreign Markets, and 3.53% to other locations (Table 4).

Table 4. Destination of Hay Shipments, from Producers

Destination	Percent
Washington	67.22%
Oregon	3.74%
California	-
Foreign Markets	25.51%
Other	3.53%
Total	100.00%

Livestock Shipment Destination: Producer

Livestock is shipped from Washington producers to various locations within the U.S. However, the large majority of shipments are to destinations within the state. Of the livestock shipped from Washington, 78.16% stays within the state, 15.17% goes to Idaho, 5.46% to Oregon and 1.21% to California (Table 5). This reflects the transportation efficiencies associated with processing livestock relatively close to production locations and the more efficient packaging and transport of processed meat when compared to live animals. Cattle ranks in the Top 5 agriculture commodities for both Oregon and California. This explains the low percentage volume of livestock that is destined for locations outside of Washington.

Table 5. Destination of Livestock Shipments, from Producers

Destination	Percentage of Destination	
	Percent	
Washington	78.16%	
Idaho	15.17%	
Oregon	5.46%	
California	1.21%	
Total	100.00%	

MODAL CHOICE OF PRODUCERS

Producer's Modal Choice for Hay Shipments

Hay is shipped from farms to market destinations via truck and truck-barge. Hay producers and processors were asked to identify the percentage of their hay shipped by each mode currently available from their farm/facility. The percentage of each hay type that is shipped via transportation mode to various destinations is presented in Tables 6.

Truck to Livestock Farms has a large percentage, representing over 60% for alfalfa and grass hay being shipped (Table 6). The lower percentages of 4.73% and 5.27% for Truck to River Barge were for hay being shipped to the Port of Pasco. The hay that is transported to the Port of Pasco is most commonly shipped to processing facilities and then loaded onto river barges to be further processed and shipped to markets abroad. The percentage of river barge usage has dropped significantly due to the increase in rail usage. This survey was conducted before September 2004, when containers were shipped almost exclusively via barge on the Columbia River to the Port of Portland. Subsequent to this date there has been an enormous increase in usage of rail. A relatively large percentage of "other" hay is shipped via the "other" transportation mode, representing 40.36% (Table 6). This high percentage represents other variety hay being transported via truck to processing facilities. Major Hay processing facilities locations are in the central region of the state. The location of these facilities increases accessibility to producers all over the state, create short haul shipment opportunities within the state and therefore reduce transportation costs.

Table 6. Annual Hay Shipments Via Transportation Mode from Producers

Transportation Modes	Percentage Shipped Via Transportation Mode			
	Alfalfa	Grass	Other	All
Truck to Livestock Farms	65.87%	61.04%	32.74%	53.22%
Truck to River Barge	4.73%	5.27%	-	3.33%
Truck to Ocean Port	12.23%	18.55%	26.91%	19.23%
Rail to River Barge	-	-	-	-
Rail to Ocean Port	-	-	-	-
Other	17.16%	15.14%	40.36%	24.22%
Total	100.00%	100.00%	100.00%	100.00%

PRIMARY HIGHWAYS FOR PRODUCERS

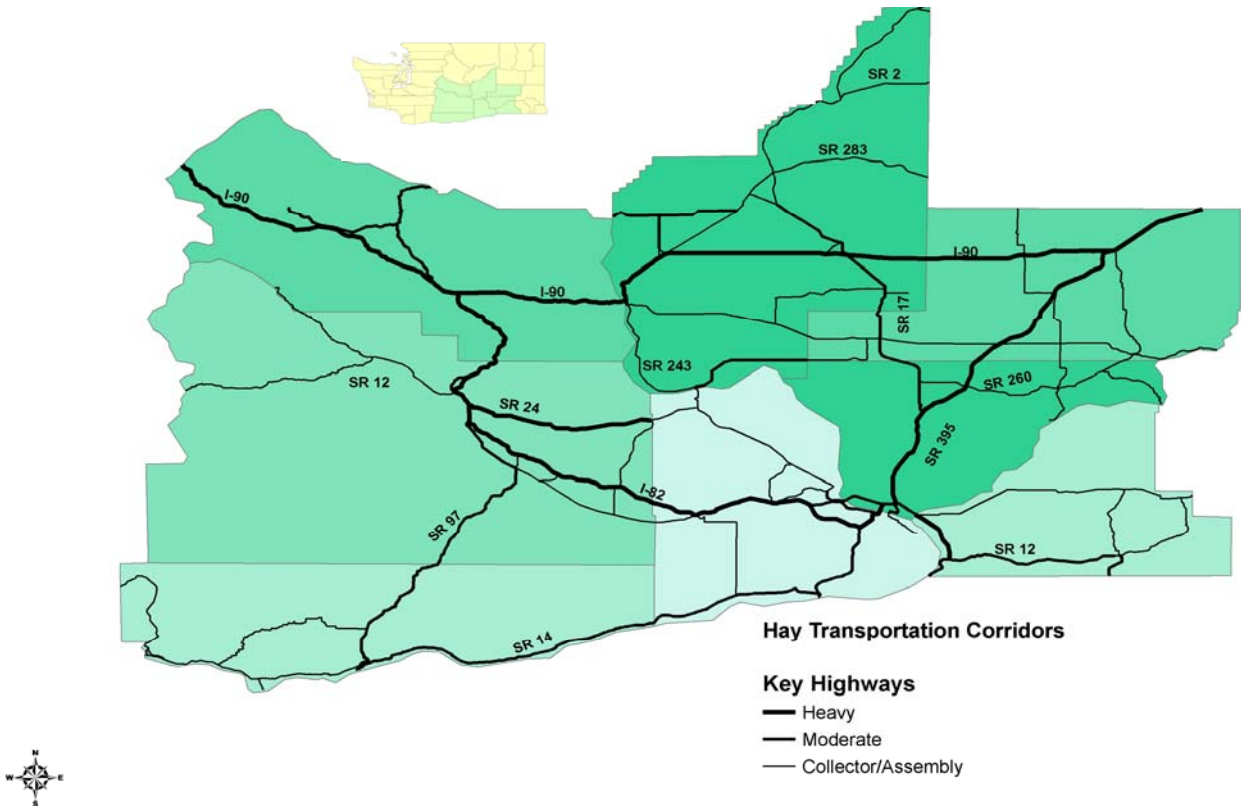
Hay Producer to Processor

When examining the transportation of hay there are three separate, identifiable segments that should be examined. There is the raw product to processor, raw product to livestock farm and finished product from processors to final markets. It is beneficial for hay producers that want to sell hay internationally to first process the hay for more efficient packaging (either compressed or cubed hay), typically performed at separate processing facilities owned by hay marketing firms or hay brokers. This is primarily due to the high costs of owning and operating a processing unit. Also, the processing facility will then find international buyers for the hay.

Hay harvest starts in late spring and runs through the end of the summer. During this time of year the hay industry related traffic peaks for processors, while producer's shipments remain fairly steady throughout the year². The harvest period involves several tons of hay being transported via truck across the state to processor or final markets.

There are three major routes, as identified by survey respondents, which are principle arterials for movement of hay throughout the state. These include highways I-90, I-82 and SR 395 (Figure 1). These three major routes run through the two largest hay producing counties (Franklin and Grant) and provide both north-south and east-west access to markets within and beyond the state. A number of major hay processing facilities are located in these two counties making these routes critical to the hay industry³.

Figure 1: Key Highways Supporting Hay Producer to Processor



Livestock Shipments

The roads and highways supporting livestock movements are more dispersed throughout the state when compared to those supporting hay shipments (Figure 2). This is largely due to the more geographically dispersed location of livestock markets throughout the state. Principle interstate highways supporting livestock movements include I-90 and I-5, accessing numerous livestock markets in areas such as Bellingham, Centralia, Moses Lake and Spokane. Other routes that also support a significant amount of livestock shipments to various markets are SR 12, SR 97 and I-82. These routes cover the areas of Walla Walla, Okanogan and Toppenish, Washington.

Many of the livestock shipments moving along I-5 are accessing markets in Oregon and California. In addition, I-82 provides access to several processing facilities near Yakima and Pasco, Washington, in addition to serving as a point of entry/exit to Oregon.

Figure 2: Key Washington State Highways Supporting Livestock Shipments



Seasonality of Hay Shipments by Processors

Hay processors have a comparatively consistent percentage of hay that is received and distributed throughout the year. One of the most evident patterns for other hay transportation is the even distribution of shipments at 25.00% received and distributed throughout the year (Table 7 and 8). Shipments of alfalfa and grass hay vary in the four seasons on the receiving end, but then remain even once distributed. The percentage of alfalfa and hay distributed during January-March is consistent at 20.53%, but then increases to 33.87% in the July-September time period (Table 8)⁴. Overall, there is more variation during the time when processors receive the hay rather than distribute it, which is indicative of the natural seasonal influences of hay production.

Table 7. Annual Hay Received by Time-Period

Time Period	Percent of Hay Received			
	Alfalfa	Grass	Other	All
January-March	15.00%	17.50%	25.00%	19.17%
April-June	21.67%	22.50%	25.00%	23.06%
July-September	41.67%	37.50%	25.00%	34.72%
October-December	21.67%	22.50%	25.00%	23.06%
Total	100.00%	100.00%	100.00%	100.00%

On average, hay which is received at processors is the lowest during the January-March time period at 19.17%, while the high was 34.72% in the July-September time period (Table 7). The distribution of all hay had a high of 30.91% in the July-September time period, with all other seasons remaining fairly consistent (Table 8). Processing facilities operate on a yearly base, not seasonal. The percentage of hay that is received at a processing facility experiences more of a variation than the processed hay that is distributed from these facilities. Hay shipment receipts coincide with harvest, whereas the hay that is distributed reflects the stable demand that is requested throughout the year.

Table 8. Annual Hay Shipments from Processors by Time-Period

Time Period	Percent of Hay Distributed			
	Alfalfa	Grass	Other	All
January-March	20.53%	20.53%	25.00%	22.02%
April-June	21.67%	21.67%	25.00%	22.78%
July-September	33.87%	33.87%	25.00%	30.91%
October-December	23.87%	23.87%	25.00%	24.25%
Total	100.00%	100.00%	100.00%	100.00%

Seasonality of Livestock Shipments

The volume of livestock per season that is received at processing facilities differs from the volume that is shipped from these processing locations. When the livestock are received at the processing facility they are totaled in live-weight. After the process of slaughtering, making choice meat cuts, packaging and boxing; the distribution of processed meat is weighed in tons.

The head count of livestock that is received from the reported processing facilities daily is 1,025 on average (Table 9). The standard live-weight of cattle that are ready to be slaughtered is 1,200 lbs. The percentage of livestock received at processing facilities has a high of 30% in the July-September time period while all other seasons remain the same at 23.30%. The higher percentage in the July-September time period reflects the life cycle of cattle. A greater majority of the cattle are at the perfect slaughter weight within this time period and transported to slaughtering facilities.

Table 9. Annual Livestock Received at Processing Facility by Time-Period

Time Period	Livestock Received	
	Percent	
January-March	23.30%	
April-June	23.30%	
July-September	30.00%	
October-December	23.30%	
Total	100.00%	
Total Average Head Per Day	1,025	

The distribution of processed meat does not fluctuate throughout the year. Table 10 displays the even distribution of processed shipments throughout the year. After the meat is packaged and boxed it is loaded into trucks and shipped to various locations in Washington and the United States. There are 8 to 10 different sizes of boxed meat ranging from 20 to 70 lbs. A truck that is packed full will hold 41,000 lbs of processed meat⁵. The reported number of trucks range from 35 to 85 daily that leave processing facilities. Trucks that are filled with processed meat are destined for domestic and U.S. markets.

Table 10. Annual Livestock Distributed from Processing Facility by Time-Period

Time Period	Livestock Distributed	
	Percent	
January-March	25.00%	
April-June	25.00%	
July-September	25.00%	
October-December	25.00%	
Total	100.00%	

DESTINATIONS OF PROCESSORS

Processor Destinations for Hay Shipments

Hay exports are an important market to Washington hay and forage producers. Alfalfa hay and cubes, timothy, orchard grass, oat hay, ryegrass and fescue straw are all forage products exported from Washington to the Pacific Rim. The demand from Japan and Asia for forage products is increasing in West Coast markets, especially in Washington. Alfalfa cubes and bales are highly demanded by markets in the Pacific Rim. Forage products are shipped to Japan and the Pacific Rim from Washington in 40 foot cargo containers. Depending on the product shipped, each container will hold approximately 20-28 metric tons. The savings in transportation costs have helped Washington increase

its market share of cube exports to Japan and Korea. About 90% of the alfalfa cubes shipped to Japan is for dairy cows and 10% for beef cows. Dairy cows also take about 60% of baled hays, and the balance would be split evenly between beef cows and horses. A recent trend has been the shipment of bagged cubes to Japan in containers. Smaller bags are generally about 30-40 Kg and larger bags are 400-550 kg. The smaller bags are stacked on a pallet and wrapped with plastic.

The marketability of the hay, especially in the foreign markets, depends on the quality of the hay. The quality of the forage is dependent on several factors including: management of the soil, nutrient composition, seeding rates, the timing of cutting, raking and baling, and the storage of the product. One of the most important factors affecting quality is the state of maturity at the time of cutting. Young, vegetative forage is higher in protein and energy than older flowering material⁶. Management experience is required to find the optimal harvesting time, to maximize both quality and quantity of forage stands.

Foreign Markets are Washington processor's largest market destination. Foreign markets absorb 91.33% of the market for processors (Table 11). Washington has the remaining 8.67% of hay shipped to domestic destinations. Processors ship to either ocean port facilities or Columbia River terminals that are accessible to ocean ports for further shipments. Processors either ship processed hay by truck, rail or barge to further market destinations.

Table 11. Annual Hay Shipments to Destinations from Processors

Destination	Percentage of Each Destination
	Percent
Washington	8.67%
Oregon	-
California	-
Foreign Markets	91.33%
Other	-
Total	100.00%

Destination of Packaged Meat

The Pacific Northwest is the destination for 58.50% of the packaged meat shipments from Washington State (Table 12). The Southwest United States is the next largest packaged meat destination with 31%, followed by both the Northeastern US and Southeastern US with 5%. Due to the previous Bovine Spongiform Encephalopathy (BSE) outbreaks, there is minimal to no packaged meat leaving the borders of the United States⁷.

Table 12. Annual Destination of Packaged Meat in the United States

Location	Percent Shipped	
	Percent	
Northeastern US	5.00%	
Southeastern US	5.00%	
Midwest/Great Plains	-	
Southwest US	31.00%	
Pacific Northwest	58.50%	
Mexico by land	0.50%	
Canada	-	
Ocean Port/Export	-	
Total	100.00%	

MODAL CHOICE OF PROCESSORS

Processor's Modal Choice for Hay Shipments

After the hay has been transported to a processing facility a large percentage is shipped for outbound movement by truck. After it has been processed hay is predominately destined for foreign markets via Truck to Ocean Ports⁸. Other hay is the only hay that is shipped 100% Truck to Ocean Ports. Alfalfa and grass both come in close with highs over 60%. Table 13 clearly represents that minimal hay is shipped by rail. It is not a feasible alternative for hay producers and processors.

Table 13: Annual Hay Shipments Via Transportation Mode from Processors

Destination	Percent of Hay Shipped			
	Alfalfa	Grass	Other	All
Truck to Livestock Farms	12.05%	15.87%	-	9.31%
Truck to River Barge	24.10%	3.17%	-	9.09%
Truck to Ocean Port	62.65%	80.95%	100.00%	81.20%
Rail to River Barge	-	-	-	-
Rail to Ocean Port	1.20%	-	-	0.40%
Other	-	-	-	-
Total	100.00%	100.00%	100.00%	100.00%

PRIMARY HIGHWAYS FOR PROCESSORS

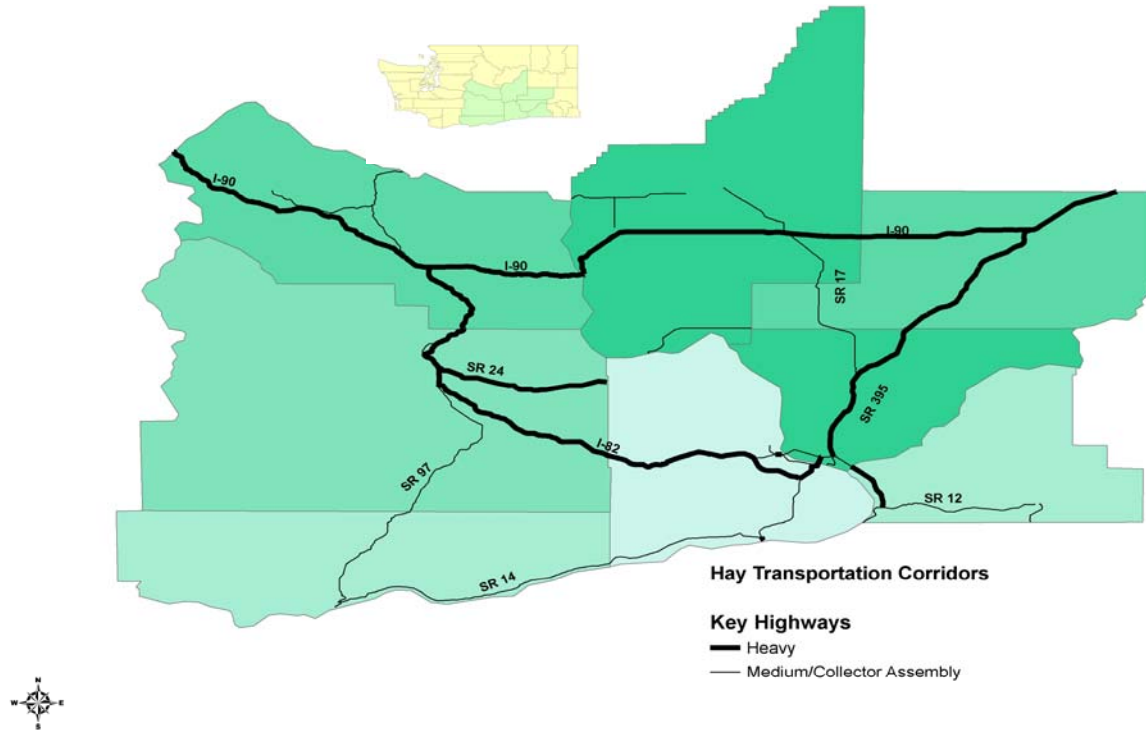
Processor to Final Destination

Key highways that support hay shipments from major hay processing facilities to final markets include; I-90, I-82, SR 24 and SR 395 (Figure 3). These highways support hay movements from hay processors to final destinations. I-90 and SR 395 are surrounded by the two leading hay producing counties in the state. 43 percent of the total tons of hay produced in Washington are supplied by Franklin and Grant County and travel on these highways⁹.

After the hay has been processed, it is transported by truck to the Port of Seattle or the Port of Tacoma for further shipment. I-90 is a major corridor to large markets

domestically and also internationally. Processed hay can also be barged from the Port of Pasco down the Columbia River for further shipments.

Figure 3: Key Washington State Highways Supporting Hay Shipments from Processor to Final Destination



IMPLICATIONS FOR PUBLIC POLICY

The hay and livestock industries contribute \$1.76 billion to Washington's economy and both rank in the top six agriculture commodities by value for the state. However, without an efficient and accessible transportation system for producers/processors, the economic success of these two industries is lessened. Evaluation of the transportation characteristics of these two industries is additionally enlightening given likely policy changes that may impact freight movements and recent changes at the Port of Portland regarding ocean container services.

Each year a significant amount of state and county highways throughout the state are closed due to freeze/thaw conditions that limit the structural integrity of the highway infrastructure. As a result, shippers are forced to find alternative routes that may increase shipping costs or limit market accessibility. One persistent highway closure is the I-90 Snoqualmie Pass that is the main east-west corridor for the state and is often closed for long periods during the winter months due to snow. The data and analysis

provide in this study will help identify the extent to which shipments of hay and livestock are impacted.

Another recent issue impacting hay shipments involves the reduction in container services at the Port of Portland. As a result, the Port of Seattle and Tacoma have experienced a considerable increase in hay shipments received by rail since September of 2004. Prior to this date, containers filled with hay were shipped almost exclusively via barge on the Columbia River to the Port of Portland. After reaching Portland, the containers were then loaded onto one of three steamship lines: Hyundai, K-Line, or Hanjin. After September 2004, Hanjin is the only carrier that calls on the Port of Portland. K-Line and Hyundai now required producers to haul their containers to the Port of Tacoma and Seattle by either truck or rail. As a result, barge shipments of containers out of the Port of Pasco decreased 75%, while rail shipments to the Port of Tacoma and Seattle grew from 40 containers per month to 600 containers per month. The Port of Pasco's rail facilities are sufficient for lighter volumes which they formerly experienced, but not for the heavier volumes now needed¹⁰.

Information provided identifying the modes of transportation utilized within the hay and livestock industries and routes most commonly used to distribute shipments provides significant insight into the type of infrastructure development required to handle freight traffic within Washington State. Data related to the volume of hay and livestock shipments, seasonality of shipments, movements from producer/processor to destinations can help the state plan for current and future transportation infrastructure needs.

Adequate rail accessibility and efficiency is essential to support the increase in container shipments that are destined to various markets within the state of Washington. The Port of Pasco has an Inter-Modal Hub Development project in the works at the Big Pasco Industrial Center. The Inter-Modal Hub Development (IHD) is a project that will develop rail and road facilities at the Port of Pasco into an inter-modal hub for the movement of agricultural products to their Asian Markets. The IHD project planning began in October 2004 and is planned to be completed by the summer of 2006. The project will provide important economic benefits to the local area and statewide region:

- Reduce the volume of trucks on state highways.
- Fosters competitive freight prices for agricultural producers shipping to international markets
- Encourages container delivery to northwest seaports by providing backhaul for empty containers
- Maintains and improves existing access to Class I railroad for regional freight.
- Investment is directed to existing inter-modal site already served by BNSF and barge lines.

Further analysis needs to be done to determine the different types of expenditure that are associated with transportation costs. Recommendations to investigate the type of problems the hay and livestock industries encounter will help to effectively evaluate the transportation characteristics and requirements necessary for efficient movement to domestic and international markets.

SUMMARY

The hay and livestock industries in Washington rely heavily on truck movements, significantly in the central southern part of the state. Truck transportation is the dominant mode of transportation utilized by processors to receive raw product as well as to ship products to final markets. Maintaining an efficient highway freight transportation system is essential to the economic success of Washington's hay and livestock industries.

Hay and livestock in Washington each have three main destination point. Hay is destined for processing facilities, livestock farms and ocean ports. Movements associated with the livestock industry consist of livestock to processing facilities, livestock to feedlots and livestock to farms. Each category presents distinctive traffic flows; heavy overlap of routes does exist.

There is year-round demand for hay and livestock, which requires an efficient and multimodal transportation infrastructure supporting movements. The livestock industry does not see any fluctuation in seasonality for demand. Processing facilities distribute processed meats consistently at 25.0% throughout the year. The seasonality of hay shipments into processing facilities is more varied and less differentiated than shipments from processing facilities, illustrating the natural climatic factors influencing hay production and the product transformation occurring at processing facilities to satisfy export demand markets.

A large majority of hay, livestock and processed meats are shipped within the Pacific Northwest. Continued production and business within the hay and livestock industries will continue to cause traffic over existing routes. Those highways supporting hay and livestock movements from the producer tend to be more local and county highways whereas shipments from hay and livestock processors are primarily state and interstate highways.

Key findings and implications were summarized, highlighting both challenges and opportunities. State transportation officials and policy makers will be better equipped to prioritize investment decisions with a more thorough understanding of the relationship between improvements in transportation efficiency and impact on the hay and livestock industry in Washington.

ENDNOTES

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