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Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables

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SFTA Research Report # 3

December 2002

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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:

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DISCLAIMER

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

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." Report Number 2. December 2002.

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EXECUTIVE SUMMARY

Focus of Paper

The general focus of this paper is to evaluate the benefits and value of competition for transportation shippers of fresh fruit and vegetables in the Northwest, especially the state of Washington. Specific objectives to respond to that general charge were to:

- Examine the overall demand for transportation of fresh fruits and vegetables moving out of the state of Washington, including markets, modes, seasonality, etc.
- Review and examine the modal alternatives available in the overall transportation system, including the operating characteristics as to cost and service attributes, and
- Evaluate the impact of competition on the overall performance of the transportation system, in the form of the price-product being offered to shipper/receivers.
- Determine the key attributes to healthy competition and successful performance by the transportation system.

Study Approach

Emphasis in the analysis was placed on four of the major volume movements from Washington to markets, especially those distant markets east of the Mississippi. The chosen fruits and vegetables were apples, pears, potatoes and onions.
First, a review of both conceptual and applied studies/literature served to provide the framework for evaluating the benefits, and the form of those benefits, derived from competition between or among the modes. This was followed by a specific investigation of the historical and current market situations in transportation of Washington fresh fruits and vegetables, including the quantitative need for transportation and the operating and pricing characteristics of the modes supplying the transportation services. Quantitative data from governmental and institutional reports were augmented by telephone interviews with representatives of shippers, receivers and transportation firms. A review of the data developed by the recent ExpressTrak surveys of shippers and receivers then provided current information on the modal decision process for Washington, detailing customer utilization, experience and preferences. Finally both conceptual and empirical competitive implications were drawn from the previous studies, the review of the current situation and other data and information developed for the study.

Major Research Findings

- Transportation is the dynamic link between Washington production areas and the table of consumers. The value of fresh fruits and vegetables to producers and shippers in the state of Washington is directly dependent on the availability and efficiency of the entire transportation system.
- The total production of Washington fresh fruits and vegetables (apple production - 10.5 million tons, potato production - 5.2 million tons, pear production - 476 thousand tons, onion production - 408 thousand tons) represents a healthy market for transportation services. Currently, truck represents the majority of domestic shipments of Washington fresh fruits and vegetables (85-90% truck, 10-15% rail). In total, for apples, a volume representing about 47,000 truck shipments or 20,650 rail cars are destined to eastern U.S. markets each year. For all four crops coming out of the state of Washington and going to eastern markets, the estimated total number of truckloads is 149,219 or equivalently, 65,131 rail cars for which the truck and rail modes compete.
- The product provided by the transportation modes can be broken into both rate and the quality of transportation service. Shippers and receivers examine both in making modal choices. Quality of service includes attributes of, at a minimum, transit time (reliability), damage, and handling of both paper and product. As value and the perishable nature of the product hauled increases, the importance of the service attributes increases.
- The benefits of having competition in a marketplace are many: prices (shipping rates) are lowered; customers have more options; new and more distant markets may be reached; shipping rates begin to reflect the costs of operation rather than "what the shippers and receivers will bear"; and innovations in marketing (e.g. Washington Fruit Express and Express Lane) and technology (reefer rail and new refrigeration rail cars) are stimulated. Without competition service declines, rates increase and efficiency is diminished.
- Continued or increased truck shortages are to be reasonably expected in the near future for Washington fresh fruit and vegetables. Such shortages are not due just to seasonal peak demands of fresh fruits and vegetables, but are also influenced by competitive geographical alternatives for perishable truck capacity (California, Christmas tree, turkey, etc. markets), increased costs of operation (driver turnover, cost and scarcity, fuel, insurance – liability, etc.), differing backhaul availability, attractiveness of routes, etc.
- Development of competitive rail alternatives is a win-win-win for shippers, receivers, and carriers. To achieve such benefits of competition, rail must strive to address negative perceptions by restoring and building shipper confidence/trust and develop close working relationships between shipper and receiver. Specific attributes desired from rail service providers are shorter transit times (for some commodities), reliable transit time (less variability of transit for all commodities), reasonably competitive rates and a perception (promise) that any new rail service will be available for a significant time period. Minimizing variability from rail results in maximizing the confidence of the shipper and receiver.

Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables

I. INTRODUCTION AND BACKGROUND

Issues and Background

Washington's agricultural industry produces and markets a wide variety of fresh fruits and vegetables. The state's climate, soil and water resources, and agricultural industry, combined with a multimodal transportation system serving the fresh fruits and vegetables industry, has led to the healthy competitive position of Washington fresh fruits and vegetables in United States and international markets. Products from Washington have been able to reach and successfully penetrate distant markets and cities far from the state's points of production Transportation is the dynamic link between the production areas of Washington and the tables of consumers. Transportation is especially important for Washington agriculture because Washington produces about three times as much food (and for some commodities, twenty or more times), on a tonnage basis as it consumes and is separated by long distances from the majority of the nation's consumers, who are principally east of the Mississippi River. This long haul movement of fresh fruits and vegetables has been served by a multimodal system of motor carriers, refrigerated rail cars, intermodal refrigerated units and some new technologies being developed and offered to the market. The service provided, the prices charged and the competitive/complementary interactions among modes directly affects the competitive success of Washington shippers in reaching and serving these distant markets.

The decision as to what mode to use in shipping fresh fruits and vegetables is predominantly made by the receiver, who also most commonly pays the shipping costs. That decision has always been conditioned by the combination of price and service offered by the alternative modes, and for the perishable fresh fruit and vegetables from Washington, the service characteristics of these modes received particular attention from the receivers. With the advent of supply chain management, just-in-time and off-the-shelf inventory management, even more pressure and economic interest was and is placed on the service characteristics of alternative modes.

From 1950 to 1970 the railroad share of fresh fruit and vegetables fell from 73 to 39 percent and, by 1980's was around 9 percent. The shift to trucks, whose transit costs were almost always higher than rail, brought higher transportation costs; however, service characteristics of shorter transit time, more certain time of delivery (reliability), better damage and loss experiences seemingly overrode the higher transportation costs.

The 50 year trend of produce transportation moving away from rail to truck was reversed for a period in the late 70's and early 80's. The increased competitiveness of railroads, fostered by the deregulation under the 4-R Act, resulted in rail movements increasing from about 9% in 1979 to almost 15% in 1983, with piggyback, the transporting of a trailer or container on a rail flatcar, being responsible for most of the gains. (Note the increased service characteristics of piggyback

as contrasted to traditional mechanical refrigerated cars.) But, by 1987 the national railroads share of fresh fruits and vegetable movements had decreased to under 12% and remained in that or a lower region. Movements out of Washington and the Pacific Northwest move significantly more often by rail reefers; 24% of produce, 49% of potato shipments and 29% of onion shipments. As will be shown in this White Paper, these percentages (probably driven by the quality of service needs of just-in-time and off-the-shelf management) have decreased further.

A critical aspect of this multimodal system is the competitive needs of the differing modes. Competition results in increased capacity being made available to receiver/shippers, increased quality of service, and rates being driven down towards cost of service. Competitive forces also generate innovations being offered on the market, such as marketing arrangements of the Washington Fruit Express and the Express Lane, as well as physical changes such as Reefer Railer, Cryogenic Cars, etc. Often one mode competitively reacts to a new price product-product service being offered by a competing mode; thus, products moving on either mode gain from the action and reaction of the competitive market place.

Paper Focus

This paper evaluates the benefits and value of competition for transportation shippers of fresh fruit and vegetables in the Northwest, especially the state of Washington. Specific objectives are to:

1. Examine the overall demand for transportation of fresh fruits and vegetables moving out of the state of Washington, including markets, modes, seasonality, etc.,
2. Review and examine the modal alternatives available in the overall transportation system, including the operating characteristics as to cost and service attributes,
3. Evaluate the impact of competition on the overall performance of the transportation system, in the form of the price-product being offered to shipper/receivers and
4. Determine the key attributes to healthy competition and successful performance by the transportation system.

Study Approach

Emphasis in the analysis was placed on four of the major volume movements from Washington to markets, especially those distant markets east of the Mississippi. The chosen fruits and vegetables were apples, pears, potatoes and onions.

First, a review of both conceptual and applied studies/literature served to provide the framework for evaluating the benefits, and the form of those benefits, derived from competition between or among the modes. This was followed by a specific investigation of the historical and current market situations in transportation of Washington fresh fruits and vegetables, including the quantitative need for transportation and the operating and pricing characteristics of the modes supplying the transportation services. Quantitative data from governmental and institutional reports were augmented by telephone interviews with representatives of shippers, receivers and transportation firms. A review of the data developed by the recent ExpressTrak surveys of shippers and receivers then provided current information on the modal decision process for

Washington, detailing customer utilization, experience and preferences. Finally both conceptual and empirical competitive implications were drawn from the previous studies, the review of the current situation and other data and information developed for the study.

II. TRANSPORTATION ECONOMICS OF PERISHABLES

An Applied Model of Perishables Transportation

The previous discussion provided some detail of the relative performance of rail and truck in transporting fresh fruits and vegetables (highly perishable). Over time the rail share has dropped significantly over time, with some brief resurgence for fairly short periods of time. This market share occurs even as truck rates are significantly and constantly higher than rail. We now use an applied model, with only three fairly straightforward equations, (Beilock and Casavant) of perishables transportation to determine what makes it so special.

Shippers and receivers, especially in the new logistics/supply chain management era, must and do consider the full cost of transportation and not just the lowest freight rate. The full transport cost (FTC) is the freight rate (R) plus the non-price costs (C) associated with the service quality characteristics (QUAL) offered by the mode:

1) $FTC = R + C\,(QUAL)$

QUAL includes many of the factors discussed above such as transit time, reliability, flexibility regarding scheduling, routing, shipment size, load handling and monitoring characteristics, and claims handling procedures. Looking at equation 1, the more sensitive (important in value) FTC is to QUAL, the more cognizant is the user of QUAL. In other words, quality of service might override the rate being charged in the business mind of the buyer of the service.

The non-price costs of transit, which result in QUAL, may be described in more detail as:

2) $C(QUAL) = iV_D + \Delta V + MISC(QUAL)$

where i is the interest rate paid on inventory; V is the cargo value at origin; D is the number of days in transit; ΔV is the change in the cargo value due to the transit (V origin – V destination). This variable includes any damage losses as well as changes in value due to market or time price differentials. And, finally, MISC is miscellaneous costs associated with QUAL, such as the necessity to have a crew available for a given interval (of varying lengths depending on mode reliability) to receive or load the cargo. Substituting equation 2 into equation 1 yields:

3) $FTC = R + iV_D + \Delta V + MISC(QUAL)$

An examination of the single relationships depicted in equation 3 reveals that shipper and receivers of commodities which are high in value or which deteriorate over time would be more sensitive than others to the speed of transit. Further, damage prone cargos would be most sensitive to handling-monitoring characteristics and claims handling procedures. Finally, the value of reliable transit and arrival times, a component of QUAL, would be a critical element in the current supply chain management process.

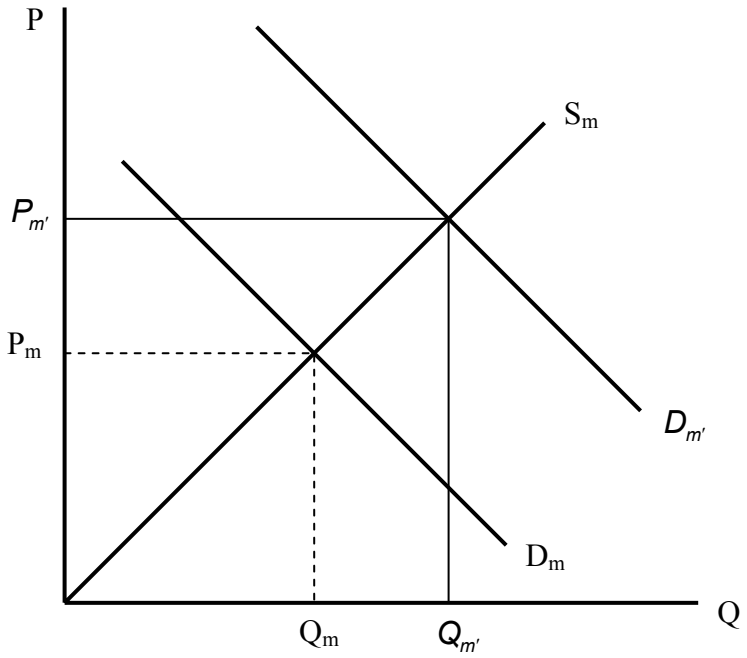
It is therefore not surprising that differentials in service quality, rather than rates, are conventionally cited as the major reason for the shift from rails to truck. It also suggests that rail,

to be competitive (and generate the results of competitive markets), might want to focus on the QUAL or service attributes rather than just trying to be cost competitive:

Competitive Market Interactions

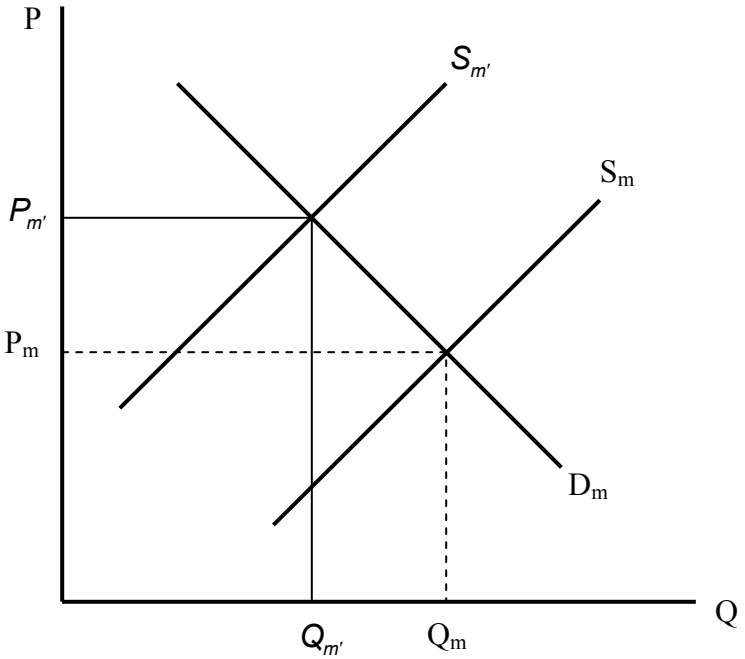
The determination of market rates and quantities occurring in the market for transportation is conceptually as expected; supply and demand forces interact to generate a market clearing price, as sketched in Figure 2.1,

Figure 2.1. Market Price and Quantity



where P_m and Q_m are the market clearing results. Increases in demand for transportation, occasioned, for example, by peak or seasonal movements of fresh fruits and vegetables to markets result in the demand for transport shifting to $D_{m'}$ and a higher $P_{m'}$ and $Q_{m'}$ being seen in the market. Alternatively, if market forces, such as increased movements in other products (Christmas trees, turkeys, etc.), or significantly increased cost in providing truck services, were to take capacity away from the transportation of fresh fruits and vegetables, a decrease in supply of trucking would occur, $S_{m'}$ in Figure 2.2.

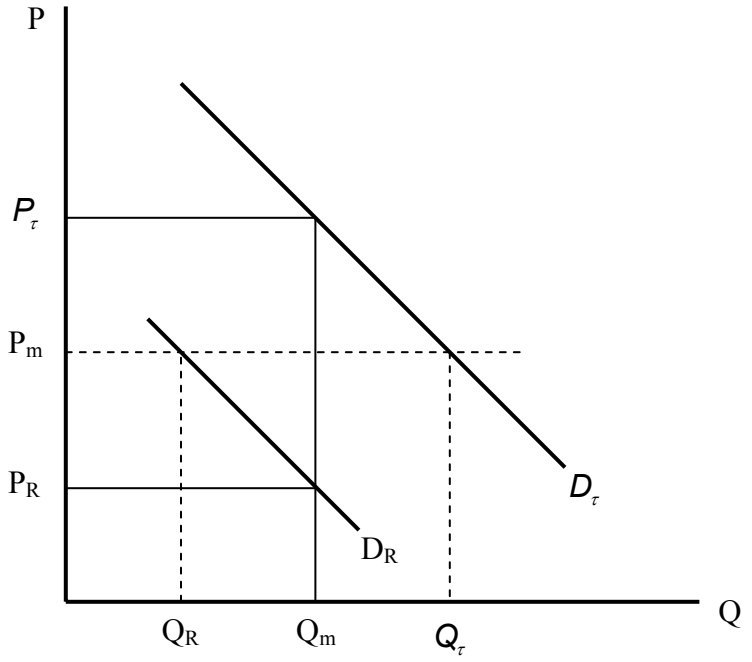
Figure 2.2. Market Price and Quantity



The market result is exactly what shippers and carriers have often experienced and feared. Concerns about the truck industry stability or the competition with other refrigerated movement arise because of the increased rates experienced $\left(P_{m'} - P_m\right)$ and the scarcity or shortage of truck capacity $\left(Q_m - Q_{m'}\right)$.

However, the above assumes no difference in the quality of service offered by rail and truck transportation. If that were the case, in markets where both modes participate in hauling the perishable commodities, only one rate would prevail. In actual Washington markets we do observe different rates for truck and rail transportation with the former exceeding the latter. Figure 2.3 depicts those differing demand functions, with truck demand D_τ being more desirable at any price (remember R and FTC) than rail service (D_R). When such a market situation occurs we have the phenomenon that at any given rate (Pm) that quantity demanded of truck transportation Q_τ far exceeds that of rail (Q_R).

Figure 2.3. Market Price and Quantity



Conversely, if we were to move a given quantity (Q_m), truck could command a significant differential above rail $(P_\tau - P_R)$ in the same market. Again, this simple graphic does reflect the actual market situations experienced in the transportation market for Washington fresh fruits and vegetables.

General Economic Results of Competition

As suggested above, shippers and receivers make logistics decisions based on the price-product combination available from the alternative modes. Transportation firms, competing for the traffic of perishables, attempt to modify the price-product combination they offer in an attempt to answer the demand of their customers. This competitive urge results in innovations and other desirable outcomes.

An industry that has elements of effective competition has specific implications for the determination of prices and outputs, as well as firm behavior. Some of these relate to firms while others offer customers certain outcomes.

- **Price takers.** The ability of firms to set prices (price makers) is constrained by intra and inter modal competition. Managers of transport firms must consider the competitive availability and/or reaction of other firms.
- **Optimal output.** In the long run managers, as market prices (rates) vary, adjust outputs (capacity) of the firm based on its cost structure. Capacity responses to e.g. seasonal increases or decreases in demand occur in a reasonable fashion, subject to other market demands and opportunity costs.

- **Stimulating new technology.** Competitive firms are always searching for new technologies (Reefer Railers) or other institutional improvements of intermodal movement (WFE) that will lower costs or increase service quality. This behavior, "a treadmill", results in continued innovations as an attempt to generate competitive edges in the marketplace.
- **Efficiency.** With competition in a market, resources are attracted into the market when potential or actual profits rise, and resources leave the industry when profits decline. No surplus, unused capacity exists in such an industry. Efficiency results when the competition among modes drives rates down toward long run costs, including a return to capital and management.

Service Differential Perceptions

A market that experiences the benefits of competition is a market that has clear market signals. Probable differentials in quality of service have been identified in many discussions, much literature and conventional wisdom. However, a market distortion occurs if the perceptions of service by the differing modes differ from reality.

Rail and intermodal rail must overcome "guilt by association" regarding past rail service. Miklius and Casavant found that shippers and receivers consistently underestimate the quality of rail service. Comparison in the study of individual shipper perceptions of transit time, transit time variability, and damage experienced versus the actual record revealed in each firms shipping files found rail had (and has) much work to do in educating shippers and receivers about the "real" service characteristics. Further evidence of this was seen in truckers' strikes and shortages, where products were forced onto intermodal and rail cars. Many receivers were surprised at the high quality of service they experienced, and many continued shipping via TOFC even after the shortages and/or strikes were over. In sum, it is possible that the reliability and other attributes of rail service may have improved in recent years but insufficient time has elapsed for the shippers and receivers to accept and internalize the fact these changes have occurred. New marketing schemes and transportation innovations will need to deal with these perceptions as they develop price-product combinations and solicit traffic. (The recent ExpressTrak surveys shed light on this situation).

III. DEMAND FOR TRANSPORTATION SERVICES

Production of Washington Fresh Fruit and Vegetables

Washington's unique combination of soils, climate and abundant water resources, combined with its geographic proximity to international markets and efficient multi-modal transportation system has contributed to the state's dominance in U.S. and international fresh fruit and vegetable markets. Washington currently ranks number one in the production of apples and pears, accounting for 55 and 42 percent, respectively, of total U.S. apple and pear production, as reflected in Table 3-1. These crops are followed closely by Washington potato and onion production, ranking number 2 and 3, respectively, and accounting for 23 and 12 percent of total U.S. production. In addition, Washington typically leads the nation (top 5 ranking) in the production of sweet cherries, apricots and asparagus.

Table 3-1. Washington State Fresh Fruit and Vegetable 2000 Production[1]

Crop	U.S. Rank (#)	Percent of U.S. Production (%)	Washington Production (thousand tons)
Apples	1	55	2,950
Pears	1	42	406
Potatoes	2	23	5,250
Onions	3	12	426

The value of these commodities to the state's economy, agricultural industry and affiliated processing, manufacturing and transportation sectors also is significant, as indicated by Table 3-2. Washington apple production represents $760 million in value of production and is the top valued agricultural product in the state (2000 Crop Year). Potato production represents $446 million (ranked 5th), followed by pears at $115 million (ranked 11th) and onions at $59 million (ranked 17th). Collectively, these commodities alone represent over $1.3 billion in value of production and are indicative of the importance that the fresh fruit and vegetable industry represents to the state's economy.

[1] Source: Washington Agricultural Statistics Service. Washington Agricultural Statistics. 2000 Annual, Olympia, Washington

Table 3-2. Washington State Fresh Fruit and Vegetable 2000 Value of Production[2]

Crop	Washington Rank	Value of Production (thousand dollars)
Apples	1	$760,200
Potatoes	5	$446,250
Pears	11	$115,995
Onions	17	$58,940

The geographic concentration of production for each of these commodities is generally located in the central part of the state, but the intensity of production varies slightly within the central region by different crops. Each of these variations in production is graphically illustrated in Figures 3.1 through 3.4. As will be discussed later, the geographic concentration of production, processing and warehousing operations, relative to the transportation infrastructure, access and efficiency, can play an important role for the presence of modal alternatives and competition. Apple production is heaviest in Yakima and Grant counties, followed by a concentration of production in the north central counties of Okanogan, Chelan and Douglas. Pear production, as illustrated in Figure 3.2, is also geographically concentrated in central Washington, with Yakima, Chelan and Okanogan counties representing the largest production. Unlike apple and pear production, potato and onion production flourishes in a more narrowly defined region around the Tri-Cities region of Washington, with Grant and Franklin counties possessing the heaviest intensity. It is also interesting to note that apple and potato production generates considerable more tonnage per acre harvested when compared to pears and onions, and also has the higher valued product per ton. These product characteristics (weight and value) combine to make competitive shipping alternatives, such as rail, more economically feasible, especially for long distance markets.

[2] Source: Washington Agricultural Statistics Service. Washington Agricultural Statistics. 2000 Annual, Olympia, Washington

Figure 3.1. Annual Washington Apple Production, by County (2000).

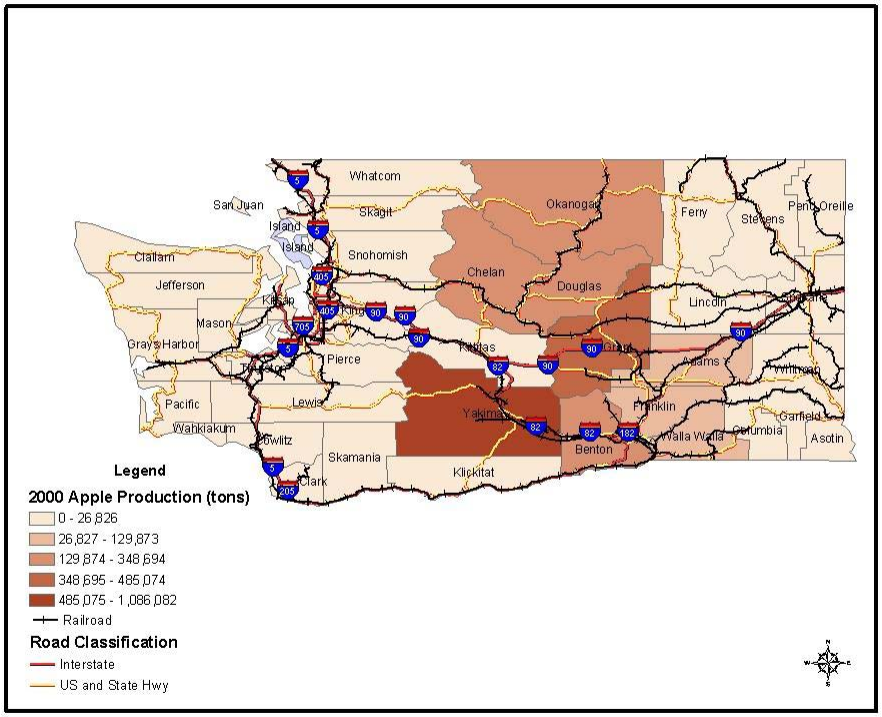


Figure 3.2. Annual Washington Pear Production, by County (2000).

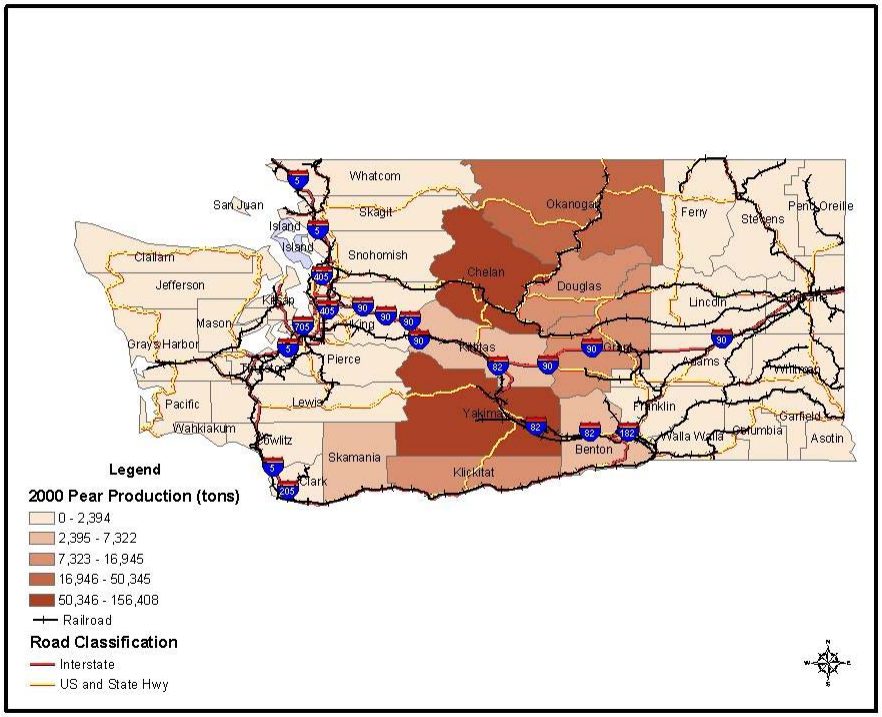


Figure 3.3. Annual Washington Potato Production, by County (2000).

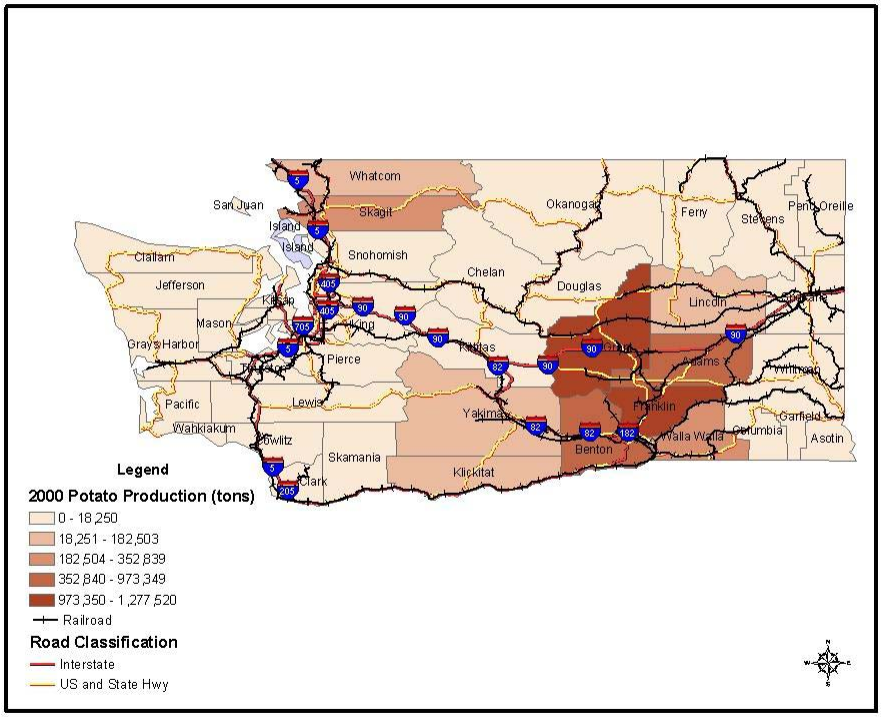
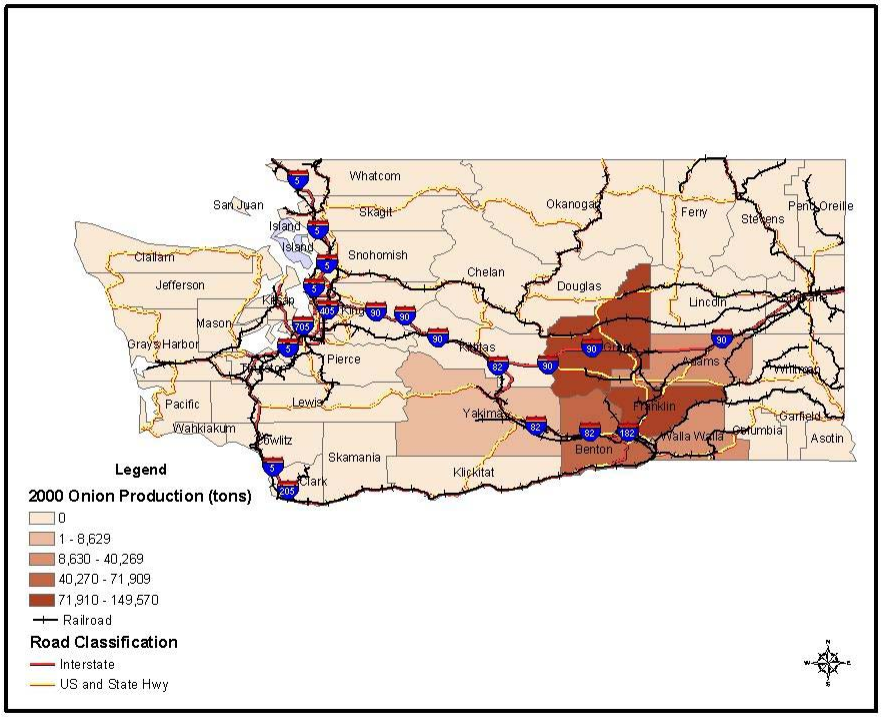


Figure 3.4. Annual Washington Onion Production, by County (2000).



Shipment Arrivals to Eastern Markets

A significant portion of the fresh fruit and vegetables produced in Washington is destined to international export markets, accessed via ocean ports in Seattle, WA, Tacoma, WA, and Portland, OR. Nearly 42 percent of all onion shipments from Washington is to export markets, totaling 348 thousand tons per year, as illustrated in Table 3-3. Roughly 30 percent of all apple and pear shipments from Washington is for export, with only 10 percent of all potato shipments. The remaining 70 percent of apple and pear shipments is to U.S. destinations, representing 1.3 million and 172 thousand tons, respectively.

Table 3-3. Total Average Annual Shipments from Washington, by Domestic and Export Shipments, 1999-2001[3]

Crop	Domestic		Export		Total
	thousand tons	%	thousand tons	%	thousand tons
Apples	1,259	69	558	31	1,817
Pears	172	70	72	30	244
Potatoes	473	90	55	10	528
Onions	202	58	146	42	348

Limited information is available for total shipments of fresh fruit and vegetables into specific cities/markets and from designated locations. However, the United States Department of Agricultural, Agricultural Marketing Service, has historically produced an annual report of Fresh Fruit and Vegetable Arrival Totals for 20 Cities, but has ceased production of this report due to budget limitations. The last year this report is available is for the calendar year 1998, and is utilized here to provide general information regarding key markets for Washington fresh fruit and vegetables, and modal share for distant markets. The data provided from this report do not capture all shipments from Washington, since there are likely many cities, not included in this report, that receive smaller volumes individually but comprise a significant portion collectively. The amount of shipments (as measured in tons) to each of the selected cities for Washington apples, pears, onions and potatoes is provided in Table 3-4 and separated by mode (truck and rail). These volumes are additionally presented geographically in Figures 3.5 – 3.8, representing the totals for each product for both truck and rail shipments. The modal share of all shipments to each city is then provided in Figures 3.9 – 3.12.

Washington apple shipments into these selected cities comprise the largest majority, accounting for almost 60 percent of all shipments and 424,800 tons during 1998, followed by onions with 20 percent (142,900 tons) and potatoes with 12 percent (85,200 tons). The fact that potato production in Washington yields the largest total tonnage, relative to apples, and that shipments into these cities are so low is indicative of the amount of potatoes which are processed at regional facilities and subsequently distributed to key markets.

[3] Source: USDA. Fresh Fruit and Vegetable Shipments by Commodities, States and Months, 1999-2001. Washington, D.C.: Agricultural Marketing Service, FVAS-4

Table 3-4. Annual Domestic Washington Arrivals into Selected Cities, by Mode and Commodity, 1998[4]

City	Truck (tons)				Rail (tons)				Total
	Commodity				Commodity				
	Apple	Pear	Potato	Onion	Apple	Pear	Potato	Onion	
Atlanta	21,600	1,800	8,150	1,100	450	0	0	50	33,150
Baltimore	19,950	2,650	1,050	3,050	18,600	100	250	150	45,800
Boston	13,750	3,550	5,950	5,100	4,600	700	2,150	2,200	38,000
Buffalo	0	0	0	0	0	0	0	0	0
Chicago	26,000	12,850	8,500	3,100	7,100	1,950	3,550	6,300	69,350
Cincinnati	0	0	0	0	0	0	0	0	0
Columbus	3,000	350	150	50	0	0	100	0	3,650
Dallas	20,550	2,100	1,250	4,600	0	0	0	0	28,500
Detroit	20,800	6,400	1,450	5,500	0	0	0	50	34,200
Los Angeles	88,750	4,550	16,550	38,150	0	0	0	50	148,050
Miami	10,350	4,600	600	750	1,200	450	0	250	18,200
New Orleans	0	0	0	0	0	0	0	0	0
New York	34,350	9,250	2,350	3,100	7,750	1,600	3,550	4,900	66,850
Philadelphia	12,600	3,500	1,400	500	4,450	500	1,600	2,800	27,350
Pittsburg	11,700	2,600	800	5,200	0	0	0	0	20,300
St. Louis	18,050	2,450	500	3,100	300	50	0	850	25,300
San Francisco	45,950	7,250	15,000	12,000	0	0	0	0	80,200
Seattle	32,950	4,950	10,300	40,000	0	0	0	0	88,200
Total	380,350	68,850	74,000	125,300	44,450	5,350	11,200	17,600	727,100
Modal Total	648,500				78,600				

While truck comprises the vast majority of shipments for all commodities, it is especially dominant for apples and pears, representing 90 and 93 percent of all shipments, respectively, as depicted in Table 3-4. For less sensitive and more durable commodities like potatoes and onions, truck is less dominant, representing 87 and 88 percent of all shipments, respectively. It is also interesting to note that for relatively close markets like Dallas, Los Angeles, San Francisco and Seattle, truck accounts for all shipments, regardless of commodity, illustrating the difficulty of rail to compete for short-haul markets. However, rail does capture a significant market share in certain select markets east of the Mississippi river, as illustrated in Figures 3.9 – 3.12.

[4] Source: USDA. Fresh Fruit and Vegetable Arrival Totals for 20 Cities, 1998. Washington, D.C.: Agricultural Marketing Service, FVAS-3.

Table 3-5 Modal Share of Domestic Washington Arrivals into Selected Cities, by Commodity, 1998[5]

City	Commodity							
	Apple		Pear		Potato		Onion	
	Truck (%)	Rail (%)	Truck (%)	Rail (%)	Truck (%)	Rail (%)	Truck (%)	Rail (%)
Atlanta	98	2	100	0	100	0	96	4
Baltimore	52	48	96	4	81	19	95	5
Boston	75	25	84	16	73	27	70	30
Buffalo	0	0	0	0	0	0	0	0
Chicago	79	21	87	13	71	29	33	67
Cincinnati	0	0	0	0	0	0	0	0
Columbus	100	0	100	0	60	40	100	0
Dallas	100	0	100	0	100	0	100	0
Detroit	100	0	100	0	100	0	99	1
Los Angeles	100	0	100	0	100	0	100	0
Miami	90	10	91	9	100	0	75	25
New Orleans	0	0	0	0	0	0	0	0
New York	82	18	85	15	40	60	39	61
Philadelphia	74	26	88	13	47	53	15	85
Pittsburg	100	0	100	0	100	0	100	0
St. Louis	98	2	98	2	100	0	78	22
San Francisco	100	0	100	0	100	0	100	0
Seattle	100	0	100	0	100	0	100	0
Total	90	10	93	7	87	13	88	12

The key eastern markets for apple arrivals include New York, Baltimore and Chicago, with each receiving more than 33 thousand tons of Washington apples in 1998. Other important apple markets include Atlanta, Boston, Detroit and Philadelphia with each receiving between 17 and 21 thousand tons. Rail accounted for 48 percent of apple shipments into Baltimore, 26 percent of shipments into Philadelphia and 25 percent of shipments into Boston. The important eastern markets for Washington pears include Chicago (14,800 tons), New York (10,850 tons) and Detroit (6,400 tons) with the clear majority of shipments being truck. However, several eastern cities received a very significant percentage of potato arrivals by rail, including Boston (27%), Chicago (29%), Columbus (40%), Philadelphia (53%) and New York (60%). A similar situation exists with onion arrivals by rail in Miami (25%), Boston (30%), New York (61%), Chicago (67%) and Philadelphia (85%). Thus, while in aggregate, truck comprises the majority of fresh fruit and vegetable shipments (90%), in certain selected markets, rail successfully competes for a sizeable share of shipments.

[5] Source: USDA. Fresh Fruit and Vegetable Arrival Totals for 20 Cities, 1998. Washington, D.C.: Agricultural Marketing Service, FVAS-3

Figure 3.5. Annual Washington Apple Arrivals for Selected Cities (1998).

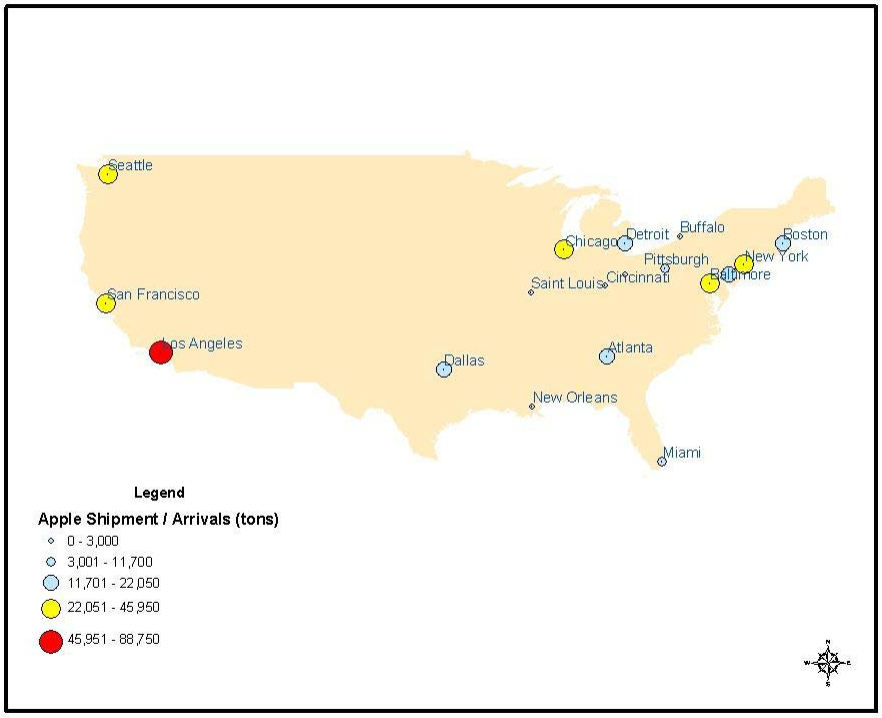


Figure 3.6. Annual Washington Pear Arrivals for Selected Cities (1998).

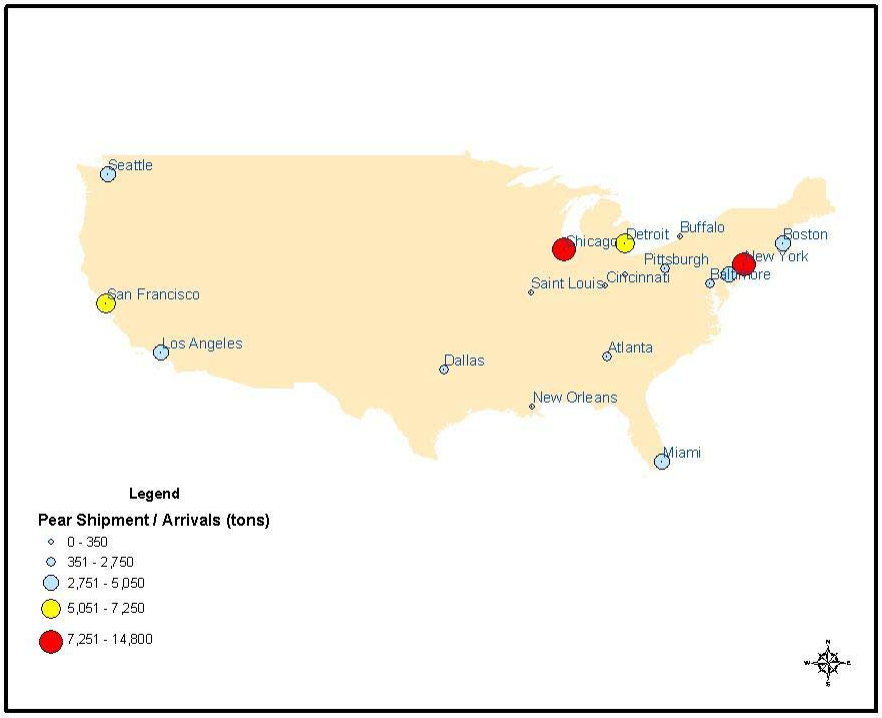


Figure 3.7. Annual Washington Potato Arrivals for Selected Cities (1998).

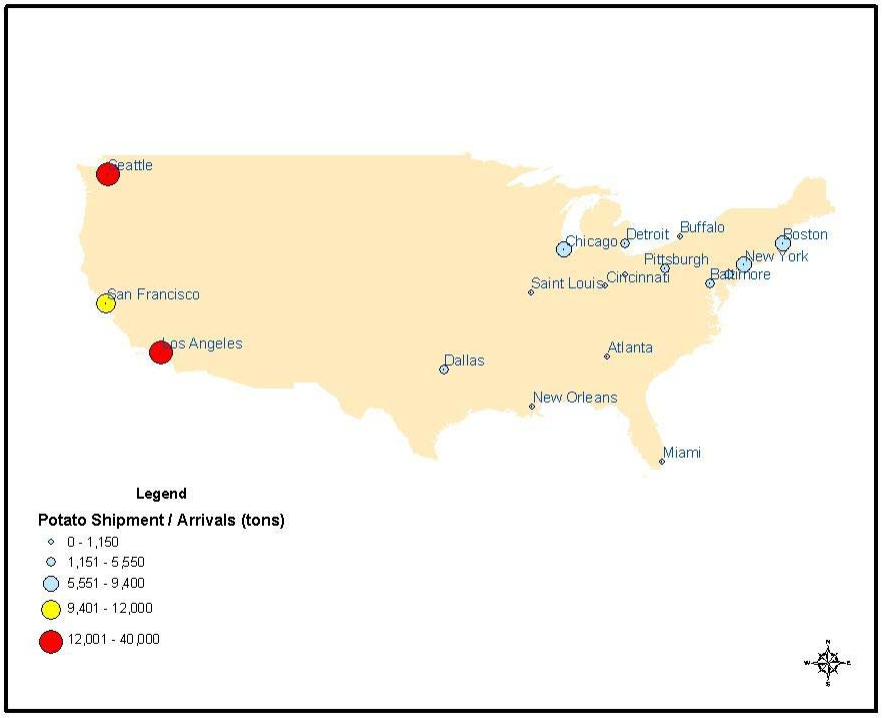


Figure 3.8. Annual Washington Onion Arrivals for Selected Cities (1998).

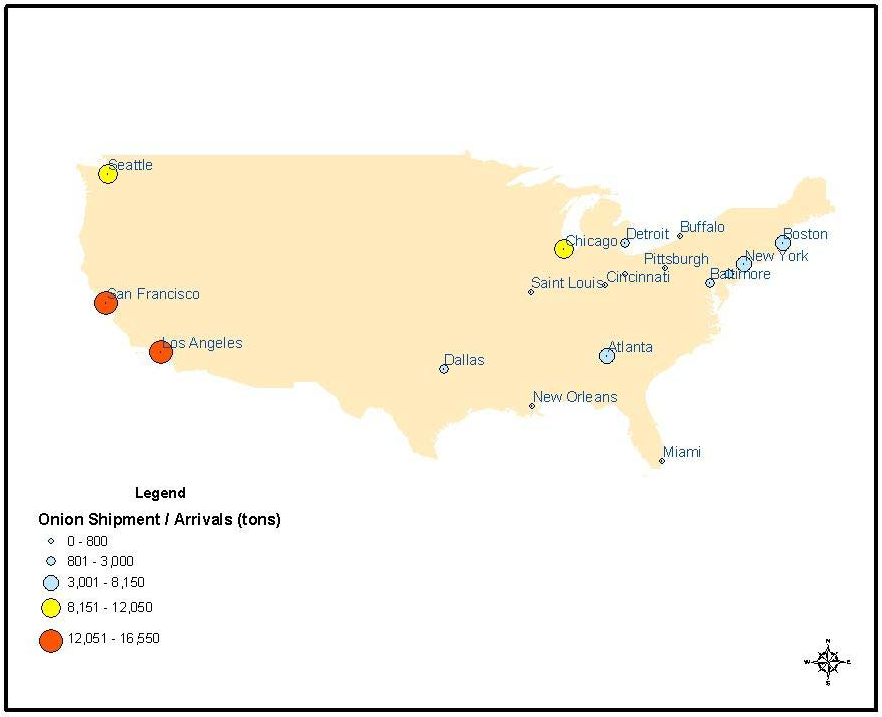


Figure 3.9. Modal Share of Annual Washington Apple Arrivals for Selected Cities (1998).

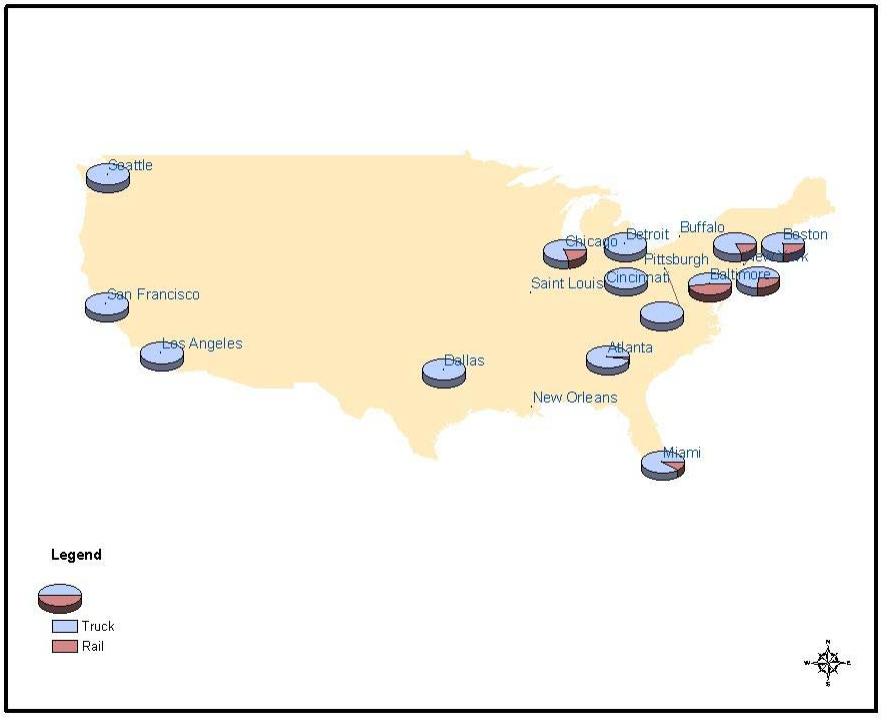


Figure 3.10. Modal Share of Annual Washington Pear Arrivals for Selected Cities (1998).

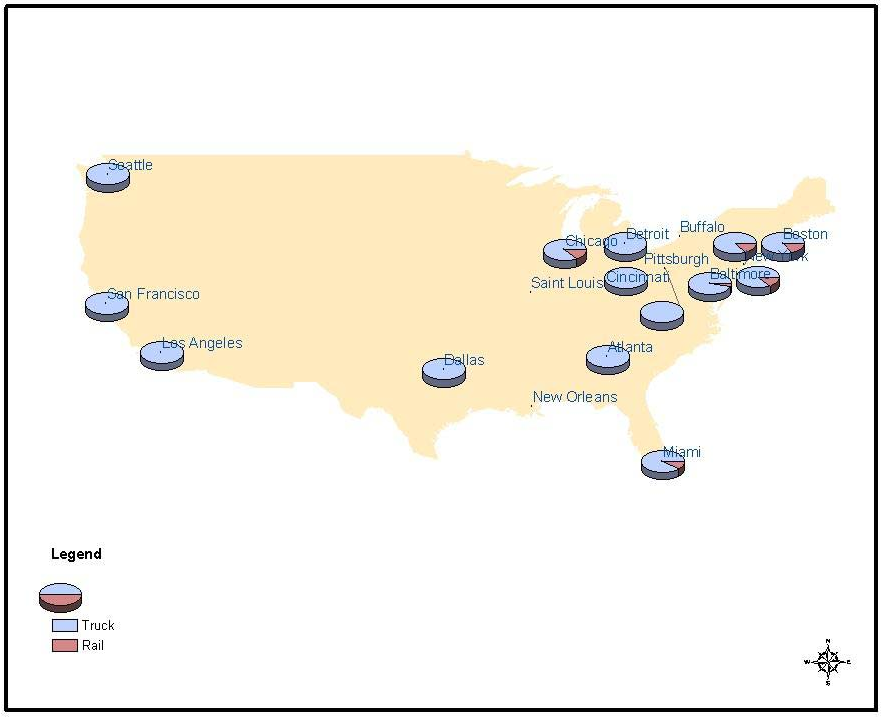


Figure 3.11. Modal Share of Annual Washington Onion Arrivals for Selected Cities (1998).

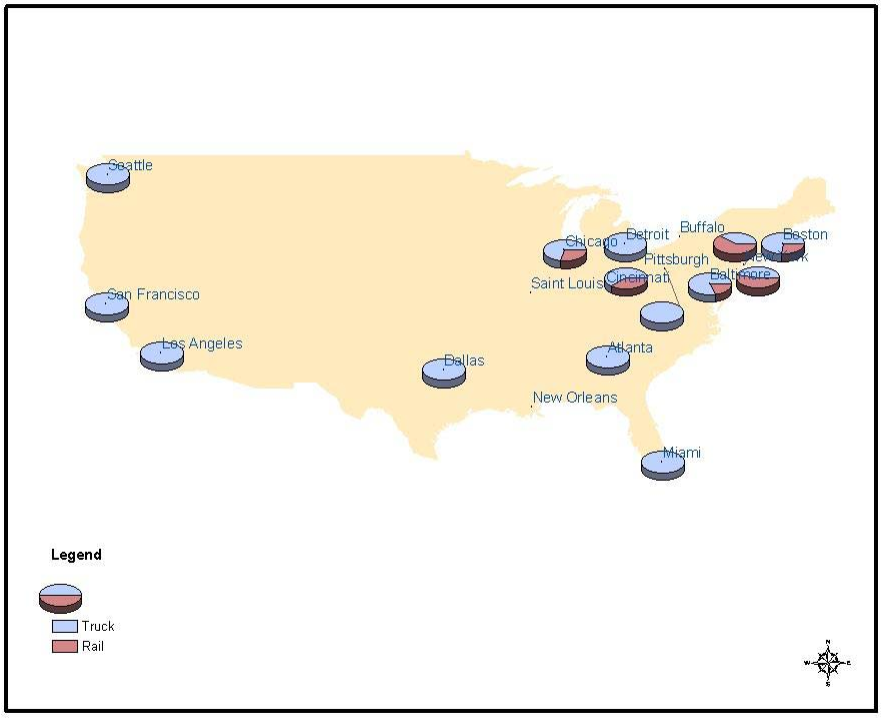
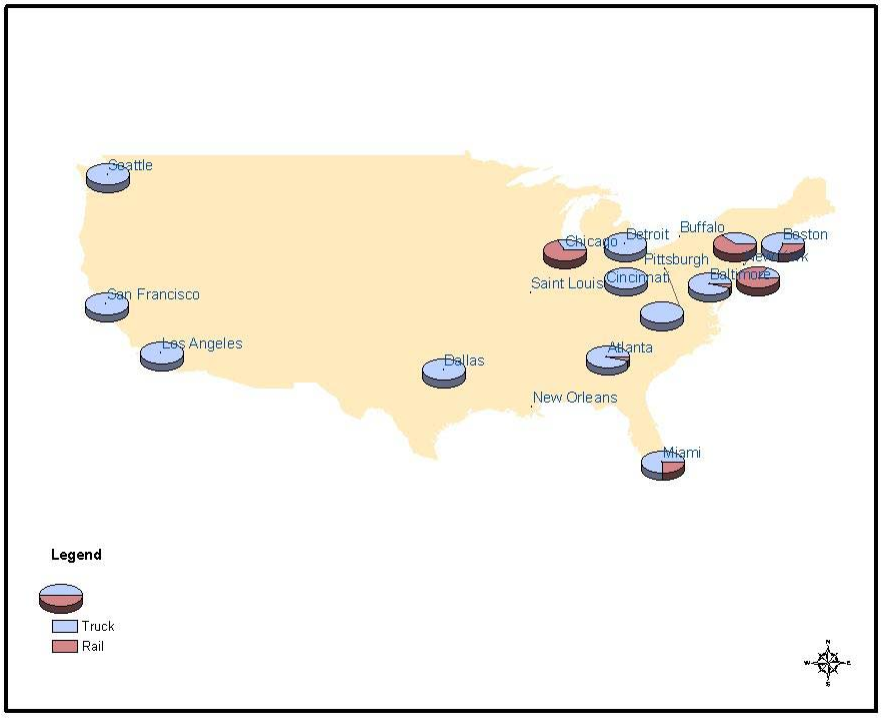


Figure 3.12. Modal Share of Annual Washington Potato Arrivals for Selected Cities (1998).



Total Movements Available

Translating the tonnage arrival shipping estimates into actual rail cars and truckloads may be approximated by dividing the total tons shipped for each product and city by the approximate truck and rail car capacity. For these purposes, we assume a truck capacity of 22 tons (44,000 lb. payload capacity) and a rail capacity of 50 tons (roughly equivalent to 2.3 trucks). Utilizing these conversion factors, we arrive at the total truck loads and rail cars for each commodity in Table 3-6. In truckload terms, it is about 33,094 total unload movements available. However, these estimates only reflect those shipments into the selected cities as reported by the USDA, and therefore are extremely conservative estimates at best.

Table 3-6. Annual Domestic Washington Arrivals into Selected Cities, by Number of Truck Loads and Rail Cars, 1998[6]

City	Truck Loads				Rail Cars			
	Commodity				Commodity			
	Apple	Pear	Potato	Onion	Apple	Pear	Potato	Onion
Atlanta	982	82	370	50	9	0	0	1
Baltimore	907	120	48	139	372	2	5	3
Boston	625	161	270	232	92	14	43	44
Buffalo	0	0	0	0	0	0	0	0
Chicago	1,182	584	386	141	142	39	71	126
Cincinnati	0	0	0	0	0	0	0	0
Columbus	136	16	7	2	0	0	2	0
Dallas	934	95	57	209	0	0	0	0
Detroit	945	291	66	250	0	0	0	1
Los Angeles	4,034	207	752	1,734	0	0	0	1
Miami	470	209	27	34	24	9	0	5
New Orleans	0	0	0	0	0	0	0	0
New York	1,561	420	107	141	155	32	71	98
Philadelphia	573	159	64	23	89	10	32	56
Pittsburg	532	118	36	236	0	0	0	0
St. Louis	820	111	23	141	6	1	0	17
San Francisco	2,089	330	682	545	0	0	0	0
Seattle	1,498	225	468	1,818	0	0	0	0
Total	17,289	3,130	3,364	5,695	889	107	224	352
Modal Total	29,478				1,572			

A more realistic approach to estimating total shipments east of the Mississippi river, and not just those in the USDA report, would be to assume the geographical distribution represented from the survey of arrivals to 20 select cities is consistent with the population of all shipments of Washington fresh fruit and vegetables throughout the U.S. and apply those percentages to the

[6] Source: USDA. Fresh Fruit and Vegetable Arrival Totals for 20 Cities, 1998. Washington, D.C.: Agricultural Marketing Service, FVAS-3.

total amount produced in the state. Thus, 2.95 million tons of apples were produced in 2000, of which 30 percent is generally destined for export markets, leaving 2.065 million tons for total domestic markets. Roughly 50 percent of all apple arrivals in the selected U.S. cities above is destined to western cities (Los Angeles, San Francisco, Seattle, Dallas), leaving 1,032,500 tons (50 percent) destined for markets east of the Mississippi river. That translates into about 46,932 trucks (assuming 100 percent truck) or 20,650 rail cars (assuming 100 percent rail). If we apply the same arithmetic to the other commodities, we arrive at an estimated total of 149,219 truckloads or 65,131 rail cars, as depicted in Table 3-7. This represents the total eastern U.S. market for which truck and rail compete.

Table 3-7. Estimated Total Truckloads and/or Rail Cars to Eastern Markets, 2000

Crop	Total Production (thousand tons)	Export %	Eastern Market %	Total Eastern Market Volume (thousand tons)	Truck Loads (100%)	Rail Cars (100%)
Apple	2,950	30	50	1,032	46,932	20,650
Pear	406	31	73	205	9,296	4,090
Potato	5,250	10	42	1,985	90,205	39,219
Onion	426	42	24	59	2,695	1,172
Total					149,219	65,131

IV. TRANSPORTATION SUPPLY: MODAL ALTERNATIVES

Capacity and Seasonality Constraints for Trucks

The transportation system serving Washington shippers and receivers of fresh fruits and vegetables from this state is continually changing and adapting to economic and political influences. While the majority of the state is served by a multi-modal transportation system, consisting of rail and truck alternatives, the majority of fresh fruit and vegetables have increasingly been shipped using truck, especially during the late 1990's. The exception to this phenomenon usually occurs whenever the shipper is confronted with truck shortages (typically seasonal but increasingly, chronic) and turn to rail when no other alternative exists. There are several forces contributing to this situation of limited truck availability and capacity, most of which are economic in nature.

The extended economic growth of the 1990's certainly contributed to the problems faced by Washington shippers, as the demand for moving products increased and availability of trucks became scarce. Trucks that normally moved lower valued products were drawn to more profitable shipment opportunities. The shortage was exacerbated when UP and SP merged and experienced early coordination problems that led to extended rail congestion and delays, and ultimately lost the confidence of many shippers who then entered the market and competed for trucks. However, the recent slowing of the national economy (2001 and 2002) may have an easing effect on the national availability of trucks.

Additionally, the transport of produce and perishables is often viewed by truck carriers as the least favorable alternative, largely due to periodic shipping delays, multiple pick-ups, loading and unloading fees and the greater likelihood of claims for damages incurred in transit (given the relative fragile and perishable nature of fresh fruit and vegetables). Thus, if a carrier has a choice (and when trucks are scarce, they have a choice), they will gravitate towards shipments that require less hassle and potential expense. The trucking industry is also facing slimmer profit margins due to the shortage of drivers and the expense associated with training drivers who leave, higher fuel costs and significant increases in insurance premiums. This may result in fewer trucking companies remaining in operation and further contributing to the shortage dilemma.

Combined with each of these issues is the seasonal nature of Washington fruit and vegetables. These products are typically harvested in the fall (between August – September) and marketed between October and December, coinciding with the peak demand and transportation for two other commodities; Christmas trees and turkeys. Turkey shipments (particularly to Mexico) have increased substantially in recent years and now represent the largest export market for U.S. turkeys (discussed more fully later).

Relative Service Attributes by Mode

There are distinct differences in the service attributes between rail and truck that largely influence the extent to which they are utilized by shippers and receivers. Trucks have the advantage of easy access and portability for both pick-ups and deliveries (door to door). They also have greater time convenience and flexibility for when shipments are picked-up and delivered and require less trans-loading when compared to rail. The transit times are usually shorter for trucks (especially for near and medium range markets) and the risk of damage or spoilage minimal. Also the size of the shipment is smaller when compared to a rail car, thus greater convenience to the shipper (or receiver) who doesn't have enough volume to fill a rail car. However, trucks are also usually more expensive for long haul trips and periodically experience availability shortages.

Rail, on the other hand, has historically been associated with fewer service attributes when compared with truck, except for lower cost shipping rates for large volume / long distance markets. They traditionally have less access to shippers and receivers, given the limited rail infrastructure and availability of loading/unloading sites. Thus, commodities must be loaded onto truck (in some cases), shipped to the rail siding, loaded onto the rail car and the reverse performed on the receiving end. This results in greater inconvenience for both shipper and handler who must handle the product several times and also contribute to the likelihood of damaged produce. Transit times are generally longer, with greater variability when compared to trucks and resolving claims for damaged products is often a substantial and time consuming challenge (in some cases up to a year).

Backhaul and Competition for Trucks

Truck carriers and trucking companies are primarily concerned with maximizing the utilization of their productive assets (trucks and trailers). This is most easily accomplished when they maximize the amount of time each truck is carrying valuable commodities and minimize delays or empty backhauls. Trucks that are sitting still or are traveling long distances without cargo represent under-utilized assets and a sizeable cost of operation. The location of some of the major shipping regions, far from I-90 or major highways, necessitates "deadhead" or empty mileage trip segments. Thus, geographical proximity to a preponderance of backhaul opportunities will largely influence the availability of trucks and the shipping rates for other commodities (such as produce) in a given region. This partially explains the truck shortage that is happening in central Washington.

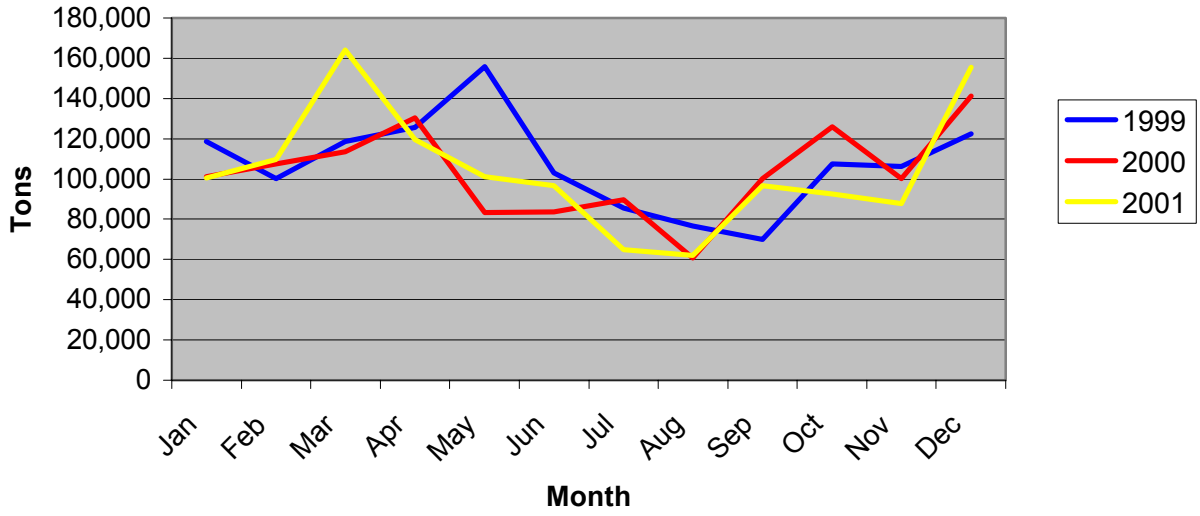
Central and southern California (especially areas in/and around Los Angeles and San Francisco) have the dual benefit of being in an area that produces large volumes of fruit, vegetables and wine and also near large population concentrations (and ocean ports for export markets) that generate western backhaul opportunities for eastbound produce. While Washington certainly has access to ocean ports that are traditionally less congested, there are considerably less demand attributes that would draw significant backhaul opportunities, especially to central or north central Washington.

V. MARKET CHARACTERISTICS / DYNAMICS

Seasonality of Movements

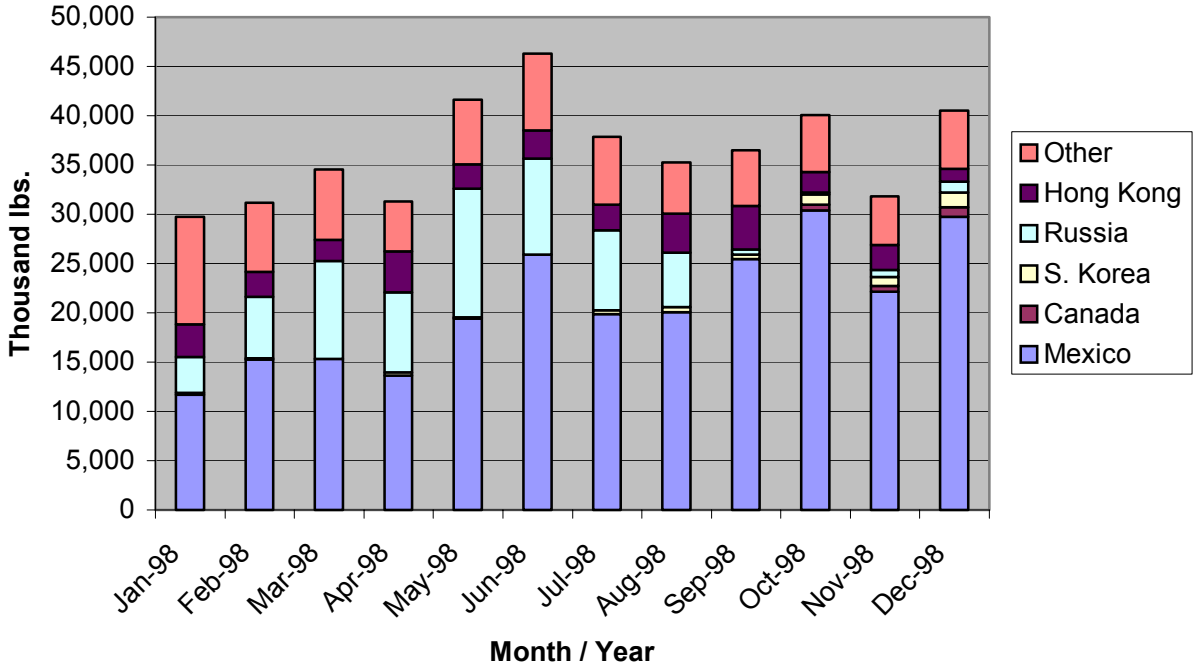
Washington fruit and vegetable shipments follow a fairly consistent seasonal pattern that is dictated by both the demand and the production/storage characteristics of the product. Apple shipments, for example, are lowest in the months preceding harvest (July to mid-Aug) and begin increasing dramatically in the months during and following harvest (September to December), typically reaching the peak at the end of the year. Early year shipments (January to March) are relatively stable before reaching another peak between March and May, as depicted in Figure 5.1. The end of year peak is driven by the demand for fresh apples, thus following the fall harvest whereas spikes in March to May shipments are reflective of apples being released from controlled atmosphere storage facilities (usually 90 days) and the push to clear storage space for the approaching harvest.

Figure 5.1. Total Domestic Apple Shipments from Washington State, 1999, 2000, 2001.



The demand for transportation services for Washington apples at the end of the year competes for transportation services of other commodities, as previously mentioned. One of the results of the North American Free Trade Agreement was duty-free access to Canadian and Mexican markets leading to increased turkey exports to Mexico. Turkey exports to Mexico now account for nearly 60 percent of all U.S. turkey exports, with the largest volume of shipments to Mexico occurring toward the end of the year, as illustrated in Figure 5.2. The predominant modal choice for these shipments is truck, therefore contributing to overall truck shortages during this important marketing period for fresh fruits and vegetables out of Washington. This is an additional demand for truck services to be combined with the traditional heavy movement of Christmas trees out of California, Washington and the rest of the Pacific Northwest during the exact same time period.

Figure 5.2. U.S. Turkey Exports, 1998.



Future of the Trucking Industry

The future of the trucking industry in the nation, and certainly the segment serving the perishables industry, is at best uncertain. All trucking firms have been affected by the down-turn in the nation's economy but other severe problems exist. Drivers are scarce and turnover is very high, causing continual retraining of this labor to be necessary and expensive. Increased insurance premiums, fuel prices and decreased value of used trucks puts further stress on the industry. While some recovery in the general truckload (TL) and less-than-truckload (LTL) segments has been predicted, such a recovery in the non-perishables trucking segment may put additional pressure on driver availability and retention in the perishables segment.

History and Status of Rail, Inter-Modal

Unfortunately, the history of rail service, as it relates to the shipment of Washington fruit and vegetables, is replete with numerous service problems that have contributed to the diminishing utilization by shippers and receivers. Periodic successes in providing reliable and quality transportation service over time are less remembered than those times when shipments are lost or delayed, even if a rare occurrence. Receivers, such as a food chain going on "ad" with a produce product remember sharply any missed or delayed loads. Shippers remember the hassle (and waiting for payment) of having the railroad try to sort out who is liable for a delayed or damaged rail car. Shippers and receivers, thus, place a premium on the reliability and quality of service, especially for time-sensitive, perishable products such as apples and pears, and are willing to pay the higher truck rate to achieve the desired level of service. The marginal savings achieved from utilizing less-expensive freight rail services is not adequate to compensate for the marginal cost (to both shipper and receiver) embedded in the unreliability and quality of service. Conversely, the marginal gain reflected in better service attributes from truck is enough to counter the higher shipping costs, as shippers reveal their preference for the bundle of services available from truck.

Washington Fruit Express as an Alternative

The Washington Fruit Express program potentially offers a favorable alternative to the traditional freight rail option and one that could legitimately compete for truck shipments to distant eastern U.S. markets, especially during seasonal shortages. Two obvious advantages are the quicker delivery times, relative to freight rail, and shipping rates that are quite competitive. However, while those attributes may be enough to generate initial interest from shippers and receivers, it probably won't insure long-run success and utilization of the program. That will depend on how well Washington Fruit Express follows through on the commitment of sustained, reliable service and their ability to restore trust and confidence throughout the shipper and receiver population. Shippers and receivers may be reluctant to break-off long-term, successful relationships with truck carriers (especially given a truck shortage situation) if they believe the Washington Fruit Express program will only be short-lived. Longevity of the program and service is of critical importance to shippers and receivers as they make logistical decisions.

Shipper Perceptions / Concerns

The academic and industry literature continually show that shippers understand the importance of maintaining valuable markets for their product and also penetrating new and emerging markets. They also understand the critical role that transportation serves, geographically connecting production with consumption activities and building long-term brand identity (freshness, quality and reliability) with Washington products. As a result, they are increasingly concerned about the limited transportation alternatives available for their specific transportation needs, especially with recent consolidation/mergers in the rail industry (generally associated with less service) and the growing truck shortages throughout the northwest. The Washington Fruit Express program, therefore, has been positively received as another choice during periodic truck shortages, and as potentially improved service compared to traditional freight rail. The extent and volume of final movements has not been determined. The general attractiveness of the service is established and it is favorable.

To better measure the current perceptions and concerns expressed by shippers, brokers, growers and co-ops in the central Washington region, a survey consisting of 23 interviews was conducted between March 26 and May 22, 2002 as part of the Washington Fruit Express Survey Research Project. This broad survey uncovered several consistent themes throughout the industry.

Overall, shippers (those which have utilized the service) had a very positive experience using the Washington Fruit Express (WFE) program, commenting on the excellent communication with brokers and reliable, on-time service. Many felt that increased utilization of the WFE program would require that it be demanded by receivers, since the receivers make 90 percent of the shipping decisions. However, in order for this program to experience long-run success and offer serious competition to truck, shippers felt that WFE would need to establish and maintain a long record of dependable, quality, and seamless service and appropriately address the optimum configuration/size of rail cars to meet the needs of both shippers and receivers. Also, minimizing the need for double or multiple handling would increase acceptance by shippers. It is noticeable that 84 percent of those shippers and receivers interviewed want WFE to succeed and continue as a competitive alternative.

Shippers also revealed some interest in the new "8th day" freight rail service to the east coast, with one-third of shippers and receivers indicating they would be interested under certain conditions. However, many shippers were skeptical that freight railroads would be able to follow through on that service, citing many of the bad experiences of the past.

Overall, truck transport has been the mode of choice for both shippers and receivers of Washington fruits and vegetables. The combined service attributes of flexibility, dependability, shipment size, speed, quality and delivery accessibility are difficult for other alternatives to match. However, truck shortages and rates are a serious problem and many shippers and receivers interviewed in this survey believe it will only get worse in the near future.

VI. IMPACT OF COMPETITION

Service and Rates

Lack of competition means increased demands for transportation must be handled somehow by the truck sector. The result is truck shortages and higher rates. One way of approximating the actual transportation shipping cost due to truck shortages is by estimating the amount of price increase due to the unavailability of trucks, and then applying that savings to the total amount of truck shipments which would have occurred without truck shortages. Considering the 1998 monthly shipments of apples to New York as a simple example, the apparent truck shortage began occurring in September and continuing through December, as illustrated in Figure 6.1. This period also coincides with modal shifts from truck to rail, as depicted in Figure 6.2. However, the dotted red line in Figure 6.1 represents the potential price assumed to hold under adequate truck availability, roughly a $200 rate savings. Applying this rate to the total volume of truck shipments (assuming no modal substitution of rail for truck between September and December, or maintaining the same ratio as the months prior to September) results in an estimate of annual increases in shipper and/or receiver costs of about 3% for New York, in this example. Having rail capacity and service available to move product in the high demand times is the same as effectively causing a lowering of the rates on all shipments, not just rail, because the available competition can serve to hold rates down by providing alternative service and capacity.

Figure 6.1. Truck Shipping Rates for Washington Apples to New York, 1998 (Monthly High, Low and Average)

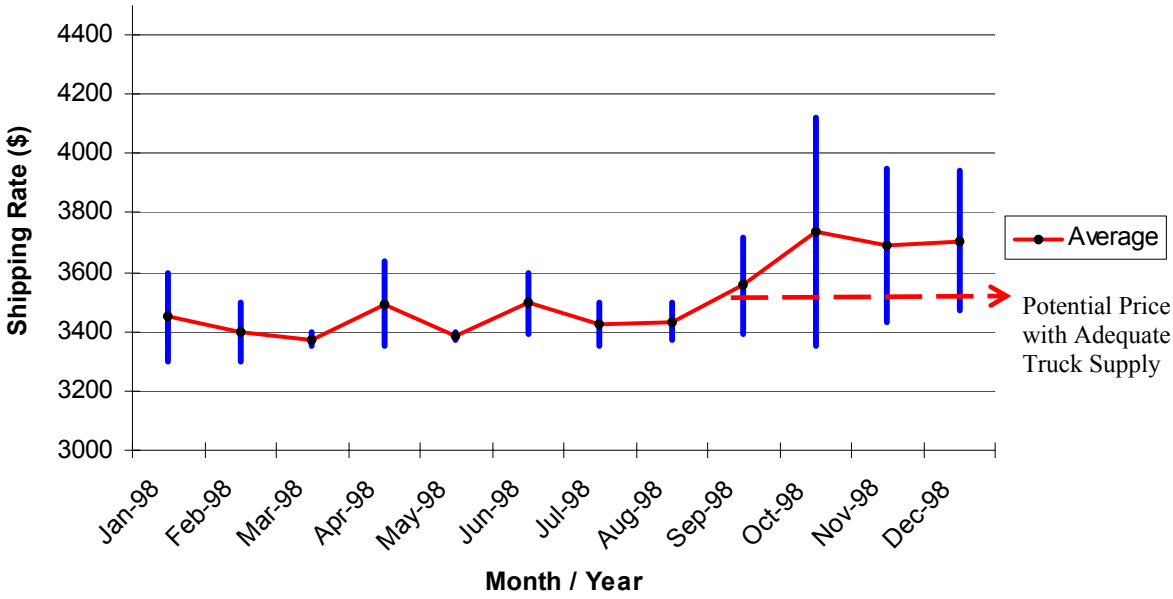
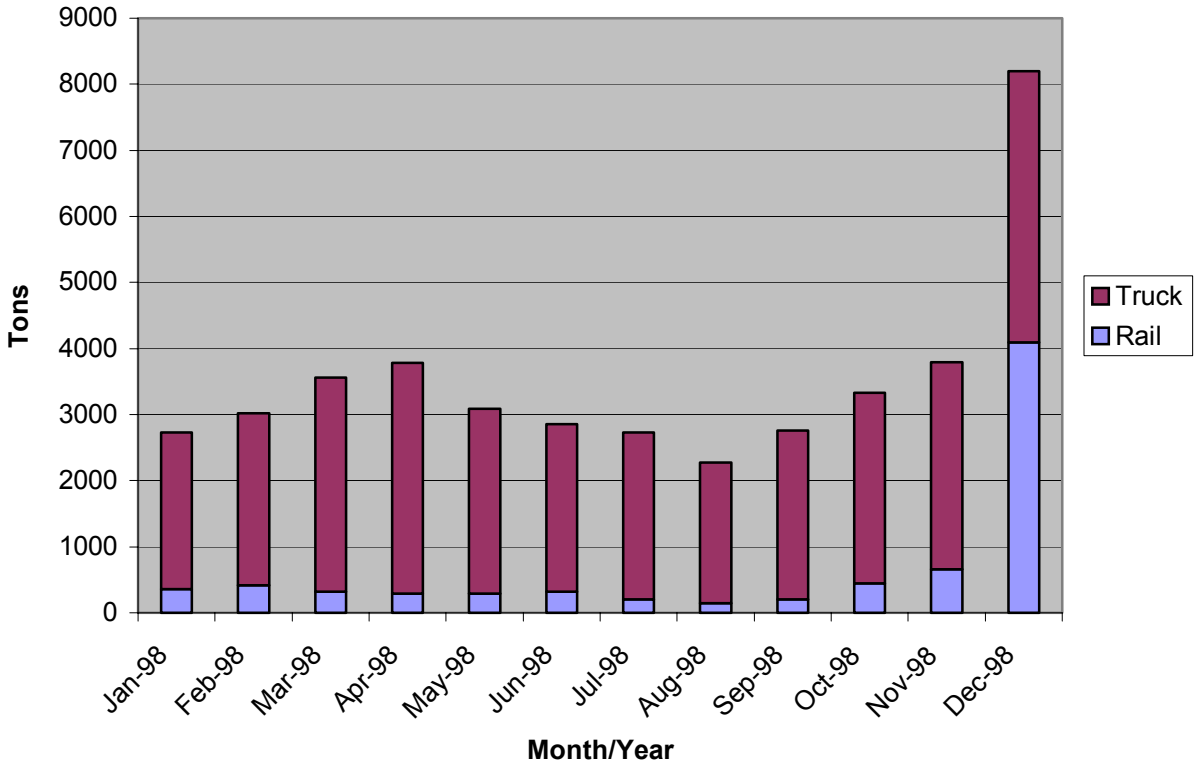


Figure 6.2. Washington Apple Shipments to New York, by Month and Mode, 1998.



Consequences of Less Competition

The consequence of continued low competition in the Washington fresh fruit and vegetables, and the overall perishables market, is unsatisfactory. It simply will remain the unappealing and inefficient status quo. Continued periodic shortages of trucks or delays in overall trucking will be evident. Rates will continue to escalate, pushed by both demand and cost (supply) factors. These increases result in lower net revenue to the Washington producer, at a time when product prices are particularly under pressure. Over time, produce receivers could lose confidence in the reliability and comparative cost of Washington produce, causing a competitive edge to be further lost by Washington shippers to other competing production areas.

Less competition also means the "urge to innovate" and the "urge to serve" is lost. Truckers, with no local competition, can treat fruit and vegetable traffic as a residual market to be served at will. Only higher and higher rates, or a lack of demand in other traffic areas, increase, though not guaranteeing, availability of trucks. Competition must exist to make decreased service a market activity that becomes costly to the trucking segment.

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