Washington State Industry Outlook and Freight Transportation Forecast:

Apple Industry

Prepared for the
Washington State Department of Transportation
Freight Systems Division

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STUDY GOAL

The goal of this report is to offer state and regional transportation planners necessary information regarding future freight flows specific to the apple industry. This is accomplished by providing general industry information regarding the prospects for increased trade and production growth and also projecting statewide apple production over the next twenty years. This projection was conducted at the Township, Section, and Range level and is then allocated to truck shipments and highways using information and data collected from a recent survey of the apple industry regarding transportation characteristics of the industry.

INDUSTRY INFORMATION

In 2002, an estimated 15.8 pounds of fresh-market apples and 26.4 pounds of processed apples were consumed by the average U.S. consumers. Apples are considered one of the top volume items in the average supermarket produce department. Approximately 2,200 varieties of apples are grown in the United States, of which 100 varieties are grown commercially. While all 50 states grow apples, only 36 of the states grow apples on a commercial basis [1].

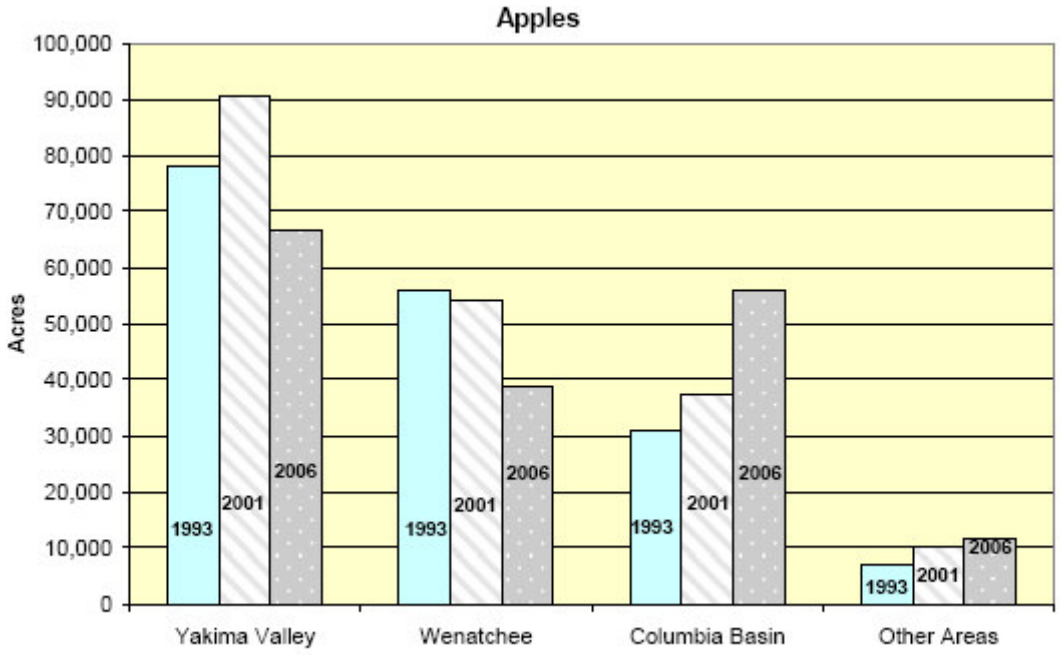
The top five apple producing states in the U.S. are Washington, New York, Michigan, Pennsylvania and California. Washington State provides more than half of the apples grown in the U.S. The other states grow less than one third of the Washington State apple production [2].

In 2006/2007, 6,321.8 million pounds of fresh apples were produced in the U.S.; 4,267.7 million pounds were imported, adding up to the total supply of 6,749.5 million pounds. 1,406.5 million pounds were exported, while 5,343 million pounds were consumed domestically. The per capita U.S. consumption was 17.73 pounds per capita [3].

Approximately, 75% of Washington State apples are sold fresh while the remaining 25 % are processed into juice, sauce or dehydrated products. This large percentage of apples being sold fresh is somewhat unique to Washington State, since most other apple producing states market less than 50 % as fresh [2].

Washington State's apple production is concentrated in three primary geographical areas in the state: Yakima Valley, Wenatchee Valley, and the Columbia Basin [4]. The acreage devoted to apple production in each of these regions has changed over time, with the Yakima Valley and Wenatchee Valley regions decreasing in total acreage since 2001 and the Columbia Basin increasing acreage substantially since 2001 (Figure 1).

Figure 1: Washington State Main Apple Producing Regions and the Acreages



Source: Washington Fruit Survey Highlights, Natural Agricultural Statistics Service

September is the typical apple harvest period in the state, although some varieties are harvested as early as mid-August and as late as October. In order to produce apples faster and increase harvest efficiency growers use "dwarf trees" in high density plantings. This allows the growers to respond to consumer demands and increase the growers' return on investment [4]. Washington exports several varieties of apples including red delicious which is often exported Mexico, Hong Kong, Indonesia, Saudi Arabia, Singapore, Malaysia, Colombia, Brazil, the Philippines and Thailand [2].

ECONOMIC OUTLOOK

Domestic versus International

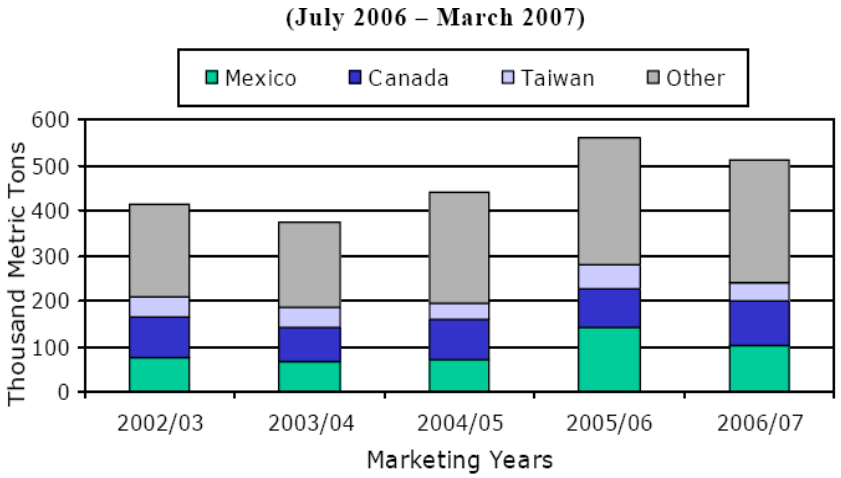
As the U.S. consumers' food choices move toward a more healthy combination of fruit and vegetables, apple consumption on a per capita basis may be expected to increase domestically. This increased per capita consumption is expected to increase even though domestic market prices are currently high and supplies tight. The competition from the snack food industry is neutralized by the availability of new processed apple

products. Based on the U.S. Apple Association Market News, May 1, 2007, total fresh apple holdings in storage decreased 5 % by May 1, 2007 compared to May 1, 2006. However, tropical fruit choices from Central and South America may put some downward pressure on U.S. apple consumption [5].

U.S. apple export quantities declined between the marketing years 2005/2006 to 2006/2007 in all top markets except Canada, India and United Kingdom. Total export market values were not affected by the decrease in the overall export quantity. A 14 % increase in the export market value was observed, increasing to $480 million through March of the marketing year 2006/2007. The main drivers of the increase in the export value were strong prices going to Canada and Taiwan [6].

The U.S. is Mexico's largest apple supplier, followed by Chile. Markets in India and Taiwan also increased concerns regarding the apple trade [6]. During the marketing years 2006/2007, U.S exports to Taiwan, and Mexico decreased, while the exports to Canada increased. A decline in the Mexican market was due to the challenge of fixed supplies, higher domestic prices and anti-dumping duties. Overall, total U.S. exports decreased compared to the marketing years 2005/2006 (Figure 2).

Figure 2: U.S. Exports



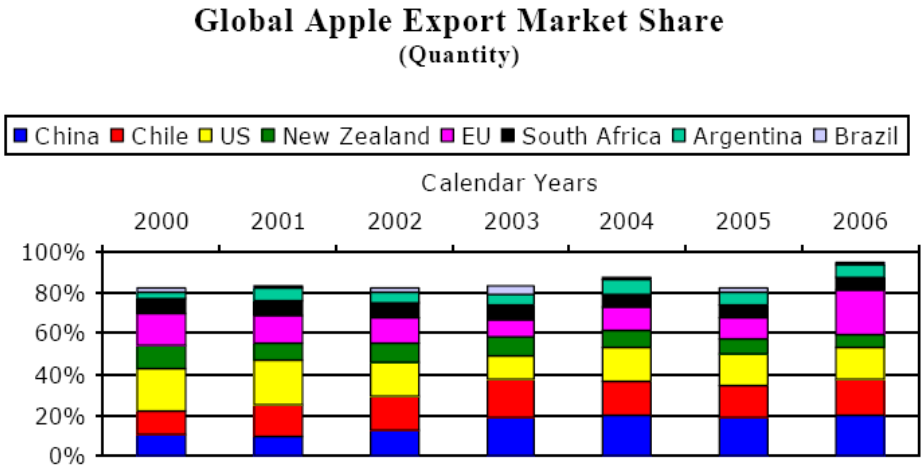
Source: World Markets and Trade, US Department of Agriculture, Foreign Agricultural Service, May 2007

U.S. apples are not currently allowed to enter into South Korean market. Access to South Korea for U.S. apples is currently limited by phyto-sanitary rules and trade restrictions. However, as the U.S. works to improve trade relations and reduce the tariff rates the South Korean market is considered an opportunity for future U.S. apples [6].

The global supply of apples has increased over time, primarily due to investments in apple orchards in China. The global supply of apples increased 20 percent between 2006 and 2007, due primarily to China's increased apple supply. China is the main driving force behind changes in the global apple production [6]. China's apple consumption is also increasing and is considered the contributing factor to increasing apple consumption worldwide. Thus, apple production in China has been growing in response to the increasing demand for apples. Improved transportation infrastructure and increased availability of cold storage facilities and capacity has also facilitated the growth of the apple industry in China [5].

While Turkey, Spain, Italy, Russia and Australia have experienced decreasing apple production, New Zealand, Argentina and Chile have increased their apple production. Total apple exports from the major traders are forecasted at 4.6 million tons [6]. The global apple market is principally shared among China, Chile, New Zealand, U.S., European Union, South Africa, Brazil and Argentina (Figure 3). Russia is the world's fifth-largest market for fruit consumption and is considered a major growing market for apple exports. A small portion of Russia's apple imports is received from the U.S. [6].

Figure 3: Global Apple Export Market Share



Source: World Markets and Trade, US Department of Agriculture, Foreign Agricultural Service, May 2007

Washington Outlook

In year 2006, Washington State apple production stayed stable, but contributions from New York and Michigan area increased the national total. Yet, Washington State apple production continues to be the largest and the main driver of the changes in US apple production.

Apples are still the largest agricultural cash crop for the State, worth $1.4 billion in 2006, despite the recent declines. According to the U.S. Department of Agriculture's National Agriculture Statistics Service, the 2007 apple crop of 5.4 billion pounds was approximately 4 percent less than 2006's. The mega retail stores contributed to the trend toward larger orchards [7].

Market prices for Washington State apples have been increasing due to the new markets opening up in Mexico and China. The higher quality apples of Washington State are demanded over the diminishing quality apples in the East Coast [5].

Approximately 45,000-50,000 people are employed in harvesting the crop. During the peak of harvest, approximately 35,000 to 45,000 pickers are in the fields [2]. The cost of producing an acre of apples varies between $4,800 and $6,600 with the greatest portion of the expenses being distributed among picking, pruning and hand fruit thinning operations. In addition to those expenses, packing and marketing costs $4,200 to $5,000 per average acre of production, which is about half of the labor costs [8]. The number of warehouses packing and shipping apples in the state is approximately 125. The number of boxes shipped varies from 25,000 to 2,000,000 annually [2].

Depending on the production, fruit quality, and variety, the average break-even price for a box of apples is about $13.50. It costs around $6.50 to $8.50 to store and pack of box of fruit. In 2000, the industry received an average of $11.97 per box sold, but only about $10 was for the common varieties, with some specialty varieties receiving a premium [8].

As indicated earlier, apples ranked first for value of production for the state in 2005. The value of production for 2005 totaled $1.23 billion, 25 percent higher than in 2004. The higher average price was the main driver of the increase in the value of production [9].

In 2006 5,650 million pounds were produced in Washington State. Value of the utilized production was $1,386, 118. 4,350 million pounds of the production was sent to fresh markets, 1,300 million pounds were processed, 140 million pounds were canned, and 820 million pounds were turned into cider or juice, the rest 340 million pounds were used for other purposes [10].

Red Delicious, Gala, Granny Smith, Fuji and Golden Delicious were the top five varieties produced in year 2006.

Table 1: Export Value and Share of Fresh Apple Production in Washington State

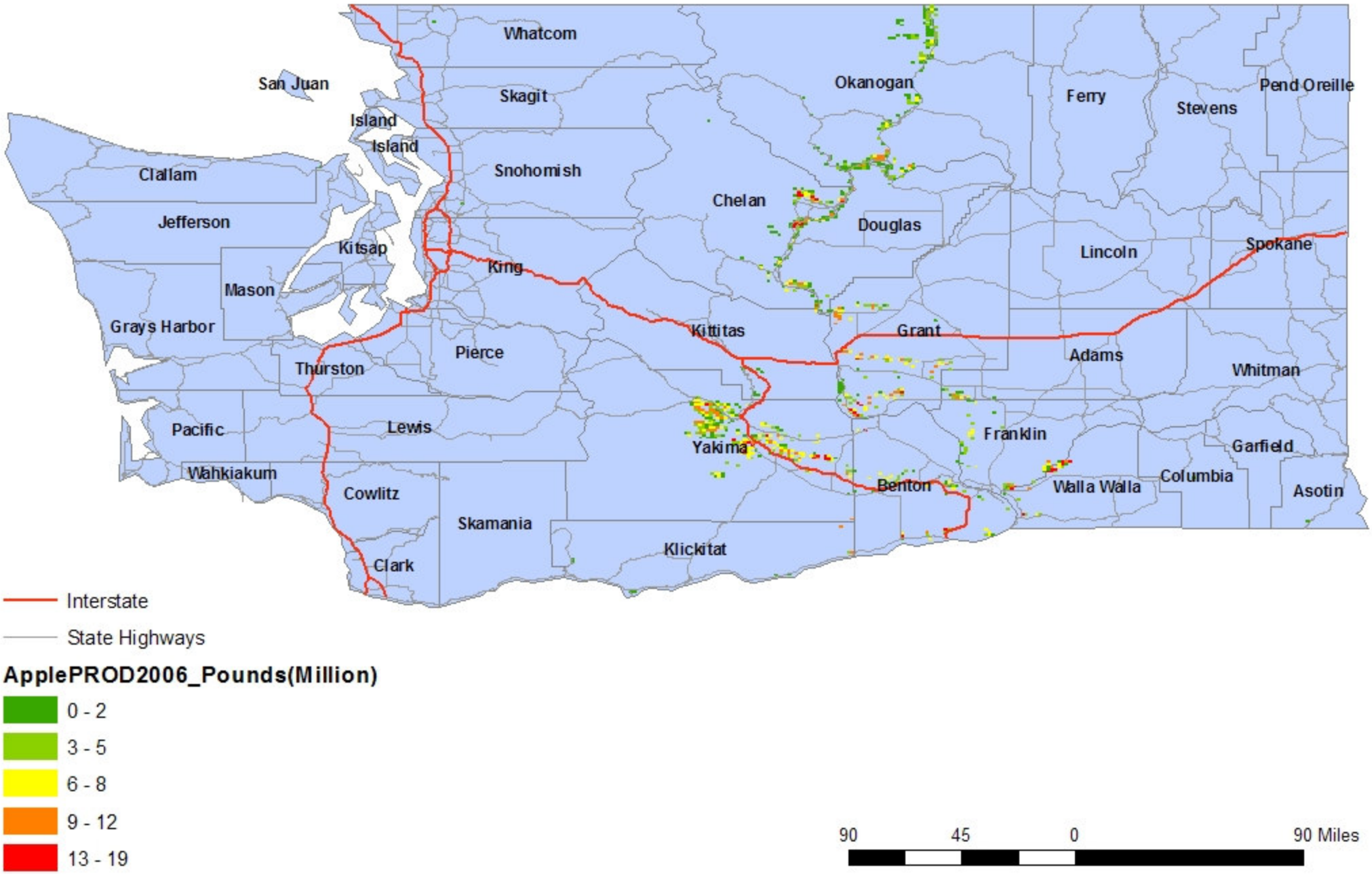
	Year			
	2003	**2004**	**2005**	**2006**
Value of Washington Fresh Apples Exports ($ million)	248	266	369	389
Proportion of Total State Exports	0.70	0.80	1.00	0.70

Source: Total U.S. Exports (Origin of Movement) via WASHINGTON, Foreign Trade Statistics

The total value of Washington State fresh apple exports has increased from 248 million dollars in 2003 to 389 million dollars in 2006, while the percentage share of fresh apple exports stayed about the same at 0.70 % (Table 2).

As indicated earlier, apple production is heavily concentrated in three primary areas in Washington State: the Columbia Basin, Yakima Valley, and Wenatchee apple production regions. The 2006 production is provided at the Township, Section and Range level in million pounds in Figure 4.

Figure 4: 2006 Washington State Apple Production Intensity



STATEWIDE TRANSPORTATION AND LOGISTICS

Washington State is served by a multi-modal transportation system, consisting of water, rail and trucks. While many fruits and vegetables were historically shipped via rail from the State of Washington, truck transport has been by far the most used modal alternative for the majority of fresh fruit and vegetables recently [11]. Based on the survey conducted by SFTA in 2001, trucks are considered the preferred choice for the transport of apples into and out of the packing facility [12].

STATEWIDE FREIGHT PROJECTIONS

Apple acreage data for the state were received from the Washington State Department of Agriculture. The township-range-section (TRS) level acreage data used in this study is the compilation of results from a series of surveys conducted by the Department of Agriculture between 1999 and 2007. The 2002 acreage information for each county (the most extensive of the prior years) was used to calculate the production proportion attributed to each county and town-range-section. The annual apple production figures for each county were then allocated to the TRS level by using yield and acreage information, while controlling for actual production in each county. Thus, future projections of statewide apple production are allocated to local geographic areas utilizing this procedure.

An average annual growth rate of 0.007 % was estimated from historical production volumes and used to forecast the production volumes between 2007 and 2027. The production levels for the years 2007, 2012, 2017 and 2027 were projected at the TRS level. The average annual growth rate from historical production information dating back to 1980 was very high at 0.018 %. However, considering the recent industry reports and industry analyses, it was considered unlikely that Washington State will experience that same level of apple production growth over the next 20 years. Thus, the forecast utilizes a more modest annual growth rate of 0.007%.

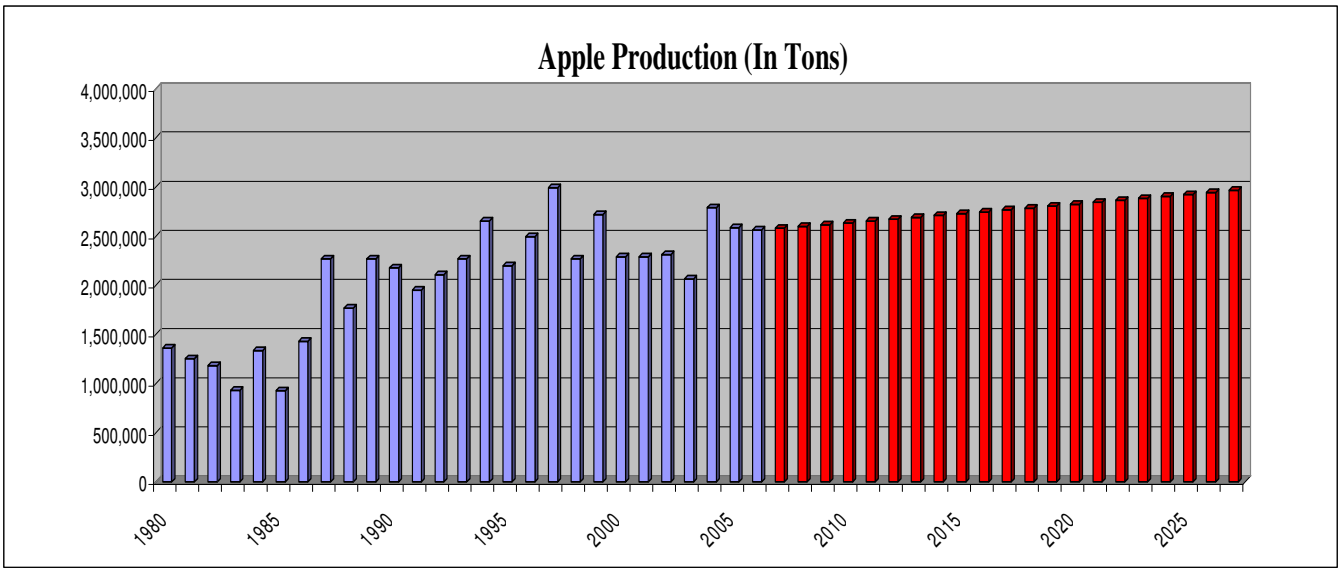
The forecasted statewide apple production for the years 2007 through 2027 are provided in Table 2, along with the growth rates for each time period. Historical and projected

statewide production is also demonstrated below in Figure 8. The blue bars indicate the historical production volumes and the red represents forecasted figures.

Table 2: Base year and forecasted Apple Production

Years	Annual Growth Rate	Year	Production in Tons
2006-2007	0.007	2007	2,580,736
2006-2012	0.04	2012	2,672,336
2006-2017	0.08	2017	2,767,186
2006-2027	0.16	2027	2,967,106

Figure 5: Historical and Projected Statewide Apple Production



The forecasted apple production for each region is provided in Figure 6. The forecasted production volumes for the state and by each region are shown in Table 3.

Figure 6: Projected Apple Production, by Region

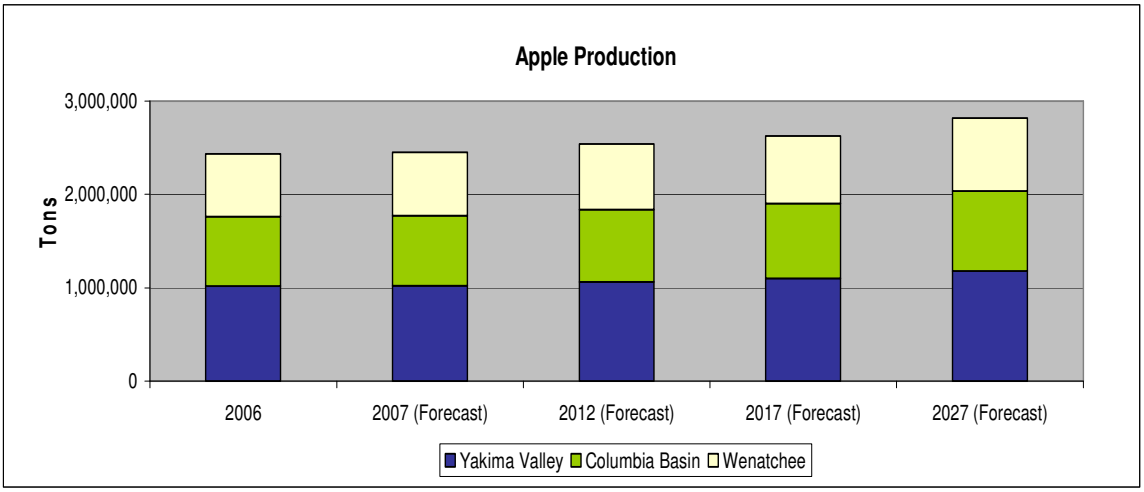


Table 3: Apple Production (in Tons) for the State, by Region

Year	Washington State	Yakima Valley	Columbia Basin	Wenatchee Valley
2006	2,562,797	1,017,481	743,891	673,285
2007 (Forecast)	2,580,736	1,024,603	749,098	677,998
2012 (Forecast)	2,672,336	1,060,970	775,686	702,063
2017 (Forecast)	2,767,186	1,098,627	803,218	726,981
2027 (Forecast)	2,967,106	1,178,000	861,248	779,503

Based on 2006 apple production, Yakima Valley will produce the highest volume of apples, while Wenatchee Valley, of the three main regions, will produce the lowest volume of apples in Washington State (Table 3).

HIGHWAY ASSIGNMENTS

In order to convert the tons of apple production into truck load equivalents, for assignment to highway usage, a per-truck capacity for fresh apples was assumed to be 22 tons. During the calculations of the truckloads, 100 percent of the state apple

production was assumed to be utilized fresh. In addition, 95 percent of the apples are assumed to be shipped by truck, while the rest is shipped by rail. Each apple production region is forecasted separately and then converted into truck equivalents leaving each region. The information of how shipments leave and which highways are traversed to each destination were obtained from the SFTA industry survey which was designed to capture information concerning the timing, size, origins, destinations, routes, and shipping characteristics of Washington apple movements.

The total volumes of production for each production region and the total number of truck loads required to transport fresh apples to their final destinations are shown below in Tables 4 through 6. Volumes in each table represent 95 percent of the region's total apple production. Unique truck loads are calculated by dividing the total volume by 22.

Table 4: Apple Production (in Tons) and Total Truck Loads for Yakima Valley

Yakima Valley	Volume (Tons)	Unique Truck Loads
		Fresh
2007 (Forecast)	953,244	46,573
2012 (Forecast)	987,078	48,226
2017 (Forecast)	1,022,113	49,938
2027 (Forecast)	1,095,957	53,545

Table 5: Apple Production (in Tons) and Total Truck Loads for Columbia Basin

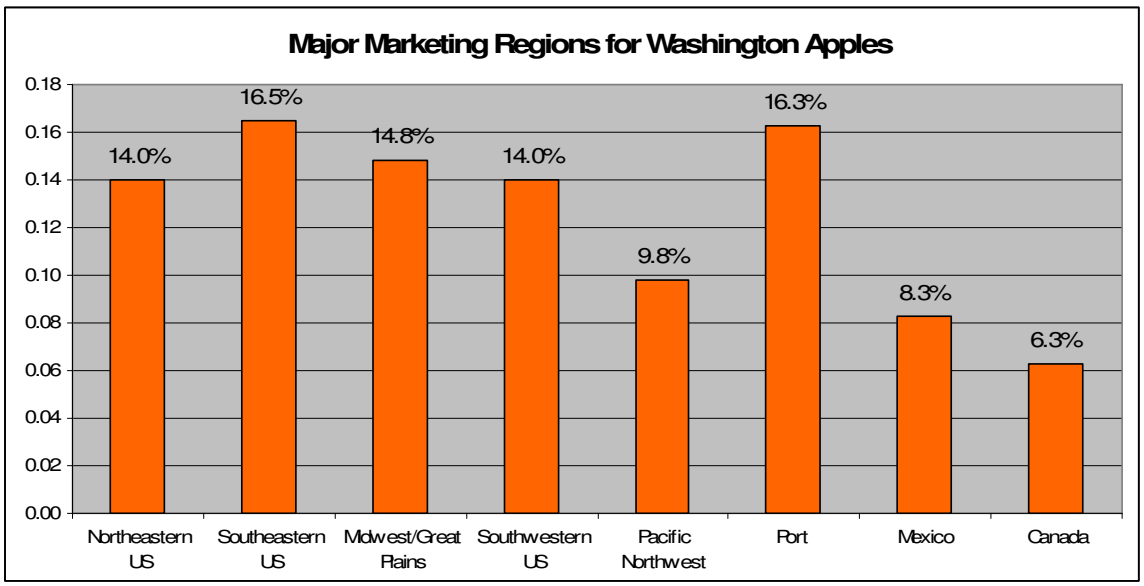
Columbia Basin	Volume (Tons)	Unique Truck Loads
		Fresh
2007 (Forecast)	696,927	34,050
2012 (Forecast)	721,663	35,258
2017 (Forecast)	747,277	36,510
2027 (Forecast)	801,266	39,148

Table 6: Apple Production (in Tons) and Total Truck Loads for Wenatchee

Wenatchee	Volume (Tons)	Unique Truck Loads
		Fresh
2007 (Forecast)	630,779	30,818
2012 (Forecast)	653,167	31,912
2017 (Forecast)	676,350	33,045
2027 (Forecast)	725,214	35,432

Among the three main apple production regions in Washington State, the Yakima Valley requires the most total number of truck loads to transport the fresh apples to their final destinations. This is consistent with the region producing the largest volume of apples.

Figure 7: Major Marketing Regions for Washington Apples



Source: SFTA Apple Survey

Major marketing regions for Washington State apples are illustrated in Figure 7. Aggregate percentage volumes for Mexico, Port (export ports such as the Ports of Seattle, Tacoma and Portland) and Canada represent the total export percentages.

Approximately 30 percent of the state apple production is exported, while 70 percent gets shipped to the eastern and western cities of United States.

Based on the SFTA Apple Survey, key highways used for transportation of apples are US 97, US 12, US 2, SR 28, SR 281, SR 124, I-82, I-182 and I-90. Increased production in Columbia Basin increased stress on both the SR 124 and I-82 corridors. Key corridors for apples are US 97 and I-82. Significant volumes of the total production are transported over I-90 for export, and some for distribution in western Washington.

Ninety-five percent of each region's production was weighted against Washington State's total apple production in 2006 to calculate the truck shipment percentages; 0.397 for Yakima Valley, 0.291 for Columbia Basin and 0.263 for Wenatchee. Each apple producing region was assumed to transport fresh apples to each of the final destinations illustrated in Figure 7. The percentages in Figure 7 were multiplied with the total volume of apples shipped by trucks in Washington State to calculate the total apple volume to be shipped to the final destinations for years 2007, 2012, 2017 and 2025. The total apple volumes shipped to each destination was multiplied with the truck shipment percentages calculated for each region. After the distribution of the volumes from each region to final destinations was completed, the volumes were divided by 22 to reach the final truck load numbers.

Figure 8: 2006 Yakima Valley Apple Production Intensity

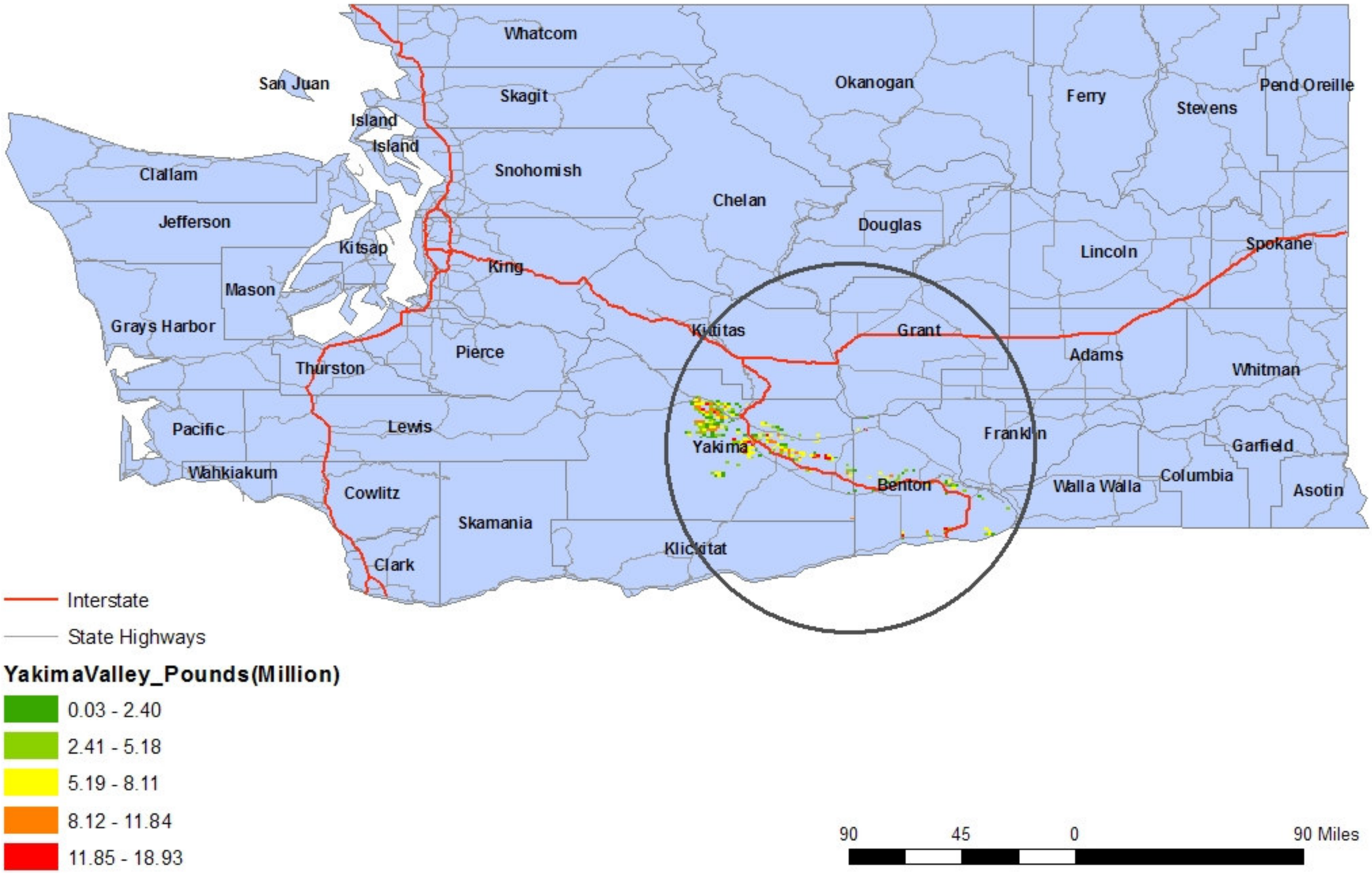


Table 7: Number of Truck Shipments, by Highway for Yakima Valley

Yakima Valley Highways	2007	2012	2017	2027
US 12	41,163	42,624	44,137	47,325
US 97	41,163	42,624	44,137	47,325
I-90	19,100	19,777	20,479	21,959
US 2	5,763	5,967	6,179	6,626
I-82	35,400	36,656	37,958	40,700
I-182	12,884	13,341	13,815	14,813
SR124	12,884	13,341	13,815	14,813
Total	**46,573**	**48,226**	**49,938**	**53,545**

Figure 8 illustrates the apple production intensity for Yakima Valley on the TRS level. On the map the highways in red are the most commonly used highways during the transportation of Washington State apples.

Most commonly used routes for transportation Yakima Valley apples to the final destinations are US 12, US 97, I-90, US 2, I-82, I-182 and SR124. Table 7 shows the aggregate number truck loads on each highway during the transportation of Yakima Valley apples to their final destinations. The total value in the bottom row of each table represents the total unique truck trips for each year. Given that many of truck trip routes are common to several different highways, summation of trucks on all highways results in exceeding the total unique truck trips due to the fact that each truck trip is not unique to one and only one highway.

Figure 9: 2006 Columbia Basin Apple Production Intensity

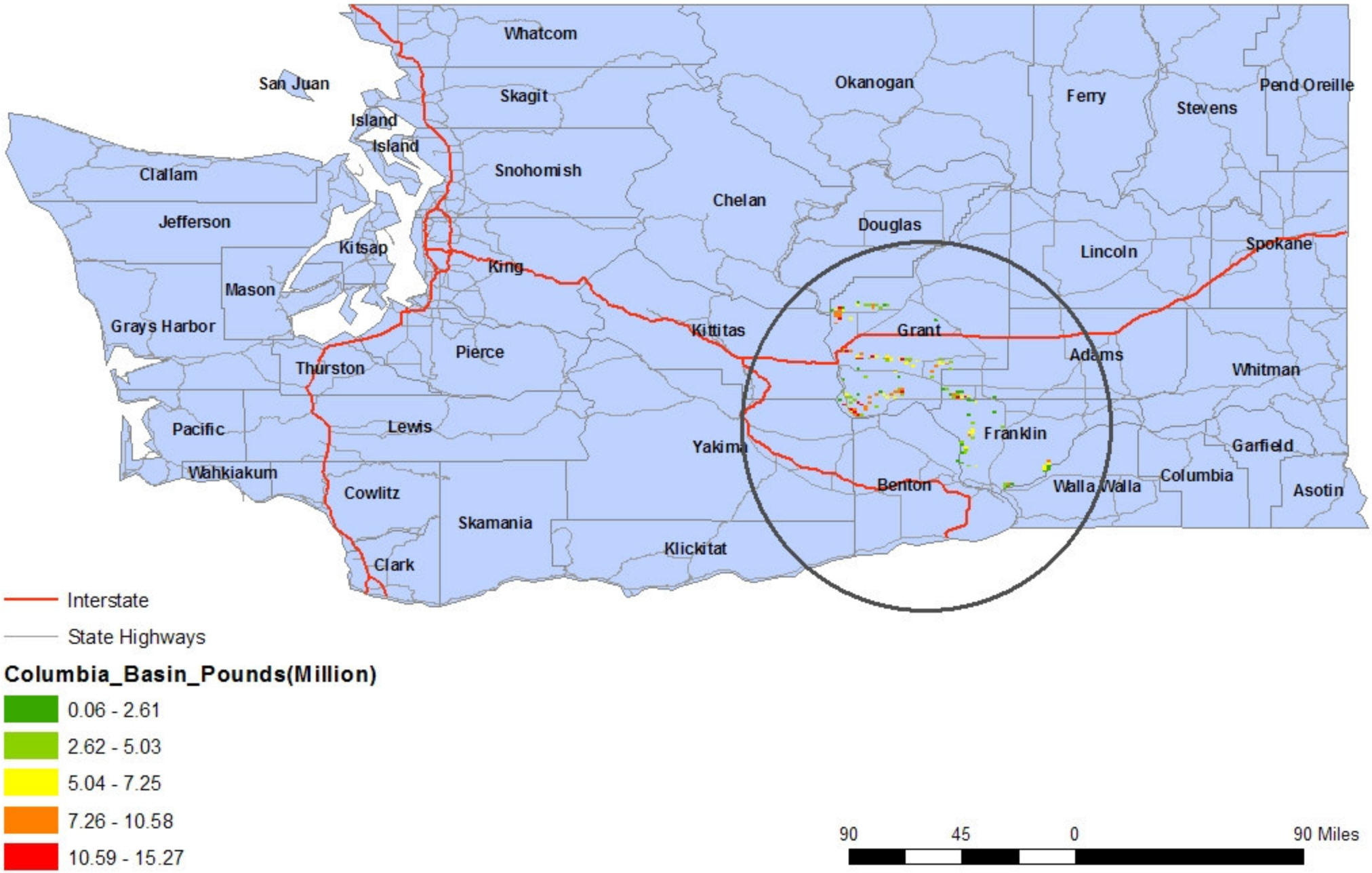


Table 8: Number of Truck Shipments, by Highway for Columbia Basin

Columbia Basin Highways	2007	2012	2017	2027
I-90	20,675	21,409	22,169	23,770
SR 28	20,675	21,409	22,169	23,770
US 2	4,213	4,363	4,518	4,844
I-182	25,881	26,800	27,751	29,756
US 12	9,420	9,754	10,100	10,830
SR124	9,420	9,754	10,100	10,830
I-82	16,462	17,046	17,651	18,926
US 97	7,463	7,728	8,003	8,581
Total	**34,050**	**35,258**	**36,510**	**39,148**

The apple production intensity for Columbia Basin on the TRS level is illustrated in Figure 9. On the map the highways in red are the most commonly used highways during the transportation of Washington State apples.

Most commonly used routes for transportation of Columbia Basin apples to the final destinations are US 12, US 97, I-90, US 2, I-82, I-182, SR124 and SR 28. The aggregate number truck loads on each highway during the transportation of Columbia Basin apples to their final destinations are shown in Table 8. The total value in the bottom row of each table represents the total unique truck trips for each year. Again, given that many of truck trip routes are common to several different highways, summation of trucks on all highways results in exceeding the total unique truck trips due to the fact that each truck trip is not unique to one and only one highway.

Figure 10: 2006 Wenatchee Basin Apple Production Intensity

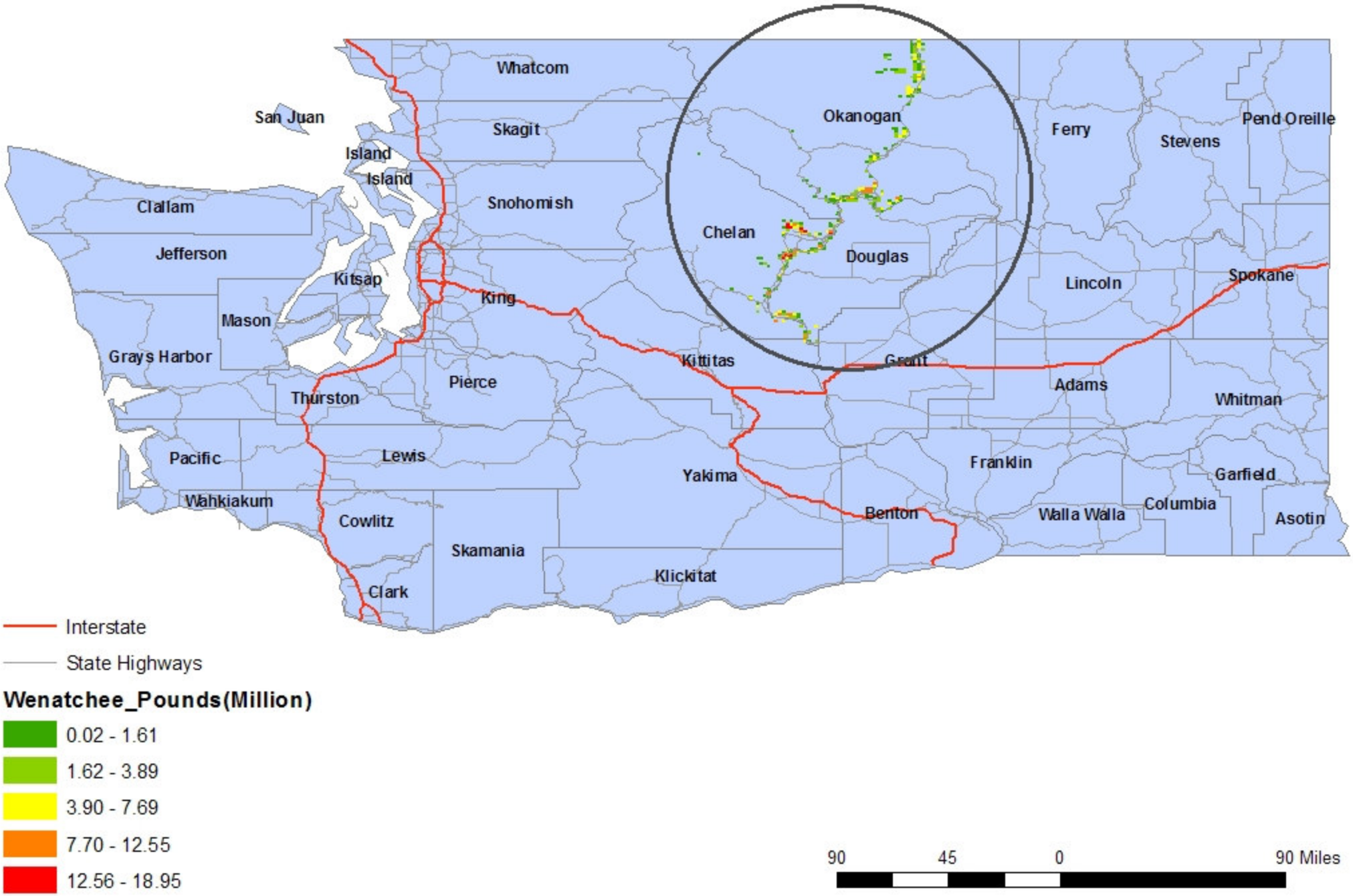


Table 9: Number of Truck Shipments, by Highway for Wenatchee

Wenatchee Highways	2007	2012	2017	2027
US 97	27,238	28,205	29,206	31,316
US 2	12,639	13,087	13,552	14,531
I-90	27,238	28,205	29,206	31,316
SR 28	22,744	23,551	24,387	26,149
SR 281	3,813	3,949	4,089	4,384
Total	**30,818**	**31,912**	**33,045**	**35,432**

The apple production intensity for Wenatchee on the TRS level is shown in Figure 10. On the map the highways in red are the most commonly used highways during the transportation of Washington State apples.

Most commonly used routes for transportation of Wenatchee apples to the final destinations are US 97, I-90, US 2, SR 281 and SR 28. Table 8 shows the aggregate number truck loads on each highway during the transportation of Columbia Basin apples to their final destinations. The total value in the bottom row of each table represents the total unique truck trips for each year. Again, given that many of truck trip routes are common to several different highways, summation of trucks on all highways results in exceeding the total unique truck trips due to the fact that each truck trip is not unique to one and only one highway.

CONCLUSIONS

The SFTA Apple Survey results and further analysis of future apple production and future total truck trips required to ship the apples to their final destinations allow conclusions to be drawn regarding the future transportation characteristics of Washington apples, logistic uses and needs of the Washington State apple industry, as follows:

- Truck to final destination is the most commonly used transportation mode in all three apple-growing regions. Commercial truck companies are the main shipping service provider for Washington apple shipments.
- Over the next several years, with the addition of RailEx in Walla Walla, there may be more volume moving by rail to domestic markets.
- Major domestic destinations of Washington apple outside the State are Southeastern US, Midwest/Great Plains, Northeastern US, Southwestern US and Pacific Northwest. A significant portion of the apple production goes to Washington State ports to be transported to their final destinations. Canada and Mexico are the other two significant export destinations.
- The most heavily used routes during the transportation of fresh transportation of fresh apples are US 97, US 12, US 2, SR 28, SR 281, SR 124, I-82, I-182 and I-90. Key corridors for apples are US 97 and I-82.
- Increased production in Columbia Basin increased stress on SR 124 and I-82 corridors.
- A significant volume of the total production is transported over I-90 for export, and/or distribution in Western Washington.

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