NORTHERN PLAINS-PACIFIC FREIGHT CORRIDOR PROFILE I: IDAHO, MONTANA, NORTH DAKOTA, AND WASHINGTON

Northwest Center for Regional Freight Mobility

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ABSTRACT

The Northern Plains-Pacific Northwest Economic Region (NORPAC) comprises a 12-state corridor between Chicago, Illinois, to the Pacific Northwest. This descriptive analysis provides a baseline of demographic, infrastructure, and freight movement information for discussing policy, investments, and planning related to freight mobility. The NORPAC region faces challenges in sustaining its transportation system as demand continues to outpace transportation resources as is the case for the nation. A primary four-state corridor of Idaho, Montana, North Dakota, and Washington faces unique challenges in dependence on highways and vast rural geography. This research is a first step in enhancing decision-making criteria for freight mobility in the NORPAC region. These freight mobility decisions are critical to the future work force and goods movements that enable the regional economy to successfully compete in a global marketplace.

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INTRODUCTION

Twelve states in the Northwest quadrant of the United States comprise an economic corridor spanning from Chicago, Illinois, to the Pacific Northwest. This region has been defined as the Northern Plains-Pacific Northwest (NORPAC) economic corridor for the purpose of freight mobility research at the Northwest Center for Regional Freight Mobility. At the eastern terminus, Chicago is known as the gateway to the west. Its heritage as a foothold in the U.S. freight transportation system is based in the role it played as an economic interchange hub between the frontier western U.S. and the eastern population centers and European markets during the homestead days (Cronin 1991).

Today, Chicago remains a dominant freight hub with the convergence of all major North American railroads and several arterial roadways including I-80, I-90, I-94, I-35, I-69, I-71, and I-75 that provide critical east-west and north-south linkages for overland traffic flows. Proximity to the Great Lakes and the Mississippi River provide additional opportunities for multimodal freight movements. The Pacific ports at the western terminus provide vibrant overseas links to Asian consumers and business partners. Freight is moved into and out of these ports on the I-5, I-82, I-84, and I-90 arterial roadways and on two large U.S. Class I railways. These overland moves are augmented by inland water capacity on the Columbia-Snake River System.

In addition to the primary transport infrastructure mentioned above, the region includes several other arterial roadways and short line railways, along with a complex of border crossings that link the U.S. and Canada. The economies and transport system of each state in the region has a great deal in common with other states contiguous with them. Yet, from end to end, there are also significant differences between states in the region. It is important to recognize both unique characteristics and similarities in viewing this corridor as an economic region.

The NORPAC region geography is identified in Figure 1. It includes the entire states of Washington, Oregon, Idaho, Montana, Wyoming, North Dakota, South Dakota, Nebraska, Minnesota, Iowa, and Wisconsin; along with northern Illinois. This 12-state region is referred to as NORPAC12 in the ensuing document. Due to the large population mass of Chicago, some of the regional demographic and industry information is presented for an 11-state region (NORPAC11) that excludes Illinois. Considering initial results, it was determined that this is advisable so results are not skewed by the large share of the population that resides in this single state.

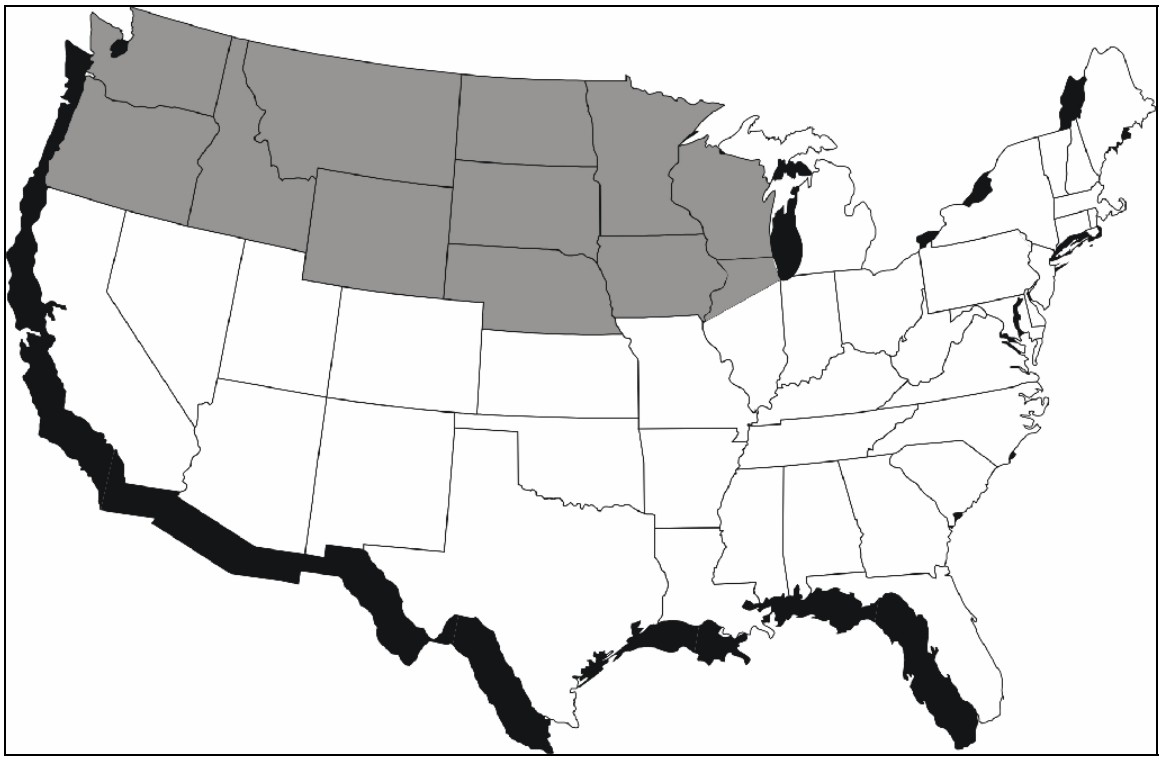


Figure 1 NORPAC Geographic Region

This initial freight mobility research activity for the NORPAC region concentrates on a four-state corridor (NORPAC4). These states are North Dakota, Montana, Idaho, and Washington. The states are selected as a primary route between the Northern Plains to the Pacific ports. This concentration also allows universities involved in the project to create a core of knowledge for the NORPAC region, and strengthen existing relationships with state DOT officials in the four states as a basis for future work in the expanded geographic region.

The profile developed in this study considers the transportation system and economy of the NORPAC region. The transportation system profile includes information on infrastructure, operations, and capacity. Economic information is developed to initiate a larger framework for understanding current and future freight flows, data needs, and planning issues.

The study objective is to enlighten decision-makers about the economy and transportation system of NORPAC region, including details for the primary corridor of North Dakota, Montana, Idaho, and Washington. Major roadways, railroads, waterways, and airports serve as the primary networks and nodes connecting this regional economy as well as linking it to international markets. Information regarding the state demographics and economies provides a foundation for understanding the regional economy, and forms a component in the framework for devising methods to enhance current and future freight mobility. These methods may include data collection, data analysis, model development, modeling enhancement, and cooperative pilot projects.

BACKGROUND

Corridors are becoming increasingly common geography in transportation planning and economic development as states and locales recognize the importance of leveraging local resources to enhance freight and personal mobility. Some recent regional corridor initiatives include the Heartland Corridor Project, the I-35 Trade Corridor Study, the Upper Midwest Freight Corridor, Great Plains Intermodal Trade Corridor, the CANAMEX Corridor of Innovation, and the Latin America Trade and Transportation Study (LATTS). Each of these initiatives recognizes that an efficient freight transportation system, including the infrastructure, operations, and administration, is critical to market accessibility and community livability. The corridor approach, as used here, may illuminate collective actions that can create a more seamless and integrated regional freight system for private and public decision-makers and serve as an asset for attracting new users.

In addition to these corridor studies, studies of freight flows were reviewed as a source for common practices in methodologies, data, and output uses. Most studies were undertaken as a part of state or local transportation planning activities, with some investigative research into truck and intermodal traffic estimates. The studies offered a variety of modal, statewide, and local freight flow estimations (Black 1997; Brogran, Birch, and Demestsky 2001; Cambridge Systematics, Inc. 2000; Niles 2003; Zhang, Bowden, and Allen 2003; Michiana Area Council of Governments 2004).

Freight transportation is a most critical aspect of mobility, in some sense it is even more important than personal mobility. As these studies recognize, freight mobility directly impacts the economic viability of many industrial sectors, and as such, impacts employment and income levels. In the absence of efficient and effective freight transportation, profits decline, jobs are eliminated and personal income drops. In the long run, population declines. The net result of this is a diminution in the need for personal transportation.

> *Transportation's vital importance to the U.S. economy is underscored by the fact that more than $1 out of every $10 produced in the U.S. gross domestic product (GDP) is related to transportation activity* (U.S. Department of Transportation, 2005a).

Furthermore, freight transportation plays a significant role in global competitiveness. U.S. grain, for instance, can attribute much of its competitiveness in global markets to an efficient transportation system. Further, many industries must rely on efficient transportation to be able to source raw materials and components internationally to remain competitive in the global market place. The key issue in these instances is the effectiveness and efficiency of the regional freight transport system. The reason for this assertion is that the remaining global transportation elements are equally available to all competitors irrespective of location, making it critical for regional interests to do everything possible to improve freight transportation in their region.

A freight transportation corridor also plays a role in promoting a domestically competitive economy. Businesses are continually evaluating location opportunities and adjusting operations to meet the changing economic and political environment. These changes often impact the freight transportation system in some way through decreased or increased demand or changing freight transportation characteristics. An efficient and effective freight transportation system provides a

broader market for more firms, which enhances competition domestically. This in turn promotes a better utilization of scarce resources and a higher standard of living.

Finally, another major role for the corridor is coordinated transportation security activities. Whether it is hazardous material movements or potential terrorism, freight transportation poses important threats to the security of those located in and around freight movements. This is to say nothing of the potential impacts on commerce and the economy. A better understanding of regional freight transportation can only help understand and mitigate such potential threats.

A recent report on freight data needs issued by the Transportation Research Board (2003) sums it up nicely. "The effectiveness and efficiency of the freight transportation system are heavily dependent on reliable data to inform a range of decisions at all levels of government and in the private sector about economic and infrastructure investments and policy issues. Data on goods movements are needed to identify and evaluate options for mitigating congestion, improve regional and global economic competitiveness, enable effective land use planning, inform investment and policy decisions about modal optimization, enhance transportation safety and security, identify transportation marketing opportunities, and reduce fuel consumption and improve air quality. While data alone cannot guarantee good decisions, informed choices are not possible without good data." Although the reference is made about data, the same applies to a better understanding of regional freight transportation issues.

The following descriptive analysis establishes the backdrop for discussing freight transportation in a four-state corridor and the larger NORPAC region that reaches from Illinois to Washington. Secondary information regarding economies, residents, infrastructure, and industry are used to form a regional freight economy profile. The research establishes a foundation for establishing cooperative freight research that will allow individual states to leverage their resources and knowledge in decisions related to freight transportation to benefit their economies in enhanced decision-making and expanded planning geographies.

FREIGHT ECONOMY

Economic characteristics provide important information for understanding current and future freight transportation demands and network flows. Trends in overall levels of economic activity are indicative of freight transportation demand, while information on individual industries such as employment and payroll may offer a means for focusing freight transportation efforts and discussing future freight transportation demands. Economic information including income, industrial composition, and freight industry payroll for the NORPAC region are presented in this section. A delineation of U.S. Department of Commerce industries into freight and service/information industries is presented in Table 1. Freight generating industries, such as agriculture and retail trade, are considered separately from other industries such as service, information, and government to allow better insight into these economic sectors and freight mobility.

The national economy grew 10% between 2000 and 2004, considering real gross product for all states (U.S. Department of Commerce, 2005). The growth factor was the same for the NORPAC11 region as the 10% gain expanded a $958 billion economy to $1,057 billion in real dollars. Regarding economies in the primary NORPAC4 corridor, real gross state product growth rates ranged from 8% to 17%. Among the four states in the corridor, Idaho experienced the largest growth in gross state product of 17%, followed by Montana at 15% and North Dakota at 12%. Washington's gross state product fell. It grew 20% slower than the national average, with an increase in gross state product from $221 billion to $240 billion between 2000 and 2004.

Table 1 Classification of Industries for Freight Analysis

Freight Industries
Agriculture, forestry, fishing, and hunting
Mining
Utilities
Construction
Manufacturing
Wholesale trade
Retail trade
Transportation and warehousing, excluding Postal Service
Service and Information Industries
Information
Finance and insurance
Real estate, rental, and leasing
Professional and technical services
Management of companies and enterprises
Administrative and waste services
Educational services
Health care and social assistance
Arts, entertainment, and recreation
Accommodation and food services
Government

The freight industries identified in Table 1 account for 44% of gross state product on a national basis over the five-year period. As detailed in Table 2, freight affiliated industries do account for a slightly larger share of the gross product for the NORPAC11 region, as 48% of the real gross state product is attributed to freight industries. Within the smaller primary NORPAC4 corridor, Idaho attributed 53% of its real gross state product to freight industries. North Dakota also attributed a share greater than the national average at 49%. The freight industries share of the Montana and Washington real gross state product averaged 42 and 37%, respectively, between 2000 and 2004.

Table 2 Real Gross State Product

	2000	2001	2002	2003	2004	5-yr Change
			Million $			
All Industries						
United States	9,749,104	9,836,571	10,009,433	10,289,220	10,734,763	10%
NORPAC11	957,801	960,117	983,391	1,014,710	1,057,091	10%
Idaho	35,206	36,182	37,413	38,849	41,107	17%
Montana	21,367	21,838	22,621	23,493	24,506	15%
North Dakota	18,076	18,198	19,037	19,909	20,335	12%
Washington	221,314	220,096	223,456	229,680	239,833	8%
Freight Industries						
United States	4,387,467	4,338,659	4,446,242	4,573,962	4,735,878	8%
NORPAC11	461,780	452,994	467,250	482,126	502,710	9%
Idaho	18,755	18,924	19,488	20,538	21,628	15%
Montana	9,126	9,156	9,609	9,911	10,297	13%
North Dakota	8,721	8,679	9,276	9,861	9,848	13%
Washington	84,769	81,540	83,301	82,947	86,990	3%

Source: Bureau of Economic Analysis

Overall, freight industries grew at a slower rate than the service, information, and government industries (Table 2). The 8% increase in freight industries income is 20% below the national average for all industries. Growth for these industries in the NORPAC11 region is estimated to be slightly higher, at 9%. Distinct differences are evident in the larger NORPAC11 economy and the primary four-state corridor as Idaho, Montana, and North Dakota experienced 15, 13, and 13% growth in their freight industries over the five-year period. Washington experienced less than one-third the national average growth in its freight industries, with only a 3% expansion of the freight industries. Although Washington's freight industries' growth is slower than the other NORPAC4 states, it is by far the largest in absolute value.

Given the variance of economic growth in the primary corridor compared to the national average, considering gross product, it is evident that more specific information regarding the freight growth is needed to understand the trends. On average, states in the NORPAC4 economy are more heavily dependent on agriculture when the freight industry composition for 2004 is compared to that of the nation (Figure 2). Agriculture accounts for 8% of freight industry product, compared to only 2% for all states. Another notable difference is in manufacturing. Manufacturing is less prominent in the region than in the nation overall, with the NORPAC4 at 26% compared to 36% for the nation. Other freight industry shares are within 1% of the national average. These differences are important to recognize in prioritizing freight issues and investments.

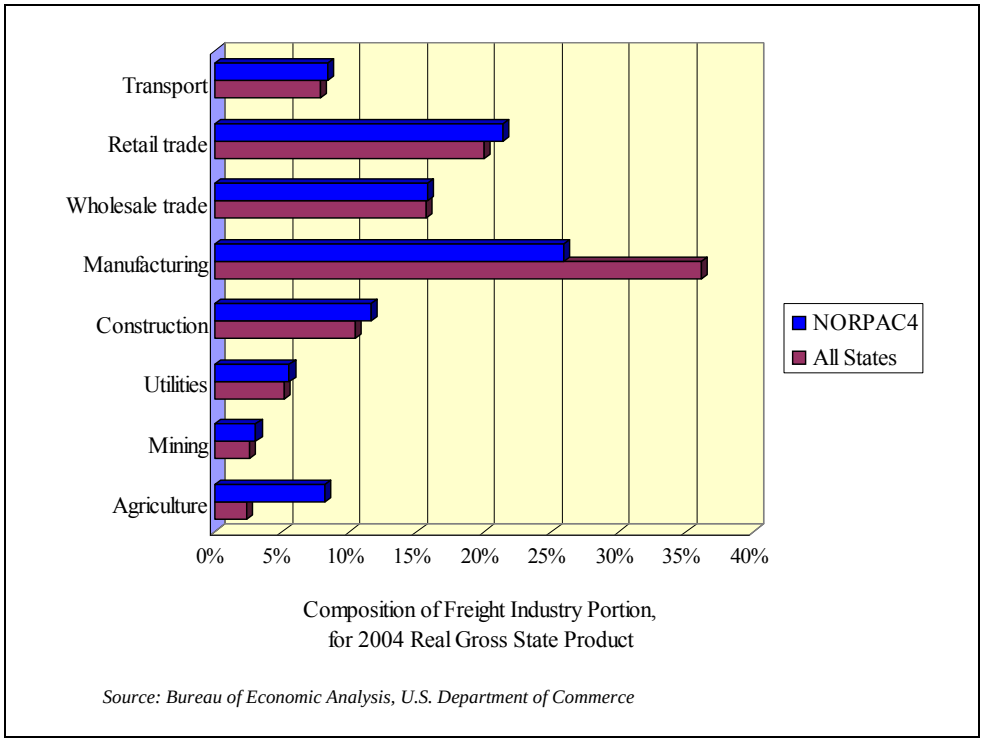


Figure 2 Composition of Freight Industries in 2004

Trends in the national and NORPAC4 freight industry activities between 1997 and 2004 are illustrated in Figure 3. As expected, the manufacturing and agriculture anomalies of the NORPAC4 2004 values are consistent with the time series illustration. The NORPAC4 manufacturing share of 26% is 120% below the national average of 36% as a share of the freight industries composition in 2004. This difference has increased in recent years as growth in the manufacturing industry between 2000 and 2004 is lower for NORPAC4 than for all states. Agriculture accounts for an increasingly smaller share of the freight industries gross state product. This sector's product declined by 2% in NORPAC4 and 1% nationally between 2000 and 2004. It does, however, remain a significant freight industry in the NORPAC4.

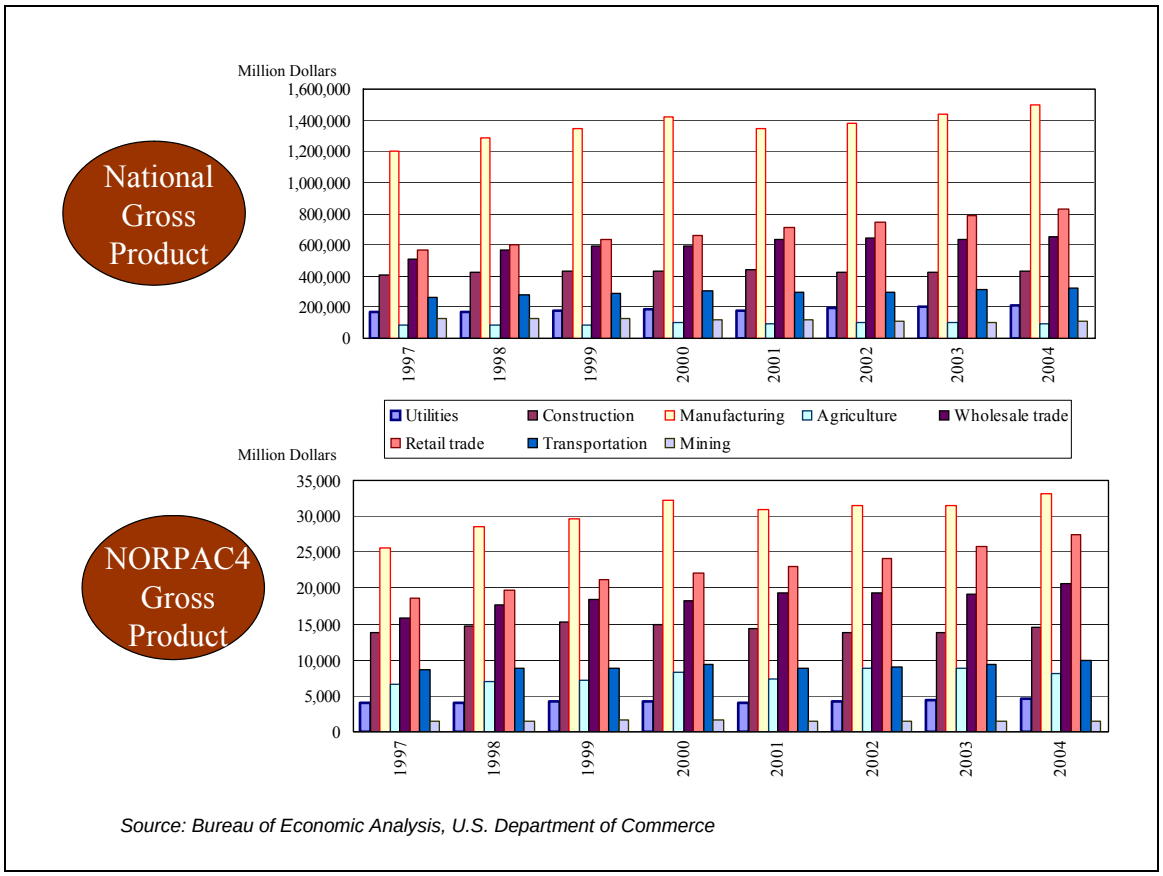


Figure 3 Real Gross State Product Trends by Industry

Regarding other large freight sector industries, retail and wholesale industries, shares are similar for NORPAC4 and all states at about 21 and 16%, respectively. Growth is also similar between 2000 and 2004, as retail experienced the fastest growth rate among industries at about 25% in both NORPAC4 and all states (Table 3). Wholesale trade grew 13 and 10% in NORPAC4 and all states, respectively. More moderate growth rates are attached to the transportation industries at about 8% and 13% for utilities.

Table 3 Freight Industries Composition, Change between 2000 and 2004

	NORPAC4	All States
	Change 2000 to 2004	
Utilities	6%	13%
Construction	-3%	-1%
Manufacturing	3%	5%
Agriculture	-2%	-1%
Wholesale trade	13%	10%
Retail trade	24%	25%
Transportation	7%	8%
Mining	-9%	-12%

Source: Bureau of Economic Analysis

While the NORPAC4 averages provide important information for focusing regional discussions regarding freight planning and investment, additional insight is gained by gaining greater detail regarding individual states. The state-level information may be important in translating regional activities into state and local impacts in distributing and leveraging resources.

Figure 4 illustrates the composition of the freight industries portion of real gross state product in 2004 for NORPAC4 state. Similarities and difference are evident in the activity levels for freight and other industries in the economies, and in the composition of the freight industries portion of state real gross product in 2004. While Idaho and North Dakota are similar in their freight/other composition with freight accounting for 52 and 55% of state real gross product, respectively, there are distinctions in the freight industries composition. Montana and Washington attribute smaller portions of their economies to freight industries at 40 and 33%, respectively.

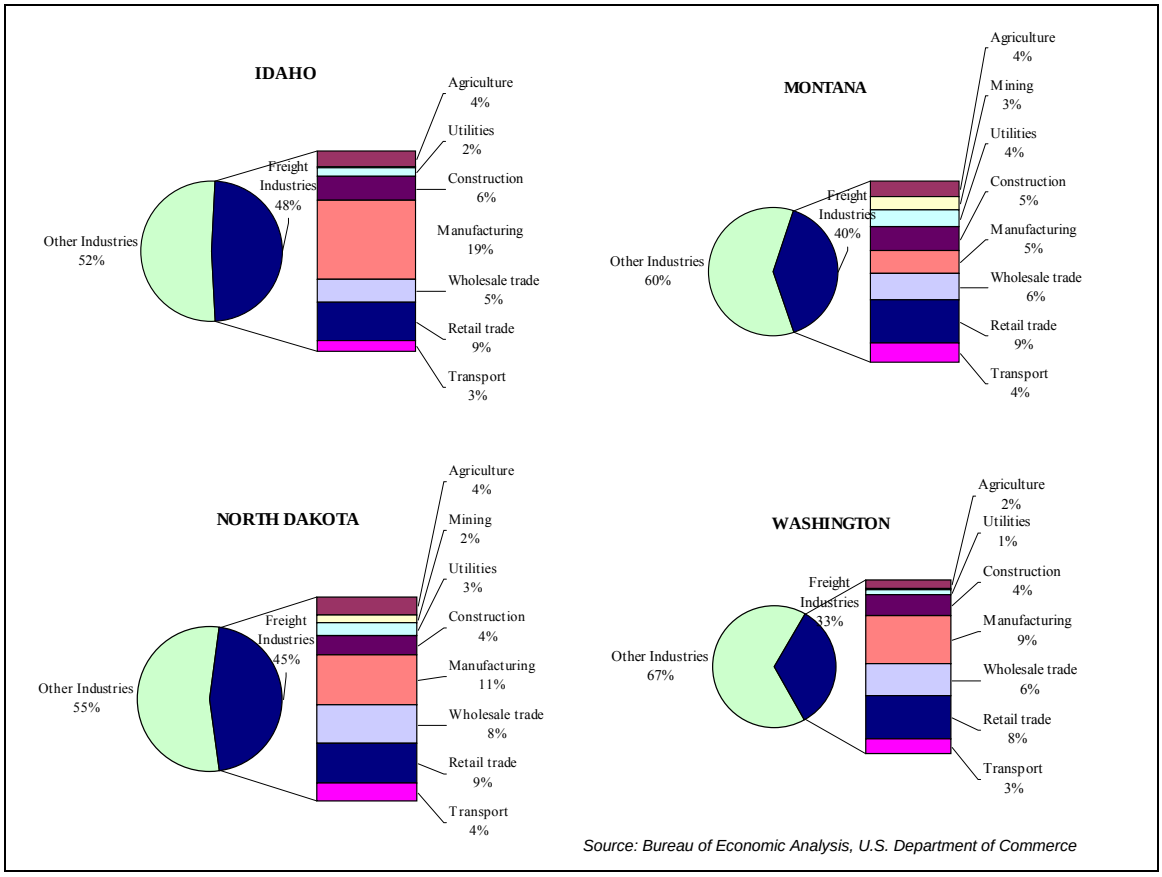


Figure 4 Composition of Gross State Product in 2004

Within the freight industries, states attribute similar shares to agriculture, construction, retail, and transportation. The shares for these for sectors are within +/-3% of the NORPAC4 average. A substantial difference exists in the NORPAC4 largest freight industry, manufacturing. NORPAC4 attributes an average 26% of activity to manufacturing, considering the composition of real gross state product attributed to freight industries in 2004. Idaho has a substantially higher share of its freight related activity in manufacturing, at 39%, and Montana a notably smaller share at only 13%. Another noticeable difference is in wholesale activities in Idaho accounting for only 11%, compared to an average 16% for NORPAC4. Other industry shares beyond the +/-3%, include 4% higher mining and utilities shares in Montana compared to the average for NORPAC4. This economic and industry trend information offers a generalized context for discussing the current and future freight mobility based on gross product attributes of the NORPAC region and its comprising state economies.

DEMOGRAPHIC AND WORK FORCE CHARACTERISTICS

Population centers dispersed across the trade corridor form the critical masses' needed for freight facilities and services (Figure 5). The population creates a source for generating freight in the way of wage earners for businesses with inbound supplies and outbound products as consumers demanding inbound retail goods. It is also commonly used as a traffic distribution factor in gravity model simulations of freight and traffic flows. As freight models become more sophisticated, the characteristics of the population offer insight into demands that may be used in discussing consumption patterns and associated freight transportation demand.

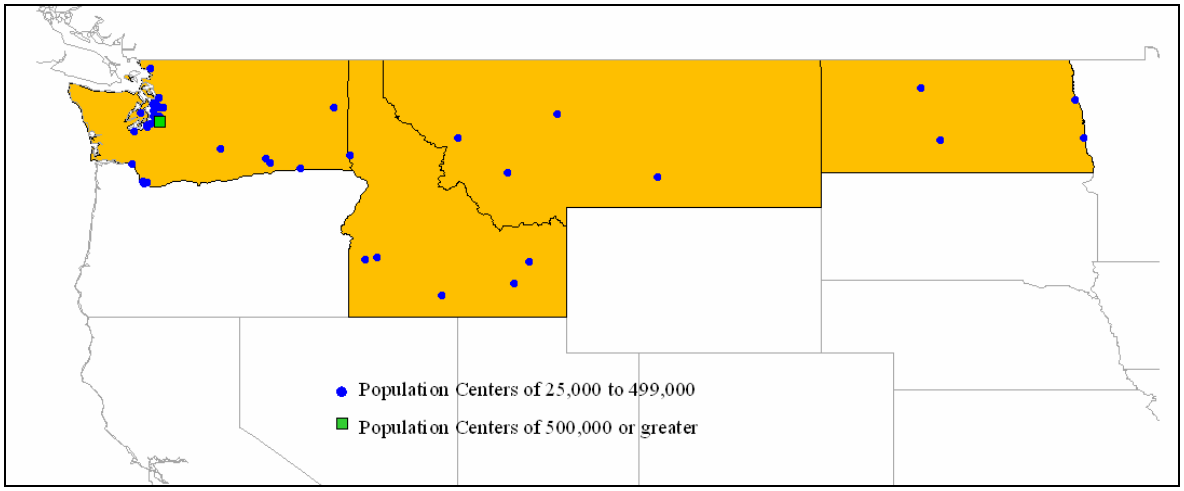


Figure 5 Population Centers in the NORPAC4 Region

Information specifically regarding the work force in an economic corridor also provides valuable information regarding current and potential freight demands associated with production and consumption activities. Just as work force planning within organization can be a valuable part of sustained success, local and regional work force planning can provide benefits in planning, policy, and investment that are suited to the population and its activities. Work force attributes include many factors, such as size, age, gender, education, unemployment, and occupation.

Age and Gender

NORPAC12 is home to about 14% of the U.S. population. About 30% of this region's population resides in Illinois, where it is largely concentrated in and around the Chicago metro area. Population in the NORPAC4 states is estimated at 9.3 million in 2005 based on trends in age and migration trends since the 2000 Census. County-level distribution of the population across counties in the region is illustrated in Figure 6. This represents a 6.3% increase in residents for the four states since decentennial census in 2000, which is 20% higher than the population growth for the entire United States over the five-year period. Among the individual states, Idaho

had the highest rate of population growth at 10% between 2000 and 2005. The populations in Washington and Montana grew about 6 and 3%, respectively; while North Dakota population declined about 1%.

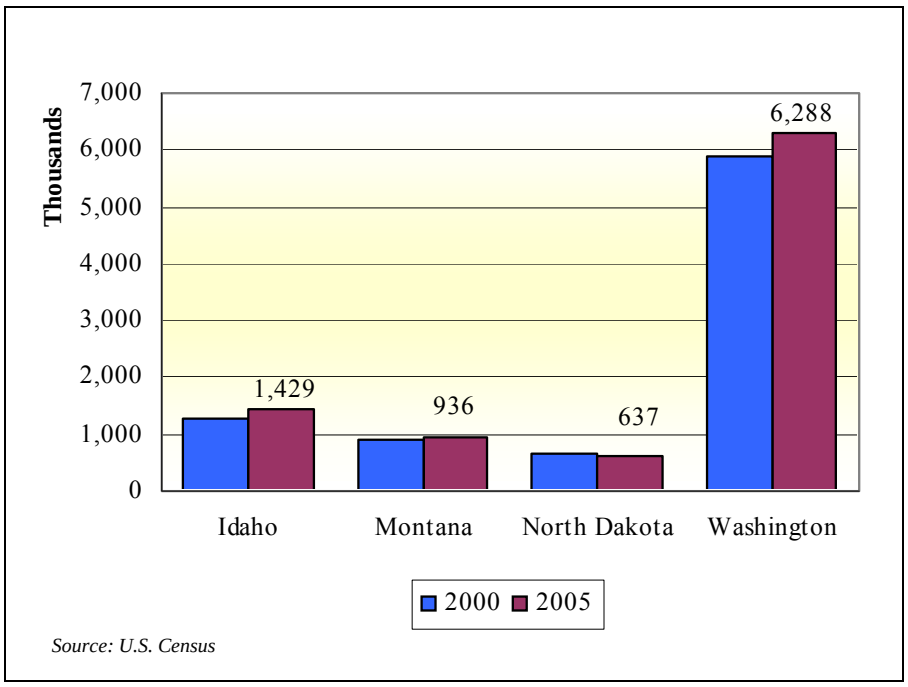


Figure 6 Population in NORPAC States, 2000 and 2005

The single megapolitan in the region is Seattle. The urban center is defined as a megapolitan because it has a population in the 90th percentile among U.S. cities in 2000 Census. The city is also given special consideration as one of 54 large Metropolitan Statistical Areas and Consolidated Statistical Areas in the Federal Highway Administration's 2002 Freight Analysis Framework. The Seattle megapolitan includes seven counties, which are Island, King, Kitsp, Pierce, Snohomish, San Juan, and Thurston. It accounts for approximately 40% of the population in the NORPAC4 region (Figure 7).

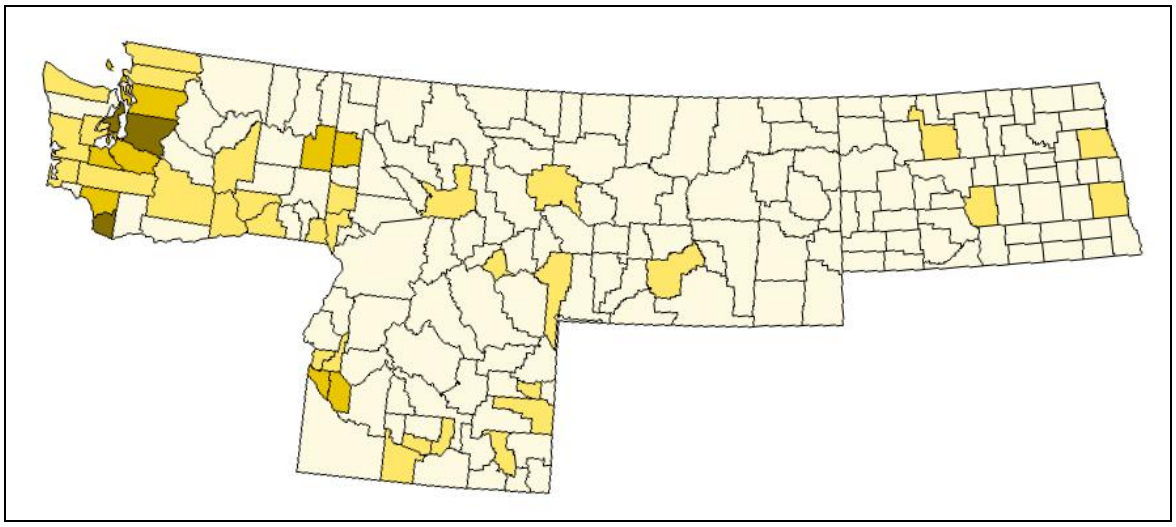


Figure 7 Population Density in the NORPAC4 Economic Region
(Darker Color Indicates Denser Population)

The median age of individuals in the NORPAC4 region is 35.3 years, the same as the average for all U.S. population. Median age for all state's population ranges from 27.1 in Utah to 38.9 years in West Virginia. Considering the distribution of median population age for all states, the median ages of 36.2 and 35.3 years in North Dakota and Washington, respectively, are near the 50th percentile of 35.8 years (Figure 8). The median age of the Idaho population is low, falling into the 25th percentile. A median age of 37.5 places Montana in the 75th percentile considering the distribution of all states.

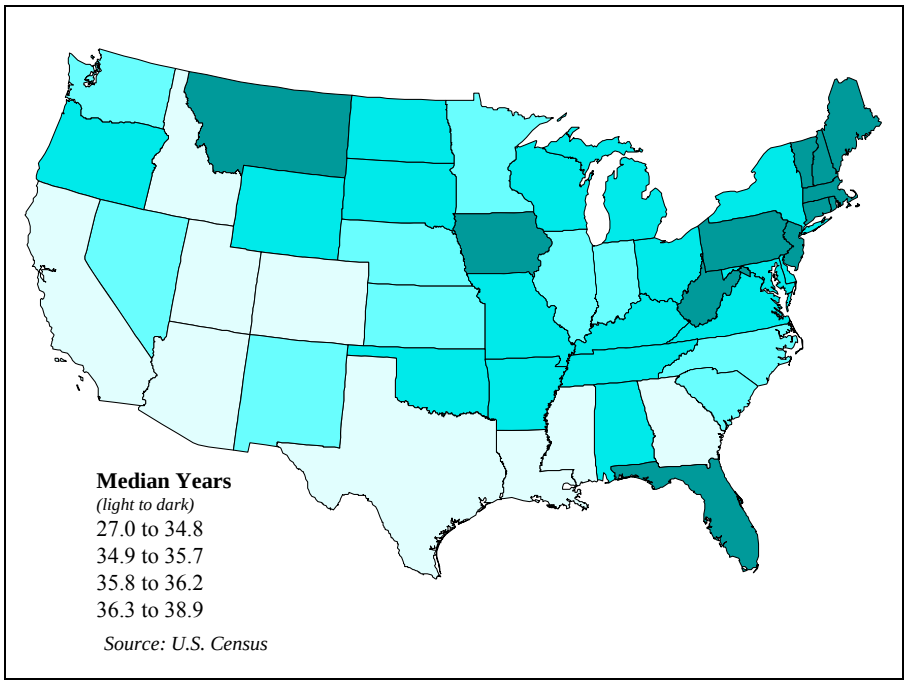


Figure 8 Median Age in 2000, by State

Additional detail about the distribution of the NORPAC4 population is provided in the county-level illustration of median population age in Figure 9. The higher median years are concentrated in the central region of North Dakota. Montana also has an area of the third quartile age bracket in an area of counties from the northwest to the south central. Although the population information does provide an interesting visual regarding the county aging patterns, the information is of little use in economic discussions without population weighting factors.

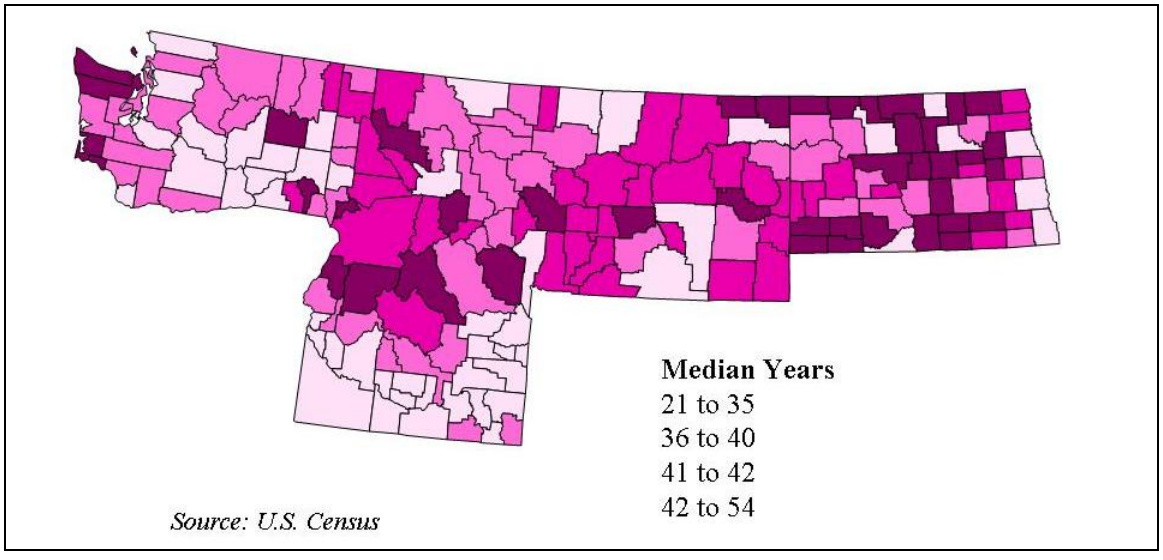


Figure 9 Median Age of Population in 2000, NORPAC4 Counties
(Darker Color Indicates Higher Median Age)

Age pyramids are another graphic tool for considering age information that may be valuable in understanding work force and consumer demand. The distribution of males and females across age groups for the NORPAC11 region compared to the U.S. population is presented in Figure 10. The NORPAC11 region has a slightly higher share of its population in the age categories 65 years and older, at 13% compared to 12% for the nation. The portion of the population in the work force age groups between 20 and 64 years is equal to the nation at 60%. The population aged younger than 19 and older than 65 are typically viewed as the dependent population. Although some individuals in these age groups may be active work force participants, these population groups are generally seen as the dependent on the work force population. As the size of these groups grows, relative to the work force population, the dependency burden becomes more prevalent.

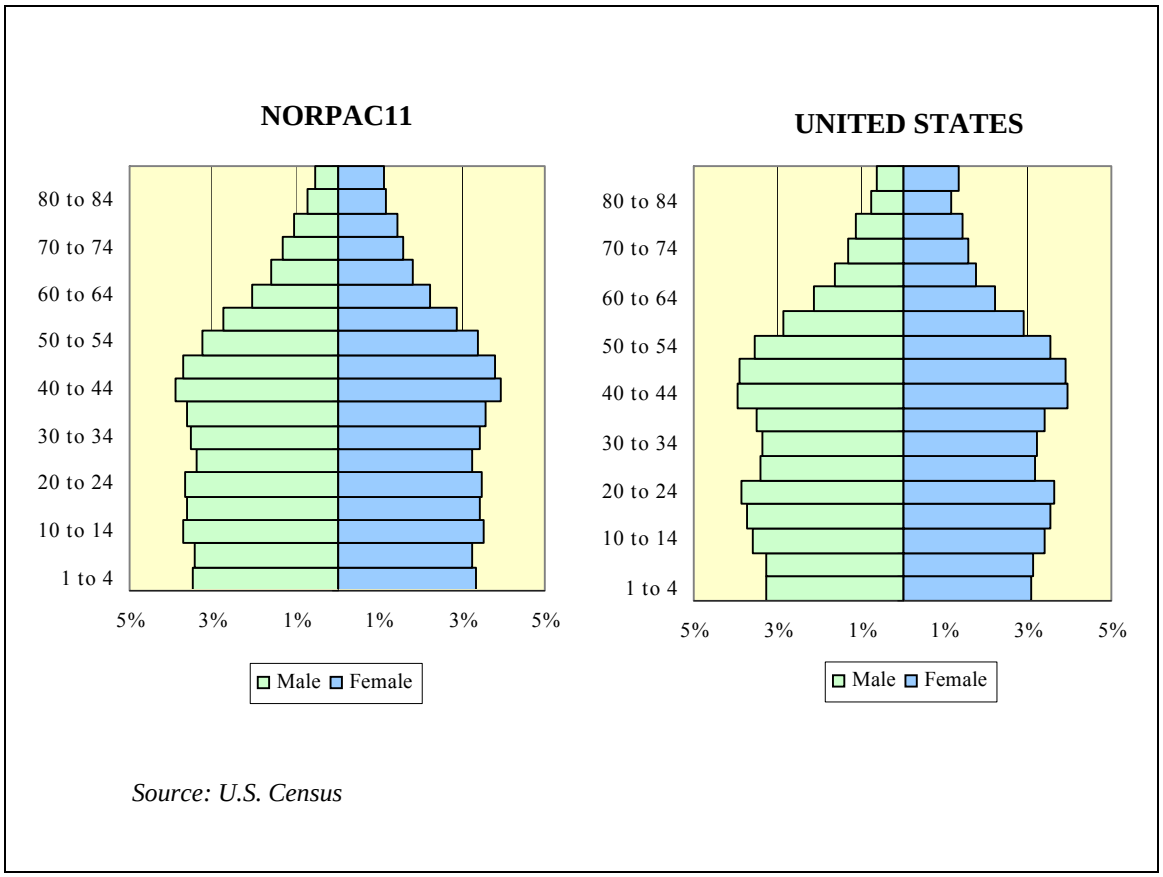


Figure 10 Population in the NORPAC11 Region and the United States, 2002

The age pyramid illustrations for each of the four states in the primary corridor are presented in Figure 11. The male and female populations in each state account for equal shares of the population, which is slightly more balanced than for the nation where females outnumber males by about 1%. These state age distributions do show some distinction among themselves and relative to the U.S. age population distribution. The Idaho distribution is skewed toward the youngest population groups with 30% of residents residing in the age groups under 20 years. Idaho is the only state among the four to have a larger share of its population in these younger age groups than the national distribution. Washington has a larger share of its population, compared

to the national distribution, in the age groups between 20 and 64 years that are grouped to represent the work force age groups in this research.

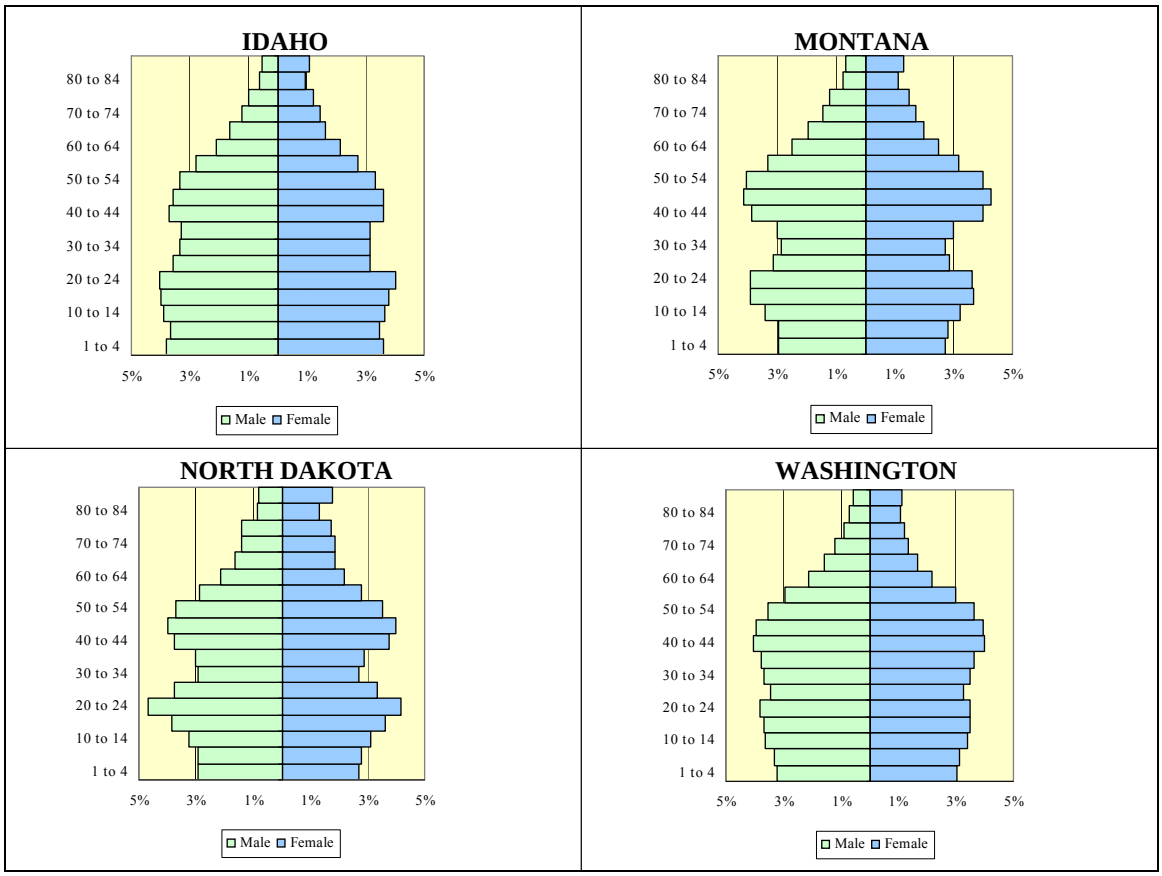


Figure 11 NORPAC4 State Population Pyramids, by Age Group in 2000

Montana and North Dakota have larger population groups, relative to the nation and the other two NORPAC4 states, in the residents aged 65 years or more. Approximately 14 and 15% of the population in Montana and North Dakota, respectively, fall into these older age groups. These proportions compare to 12% for the nation, and 11% in both Idaho and Washington. The age group information is useful in discussing current population-related freight transportation issues such as age and gender related product demands, along with work force size and composition.

Education

Education is another characteristic to consider in discussing economic capacity and derived demand for consumer products (Lucas1988; Ketkar and Ketkar 1987; Louis 1986; Grunerta et al. 1995; Rauch (1993); Lin 2004; Kruegera and Kumar 2004, ed from dis). Considering the education information collected in the 2000 Census, the NORPAC11 region has a population with better than average basic human capacity gained in securing at least a high school diploma (Table 4). Approximately 86% of the NORPAC residency has attained at least a high school education, considering the population 25 years and over (U.S. Census, 2004). This share is about 8% larger

than the share of the total U.S. over 24 years who have completed at least a high school education.

The Census information does indicate that although NORPAC residents have a greater tendency to complete high school and continue their education, relative to the total U.S. population, they have a lower smaller share of the population with a bachelor degree or higher. In the total U.S. population, 24.4% have a bachelor degree or higher compared to 24.0 and 23.8 for NORPAC4 and the larger NORPAC11 regions, respectively. This information suggests that education such as technology certification programs and associate education degrees may be more common than in the total U.S. population.

Table 4 Education Characteristics of NORPAC States

Geographic area	Percent of population 18 to 24 years enrolled in college or graduate school	Population 25 years and over		
		Percent with less than a 9th grade education	Percent high school graduate or higher	Percent with bachelor degree or higher
United States	34.0	7.5	80.4	24.4
Idaho	30.7	5.2	84.7	21.7
Montana	33.8	4.3	87.2	24.4
North Dakota	44.1	8.7	83.9	22.0
Washington	30.9	4.3	87.1	27.7
NORPAC4	34.9	5.6	85.7	24.0
NORPAC11	35.2	5.6	85.6	23.8

Source: U.S. Census, 2005c

Among the four states in the primary NORPAC corridor, a larger share of Washington's residents has a bachelor or higher degree. About 27.7% of Washington's population 25 years and older has higher education degrees compared to 24.4, 22.0, and 21.7% in Montana, North Dakota, and Idaho. It is interesting to note that North Dakota has, by far, the largest share of state college-aged population enrolled in college or graduate school, among the four states. It has 44.1% of its population, between 18 and 24 years, enrolled in college or graduate school. This share is about 30% higher than that of the total U.S. population. North Dakota also has a distinction in the share of its residents not completing a basic education defined as schooling through at least the ninth grade. About 8.7% of North Dakota residents chose to end their education before completing ninth grade. Although this is only slightly lower than the national level of 7.5, it is more than double in the states of Montana and Washington, where a mere 4.3% of residents ended their education before the ninth grade.

Work Force

In addition to general demographic information, work force characteristics offer insight into the NORPAC4 economy and its productivity. Two work force characteristics that are considered in this descriptive analysis are unemployment rates and industry employment information.

Unemployment rates indicate untapped potential in an existing population, and also offer information regarding the stability and strength of an economy in terms of its ability to employ able and willing population as indicated by the rate of unemployment compared to the nation and region (Brookings Institute 2002; Wong et. al 2005). The industrial composition of the employment may provide a means for interpreting some of the unemployment information, and for discussing current and future transportation demands based on national and regional trends in the freight related industries.

Unemployment

Unemployment rates for U.S. workers, considering individuals who are actively seeking employment, is lower than it was in the early 1980s. The business cycles are evident in the rate trend over time, as illustrated in Figure 12. The peaks in the national unemployment trend were lower in the 1990s and in the first half of the 2000s. The average unemployment rate between 1980 and 1989 was 7.27%, compared to 5.76% between 1990 and 1999 and 5.18% between 2000 and 2005, considering annual unemployment rates (Bureau of Labor Statistics 2006).

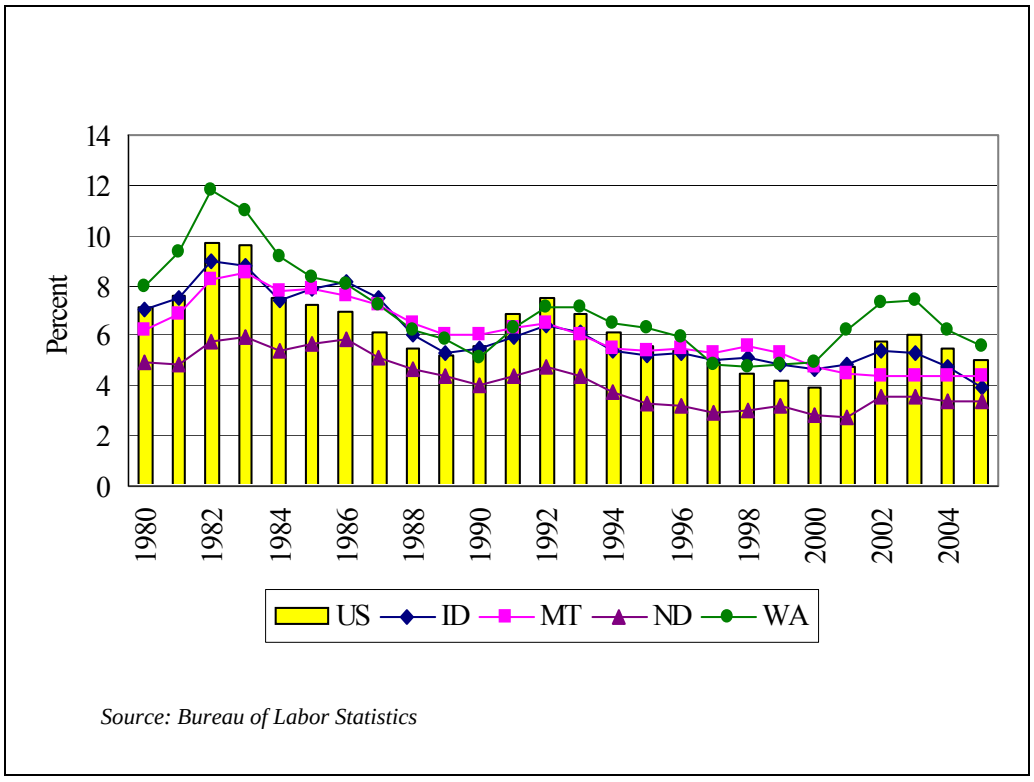


Figure 12 Unemployment Rates for NORPAC4 States, 1980 to 2005

The NORPAC4 unemployment rate averaged 6.03 between 2000 and 2005, considering an average of state member unemployment rates weighted by unemployed work force population. This unemployment level is 25% lower than in the 1980s, but remains above the national average. Within the region, average annual unemployment rates for Idaho, Montana, and North Dakota fell below the national rate during 2000 to 2005. Among the NORPAC4

states, North Dakota has consistently had the lowest unemployment rate at 3.26%. It is the only state to be below the national average for all time periods considered in the Table 5 decade trend information.

Table 5 Average Annual Unemployment Rates, Trends in Recent Decades

	ID	MT	ND	WA	NORPAC4	US
1980-1989	**7.46**	**7.29**	5.26	**8.51**	**8.04**	7.27
1990-1999	5.50	5.74	3.69	**5.89**	**5.68**	5.76
2000-2005	4.81	4.48	3.26	**6.28**	**6.03**	5.18

Note: Monthly data used in the calculations were seasonally adjusted.
Source: Bureau of Labor Statistics, 2006

Washington had an average unemployment rate of 6.28% between 2000 and 2005. Although the rate has declined since the 1980s, it has increased relative to the U.S. unemployment rate over recent years. In the 1980s and 1990s, Washington's rate was 17 and 2% higher than the national rate. The rate differential grew to 21% in the early 2000s.

The illustration of average annual unemployment rates in Figure 12 suggests that the Washington unemployment rate was somewhat more volatile than the other NORPAC4 states between 1980 and 2005. While the lowest rates are similar to those of the other NORPAC4 states, the peaks tend to be higher than other states. These unemployment rate trends and education characteristics offer another data source for understanding and predicting economic activity and the associated freight transportation demands, as well as providing a better understanding of the local work force as a factor in regional economic productivity.

Industry Employment

Information about the work force wages and jobs can provide useful insight detail regarding the distribution of economic activity within the NORPAC region. The primary source for data presented regarding this information is the U.S. Census Bureau's *County Business Patterns* (CBP). The CBP includes annual payroll, employment, and establishment data for sub national geographies including county and ZIP code stratification (U.S. Census Bureau, 2005b). The information is reported using the North American Industry Classification System (NAICS) at the six-digit level. The six-digit detail is aggregated into two-digit strata for major industry classification in this report. The three-digit level may be used in case study county examples or specific discussions of this research, but the two-digit NAICS industry classifications listed in Table 1 will be this primary stratification for the information presented due to the difficulties associated with making a coherent presentation of the data. Furthermore, the six-digit NAICS information is limited due to confidentiality. An initial review of public data provides no detail for the selected states or counties beyond the three-digit NAICS. The U.S. Census Bureau does mention that additional information may be available through special requests to state data centers. At the time this research was compiled, county level information for wages is available from 2001 to 2004, and for employment levels through 2003. Although wage information may be useful in tax and other revenue discussions, the employment information is the data element

considered relevant here. As with general population numbers, the CBP employee information has been used in gravity models illustrating freight flows.

The County Business Patterns information on employees by industry at the NAICS two-digit strata are presented in Table 6 (Bureau of Economic Analysis 2005). As expected, the aggregated county-level employment patterns follow the composition of income by industry in the state-level gross state product information presented earlier in the paper. A primary difference is the treatment of agriculture in the two data sources is that the U.S. Department of Commerce does consider farm income in calculation of the gross state product in its Regional Economic Accounts, but does not include farm income in the County Business Pattern data. The employment numbers and wages of self-employed, private household, railroad, agricultural production, and most government employees are excluded in the CBP economic series due to the classification and records on business establishments in CBP data sources. The CBP data are used as the primary source for county-level business data in this research for several reasons; (1) it is based on universal data,[1] (2) excluded data relevant to freight is largely available from other sources such as the U.S. Department of Agriculture, and (3) valuable industry detail may potentially be provided by the six-digit NAICS classification. Another difference is in the share of the economy attributed to manufacturing. Manufacturing is a relatively larger share of state gross product than the aggregated county employee numbers. This difference likely is attributed to a higher output per worker in the manufacturing sector than in the retail sector.

Freight industries account for approximately 41.1% of U.S. employees, based on 2003 CBP data (U.S. Census, 2005b). As discussed in the freight economy section, a slightly higher share of the national income − 44% − is attributed to freight industries. Retail trade accounts for the largest share of employees in the U.S. and the NORPAC4 region, with manufacturing second among industries ranked by number of employees (Table 6). The larger NORPAC11 region has a slightly different employee pool, as the largest share of its employee numbers is attributed to manufacturing. About 32% of NORPAC11 workers are employed by the manufacturing sector, similar to the U.S. average.

The NORPAC4 attributes a much smaller share of its workers to manufacturing, with relatively larger shares of employees involved in retail trade and construction. Approximately 35% of the NORPAC4 work force is employed in retail and 25.5% in manufacturing. Construction accounts for 16.2% of NORPAC4 workers, compared to only 12.9 and 13.7 in the NORPAC11 and nation, respectively. Transportation and warehousing industry is attributed with about 8% of the work force in the NORPAC11 and NORPAC4 regions. This industry share compares to a slightly higher national share of 8.7%. Minor freight industries, which each account for less than 2% of employees in the CBP summary, include the forestry, fishing, hunting, and agriculture industry; utility industry; and mining industry. Although industries may represent a small share of regional or national employment, it is important to note the industries due to their potential role in individual county freight traffic discussions. Additional information on business activity is included in the summary of state-level employment at the three-digit NAICS level that is included as Appendix A.

[1] The CBP data are not subject to sampling errors because they are based on universe files. The data are, however, subject to nonsampling errors such as unidentified cases, classification issues, interpretation, coding errors, and delinquent submissions.

Table 6 County Business Patterns Employment Summary, 2003

Industry, two-digit NAICS	Employees					
	NORPAC11		NORPAC4		U.S.	
Freight	**5,149,865**	**44.0%**	**1,359,604**	**41.5%**	**46,624,205**	**41.1%**
Freight Composition:						
Retail Trade	1,647,432	32.0%	475,935	35.0%	14,867,825	31.9%
Manufacturing	1,717,655	33.4%	346,488	25.5%	14,132,020	30.3%
Construction	662,139	12.9%	220,570	16.2%	6,381,404	13.7%
Wholesale Trade	611,130	11.9%	171,852	12.6%	5,863,860	12.6%
Transportation[1]	414,361	8.0%	107,672	7.9%	4,067,935	8.7%
Forestry[2]	36,720	0.7%	19,022	1.4%	180,673	0.4%
Utilities	29,487	0.6%	10,694	0.8%	675,938	1.4%
Mining	30,941	0.6%	7,371	0.5%	454,550	1.0%
Services	**6,559,890**	**56.0%**	**1,916,367**	**58.5%**		**58.9%**
Total	**11,711,916**		**3,276,998**		**113,398,043**	

[1]Includes Warehousing.
[2]Includes Fishing, Hunting, and Agriculture.
Source: U.S. Census Bureau, 2005b

Detailed county information is available for the NORPAC11 and NORPAC4 region. Although some information is concealed to ensure confidentiality, many counties' employee, wage and firm information can be detailed at the three-digit NAICS. Due to the volume of information, a map is used to make a simple illustration of the largest freight industry, by number of employees, in each of the NORPAC4 counties (Figure 13). As with the employee numbers, the retail industry accounts for the largest share of counties, 72%, considering the top industry in NORPAC4 each county. Manufacturing is second with 17%, as the leading industry in 34 counties. Construction and mining lead in seven and six counties, respectively.

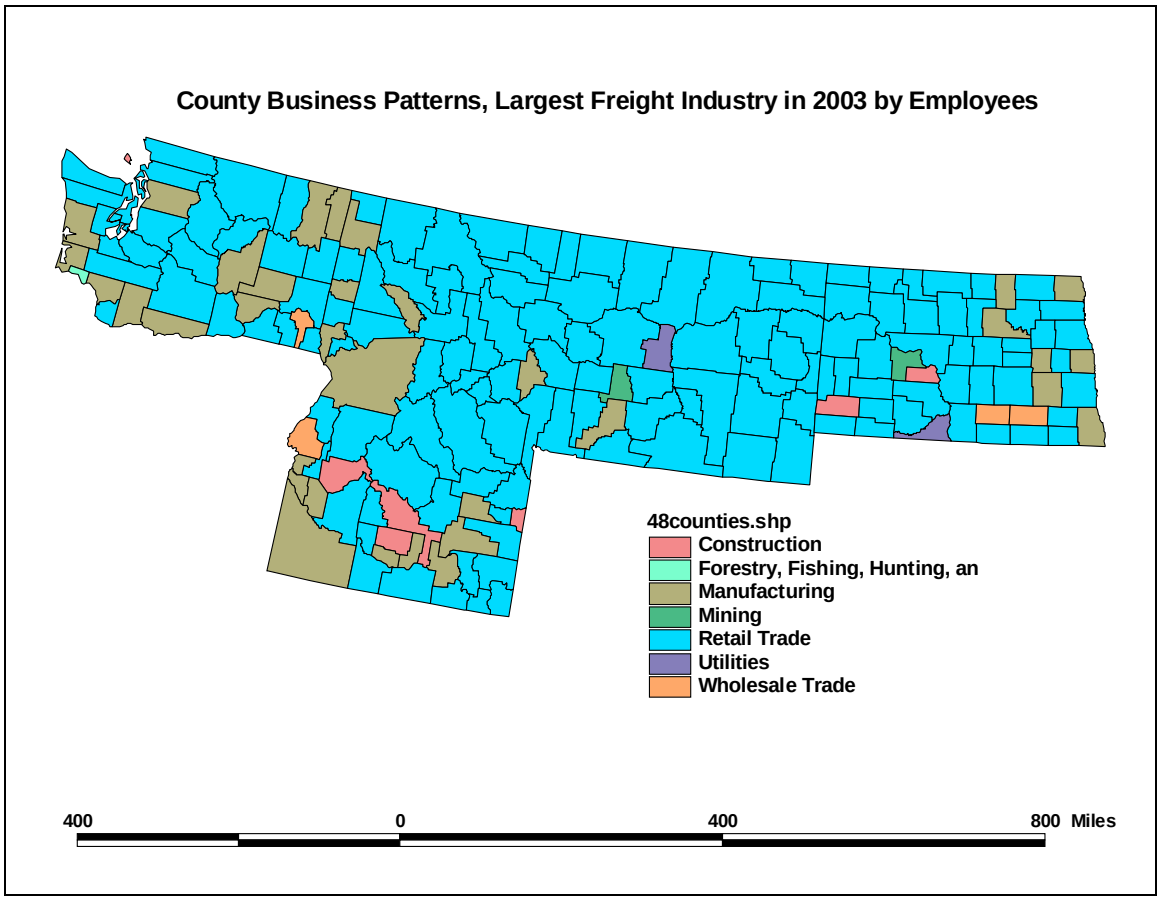


Figure 13 Largest Freight Industry in NORPAC4 Counties, Based on County Business Patterns Employee Numbers for 2003

Additional insight into business activity is provided by the County Business Patterns employee information in Table 7. The data show that within the largest industry, retail, employees are spread over a large number of retail activities with the largest shares in food and beverage stores. Other leading retail activities are general merchandise and motor vehicles/parts dealers. These leading retail sectors are consistent with the national retail sector (Appendix B). Within the manufacturing industry, the NORPAC4 food, wood products, and transportation equipment sectors are larger than in the composition of the national manufacturing industry. Manufacturing associated with computers/electronics and fabricated metal products are found to be smaller than at the national level.

Table 7 County Business Pattern Summary for 2003, NAICS

Number of Employees					
Industry	County				
	Ada ID	Carter MT	Cass ND	King WA	NP4
Forestry, Fishing, Hunting, and Agriculture					
Forestry and Logging	39		-	440	2,973
Fishing, Hunting and Trapping		-		-	198
Support Activities for Agriculture	27	-	-	-	5,250
Mining					
Oil and Gas Extraction	-	164		-	496
Mining (except Oil and Gas)	124	-		199	1,055
Support Activities for Mining	-	-	-	-	1,611
Utilities					
Utilities	1,797	320	161	1,819	10,694
Construction					
Construction of Buildings	1,936	860	1,324	14,972	53,855
Heavy and Civil Engineering Const.	6,118	1,026	941	10,382	37,826
Specialty Trade Contractors	7,733	1,756	2,937	30,246	125,410
Manufacturing					
Food Manufacturing	1,807	648	1,134	11,179	48,804
Beverage and Tobacco Product Manuf.	-	-	-	1,440	2,780
Textile Mills	-	-	-	72	152
Textile Product Mills	-	34	-	923	1,673
Apparel Manufacturing	-	-	-	876	1,796
Leather and Allied Product Manuf.	-	-	-	58	117
Wood Product Manufacturing	944	165	546	1,186	26,369
Paper Manufacturing	-		-	2,021	5,457
Printing and Related Support	485	174	426	4,626	10,406
Petroleum and Coal Products Manuf.	-	-	-	85	1,353
Chemical Manufacturing	-	83	-	1,292	3,859
Plastics and Rubber Products Manuf.	-	97	610	3,066	11,961
Nonmetallic Mineral Product Manuf.	-	176	309	2,863	9,004
Primary Metal Manufacturing	-	-	-	1,163	3,518
Fabricated Metal Product Manuf.	701	340	775	5,498	21,831
Machinery Manufacturing	1,483	165	1,337	5,044	16,655
Computer and Electronic Product	-	-	-	18,681	29,102
Electrical Equipment, Appliance	-	-	-	950	2,575
Transportation Equipment Manuf.	764	177	555	24,837	59,299
Furniture and Related Product Manuf.	493	86	315	1,953	10,463
Miscellaneous Manufacturing	540	380	227	4,102	12,349
Wholesale					
Merchant Wholesalers, Durable Goods	5,872	2,553	3,104	38,031	90,196
Merchant Wholesalers, Nondurable	2,590	1,935	2,444	23,118	65,664
Wholesale Electronic Markets and Ag	241	332	227	3,336	6,610

Table 7 County Business Pattern Summary for 2003, NAICS

Number of Employees						
Industry	County					
	Ada ID	Carter MT	Cass ND	King WA	NP4	
Retail						
Motor Vehicle and Parts Dealers	2,581	1,737	1,711	12,473	67,671	
Furniture and Home Furnishings	980	444	369	4,911	16,340	
Electronics and Appliance Stores	680	374	482	4,057	13,395	
Building Material and Garden Equip.	2,018	757	1,191	7,666	42,840	
Food and Beverage Stores	2,383	993	1,560	20,371	83,824	
Health and Personal Care Stores	752	315	584	5,496	22,305	
Gasoline Stations	1,198	628	847	4,002	31,690	
Clothing and Clothing Accessories	1,845	768	948	11,755	38,317	
Sporting Goods, Hobby, Book, Music	1,451	652	612	6,798	24,440	
General Merchandise Stores	4,727	2,090	1,777	13,405	74,991	
Miscellaneous Store Retailers	1,209	824	593	7,455	29,308	
Nonstore Retailers	585	185	680	4,166	14,534	
Transportation and Warehousing						
Air Transportation	720	434	-	12,149	14,270	
Water Transportation				2,316	2,591	
Truck Transportation	1,322	1,134	1,889	7,920	37,347	
Transit and Ground Passenger Transp.	417	385	284	2,418	7,797	
Pipeline Transportation	-	-	-	363	363	
Scenic and Sightseeing Transp.	-		-	334	359	
Support Activities for Transp.	318	369	154	6,436	13,856	
Couriers and Messengers	827	501	338	5,593	11,217	
Warehousing and Storage	623	-	75	3,466	8,896	
Total	58,330	24,061	31,466	358,008	1,237,712	

Source: U.S. Census Bureau, 2005b

The three-digit NAICS information is useful in understanding current economic composition. These data may be used for predicting freight flows in conjunction with other information on freight composition, modal shares, and industry trends. For the larger industry concentrations, it may warrant seeking additional detail regarding the industry at multi-county or regional level. An example of the six-digit industry classification of food manufacturing included in Food Manufacturing (NAICS 311) is included in Appendix C.

INFRASTRUCTURE AND GEOGRAPHY

The NORPAC region's transportation infrastructure provides the critical connection link to the regional, national and international economies. NORPAC transportation networks are the backbone of the regional freight movement supporting and enhancing the region's economy. Furthermore, the NORPAC region is heavily dependent upon the highway and railroad to effectively compete in the increasingly global market. Inland waterways play an important role in the region's freight transportation system, as a carrier in the more western areas and as a cost-effect route to the Gulf region for the eastern areas of the region.

Highway System

The nation's highways support the transportation of enormous quantities of freight. It includes nearly 48,000 miles of multi-lane highway network. The NORPAC11 – Chicago region has over 9,000 miles of interstate highway or over 18% of the nation's total interstate system. A critical component of the national highway network is the interstate highway system. Figure 14 shows the U.S. and the NORPAC12 interstate system.

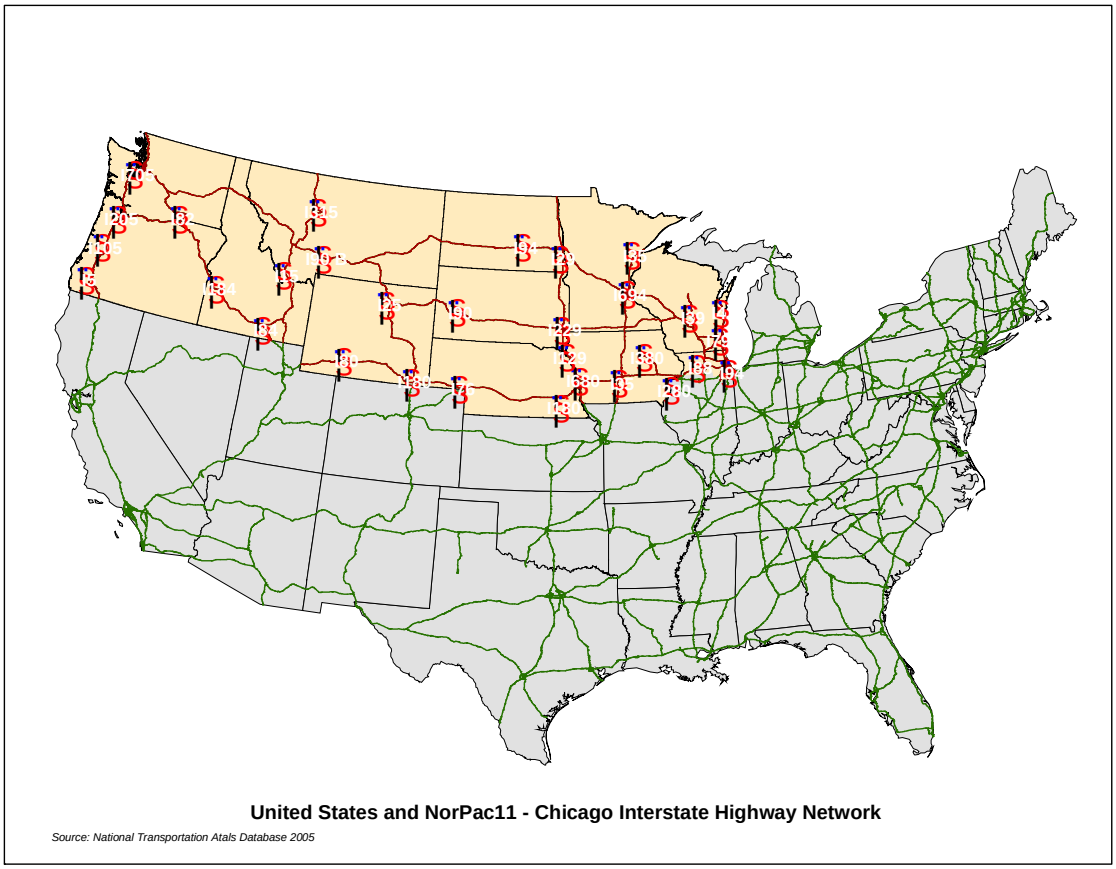


Figure 14 United States and NORPAC12

Regarding financing and management, these highway miles can be generally classified as federal-aid and non-federal aid highways. Federal-aid highways receive funding through a series of grant programs. These highway funds for the most recent years have been contained with the Surface Transportation Bills. The *Transportation Efficiency Act for the 21st Century* (TEA-21) funded programs from 1998 to 2003. Under this legislation and a series of statutory formulas, the Federal Highway Administration distributed about $172 billion for highways, transit, highway safety, and motor carrier programs (General Accounting Office, 2005). The most recent transportation bill, titled the *Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU), was enacted in 2005. It includes $284 billion to fund programs through 2009 (American Association of State Highway Officials, 2006).

Nationally, about 38% of the highway miles are classified as federal-aid highways. The share is 13% lower for the NORPAC11 region at 34%. The NORPAC4 region has an even lower share of its highway network, 31%, designated as federal-aid highways. Among the four states in this primary corridor, Washington has the largest share of its highway system under the federal-aid label. North Dakota has the smallest share as only 28% of its highway line-miles are categorized as federal-aid.

Table 8 Federal Aid and Non-Federal Aid Highways, by Region and State

State/Region	Federal-Aid Highways			Non-Federal-Aid Highways		
	Rural	Urban	Total	Rural	Urban	Total
			Lane-Miles			
Idaho	19,677	3,882	23,559	66,946	6,099	73,045
Montana	30,127	1,975	32,102	105,796	3,879	109,675
North Dakota	36,598	1,915	38,513	135,032	2,146	137,178
Washington	27,099	18,225	45,324	96,804	27,462	124,266
NORPAC4	113,501	25,997	139,498	404,578	39,586	444,164
NORPAC11	388,174	86,331	474,505	1,261,264	139,257	1,400,521
U.S. Total	1,505,048	806,135	2,311,183	4,634,611	1,393,019	6,027,630

Source: Office of Highway Policy Information (2006).

Montana also has a relatively small share at 29%. About 32% of the highway line-miles in Idaho are identified as federal-aid. The share of lane-miles with the federal-aid designation has important implications for the future financing of road systems in the NORPAC region. Federal dollars are an important source of funds for the needed construction and maintenance of roadways, in actual spending and in leverage public and private funds for financing road improvement projects.

The Dwight D. Eisenhower Interstate and Defense Highway System, commonly referred to as the 'interstate system' was completed in 1956. These interstate routes are a primary component in the larger, more recently designated National Highway System that was defined to include roads seen as essential to the nation's economy, defense, and mobility (Federal Highway Administration, 2006). The Eisenhower System includes about 26,700 miles, while the National Highway System includes approximately 160,000 miles of roadway. The significance of the National Highway System for state and local managers is in the priority treatment of these roadways in federal highway spending.

> *"Together, the united forces of our communication and transportation systems are dynamic elements in the very name we bear - United States. Without them, we would be a mere alliance of many separate parts."*
> - President Dwight D. Eisenhower, Feb. 22, 1955.

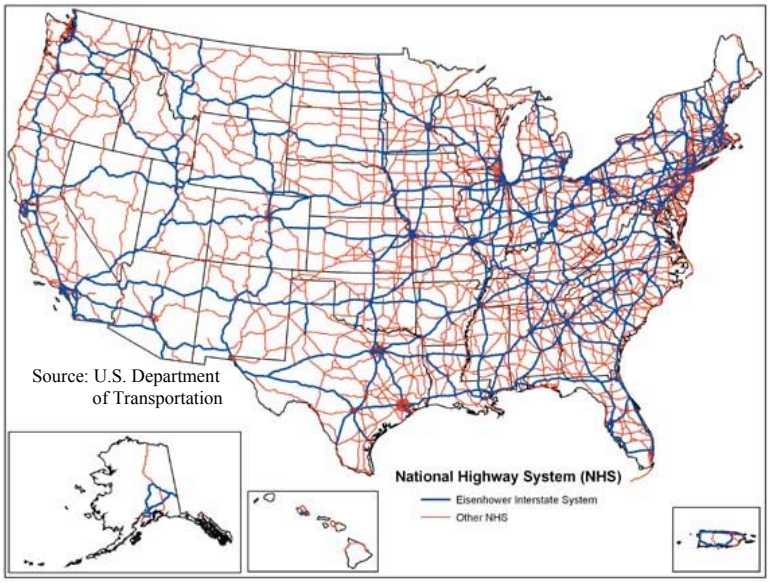


Figure 15 National Highway System

States within the NORPAC region are near the national average for interstates as the portion of their highways designated as National Highway System Miles (Table 9). These federally designated National Highway System roadways account for about 7% of all U.S. highway lane-miles. About 7% of Idaho and Montana highways are designed as National Highway System miles, and 6% of Washington's highways. North Dakota does have a substantially smaller share, only 4%, of its total highway lane miles designated in the National Highway System.

Table 9 National Highway System Miles in the NORPAC Region, by State

State/Region	Interstate Lane Miles			Total Lane Miles		
	Rural	Urban	Total	Rural	Urban	Total
Idaho	2,083	390	2,473	5,776	761	6,537
Montana	4,518	247	4,765	10,011	466	10,477
North Dakota	2,083	214	2,297	6,983	453	7,436
Washington	2,082	1,868	3,950	6,705	4,087	10,792
NORPAC4	10,766	2,719	13,485	29,475	5,767	35,242
NORPAC11	27,731	7,669	35,400	85,367	20,547	105,914
U.S. Total	127,889	82,926	210,815	348,461	209,626	558,087

Source: Office of Highway Policy Information (2006).

The NORPAC4 interstate highway system of about 13,000 line miles is comprised in the 3,100 roadway network miles, as summarized in the NTAD. NORPAC4 interstate highways account for nearly one-third of the interstate mileage in the larger NORPAC12. Figure 16 illustrates the NORPAC4 interstate system and shows that all major urban centers in the region are directly connected by interstate highways. Moreover, as with the railroad network, a substantial share of highway freight transportation between Chicago and the Pacific Northwest will be routed over the NORPAC4 interstate network based on forecasted flows for 2010 and 2020 (Federal Highway Administration 2006).

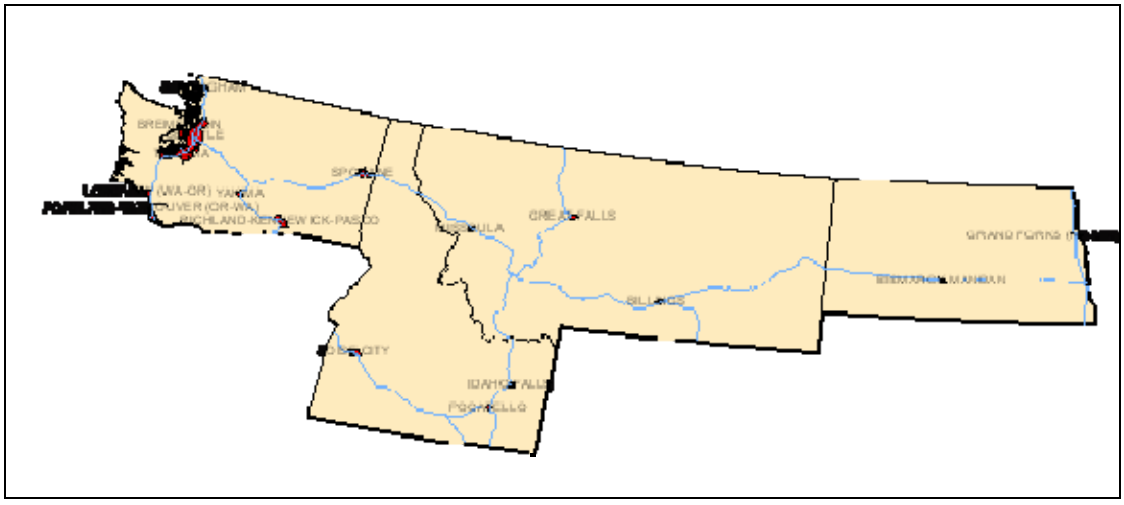


Figure 16 The NORPAC4 Interstate Network and Major Urban Centers

The NORPAC4 interstate network is part of a larger system of national and state highways. Figure 17 illustrates the larger, more localized, highway network that is interconnected with the interstate network. This larger network forms the nexus to local economies. The total NORPAC4 public highway network includes about 584,000 lane-miles. Approximately 30 and 29% of the lane-miles are located in Washington and North Dakota, respectively. The lane-miles in Idaho and Montana account for 17 and 24% of the total NORPAC4 highway lane-miles.

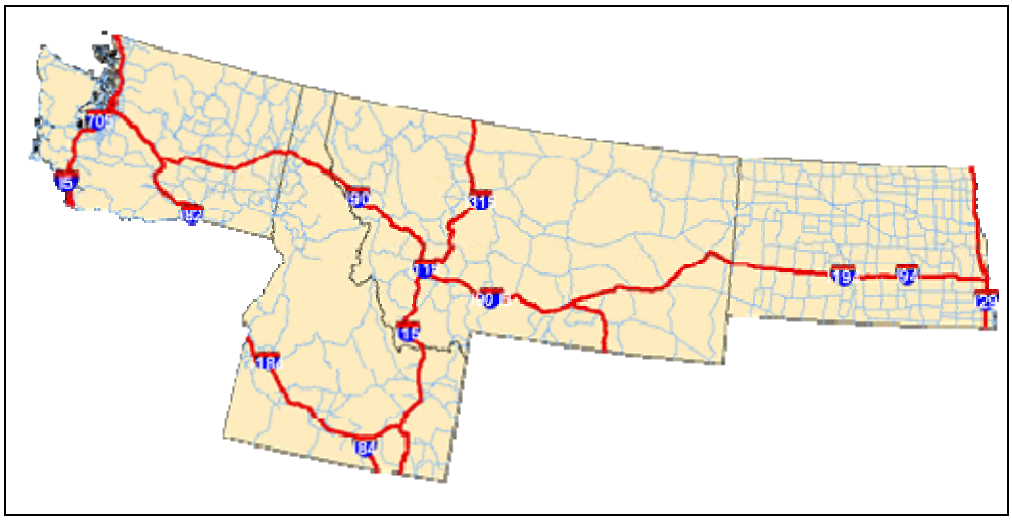


Figure 17 NORPAC4 Interstates, and the National and State Highway Network

The U.S. Department of Transportation publishes a variety of statistics regarding road usage, funding, and characteristics (Office of Highway Policy Information 2006). A selection of this data was compiled in several tables to create a better understanding of the highway system in the NORPAC4 region. Table 10 describes annual vehicle-miles traveled in the NORPAC4 region, compared to the larger NORPAC11 region and the United States in whole. Annual vehicle miles traveled (VMT) for the NORPAC4 region account for 29% of the vehicle miles traveled in the larger NORPAC11 region.

Table 10 Annual Vehicle-Miles Traveled by State and Region, 2004

STATE	Annual VMT (Million)	Annual VMT PER Capita	Annual Truck VMT per Capita (1,000)	Percent Annual VMT Urban	Percent Annual VMT Trucks*
Idaho	14,729	10,775	3,849	39.1%	16.4%
Montana	11,207	12,116	3,366	23.0%	11.2%
North Dakota	7,594	11,978	3,788	26.1%	15.4%
Washington	55,673	8,834	2,408	70.8%	10.3%
NORPAC4	89,203	9,667	13,410	58.3%	11.7%
NORPAC11	310,524	10,842	40,084	47.4%	10.5%
U.S. Total	2,962,513	10,077	73,315	63.9%	10.6%

*Percent Trucks includes combination trucks and single-unit trucks and buses with at least two axles and six tires.
Source: Office of Highway Policy Information (2006).

The highest annual VMT per capital among the NORPAC4 states was Montana at 12,116 miles. Residents of Montana travel approximately 20% more miles than U.S. residents on average. This level of travel is in the 75th percentile of average state per capita VMT. The higher level of travel is expected given the long travel distances in the state and lower population density. Annual VMT has a moderate negative correlation with population per square mile ($r(48)=-0.499$, $p=.0001$) considering the contiguous 48 states.

Truck traffic plays a larger role in NORPAC4 traffic than in the U.S. overall at 11.7% compared to 10.6%, respectively. Idaho and North Dakota attribute a significantly larger share of their annual VMT to trucks, at 16.4 and 15.4%, respectively, than do Montana or Washington. These values are in the 75th percentile for the distribution of all state annual truck VMT share of total VMT. These larger shares may be attributed to active border crossings. Although Montana and Washington also have border crossings, the Montana crossings may be lower and the Washington border traffic is likely overshadowed by the large share of residential urban traffic, 65%, in the annual VMT. The truck share of total annual VMT has a moderate negative correlation with population density considering the relationship for all states ($r(48)=-0.525$, $p=.0001$).

Table 11 provides additional context for understanding the highway systems in the NORPAC region. Information regarding the share of lane miles located in urban areas, lane-miles per square-mile, and gross state product offer information that may be useful in discussions regarding the future of highway infrastructure and maintenance finance and a state's ability to access revenues to improve highways. Highway density, considering lane-miles per square-mile of state geography, is relatively low for NORPAC4 compared to all states. Density across all 48 contiguous states ranged from 0.59 in Wyoming to 12.96 in Rhode Island.

For individual states in NORPAC4, the lane-mile per square-mile measure shows that North Dakota and Washington have the most dense highway network at 2.55 lane-miles per square-mile. This density is slightly higher than the national average of 2.36 but much lower than the national median of 3.70 lane-miles per square-mile. All the states in the NORPAC region are below the 50th percentile in this measure of highway density. Montana, with its' 0.97 lane-miles per square-mile, is in the 25th percentile for the distribution of all states highway density.

Table 11 Highway Lane Miles, Coverage, and Gross State Product

State/Region	All Lane-Miles		Lane-Mile Per Sq. Mile Area	GSP per 1,000 VMT	GSP Per 100 Lane-Miles
	Total	Percent Urban			
Idaho	96,604	10.3%	1.17	$2.51	$38.30
Montana	141,777	4.1%	0.97	$2.05	$16.22
North Dakota	175,692	2.3%	2.55	$2.50	$10.81
Washington	169,592	26.9%	2.55	$4.01	$131.49
NORPAC4	583,665	11.2%	1.94	$3.49	$97.84
U.S. Total	8,338,821	26.4%	2.36	$3.42	$121.60

Source: Office of Highway Policy Information (2006).

Other measures in Table 11 may offer insight for discussions regarding the future financing of highway infrastructure and maintenance. The first measure, percent urban, shows the share of the highway lane-miles that are located within higher-density urban areas. These higher-density areas may have opportunity to access different funding programs and may have more potential for instituting user-fee based highway funding programs such as toll-roads and value-pricing. Considering the 48 contiguous states, about one in four lane-miles is located in an urban driving area. The share is much smaller for the NORPAC4 corridor, at 11.2%. As expected, with the Seattle metropolitan area, Washington has the largest share of its lane-miles located in urban areas at 26.9%. The share is very near the national average of 26.4% and above the national median of 22.7%. North Dakota has the smallest share of its lane-miles located in urban areas, at just 2.3%. This share is the lowest in the 48 contiguous states. The highest share is in New Jersey where 82.6% of highway lane-miles are in urban areas.

The final two measures in Table 11 offer insight for additional state funds based on the relative income of the state considering the gross state product (GSP) parameter. The first measure is GSP per 1,000 VMT by state residents, showing the relative usage of highway lane-miles by users among the states with the comparison, normalized by income rather than the geographic scale as indicated by the square-mile measure. GSP per 1,000 VMT ranges from $1.70 to $6.00 across the 48 contiguous states. The lowest value is found in Mississippi and the highest in New York. The NORPAC4 corridor value of $3.49 is above the 48-state average of $2.91 in GSP per 1,000 VMT. Washington has the highest value at $4.01, which is in the 75th percentile in the distribution for all 48 states. Idaho and North Dakota, at $2.51 and $2.50 GSP per 1,000 VMT, respectively, are in the 25th percentile. Montana falls below the 25th percentile with a value of $2.05.

Given the high level of bridge traffic, which is neither originated nor terminated in the region, it is also important to understand how state income resources in terms of income are related to highway resources as measured by lane-miles. Average GSP per 100 lane-miles for the 48 states is $121.60, with a median of $96.60. The large difference between the mean and the median suggests that the value is highly skewed in a few states at relatively high values. The NORPAC4 corridor is well-below the average at $97.84. New Jersey has the highest GSP per 100 lane-miles, at $440 and North Dakota the lowest at $10.81. This wide difference in values offers context for discussing the abilities of states to fund highway maintenance and construction from within. Washington is in the 50th percentile among the states in a distribution of GSP per 100 lane-miles. The other three states in the NORPAC corridor, with GSP per 100 lane-miles between $10.81 and $38.30, fall below the 25th percentile value of $52.26.

A final piece of information compiled regarding the NORPAC highway system is in regard to ownership. As with the previous discussion of GSP, the prominence of state-owned roads may offer fodder for discussing future innovative financing programs and public-private collaborations. Approximately 22% of U.S. highway lane-miles are state-agency owned (Table 12). The share ranges from a high of 94% in Delaware to a low of 12% in North Dakota. The NORPAC4 corridor has a lower share of its lane-miles under state-agency ownership at 11%, relative to the rest of the country. A proportionately larger share of these state-agency owned miles are in rural areas, with only 11% of NORPAC4 state-agency owned lane miles in urban areas compared to 22% for the 48 states. In both Idaho and Montana, the state-agency owned highways, which account for 12.4 and 13.1% of all lane-miles, respectively, are attributed to over half the daily VMT in the state.

Table 12 State-Agency Owned Highways

	Lane-Miles		Percent of State Total	
	Total	Percent Urban	Lane-Miles	Daily VMT
Idaho	11,990	9.5%	12.4%	55.9%
Montana	18,591	3.4%	13.1%	63.2%
North Dakota	16,832	4.3%	9.6%	12.2%
Washington	18,308	28.1%	10.8%	59.1%
NORPAC4	65,721	11.6%	11.4%	47.7%
U.S. Total	1,834,132	22.0%	22.0%	64.2%

Source: Office of Highway Policy Information (2006).

Railroad Network

The NORPAC12 region has an extensive railroad network as illustrated in Figure 18. The National Transportation Atlas Database (NTAD) reports nearly 42,000 miles of railroad line in this region representing approximately 24% of the total miles of railroad line in the United States (Bureau of Transportation Statistics 2005d). The Chicago area, defined as the northern tier of Illinois counties, alone has over 2,000 miles of railroad line. It contains major U.S. rail terminals, where several Class I railroads interline, at Chicago, Omaha, and Minneapolis. Chicago is the largest large rail hub in the United States. Approximately 500 freight trains and 37,500 rail cars are processed daily at the Chicago yards (Reebie Associates 2003).

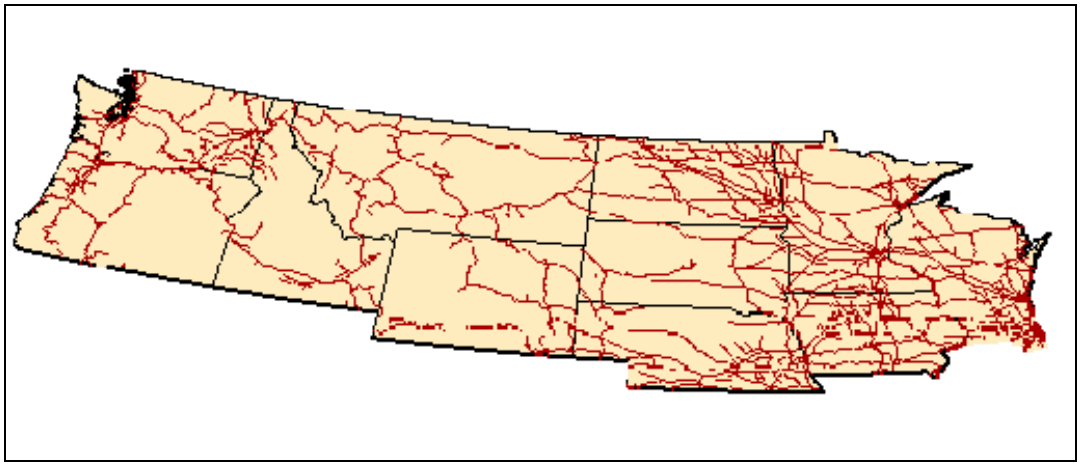


Figure 18 NORPAC12 Railroad Network

The NORPAC4 railroad network is highlighted in Figure 19. It has nearly 14,000 miles of railroad line or one-third of the railroad miles in the NORPAC12 region. As shown in the figure, any railroad shipment moving between Chicago and the Pacific Northwest will travel predominately over the NORPAC4 railroad network. Moreover, the NORPAC4 railroad network connects local and regional, inland economic activity to regional, U.S. and international markets. The composition of the rail traffic for the NORPAC4 corridor is detailed in the Waybill section of this report.

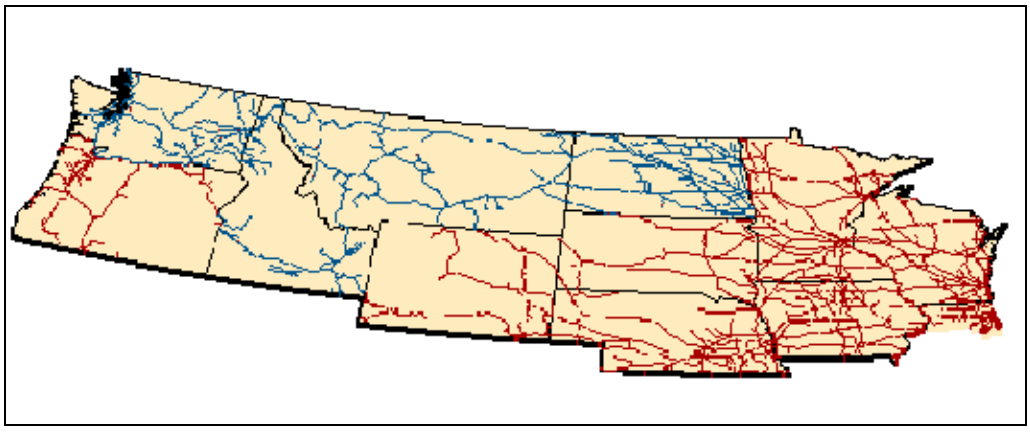


Figure 19 NORPAC4 and NORPAC11-Chicago Railroad Network

Class I railroads, which carry the majority of the nation's railroad freight, account for over 28,000 miles of railroad line in the larger NORPAC12. Table 24 illustrates that approximately two-thirds of the railroad mileage in the region, as reported by NTAD, are those of Class I railroad lines. Many factors affect the capacity of the rail system including track infrastructure, rolling stock technology, weather, and operational issues. Considering the basic engineering infrastructure as a key factor, the future capacity for the NORPAC region looks good − using the primary Class I railroads' gross allowable weight maps as an indicator (Appendix D). With the exception of some light density branch lines, primarily in Illinois, Minnesota, and North Dakota, the NORPAC12 region's Class I rail system is approved for primarily 268,000 and 315,000 pound load limits. These weights are currently the common maximum for rail loads on the Class I railways. Although research has been conducted to assess the feasibility for higher load limits, a widespread system change seems unlikely due to issues associated with damage to the track at higher weights. Findings suggest that costs, in damage associated with the integrity of the track bed, are higher than potential revenue gains at the higher gross railcar weight (Rocky 2006).

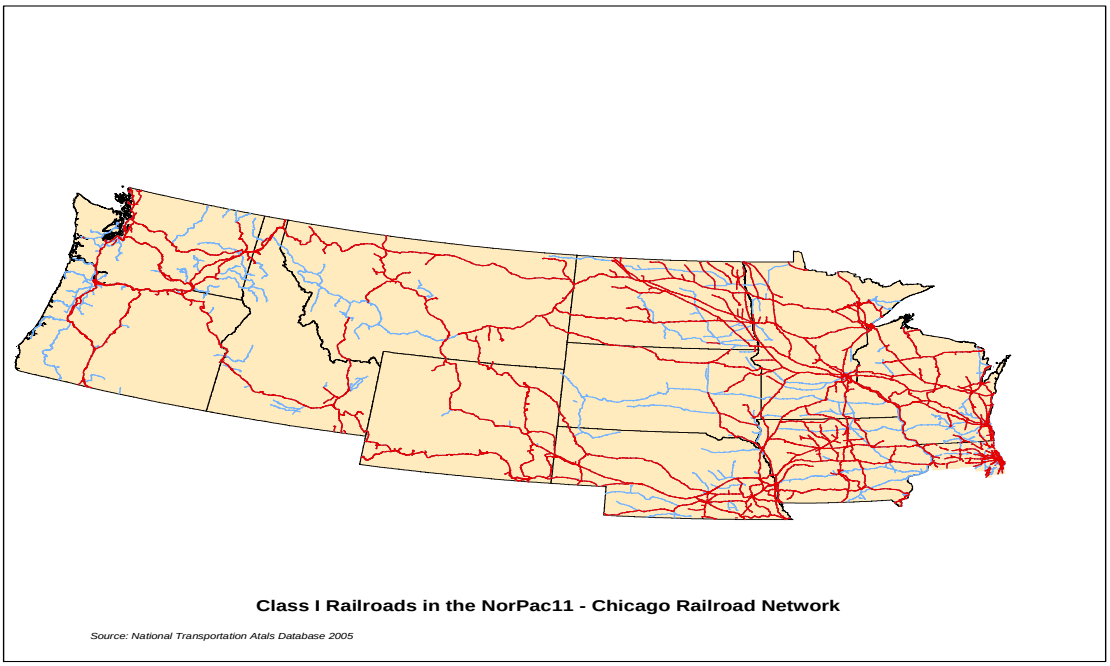


Figure 20 The Class I Railroad Network in the NORPAC11 – Chicago Region

The Class I railroad network in the NORPAC4 region and major urban population centers are illustrated in Figure 20. The NORPAC4 Class I railroad miles account for approximately 65% of the total railroad miles in the region. This share is slightly smaller than the national Class I percentage of railroad miles of approximately 68% reported by NTAD. All major NORPAC4 urban centers but Missoula, Montana are served by a Class I railroad.

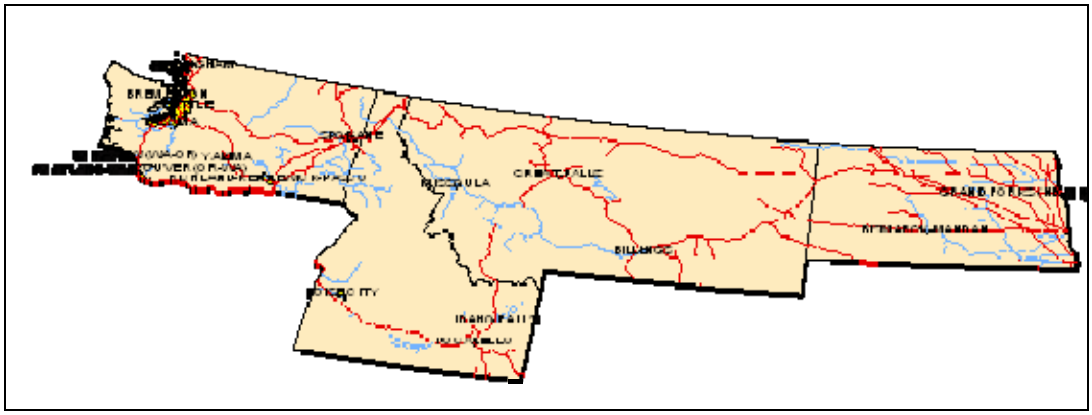


Figure 21 The NORPAC4 Class I Railroad Network and Major Urban Centers

Inland Waterways

NORPAC4 waterways are shown in Figure 15. Three of the four NORPAC4 states have NTAD recognized waterways but only the state of Washington has significant waterway mileage. NORPAC4 has just over 1,000 miles of waterways with almost all located in Washington. Almost all of NORPAC4's waterway network is within 20 miles of a railroad line, with the exception of some of the deepwater draft that extends along the Washington coastline.

Given their prominence in movement of the bulk agricultural products, an assessment of proximity between the inland water and rail modes was made using the Geographic Information System application. Regarding waterway and railroad modal competition from a geographical perspective of the location of NORPAC4 waterways in the Pacific Northwest, almost all of NORPAC4's waterway network is within 20 miles of a railroad line, with the exception of some of the deepwater draft that extends along the Washington coastline. This close modal proximity may be important for future capacity and investment discussions.

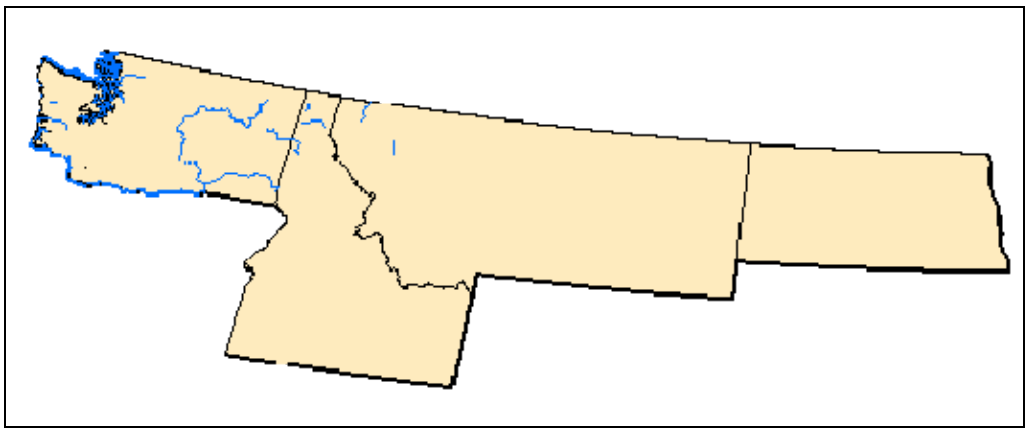


Figure 22 NORPAC4 Waterway Network

In addition, the national significance of these waterways in the multi-modal network is evidenced as several National Highway System Intermodal Freigh Connectors are a part of this waterways network. The Port of Lewistown in Idaho, along with the ports of Vancouver, Kalama, Longview, Tacoma, Seattle, and others are listed in Table 13. It should also be noted that two airports in the NORPAC4 region are identified as NHS Connectors. Considering the time and monetary resources available for this study, efforts concentrate on surface modes and connectors, but brief information on air cargo is presented in a subsequent section.

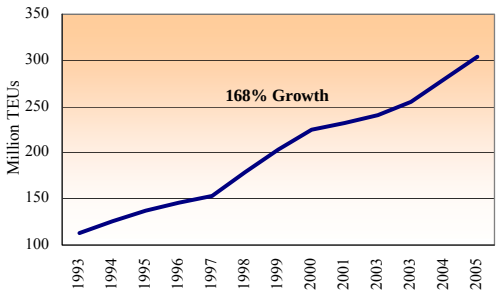
Table 13 NORPAC4 NHS Intermodal Freight Connectors

Location	Facility Type
Idaho	
Curtis Rd Pipeline Terminal	Truck/Pipeline
Port of Lewiston	Port
Spokane International Airport	Airport
Washington	
Union Pacific ARGO Yard, Seattle	Truck/Rail
Port of Vancouver	Port
Port of Kalama	Port
Port of Longview	Port
Port of Olympia	Port
Port of Port Angeles	Port
Port of Anacortes	Port
Port of Bellingham	Port
Burlington Northern Interbay Yd, Seattle	Truck/Rail
BN-UP Port of Tacoma Yards	Truck/Rail
BN-SIG Yard (Seattle Intl Gateway)	Truck/Rail
Port of Everett	Port
Elliot Bay-Florida St. Port (Seattle)	Port
SEA-TAC International Airport	Airport
Port of Tacoma	Port
Elliot Bay-Alaskan Way Port (Seattle)	Port
BN-South Seattle Yard	Truck/Rail
BN - Yardley (Spokane)	Truck/Rail

Source: Federal Highway Administration, 2000

Container Terminals

The final piece of surface infrastructure information offered in this section is for the relatively new container industry. While the container industry has been around in some form since the 1950s, its role has become increasingly prominent with technological advances and economic globalization. Intermodal container terminals have especially increased in importance during the last decade as the level of international container traffic has grown quickly. As illustrated in Figure 23, global traffic has grown from about 113 million 20-foot equivalent units (TEUs) in 1993 to over 300 million in 2005. A comparison can be



Source: Crainie and Kim, 2005.

Figure 23 Global Container Traffic Trend

made to U.S. truck and rail traffic growth between 1993 and 2003, where traffic has grown by about 35 and 41%, respectively, compared to 125% in global container trade (Crainic and Kim 2005).

About one-quarter of U.S. imports and one-sixth of exports are transported via container. The top 20 U.S. ports account for about 80% of the container traffic moving in and out the United States (Congressional Budget Office 2006). About one-half of this traffic moves through Chicago, Illinois, rail yards (World Business Chicago 2006). Within the top 20 ports, Seattle and Tacoma, Washington, are number 11 and 12 in volume in 2004. Seattle accounted about 4.5% and Tacoma about 4% (U.S. Department of Transportation 2005b). Figure 24 shows NORPAC4 container terminals in 2002 and the railroad network. The long distance drayage required for much of the region to reach these container terminals is a concern as this mode continues to grow as a transport vehicle in global goods movements.

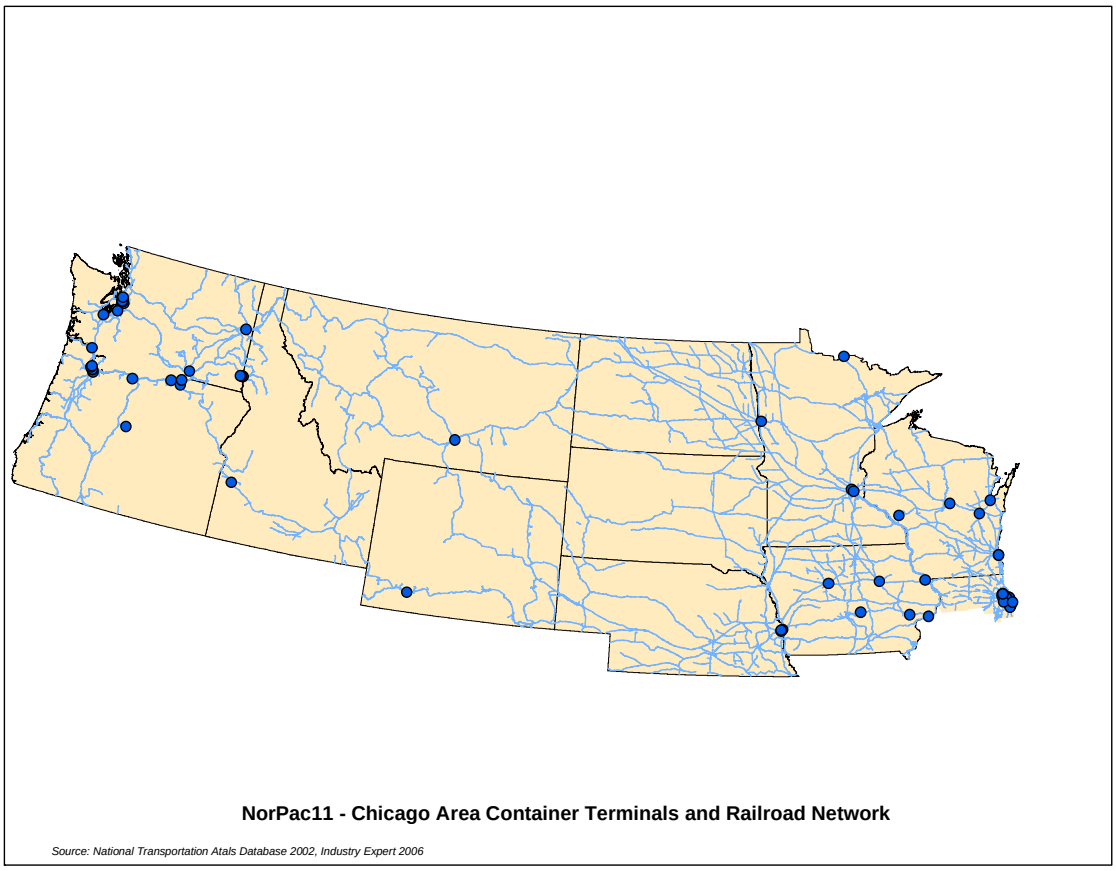


Figure 24 NORPAC11 Container Terminals and Railroad Network

Gateways

International market connections through borders and ports are critical to the U.S. economy. The NORPAC4 corridor has over 1,200 miles of border that it shares with Canada. In addition, Washington is home to the ports of Seattle and Tacoma which are active in international bulk and container trade. Trade has become an increasing important factor in the U.S. gross domestic product so these international gateways are often recognized as a priority in planning and operational decisions. As illustrated in Figure 26, goods exports represent about 25% of total goods in the gross domestic product. The level is a substantial increase in the absolute and relative level of goods exports in 1960.

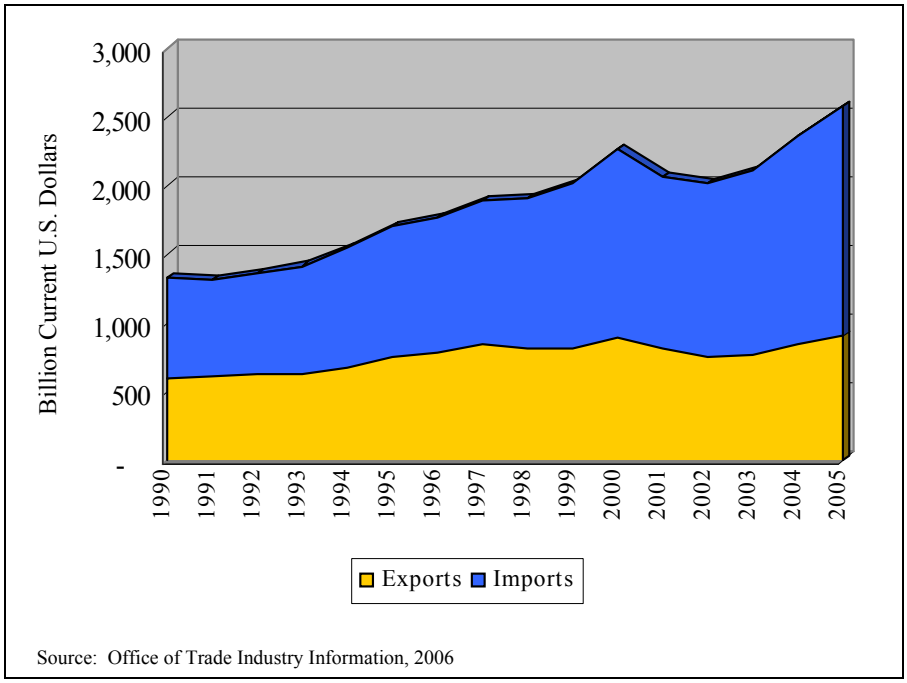


Figure 25 U.S. Global Merchandise Trade

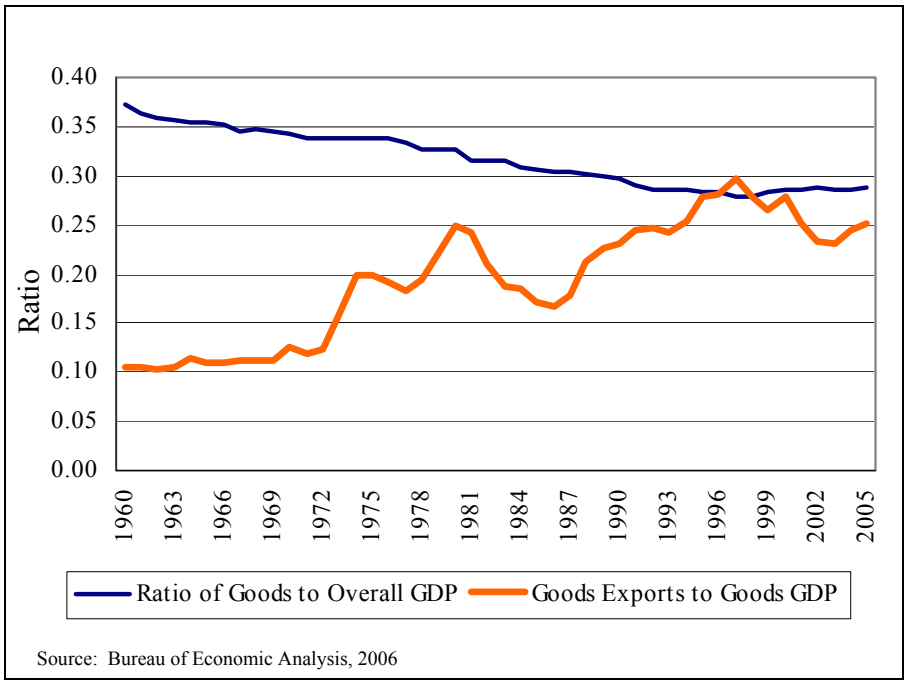


Figure 26 Goods and Goods Exports in National Income

Trade gateways with Canada are an important aspect of the U.S. transportation system. The value of goods traded with Canada has continued to grow under the U.S. Canada Free Trade Agreement that liberalized trade between the countries when it was implemented in 1989. The total value in merchandise traded between the two countries has nearly doubled since 1990, estimated at nearly $500 billion in 2005 (Office of Trade Industry Information, 2006). Among the top 50 U.S. Freight Gateways ranked by value of 2003 shipments, the ports of Tacoma and Seattle, Washington, are 17th and 21st. The Port of Blaine, Washington, is 34th with about $12 billion in value. Other NORPAC4 gateways in the top 50 are the Port of Pembina, North Dakota; Port of Sweetgrass, Montana, and the Seattle-Tacoma International Airport (Bureau of Transportation Statistics 2004).

Approximately 19% of the freight vehicle crossings made in land trade between the United States and Canada occur along the NORPAC border. Washington accounts for over half, 54%, of these crossings. North Dakota is second with over 350,000 crossings in 2002. Approximately 14 and 4% of the gateway crossings take place along the northern borders of Montana and Idaho, respectively. As trade with Canada continues to grow, an efficient and reliable systems of gateways along our northern border becomes increasingly important to U.S. businesses and consumers.

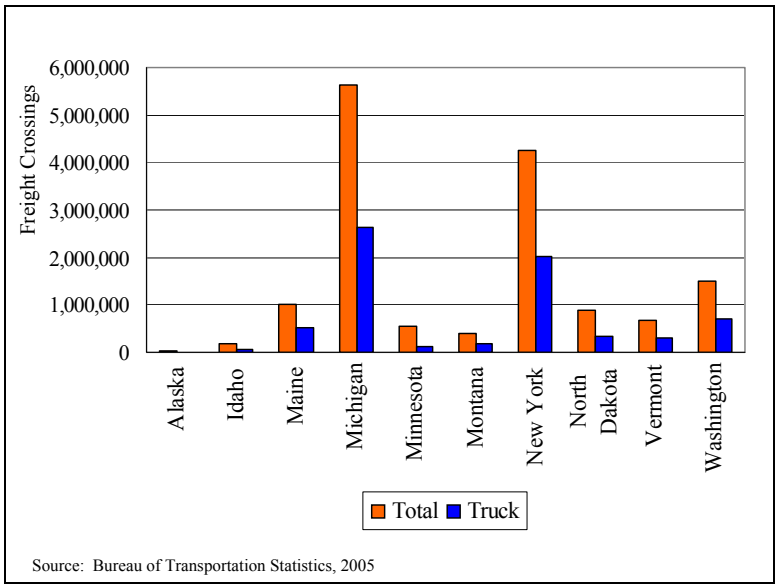


Figure 27 Gateways Traffic along the U.S.-Canada Border

The region west of the Great Lakes includes the NORPAC4 region and Minnesota. The four states in the NORPAC4 region account for over 90% of the highway traffic. A summary of individual U.S.-Canadian border point traffic between 2001 and 2004 shows Washington accounted for 50% of the highway traffic (Table 14). Approximately, 1.3 million trucks and truck containers pass through Washington border points each year. The Blaine, Washington, point of entry accounted for about 60% of this traffic (Appendix E). North Dakota is second in border crossings with an average 318,888 trucks and 254,483 truck containers. Pembina, North Dakota, is the largest single highway border crossing point in the state, attributed with about 60% of the truck traffic.

Table 14 Freight Border Traffic Entry in the NORPAC4 States and Minnesota, Average by Crossing from 2001 to 2004

	Trucks	Truck Containers	Highway Freight Traffic	Share of Highway Traffic	Rail Containers	Trains	Share of Trains
ID	53,500	49,774	103,274	4.1%	51,550	686	4.4%
MN	122,150	100,955	223,105	8.8%	228,070	9,831	62.9%
MT	170,248	172,791	343,039	13.6%	27,037	377	2.4%
ND	318,888	254,483	573,370	22.7%	161,866	1,692	10.8%
WA	683,658	596,385	1,280,044	50.7%	92,099	3,042	19.5%

Source: Bureau of Transportation Statistics, 2006b.

Located just east of the North Dakota, Minnesota is a primary rail corridor with nearly 10,000 trains passing through the border annually. Accordingly, Minnesota has a large share of the rail containers west of the Great Lakes – about 41% of rail containers cross the Minnesota border. Among the NORPAC4 states, North Dakota has the largest volume of rail containers moving across its borders, accounting for nearly 50% of the NORPAC4 total. This impact of this traffic at grade crossings is significant considering the growth trends in the container market.

Ports

Ports provide the global gateways for much of the U.S. international trade. Ocean-going vessels account for 99% of U.S. overseas trade by volume and 61% by value (American Association of Port Authorities 2006). Washington is home to nine ports with measurable foreign trade volumes in 2004. The largest total volume is attributed to the Port of Tacoma at 18.6 million tons (Table 15). The port vessel calls in 2003 included a mix of primarily container and dry bulk. The Port of Seattle, with a slightly lower total volume, has larger container industry in its vessel mix (Bureau of Transportation Statistics 2004). Seattle was fourth, behind California ports of Los Angeles, Long Beach, and Oakland, in container traffic for 2005 (American Association of Port Authorities 2006).

Table 15 Foreign Trade Washington Ports, by 2004 Volumes

Rank Among U.S. Ports	Port	Tons
22	Tacoma, WA	18,607,901
28	Seattle, WA	17,612,102
35	Kalama, WA	9,071,685
42	Vancouver, WA	5,210,540
47	Longview, WA	4,005,575
66	Anacortes, WA	2,245,699
85	Grays Harbor, WA	929,755
96	Everett, WA	538,351
109	Olympia, WA	257,420

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center
Summary Published by the American Association of Port Authorities

Cargo Airport

Airports also offer another connection for freight and economic activity. Cargo airports are seen to play a small but important role in express delivery and specialized markets (U.S. Department of Transportation 2005b). As with the rail system, the airports are connected through a hub-and-spoke network. Six airports in the region are identified by the major U.S. parcel couriers, including United Parcel Service (UPS), Federal Express (FedEx), and DHL as significant locations within their system. The locations are identified in Figure 28. The Seattle-Tacoma International Airport and the Spokane International Airport are also identified in the system of NHS Intermodal Connectors. None of the airports in the region, however, have volumes to make the significant hubs in the international air freight market (Table 16). In the larger NORPAC12 region Chicago, Illinois, is ranked 15th in the world considering 2005 air cargo volume.

Figure 28 Airfreight Handled by USPS, FedEx, and DHL at their Hubs in 2004
Source: Bureau of Transportation Statistics, 2006a

Table 16 World Air Cargo Traffic Rankings, 2005 Preliminary

Rank	City (Airport)	Rank	City (Airport)
1	**Memphis, TN**	16	Amsterdam, NL
2	Hong Kong, CN	17	London, GB
3	**Anchorage, AK***	18	Dubai, AE
4	Tokyo, JP	19	Bangkok, TH
5	Seoul, KR	**20**	**Indianapolis, IN**
6	Frankfurt, DE	21	Newark, NJ
7	**Los Angeles, CA**	22	Osaka, JP
8	Shanghai, CN	23	Tokyo, JP
9	Singapore, SG	24	Beijing, CN
10	**Louisville, KY**	**25**	**Atlanta, GA**
11	Paris, FR	26	Guangzhou, CN
12	**Miami, FL**	27	Luxembourg, LU
13	Taipei, TW	**28**	**Dallas/Ft Worth, TX**
14	**New York, NY**	29	Brussels, BE
15	**Chicago, IL**	**30**	**Oakland, CA**

Airports participating in the ACI monthly traffic statistics collection.
Total Cargo: loaded + unloaded freight + mail in metric tonnes.
*ANC data includes transit freight.
Source: Airports Council International, 2006

Freight Generators

The final item included in this overview of the infrastructure is the beginning of an effort to establish an inventory of freight generators in NORPAC4. Relying on work done in Minnesota, freight generators are defined as the largest freight origins and destinations. Generators in close proximity and on the same primary transportation route are identified as "freight clusters." These freight generators or clusters generally have traffic of at least 50 truck trips per day (Minnesota Department of Transportation 2006). Given the prominence of agriculture in the NORPAC4 region that was noted in the earlier section, this industry was chosen as the initial industry in creating the inventory of freight generators. Several public and industry sources are used in this initial map that identifies the geographic location and primary business of the freight generators. The agricultural freight generators include elevators, export terminals, and processing plants. Information regarding freight generators current location and activities is important in understanding regional freight flows and projecting future system demands. Other freight generators such as large manufacturers or distribution centers, that can be identified from public sources or existing databases, will be included as the inventory is expanded.

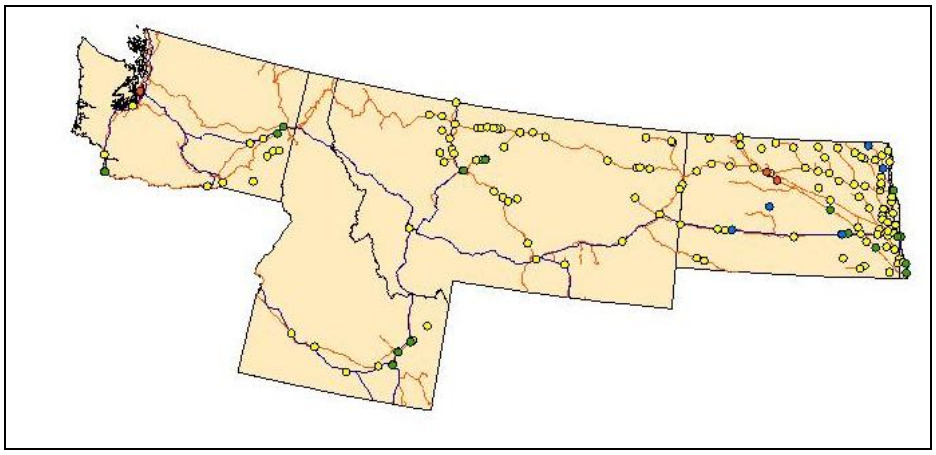


Figure 29 NORPAC4 Agricultural Industry Freight Generators

FREIGHT MOVEMENTS

Freight movements have many important aspects with regard to their role in regional mobility and economic impacts. The movement of goods is a factor in the economy's wealth creation, where the market requires a relocation of goods as inputs and or outputs to a business. In addition, the smooth flow of consumer freight is fundamental to residential satisfaction be it in finding a regional fresh milk product on the grocery store shelf store or an imported electronics item at a large retailer. Understanding current freight composition and flows is an ongoing endeavor that is critical to public planning and private investment decisions. The remainder of this research concentrates on the surface modes, which handle a majority of the freight movements that move across a multimodal system based in a complex of private and public investment and operations.

Because freight investments are long-lived and often associated with other aspects such as natural advantages like coastlines, man-made advantages such as interstates and bridges, and critical mass associated with large populations, it is important to take a holistic view of the existing system with its local and international interconnectivity. In covering the fundamental step, we create a more efficient and effect decision-making environment as our economy and its freight movements are part of a global transportation system.

The freight profile research for the NORPAC4 region draws on several data sources. The project scope and budget did not include primary data collection. This research does provide valuable experience in identifying and working with existing data sources on a regional basis. The endeavor will also contribute to another goal focused on establishing a regional freight planning data resource pool. The primary national data sources are the Federal Highway Administration *Freight Analysis Framework*[2] (FAF), *Highway Statistics,* and *Highway Performance Monitoring System* (HPMS); Bureau of Transportation Statistics *Commodity Flow Survey* (CFS); Surface Transportation Board *Public Use Rail Waybill*; and U.S. Army Corp of Engineers *Waterborne Commerce*. The discussion will begin with multimodal national data sources, and conclude with information developed on individual modes and markets. These data will be supplemented with other national and state data resources in the discussion of freight movements.

Mode

Freight transportation is dominated by the surface modes, including rail, truck, and waterways. These three modes account for approximately 80% of U.S. freight ton-mile movements in 2003 (Bureau of Transportation Statistics 2005a). Among these modes, trends in U.S. freight ton-miles suggest that truck rail to a ton-miles are continuing to grow based on the illustration of annual shipments between 1990 and 2003 (Figure 30). Truck and rail ton-miles increased by about 7% between 1999 and 2003. Water transportation, measured in ton-miles, declined nearly 8% over the same five-year period. In 2002, rail and truck accounted for approximately 37 and 29% of freight movements, respectively, based on the Bureau of Transportation Statistics (BTS) *National Freight Statistics* (2005a). The freight ton-miles reported in this publication are based on a compilation of data from public and industry sources including the American Association of Railroads, Army Corp of Engineers, and the American Petroleum Institute. These national freight figures do differ compared to a more recent BTS publication, *Freight in America* (2006).

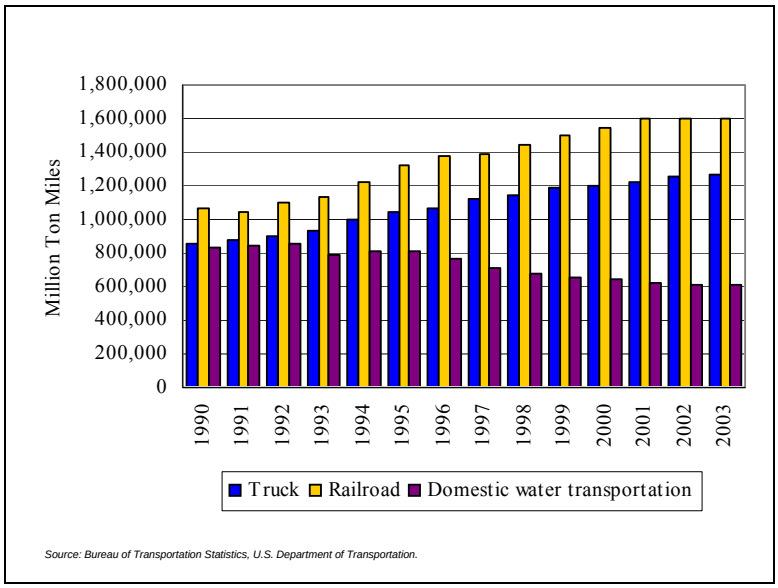


Figure 30 U.S. Freight Ton-Miles for Surface Modes, 1990 to 2003

For comparison, results of the U.S. Census *2002 Commodity Flow Survey* are presented as another popular source of freight transportation statistics. The *Commodity Flow Survey* (CFS) is an estimate of freight movements based on a survey of U.S. business establishments in mining, manufacturing, wholesale trade, and selected retail industries in five-year intervals. It represents about 71% of total commercial freight ton miles (Bureau of Transportation Statistics 2004). The rail ton-mile share, among the three surface modes, is between 41 to 46% for the three publications. The truck share of 36.2% of surface freight ton-miles in the *National Freight Statistics* is 20 to 40% lower than the shares estimated in the other reports. For the recent *Freight in America* estimates, which offer composite estimates that include the CFS and several CFS out-of-scope markets,"[2] the truck industry share is 34.4% and rail is 31.1%. The differences in the reports' pictures of U.S. freight transportation are complicated by the multiple modes category.

[2] Markets included in the *Freight in America* composite as a supplement to the *Commodity Flow Survey* industry coverage are: importers, farm-based, fisheries, crude petroleum, natural gas, municipal solid waste, logging, publishing, construction, services, retail, exports, petroleum products, household and office moves, and in-transit (Bureau of Transportation Statistics 2006).

Table 17 Share of U.S. Freight by Mode, 2002 Ton-Miles

	National Freight Statistics	Commodity Flow Survey	Freight in America
Truck	28.8%	40.0%	34.4%
Rail	36.8%	40.2%	31.1%
Water	14.0%	9.0%	11.0%
Air	0.3%	0.2%	0.3%
Pipeline	20.1%	S	15.6%
Multiple Modes	N/A	7.2%	5.3%

S = Estimate does not meet publication statistical reporting standards.
N/A = Not Applicable
Source: Bureau of Transportation Statistics 2005a; U.S. Census, 2005a; Bureau of Transportation Statistics 2006a

The primary use of the CFS is for "public policy analysts and for transportation planning and decision-making to assess the demand for transportation facilities and services, energy use, and safety risk and environmental concerns."[3] *National Freight Statistics* is similar in its scope, as its goal is to provide annual "information on the U.S. transportation system, including its physical components, safety record, economic performance, energy use, and environmental impacts."[4] *Freight in America* is offered as the "most comprehensive nationwide source of freight data" (Bureau of Transportation Statistics, 2006a). A critical difference between the publications is sub national freight information is not included in the *National Freight Statistics* or *Freight in America*. Furthermore, the *Freight in America* publication does not offer any historical information regarding freight movement characteristics that is needed for most planning and analytical processes. Given the regional focus of this research, the *Commodity Flow Survey* is preferred because it provides needed industry and geographic stratification of U.S. freight transportation. Given the national scope of the CFS, however, it is important to recognize the need for supplemental sources improving our understanding of the regional freight economy.

Understanding modal distribution of freight within the NORPAC4 region is an important part of discussing regional freight flows and information priorities. Two primary public data sources for multimodal freight activity at the state level are the *Commodity Flow Survey* (CFS) and the *Freight Analysis Framework* (FAF). A summary of overall freight shares for the region, and individual states is presented in Table 17. Both information sources are designed primarily to provide a national overview of freight flows, although FAF methodologies have been revised in the most recent version (titled FAF^2) to address gaps in the other primary data source − the CFS − and to improve reliability of data for sub national geographies such as states.

Trucks are the largest supplier of transportation in the NORPAC4 region considering a modal distribution of ton-miles in 2002 (Table 18). Truck share is estimated to be over 50% in both the CFS and FAF^2 datasets. The CFS estimates a higher share for rail at 22%, compared to 13%

[3] U.S. Census, http://www.census.gov/econ/www/se0700.html
[4] Bureau of Transportation Statistics, www.bts.gov/publications/national_transportation_statistics/2005/html/introduction.html

under the FAF[2] flows scenario. Other and pipeline are attributed 15% of the movement in the CFS estimates, and 26% in FAF.[2] The remainder of the freight ton-miles is comprised of water, air, multiple modes, and parcel-type shipments.

Table 18 Modal Freight Distributions in 2002, CFS and FAF[2]

Commodity Flow Survey	ID	MT	ND	WA	NP4
	Percent of Ton-Miles				
Truck	76%	25%	43%	62%	51%
Air	—	—	S	—	0%
Rail	17%	57%	19%	10%	22%
Water	S	—	S	S	0%
Pipeline*	S	S	S	9%	5%
Multiple modes**	1%	S	S	1%	1%
Parcel, Postal, or Courier	0%	—	—	0%	0%
Other and unknown mode	S	S	39%	6%	10%
Total	94%	82%	100%	88%	89%
Freight Analysis Framework[2]			Percent of Tons		
Truck	75%	32%	50%	67%	58%
Air	0%	0%	0%	0%	0%
Rail	5%	39%	9%	7%	13%
Water	1%	0%	0%	6%	3%
Truck and Rail	0%	0%	0%	0%	0%
Other Multimodal	0%	0%	0%	0%	0%
Pipeline and Unknown	19%	28%	41%	19%	26%
Total	100%	100%	100%	100%	100%

* Estimate for pipelines excludes shipments of crude petroleum.
** Multiple modes includes Parcel, U.S.P.S, Courier, Truck-Rail, Truck-Water, Rail-Water and Other multiple modes.
S Estimate does not meet publication standards because of high sampling variability or poor response quality.
\- Represents data cell equal to zero or less than 1 unit of measure.
NOTE: Data are estimates based on a sample and subject to error.
Source: U.S. Census and Bureau, Bureau of Transportation Statistics, 2005a; Federal Highway Administration 2006.

Considering the overview of the freight distribution, by ton-miles available from the *National Freight Statistics*, *Freight in America*, CFS, and FAF,[2] the NORPAC region is more dependant on truck that the nation as a whole (Table 19). Assuming that the *Freight in America* offers a holistic estimate of the freight data estimates than the CFS, nationally trucks are estimated to move about 45% of surface freight compared to over 70% in the NORPAC4 region. The NORPAC4 truck share reflects estimates of 72 for the CFS and 79% for the FAF.[2] The region is less likely to use rail and water than some other regions of the U.S., as these modes account for 46 and 18% of national surface freight ton miles, compared to 17 and 4% in the FAF[2] estimates. The CFS does not offer an estimate of water movements for states in the NORPAC4 region due to high sampling variability and poor response quality.

Table 19 Surface Mode Activity by State, 2002

	ID	MT	ND	WA	NP4
FAF[2] Freight Tons	122,701	135,675	176,029	348,224	782,630
Surface Modes	80.7%	71.1%	59.0%	80.3%	74.0%
Truck	93.1%	45.2%	84.5%	83.1%	78.7%
Rail	6.0%	54.7%	15.5%	8.8%	17.2%
Water	0.8%	0.0%	0.0%	8.0%	4.0%
CFS Freight Ton-Miles	34,971	89,547	8,302	59,594	472,414
Surface Modes	93.2%	82.3%	61.2%	71.9%	73.4%
Truck	81.9%	30.3%	69.6%	85.5%	71.8%
Rail	18.1%	69.7%	30.4%	14.5%	28.2%
Water	S	S	S	S	S

S Estimate does not meet publication standards because of high sampling variability or poor response quality.

SOURCE: U.S. Census and Bureau and Bureau of Transportation Statistics 2005a; Federal Highway Administration 2006.

Origin-Destination

Information related to the origin and destination (O-D) of U.S. freight flows is a key in understanding the current traffic flows and projecting future demands. The FHWA FAF[2] dataset specifies its O-D commodity flows based on several national data sources (FHWA, 2006). The information presented in this section is a compilation of that data, which estimates movements among 138 regions. The regions cover the 50 states, 57 major metropolitan centers (megapolitans), 17 international gateways, and 7 foreign trade regions. A map of the U.S. regions is provided in Figure 31.

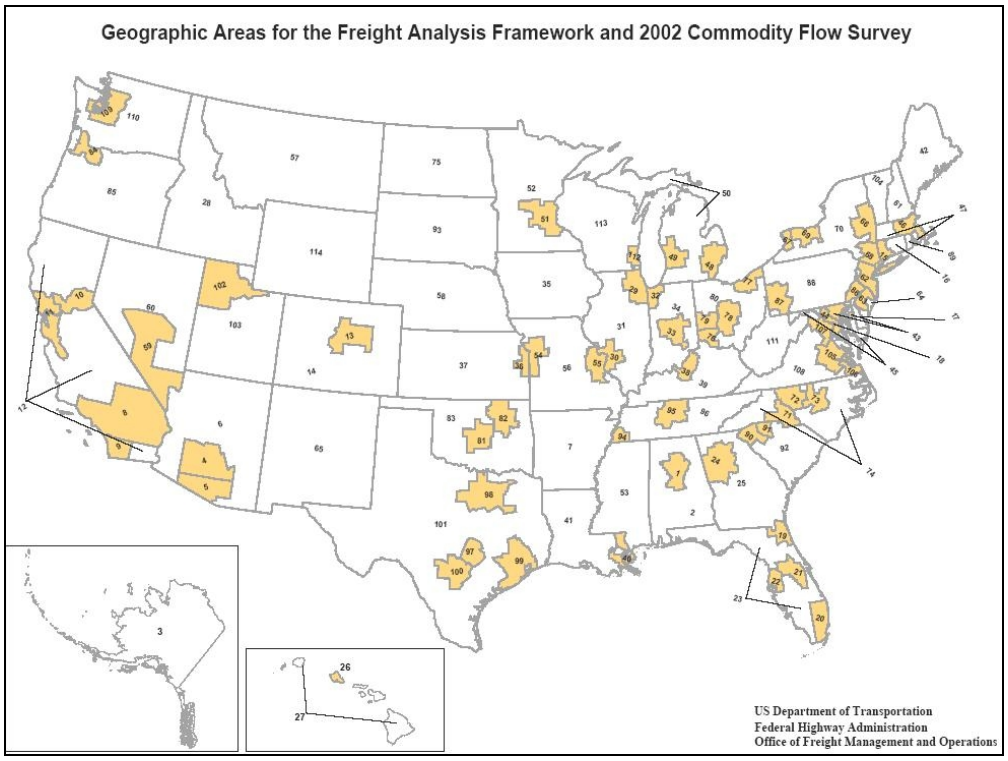


Figure 31 FAF^2 Geographic Regions

The FAF^2 data designates traffic originations and terminations among domestic and international market areas, as aforementioned. Approximately 8% of the freight originated in the United States is export. Traffic originated from the NORPAC4 region is largely destined for domestic markets, although the four-state region does show a greater propensity to ship to foreign markets than the larger NORPAC12 region (Table 20). An estimated 6% of traffic originated from the NORPAC4 region is exported, compared to 4% for NORPAC12. The international traffic is routed through port and border gateways. The numbers are similar for freight terminated in 2002, with approximately 5 and 2% designated as export for NORPAC4 and NORPAC12 regions, respectively.

Table 20 Type of Traffic Originated in 2002, Domestic and International

	ID	MT	ND	WA	NP4	NP12	US
	Share of Total Tons						
Domestic	97%	95%	98%	91%	94%	96%	92%
International							
Border	1%	1%	1%	1%	1%	1%	2%
Sea	3%	4%	1%	8%	5%	3%	6%

Source: FHWA 2006

Approximately 74% of the freight originated in the 12-state NORPAC region is also terminated within the 12-state region (Table 21). The termination points do include the border and gateways for exports that move beyond the U.S. system into the international transportation system. Over 85% of the freight originated in the NORPAC4 region in terminated within the NORPAC12 region. The NORPAC4 corridor is the destination for about 70% for the freight originated within its four-state geography. This share does vary among the states with Idaho shipping about 80% of its freight to destinations within the NORPAC4 borders, compared to only about 47% for Montana. A large share of the intra-region movements are attributed to goods moved within state borders. Over 70% of the freight originated in Washington and Idaho terminates within the respective states. About 66 and 42% of the freight movements originated in North Dakota and Montana are intra-state, respectively.

Table 21 Freight Originated and Terminated within State and Region, 2002

Origin	Within State		Within NP4		Within NP12		Total Shipments
			Unit is 1,000 Tons				
Idaho	71,143	72%	79,215	80%	84,187	85%	99,194
Montana	41,113	42%	45,744	47%	81,830	84%	96,974
North Dakota	68,866	66%	70,302	68%	95,080	91%	104,031
Washington	208,865	74%	213,425	76%	243,649	87%	281,392
NP4 Total	389,987	67%	408,687	70%	504,745	87%	581,592
NP12 Total					2,638,413	74%	3,548,436

Source: FHWA 2006

Figure 32 provides a broad overview of goods flows for the NORPAC4 corridor. As noted above, approximately 70% of the freight is shipped from origins to destinations within the NORPAC4 region. Approximately 7% of the shipments continue as exports through the border and ocean gateways. Approximately 17% of the NORPAC4 goods movements are terminated within the eight states that comprise the remainder of the NORPAC geography. Although this information is useful in understanding the scope of goods movements originated in the NORPAC region, more specific information regarding destinations needed for specific planning, operation, policy, and investment decisions.

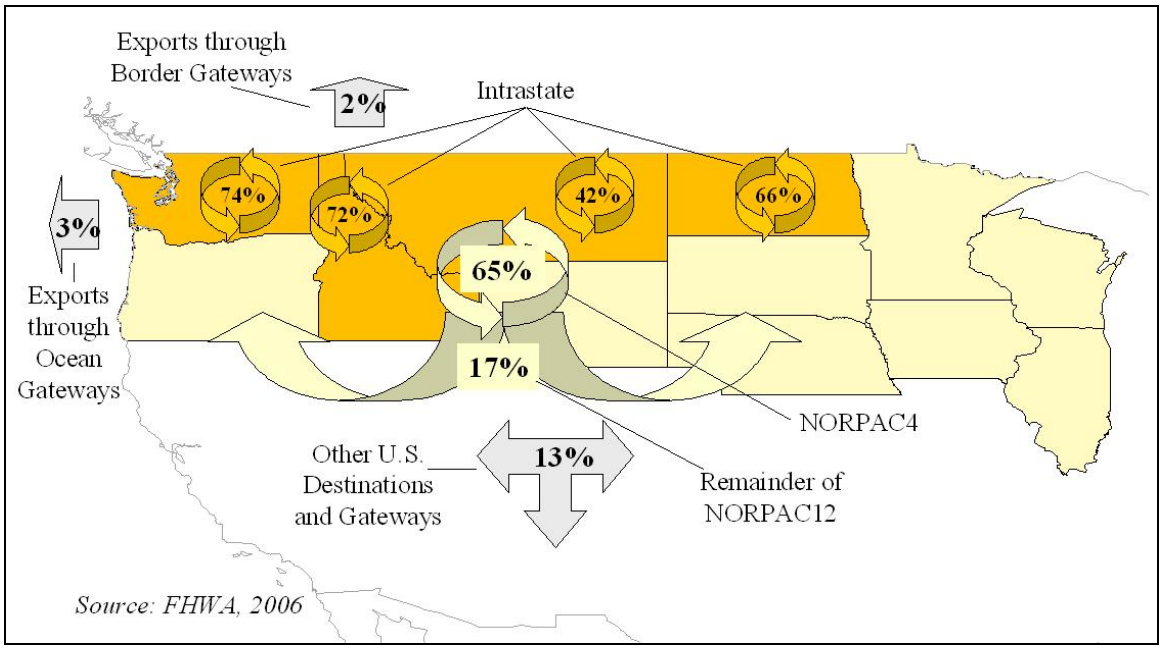


Figure 32 Overview of NORPAC4 Freight Destinations, 2002

More specific information regarding the final destination for shipments beyond the NORPAC4 region are presented in Table 22. The leading destinations of Alaska, Oregon, and Canada, are not surprising. Virtually all the freight shipped from Alaska to the NORPAC4 region is attributed to crude oil shipments to Washington ports. Oregon, Canada, Minnesota, and Utah round out the top five origins considering surface freight entering the NORPAC4 region. These five states account for about two-thirds of the freight shipped into the NORPAC4 region.

Among international origins, East Asia is the largest shipper to the NORPAC4 region. Approximately 87% of these goods arrive via the Washington ports. Oregon and California are also notable gateways for the Asia freight destined for the NORPAC4 region. Latin and South America and Africa also move measurable amounts into the NORPAC4 region. Information about individual state's inbound shipments origins are provided in Appendix F.

Table 22 Origin of Freight Received from Outside the NORPAC4 Region, Surface Modes

Rank	Origin	Freight	Share	Rank	Origin	Freight	Share
		Freight Unit is 1,000 Tons					
1	Alaska	25,063	20%	13	South Dakota	1,556	1%
2	Oregon	18,445	15%	14	Africa	1,407	1%
3	Canada	16,612	13%	15	Louisiana	1,331	1%
4	Minnesota	8,924	7%	16	Texas	1,152	1%
5	Utah	8,649	7%	17	Nevada	1,136	1%
6	Wyoming	7,743	6%	18	Mexico	1,067	1%
7	East Asia	7,689	6%	19	Iowa	969	1%
8	California	6,591	5%	20	Ohio	907	1%
9	Illinois	2,699	2%	21	Alabama	856	1%
10	Colorado	1,986	2%	22	Nebraska	754	1%
11	L & S America	1,677	1%	23	Missouri	692	1%
12	Wisconsin	1,562	1%	24	Florida	662	1%

Includes origins outside NORPAC4 accounting for at least 1% of total inbound freight.
Source: FHWA 2006

Top destinations for shipments beyond the NORPAC4 border are Minnesota, Oregon, East Asia, Wisconsin, and California (Table 23). These five destinations account for about three-fourths of the freight moved to destinations beyond the four-state corridor. More than half of the tons destined for Minnesota are cereal grains. Coal is another primary product moved from the NORPAC4 region to Minnesota, as it is attributed with about 25% of the volume. Wood and other agricultural commodities are also notable commodities, but both are minor compared to the grain and coal volumes.

Table 23 Destination for Freight Shipped Beyond the NORPAC4 Region, Surface Modes

Rank	Destination	Freight	Share	Rank	Destination	Freight	Share
		Freight Unit is 1,000 Tons					
1	Minnesota	33,322	21%	14	Indiana	1,648	1%
2	Oregon	32,043	20%	15	Colorado	1,636	1%
3	East Asia	22,346	14%	16	Arizona	1,572	1%
4	Wisconsin	15,867	10%	17	Iowa	1,569	1%
5	California	11,368	7%	18	Pennsylvania	1,221	1%
6	Illinois	8,976	6%	19	Nevada	1,211	1%
7	Canada	8,868	6%	20	Ohio	1,098	1%
8	Michigan	4,273	3%	21	Missouri	1,030	1%
9	Utah	3,967	3%	22	Florida	881	1%
10	New York	2,398	2%	23	Georgia	872	1%
11	Texas	2,275	1%	24	Kansas	850	1%
12	South Dakota	1,906	1%	25	Africa	819	1%
13	Wyoming	1,820	1%				

Includes destinations outside NORPAC4 accounting for at least 1% of total outbound freight.
Source: FHWA 2006

A wide variety of products moves from NORPAC4 to Oregon. The largest volume good is gravel, which accounts for about 40% of the total movement. Wood and wood products are a second large category, attributed with about 20% of the total tonnage. Other products include cereal grains, gasoline, fertilizer, and meat. The largest export market volume is associated with Asia, which is the destination for about 14% of the tons shipped beyond NORPAC4 borders. Cereal grains and other agricultural products comprise 67% of the volume moved to East Asia. With the consideration of two additional agricultural products, logs and animal feed, agriculture accounts for over 80% of the volume shipped from NORPAC4 to Asian markets. Additional detail regarding destinations for shipments made by individual states in the NORPAC4 region (Appendix G), and the port gateway for the regions and states (Appendix H) are provided in the Appendices.

Commodity

Knowledge regarding product composition of freight shipment within, into, and out of the NORPAC4 regions is valuable in understanding current freight flows and particularly important in forecasting assignments when integrating industry and population trend information. Table 24 shows the volume, in tons, that was originated and terminated by the NORPAC4 and NORPAC12 region, along with total U.S. shipments of the commodity (Federal Highway Administration, 2006). Both the NORPAC4 corridor and NORPAC12 region originate a greater volume in tons than they receive. NORPAC4 ships approximately 11% more than it terminates. The NORPAC12 region has an even greater traffic imbalance with originations 15% larger than

terminations. The traffic ratio of outbound to inbound shipments is highest for Montana, which has 1.88 tons of freight outbound for each ton terminated. North Dakota and Idaho also originate more freight than they receive with ratios of 1.26 and 1.07 respectively. Washington is the single NORPAC4 state to receive a larger volume that it originates, shipping 0.91 tons for each ton received. These ratios on traffic balance are a factor in considering freight capacity available in the region as a source for increasing efficiency. For instance, Montana may be able to gain some overall efficiencies and target freight growth related to inbound shipments. Due to the relatively large imbalance, shippers with inbound surface mode demand that are large relative to outbound demand may be able to attain favorable pricing or service to fill existing outbound capacity.

Cereal grains and aggregates account for the largest traffic shares among the top 20 largest volume goods, accounting for 22% of tons originated and 18% of tons terminated in the NORPAC4 region. Although the significance is somewhat less in the larger NORPAC12 regions, the cereal grains are still the single largest commodity among traffic originated and terminated. Gravel and crushed stone, second among commodities in volume moved within the NORPAC region, is the largest U.S. goods movement category. It is attributed with 13% of all U.S. commodity ton movements. Non-metallic and cereal grains minerals are second and third, respectively, in U.S. freight traffic volume by commodity. Other important commodities for the NORPAC4 region, considering volume originated, include logs, coal, waste and scrap metal, other agricultural products, fuel, and wood products.

Agricultural freight, including fertilizer, account for about 46% of NORPAC4 traffic originations, compared to 34% for the 12-state NORPAC region and 40% of all U.S. traffic. Commodities of significance to the NORPAC4 region, considering tons terminated, are similar with the exception of relatively large inbound crude petroleum movements. Commodity detail for individual states in the NORPAC4 corridor, and identification of commodities included in agricultural freight, are presented in Appendix I and J.

Table 24 NORPAC4 and NORPAC12 Commodities Originated and Terminated, Surface Modes

	Traffic Originated		Traffic Terminated		
	NP4	NP12	NP4	NP12	Total US Traffic
	Unit is 1,000 Tons				
Cereal grains	127,545	603,084	97,816	495,840	1,322,760
Gravel and crushed stone	88,964	479,390	74,621	461,400	2,001,970
Logs and rough wood	39,114	86,635	35,647	85,696	430,184
Coal	50,765	439,908	18,310	198,768	1,114,094
Waste and scrap	32,785	158,592	31,709	141,438	932,916
Other agricultural products	32,625	146,129	23,322	108,019	517,394
Nonmetallic minerals n.e.c.	23,442	307,793	24,584	311,715	1,330,242
Gasoline and aviation fuel	23,709	92,836	23,798	84,464	706,201
Wood products	26,431	81,067	18,974	73,871	421,831
Coal and petroleum prod.	13,795	67,889	15,546	67,881	511,761
Crude Petroleum	853	1,600	28,134	29,119	211,538
Other prepared foodstuffs	16,667	121,630	12,242	91,428	487,935
Fuel oils	11,968	53,402	14,359	55,574	379,295
Animal feed & animal prod.	12,465	72,029	12,736	57,939	253,500
Transportation equipment	12,189	124,174	11,824	110,958	449,860
Mixed freight	8,593	62,206	11,004	60,327	343,801
Natural sands	6,472	59,994	8,436	56,078	540,586
Fertilizers	5,760	59,080	7,732	65,467	310,226
Machinery	4,552	62,029	8,623	60,277	272,255
Live animals and live fish	5,833	32,187	6,136	33,327	106,045
Top 20 Commodities	544,527	3,111,652	485,552	2,649,587	12,644,395
All Commodities	581,592	3,548,436	535,490	3,050,106	15,070,748
Top 20 Share of All	94%	88%	91%	87%	84%

Includes commodities accounting for at least 1% of NORPAC4 traffic.
Source: FHWA 2006.

Imports and Exports

Given the globalization of the marketplace, understanding traffic flows related to international markets is becoming increasingly important in national and local transportation planning and investment. Some detail on trade was provided in the previous section covering origin-destination volumes. This section develops additional detail on trends and market specifics from Office of Trade and Industry Information, U.S. Department of Commerce reports which are based on the Census Bureau *Origin of Movement Report*.

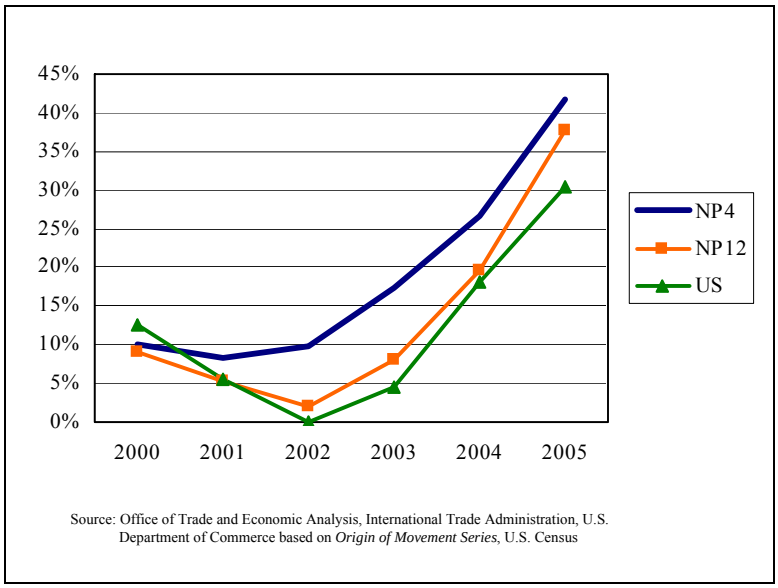


Figure 33 Trend in Value of Goods Exported from NORPAC Region, as Percent of Value Exported in 1999

As expected, the trend for exports at all levels has increased substantially since 1999. A number of factors including weak U.S. dollar, multilateral trade agreements, and a growing U.S. economy have influenced goods exports over recent years. The NORPAC4 corridor has consistently shown a stronger trend in goods exports over the past six years, compared to the NORPAC12 region. The trend in the corridor has also been stronger than that of the nation, considering that the value of goods exported, compared to 1999, has been higher since 2001. The strong export merchandise trends have important implications for those states originating goods, and for the states that house primary transport corridors and gateways.

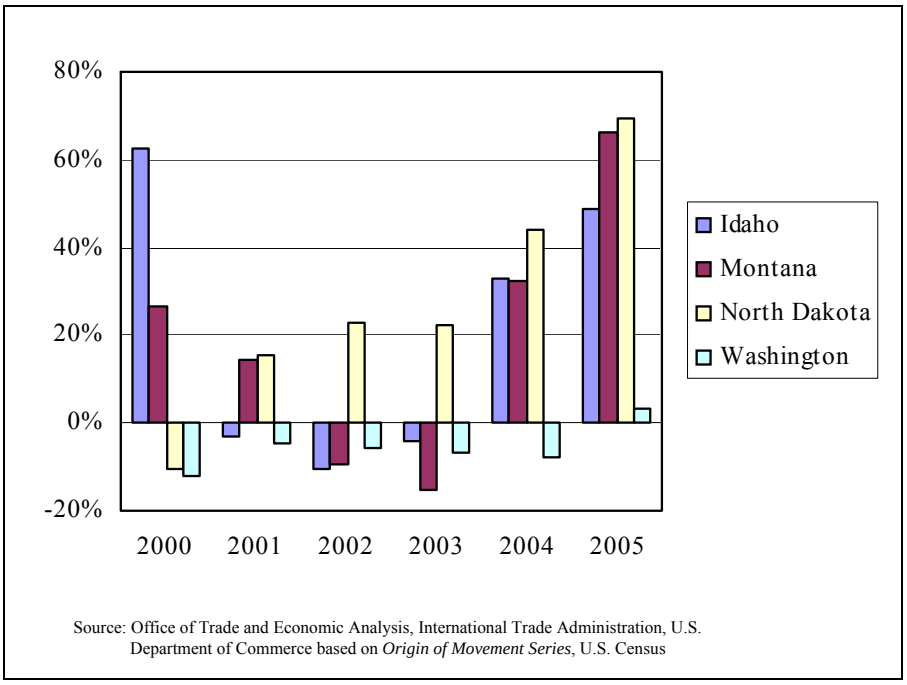


Figure 34 Trend in Values of Goods Exported from States in the NORPAC4 Corridor, as Percent of Value Exported in 1999

Merchandise exports for states in the NORPAC4 corridor totaled for $40 billion in 2005 (Office of Trade and Industry Information 2006). Washington had the highest export level at $37.9 billion. Idaho is second among the states with $3.3 billion. North Dakota and Montana reportedly exported $1.2 and $0.7 billion in merchandise, respectively. Figure 17 shows a consistent upward trend for the value of North Dakota in export merchandise since 2001, compared to 1999 levels. Montana and Idaho have also shown strength in their export growth over recent years. Washington, with the largest value in merchandise exports across all years, shows slight declines until an increase with the 2005 export value.

A quick look at average merchandise exports by country of destination suggests that the economies of East Asia and Canadian provinces are important to the NORPAC4 region Table 25. Japan ranks first as a destination for NORPAC4 exports, based on merchandise value originated by the four-state corridor. Canada is identified as the top foreign buyer of goods from the states of Idaho, Montana, and North Dakota, and it is second for the NORPAC4 corridor overall. Japan is the largest international market for Washington businesses, with Canada ranking second, based on average annual value of merchandise exports between 2003 and 2005. China, Taiwan, and South Korea fill out a list of the top five export customers for the NORPAC4 region. These five countries account for over half the value of exports originated from the NORPAC4 economic corridor. Additional information regarding individual state's trading partners is provided in Table 25.

Table 25 Average Annual Merchandise Exports, Value 2003 to 2005

Value in Million $

		ID		MT		ND		WA		NP4
	Country	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share
1	Japan	10.2%	4	8.2%	2	1.9%	8	17.1%	1	16.1%
2	Canada	16.0%	1	54.4%	1	49.0%	1	11.9%	2	13.7%
3	China	7.2%	6	3.2%	7	0.9%	14	10.8%	3	10.2%
4	Taiwan	9.5%	5	4.2%	4	0.3%	23	6.8%	4	6.8%
5	South Korea	3.9%	8	3.6%	6	0.6%	18	5.2%	5	5.0%
6	Singapore	10.3%	3	1.4%	11	0.4%	21	4.5%	6	4.8%
7	United Kingdom	14.0%	2	2.8%	8	2.0%	7	3.2%	9	4.0%
8	Australia	1.0%	16	0.6%	15	6.6%	3	3.8%	8	3.6%
9	Ireland	0.2%	24	0.1%	30	0.2%	32	4.0%	7	3.5%
10	Netherlands	1.1%	15	2.1%	9	1.2%	13	3.2%	10	2.9%
11	France	1.2%	13	1.6%	10	1.2%	12	2.8%	11	2.6%
12	Mexico	3.0%	10	5.1%	3	4.3%	4	2.3%	12	2.4%
13	United Arab Emirats	0.3%	23	0.3%	21	0.7%	17	2.2%	13	2.0%
14	Germany	1.3%	12	4.2%	5	1.7%	10	1.7%	14	1.7%
15	Italy	0.9%	17	0.5%	17	3.5%	5	1.6%	15	1.6%
16	Hong Kong	6.1%	7	0.2%	22	0.2%	31	1.0%	20	1.3%
17	Philippines	3.0%	11	0.3%	18	0.2%	42	1.2%	16	1.3%
18	Malaysia	3.7%	9	0.9%	12	0.1%	46	0.9%	22	1.1%
19	Thailand	1.1%	14	0.2%	23	0.1%	57	1.0%	18	1.0%
20	Vietnam	0.0%	57	0.1%	42	0.0%	96	1.1%	17	1.0%
21	Spain	0.4%	21	0.2%	27	2.2%	6	1.0%	19	1.0%
22	India	0.5%	19	0.1%	32	0.3%	24	0.9%	21	0.9%
23	Indonesia	0.4%	22	0.2%	25	0.3%	28	0.7%	23	0.7%
24	Ethiopia	0.1%	40	0.0%	64	0.2%	35	0.7%	24	0.6%
25	Kenya	0.0%	50	0.0%	59	0.1%	61	0.6%	25	0.6%
26	New Zealand	0.1%	29	0.2%	28	0.3%	26	0.6%	26	0.5%
27	Belgium	0.2%	25	0.7%	14	10.2%	2	0.3%	36	0.5%
28	Luxembourg	0.0%	64	0.0%	123	0.0%	65	0.6%	27	0.5%
29	Pakistan	0.0%	78	0.0%	87	0.0%	124	0.6%	28	0.5%
30	Russian Federation	0.1%	41	0.1%	37	1.9%	9	0.5%	29	0.5%
	Exports to Top 30	2,643		523		919		32,658		36,743
	All Exports	2,757		546		1,016		35,305		39,623
	Top 30 Share of Total	96%		96%		90%		93%		93%

Includes countries that account for at least 0.05% of total NORPAC4 export merchandise, by value.

Source: Office of Trade and Economic Analysis, International Trade Administration, Dept. of Commerce, from *Origin of Movement Series*, Census Bureau

The U.S. Census Bureau also provides some limited information on the bundle of goods that comprise this export merchandise in its *Foreign Trade Statistics.* Figure 35 is an overview of the exports from the NORPAC4 corridor using the two-digit harmonized system (HS) to categorize goods. This categorization was selected because the available data on state level exports is coding using the HS system. While this data summary includes the value information and not volume, it does provide additional detail regarding products and export trends. A summary of all U.S. exports is provided as a context for assessing the relative importance of industries to the NORPAC4 region, relative to other areas in the country.

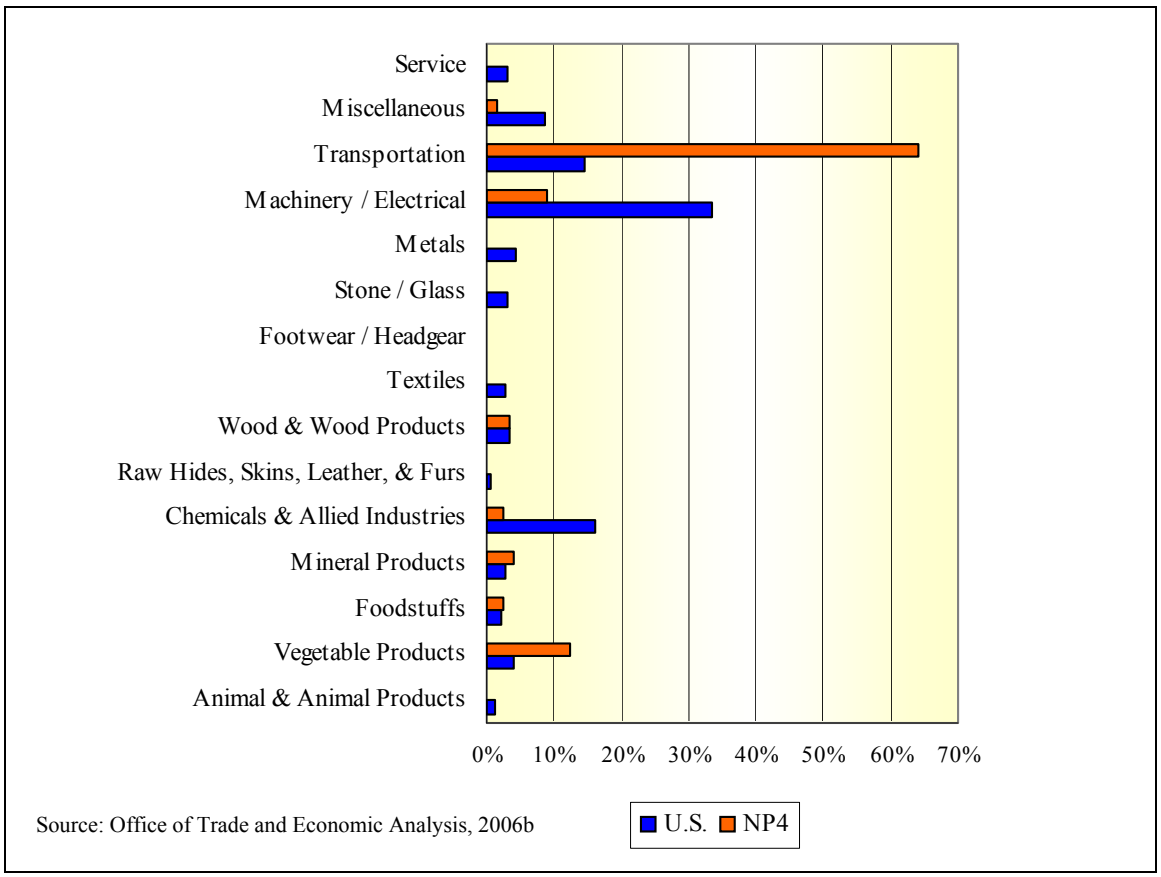


Figure 35 Commodities Exported from the NORPAC4 Corridor and the U.S. Overall, Based on 2004 Values

Transportation exports stand out as an overall and relatively large category. About 97% of the transportation exports are attributed to Washington, which is the home of Boeing and several related companies. Machinery and electrical is also a large category compared to the national average. Idaho and North Dakota have large contributions to this export market with digital monolithic integrated circuits and self-propelled mechanical front-end shovel loaders, respectively. General information about other exports originated from states in the NORPAC are provided in Table 26. More specific information is included in Appendix K.

Table 26 Top Exports By Harmonized System (HS) Code, Based On 2005 Merchandise Values

	ID	MT	ND	WA	NP4
	Share of Total Value				
Vegetable Products (HS 06-15)	4%	8%	17%	13%	12%
Grains & Foodstuffs (HS 16-24)	10%	2%	4%	2%	3%
Mineral Products (HS 25-27)	3%	30%	6%	4%	4%
Chemicals & Allied Industries (HS 28-38)	9%	21%	0%	2%	3%
Raw Hides, Skins, Leather, Furs (HS 41-43)	1%	0%	0%	0%	0%
Wood & Wood Products (HS 44-49)	11%	10%	0%	3%	3%
Textiles (HS 50-63)	0%	0%	0%	0%	0%
Footwear / Headgear (HS 64-67)	0%	0%	0%	0%	0%
Stone / Glass (HS 68-71)	0%	0%	0%	0%	0%
Metals (HS 72-83)	0%	0%	0%	1%	0%
Machinery / Electrical (HS 84-85)	55%	27%	55%	4%	9%
Transportation (HS 86-89)	4%	1%	17%	72%	64%
Miscellaneous (HS 90-97)	3%	0%	0%	1%	1%
Service (HS 98-99)	0%	0%	0%	0%	
Total Export Value in $ Million	2,344	520	852	28,157	31,876

Source: U.S. Census Bureau 2006.

In scanning Appendix I, it is interesting and somewhat concerning that corn and soybean are third and forth among Washington's top 25 exports based on the Office of Trade and Industry Information (OTII), yet this state produces little corn and virtually no soybeans (National Agricultural Statistics Service 2005). Although "all state export statistics are drawn from the *Origin of Movement* (OM) series compiled by the Foreign Trade Division of the U.S. Census Bureau" for a national picture of merchandise flows, it is evident that for the region of interest in this study that additional research is needed regarding export flows as this information is used in other national data sources such as FAF[2] and local economic studies with export aspects (Office of Trade and Industry Information 2006).

Rail Waybill Summaries

The *Public Use Waybill Sample* and the *Confidential Master Waybill Sample* are valuable information sources for understanding trends and market flows related to the rail freight industry. The *Public Use* version is a revised compilation of selected *Confidential Waybill* information. It has a more limited set of descriptive shipment variables, such as less detail on origin and destination geography, no railroad identifier, and other masked or hidden values to ensure confidentiality for individual rail shippers. The *Confidential* version is made available to government agencies through special request under strict guidelines for information releases. The *Confidential Master Waybill Sample* was available for this analysis for the years 2002, 2003, and 2004. Although this timeframe provides limited opportunity to distinguish trends in rail freight

shipments, it is valuable in establishing some more detailed baseline information and understanding how representative the *Public Use* geography is in discussing NORPAC4 rail traffic over the longer timelines available with that public source.

As indicated in Table 27, overall volumes for the nation are similar for the *Public Use Waybill* and *Confidential Master Waybill* samples so rail traffic volume is well-represented in the *Public Use* version. A substantial difference does exist for the smaller NORPAC4 region, as about 24% high traffic levels are estimated using the Public Use geography that is based on Bureau of Economic Analysis regions. The primary reason that the Public Use value is consistently low is due to masked origin or destination values that are associated with confidentiality requirements. In addition, the Public Use version skews state-level summaries because the BEA regions do not follow state boundaries, so counties in bordering states are included in the estimate. The value of the Confidential Master Waybill is evident. It is important, however, to note the consistency in the difference between the Public Use and Confidential data across years. Given similarity in overall traffic trends, the Public Use may still be valuable in understanding overall rail volume trends.

Table 27 Comparison of Public Use and Confidential Master Waybill Samples

	U.S. Total *(1,000 Tons)*			NORPAC4 Region *(1,000 Tons)*		
Year	Confidential Master Waybill	Public Use Waybill	Percent Difference	Confidential Master Waybill	Public Use Waybill	Percent Difference
2002	2,090,835	2,091,842	<1%	93,937	70,505	-24.9%
2003	2,119,774	2,120,192	<1%	96,312	72,370	-24.9%
2004	2,183,367	2,184,321	<1%	106,753	83,637	-21.7%

The Confidential Waybill Sample information regarding the rail traffic that originates, terminates, and transits the NORPAC region is presented in Figure 36 (Surface Transportation Board 2006). As with the FAF summaries, the NORPAC4 region is shown to originate more rail traffic, by tons, then it terminates. Figure 36 shows both origin and destination traffic trending upwards between 2002 and 2004. The inbound/outbound rail traffic ratio is 1.4, so for each ton originated approximately 0.7 tons were terminated during the three years.

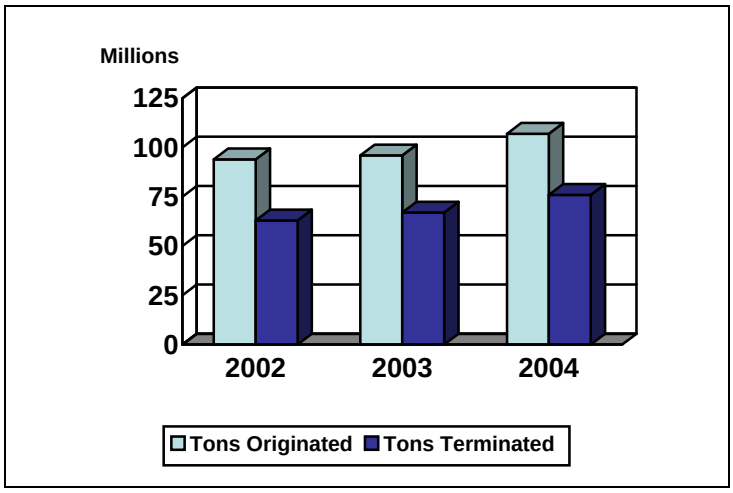


Figure 36 NORPAC4 Railroad Tons Originated and Terminated, Average 2002 to 2004

Detail regarding the origination of rail commodities by the four NORPAC4 member states is provided in Table 28 and Table 29. The commodity detail for the rail volume shows the originations by state for the 10 largest volume NORPAC4 commodities. Similar to the *FAF* summary of all goods in Appendix L, coal is the largest volume commodity for Montana and farm goods is second. North Dakota rail shipments are also dominated by farm goods and coal, but the goods are reverse in their relative importance with farm goods leading the way. Idaho is consistent with both data sources as well, originating primarily farm and lumber rail products. A large share of rail tons originated by Washington are classified as miscellaneous mixed shipments. These shipments remain a mystery. Even with the additional detail provided in the Confidential Waybill Sample, the goods and characteristics included in this category could not be further defined (Appendix M).

Table 28 Average Annual Originating Railroad Tons, 10 Largest Volume Rail Commodities

	Annual Average Originating Railroad Tons, 2002-2004				
Commodity	Idaho	Montana	North Dakota	Washington	NorPac4
Coal	0	27,873,729	4,773,039	2,333,264	34,980,032
Farm Products	3,136,239	3,917,276	12,546,206	1,562,394	21,162,115
Lumber & Wood Products exc. Furniture	2,491,297	1,957,653	72,667	4,743,653	9,265,269
Food Products	1,781,584	518,300	4,678,047	1,216,831	8,194,761
Miscellaneous Mixed Shipments	2,387	9,453	400	5,897,480	5,909,720
Petroleum or Coal Products	5,613	3,001,781	253,917	1,497,679	4,758,991
Waste and Scrap Material	134,499	117,255	549,263	3,367,511	4,168,527
Nonmetallic Minerals	1,899,152	258,231	85,160	368,353	2,610,896
Chemicals	1,071,817	174,333	355,623	578,159	2,179,932
Pulp, Paper and Allied Products	169,240	433,627	0	1,447,887	2,050,753
Total Rail Shipments	10,850,059	39,098,797	23,354,885	25,696,773	99,000,514
Top 10 Share of Total	98.5%	97.9%	99.8%	89.6%	96.2%

Source: Surface Transportation Board 2006.

Because the second largest NORPAC4 rail good, by volume, is broadly defined as farm, additional detail regarding these shipments is presented in Table 29. More specific information on the commodity provides a tool for assessing current flows and discussing future modal and market shifts. Wheat is the dominant rail farm product originating in the NORPAC4 region, accounting for about three of every five tons shipped. Barley, corn, and soybeans are next in volume, but each with much smaller annual volumes.

Table 29 Average Annual Agricultural Originating Railroad Tons, 10 Largest Rail Volume Agricultural Commodities

	Annual Average Agricultural Originating Railroad Tons, 2002-2004				
Commodity	Idaho	Montana	North Dakota	Washington	NorPac4
Wheat	772,127	3,259,195	7,072,528	1,160,166	12,264,016
Barley	751,567	640,768	1,316,327	127,445	2,836,107
Soybeans	0	0	1,975,171	2,112	1,977,283
Corn	13,387	0	1,287,361	2,667	1,303,414
Sugar Beets	869,480	0	0	0	869,480
Potatoes, Other than Sweet	477,473	0	13,160	41,253	531,887
Beans, Dry, Ripe	23,467	7,947	307,196	10,627	349,236
Oil Kernels, Nuts or Seeds, NEC	7,527	1,160	226,713	0	235,399
Flax Seeds	0	0	182,169	0	182,169
Fodder, Hay or Roughage	143,920	0	0	13,120	157,040
Top 10 Ag Total	3,058,948	3,909,070	12,380,625	1,357,390	20,706,031
Farm Products Total	3,136,239	3,917,276	12,546,206	1,562,394	21,162,115
Top 10 Share of Total	97.5%	99.8 %	98.7%	86.9%	97.8%

Source: Surface Transportation Board 2006.

Crop Production

Grain and oilseed production and distribution are important components in the freight movements in NORPAC4. As noted in the previous discussion, existing transportation data sources are weak regarding their coverage of these movements due to methodologies and data collection processes. The U.S. Department of Agriculture does collect annual crop production by county, and in some states this production has been distributed across the county though geographic information system (GIS) processes. This information is valuable in local and state highway planning processes, and in the multimodal needs assessments. In addition, some states have collected grain production and transportation information on a regular and ad hoc basis. For example, North Dakota and Montana have reporting systems for grain by mode. Washington has collected modal grain shipment information periodically in research projects. Future endeavors may be directed at identifying, compiling, and augmenting existing data sources.

SUMMARY

Freight transportation capacity and capabilities are a critical aspect of the economy in personal and goods mobility. The objective of this research was to provide fundamental information about freight composition and flows for the NORPAC economic region between Chicago to the Pacific Northwest. In addition to general information regarding freight transportation in the NORPAC region, specific information was developed for a primary four-state corridor that includes Idaho, Montana, North Dakota, and Washington. The descriptive analysis provides a foundation for future research and priority-setting with regard to increasing the knowledge about freight movements in the region.

The NORPAC region has a traffic distribution slightly different than of the nation, with regard to shipment bound for domestic and international markets, as about 4% is bound for other countries compared to 8% for the nation. About 74% of the traffic originated in the NORPAC region is also terminated within the region or at one of its gateways. The NORPAC region generates a slightly larger share of its income from freight generating industries than does the balance of the nation. Cereal grains and aggregates are found to be the most prominent goods among freight industry generators. Agriculture is attributed with a relatively large share of the freight industry GSP compared to other areas of the U.S. Manufacturing is found to be a lesser industry in the mix of freight generators.

The NORPAC region is generally described as a light-density population area with vast rural areas that require long-distance travel. Three of the four states in NORPAC4 have per capita vehicle miles traveled (VMT) above the national average. These vast rural areas create challenges for work force and freight mobility. While railroad and waterways are important carriers in the multimodal freight network, the NORPAC region is generally found to be more dependent on highway transportation than the rest of the remaining 48 states. The coverage and composition of this highway system is important in discussions regarding future funding and operational issues. Approximately one in ten of the NORPAC4 lane miles are urban, higher-density, compared to one in four for the nation on average. This share poses challenges for areas seeking to employ user-financing road pricing schemes. Furthermore, some indication of the challenges this region faces in future highway financing may be gained by considering GSP and highway travel. For instance, the gross state product per 1,000 VMT in North Dakota is the lowest in the nation at $10.81 compared to $121.60 for the 48 contiguous U.S. states.

These findings, along with the demographic and infrastructure detail developed in the report, provide a foundation for discussing the future of freight mobility in the NORPAC region. The research will be used by practitioners in discussing policy, investment, and research priorities to enhance the future environment for freight mobility that is essential to the work force and good movements in the economy.

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APPENDIX A. COUNTY BUSINESS PATTERNS STATE-LEVEL SUMMARY FOR 2003, NAICS

Number of Employees

Industry		IA	MT	ND	WA	NP11
Forestry, Fishing, Hunting, and Agriculture						
	Forestry and Logging	502	124	-	2,347	7,572
	Fishing, Hunting and Trapping	-	-	-	198	210
	Support Activities for Agriculture	726	63	247	4,214	8,934
Mining						
	Oil and Gas Extraction	-	379	117	-	2,086
	Mining (except Oil and Gas)	337	-	-	718	5,885
	Support Activities for Mining	24	785	802	-	9,142
Utilities						
	Utilities	2,649	1,113	2,201	4,731	29,487
Construction						
	Construction of Buildings	7,322	6,041	2,877	37,615	166,964
	Heavy and Civil Engineering Constru	8,468	3,595	1,645	24,118	81,379
	Specialty Trade Contractors	20,473	9,323	8,184	87,430	398,111
Manufacturing						
	Food Manufacturing	12,292	1,790	2,436	32,286	225,042
	Beverage and Tobacco Product Manuf.	-	133	-	2,647	5,205
	Textile Mills	-	-	-	152	1,112
	Textile Product Mills	9	34	-	1,630	4,653
	Apparel Manufacturing	-	-	-	1,796	4,737
	Leather and Allied Product Manufact	-	4	-	113	155
	Wood Product Manufacturing	5,584	3,699	546	16,540	91,223
	Paper Manufacturing	-	-	-	5,457	46,888
	Printing and Related Support Activi	1,027	740	696	7,943	86,769
	Petroleum and Coal Products Manufac	-	-	-	1,353	2,186
	Chemical Manufacturing	74	83	-	3,702	33,668
	Plastics and Rubber Products Manufa	634	274	610	10,443	73,822
	Nonmetallic Mineral Product Manufac	518	706	436	7,344	32,002
	Primary Metal Manufacturing	-	-	-	3,518	32,892
	Fabricated Metal Product Manufactur	2,985	1,029	1,397	16,420	163,230
	Machinery Manufacturing	2,509	268	1,569	12,309	153,717
	Computer and Electronic Product Man	513	-	-	28,589	123,594
	Electrical Equipment, Appliance, an	-	2	-	2,573	27,422
	Transportation Equipment Manufactur	1,318	239	555	57,187	111,588
	Furniture and Related Product Manuf	1,916	696	596	7,255	45,448
	Miscellaneous Manufacturing	1,379	1,349	354	9,267	62,161
Wholesale						
	Merchant Wholesalers, Durable Goods	10,704	6,935	6,663	65,894	323,850
	Merchant Wholesalers, Nondurable Go	8,750	4,965	6,654	45,295	220,949
	Wholesale Electronic Markets and Ag	394	502	501	5,213	23,423
Retail						
	Motor Vehicle and Parts Dealers	11,190	8,097	6,214	42,170	217,518
	Furniture and Home Furnishings Stor	2,277	1,785	986	11,292	53,533
	Electronics and Appliance Stores	1,694	1,292	1,158	9,251	46,517

APPENDIX A. COUNTY BUSINESS PATTERNS STATE-LEVEL SUMMARY FOR 2003, NAICS

	Number of Employees				
Building Material and Garden Equipm	6,951	5,376	3,922	26,591	148,144
Food and Beverage Stores	10,149	7,776	6,430	59,469	290,778
Health and Personal Care Stores	2,647	1,847	1,834	15,977	78,862
Gasoline Stations	5,585	4,997	4,596	16,512	129,653
Clothing and Clothing Accessories S	4,295	2,885	2,346	28,791	120,754
Sporting Goods, Hobby, Book, and Mu	3,834	3,384	1,569	15,653	73,853
General Merchandise Stores	12,025	7,676	6,189	49,101	263,155
Miscellaneous Store Retailers	3,694	3,435	1,926	20,253	93,733
Nonstore Retailers	1,657	966	1,370	10,541	59,809
Transportation and Warehousing					
Air Transportation	978	670	-	12,622	42,647
Water Transportation	.	-	.	2,591	2,650
Truck Transportation	6,349	4,486	4,366	22,146	173,866
Transit and Ground Passenger Transp	1,023	1,070	303	5,401	34,813
Pipeline Transportation	-	-	-	363	1,032
Scenic and Sightseeing Transportati	-	13	-	346	486
Support Activities for Transportati	547	883	519	11,907	32,688
Couriers and Messengers	1,231	1,052	338	8,596	35,237
Warehousing and Storage	1,158	32	191	7,515	30,326
	168,391	102,593	83,343	883,385	4,535,560

Source: U.S. Census Bureau, 2005a

APPENDIX B. COUNTY BUSINESS PATTERNS NATIONAL SUMMARY FOR 2003, NAICS

Number of Employees

Industry		U.S. Total Freight Employees	Share
Forestry, Fishing, Hunting, and Agriculture			
	Forestry & logging	75,818	0.2%
	Fishing, hunting & trapping	8,945	0.0%
	Support activities for agriculture & forestry	95,910	0.2%
Mining			
	Oil and gas extraction	83,447	0.2%
	Mining, except oil and gas	184,423	0.4%
	Support activities for mining	186,680	0.4%
Utilities			
	Utilities	675,938	1.4%
Construction			
	Construction of buildings	1,491,688	3.2%
	Heavy and civil engineering construction	910,946	2.0%
	Specialty trade contractors	3,978,770	8.5%
Manufacturing			
	Food mfg	1,495,998	3.2%
	Beverage & tobacco product mfg	155,161	0.3%
	Textile mills	254,838	0.5%
	Textile product mills	187,526	0.4%
	Apparel mfg	303,654	0.7%
	Leather & allied product mfg	44,113	0.1%
	Wood product mfg	523,984	1.1%
	Paper mfg	482,232	1.0%
	Printing & related support activities	700,221	1.5%
	Petroleum & coal products mfg	98,334	0.2%
	Chemical mfg	841,375	1.8%
	Plastics & rubber products mfg	921,392	2.0%
	Nonmetallic mineral product mfg	467,644	1.0%
	Primary metal mfg	479,693	1.0%
	Fabricated metal product mfg	1,518,266	3.3%
	Machinery mfg	1,129,140	2.4%
	Computer & electronic product mfg	1,189,485	2.6%
	Electrical equipment, appliance, & component m	459,993	1.0%
	Transportation equipment mfg	1,606,713	3.4%
	Furniture & related product mfg	564,414	1.2%
	Miscellaneous mfg	707,844	1.5%
Wholesale			
	Durable goods merchant wholesalers	3,312,720	7.1%
	Nondurable goods merchant wholesalers	2,287,616	4.9%
	Wholesale electronic markets and agents and br	263,524	0.6%
Retail			
	Motor vehicle & parts dealers	1,921,158	4.1%
	Furniture & home furnishings stores	560,717	1.2%

APPENDIX B. COUNTY BUSINESS PATTERNS NATIONAL SUMMARY FOR 2003, NAICS

	Number of Employees	
Electronics & appliance stores	419,321	0.9%
Building material & garden equipment & supplie	1,189,772	2.6%
Food & beverage stores	2,883,781	6.2%
Health & personal care stores	969,863	2.1%
Gasoline stations	936,492	2.0%
Clothing & clothing accessories stores	1,467,427	3.1%
Sporting goods, hobby, book, & music stores	602,996	1.3%
General merchandise stores	2,525,180	5.4%
Miscellaneous store retailers	819,281	1.8%
Nonstore retailers	571,837	1.2%
Transportation and Warehousing		
Air transportation	533,799	1.1%
Water transportation	67,329	0.1%
Truck transportation	1,423,286	3.1%
Transit & ground passenger transportation	397,949	0.9%
Pipeline transportation	41,003	0.1%
Scenic & sightseeing transportation	22,523	0.0%
Support activities for transportation	504,604	1.1%
Couriers & messengers	534,112	1.1%
Warehousing & storage	543,330	1.2%
	46,624,205	

Source: U.S. Census Bureau, 2005a

APPENDIX C. COUNTY BUSINESS PATTERNS NATIONAL SUMMARY FOR FOOD MANUFACTURING

Number of Employees at the Six-Digit NAICS, 2003

NAICS	NAICS Description	Number of Employees
311111	Dog & cat food mfg	14,712
311119	Other animal food mfg	32,626
311211	Flour milling	11,325
311212	Rice milling	4,388
311213	Malt mfg	886
311221	Wet corn milling	8,830
311222	Soybean processing	7,407
311223	Other oilseed processing	1,637
311225	Fats & oils refining & blending	7,705
311230	Breakfast cereal mfg	12,740
311311	Sugarcane mills	5,114
311312	Cane sugar refining	2,742
311313	Beet sugar mfg	5,052
311320	Chocolate & confectionery mfg from cacao beans	9,825
311330	Confectionery mfg from purchased chocolate	33,554
311340	Nonchocolate confectionery mfg	23,343
311411	Frozen fruit, juice, & vegetable mfg	35,427
311412	Frozen specialty food mfg	51,089
311421	Fruit & vegetable canning	49,276
311422	Specialty canning	13,044
311423	Dried & dehydrated food mfg	14,927
311511	Fluid milk mfg	56,716
311512	Creamery butter mfg	1,891
311513	Cheese mfg	38,928
311514	Dry, condensed, & evaporated dairy product mfg	15,026
311520	Ice cream & frozen dessert mfg	21,726
311611	Animal (except poultry) slaughtering	158,167
311612	Meat processed from carcasses	98,051
311613	Rendering & meat byproduct processing	8,279
311615	Poultry processing	235,401
311711	Seafood canning	4,047
311712	Fresh & frozen seafood processing	35,533
311811	Retail bakeries	65,718
311812	Commercial bakeries	164,268
311813	Frozen cakes, pies, & other pastries mfg	21,045
311821	Cookie & cracker mfg	34,010
311822	Flour mixes & dough mfg from purchased flour	14,567
311823	Dry pasta mfg	4,167
311830	Tortilla mfg	13,265
311911	Roasted nuts & peanut butter mfg	11,980
311919	Other snack food mfg	33,389
311920	Coffee & tea mfg	12,581

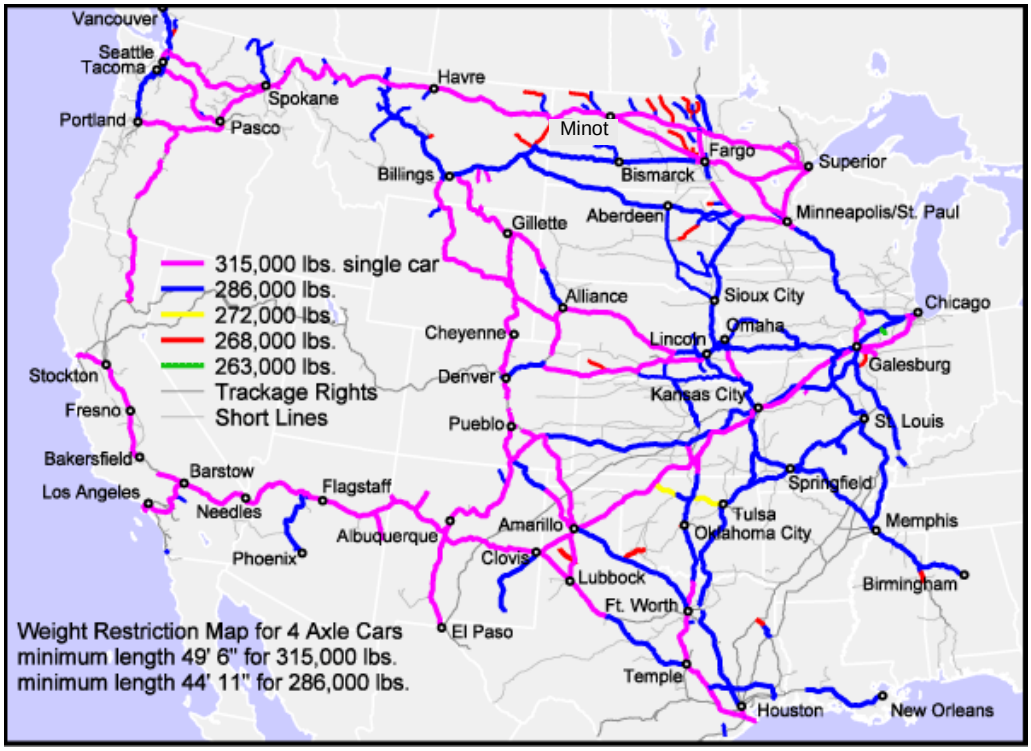
APPENDIX C. COUNTY BUSINESS PATTERNS NATIONAL SUMMARY FOR FOOD MANUFACTURING

Number of Employees at the Six-Digit NAICS, 2003

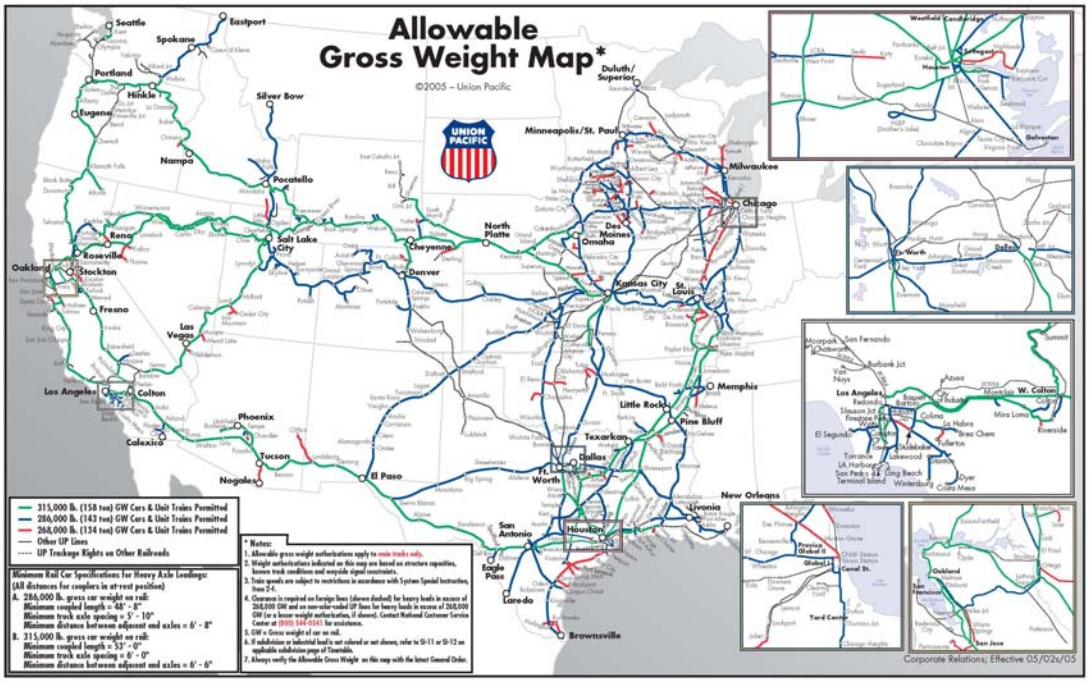
311930	Flavoring syrup & concentrate mfg	5,122
311941	Mayonnaise, dressing, & other prepared sauce	13,765
311942	Spice & extract mfg	14,847
311991	Perishable prepared food mfg	32,242
311999	All other miscellaneous food mfg	35,618
311	**Total Food Manufacturing**	**1,495,998**

Source: U.S. Census Bureau, 2005a

APPENDIX D: RAIL ALLOWABLE GROSS WEIGHT, BNSF AND UP



Source: BNSF 2006.



Source: UP Railroad 2006.

APPENDIX E. INDIVIDUAL BORDER CROSSING TRAFFIC IN THE NORPAC REGION, AVERAGE 2001-2004

State	Border Point	Trucks	Truck Containers	Rail Containers	Trains	Trucks and Truck Containers
ID	Eastport	45,216	45,185	69,282	871	159,682
ID	Porthill	8,235	8,094	-	-	16,329
MT	Sweetgrass	125,172	125,367	30,452	369	280,991
MT	Roosville	24,263	24,279	-	-	48,542
MT	Raymond	19,226	19,003	-	-	38,230
MT	Wildhorse	2,298	2,163	-	-	4,461
MT	Piegan	2,099	2,105	-	-	4,204
MT	Morgan	1,803	1,892	-	-	3,694
MT	Opheim	1,411	1,350	-	-	2,761
MT	Del Bonita	1,056	1,050	-	-	2,106
MT	Scobey	916	907	-	-	1,823
MT	Whitlash	466	556	-	-	1,022
MT	Turner	392	393	-	-	785
MT	Whitetail	210	191	-	-	401
ND	Pembina	208,236	210,643	750	87	419,629
ND	Portal	60,880	61,759	202,515	1,957	325,154
ND	Dunseith	20,083	20,267	-	-	40,350
ND	Neche	15,062	16,007	-	-	31,069
ND	Walhalla	11,883	11,807	-	-	23,689
ND	Westhope	6,361	5,959	-	-	12,319
ND	Northgate	4,644	4,638	113	5	9,394
ND	Fortuna	4,689	4,676	-	-	9,365
ND	Sherwood	2,186	2,158	-	-	4,344
ND	St. John	1,890	1,844	-	-	3,734
ND	Sarles	1,754	1,763	-	-	3,516
ND	Noonan	1,852	1,439	-	-	3,291
ND	Hansboro	1,629	1,630	-	-	3,259
ND	Maida	1,595	1,582	-	-	3,177
ND	Antler	1,276	1,270	-	-	2,546
ND	Carbury	1,150	998	-	-	2,148
ND	Hannah	259	263	-	-	522
ND	Ambrose	130	118	-	-	248
WA	Blaine	404,694	402,201	95,313	1,530	902,209
WA	Sumas	136,624	139,360	4,664	722	280,647
WA	Lynden	53,086	47,948	-	-	101,034
WA	Oroville	38,901	38,982	-	-	77,883
WA	Frontier	20,626	20,806	9,885	217	51,317

WA	Laurier	10,910	10,912	5,628	240	27,449
WA	Point Roberts	13,930	4,622	-	-	18,552
WA	Metaline Falls	6,116	6,575	-	-	12,691
WA	Ferry	3,195	2,450	-	-	5,644
WA	Danville	1,495	1,549	2,100	212	5,143
WA	Port Angeles	1,305	-	-	-	1,305
WA	Anacortes	1,261	-	-	-	1,261
WA	Boundary	409	-	-	65	409
WA	Nighthawk	19	-	-	-	19
WA	Friday Harbor	-	-	-	-	-

Source: Bureau of Transportation Statistics, 2006b

APPENDIX F. RANK OF ORIGINS FOR FRIEGHT SHIPPED TO NORPAC, BY STATE

	Destination				
Origin	ID	MT	ND	WA	Share of NORPAC4 Total
	Rank for Volume in 1,000 Tons				
Washington	1	7	7		37.7%
Idaho	-	9	33	4	13.1%
North Dakota	32	13		46	12.0%
Montana	6		12	8	7.5%
Minnesota	24	1	1	6	5.7%
Oregon	3	6	30	1	5.5%
E Asia	4	12	13	2	3.8%
Wisconsin	20	2	2	13	2.7%
California	5	8	5	3	2.0%
Illinois	8	3	8	7	1.5%
Canada	10	5	6	5	1.5%
Michigan	31	4	23	24	0.7%
Utah	2	14	52	12	0.7%
New York	17	24	3	22	0.4%
Texas	9	17	10	14	0.4%
South Dakota	48	16	4	52	0.3%
Wyoming	12	11	37	48	0.3%
Indiana	23	10	36	41	0.3%
Colorado	7	21	24	18	0.3%
Arizona	14	18	42	10	0.3%
Iowa	22	23	15	9	0.3%
Pennsylvania	16	19	19	23	0.2%
Nevada	11	20	47	29	0.2%
Ohio	13	30	17	21	0.2%
Missouri	19	26	11	32	0.2%
Florida	18	27	35	17	0.2%
Georgia	15	33	28	19	0.1%
Kansas	26	47	9	47	0.1%
Africa	29	32	34	11	0.1%
Mexico	27	25	27	15	0.1%
Maine	47	15	46	51	0.1%
Europe	37	41	16	25	0.1%
Tennessee	21	37	20	35	0.1%
Nebraska	28	29	14	44	0.1%
Virginia	44	42	18	30	0.1%
Alabama	30	22	44	38	0.1%
SW Asia	35	40	48	20	0.1%
Kentucky	25	28	41	36	0.1%
Hawaii	na	na	na	16	0.1%
New Jersey	36	34	31	33	0.1%
Massachusetts	33	36	26	39	0.1%
North Carolina	40	31	25	40	0.1%

Oklahoma	39	46	32	34	0.1%
West Virginia	34	51	50	27	0.1%
L & S America	42	44	40	31	0.1%
New Mexico	49	43	21	43	0.0%
Louisiana	38	35	22	49	0.0%
Arkansas	50	38	49	28	0.0%
Alaska	na	52	55	26	0.0%
Maryland	41	49	29	45	0.0%
Connecticut	51	48	51	37	0.0%
Delaware	na	na	39	42	0.0%
South Carolina	43	45	53	50	0.0%
New Hampshire	52	39	43	53	0.0%
Mississippi	46	50	45	55	0.0%
Vermont	na	na	38	54	0.0%
Rhode Island	45	na	54	56	0.0%
	99,194	96,974	104,031	281,392	

n.a.: volume is less than 1,000 tons
Source: FHWA

APPENDIX G. RANK OF NORPAC4 MARKET DESTINATIONS, BY STATE

Rank for Volume in 1,000 Tons

Destination	Origin ID	MT	ND	WA	Share of NORPAC4 Total
Minnesota	24	1	1	6	19.3%
Oregon	3	6	30	1	18.5%
Asia	4	12	13	2	12.9%
Wisconsin	20	2	2	13	9.2%
California	5	8	5	3	6.6%
Illinois	8	3	8	7	5.2%
Canada	10	5	6	5	5.1%
Michigan	31	4	23	24	2.5%
Utah	2	14	na	12	2.3%
New York	17	24	3	22	1.4%
Texas	9	17	10	14	1.3%
South Dakota	48	16	4	52	1.1%
Wyoming	12	11	37	48	1.1%
Indiana	23	10	36	41	1.0%
Colorado	7	21	24	18	0.9%
Arizona	14	18	42	10	0.9%
Iowa	22	23	15	9	0.9%
Pennsylvania	16	19	19	23	0.7%
Nevada	11	20	na	29	0.7%
Ohio	13	30	17	21	0.6%
Missouri	19	26	11	32	0.6%
Florida	18	27	35	17	0.5%
Georgia	15	33	28	19	0.5%
Kansas	26	na	9	47	0.5%
Africa	29	32	34	11	0.5%
Mexico	27	25	27	15	0.4%
Maine	47	15	46	51	0.3%
Europe	37	na	16	25	0.3%
Tennessee	21	37	20	35	0.3%
Nebraska	28	29	14	44	0.3%
Virginia	44	na	18	30	0.3%
Alabama	30	22	44	38	0.3%
SW Asia	35	40	na	20	0.2%
Kentucky	25	28	41	36	0.2%
Hawaii	na	na	na	16	0.2%
New Jersey	36	34	31	33	0.2%
Massachusetts	33	36	26	39	0.2%
North Carolina	40	31	25	40	0.2%
Oklahoma	39	na	32	34	0.2%
West Virginia	34	na	na	27	0.2%
L & S America	42	na	40	31	0.2%
New Mexico	49	na	21	43	0.2%
Louisiana	38	35	22	49	0.2%

Arkansas	50	38	na	28	0.1%
Alaska	na	na	na	26	0.1%
Maryland	41	na	29	45	0.1%
Connecticut	51	na	na	37	0.1%
Delaware	na	na	39	42	0.1%
South Carolina	43	na	na	50	0.1%
New Hampshire	na	39	43	na	0.0%
Mississippi	46	na	45	na	0.0%
Vermont	na	na	38	na	0.0%
Rhode Island	45	na	na	na	0.0%
Washington	1	7	7	na	0.0%
North Dakota	32	13	na	46	0.0%
Montana	6	na	12	8	0.0%
Idaho	na	9	33	4	0.0%

n.a.: volume is less than 1,000 tons
Source: FHWA

APPENDIX H. PORT GATEWAYS FOR FREIGHT ORIGINATED AND RECEIVED BY THE NORPAC4 REGION

1,000 Tons

	Traffic Originated						Traffic Received						Total Traffic
State and Port	ID	MT	ND	WA	NP4	NP12	ID	MT	ND	WA	NP4	NP12	US
WA Seattle	69	14	112	9,965	10,160	12,942	122	72	3	9,548	9,746	10,551	25,935
WA remainder	1,310	118	139	9,106	10,673	12,224	303	97	4	6,416	6,820	7,752	21,840
WA Blaine	42	72	16	1,382	1,512	2,262	169	105	40	3,359	3,673	5,840	13,794
OR Portland	808	585	39	1,922	3,354	9,614	100	9	0	680	789	3,570	15,255
MT	130	592	79	45	846	1,364	290	1,731	123	417	2,562	3,146	7,968
ND	29	75	703	41	849	3,592	18	20	1,722	147	1,908	8,599	21,009
WI remainder	3	2,393	114	0	2,510	8,631	2	1	0	1	5	438	9,701
ID	115	25	1	219	360	542	519	33	1	527	1,080	3,076	5,931
MI Detro	328	74	172	332	906	8,554	22	14	15	135	186	6,852	90,337
MN remainder	7	271	307	5	590	5,200	3	39	313	65	419	3,936	11,596
CA Los Angeles	59	33	10	213	315	1,824	141	102	13	391	648	1,532	77,607
TX Laredo	69	52	30	182	333	3,223	61	1	8	44	114	1,750	37,704
Total for These 12 Gateways	2,968	4,303	1,723	23,413	32,407	69,972	1,750	2,224	2,243	21,731	27,948	57,042	338,677
All Gateways	3,378	4,472	1,928	24,307	34,085	115,658	1,902	2,329	2,352	22,539	29,122	75,101	1,158,998
Share for 12 Gateways	88%	96%	89%	96%	95%	60%	92%	96%	95%	96%	96%	76%	29%

Source: FHWA, 2006

APPENDIX I. NORPAC4 COMMODITIES ORIGINATED AND TERMINATED, BY STATE

Unit is 1,000 Tons, Percent of State Total

	Traffic Originated								Traffic Terminated							
	ID		MT		ND		WA		ID		MT		ND		WA	
Cereal grains	38,484	39%	11,712	12%	56,723	55%	20,627	7%	33,564	36%	9,222	18%	36,290	44%	18,740	6%
Gravel and crushed stone	1,480	1%	2,485	3%	4,318	4%	80,682	29%	1,563	2%	2,491	5%	5,158	6%	65,410	21%
Logs and rough wood	9,701	10%	4,407	5%	57	0%	24,948	9%	9,678	10%	3,910	8%	249	0%	21,810	7%
Coal	9	0%	44,570	46%	6,169	6%	17	0%	283	0%	5,780	11%	6,280	8%	5,968	2%
Waste and scrap	3,244	3%	1,997	2%	4,911	5%	22,632	8%	2,804	3%	2,024	4%	4,989	6%	21,892	7%
Other agricultural products	10,263	10%	487	1%	6,067	6%	15,808	6%	6,239	7%	684	1%	4,337	5%	12,062	4%
Nonmetallic minerals n.e.c.	3,346	3%	6,275	6%	3,478	3%	10,342	4%	4,107	4%	2,829	5%	4,796	6%	12,851	4%
Gasoline and aviation fuel	2,472	2%	4,931	5%	3,848	4%	12,458	4%	2,382	3%	4,880	9%	3,630	4%	12,907	4%
Wood products	4,937	5%	3,925	4%	550	1%	17,019	6%	4,288	5%	2,320	4%	959	1%	11,407	4%
Coal and petroleum products	1,611	2%	2,827	3%	2,068	2%	7,290	3%	2,405	3%	2,113	4%	2,418	3%	8,609	3%
Crude Petroleum	1	0%	587	1%	12	0%	253	0%	1	0%	587	1%	12	0%	27,534	9%
Other prepared foodstuffs	4,826	5%	914	1%	4,127	4%	6,800	2%	2,117	2%	900	2%	1,832	2%	7,393	2%
Fuel oils	998	1%	2,928	3%	2,362	2%	5,679	2%	2,110	2%	3,046	6%	2,090	3%	7,112	2%
Animal feed and animal prod	1,222	1%	334	0%	1,961	2%	8,948	3%	1,282	1%	493	1%	688	1%	10,273	3%
Transportation equipment	3,498	4%	1,556	2%	1,498	1%	5,636	2%	2,946	3%	1,496	3%	1,285	2%	6,096	2%
Mixed freight	620	1%	701	1%	561	1%	6,711	2%	1,581	2%	1,335	3%	609	1%	7,479	2%
Natural sands	1,441	1%	1,326	1%	562	1%	3,143	1%	714	1%	1,383	3%	935	1%	5,405	2%
Fertilizers	1,916	2%	618	1%	393	0%	2,832	1%	1,152	1%	645	1%	2,354	3%	3,581	1%
Machinery	1,057	1%	495	1%	848	1%	2,152	1%	1,056	1%	643	1%	632	1%	6,292	2%
Live animals and live fish	2,757	3%	912	1%	421	0%	1,744	1%	2,687	3%	907	2%	388	0%	2,154	1%
Top 20 Commodities	93,883		93,987		100,934		255,723		82,959		47,687		79,931		274,975	
All Commodities	99,194		96,974		104,031		281,392		92,543		51,648		82,505		308,794	
Top 20 Share of All	95%		97%		97%		91%		90%		92%		97%		89%	
Agriculture Share of All	75%		19%		64%		24%		53%		28%		55%		19%	

Includes commodities accounting for at least 1% of NORPAC4 traffic.

Agriculture Commodities in Bold

Source: FHWA

APPENDIX J. NORPAC4 INTRASTATE SHIPMENTS, BY STATE AND COMMODITY

Commodity	ID	MT	ND	WA
		1,000 Tons		
Alcoholic beverages	288	237	174	1,030
Animal feed and products of animal origin, n.e.c.	738	188	214	7,798
Articles of base metal	480	227	169	1,389
Base metal in primary or semi-finished forms and in finished basic shapes	221	57	33	835
Basic chemicals	25	40	14	1,409
Monumental or building stone	47	24	19	740
Cereal grains	32,030	8,416	34,928	11,117
Chemical products and preparations, n.e.c.	134	135	99	602
Coal	7	5,232	6,169	16
Coal and petroleum products, n.e.c.	1,198	1,330	1,620	5,776
Crude Petroleum	1	587	12	253
Electronic and other electrical equipment and components and office equipment	50	42	21	377
Fertilizers	669	186	247	2,545
Fuel oils	853	2,680	2,078	5,470
Furniture, mattresses and mattress supports, lamps, lighting fittings	63	40	32	373
Gasoline and aviation turbine fuel	1,791	4,697	3,511	11,567
Gravel and crushed stone	1,143	2,397	3,686	64,878
Live animals and live fish	2,449	871	322	1,469
Logs and other wood in the rough	8,348	3,563	43	18,455
Machinery	797	422	423	1,371
Meat, fish, seafood, and their preparations	115	55	38	315
Metallic ores and concentrates	7	4	10	3,120
Milled grain products and preparations, bakery products	117	79	101	997
Miscellaneous manufactured products	218	44	34	402
Mixed freight	420	472	335	4,964
Motorized and other vehicles (including parts)	129	73	36	204
Natural sands	686	1,303	509	2,787
Nonmetallic mineral products	67	24	22	614
Nonmetallic minerals n.e.c.	2,753	2,079	2,808	9,144
Other agricultural products	5,892	441	3,617	9,449
Other prepared foodstuffs and fats and oils	1,469	702	1,046	4,083
Paper or paperboard articles	377	31	48	1,271
Pharmaceutical products	74	19	16	76
Plastics and rubber	61	13	17	319
Precision instruments and apparatus	10	4	9	75
Printed products	85	13	9	280
Pulp, newsprint, paper, and paperboard	84	44	200	507
Textiles, leather, and articles of textiles or leather	9	7	4	26
Tobacco products	132	63	59	273
Transportation equipment, n.e.c.	2,699	1,381	1,103	5,047
Waste and scrap	2,590	1,896	4,719	20,679
Wood products	1,818	997	311	6,764
Intrastate Freight Total	71,143	41,113	68,866	208,865
Total Freight Originated	99,194	96,974	104,031	281,392
Instate Share of Total	72%	42%	66%	74%

Source: FHWA, 2006.

APPENDIX K. TOP 25 COMMODITIES, BASED ON 2005 MERCHANDISE EXPORT VALUES

	Idaho		Montana		North Dakota		Washington	
	Total Export Value	**3,260**	**Total Export Value**	**711**	**Total Export Value**	**1,185**	**Total Export Value**	**37,948**
	Top 25 Share of State Total	**80.4**	**Top 25 Share of State Total**	**73.2**	**Top 25 Share of State Total**	**71.9**	**Top 25 Share of State Total**	**74.3**
Rank	**Commodity**	**Share**	**Commodity**	**Share**	**Commodity**	**Share**	**Commodity**	**Share**
1	Digital Monolithic Integrated Circuits	19.4	Pts Of Mach/Mechncl Appl W Indvdul Function Nesoi	9.5	Mech Front-End Shovel Loaders, Self-Propelled	19.4	Airplane & Ot A/C, Unladen Weight > 15,000 Kg	48.4
2	Parts & Accessories For Adp Machines & Units	10.1	Copper Ores And Concentrates	7.9	Tractors, Nesoi	10.1	Parts Of Airplanes Or Helicopters, Nesoi	3.9
3	Monolithic Integrated Circuits, Other Than Digital	7.8	Lead Ores And Concentrates	6.7	Mech Shovels Excavators Etc W 360 Degree Sprstruc	7.8	Soybeans, Whether Or Not Broken	3.8
4	Fertilizers, Exports Only Incl Other Crude Mat'ls	4.8	Copper Oxides And Hydroxides	6.5	Parts And Attachments Nesoi For Derricks Etc.	4.8	Corn (Maize), Other Than Seed Corn	2.7
5	Potatoes, Prepared Etc., No Vinegar Etc., Frozen	3.9	Wheat (Other Than Durum Wheat), And Meslin	5.2	Seeders, Planters And Transplanters	3.9	Oil (Not Crude) From Petrol & Bitum Mineral Etc.	2.2
6	Parts, Nesoi, Of Locomotives	2.5	Inorganic Compounds Nesoi; Liq Air; Amalgams Nesoi	4.9	Sunflower Seeds, Whether Or Not Broken	2.5	Wheat (Other Than Durum Wheat), And Meslin	1.5
7	Kraft Pr Nesoi, Ov150g/M2und225g/M2, Bl, 95% Wf Uc	2.4	Kraftliner, Uncoated Unbleached In Rolls Or Sheets	4.9	Rapeseed/Colza Oil & Fractions, Lw Erucic Acid,Crd	2.4	Coniferous Wood In The Rough, Not Treated	1.1
8	Ppr/Pbrd,Ctd/Impg/Cvr W/Plast,Bleach,Wt>150g/M2	2.2	Mach & Mechanical Appl W Individual Function Nesoi	4.6	Soybean Oilcake & Oth Solid Residue, Wh/Not Ground	2.2	Digital Monolithic Integrated Circuits	1.1
9	Cards Incorp. Elec. Integrated Crct (Smart Cards)	2.0	Herbicides, Antisprouting Products Etc, Retail Etc	2.9	Crude Oil From Petroleum And Bituminous Minerals	2.0	Apples, Fresh	1.0

APPENDIX K. TOP 25 COMMODITIES, BASED ON 2005 MERCHANDISE EXPORT VALUES

	Idaho		Montana		North Dakota		Washington	
10	Pts Of Inst F Meas Elect Quat Alpha Beta Inzng Rdt	1.8	Natural Steatite And Talc, Crushed Or Powdered	2.1	Sunflower-Seed Or Safflower Oil, Refine, Fract Etc	1.8	Ultrasonic Scanning Apparatus	1.0
11	Flakes, Granules And Pellets Of Potatoes	1.7	Portland Cement Except White Portland Cement	2.1	Magnetic Tape Unrecorded Width Exceeding 6.5 Mm	1.7	Fork-Lift And Works Trucks, Nesoi	0.9
12	Kraft Paper Nov150g/M2, Bleach, 95% W Fib Ch Pr Ct	1.5	Crude Oil From Petroleum And Bituminous Minerals	1.8	Peas, Dried Shelled, Including Seed	1.5	Silicon Contain By Wt Nt < 99.99% Of Silicon	0.7
13	Vegetable Seeds For Sowing	1.3	Fiberbd Ligneous Ov .5 Nov .8g/Cm3 Nt Mechanicl Wk	1.4	Phenol (Hydroxybenzene) And Its Salts	1.3	Potatoes, Prepared Etc., No Vinegar Etc., Frozen	0.7
14	Lead Ores And Concentrates	1.3	Zinc Ores And Concentrates	1.4	Soybeans, Whether Or Not Broken	1.3	Forage Products Nesoi (Hay, Clover, Vetches, Etc)	0.6
15	Lactose In Solid Form And Lactose Syrup, Nesoi	1.1	Platinum, Unwrought Or Powder	1.4	Lentils, Dried Shelled, Including Seed	1.1	Ppr/Pbrd,Ctd/Impg/Cvr W/Plast,Bleach,Wt>150g/M2	0.6
16	Photo Plates & Film, Expos & Devl, Nesoi	1.1	Compression-Igntn Int Combustion Piston Eng, Nesoi	1.4	Oil (Not Crude) From Petrol & Bitum Mineral Etc.	1.1	Uranium Enriched In U235 Etc. Plutonium Etc.	0.6
17	Sweet Corn, Prepared/Preserved Nesoi, Not Frozen	1.0	Silicon Contain By Wt Nt < 99.99% Of Silicon	1.3	Low Erucic Acid Rape/Colza Seeds W/Not Broken	1.0	Road Tractors For Semi-Trailers	0.5
18	Food Preparations Nesoi	0.9	Pasta, Uncooked, Not Stuffed Etc., Containing Eggs	1.2	Mv Trnsp >Ten Prsns Com-Igntn Intr Comb Pist(Disl)	0.9	Newsprint, In Rolls Or Sheets	0.4
19	Ppr/Pbrd,Unct, Wt<=150g/M2, Rolls/Sheett, Nesoi	0.8	Pass Veh Spk-Ig Int Com Rcpr P Eng > 3000 Cc	1.0	Unrecorded Magnetic Discs	0.8	Ferrous Waste & Scrap Nesoi	0.4
20	Whole Hides & Skins, Of A Wt >16kg Bovine/Equine	0.8	Plywood, Ply Nov6mm, Both Outer Plies Coniferous	0.9	Pass Veh Com-Ig Int Com Eng > 2500 Cc	0.8	Truck, Diesel Eng, Gvw > 20 Metric Tons	0.4

APPENDIX K. TOP 25 COMMODITIES, BASED ON 2005 MERCHANDISE EXPORT VALUES

	Idaho		Montana		North Dakota		Washington	
21	Surface-Active, Washing Etc Prep Etc, Retail Sale	0.7	Turbojets Of A Thrust Exceeding 25 Kn	0.8	Beans Nesoi, Dried Shelled, Including Seed	0.7	Salmon, Prepared Or Preserved, Whole Or Pieces	0.4
22	Inst To Check Semiconduct Wafers &Such That Record	0.7	Parts & Accessories For Adp Machines & Units	0.8	Linseed Oilcake And Oth Solid Residues W/Nt Ground	0.7	Petroleum Coke, Calcined	0.4
23	Chem Wdpulp Sulfite Ex Dsslvng Gr Conif Semi/Blech	0.7	Barley	0.8	Parts Of Airplanes Or Helicopters, Nesoi	0.7	Port Digtl Automatic Data Process Mach Not > 10 Kg	0.3
24	Trailers & Semi-Trailer F Trans Cds Nesoi	0.7	Combine Harvester-Threshers	0.8	Turbojets Of A Thrust Exceeding 25 Kn	0.7	Soybean Oilcake & Oth Solid Residue, Wh/Not Ground	0.3
25	Copper Ores And Concentrates	0.7	Vacuum Pumps	0.8	Combine Harvester-Threshers	0.7	Automatic Data Processing Storage Units, N.E.S.O.I	0.3

Source: U.S. Census Bureau, 2006

APPENDIX L. NORPAC4 RAIL TRAFFIC ORIGINATIONS BY STATE AND COMMODITY, AVERAGE 2002-2004

Commodity	Average Annual Originating Tons	Average Annual Originating Cars	Average Annual Originating Ton-Miles
Idaho			
Farm Products	3,136,239	35,251	3,067,240,067
Lumber & Wood Products exc. Furniture	2,491,297	33,888	3,080,950,187
Nonmetallic Minerals	1,899,152	21,229	76,898,164
Food Products	1,781,584	23,143	2,498,577,345
Chemicals	1,071,817	11,139	1,164,231,175
Pulp, Paper and Allied Products	169,240	2,287	274,637,413
Waste and Scrap Material	134,499	1,688	115,147,657
Stone, Clay and Glass Products	105,729	997	48,287,959
Transportation Equipment	21,549	676	23,518,081
All Other Primary Metal Products	13,991	169	19,526,116
Montana			
Coal	27,873,729	240,385	26,797,653,535
Farm Products	3,917,276	38,286	3,918,150,170
Petroleum or Coal Products	3,001,781	33,964	1,909,526,903
Lumber & Wood Products exc. Furniture	1,957,653	24,027	2,578,264,947
Stone, Clay and Glass Products	552,627	5,860	514,529,613
Food Products	518,300	5,564	554,334,840
Pulp, Paper and Allied Products	433,627	6,853	456,969,400
Nonmetallic Minerals	258,231	2,649	225,421,848
Metallic Ores	184,082	1,968	144,155,927
Chemicals	174,333	1,840	173,484,880
Waste and Scrap Material	117,255	1,352	131,175,193
North Daktoa			
Farm Products	12,546,206	125,365	12,358,390,281
Coal	4,773,039	48,466	143,023,380
Food Products	4,678,047	50,699	4,453,355,805
Waste and Scrap Material	549,263	5,971	285,054,208
Chemicals	355,623	4,104	402,773,147
Petroleum or Coal Products	253,917	3,336	238,240,035
Nonmetallic Minerals	85,160	827	80,791,807
Lumber & Wood Products exc. Furniture	72,667	893	36,267,947
Machinery except Electrical	21,011	565	28,380,987
Stone, Clay and Glass Products	11,693	120	15,289,867
Washington			

APPENDIX L. NORPAC4 RAIL TRAFFIC ORIGINATIONS BY STATE AND COMMODITY, AVERAGE 2002-2004

Commodity	Average Annual Originating Tons	Average Annual Originating Cars	Average Annual Originating Ton-Miles
Miscellaneous Mixed Shipments	5,897,480	460,720	12,925,193,800
Lumber & Wood Products exc. Furniture	4,743,653	62,223	7,175,093,805
Waste and Scrap Material	3,367,511	121,024	1,143,342,564
Coal	2,333,264	19,376	478,319,052
Farm Products	1,562,394	19,171	961,101,807
Petroleum or Coal Products	1,497,679	17,016	640,037,556
Pulp, Paper and Allied Products	1,447,887	22,307	1,966,247,047
Food Products	1,216,831	22,204	2,405,959,796
All Other Primary Metal Products	769,504	9,015	947,259,011
Stone, Clay and Glass Products	657,040	7,472	419,531,876

Source: Surface Transportation Board, 2006

APPENDIX M. NORPAC4 RAIL TRAFFIC TERMINATIONS BY STATE AND COMMODITY, AVERAGE 2002-2004

Commodity	Average Annual Terminating Tons	Average Annual Terminating Cars	Average Annual Terminating Ton-Miles
Idaho			
Farm Products	2,663,401	27,836	2,417,664,430
Nonmetallic Minerals	2,587,044	27,997	199,872,730
Chemicals	1,520,261	15,924	1,115,701,020
Food Products	818,329	8,961	1,057,396,667
Lumber & Wood Products exc. Furniture	533,037	9,341	286,248,404
Petroleum or Coal Products	503,657	5,553	359,296,724
Coal	352,139	3,625	127,297,017
Waste and Scrap Material	254,400	2,748	373,904,093
Pulp, Paper and Allied Products	253,787	3,653	326,849,040
Stone, Clay and Glass Products	135,884	1,339	84,480,687
Montana			
Petroleum or Coal Products	1,655,329	18,665	355,111,983
Coal	934,398	8,203	264,849,683
Lumber & Wood Products exc. Furniture	477,132	5,747	273,385,083
Chemicals	326,592	3,417	329,740,023
Farm Products	288,901	2,965	141,649,257
Food Products	197,372	2,507	194,134,889
Metallic Ores	156,165	1,577	76,605,299
Nonmetallic Minerals	133,404	1,372	85,078,935
Stone, Clay and Glass Products	125,507	1,348	67,843,240
Waste and Scrap Material	100,701	1,833	97,713,824
North Dakota			
Coal	5,822,748	58,720	920,575,940
Farm Products	1,075,252	11,308	315,654,000
Chemicals	836,071	9,128	881,830,484
Nonmetallic Minerals	762,019	8,008	157,027,884
Stone, Clay and Glass Products	575,376	5,792	505,626,172
Food Products	256,237	3,351	74,394,637
Petroleum or Coal Products	196,832	2,476	146,029,183
All Other Primary Metal Products	193,139	2,183	174,850,584
Lumber & Wood Products exc. Furniture	119,773	1,413	147,226,027
Waste and Scrap Material	111,247	1,149	13,987,027

APPENDIX M. NORPAC4 RAIL TRAFFIC TERMINATIONS BY STATE AND COMMODITY, AVERAGE 2002-2004

Commodity	Average Annual Terminating Tons	Average Annual Terminating Cars	Average Annual Terminating Ton-Miles
Washington			
Farm Products	19,008,542	181,678	28,980,256,164
Miscellaneous Mixed Shipments	3,961,039	229,589	8,285,930,475
Coal	3,138,174	26,436	3,041,453,878
Food Products	3,054,262	39,592	5,114,498,021
Waste and Scrap Material	2,510,635	85,293	1,129,699,100
Chemicals	2,463,708	30,486	3,489,385,910
Lumber & Wood Products exc. Furniture	2,268,803	27,959	1,509,723,177
Petroleum or Coal Products	2,208,120	26,191	1,368,257,949
Containers, Shipping, Returned Empty	1,150,728	258,328	2,437,274,107
Stone, Clay and Glass Products	1,094,851	12,632	857,577,368

Source: Surface Transportation Board, 2006