

*Final Report*

# Great Plains International Trade Corridor Assessment

## *Connecting America's Energy and Agricultural Heartland*



*prepared for*

Texas Department of Transportation



*prepared by*

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# Executive Summary

Three nationally designated high-priority corridors, the Ports-to-Plains Corridor, the Heartland Expressway, and the Theodore Roosevelt Expressway, comprise the Great Plains International Trade Corridor (GPITC) traversing 2,333 miles through Texas, New Mexico, Oklahoma, Colorado, Nebraska, Wyoming, South Dakota, North Dakota, and Montana. Although the three corridor coalitions overseeing the development of their respective corridors have conducted independent studies, little has been done to document the transportation infrastructure and demand characteristics of the GPITC as a whole or understand the entire corridor's potential development opportunities.

With the exception of the corridor's linkage to Denver, Colorado, the GPITC is primarily rural, serving cities and towns with modest populations under 300,000. Agriculture has historically played, and will continue to play, a large role in the Great Plains economy. However, forecasted employment data indicates that service industries will grow at a faster rate than goods-dependent industries in the study area as the region continues to diversify. Also contributing to change is the growing volume of north-south trade associated with the North American Free Trade Agreement (NAFTA). Understanding the transportation-related impacts of emerging industries and shifting trade flows will help to identify development opportunities in the GPITC.

Based on the findings of this study, CS recommends that TxDOT and other GPITC stakeholders consider the following next-step activities:

- Determine the effects of high-growth industries or commodities on the GPITC's transportation infrastructure and economy.
- Assess the transportation impact of energy proposals, especially those related to renewable energy generation and transmission, and identify opportunities to encourage manufacturing and transportation support activities in the GPITC.
- Initiate studies similar to the *Ports-to-Plains Development and Management Plan* for the Heartland and Theodore Roosevelt Expressways to define and prioritize transportation improvements based on cost/benefit analysis. The North Dakota DOT recently released a request for proposals for a Theodore Roosevelt Expressway development and management plan.
- Initiate efforts to fill the known corridor data gaps, including commodity volumes, values, and transportation routings transported along GPITC segments.
- After identifying specific improvements, consider the use of economic benefit analysis tools to measure the direct and indirect economic effects of potential transportation improvements in the GPITC study area.

# 1.0 Introduction

The Great Plains International Trade Corridor (GPITC) is comprised of three nationally designated “High-Priority Corridors” through the Great Plains from Mexico to Canada. The 2,333-mile corridor runs north-south through Texas, New Mexico, Oklahoma, Colorado, Nebraska, Wyoming, South Dakota, North Dakota, and Montana. As shown in Figure 1.1, the GPITC consists of the following three “High-Priority Corridors”:

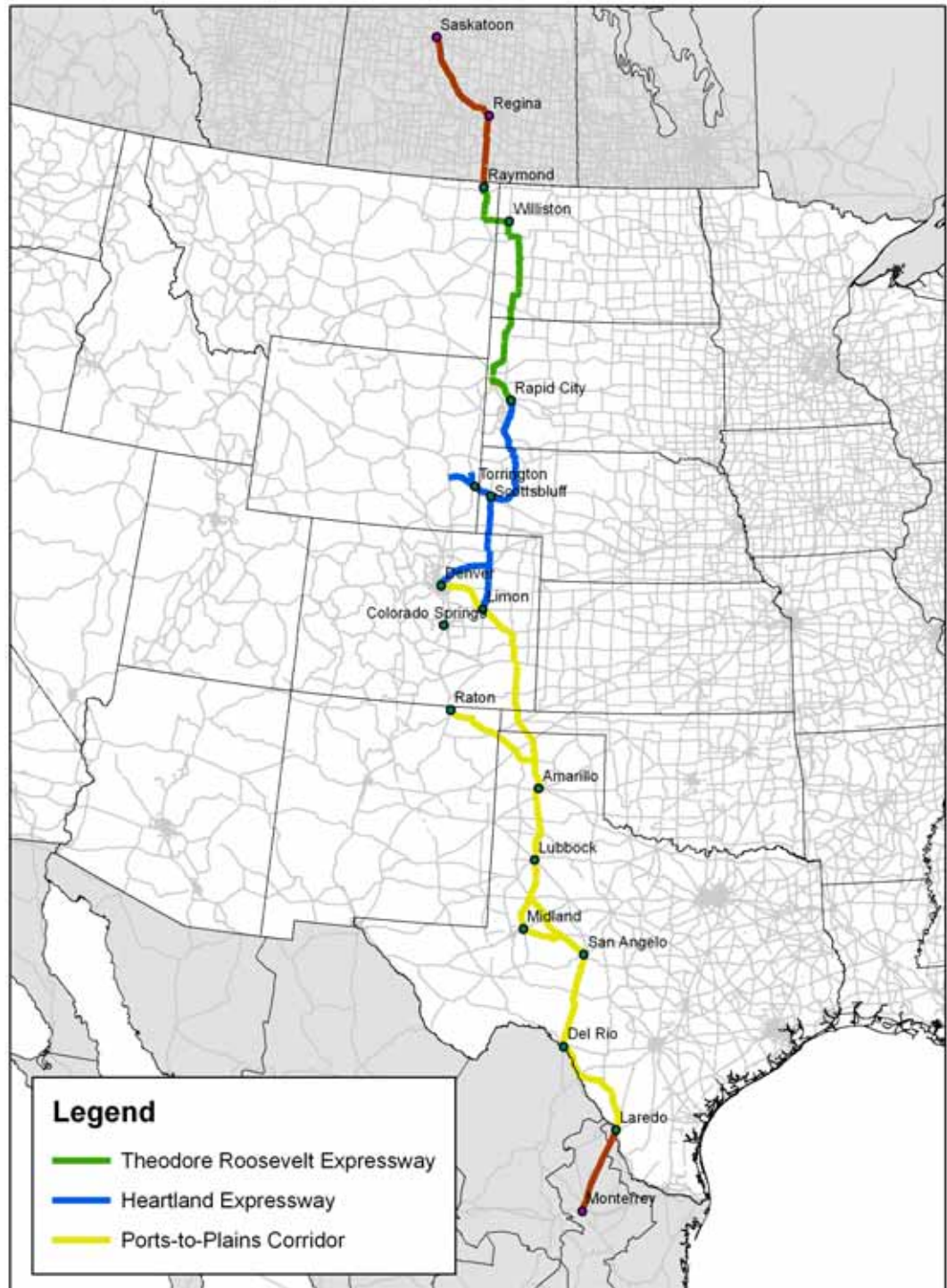
- **Ports-to-Plains Trade Corridor** (1,390 miles) – Commences at the Mexican border at Laredo, Texas, and links Del Rio, San Angelo, Lubbock, and Amarillo, Texas with Denver, Colorado via New Mexico and Oklahoma. From ports of entry at Del Rio, Eagle Pass, and Laredo, this route leads to the Mexican states of Coahuila, Nuevo Leon, and Tamaulipas and connects to major trade centers in Mexico, including Monterrey.
- **Heartland Expressway** (498 miles) – Connects Denver, Colorado and Rapid City, South Dakota via the Nebraska Panhandle.
- **Theodore Roosevelt Expressway** (445 miles) – Links Rapid City, South Dakota to Port Raymond, Montana via Williston, North Dakota. The corridor connects to the Canadian province of Saskatchewan and leads to Regina and Saskatoon, two primary cities in the province.

Stakeholders representing the three multi-state corridors have joined forces to form the Great Plains International Trade Corridor Coalition (Coalition) to advance the corridor’s development. Goals and outcomes of GPITC include:

- Connect metropolitan cities and regional trade centers;
- Promote and enhance domestic and international trade;
- Improve homeland security in central United States by enhancing the mobility of Great Plains military bases;
- Initiate economic growth within the Great Plains region;
- Develop a significant tourism corridor; and
- Provide connectivity to existing interstate highways.

To promote national and international trade and transportation, the GPITC plan proposes upgrading the existing highway facilities along the GPITC route to four-lane divided facilities. The designation as a High-Priority Corridor qualifies the GPITC for special Federal funding in addition to each state’s standard Federal highway fund allotment.

Figure 1.1 Great Plains International Trade Corridor Route



## 1.1 PROJECT PURPOSE

The Texas Department of Transportation (DOT) Government and Public Affairs (GPA) Division commissioned Cambridge Systematics, Inc. (CS) to develop a comprehensive overview of the needs and benefits of developing the GPITC. The purpose of the project is to identify potential corridor development opportunities that would bolster economic development through investment in highway, rail, or energy infrastructure. To that end, the study assesses the corridor's infrastructure, current and future demand, historical and forecasted shifts in population, and the geography of emerging industries. This study is intended to help Texas and the other states on the corridor determine next steps for study and implementation.

## 1.2 APPROACH

CS assembled a library of existing studies, reports, and data and conducted a literature review to identify current trade and traffic flows, key infrastructure assets, population and activity centers in the corridor, and planned roadway improvements. We used the information collected from the literature review to develop a snapshot of the corridor's key supply (infrastructure) and demand (trade and traffic flows) characteristics. We collected previous feasibility studies for the GPITC corridors, statewide and regional transportation plans, economic development studies, needs assessments, mobility studies, local newspaper articles, and university research reports. We provide a list of the documents we assembled for our literature review in Appendix A.

In addition to the information provided in previous reports and studies, we identified and used a broad range of data sources to profile the existing transportation infrastructure within the GPITC study area and to evaluate current and future demand. We based our analysis on existing demographic and socioeconomic data sources to characterize the historical, existing, and forecasted population and employment within the Great Plains region. We also assessed datasets that provided information on trade flows and the production and transport of agricultural products and other key commodities through the study area.

While we relied primarily on web-based resources for the literature review and data analysis, we supplemented our efforts with targeted telephone calls to representatives from the three multi-state corridor coalitions, state departments of transportation, economic development agencies, and renewable energy industry stakeholders. Our interviews with local officials provided additional insight into the emerging trends, industries, and planned projects in the GPITC.

To evaluate the demographic, socioeconomic, industry trends within the corridor, we identified a GPITC study area that includes all counties within a 100-mile buffer of the corridor's alignment. As a result, our study area is approximately 200 miles wide and includes the counties shown in Figure 1.2. We chose to exclude the mountainous counties west of Denver to avoid skewing



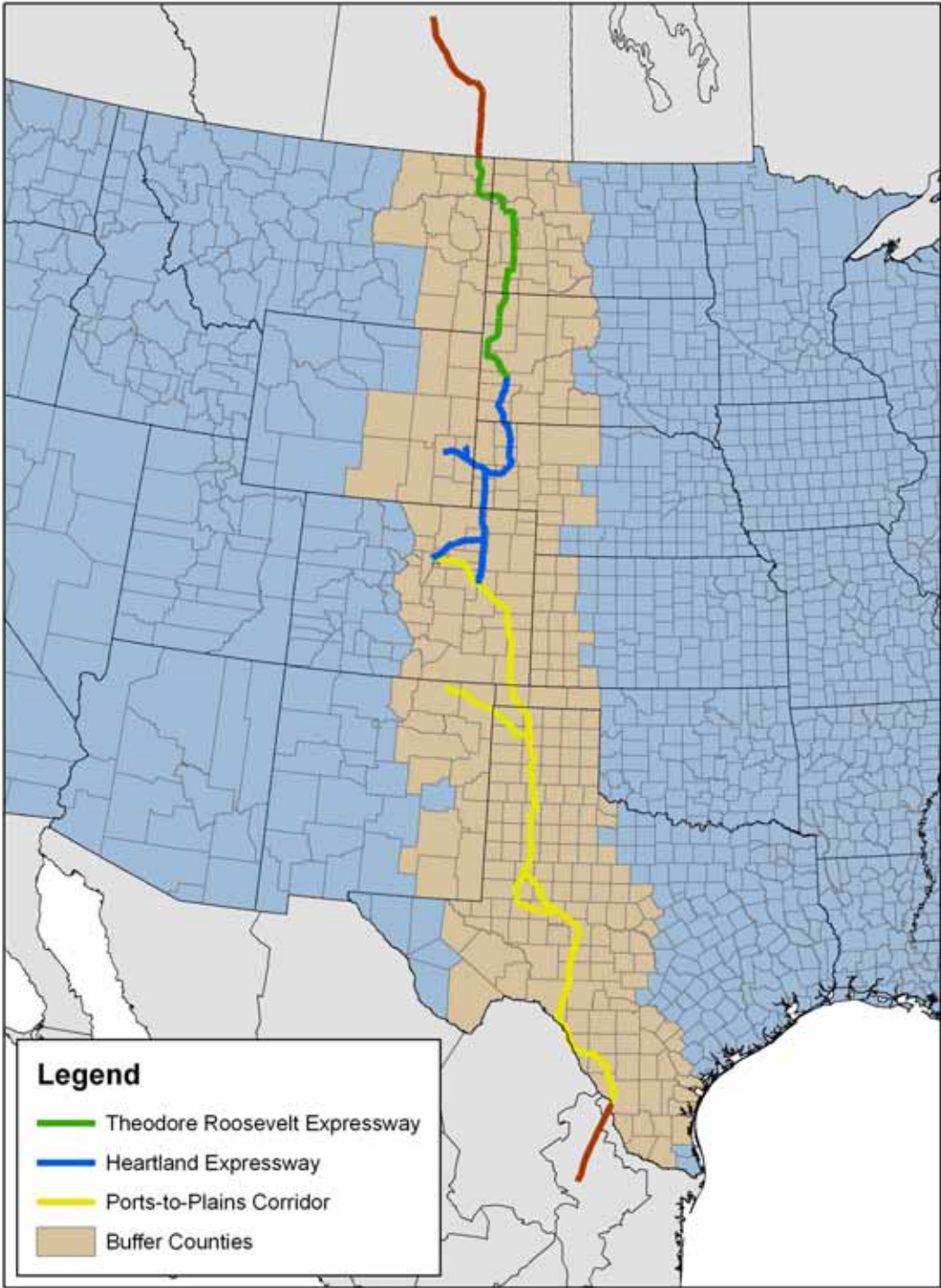
our Great Plains industry analysis with the services, recreation, and tourism data from the Rocky Mountain recreational areas. Similarly, we identified several counties within the buffered study area that included significant metropolitan populations (Denver, Colorado, and its suburbs; San Antonio, Texas; and Hidalgo County, Texas) that were located on the periphery of our study area but would exhibit demographic and industry trends that are inconsistent with a majority of the Great Plains corridor.<sup>1</sup> We conducted our industry analysis with and without these metropolitan counties to determine the economic influence of the major metropolitan areas along the periphery of the study area.

We synthesized the information from our literature review, data analysis, and targeted interviews in Technical Memorandum #1, describing both the current and future corridor views from a transportation planning perspective. Included as Appendix B, Technical Memorandum #1 inventories the GPITC transportation infrastructure, identifies major freight flows, and evaluates employment patterns to identify emerging industries.

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<sup>1</sup> We identified the following counties as peripheral metropolitan areas within our 100-mile buffer area: Denver, Larimer, Weld, Boulder, Jefferson, Adams, Arapahoe, Douglas, El Paso, Gilpin, Clear Creek, Park, Teller, Bexar, and Hidalgo.

Figure 1.2 Study Area Counties



## 1.3 REPORT OUTLINE

This report consolidates and summarizes the current and future corridor view findings from Technical Memorandum #1 (Appendix B) and identifies potential corridor development opportunities, particularly related to energy and agriculture. We provide a qualitative discussion of the potential benefits of each development opportunity to the GPITC states and local jurisdictions, as well as corridor needs and/or impediments to growth. The report also identifies existing data gaps and provides suggestions to GPITC stakeholders (including the multi-state corridor coalitions and their state DOT partners) to obtain data at a more corridor-specific level as they undertake future corridor development efforts. We conclude with several next-step recommendations.

We have organized this report as follows:

- **Section 2.0, Corridor View Summary**, presents a description of the GPITC study area including existing and planned transportation infrastructure assets as well as existing and forecasted population and employment growth. We also summarize the key agricultural commodities, natural resources, and trade flows through the corridor.
- **Section 3.0, Corridor Development Opportunities: Potential Benefits and Needs**, identifies industry trends and potential development opportunities along the corridor that will likely impact transportation demand and infrastructure.
- **Section 4.0, Data Gaps Analysis**, provides a comprehensive matrix of data needs and availability, identifies any data gaps or shortcomings, and describes strategies to remedy the data gaps for the purposes of this study or future GPITC studies.
- **Section 5.0, Next-Step Recommendations**, suggests compelling topics and future studies for GPITC stakeholders to consider for assistance in corridor transportation planning and economic development.

## 2.0 Corridor View Summary

This section summarizes the existing and future corridor views described in Technical Memorandum #1 (included in Appendix B). It includes an assessment of the GPITC's transportation infrastructure and demand characteristics. The transportation infrastructure description focuses on existing and planned highway, freight rail, and intermodal facilities in the study area, while the demand characteristics description focuses on existing and forecasted population, employment, travel demand, and commodity flows.

### 2.1 INFRASTRUCTURE

#### Route Description

As described in Section 1.0, the GPITC is comprised of three nationally designated high-priority routes: the Ports-to-Plains Trade Corridor, the Heartland Expressway, and the Theodore Roosevelt Expressway. The GPITC traverses Texas, New Mexico, Oklahoma, Colorado, Nebraska, Wyoming, South Dakota, North Dakota, and Montana via existing highway facilities. The following sections describe the 2,333-mile GPITC route.

#### *Ports-to-Plains Trade Corridor*

In Texas extending north from Laredo via U.S. 83, the Ports-to-Plains corridor connects to U.S. 277 in Carrizo Springs. Following U.S. 277, the corridor passes through Eagle Pass, Del Rio, and Sonora before connecting to U.S. 87 in San Angelo. En route to Lubbock, the corridor follows U.S. 87 through Big Spring and Lamesa. A second route follows SH 158 between Sterling City and Midland/Odessa and SH 349 between Midland/Odessa and Lamesa before rejoining U.S. 87 to Lubbock. The corridor uses I-27 between Lubbock and Amarillo and U.S. 87 through Dumas; Dalhart; and Clayton, New Mexico. In New Mexico, the corridor follows U.S. 64 between Clayton and Raton before connecting to I-25. Beginning in Dumas, Texas, an alternative route uses U.S. 287 to pass through Stratford before reaching the Oklahoma border. Following U.S. 287, the corridor passes through Boise City, Oklahoma, and enters Colorado, passing through Springfield, Lamar, and Kit Carson. In Kit Carson, the corridor follows U.S. 40 to Limon before connecting to I-70 into Denver.

#### *Heartland Expressway*

The Heartland Expressway has two southern termini in Colorado – one in Denver and one in Limon. From Denver, the 498-mile corridor follows I-76 northeast to Brush where it connects to SH 71. From Limon, the corridor follows SH 71 to Brush and merges with the spur from Denver. The corridor continues

to follow SH 71 to Scottsbluff, Nebraska. In Scottsbluff, a corridor spur follows U.S. 26 towards Wyoming, passing through Torrington, Wyoming, and connecting to I-25. The mainline corridor follows SH 62A east of Scottsbluff before turning north onto U.S. 385. The corridor continues to follow U.S. 385 into South Dakota before connecting to SH 79 to Rapid City, South Dakota.

### *Theodore Roosevelt Expressway*

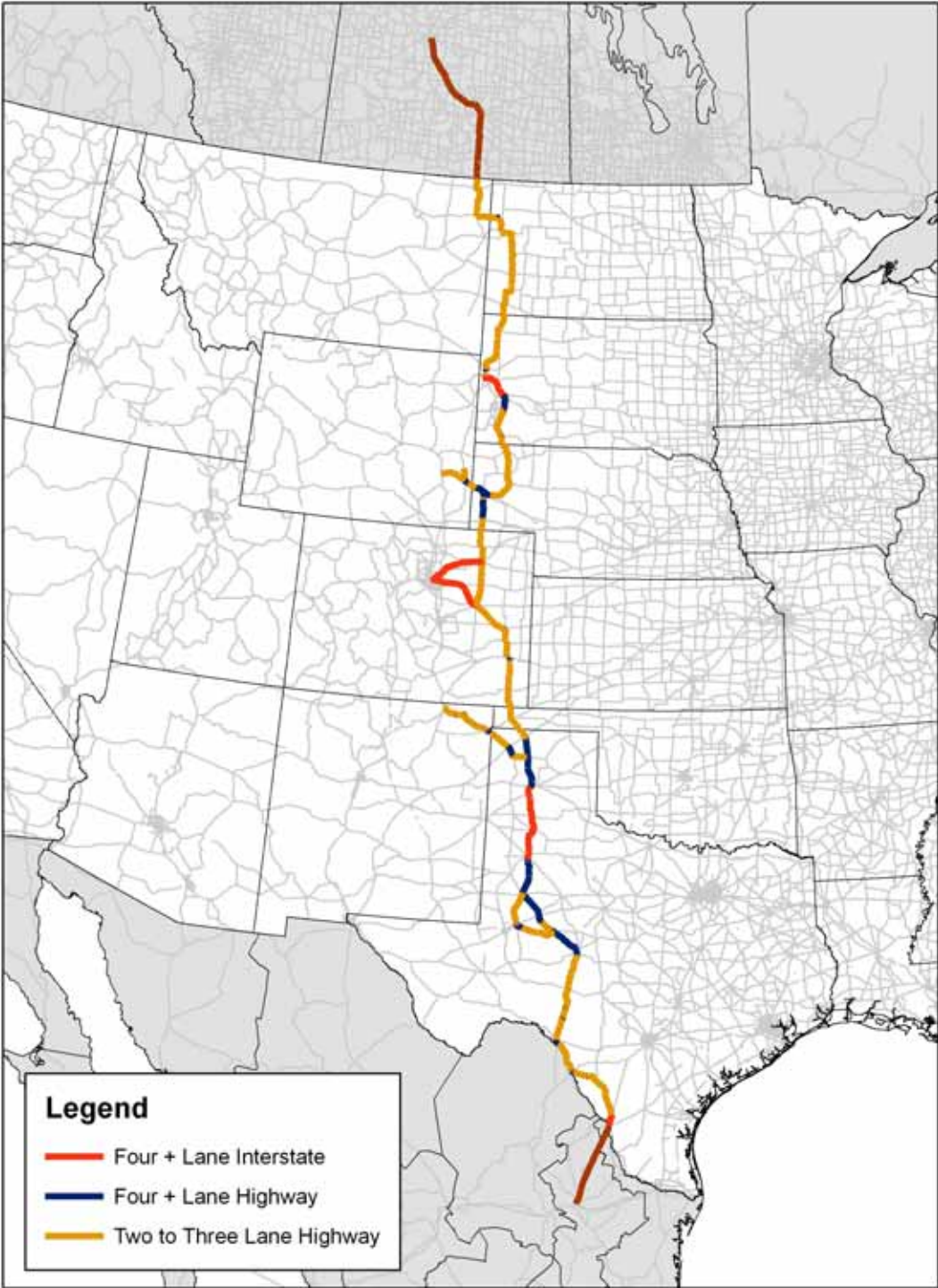
Beginning at its southern terminus in Rapid City, South Dakota, the Theodore Roosevelt Expressway follows I-90 north to Spearfish where it connects to U.S. 85. The corridor follows U.S. 85 north to North Dakota and passes through Bowman, Belfield, Watford City, and Williston. In Williston, the corridor turns west toward Montana following U.S. 2 to Culbertson, Montana. From Culbertson, the corridor follows SH 16 north through Plentywood before passing through the Port of Raymond and connecting to the Canadian highway network.

## **Highway Capacity and Planned Projects**

Under current conditions, a majority of the GPITC route is a two-lane highway. Figure 2.1 identifies the existing number of lanes along the GPITC. Several stretches of the corridor are constructed to interstate standards, including I-27 from Lubbock to Amarillo, Texas; I-70 from Limon to Denver, Colorado; I-76 from Denver to Brush, Colorado; and I-90 from Rapid City to Spearfish, South Dakota.

While some capacity improvements already have been implemented in the GPITC since the three segments were nationally designated as high-priority routes, the current Statewide Transportation Improvement Plans (STIP) for several of the study area states have identified additional short-term capacity improvements in their financially constrained plans. We summarize these planned improvement projects by corridor in the following sections.

Figure 2.1 Existing GPITC Highway Capacity



Source: Federal Highway Administration, HPMS.

### *Ports-to-Plains Corridor*

As documented in the current Texas STIP (2008-2011), the Texas DOT plans to widen approximately 12 miles of U.S. 277 from two to four lanes north of Eagle Pass between FM 1588 and FM 1665. Northwest of San Angelo, plans include widening approximately 14 miles of SH 158 to a four-lane divided highway between U.S. 87 to the Glasscock county line. A two-lane, undivided reliever route around Midland also will be constructed with plans to eventually upgrade to four lanes. Approximately 35 miles of U.S. 87 will be widened to four lanes beginning at the Moore county line through Dalhart and Hartley.<sup>2</sup>

In New Mexico, efforts to widen U.S. 64/87 are ongoing. As part of Governor Richardson's Investment Partnership, approximately 81 miles along U.S. 65/87 between Raton and Clayton have been expanded or are planned for expansion from two to four lanes by 2010.<sup>3</sup> Widening U.S. 64/87 is cited as a long-term regional transportation priority in the Northeast Regional Planning Organization Long-Range Transportation Plan (LRTP).

In Colorado, improvements along U.S. 287 to improve the corridor to a "Super Two" configuration are approximately 80 percent complete.<sup>4</sup> The U.S. 287 Ports-to-Plains Corridor project is identified as one of the state's 28 "Strategic Projects" identified in its LRTP.

The Oklahoma eight-year statewide construction plan includes funding to purchase two additional lanes of right-of-way along U.S. 287 north of Boise City to the Colorado state line. However, there are no current plans to widen U.S. 287 in Oklahoma to four lanes. A three-phase construction project to build a northeast bypass of Boise City currently is underway.

### *Heartland Expressway*

Although none of the STIPs identified specific programmed projects along the Heartland Expressway, the governor of Nebraska announced in May 2008 that two sections of the Heartland Expressway in the Nebraska Panhandle had been moved up on the state's priority listing for highway funding.<sup>5</sup> The projects include a key interchange at Kimball, also known as the Kimball bypass, that

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<sup>2</sup> Texas Department of Transportation. 2007. Statewide Transportation Improvement Program Fiscal Years 2008-2011. Approved October 2007.

<sup>3</sup> Governor Richardson's Investment Partnership. 2007. GRIP U.S. 64/87 – Raton to Clayton. < <http://nmgrip.com> > (accessed June 2003).

<sup>4</sup> A "Super Two" highway is a two-lane road built to high standards often including partial access control, periodic passing lanes, and full shoulders. It is often built for eventual upgrade to a four-lane facility or divided highway as traffic volumes increase.

<sup>5</sup> Frederick, Steve. "Governor Moves Up Expressway Projects" *Star Herald*, 4 May 2008. <http://www.starherald.com/site/news.asp?brd=484>.

will provide a four-lane connection to SH 71 north of town and a 14.5-mile segment along US 385 east of Scottsbluff.

In addition to the planned projects in Nebraska, the Upper Front Range Regional Planning Commission and the Colorado DOT vision-based approach to long-range planning have defined goals and strategies to increase travel reliability, improve mobility, and provide improved freight linkages along the SH 71 component of the Heartland Expressway.

### *Theodore Roosevelt Expressway*

In Montana, the draft 2008-2012 STIP identifies plans to widen approximately 22 miles of U.S. 2 from two to four lanes between the North Dakota border and Culbertson.<sup>6</sup>

## **Freight Rail and Intermodal Facilities**

There are two Class I<sup>7</sup> railroads operating in the nine GPITC states: the Union Pacific (UP) and the Burlington Northern Santa Fe (BNSF). While the BNSF network serves all of the GPITC states, the UP network does not extend into the Dakotas or Montana. In Mexico, two Class I railroads connect to the study area's three U.S.-Mexico border ports: Ferrocarril Mexicano and Grupo Transportacion Ferroviaria Mexicana (wholly owned by the Kansas City Southern Railway and operated as Kansas City Southern de Mexico). Class I rail carriers in Canada, the Canadian Pacific Railway and the Canadian National Railway, operate in Saskatchewan and Alberta. Figure 2.2 presents the rail network in the GPITC study area.

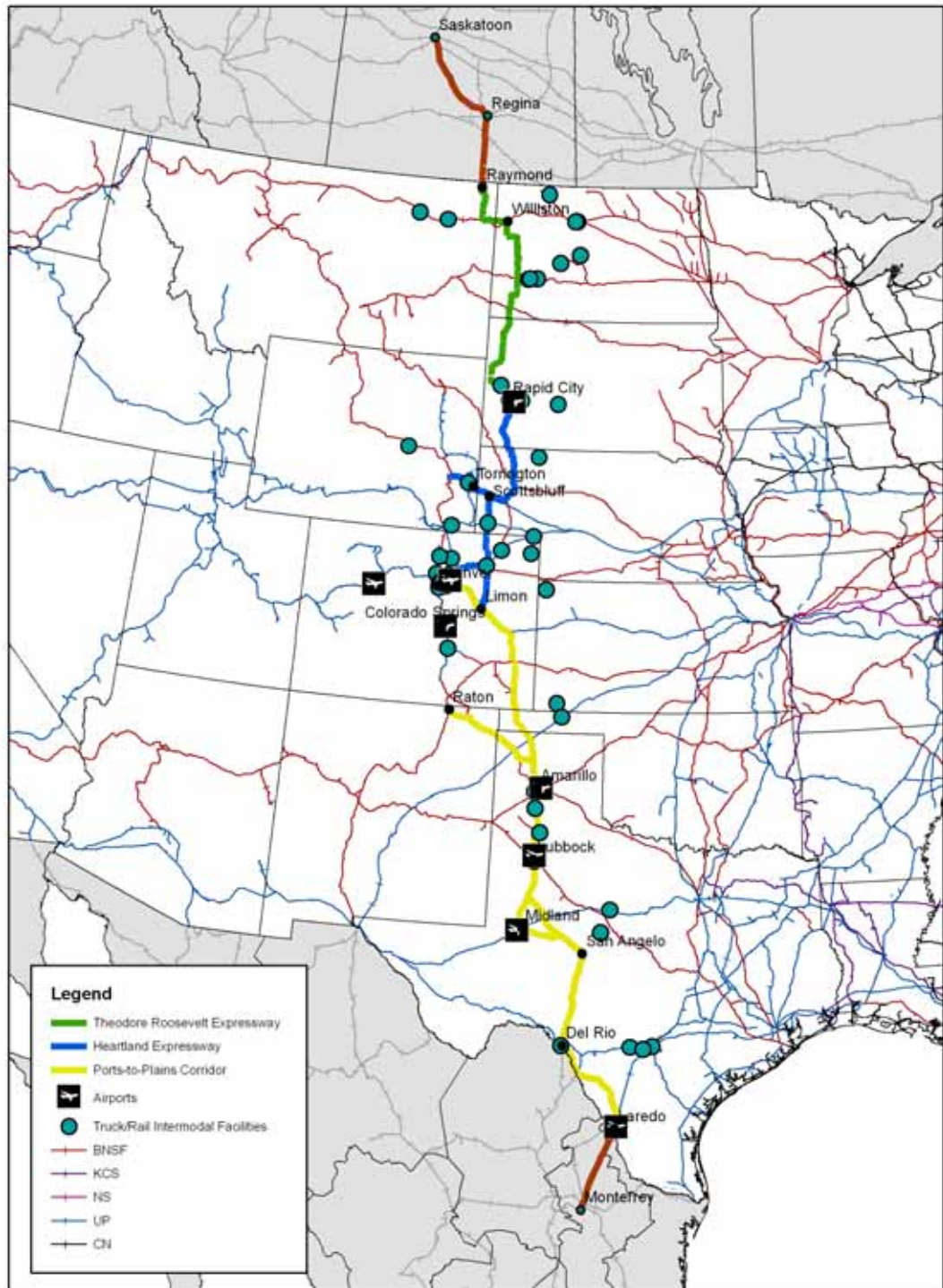
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<sup>6</sup> Montana Department of Transportation. 2008. *Draft Statewide Transportation Improvement Program 2008-2012*.

<sup>7</sup> Class I railroads are defined as railway companies with minimum annual operating revenues exceeding \$319.3 million.



Figure 2.2 Freight Rail, Airports, and Intermodal Facilities



Note: BNSF (Burlington Northern Santa Fe), KCS (Kansas City Southern), NS (Norfolk Southern), UP (Union Pacific), CN (Canadian National)

Source: Bureau of Transportation Statistics, 2007 National Transportation Atlas Database.

The truck/rail intermodal facilities, shown in Figure 2.2, represent locations within the GPITC study area that accommodate large freight volume transfers between the two modes. Connectivity between the intermodal facilities and the highway network is important to ensure efficient transfer with minimal delay. Similarly, Figure 2.2 identifies the leading commercial airports in the study area. Among the airports shown in the figure, the GPITC study area includes four all-cargo airports listed in Table 2.1.<sup>8</sup> Note that while the City of Colorado Springs Municipal airport is located within the study area, the GPITC does not serve the airport directly.

**Table 2.1 Enplaned Cargo at GPITC Airports, 2005 (thousand lbs)**

Airport	Enplaned Cargo	Deplaned Cargo	Total Cargo
Denver International*	324,423	393,394	717,817
Lubbock Preston Smith International*	20,220	31,050	51,270
Laredo International*	16,810	23,363	40,173
City of Colorado Springs Municipal*	10,754	16,175	26,929
Midland/Odessa International	2,825	3,427	6,252
Rapid City Regional	2,118	2,720	4,838
Amarillo International	644	932	1,576
Sloulin Field -Williston	139	405	544
Del Rio International	102	37	139
Eagle Pass Municipal	5	0	5

Source: Bureau of Transportation Statistics, All Carrier Market Data.

Note: \* Indicates all-cargo airport designation by the Federal Aviation Administration.  
Enplaned/deplaned cargo includes combined freight and mail weight

Figure 2.3 places the GPITC in a continental context, highlighting its intermodal connectivity beyond the study area limits. Growing international freight movement between Canada, Mexico, and the United States resulting from NAFTA and changes in global trade, transportation, and logistics patterns will impact the volume of goods moved along the corridor.

<sup>8</sup> The Federal Aviation Administration defines all-cargo airports as those that provide service to cargo-dedicated aircraft with a total annual landed weight of more the 100 million pounds. An airport can provide both all-cargo and commercial passenger service.

Figure 2.3 GPITC Intermodal Connectivity



Source: Saskatchewan Agrivision Corporation Inc.

## 2.2 DEMAND CHARACTERISTICS

### Population

The GPITC study area is primarily rural, including many cities and towns with modest populations. Denver, the largest population center in the GPITC study area, exceeds the population of the next largest city in the corridor, Lubbock, by almost 10 times (Table 2.2). Figure 2.4 illustrates the 2005 county populations within the GPITC study area. The counties with the highest populations are those that contain the towns and/or Metropolitan Statistical Areas (MSA) listed in Table 2.2.

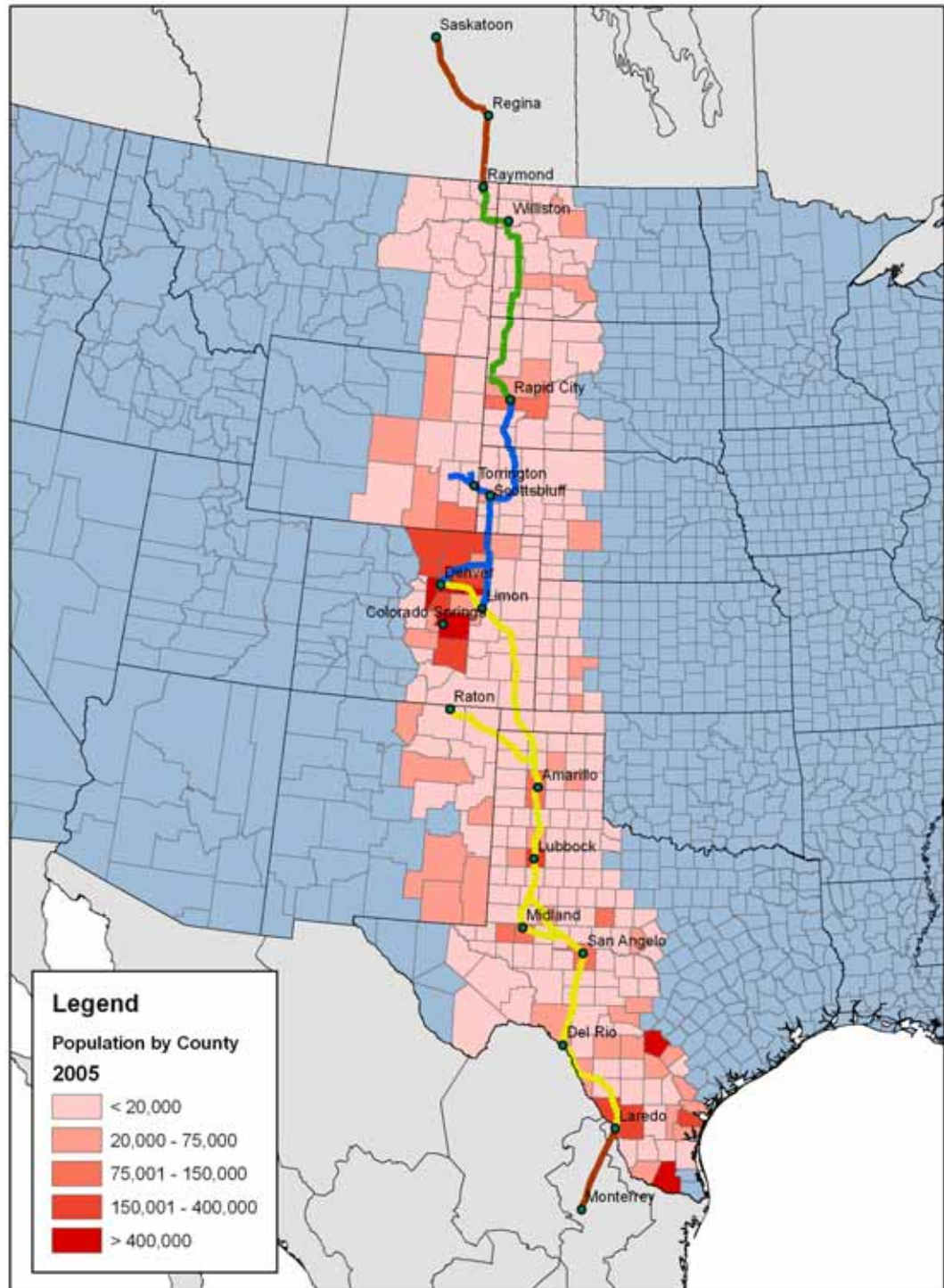
**Table 2.2 Existing and Forecasted Population of Cities in the GPITC**

Town or MSA	Population		Percent Change
	2005	2030	2005-2030
Denver, Colorado (MSA)	2,364,828	3,712,000	57.0%
Lubbock, Texas (MSA)	261,842	295,621	12.9%
Amarillo, Texas (MSA)	238,026	308,552	29.6%
Laredo, Texas (MSA)	222,037	435,776	96.3%
Odessa, Texas (MSA)	124,522	153,887	23.6%
Midland, Texas (MSA)	119,636	140,150	17.1%
Rapid City, South Dakota	118,131	N/A	N/A
San Angelo, Texas (MSA)	106,768	122,385	14.6%
Del Rio, Texas	47,164	N/A	N/A
Scottsbluff, Nebraska	37,017	N/A	N/A
Williston, North Dakota	19,133	N/A	N/A
Raton, New Mexico	6,922	N/A	N/A
Torrington, Wyoming	5,477	N/A	N/A
Limon, Colorado	1,879	N/A	N/A
Saskatoon, Saskatchewan	234,800	N/A	N/A
Regina, Saskatchewan	198,200	N/A	N/A
Ciudad Acuna, Coahuila	124,232	N/A	N/A
Piedras Negras, Coahuila	142,011	N/A	N/A
Nuevo Laredo, Tamaulipas	348,387	N/A	N/A

Sources: 2005 population estimates from the U.S. Census Bureau, Statistics Canada and Instituto Nacional de Estadística y Geografía. 2030 forecasts from Denver Regional Council of Government projections, Texas State Data Center (Scenario 0.5).

Note: N/A indicates population projections were unavailable.

Figure 2.4 2005 Population by County



Source: Woods & Poole, 2007.

While many of the cities and towns in the GPITC study area have experienced population growth over the past 25 years, many of the rural counties have experienced stagnant or declining growth. Figure 2.5 shows the historic population growth in the study area counties from 1980 to 2005 from the Woods & Poole dataset.<sup>9</sup> Many counties in Eastern Montana, western North Dakota, western Nebraska, and the Texas Panhandle declined by more than 10 percent over this 25-year period. The population decline in rural counties is consistent with the national trend of continued urbanization. For example, in 2005, 80.8 percent of the U.S. population resided in cities and suburbs as compared to 73.7 percent in 1980.<sup>10</sup> Within the study area, the regions of fastest population growth between 1980 and 2005 included the Denver metropolitan area and the border counties along the Texas-Mexico border, including Laredo.

Over the next 25-year period, however, population growth rates within the study area counties are forecasted to increase. As shown in Figure 2.6, more of the GPITC study area counties will experience growth between 2005 and 2030. Meanwhile, the counties with populations that are forecasted to decline over the next 25 years will experience slower declines than were recorded between 1980 and 2005. Whereas 55 percent of counties experienced population growth between 1980 and 2005, over 65 percent of counties are forecasted to grow over the next 25 years.

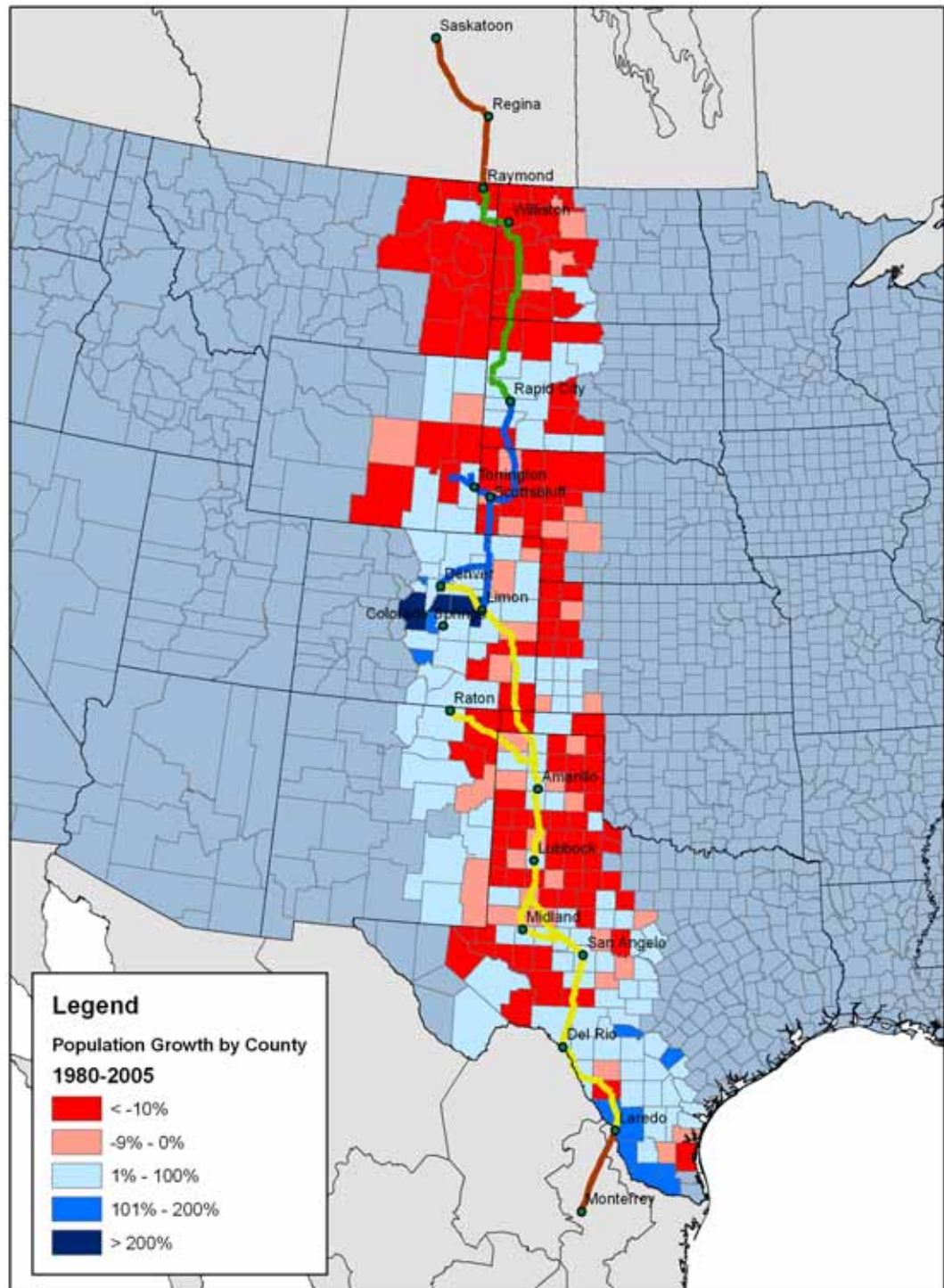
Overall, the total study area population is expected to increase by 3.73 million people. Almost 73 percent of this growth will occur in the 15 peripheral metropolitan counties listed above in Section 0. The regions of highest population growth will continue in the Denver metropolitan area, the Texas-Mexico border counties, and San Antonio.

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<sup>9</sup> Woods & Poole data is a proprietary dataset updated annually from public data sources that includes historical and forecast population, employment, and industry data at the country level. We used the Woods & Poole data in this study to analyze historical and forecasted population and employment changes within the study area counties.

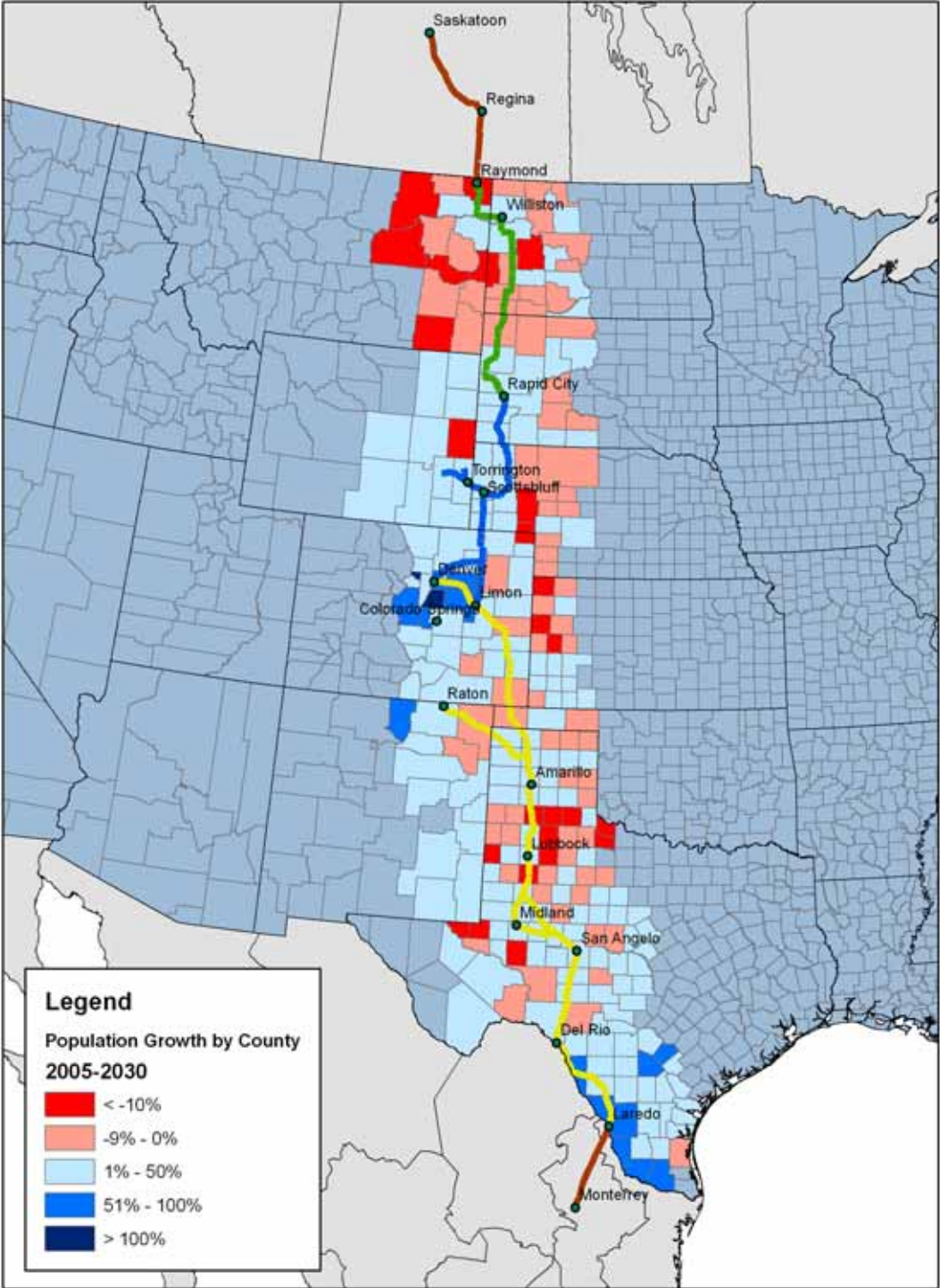
<sup>10</sup> U.S. Census Bureau.

Figure 2.5 Percent Population Growth by County  
1980 to 2005



Source: Woods & Poole, 2007.

Figure 2.6 Forecasted Population Growth by County  
2005 to 2030



Source: Woods & Poole, 2007.

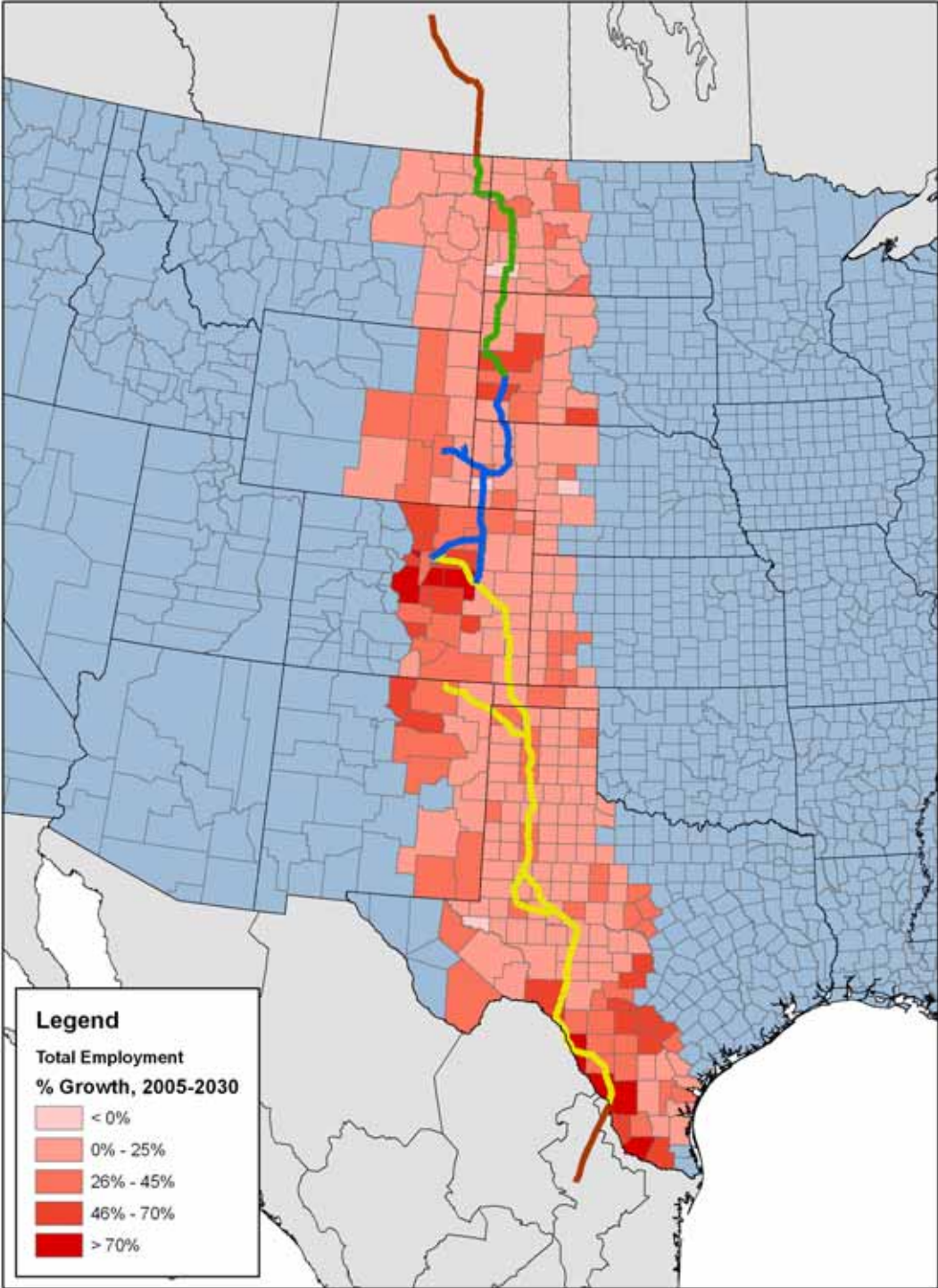


## Employment

We evaluated the existing and forecasted employment in the study area to identify the leading industries and areas of growth in the GPITC. Figure 2.7 presents total employment change by county between 2005 and 2030. Employment growth is highest in the urban counties such as the Denver metropolitan area in Colorado; Rapid City, South Dakota; and Del Rio, Eagle Pass, and Laredo, Texas. All but four counties in the corridor will experience neutral or positive growth over the next 25 years.

The industries and businesses that make up a region's economy drive the level of freight transportation demand within the region. For the purposes of estimating the freight transportation needs in the GPITC corridor, we divided industry employment into two categories: goods-dependent industries and service industries. Goods-dependent industries are those that rely on the movement of goods to receive raw supplies and manufactured goods and to send their refined/finished product to market. Service industries (including professional and business services, education, healthcare, and government) are not as dependent on freight movement, but do rely on shipments of materials, office products, or other goods and supplies.

Figure 2.7 Total Employment Change by County  
2005 to 2030



Source: Woods & Poole, 2007.

Table 2.3 presents the total employment by industry for all of the counties within the study area over a 50-year period. Between 1990 and 2005, total employment increased by approximately 63 percent from nearly four million employees to 6.5 million. In 2005, approximately 59 percent of these total employees worked within the 15 peripheral major metropolitan counties identified in Section 0 (including the Denver, Boulder, Fort Collins, and Colorado Springs metropolitan areas in Colorado and Hidalgo County and San Antonio/Bexar County in Texas).

Forecasts indicate the total employment within the study area will increase by 2.8 million between 2005 and 2030 at an average annual rate of 1.5 percent. Over 69 percent of the employment growth will occur in the 15 peripheral metropolitan counties. Excluding the aforementioned metropolitan counties, employment is expected to increase at an average annual rate of 1.1 percent, adding over 870,000 employees in the counties in the corridor over the next 25 years. Unlike the period between 1980 and 2005 where some of the industries experienced a decline in employment, all industries are forecasted to grow over the next 25 years. In addition, services industries will continue to grow at a faster rate than the goods-dependent industries.

**Table 2.3 Total Employment by Industry**  
*1980, 2005, and 2030*

Industry	1980	2005	2030	CAGR	
				1980-2005	2005-2030
Agriculture	268,432	312,116	362,976	0.60%	0.02%
Mining	190,183	118,337	139,928	-1.88%	0.67%
Construction	243,402	428,791	698,369	2.29%	1.97%
Manufacturing	371,214	390,098	433,153	0.20%	0.42%
Retail Trade	646,107	1,068,081	1,434,451	2.03%	1.19%
Wholesale Trade	198,996	251,043	332,219	0.93%	1.13%
Transportation, Communications, and Utilities	208,984	349,609	521,399	2.08%	1.61%
<b>Total Goods Dependent</b>	<b>2,127,318</b>	<b>2,918,075</b>	<b>3,922,495</b>	<b>1.27%</b>	<b>1.19%</b>
Finance, Insurance, and Real Estate	298,617	557,683	829,673	2.53%	1.60%
Services	790,207	1,968,215	3,164,488	3.72%	1.92%
State and Local Government	473,559	780,713	1,120,095	2.02%	1.45%
Federal Government	126,632	121,080	130,862	-0.18%	0.31%
Military	150,016	126,089	132,865	-0.69%	0.21%
<b>Total Services</b>	<b>1,839,031</b>	<b>3,553,780</b>	<b>5,377,983</b>	<b>2.67%</b>	<b>1.67%</b>
<b>Grand Total</b>	<b>3,966,349</b>	<b>6,471,855</b>	<b>9,300,478</b>	<b>1.98%</b>	<b>1.46%</b>

Source: Woods & Poole, 2007.

Between 1980 and 2005, total employment in all service industries within the GPITC study area overtook the formerly dominant goods-dependent industries. In 2005, goods-dependent industries accounted for 45 percent of total employment as compared to 54 percent in 1980. The trend favoring stronger service industry employment growth is expected to continue through 2030, with the goods-dependent declining to 42 percent over the next 25 years.

When excluding the 15 peripheral major metropolitan counties in the study area, total employment increased by two-thirds of a million employees representing a growth rate of approximately one percent per year. Overall, we observed many of the same historical trends, such as the strengthening of the service industry and decline in the mining and military sectors (Table 2.4). Whereas the goods-dependent industries accounted for over 59 percent of total employment in 1980, employment within the goods-dependent industries declined to 49 percent by 2005 (compared to the service industry percentage of 51 percent). This shift represented a trend of industry diversification as the key industry in the study area shifts from agriculture to services.

As would be expected, most of the agriculture and mining employment (78 percent and 82 percent, respectively) occurred outside of the 15 peripheral metropolitan counties. Following services, retail trade, and state/local

government, the agriculture industry employment accounted for over nine percent of total employment when excluding the 15 outlying counties.

**Table 2.4 Total Employment by Industry Excluding Peripheral Metropolitan Areas**  
*1980 and 2005*

Industry	1980	2005	2030	CAGR	
				1980-2005	2005-2030
Agriculture	229,545	243,382	266,286	0.23%	0.04%
Mining	157,369	96,986	114,145	-1.92%	0.65%
Construction	127,902	153,225	207,737	0.73%	1.22%
Manufacturing	152,245	144,411	161,212	-0.21%	0.44%
Retail Trade	332,441	445,234	559,680	1.18%	0.92%
Wholesale Trade	98,333	92,128	111,164	-0.26%	0.75%
Transportation, Communications, and Utilities	118,615	135,537	181,131	0.53%	1.17%
<b>Total Goods Dependent</b>	<b>1,216,450</b>	<b>1,310,903</b>	<b>1,601,355</b>	<b>0.30%</b>	<b>0.80%</b>
Finance, Insurance, and Real Estate	118,762	176,331	237,314	1.59%	1.20%
Services	370,552	708,285	1,071,495	2.63%	1.67%
State and Local Government	254,559	396,496	547,665	1.79%	1.30%
Federal Government	43,623	44,186	49,283	0.05%	0.44%
Military	54,645	46,088	48,580	-0.68%	0.21%
<b>Total Services</b>	<b>842,141</b>	<b>1,371,386</b>	<b>1,954,337</b>	<b>1.97%</b>	<b>1.43%</b>
<b>Grand Total</b>	<b>2,058,591</b>	<b>2,682,289</b>	<b>3,555,692</b>	<b>1.06%</b>	<b>1.13%</b>

Source: Woods & Poole, 2007.

Note: The counties excluded from the statistics in this table include Denver, Larimer, Weld, Boulder, Jefferson, Adams, Arapahoe, Douglas, El Paso, Gilpin, Clear Creek, Park, Teller, Bexar, and Hidalgo.

In Technical Memorandum #1, we presented a series of maps depicting forecasted employment change by industry sector between 2005 and 2030. To summarize, the GPITC alignment passes through many of the counties that exhibit among the highest goods-dependent employment growth in the study area, particularly in the Texas Panhandle, Nebraska, and South Dakota. The areas of highest forecasted goods-dependent employment growth are located within or near the Denver metropolitan area; Lamar, Colorado; and along the Texas-Mexico border.

Texas, Colorado, and North Dakota have the counties with the highest forecasted agriculture employment growth. Mining (including metal mining, coal mining, and oil and gas extraction) and manufacturing employment growth is most prevalent in the northern half of the study area. Construction employment growth is most concentrated in Colorado and south Texas, while wholesale trade growth is most prevalent in South Dakota. The highest

employment growth rates within the transportation, communications, and utilities industry is forecasted to occur along the Texas-Mexico border; Denver, Colorado; and Rapid City, South Dakota.

Within the study area as a whole, total service industry employment is expected to grow faster than goods-dependent industry employment. Forecasts indicate that the areas of fastest growth will occur in the Denver metropolitan area, the Texas Rio Grande Valley, and near Taos and Santa Fe, New Mexico. Overall, the service industries in counties with urban populations will tend to grow at a faster rate than primarily rural counties.

### **Agricultural Commodities**

The agriculture sector has historically played a very large role in the Great Plains region. The region's vast acreage and sparse population allows for large amounts of land to be dedicated to agricultural land use and activities. The movement of agricultural goods also is heavily reliant on the transportation system, thereby affecting freight demand within the GPITC corridor. To summarize the agriculture commodity information presented in the Technical Memorandum:

- Wheat is one of the most heavily produced agricultural crops in the Great Plains region. While wheat grows throughout the GPITC study area North Dakota and Montana harvest the highest acreage. The GPITC states harvested 46.3 million acres of wheat, accounting for 51 percent of the total wheat harvested in the United States in 2006.<sup>11</sup> Over 33 percent of the total U.S. wheat and wheat product exports (\$6.1 billion) originated from the GPITC states in 2006.<sup>12</sup>
- Harvesting 8.7 million acres of cotton in 2006, cotton grown in the GPITC states accounted for over 43 percent of the cotton harvested in the United States and approximately 30 percent of the nation's total cotton exports. The West Texas region in the GPITC corridor contains among the highest acreage of cotton grown in the study area and nation.
- Sorghum harvested for grain is another primary agricultural commodity grown in the Great Plains region. In 2006, sorghum harvested within the GPITC states accounted for 43 percent of all sorghum harvested in the United States.
- While the primary Corn Belt region (Iowa, Indiana, Illinois, and Ohio) does not include the Great Plains states, corn was among the top five agriculture commodities produced in Nebraska, Colorado, North Dakota, and South Dakota in terms of total receipts from 2006.<sup>13</sup>

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<sup>11</sup>U.S. Department of Agriculture.

<sup>12</sup> U.S. Department of Agriculture, Economic Research Service.

<sup>13</sup>U.S. Department of Agriculture, State Fact Sheets.

- North Dakota harvested 995,000 acres of barley (the most in the nation) and 120,000 acres of oats (the third highest in the nation) in 2006.
- Sunflower seed is almost exclusively grown and harvested in the Great Plains region, with North Dakota leading the nation in harvested acres (860,000 in 2006). Over 72 percent of the nation's total sunflower seed and oil exports originated from North and South Dakota.<sup>14</sup>
- Although hay is grown all over the country, the northern Great Plains and Pacific Northwest regions provide the highest annual harvested acres. The GPITC states harvested 21.8 million acres of hay in 2006, accounting for 42 percent of the national hay harvest.<sup>15</sup>
- Peanuts are primarily grown in three U.S. regions – West Texas, southern areas of Alabama and Georgia, and eastern portions of North Carolina and Virginia. The Ports-to-Plains corridor passes through the West Texas peanut region.
- The GPITC study area counties are big producers of cattle and calves. In 2006, there were approximately 39.6 million head of cattle in the GPITC states, accounting for 63 percent of the national total. There is a high concentration of cattle and calves in the Texas Panhandle, as well as northeastern Colorado. In 2006, cattle and calves was the top agricultural commodity in terms of receipt value in all GPITC states except North Dakota, where cattle and calves production was second only to wheat.<sup>16</sup>

## Natural Resources

Many of the Great Plains states have abundant mineral resources and oil, natural gas and coal reserves. As shown in Figure 2.8, the GPITC passes through several large oil and gas fields, including the Williston Basin (Figure 2.9), the Powder River Basin, the Denver Basin, the Anadarko Shelf, the Raton Basin, the Permian Basin, and the Western Gulf Province. Many of the counties within the GPITC study area are leaders in the production of these energy resources. This section summarizes the existing oil, natural gas, and coal production within the GPITC states.

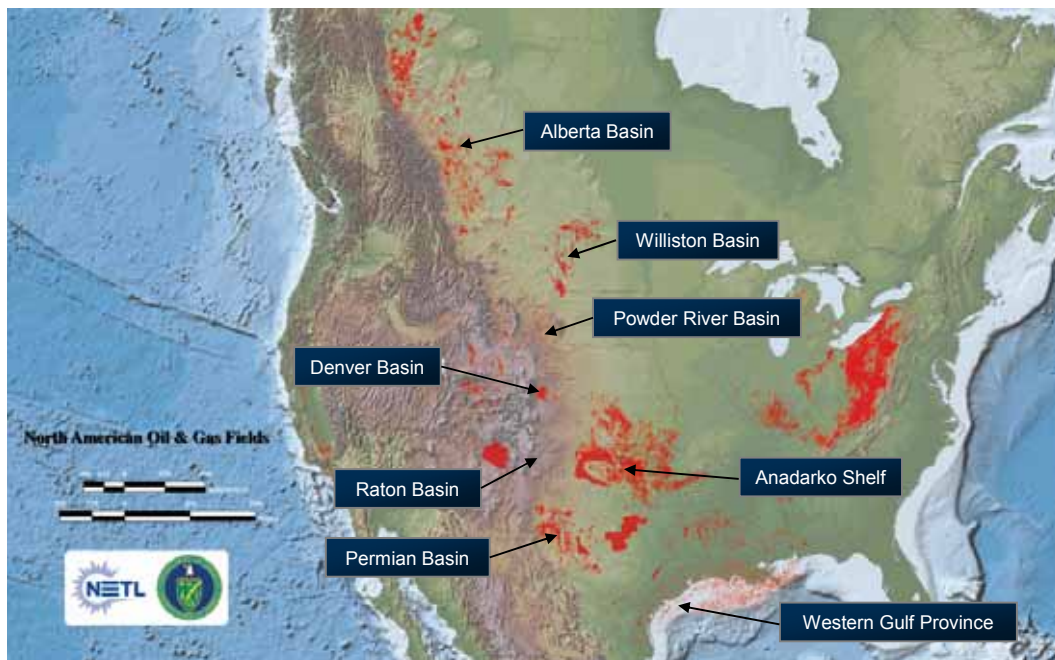
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<sup>14</sup> U.S. Department of Agriculture, Economic Research Service.

<sup>15</sup> U.S. Department of Agriculture.

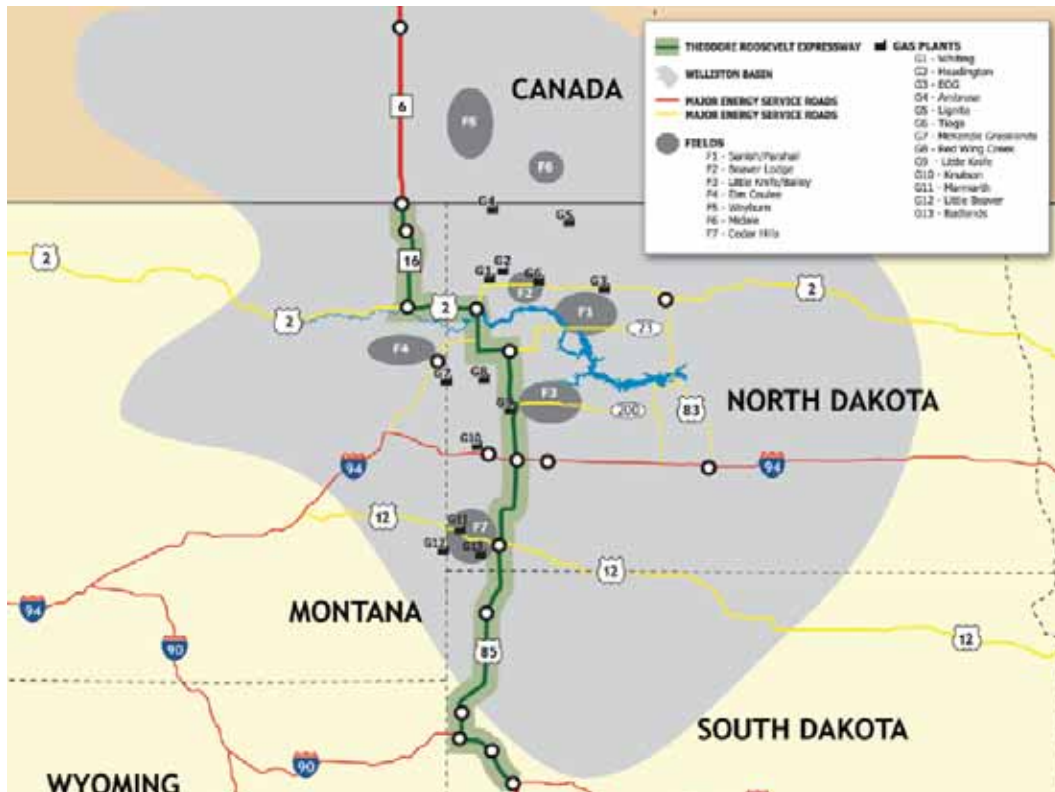
<sup>16</sup> U.S. Department of Agriculture, State Fact Sheets.

Figure 2.8 North American Oil and Gas Fields



Source: U.S. Department of Energy's National Energy Technology Laboratory.

Figure 2.9 Williston Basin Energy Corridor



Source: Theodore Roosevelt Expressway Association



### *Crude Oil Production and Reserves*

Excluding Federal offshore drilling, Texas is the leading oil producer in the United States producing over 355 million barrels of crude oil in 2006. During the same year, the GPITC states combined to produce almost 600 million barrels, representing 36.1 percent of total U.S. production.<sup>17</sup> Whereas overall U.S. production has declined by approximately 2.9 percent each year over the past six years, crude oil production in the GPITC states has increased by an average of 0.5 percent over the past four years.

Texas also has the largest volume of proven crude oil reserves in the country with almost 4.9 billion barrels. The proven crude oil reserves in the GPITC states comprise 38 percent of the nation's total reserves.

While pipelines provide the most efficient method for transporting crude oil and refined products, trucks and rail also transport oil from production sites to refineries and ultimately to consumers.

### *Natural Gas Withdrawals*

Texas is the leading natural gas producer in the country. In 2006, Texas alone produced over one-fourth of the nation's total natural gas withdrawals. Combined, natural gas production in the nine GPITC states has steadily increased over the past five years. In 2006, the GPITC states produced almost 56 percent of the nation's natural gas.<sup>18</sup> New Mexico, Texas, Oklahoma, and Wyoming are among the top six natural gas-producing states in the United States.

Figure 2.10 identifies the volume of natural gas imported and exported in North America. Almost 95 percent of U.S. natural gas imports come from Canada.<sup>19</sup> Pipeline is the only means of transport used for natural gas between the three nations; therefore, pipeline location is a critical factor in the determination of commercial viability. Unless the natural gas industry determines a need to warrant construction of additional pipelines in the GPITC, natural gas transportation development opportunities may be limited along the corridor.

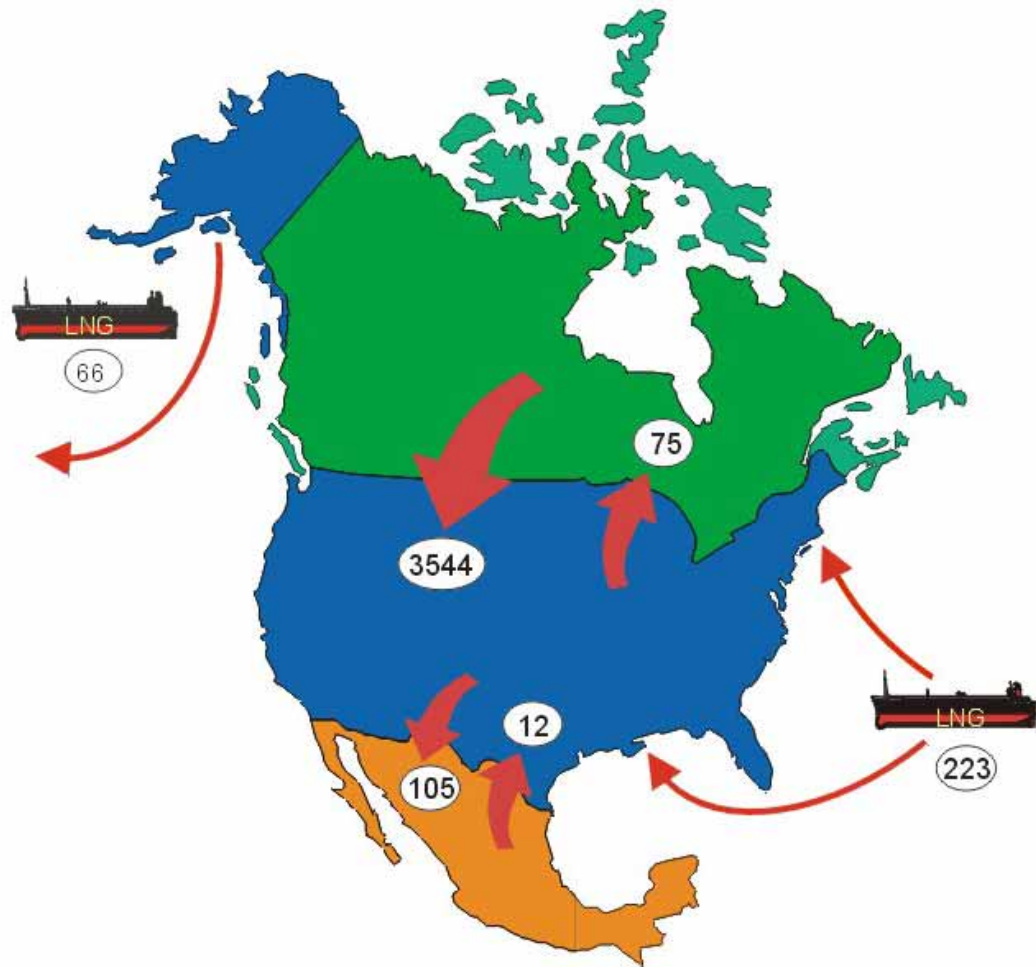
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<sup>17</sup>Energy Information Administration.

<sup>18</sup> Energy Information Administration.

<sup>19</sup> North American Energy Working Group. 2002. *North America: The Energy Picture*.

Figure 2.10 Natural Gas Imports and Exports  
2000 (Billion Cubic Feet)



Note: LNG stands for "liquefied natural gas"

Source: North American Energy Working Group, 2002.

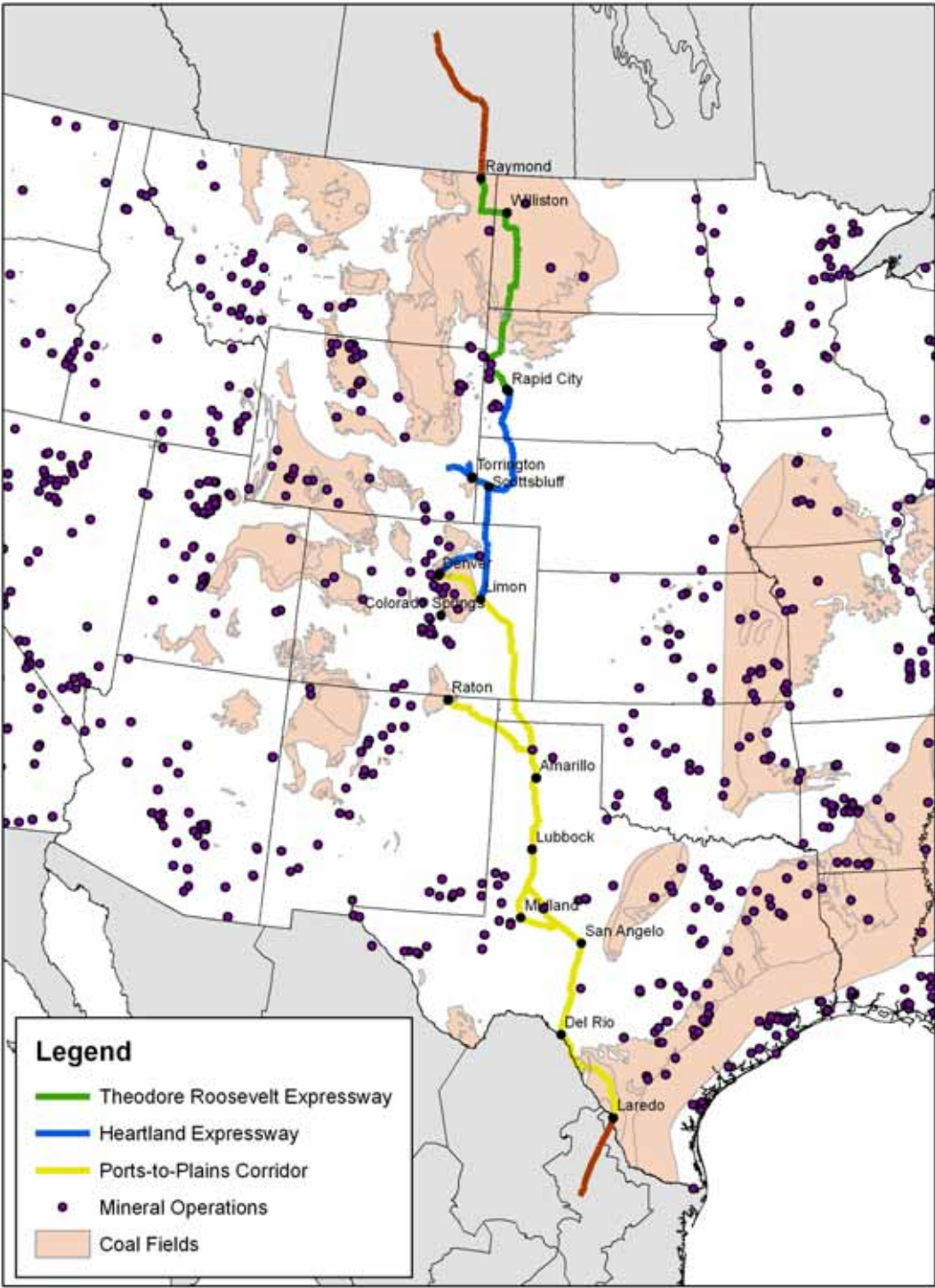
### *Coal Production*

Figure 2.11 illustrates the areas of existing mineral operations and coal field locations. In 2006, Wyoming was the top coal-producing state in the country, producing 447 million short tons of coal from 21 mines—most of which originated in the Powder River Basin. Coal production in the nine GPITC states increased by 6.7 percent in 2006 and combined to account for 54 percent of the nation's total.<sup>20</sup>

<sup>20</sup>Energy Information Administration.

Within the GPITC study area, coal transport typically moves by rail, truck or a multimodal combination of truck and rail. As such, increases in coal production will create additional demands on the highway and rail transportation system within the study area. As the volume of multimodal coal transport increases, access to intermodal facilities capable of handling rail-truck transshipments will be required.

Figure 2.11 Mineral Operations and Coal Field Locations



Source: National Atlas of the United States, 2001 (coal fields), 2005 (mineral operations).

## Existing and Forecasted GPITC Traffic Volumes

Figure 2.12 maps average annual daily traffic (AADT) volumes and Figure 2.13 depicts average annual daily truck traffic (AADTT) volumes in the corridor. The most heavily traveled segments for total traffic are located in the cities through which the corridor passes, primarily Denver, Laredo, San Angelo, Lubbock, Amarillo, and Rapid City. The highway segments between urban areas with the highest AADT include U.S. 87/I-27 corridor through the Texas Panhandle, I-70 and I-76 east of Denver, and I-90 in South Dakota. The Theodore Roosevelt Expressway north of Rapid City to the Canadian border is the longest stretch of the corridor with the lowest traffic volumes.

When considering truck volumes only, Laredo and Denver emerge as the most heavily truck-traveled areas. The Ports-to-Plains corridor between Lubbock and Denver/Raton also accommodates a high concentration of truck traffic. Based on traffic data obtained from the Colorado DOT, the traffic mix on some stretches of U.S. 287 and U.S. 40 from the Colorado state line to Limon included as much as 65 percent trucks, averaging approximately 42 percent over the whole segment.<sup>21</sup>

Table 2.5 shows the combined north and southbound volumes of vehicles, trucks, and rail crossing the border at all six GPITC ports in 2006. The Texas-Mexico border ports serve a considerably higher volume of passenger vehicles and commercial trucks than the U.S.-Canada border ports. Sweetgrass, Montana is second to Laredo, Texas for total rail crossings.

**Table 2.5 2006 Border Crossings at GPITC Ports (North and Southbound)**

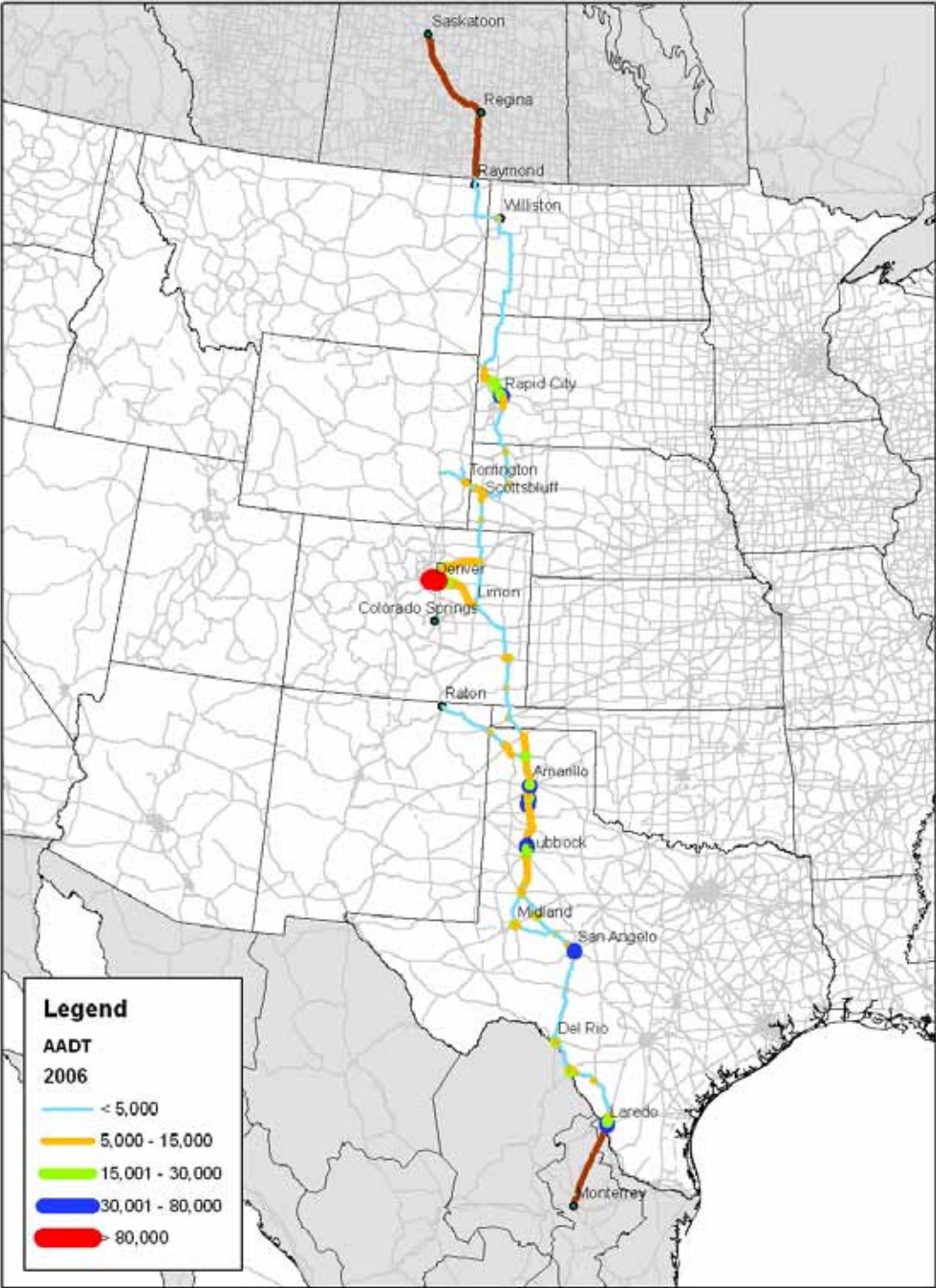
Border Crossing	Vehicles	Commercial Trucks	Rail
Del Rio, Texas	3,562,729	136,391	-
Eagle Pass, Texas	6,089,445	194,683	118,866
Laredo, Texas	11,971,727	3,224,349	401,609
Raymond, Montana	45,884	38,460	-
Sweetgrass, Montana	471,334	766	241,982
Portal, North Dakota	139,010	129,516	4,748

Source: Texas A&M International University (U.S.-Mexico border crossings), Bureau of Transportation Statistics (BTS) Border Crossing/Entry data (U.S.-Canada border crossings).

Note: The BTS border crossing/entry data provides information on inbound border crossings only. To estimate total north and southbound crossings at the U.S.-Canada border ports, we assumed that the bidirectional flows are approximately equal. The north-south data presented for Raymond, Sweetgrass, and Portal represents two times the total inbound volumes by mode.

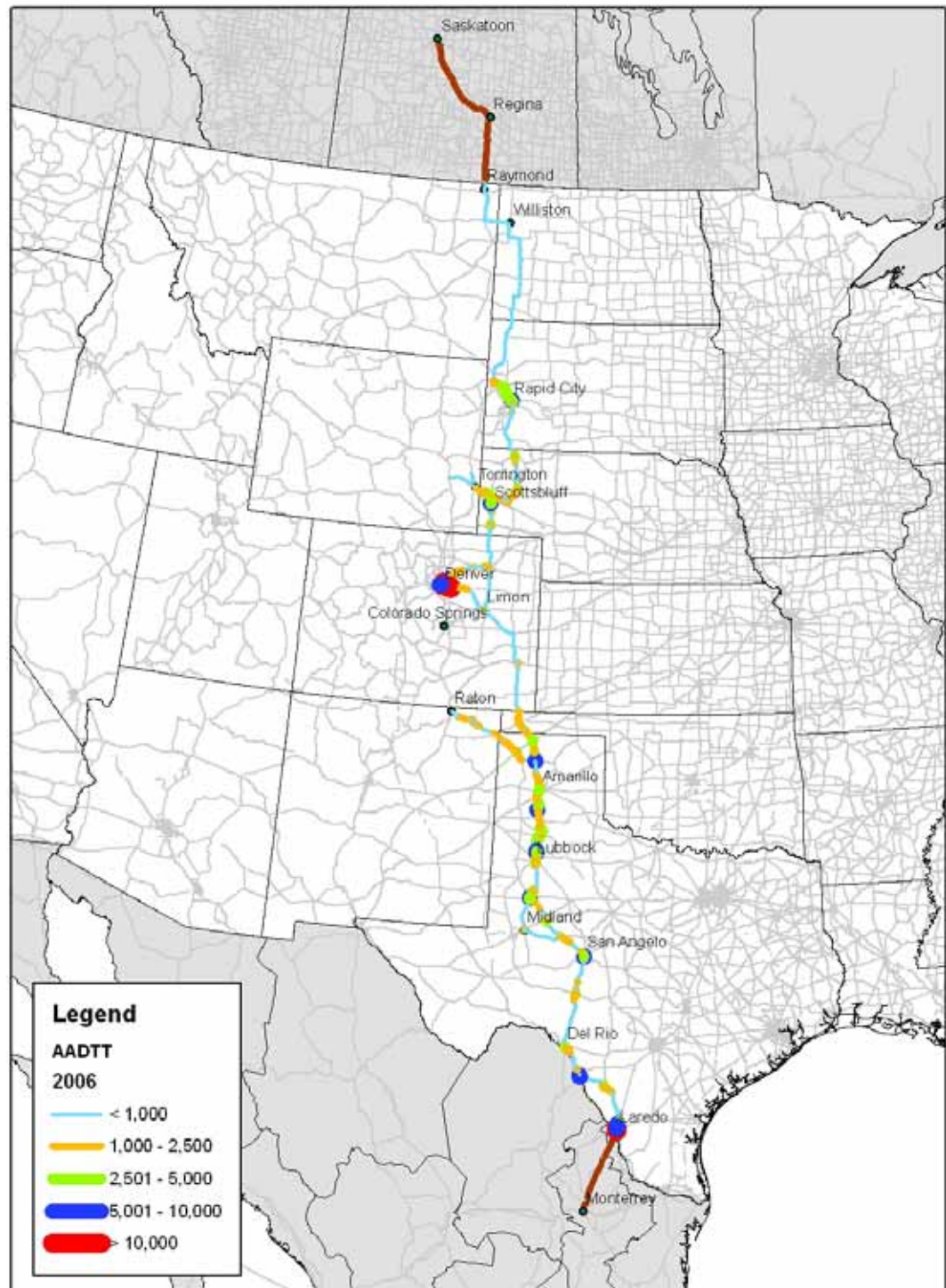
<sup>21</sup>Colorado Department of Transportation, Vehicle Traffic Volumes and Truck Weights on Colorado State Highways, 2007.

Figure 2.12 2006 Average Annual Daily Traffic Volumes



Source: FHWA, Highway Performance Monitoring System.

Figure 2.13 2006 Average Annual Daily Truck Traffic Volumes



Source: FHWA, Highway Performance Monitoring System.

Figure 2.14 illustrates the percent growth of AADT between 2006 and 2030.<sup>22</sup> The portions of the corridor with the highest forecasted growth rates occur at the following locations:

- Between Laredo and Del Rio along the Texas-Mexico border;
- In Texas between Lamesa and Lubbock on U.S. 87;
- Between Dalhart, Texas and Raton, New Mexico along U.S. 64;
- Between Denver and Brush, Colorado along I-76;
- Along the Heartland Expressway through Nebraska to I-90 north of Rapid City, South Dakota; and
- Near the Port of Raymond along the Montana-Canada border.

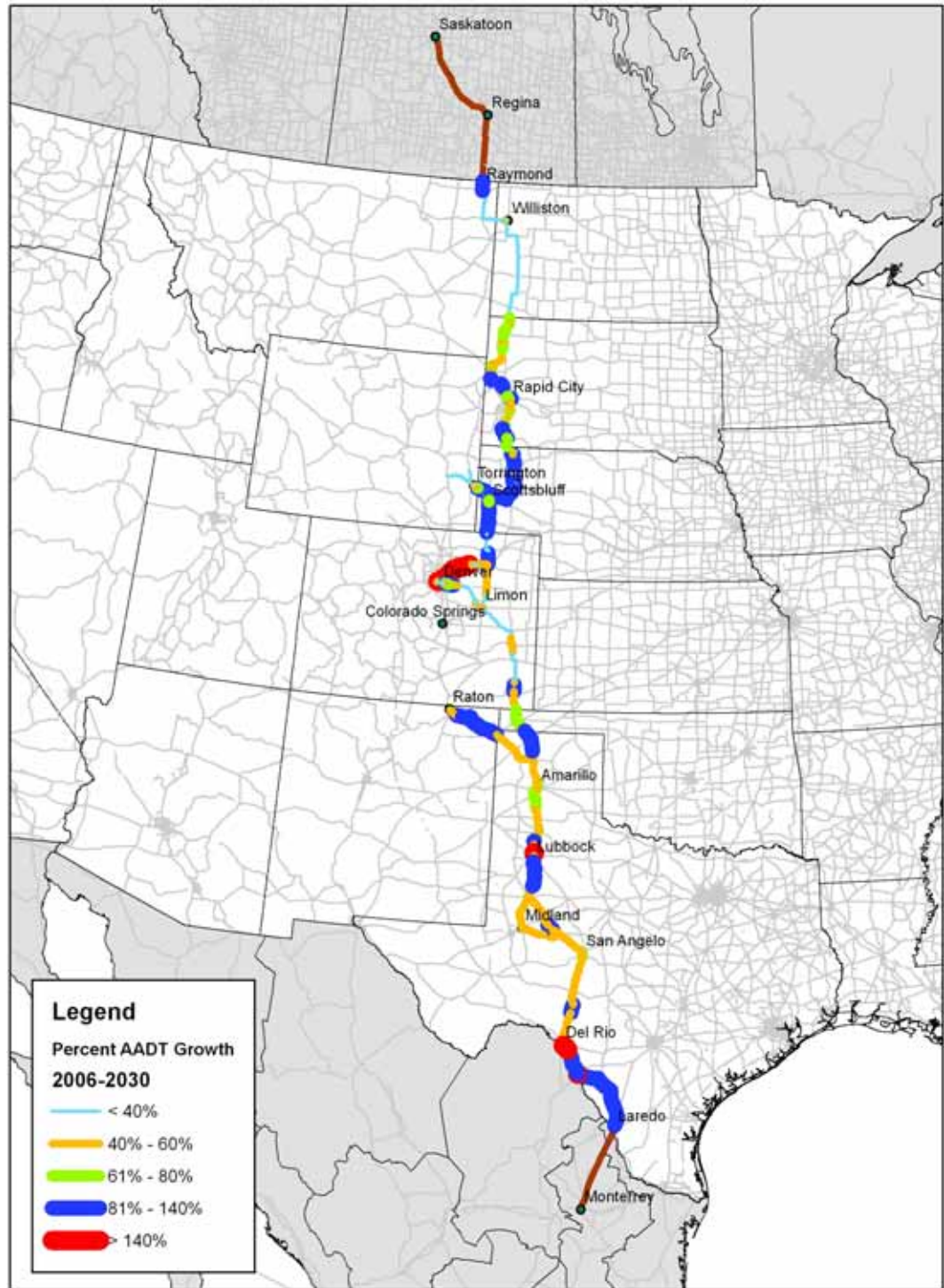
Depending upon the existing highway capacity and traffic volumes along these portions of the GPITC, there may be a future need to improve the infrastructure to accommodate the forecasted growth.

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<sup>22</sup> A 40 percent growth rate between 2006 and 2030 corresponds to a compound annual growth rate of 1.4 percent. A 140 percent growth rate during the same period corresponds to a compound annual growth rate of approximately four percent.



Figure 2.14 Percent Average Annual Daily Traffic Growth  
2006 to 2030



Source: FHWA, Highway Performance Monitoring System. 2030 forecasts derived from CAGR of state forecasts.

## Trade and Commodity Flows

To evaluate trade flows originating and terminating in the GPITC states, we used FHWA's Freight Analysis Framework (FAF2). The FAF2 data provides existing and forecasted information on origins and destinations of the commodities traveling between the nine GPITC states. We used this data to identify the future transportation-intensive and high-growth commodities traveling through the states in our study area.

### *Truck Transport*

In 2006, approximately 90 million tons of freight was transported by truck within the GPITC states. Between 2006 and 2035, FHWA forecasts total truck freight (by weight) between the nine GPITC states will increase by 114 percent to 193 million tons. In both 2006 and 2035, the top four commodities in terms of total tonnage moved by truck include:

- Cereal grains;
- Nonmetal mineral products;
- Gravel; and
- Coal.

Together, these four commodities accounted for almost 45 percent of the total weight transported by truck in 2006 (compared to almost 40 percent in 2035). By 2035, the FAF2 data forecasts coal to surpass the other commodities for highest total weight transported by truck, accounting for 19.8 million tons. The truck/rail mode split for the transport of cereal grains will heavily favor trucking by 2035. Whereas trucks transported 82 percent of cereal grain in 2006, approximately 95 percent will travel by truck in 2035.<sup>23,24</sup>

The commodities transported by truck experiencing the highest growth (in terms of weight) between 2006 and 2035 include:

- Transport equipment (increasing 393 percent);
- Manufactured products (increasing 381 percent); and
- Fuel oils (increasing 329 percent).

### *Rail Transport*

In 2006, approximately 83 million tons of freight moved by rail within the GPITC states. Similar to the growth in truck freight, the total weight of freight transported by rail is expected to increase by 89 percent, totaling 163 million tons

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<sup>23</sup>Federal Highway Administration, Freight Analysis Framework 2.

<sup>24</sup> Higher fuel prices, however, will make the forecasted shift toward truck less likely as freight rail remains an economically competitive alternative.

in 2035. Coal is the primary commodity transported by rail in the study area, accounting for nearly 83 percent (68 million tons) of the region's total rail tonnage in 2006. By 2035, over 142 million tons of coal is expected to travel by rail between the GPITC states, accounting for 87 percent of the rail weight total.

Behind coal, rail transported a combined 5.1 million tons of gravel and cereal grains during 2006.<sup>25</sup> By 2035, fuel oils will emerge as the second-ranked commodity by weight at 4.9 million tons, followed by gravel at 3.9 million tons. Rail commodities with the highest growth include:

- Chemical products (2,148 percent growth);
- Fuel oils (397 percent growth); and
- Transport equipment (259 percent growth).

Truck and rail transport of metallic ore is expected to experience the sharpest decline between 2006 and 2035, decreasing 61 percent by truck and 72 percent by rail. Gasoline transport by rail also will decrease by 74 percent as trucking is forecast to accommodate 99 percent of all gasoline movement through the GPITC states by 2035.

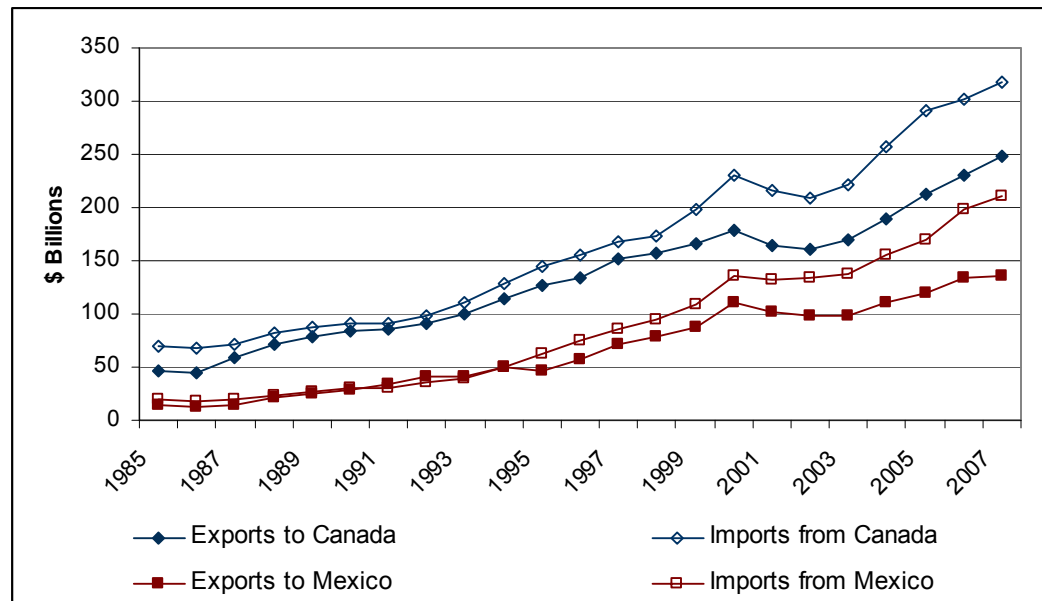
## 2.3 MEXICO AND CANADA

The GPITC connection to Mexico and Canada provides an important economic link between the three countries. Implementation of the North American Free Trade Agreement (NAFTA) in 1994 between the United States, Canada, and Mexico ushered in a new era of economic growth and integration between the three countries' economies. As shown in Figure 2.15, trade between the three countries has grown significantly. Consequently, NAFTA has elevated the importance of the intermodal infrastructure connecting the trading partners. This section highlights the economic importance of Mexico and Canada to the GPITC states and summarizes emerging trends that may impact trade and transportation demand in the study area.

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<sup>25</sup>Federal Highway Administration, Freight Analysis Framework 2.

Figure 2.15 Total U.S. Imports and Exports to/from Canada and Mexico



Source: U.S. Census Bureau, Foreign Trade Division

## Mexico

In 2006, U.S. trade with Mexico grew 14.4 percent to reach a new annual high of \$332.4 billion. While over 80 percent of the trade passed through U.S.-Mexico border ports, Laredo accommodated the highest percentage of the market share at 40.5 percent in 2006 (Table 2.6). Growing by 45.5 percent between 2005 and 2006, Eagle Pass showed the highest growth among all U.S.-Mexico border ports. Combined, the three border ports in the GPITC (Laredo, Eagle Pass, and Del Rio) accounted for over 46 percent of total U.S.-Mexico border trade in 2006.

Narrowing the focus to trade between Mexico and the nine GPITC states, combined trade totaled \$88.5 billion in 2006. Almost 39 percent of this total trade passed through the three U.S.-Mexico border ports of the GPITC, Laredo, Eagle Pass, and Del Rio. Of the \$34.4 billion worth of goods passing through GPITC ports destined for or originating from the GPITC states, 78.1 percent moved by truck (compared to the 21.9 percent moved by rail). Total trade through the GPITC ports in 2006 increased by nearly eight percent over 2005 levels.<sup>26</sup>

<sup>26</sup>Bureau of Transportation Statistics, Transborder Surface Freight Data. Compiled by the Ports-to-Plains Trade Corridor Coalition.

**Table 2.6 Total U.S. Imports and Exports to/from Mexico**  
*2005 and 2006, Billions of U.S. Dollars*

Border Port	2005	2006	Percent of Total (2006)	Percent Change (2005-2006)
Laredo	\$93.8	\$104.1	40.5%	11.0%
El Paso	43.1	46.8	18.2%	8.6%
Otay Mesa Station	24.4	28.6	11.1%	17.2%
Hidalgo	18.3	20	7.8%	9.3%
Nogales	14.1	18.9	7.4%	34.0%
Brownsville	11.5	12.6	4.9%	9.6%
Calexico-East	10.8	11.6	4.5%	7.4%
Eagle Pass	7.7	11.2	4.4%	45.5%
Del Rio	3	3.1	1.2%	3.3%
<b>Total All Ports</b>	<b>226.7</b>	<b>256.9</b>		

Source: U.S. Department of Commerce data compiled by the Texas Center at Texas A&M International University.

Trade growth at points of entry along the Texas-Mexico border places additional strain on the existing transportation infrastructure, including port of entry facilities. Because the economies of the communities on both sides of the national border rely directly and indirectly on trade and the movement of goods and the U.S.-Mexico twin plant industries require highway and rail connectivity, a transportation network with the capacity to accommodate growing trade volumes is critical in supporting the regional economy. Planned transportation improvements such as a grade-separated rail overpass in Eagle Pass, a new customs facility at the Del Rio port of entry, and expansion of Highway 2 connecting the Mexican cities of Acuña and Piedras Negras from two to four lanes are designed to improve efficient goods movement across the border.

The number of maquilas (Mexican assembly plants that import raw materials to produce goods for export) and automotive manufacturing facilities along the Texas-Mexico border has grown as industries have adjusted geographically to locations with lower labor and other costs. This trend is likely to continue as energy costs continue to rise, making overseas production less cost-effective. Concurrently, Mexican industry continues to evolve from low-wage, low-skill, labor-intensive assembly of low-cost products to higher-wage, higher-level technical skill, high-value production as the low-wage activities move to Asia. As a result, NAFTA has benefited Northern Mexican consumers by elevating incomes and increasing consumer purchasing power. This outcome continues to

increase the demand for consumer goods in communities along the Texas-Mexico border and promote growth in the region's retail trade industry.<sup>27</sup>

Construction of a new beer brewery and bottle manufacturing plant 20 miles south of Eagle Pass near Allende, Mexico will increase passenger and freight demand on the southern portion of the GPITC. Owned by Grupo Modelo, the brewery will be one of the largest breweries in the world with products primarily destined for U.S. markets. With operations expected to begin by 2010, the plant is expected to produce about 264 million gallons during the first year of operation and 839 million gallons per year once the facility is fully expanded.<sup>28</sup> The plant will generate approximately 200 rail container shipments per day, with most of this rail traffic entering the United States through Eagle Pass. The influx of workers to support the brewery and supporting industries will have a positive economic impact along the Texas-Mexico border, further promoting growth in the region's goods-dependent and service industries.

Another industry experiencing growth in the Acuña/Piedras Negras region in recent years is the motor vehicle metal industry, manufacturing special components for cargo trucks. An industry cluster has developed around Acuña and Piedras Negras as several mechanical metal manufacturing facilities have located in the region.<sup>29</sup> By providing enhanced transportation connectivity and capacity, the GPITC will increase competitiveness and expedite the receipt of supplies and shipment of manufactured goods to/from the many manufacturing industries located along the Texas-Mexico border.

## Canada

As shown in Figure 2.15, U.S. trade with Canada grew 6.2 percent to reach a new annual high of \$566 billion in 2007.<sup>30</sup> Trade between Canada and the nine GPITC states accounted for \$37.6 billion of goods in 2007 (total exports and imports). Of this trade value, approximately 25.7 percent (\$9.7 billion) passed through the three inland ports served by the GPITC (Raymond, Montana; Sweet Grass, Montana; and Portal, North Dakota). Trucks transported over three-fourths of the trade through these three ports in 2007 with total truck trade value increasing by \$1.1 billion over 2006 levels.<sup>31</sup>

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<sup>27</sup> Interview with Judith Canales, Maverick County Economic Development Corporation, 25 August 2008.

<sup>28</sup> Sontag, Bill. "Giant brewery headed to Piedras Negras region," *Southwest Texas LIVE!*, January 28, 2007.

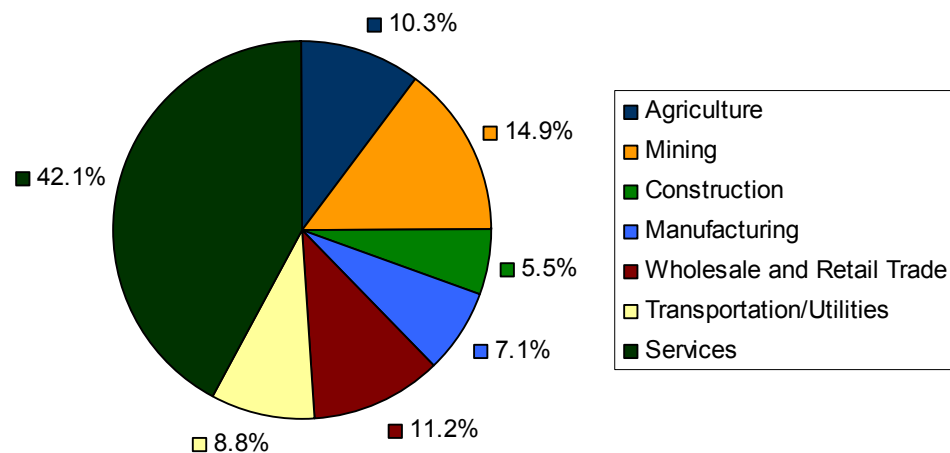
<sup>29</sup> Interview with Trinidad Herrera, City of Acuña Economic Development Director, 28 August 2008.

<sup>30</sup> U.S. Census Bureau, Foreign Trade Division.

<sup>31</sup> Bureau of Transportation Statistics, Transborder Surface Freight Data. Compiled by the Ports-to-Plains Trade Corridor Coalition.

Saskatchewan, the Canadian province at the northern end of the GPITC study area, has a population of just over one million with most of the population living in the southern half of the province. Saskatoon and Regina, located along the GPITC alignment, are Saskatchewan's two largest cities. Saskatchewan's economy has long been associated with agriculture; however, due to increasing diversification and growth in the services industries, agriculture comprised only 10.3 percent of the \$37.5 billion provincial gross domestic product (GDP) in 2007 (Figure 2.16). Key agriculture commodities include wheat, canola, lentils, flax, rye, and barley. The mining industry, which includes oil, gas, and solid mineral extraction, was the leading goods-dependent industry in Saskatchewan, accounting for 14.9 percent of the province's GDP in 2007. Saskatchewan is the largest producer of potash in the world, providing nearly one-half of the total global demand for use as fertilizer and the manufacture of glass and soap. Saskatchewan is also one of the global leaders in uranium exports, supplying 30 percent of the world's output. Oil and natural gas production is also an important part of the provincial economy. Saskatchewan currently accounts for nearly one-third of the energy produced in Canada and is second only to Alberta in overall oil production.

Figure 2.16 Industry Contribution to Saskatchewan GDP  
2007



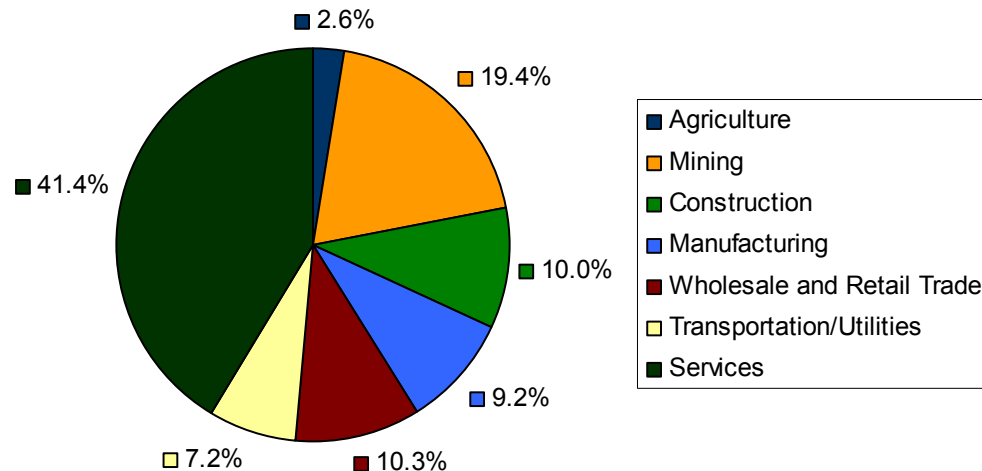
Source: Statistics Canada

Although the GPITC states in close proximity to Saskatchewan, such as Montana and North Dakota, produce similar agricultural commodities and have similar proximity to natural resources, the Saskatchewan economy relies much more heavily on income from international exports than the neighboring U.S. states. International goods exports accounted for 29 percent of the provincial GDP in 2003, as compared to four percent and one percent of the North Dakota and

Montana gross state products, respectively.<sup>32</sup> As the United States is Saskatchewan's key trading partner, the provincial economy relies on efficient, multimodal transportation connectivity and mobility to transport goods across the border.

In addition to Saskatchewan, the province of Alberta plays an important role as a northern anchor to the corridor and is becoming an increasingly noticeable trading partner with the GPITC states. Totalling over \$183 billion in 2007, Alberta's GDP was almost five times larger than its neighboring province of Saskatchewan. Similar to Saskatchewan, the mining industry was the leading goods-dependent industry in Alberta, accounting for 19.4 percent of the province's GDP in 2007 (Figure 2.17). Alberta is the second largest exporter and the fourth largest producer of natural gas in the world. It is also the leading producer of conventional crude oil and synthetic crude oil in the country. From a transportation perspective, the continued growth of oil extraction in northern Alberta's Athabasca tar sands, which rival Saudi Arabia in oil reserve potential, will continue to increase demand for oil field equipment manufactured in the GPITC states. The Midland-Odessa region, with its cluster of rigging, drilling, and tank manufacturing, is one of the principal trading partners with Alberta. Section 3.0 of this report details this relationship further.

Figure 2.17 Industry Contribution to Alberta GDP  
2007



Source: Statistics Canada

<sup>32</sup> SJT Solutions. *Saskatchewan's State of Trade, 2005*.



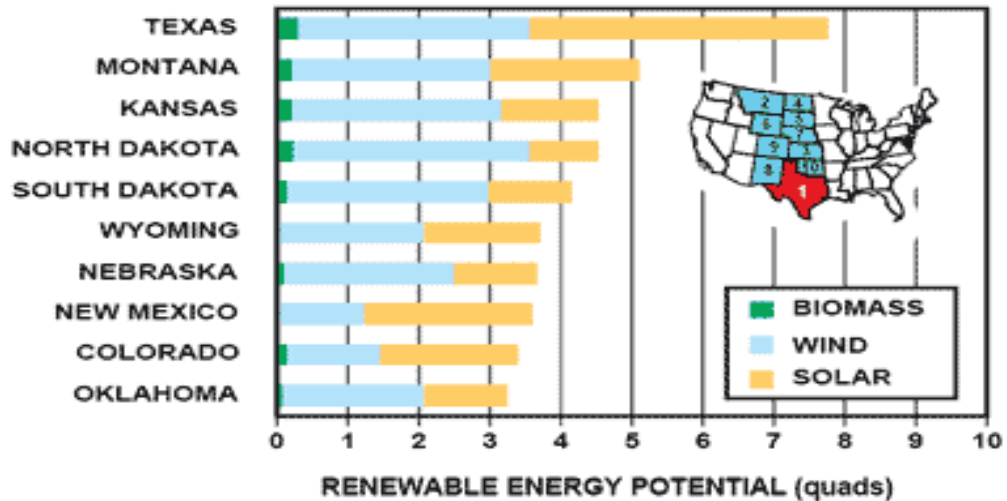
## 3.0 Corridor Development Opportunities: Potential Benefits and Needs

One of the GPITC Coalition's primary goals is to initiate economic growth within the Great Plains region through the provision of enhanced transportation capacity and connectivity. In Technical Memorandum #1, we identified several emerging trends and industries in the GPITC study area, including renewable energy, tourism, dairy, agriculture and livestock, mining and drilling, and trucking. By further promoting these trends through the provision of improved infrastructure or institutional settings, the GPITC could realize economic benefits. The following sections highlight several compelling development opportunities within the GPITC study area, primarily related to energy and agricultural pursuits. Ultimately, this section provides the Texas DOT and the GPITC Coalition with an initial qualitative assessment of economic development opportunities in the GPITC.

### 3.1 RENEWABLE ENERGY

Increased environmental awareness in the United States has recently stimulated renewable energy industries such as wind power generation, biofuel, and solar power. The renewable energy sources within the Great Plains region continue to increase in importance due to strong demand, investment of private capital, and support of Federal and state governments. Figure 3.1 presents the estimated renewable energy potential within the Great Plains states. Given the region's vast renewable energy potential, development of the region's resources and promotion of the GPITC as a key "Renewable Energy Corridor" present one of the corridor's greatest economic development opportunities.

Figure 3.1 Renewable Energy Potential within the Great Plains Region



Source: State Energy Conservation Office ([http://www.seco.cpa.state.tx.us/re\\_solar.htm](http://www.seco.cpa.state.tx.us/re_solar.htm)).

Note: A “quad” is one quadrillion British Thermal Units (Btus). One quad is about equivalent to the energy in 45 million short tons of coal or 167 million barrels of crude oil.

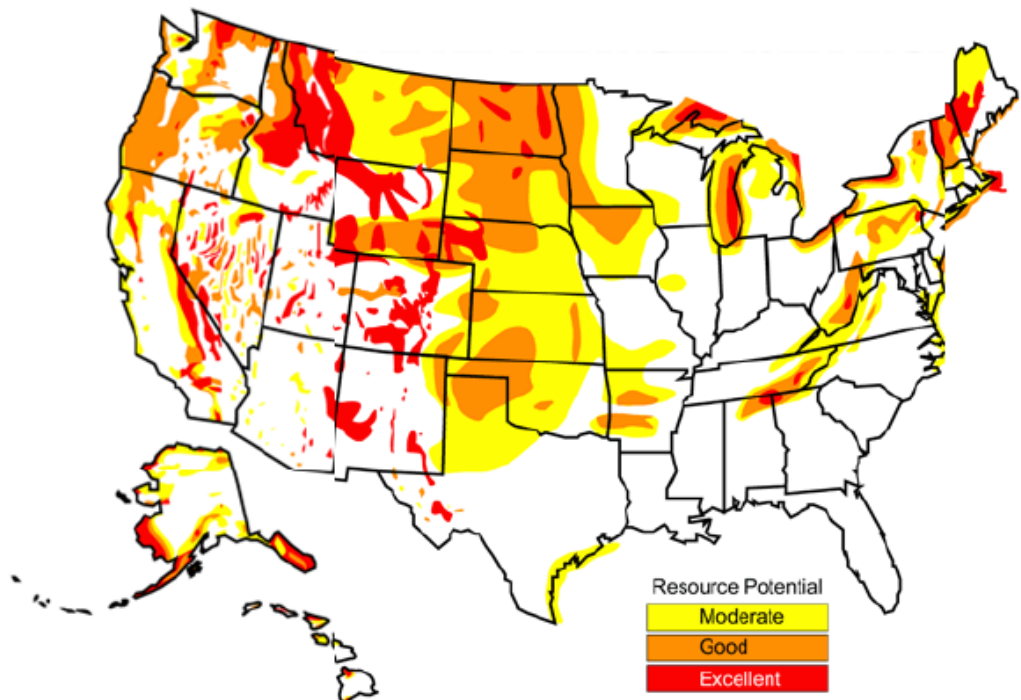
### Wind Power

Figure 3.2 illustrates the wind power potential in the United States, taking into account environmental and land use exclusions. A large belt of high wind energy potential stretches from the Texas Panhandle north through the Great Plains corridor. As shown in Table 3.1, the GPITC states comprise nine of the top 12 states for national wind energy potential. The Great Plains region offers robust wind resources coupled with attractive, available land for locating turbines and developing wind farms.

The attractiveness of wind power in the Great Plains is evident by the rapid growth of installed wind power capacity over the last several years. Between 2000 and 2007, the installed wind power capacity in the Great Plains states increased 2,520 percent, from 300 megawatts of capacity in 2000 to 7,890 megawatts in 2007.<sup>33</sup> The 10 states within the Great Plains region (including Kansas) accounted for over 47 percent of the total wind power wattage produced in the United States in 2007. As shown in Figure 3.3, the Texas wind power industry is now the largest wind energy producer in the country, with most of the commercial wind farms located in west Texas and the Texas Panhandle. The nation’s top two wind power-producing wind farms are located near Sweetwater, Texas in the GPTIC study area.

<sup>33</sup>U.S. Department of Energy, National Renewable Energy Laboratory.

Figure 3.2 United States Wind Energy Potential



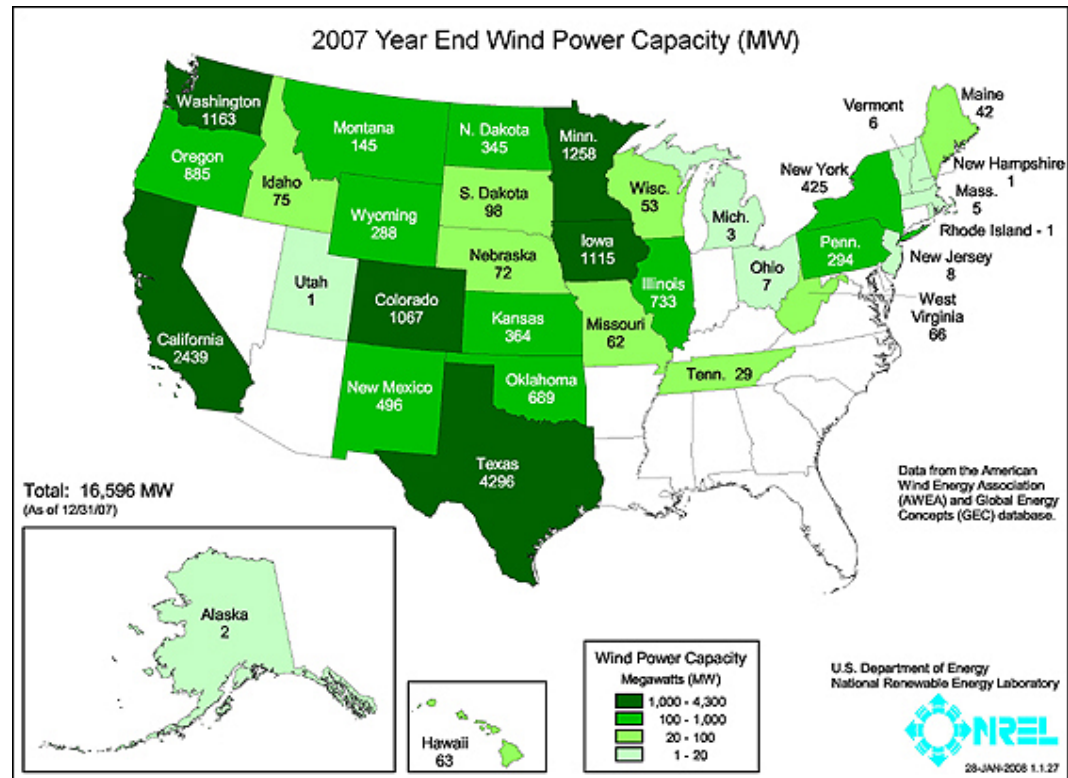
Source: American Wind Energy Association.

Table 3.1 GPITC States Wind Energy Potential Rankings

National Rank	State	Annual Energy Potential (billions of kWhs)
1	North Dakota	1,210
2	Texas	1,190
4	South Dakota	1,030
5	Montana	1,020
6	Nebraska	868
7	Wyoming	747
8	Oklahoma	725
11	Colorado	481
12	New Mexico	435

Source: American Wind Energy Association

Figure 3.3 United States Installed Wind Power Capacity



Source: U.S. Department of Energy, 2007.

Growth in the wind power industry is expected to grow in the future. Between 2002 and 2012, the global wind power industry is forecasted to grow from \$5.5 billion to \$49 billion.<sup>34</sup> Many of the Great Plains states have plans to expand their wind power capabilities. The Valley County Wind Energy Project in Montana, planned for completion by 2016, could generate up to 500 megawatts of wind energy.<sup>35</sup> North Dakota ranks first in the United States for potential wind generation with sizeable opportunities to increase installed wind capacity. By 2015, seven planned wind farm expansions in North Dakota will at least double the state’s existing wind power generation.<sup>36</sup>

In order to maximize potential wind power production, additional transmission capacity from the Great Plains region will be required. The lack of transmission

<sup>34</sup>Wobbekind, Richard et al., University of Colorado, Leeds School of Business, Business Research Division. 2004. Colorado’s Economic Opportunities: Today, Tomorrow, and the Future.

<sup>35</sup>Montana Department of Transportation. 2007. U.S. 2/MT 16 Transportation Regional Economic Development Study.

<sup>36</sup>“Big Wind Farm Planned in Central N.D.” Associated Press. The Bismarck Tribune. May 23, 2008.

capacity is often one of the biggest challenges impeding the installation of wind energy projects. In addition to transmission connectivity, a location suitable for commercial renewable energy power production must also have adequate natural resource, capital for large facility construction, and willing landowners. Texas has taken the first steps toward development of more transmission capacity through the recent approval of a large-scale transmission plan by state regulators. The new lines will convey wind power from the Texas Panhandle to urban areas in the eastern part of the state.

### *Potential GPITC Opportunities*

As the Great Plains states have robust wind energy potential and are centrally located within the country, the GPITC has a unique opportunity to cater to the nation's growing wind-energy industry. The following paragraphs discuss these opportunities, which include:

- Wind power equipment manufacturing;
- Heavy-haul routes for transporting wind power equipment; and
- Transmission corridors to move wind output to urban centers.

### **Wind Power Manufacturing**

While most of the wind power equipment used in emerging U.S. wind farms is produced overseas, there are signs of a shift to U.S. production, with a possible concentration of manufacturing within the GPITC study area. High transport costs (related to oil price increases) and a relatively weak U.S. dollar provide motivation to wind turbine equipment manufacturers to consider U.S. sites for production. For example, Vestas – one of the world's largest wind power producers – is interested in manufacturing more of its wind power equipment components in the United States. Whereas Vestas previously manufactured all of its equipment in Europe, it recently opened a new blade production facility in Windsor, Colorado and announced plans to build two more factories in nearby Brighton, Colorado expected to be fully operational in 2010.<sup>37</sup> Opening new wind power equipment manufacturing plants in the United States would reduce their transportation costs for turbine producers as the U.S. pushes to increase its renewable energy output.

Currently most U.S. wind turbine components arrive through international ports and utilize rail (first priority) and truck for landside moves to wind farm locations. The reliance on rail stems from the costly and sometimes onerous process of obtaining oversize/overweight permits for trucks carrying wind turbine components. Because rail transport is more economical than trucking, proximity to rail lines has become a key criterion in location decisions for wind-energy manufacturers. As such, the use of freight rail to transport wind-energy

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<sup>37</sup> Vestas Americas. "Vestas builds two new factories in Colorado, USA" Local press release No. 5/2008 from Vestas Americas A/S. 15 August 2008.

equipment is expected to strengthen.<sup>38</sup> For example, a new wind-tower factory in Lamar, Colorado will open later this year. With proximity to one of Colorado's largest wind farms south of Lamar, the factory will use the town's rail access to transport the towers.

While rail will continue to gain importance as a mode to transport wind energy components, the magnitude of development will continue to demand truck service, which is hampered by the circuitous routing required of many oversize/overweight permits.

### Heavy-Haul Routes

Transport of a wind turbine's components requires approximately 15 trucks, the majority of which require oversize/overweight permits.<sup>39</sup> The average weight of an assembled turbine weighs 352 tons.<sup>40</sup> Currently, the routes required to transport wind turbine equipment are circuitous and inefficient. The oversize/overweight trucks require substantial meandering and backtracking to avoid insufficient bridges and low-clearance overpasses, resulting in traffic disruptions and added transportation costs. As many of the GPITC segments are two-lane highways, the corridor may not have the necessary capacity to efficiently accommodate wind power equipment shipments. One potential solution to facilitate the movement of turbine equipment would be to designate one or more specific heavy-haul routes for the components to maximize access to the location of the emerging wind farms. The most important characteristic of such a heavy haul route would be the ability to sustain heavy loads (up to 193,000 pounds), which means that some bridges may require upgrades. In the GPITC, designation of sections for heavy haul would require funding for retrofitting and upgrading bridges and structures. Before moving forward with upgrades, states should test the feasibility of generating sufficient permit fees or economic benefits to offset the expenditure.

### Transmission Corridors

As shown in Figure 3.4, the GPITC straddles the three North American power grids. Throughout the United States and Canada, Regional Reliability Councils keep the power grid balanced through the control of energy flow. Regional Reliability Councils also are responsible for planning and development functions related to transmission and distribution of electric energy. As shown in Figure 3.5, four reliability councils oversee electric transmission within the GPITC: the Electric Reliability Council of Texas (ERCOT), Southwest Power Pool (SPP), Western Electricity Coordinating Council (WECC), and Midwest Reliability Organization (MRO). While it is not impossible for power users in one Regional

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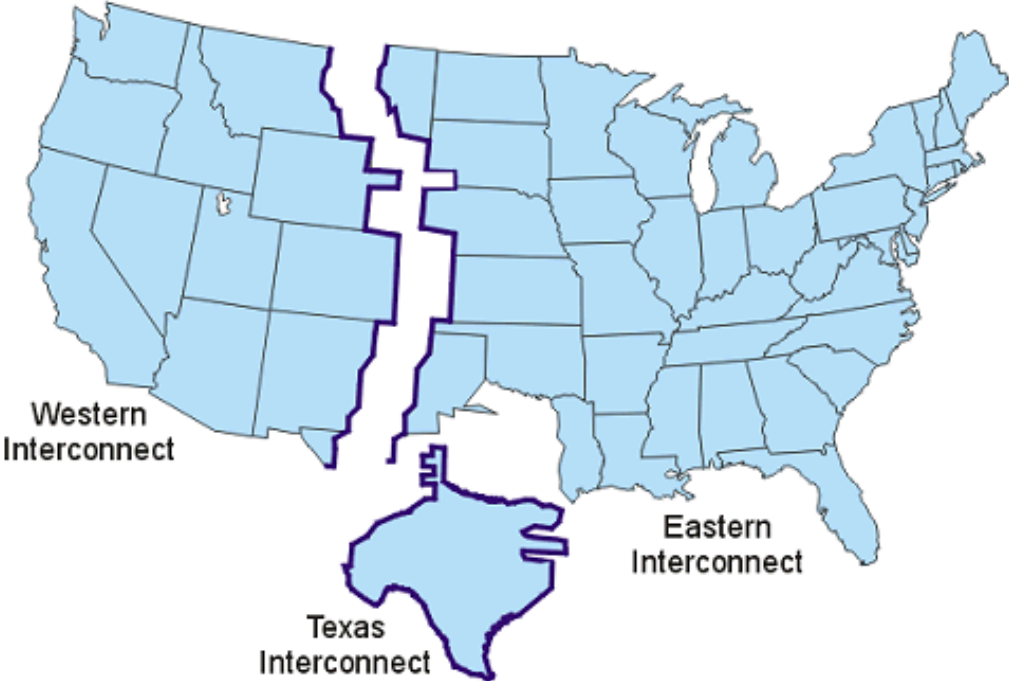
<sup>38</sup> Raabe, Steve. "Rolling with the Wind" *The Denver Post*. May 3, 2008.

<sup>39</sup> Chirinos, Fanny S. "Wind turbine parts are unloaded at port." *Corpus Christi Caller-Times*. November 8, 2006.

<sup>40</sup> Ibid.

Reliability Council to utilize energy from another council or grid, it requires careful institutional and engineering cooperation.

Figure 3.4 North American Power Grids



Source: Energy Information Administration

Figure 3.5 North American Regional Reliability Councils



Source: North American Electric Reliability Corporation (NERC).

Following the Texas Public Utility Commission's (PUC) approval of a nearly \$5 billion plan for new transmission lines in Texas to bring wind energy to the state's urban areas, there may be possible synergies to jointly develop new transportation / transmission capacity.<sup>41</sup> One possibility within this idea would include the use of Texas DOT rights-of-way instead of necessitating the acquisition—possibly through eminent domain—the rights of way for new transmission corridors. Currently the exact location of proposed transmission facilities is undefined. Working together, state agencies including the PUC, Texas DOT, the power grids (the Electric Reliability Council of Texas and the Southwest Power Pool) could jointly identify opportunities to realize the construction of these transmission lines. The *Trans-Texas Corridor Rural Development Opportunities: Ports-to-Plains Case Study* prepared by CS for the Texas DOT in 2007 provides ideas and recommendations for institutional collaboration to promote wind power transmission.

<sup>41</sup> "Texas to Spend Billions on Wind Power Transmission Lines." *Environment News Service*. July 18, 2008. (<http://www.ens-newswire.com/ens/jul2008/2008-07-18-094.asp>)

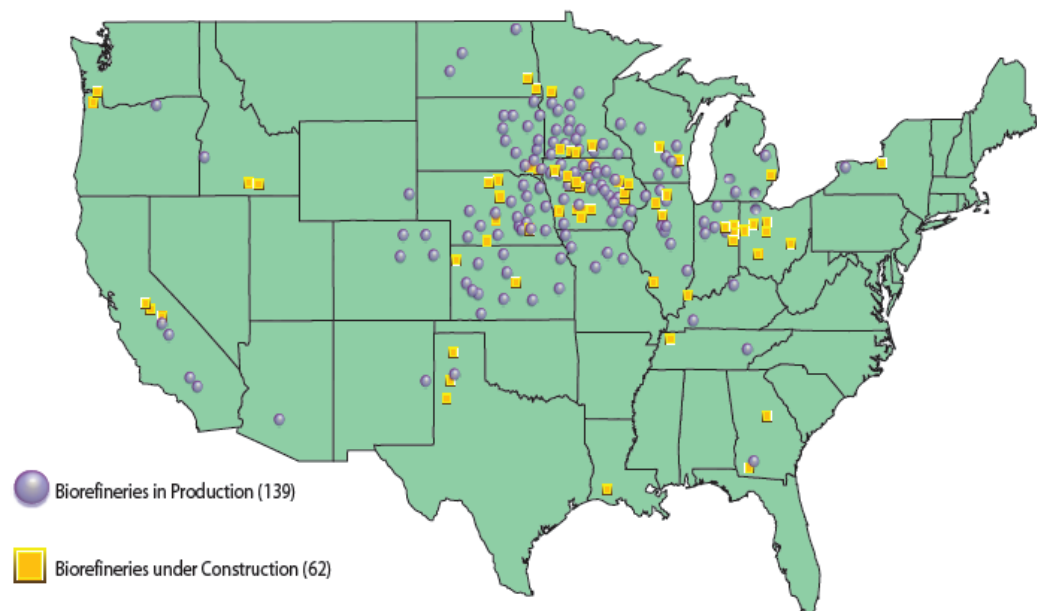


## Biofuel

Technological advancements in the cost-effective production of biofuels may create new economic opportunities for the agricultural industry and rural areas of the GPITC. Ethanol and biodiesel production facilities bring jobs, value-added markets, and increased tax revenues to rural areas, while the transport of biofuel inputs from farm to production facility and refined products from production facility to market affects truck and rail demand.

Once concentrated in the traditional corn growing states in the Midwest, ethanol production facilities have expanded across the country to meet rising demand. Figure 3.6 locates the biorefineries currently in production or under construction across the country, several of which are located in the GPITC study area. An economic analysis of the ethanol industry prepared for the Renewable Fuels Association indicated that ethanol plants provide important benefits to the local communities in which they are located. A large ethanol plant producing 100 million gallons per year (MGY) is estimated to annually contribute an additional \$300 million to the state's gross domestic product, increase average annual household income by \$76.7 million, and add over 1,100 new jobs (directly employing 50 people at the plant and indirectly creating over 1,000 jobs).<sup>42</sup> A medium-sized ethanol plant producing 50 MGY would generate benefits slightly more than half of those generated by the 100 MGY facility.

Figure 3.6 U.S. Ethanol Biorefinery Locations



Source: Renewable Fuels Association, 2008.

<sup>42</sup>LECG, LLC. 2008. *Contribution of the Ethanol Industry to the Economy of the United States*.

The Renewable Fuels Association approximates that 75 percent of the country's ethanol is transported by rail, while the remaining 25 percent moves by truck.<sup>43</sup> Although pipeline would likely be the most economical method of delivery, the decentralized locations of ethanol production facilities and insufficient volume makes ethanol transport by pipeline unfavorable from a logistics perspective.<sup>44</sup> Where destination terminals are accessible by water, barges and ships provide additional transport alternatives for ethanol. The cost of moving ethanol by water, however, is comparable to rail transport and would not be applicable to the GPITC study area.

The most cost-effective delivery method for moving ethanol from the production facility to the destination terminal largely depends on the required transport distance and shipment size. Rail is generally most cost-effective over medium to long-range distances (between 300 to 2,000 miles), while trucks economically accommodate distances under 300 miles. Trucks also are required for delivering ethanol to terminals that do not have rail accommodations. Depending on the size of the plant's production capacity, rail shipments may be as small as one rail car (with approximate capacity of 29,000 gallons) to daily multi-car movements. Comparatively, trucks can transport approximately 8,000 gallons.<sup>45</sup>

A plant producing 10 MGY equates to approximately one rail car per day. Given operational and cash flow considerations, very small plants (producing less than 10 MGY) ship their ethanol almost exclusively by truck. Larger facilities producing greater than 10 MGY, however, use a combination of truck and rail. Considering the importance of truck and rail connectivity to the biofuel industry, providing the necessary transportation infrastructure within the GPITC study area would be an important component in supporting the region's growing biofuel industry.

While all of the ethanol currently used in the U.S. as an additive to gasoline comes from corn, recent Federal legislation provides incentives and tax credits to rural areas producing cellulosic biofuels made from corn stalks, wood, and other non-edible, agricultural waste.<sup>46</sup> Drought-resistant switchgrass grown in the semiarid regions of the Great Plains can be used to create cellulosic biofuels, providing an economic opportunity along the corridor where growing corn for ethanol without irrigation is often difficult. However, before cellulosic ethanol can become a significant energy production activity in the GPITC, the manufacturing science of creating ethanol from cellulosic sources needs to

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<sup>43</sup>Renewable Fuels Association. 2006. *From Niche to Nation: Ethanol Industry Outlook 2006*.

<sup>44</sup>Downstream Alternatives Inc. 2002. *Infrastructure Requirements for an Expanded Fuel Ethanol Industry*.

<sup>45</sup>Downstream Alternatives Inc. 2000. *The Current Fuel Ethanol Industry Transportation, Marketing, Distribution, and Technical Considerations*.

<sup>46</sup>"New Farm Bill Helps Colorado" *The Denver Post*. May 26, 2008.

progress to make the process more cost effective.<sup>47</sup> As cellulosic biofuel manufacturing technology improves, the greatest opportunities for switchgrass production will occur in areas where switchgrass is economically competitive with the existing agricultural land uses.

Several biofuel facilities are under consideration in the GPITC study area. A proposed biomass electric generation facility near Raton, New Mexico would convert waste from tree thinning and agriculture into power.<sup>48</sup> Similarly, two biodiesel plants are slated for construction in North Dakota.<sup>49</sup> To provide opportunities for increased trade with Canada, Montana is considering building biodiesel plants and increasing the production of crops to fuel the plants.

## Solar Power

Solar energy, particularly in the southern half of the GPITC study area, provides an additional renewable energy opportunity. Between 2002 and 2012, the global solar photovoltaics industry is forecasted to grow from \$3.5 billion to \$27.5 billion.<sup>50</sup> Similar to the wind farms opportunities previously described, large-scale solar towers as well as off-grid applications could provide economic opportunities in the GPITC study area. The significant upfront capital costs, however, provide the biggest impediment to growth in the solar energy market. In addition, the Great Plains region will not be as competitive as the Southwest for solar power production due to its lower solar radiation concentration.

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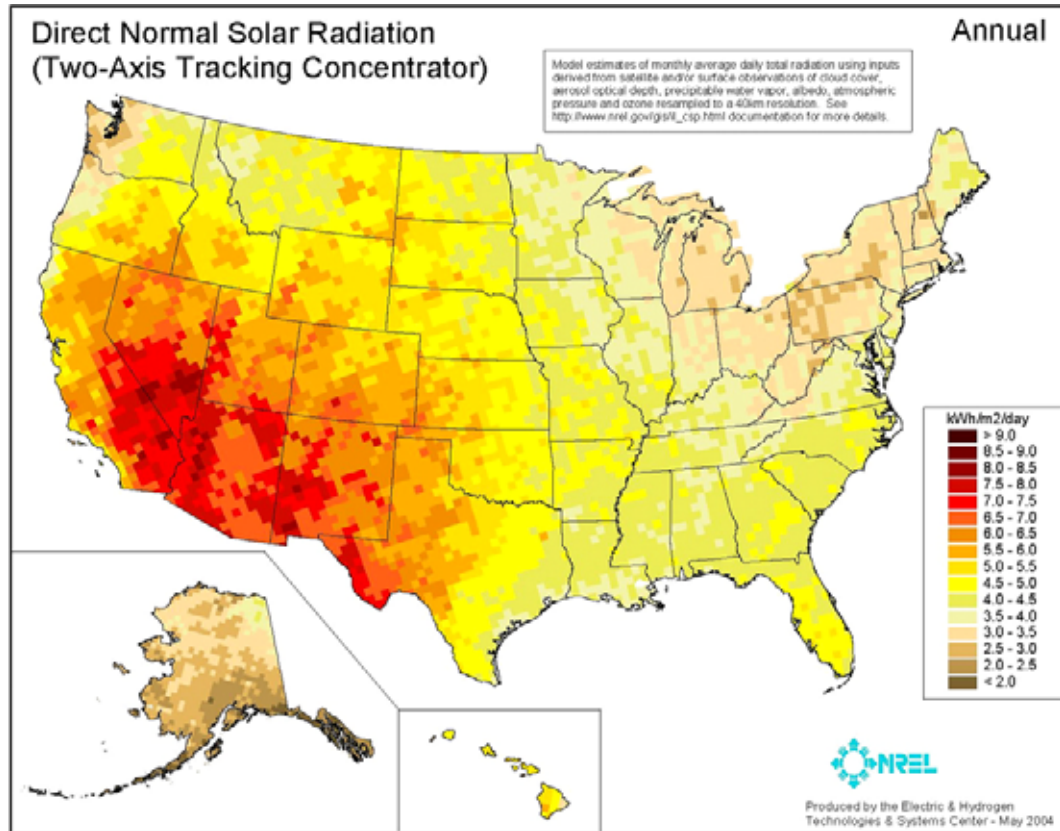
<sup>47</sup> Dartmouth College. "Genetically Engineered Thermophilic Bacterium: Researchers Advance Cellulosic Ethanol Production." *ScienceDaily* 12 September 2008. 23 September 2008 <<http://www.sciencedaily.com/releases/2008/09/080908185132.htm>>.

<sup>48</sup> Wobbekind, Richard et al., University of Colorado, Leeds School of Business, Business Research Division. 2004. *Colorado's Economic Opportunities: Today, Tomorrow, and the Future*.

<sup>49</sup> North Dakota Department of Transportation. 2007. *TransAction II – North Dakota's Statewide Strategic Transportation Plan*.

<sup>50</sup> Wobbekind, Richard et al., University of Colorado, Leeds School of Business, Business Research Division. 2004. *Colorado's Economic Opportunities: Today, Tomorrow, and the Future*.

Figure 3.7 Solar Radiation Concentration



Source: U.S. Department of Energy.

## 3.2 OIL AND NATURAL GAS

Drilling for crude oil becomes more profitable as global oil prices continue to rise. For example, extracting oil products from non-conventional oil deposits, such as Alberta's tar sands, becomes economical when crude oil sells for about \$70 per barrel.<sup>51</sup> Long-term forecasts of sustained high oil prices and a renewed interest in oil exploration in Montana, North Dakota and Alberta, Canada presents an opportunity for economic growth in the northern GPITC study area. The recent economic growth in Alberta has been due, in large part, to oil and gas projects in the region's substantial oil sands deposits. As identified in an economic development study for Montana's portion of the Theodore Roosevelt Expressway, oil exploration and extraction activities could increase truck traffic in the corridor as oil pipelines transporting oil from Canada to points south for refining reach capacity. While trucking is the only alternative to pipeline for the transport of oil, it also is a more expensive alternative. Development of an oil

<sup>51</sup> Duggal, Arun. "Crude oil at \$250 per barrel?" *The Economic Times*. 18 July 2008.

refinery in the northern GPITC region would reduce the required distance for transport while creating economic opportunities for the region.<sup>52</sup>

Another transportation dimension to the oil and natural gas drilling activity in the GPITC (and on its periphery in Canada) is the manufacturing and transport of specialized drilling and rigging equipment. The Midland-Odessa area, located at the center of one of the largest domestic oil regions, is a center for the production of oil and gas equipment and tools. As such, the companies engaged in this type of specialized manufacturing provide finished products not only to sustain oil exploration and extraction in the immediate Permian Basin Region, but to support operations throughout oil producing regions of the world. Within the GPITC, shipments to major oil fields, including the Williston Basin in Montana/North Dakota; the Powder River Basin in Wyoming; the Denver Basin in Colorado; and the Andarko Shelf in Oklahoma. In addition, some shipments are destined for one of the major emerging oil extraction areas of the world: the Athabasca Tar Sands area of Northeastern Alberta (Figure 3.8).

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<sup>52</sup>Montana Department of Transportation. 2007. *U.S. 2/MT 16 Transportation Regional Economic Development Study*.

Figure 3.8 Alberta, Canada Oil Sands



Source: Norman Einstein, May 10, 2006 (released into public domain)

### 3.3 AGRICULTURE AND LIVESTOCK

The economies of the Great Plains states have historically relied largely on agriculture. Likewise, growth in agriculture will likely play a vital role in determining future economic growth in the region. Within the study area, the growing number of biofuel plants could support an increase in livestock and dairy production by providing by-products, such as dried distilled grains, for livestock food. The use of switchgrass for biofuels may provide an opportunity for dry land farming in areas that might not otherwise be suitable for other lucrative crops. Alternatively, the growing market demand for organic, non-genetically modified commodities could provide an opportunity to farmers to add value to their agribusiness.

The emerging economic presence of “high-tech” hog farming in the Oklahoma Panhandle could require increased or improved rail freight service and specialized high-volume truck-rail intermodal facilities for livestock.<sup>53</sup> Beyond these “new” agricultural opportunities, the GPITC will continue to see growth in production and demand of several staple commodities of the region. The commodity class with the greatest forecast growth in trucking demand is cereal grains, which may require additional investment in grain loading facilities to transload from truck to rail.

### 3.4 OTHER DEVELOPMENT OPPORTUNITIES

#### Eco-Tourism

Many of the Great Plains’ top tourist destinations are located in rural areas, including the region’s state and national parks (Custer State Park, Mount Rushmore National Memorial, Badlands National Park, and Theodore Roosevelt National Park), reservoirs (Fort Peck Lake and Lake Meredith), and other recreational areas (Black Hills National Forest). As the rural areas of the Great Plains have experienced steady population declines over the past decades, some conservationists and environmentalists have identified an opportunity to restore, preserve, and protect the region’s natural wildlife and habitat while promoting ecotourism in the area. In an attempt to “rewild the west,” organizations are creating wildlife reserves and preserving open space to help restore the upper Great Plains to its natural, pre-agricultural state. Eco-tourism outfitters provide multi-day wildlife safaris to observe migrations of antelope, elk, mountain lions, bighorn sheep, and bison.<sup>54</sup> With the goal to increase land preservation for native plants and animals and promote sustainable farming and

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<sup>53</sup>Oklahoma Department of Transportation. 2005. *2005-2030 Statewide Intermodal Transportation Plan*.

<sup>54</sup> Kurlantzick, Joshua. “Back to Nature and Ready for Guests in the Great Plains.” *The New York Times*. June 8, 2008.

ranching, the World Wildlife Fund added the northern Great Plains to its list of “high-priority places” in 2005.<sup>55</sup>

A safe, reliable, and well-signed highway system is important in attracting visitors to the region. Promoting tourism in the Great Plains region will encourage economic development in the region.

## Dairy Industry

The Hilmar Cheese Company manufacturing facility, which opened in 2007 in Dalhart, Texas, represents the rapid growth in dairy farming in the Texas Panhandle over the past several years. This growth has been fueled by several factors, including:

- The increasing cost of land for dairy farming in California’s Central Valley;
- The abundant and relatively inexpensive land and water in the Texas Panhandle; and
- The region’s strategic location halfway between the Pacific and Atlantic coasts and relative proximity to major metropolitan areas of the Sunbelt, including Los Angeles, Phoenix, and Dallas-Fort Worth.

The Hilmar plant and other new cheese and milk processing facilities will continue to attract new dairy farming ventures to the area, many relocating from California. The processed cheese and milk produced in the Texas Panhandle will likely rely on refrigerated truck transportation to get the perishable products to market quickly. As truck volumes increase to serve the expanding Texas Panhandle dairy industry, safety considerations, and economic development opportunities should be evaluated.

## Trucking

The trucking industry operating in the GPITC serves both domestic and international transportation demand. Given much of the corridor’s rural location serving cities with modest populations, many of the businesses located within the GPITC study area are dependent on the transportation network to transport their products to final markets outside of the study area. Similarly, as the volume of north-south trade associated with NAFTA continues to increase, additional transportation infrastructure will be required to support a growing trucking industry.

Highway upgrades and reliever routes along the corridor’s busiest trade routes could improve the performance and safety of trucking operations. Likewise, rest areas, wider shoulders, and other provisions to accommodate needs of the truck drivers traveling along GPITC would improve safety and present the region with economic benefits.

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<sup>55</sup>Nasser, Haya. “Life on the Great Plains is anything but plain, simple.” *USA Today*. August 13, 2007.



A rest area study completed in 2007 assessed the needs and benefits of additional truck parking and rest areas along the Ports-to-Plains Corridor.<sup>56</sup> It concluded that state and local jurisdictions would experience increases in employment, household income, and tax revenues with the addition of each gas station, convenience store, travel plaza, or truck stop. The study also identified opportunities to leverage private investment or develop public-private-partnerships to help fund future truck accommodations. To determine the potential economic benefits of improved truck accommodations in the northern half of the GPITC, stakeholders could initiate similar studies for the Heartland and Theodore Roosevelt Expressways.

As is true for all NAFTA corridors, one impediment to truck industry growth along the GPITC is the lack of truck size and weight (TS&W) regulation uniformity. Within the GPITC study area, TS&W regulations are variable, complex, and administered by 12 different entities: the States of Colorado, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming; the U.S. Federal government; the Mexico Federal government; and the Provinces of Alberta and Saskatchewan. Table 3.2 presents a sampling of the TS&W regulations for the 12 jurisdictions. TS&W inconsistencies add to the time and cost of cross-border truck movements by requiring additional truck inspections, axle or tire repositioning, load modifications, ownership of a diverse fleet of truck sizes, etc. to ensure compliance with local regulations. While cross-border truckers, confronted with several TS&W regulations, may choose to operate under the most stringent of the regulations, truck weight limitations reduce the truck's maximum payload and efficiency on the total length of haul. Although higher allowable vehicle weights would reduce freight transportation costs, it also would result in faster deterioration of pavements and present traffic safety concerns. As such, policy considerations to improve highway transportation efficiency to support economic development, while adequately maintaining highway infrastructure, could play an important role in advancing truck activity in the GPITC study area. Harmonization of TS&W policy between the United States, Canada, and Mexico is necessary to improve trucking efficiencies, reduce costs, and provide real economic benefits to the GPITC states.

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<sup>56</sup>DMJM Harris, AECOM. 2007. *Ports to Plains Corridor Rest Area Study*.

Table 3.2 Truck Size and Weight Regulations

Jurisdiction	Pound			Feet Maximum Height
	Maximum GVW	Single Axle	Tandem Axle	
Colorado	85,000	20,000	36,000	13.0 <sup>d</sup>
Montana	132,000 <sup>a</sup>	20,000	34,000	14.0
Nebraska	95,000	20,000	34,000	14.5
New Mexico	86,400			14.0
North Dakota	105,500	20,000	34,000	14.0
Oklahoma	90,000 <sup>b</sup>	20,000	34,000	13.5
South Dakota	129,000 <sup>b</sup>	20,000	34,000	14.0
Texas	80,000	20,000	34,000	14.0
Wyoming	117,000	20,000	36,000	14.0
U.S. Interstates	80,000 <sup>c</sup>	20,000	34,000	None <sup>e</sup>
Western Regional Permit Agreement <sup>f</sup>	160,000	21,500	43,000	14.0
Saskatchewan	137,787	20,062	37,477	13.6
Alberta	139,992	20,062	37,477	13.6
Mexico	97,000			13.9

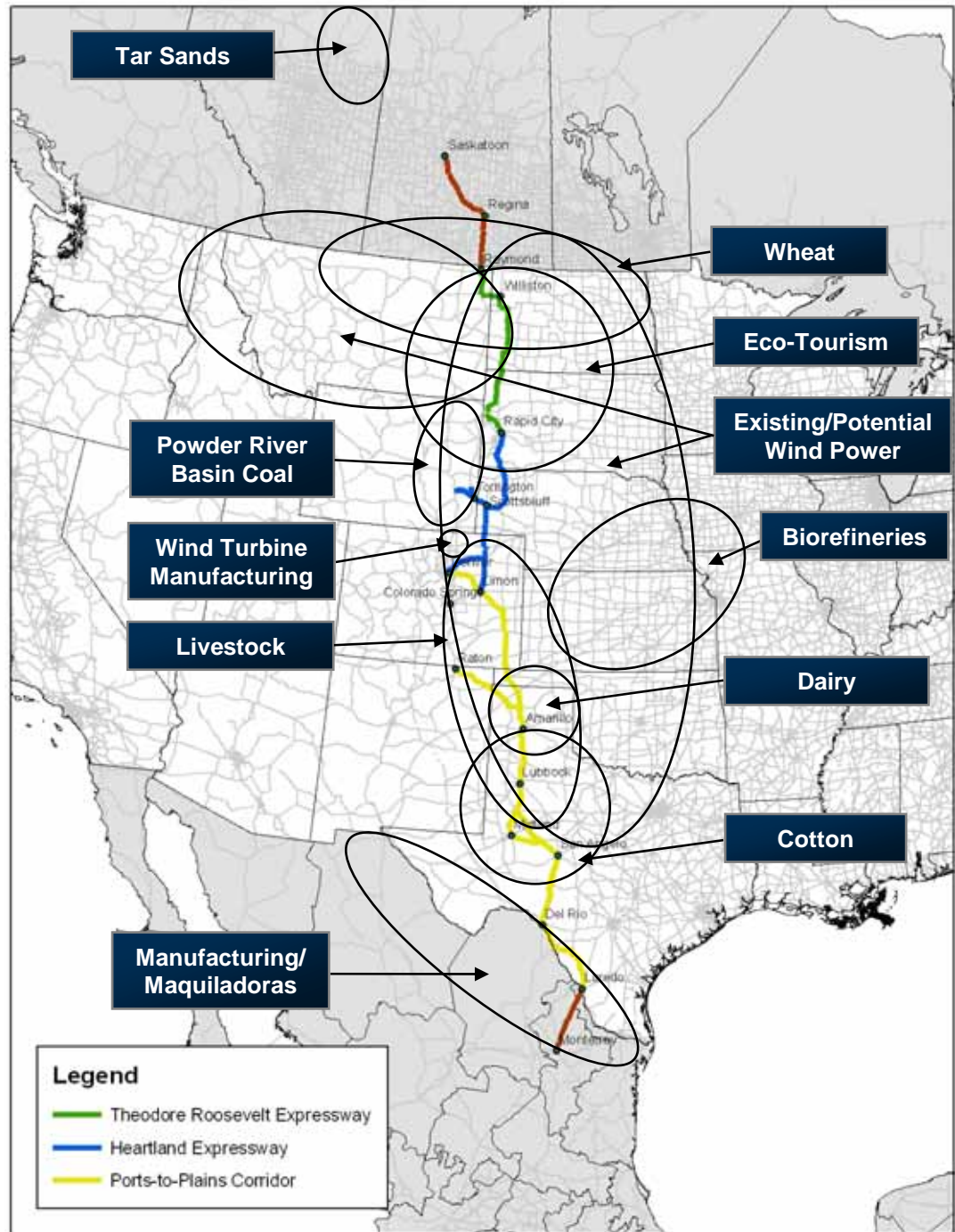
Source: <http://www.transportation.alberta.ca/3173.htm>

- Notes:
- <sup>a</sup> In Montana, the GVW is 132,000 pounds; however, you can register for 138,000 pounds if you are traveling between Sweetgrass and Shelby.
  - <sup>b</sup> For Oklahoma and South Dakota, an overweight permit is required over 80,000 GVW on an interstate.
  - <sup>c</sup> Three GPITC states, New Mexico, North Dakota, and Wyoming, have exercised their rights under the grandfather authority to exceed 80,000 GVW on the interstates within their jurisdiction.
  - <sup>d</sup> In Colorado, any vehicle with a height of 14.5 feet must travel only on highways designated by the state DOT.
  - <sup>e</sup> State height standards apply on U.S. interstates.
  - <sup>f</sup> The Western Regional Permit Agreement allows member jurisdictions to issue permits to qualifying oversize and/or overweight vehicles and collect fees for all member states when they are the entry/origin, destination/exit, or a pass through jurisdiction on the route. Current member states include Arizona, Colorado, Idaho, Louisiana, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, and Washington. Four GPITC states, including Nebraska, North Dakota, South Dakota, and Wyoming, are not participating members of the agreement

### 3.5 DEVELOPMENT OPPORTUNITIES SUMMARY

Figure 3.9 highlight the general locations of the key GPITC economic activities previously described in this section and show how the corridor ties to the economies of each region. Most of these activities relate to the production of energy (including fossil fuels and renewable sources) and agriculture (including crops and livestock). These two industries rely heavily on highway and rail infrastructure for the transport of drilling and rigging equipment from manufacturing facilities to the field, oversize/overweight wind turbine equipment from U.S. seaports to new wind farm developments, crude oil from wells to refineries, and agricultural commodities from farms to final markets. Given these transportation demands, the GPITC is well-positioned to serve the needs of the region's energy and agricultural industries while promoting economic development in the communities through which it passes.

Figure 3.9 Composite GPITC Economic Activity Map



Source: Cambridge Systematics, Inc.

## 4.0 Data Gaps Analysis

The GPITC corridor views and development opportunities assessments relied on multiple sources of data, including infrastructure data, socioeconomic and industry data, and traffic volume and commodity flow data. Both current and forecast data were required to describe existing conditions as well as to predict future system performance and identify industry trends. We supplemented the available data with information obtained from targeted interviews to identify potential development opportunities and infrastructure needs within the GPITC study area. Although we utilized multiple data sources, significant data gaps still exist for evaluating GPITC-specific commodity flows and the potential economic, trade, and transportation effects of roadway improvements along the corridor. This section provides a comprehensive matrix of available data sources, identifies the data gaps and shortcomings, and recommends strategies to remedy the data gaps for future studies.

For purposes of discussion, we divide the data gaps analysis discussion into two categories: infrastructure supply and transportation demand. Infrastructure supply pertains to the location and capacity of the existing and planned intermodal transportation network including highway, rail, and aviation facilities. Transportation demand data characterize the people and goods that use the transportation network. By identifying the data gaps and understanding the limitations of existing data sources, the Texas DOT, GPITC Coalition and their partners, or other GPITC stakeholders can choose to pursue future analysis efforts to fill the gaps that will support GPITC economic development initiatives.

### 4.1 INFRASTRUCTURE SUPPLY

Table 4.1 summarizes the data needs pertaining to GPITC infrastructure supply. Data needs include information on the location and capacity of existing transportation facilities (including highway, rail, intermodal, and aviation facilities) as well as planned transportation improvements that will affect capacity, connectivity, and/or efficiency in the future. Data related to existing transportation infrastructure is readily available from the U.S. DOT's Bureau of Transportation Statistics (BTS). Information on planned and programmed transportation improvements is documented in each state DOT's Statewide Transportation Improvement Program (STIP) (updated every three to five years), long-range statewide plans, and regional transportation plans prepared by local metropolitan planning organizations (MPO), if applicable. Because state DOTs occasionally make amendments to an adopted STIP due to changes in funding, project scope, or prioritization, direct coordination with each DOT at the state or district level is important to maintain an accurate list of planned projects.

Table 4.1 Infrastructure Supply Data Gaps Analysis

Data Need	Availability	Source(s)	Gap(s)	Suggested Action Plan
Highway Network (existing number of lanes)	●	BTS 2007 National Transportation Atlas	None.	None required.
Rail Network	●	BTS 2007 National Transportation Atlas	None.	None required.
Intermodal Facilities	●	BTS 2007 National Transportation Atlas	None.	None required.
Military Installations	●	BTS 2007 National Transportation Atlas	None.	None required.
Public-Use Airports	●	BTS 2007 National Transportation Atlas	None.	None required.
Planned Transportation Improvements	●	State DOT STIPs, DOT interviews	None.	None required.
Existing Conditions and Future-Year Capacity Assessment (volume/capacity)	◐	State DOTs (AADT, percent trucks, and future-year traffic forecasts), Highway network data (existing conditions network), and State DOT STIPs (future-year network).	Traffic operations along the GPITC through cities will be affected by traffic control devices and varying roadway geometry. Capacity assessment in non-rural areas requires local information and field observation.	Conduct an assessment of highway capacity on the rural and urban segments of the GPITC to identify chokepoints and potential improvement projects. This process would be similar to the analysis performed for the Ports-to-Plains Corridor Development and Management Plan (2004), but would include all GPITC segments. If possible, link the impacts of highway chokepoints to business operations (through stakeholder interviews) to prioritize infrastructure investment and promote economic development. Field visits along the corridor would provide an opportunity to synthesize the available traffic volume, highway capacity, and stakeholder interview data.

Data Availability Scale
● Data are available, no additional analysis required
◐ Data are available, some modifications/analysis required
○ Data are not available or significant analysis/modifications required

Source: Cambridge Systematics, Inc.

## Suggested Action Plan for Future Efforts

While the corridor views described in Section 2.0 identified the number of lanes and range of traffic and truck volumes on the GPITC segments, additional analysis is required to assess the adequacy of existing highway capacity. Evaluating the volume-to-capacity ratios of urban and rural segments of the GPITC would allow the Coalition to identify chokepoints along the corridor and provide a basis for improvement project prioritization as it proceeds towards the goal of providing four lanes divided along the corridor's length. This capacity analysis would be similar to the analysis performed for the *Ports-to-Plain Corridor Development and Management Plan*,<sup>57</sup> but conducted for the entire GPITC. As the highway capacity of GPITC segments in urban areas depends upon the characteristics of traffic control devices and varying roadway geometry, local information and field observation will be required to conduct a detailed analysis of the corridor through metropolitan areas. Field visits along the corridor would also provide an opportunity to verify and synthesize the available transportation infrastructure data. To supplement the capacity analysis, targeted interviews with local stakeholders would provide information to link the impacts of highway chokepoints to business operations. This information could be used to further prioritize infrastructure investment and promote economic development along the corridor.

## 4.2 TRANSPORTATION DEMAND

Identifying transportation infrastructure needs and potential development opportunities within the GPITC requires the evaluation of data describing existing and future transportation demand. The data related to transportation demand are summarized in Table 4.3.

### Population and Growth Patterns

To evaluate historical and forecasted population shifts within the study area, we required data sources that could provide historic and forecasted population by county. The U.S. Census Bureau provides historical and existing county-level population data for all states and counties. Similarly, Statistics Canada and the Instituto Nacional de Estadística y Geografía (INEGI) provide historical and current population data for Canada and Mexico, respectively. However, none of these national sources provide long-term population projections at a sub-state/province or regional level. For future-year population projections, we used the proprietary Woods & Poole national dataset (developed from public

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<sup>57</sup> DMJM + Harris et al. 2004. *Ports to Plains Corridor Development and Management Plan*. Prepared for the Colorado Department of Transportation, New Mexico Department of Transportation, Oklahoma Department of Transportation, and the Texas Department of Transportation.

data sources) that provided population data by county from 1970 to 2030. This data, published by a single source, allowed us to map and better analyze historical and forecasted population shifts within the U.S. portion of the corridor. Data gaps remain for identifying future-year population projections for the Canada and Mexico portions of the GPITC.

### **Employment by Industry**

Similar to population, our analysis required county-level information on employment within the study area to identify growing and declining industries. A variety of public sources, such as each state's Department of Labor and Department of Commerce, County Business Patterns from the U.S. Census Bureau, and the U.S. Department of Commerce's Bureau of Economic Analysis, provide historical employment data. These sources, however, do not offer future projections of employment by industry and would require considerable effort to compile consistent data for all nine GPITC states. Instead, we opted to use the Woods & Poole dataset to identify industry trends. This dataset provides historical and projected industry employment at the county level for all nine states in the GPITC study area. Like the Woods & Poole population data, however, employment projection data gaps for Canada and Mexico remain.

### **Existing and Future Traffic and Truck Volumes**

Traffic volume data are important to evaluate the performance of the transportation system and identify highway segments that may require additional capacity at current or future volume levels. Truck volumes indicate which routes are used for interstate and intrastate commerce and where improvements would most efficiently support truck movements or lessen truck impacts.

The state DOTs through which the GPITC passes provide the primary source for annual traffic and truck data along the corridor. Using automatic traffic recorders, weigh-in-motion stations, and other data collection methods, the state DOTs routinely collect traffic data at periodic locations along the state's highway system and report the data annually to the Federal Highway Administration (FHWA) to support the national Highway Performance Monitoring System (HPMS) database. While many of the state DOTs post traffic volume data on their websites, this data is not always representative of the most current data available. Table 4.2 lists the current traffic volume data available from the nine GPITC state DOTs. Rather than merging data reported individually by each DOT in the corridor (with varying source years, truck data availability, and future-year information), the HPMS national database provides traffic volumes, truck data, and future-year traffic projections for all states and can be used as a single source of traffic data across multi-state boundaries for planning purposes. However, the truck count and 20-year forecast data included in the HPMS database only represent sample sections along a highway and may not include the universe of data collected by the DOT. As a result, direct coordination with each DOT will ensure that the traffic volume data to be



used in a study is the most current and that truck percentages and future-year traffic forecasts are consistent with current DOT estimates.

**Table 4.2 Current Traffic Volume Data by State DOT**

State DOT	Year	Information Included	Format	Notes
Colorado	2007	AADT, truck %, 20-year growth factors	Data table and maps	
Montana	2007	AADT, AADTT	Data table	
Nebraska	2006	AADT, AADTT	Map	Data compiled in even numbered years and maps published in odd numbered years.
New Mexico	2007	AADT, truck %	Data table	Data not available online; counts and forecasts available by request
North Dakota	2007	AADT, AADTT	Map	Although a new map is released every year, statewide counts updated once every three years
Oklahoma	2007	AADT, 2030 AADT, truck %	Data table, Map	
South Dakota	2007	AADT, AADTT	Map	Annual release in February
Texas	2006	AADT, truck flow bands	Map	AADT by district available by request, 2007 data to be release Fall 2008
Wyoming	2007	AADT, % trucks	Data table	

Note: Current information as of August 2008. AADT – Average annual daily traffic, AADTT – Average annual daily truck traffic

One outstanding data gap related to traffic and truck volumes in the GPITC study area pertains to traffic volumes along the Mexican and Canadian portions of the corridor. Although border crossing information provides some insight into the passenger car and truck volumes passing between the three counties, future study efforts may require knowledge of existing traffic volumes and future-year projections to identify key chokepoints and priority projects.

Table 4.3 Transportation Demand Data Gaps Analysis

Data Need	Availability	Source(s)	Gap(s)	Suggested Action Plan
Population and Growth Patterns	●	U.S. Census Bureau (historical data), Woods & Poole (historical and forecast data), Statistics Canada (historical data), Instituto Nacional de Estadística y Geografía (historical data)	Future-year Canada and Mexico population forecasts and distribution	Coordinate with state, provincial, or local officials to determine if future population projections have been prepared for the portions of Canada and Mexico in the GPITC study area. If available, no additional analysis will be required.
Employment by Industry	●	Woods & Poole (historical and forecast data)	Canada and Mexico employment distribution (existing and forecasted)	Coordinate with state, provincial, or local officials to determine if future population projections have been prepared for the portions of Canada and Mexico in the GPITC study area. If available, no additional analysis will be required.
Existing and Future Traffic and Truck Volumes	◐	State DOTs, FHWA HPMS	The state DOTs submit traffic data annually to support the FHWA's HPMS system. As the DOTs routinely collect and update their highway traffic data, the data posted on the DOT websites is not always the most current data available. Similarly, the methodologies for forecasting future-year traffic volumes vary by state (although forecasts are typically based on trendline regressions of historic traffic data) and are often conducted on a project-specific basis only. While the DOTs report forecast data for inclusion in FHWA's HPMS, only sample sections of highways are reported. Therefore, the HPMS forecast data may not include data for as many points on a given highway segment as those routinely counted by the DOTs. An additional data gap is traffic and truck volumes on the GPITC segments in Canada and Mexico.	Rather than merging data reported individually by each DOT in the corridor, the FHWA's national HPMS data can be used for planning purposes as a single source for AADTs across multi-state boundaries. However, direct coordination with each DOT will ensure that the data received is the most current and that truck percentages and future-year forecasts are consistent with current DOT estimates.  Additional efforts will be required to collect traffic volume and truck data on the GPITC segments in Canada and Mexico.

Data Availability Scale
● Data are available, no additional analysis required
◐ Data are available, some modifications/analysis required
○ Data are not available or significant analysis/modifications required

Table 4.3 Transportation Demand Data Gaps Analysis (continued)

Data Need	Availability	Source(s)	Gap(s)	Suggested Action Plan
Border Crossing Data	●	BTS Border Crossing/Entry Data	While the BTS data includes inbound traffic volumes only, outbound volumes can be approximated by assuming inbound and outbound movements are approximately equal or supplemented by information from U.S. Customs or other organizations that routinely collect border crossing data (such as Texas A&M International University).	More detailed border crossing data related to traffic volumes, travel mode, and border chokepoints could be obtained by directly contacting the city bridge managers at each gateway city and/or U.S. Customs and Border Protection. Other private sources and organizations in Mexico and Canada could provide additional information. For example, the Transportation Border Working Group coordinates transportation initiatives along the Canada-U.S. border.
Agriculture Output	●	USDA National Agriculture Statistics Service, Saskatchewan and Alberta Ministries of Agriculture, Instituto Nacional de Estadística y Geografía	None.	None required.
Truck and Rail Commodity Flows (origin-destination data)	○	FHWA's FAF2 data, Global Insight TRANSEARCH	FHWA's existing FAF2 dataset aggregates freight movements to the state level within the GPITC and does not estimate county-level commodity flows (although country level distribution efforts are currently underway). To determine freight volumes traveling to, from, and through the GPITC study area counties, county-level data would be the preferred level of geography to support regional and state GPITC planning efforts. Commodity data are necessary to develop the connection between goods movement and the economy.	Purchase of Global Insight's TRANSEARCH dataset to cover nine states and Mexico and Canada cross-border commodity flows can be prohibitively expensive and further complicated by multi-state ownership. Alternatively (for a lesser fee), Global Insight can generate high-level summary reports based on their data specific to the GPITC study area counties and relevant to the topics of the GPITC Coalition's choosing. A second alternative would be to await FHWA's release of the new FAF2 county-level commodity distribution data (potentially by early 2009). Commodity flow data must also include information for Canada and Mexico to fully analyze the commodities that travel within the GPITC.

**Data Availability Scale**

- Data are available, no additional analysis required
- ◐ Data are available, some modifications/analysis required
- Data are not available or significant analysis/modifications required

Table 4.3 Transportation Demand Data Gaps Analysis (continued)

Data Need	Availability	Source(s)	Gap(s)	Suggested Action Plan
Economic Importance of Canada and Mexico to the GPITC	○	Transborder Freight Data, FHWA's FAF2 data, Global Insight TRANSEARCH, Interviews	Additional data is required to evaluate the link between Canada, Mexico, and the GPITC economies. Since the enactment of NAFTA in 1994, trade between the U.S., Canada, and Mexico has rapidly increased. However, additional study is required to estimate how much of this trade utilizes the GPITC as opposed to other key NAFTA corridors.	Use Global Insight TRANSEARCH data or await the release of FHWA's FAF2 county-level commodity distribution data to evaluate the commodity flows between Canada, Mexico, and the GPITC study area counties. This information will allow the GPITC Coalition and their state DOT partners to understand the interactions between local industries and their Mexico and Canada trading partners as well as identify opportunities to bolster economic development through enhanced transportation connectivity.
GPITC Industry Locations and Freight Logistics Patterns (including oil rigging and oil field equipment manufacturing)	○	U.S. Census Bureau County Business Patterns, Industry Interviews	Anecdotal information from industry stakeholders	Conducting interviews with industry stakeholders in the nine GPITC states as well as Saskatchewan and Alberta, Canada and the northern states in Mexico would help to identify the highway and rail links that are most heavily used by different industries. Identifying the business impacts of transportation system deficiencies on specific industries can assist the GPITC Coalition and state DOTs prioritize the infrastructure investments to promote economic development. Future efforts can incorporate interview findings and shifts in freight logistics patterns to expand on the economic geography theme mapping conducted in this study.

Data Availability Scale	
●	Data are available, no additional analysis required
◐	Data are available, some modifications/analysis required
○	Data are not available or significant analysis/modifications required

Source: Cambridge Systematics, Inc.

## Border Crossing Data

Border crossing data from the BTS includes the volume of personal vehicles, trucks, and rail entering through U.S. ports of entry. However, this data includes inbound movements only. Outbound volumes can be determined from supplemental data sources (such as U.S. Customs or other organizations that routinely collect border crossing data) or approximated by assuming bidirectional daily traffic (inbound and outbound) volumes are approximately symmetrical (or equal) following standard traffic engineering practice. For outbound border crossings at Texas ports of entry, we used data from the Texas Center for Border Economic and Enterprise Development at Texas A&M International University. As information on outbound vehicle, truck, and train crossings at Canadian GPITC border ports was limited, we used the BTS border crossing data and doubled the inbound movements reported in BTS to present northbound and southbound totals at the Canadian ports of entry.

## Agriculture Output

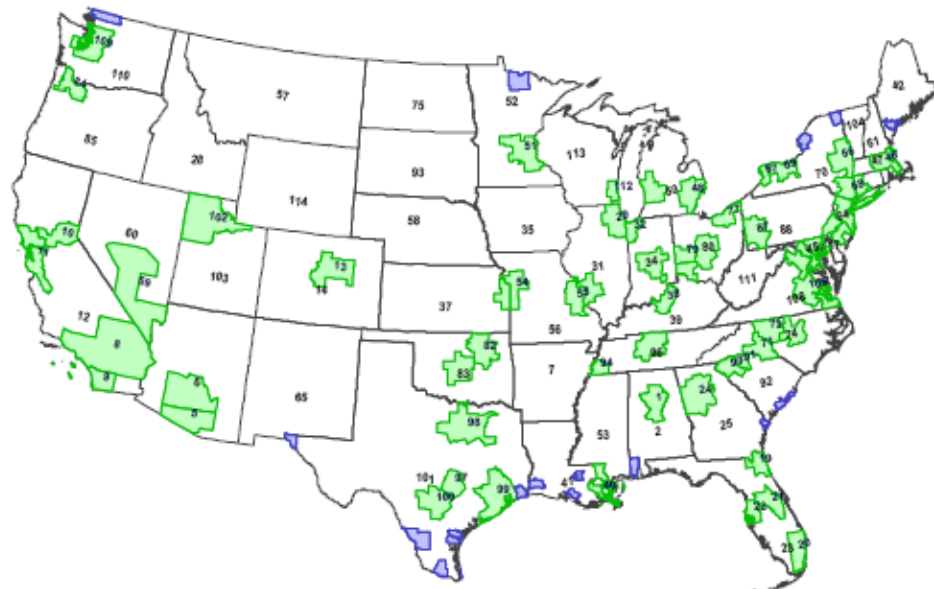
As the agriculture industry is a key component to the economies of the Great Plains region and heavily reliant on transportation, we collected data to identify the geographic distribution of the key agriculture commodities in the GPITC study area. The U.S. Department of Agriculture (USDA) National Agriculture Statistics Service (NASS) conducts a census of agriculture every five years, compiling data for every county in the United States. NASS also publicizes agriculture data estimates between census years. The USDA Foreign Agriculture Service (FAS) collects global trade statistics and market information, including state agricultural exports and imports. Web-based agriculture data for Saskatchewan is available from Statistics Canada and the Saskatchewan Ministry of Agriculture. Agriculture data is available for the province as a whole, as well as by crop district (nine crop districts in Saskatchewan) and rural municipality (over 400 rural municipalities in the province). In Mexico, the INEGI conducts a census of agriculture, livestock, and forestry approximately once every ten years, with the latest census occurring in 2007. INEGI reports agriculture data by state and municipality.

## Truck and Rail Commodity Flows

Commodity origin-destination information describes the combinations of origins and destinations for different types of goods in a state. Commodity data are necessary to develop the connection between goods movement and the economy. Commodity information also is important for estimating the amount of demand for a particular mode, because mode choice is largely a function of the commodity type and the distance the commodity must travel. For the purposes of evaluating development opportunities in a particular corridor, such as the GPITC, routing information documenting the specific roads that trucks use to travel from an origin to a destination also is important.

We used FHWA's Freight Analysis Framework (FAF2) to identify current and forecasted freight flows to, from, within, and through the GPITC states. This national dataset of freight flows prepared and supported by the FHWA provided additional information on domestic trade within the Great Plains states. FHWA bases the FAF2 origin-destination analysis on state, substate, and international gateway trade flows. The only substate region in the corridor is Denver, Colorado, the largest metropolitan area in the GPITC study area (Figure 4.1). All other freight movements in FAF2 are aggregated at the state level. For this assessment, the FAF2 data was applied to understand broad statewide commodity flows at a non-corridor-specific level.

Figure 4.1 FAF2 Domestic Regions and International Gateways



Metropolitan areas shown in green, gateways shown in purple. Not shown: Alaska (3), Honolulu (26), Hawaii (27), and the Anchorage Gateway (115)

Source: 2002 FAF Commodity Origin-Destination Database Dictionary.

Data aggregated at the state level, however, limits our ability to study trade flows to, from, and through the study area counties or determine the volume of freight that could potentially be served by the GPITC specifically. County-level data would be the preferred level of geography to support regional and state planning efforts and to identify the commodities originating from and destined to the GPITC study area. The lack of publicly available county-level commodity flow data remains a large data gap.

### *Suggested Action Plan for Future Efforts*

For the FHWA, CS currently is disaggregating the FAF2 regional commodity origin/destination data to county-level origin/destination data for all modes and commodities by tonnage and value. Once complete, the disaggregated FAF2 database will be available to the public free of charge. While the database

will provide detailed commodity flow information at the county level, none of the commodity flows will have been assigned to the transportation network.

Although scheduled for completion by CS at the end of October 2008, FHWA will spend time reviewing the origin/destination matrix before making the data available to the public. Therefore, the primary disadvantage to using the disaggregated FAF2 data would be its uncertain release date.

As an alternative to the FHWA FAF2 data, Global Insight produces a proprietary dataset called TRANSEARCH that provides comprehensive county-level commodity flows across every transportation mode using consistent commodity classifications and methodologies. Global Insight compiles the database from a variety of data sources, including long-term, proprietary motor carrier traffic samples; proprietary railroad data; and numerous commercial and Federal surveys, samples, and census. The TRANSEARCH database also includes freight movement information to/from U.S. counties from Canada and Mexico.

TRANSEARCH data would fill the existing commodity flow data gap by allowing for a more detailed analysis of the potential effects of improving GPITC infrastructure. However, the primary disadvantage to the TRANSEARCH data is its high cost. The data's cost depends on the level of detail requested from a geographic and/or industry classification perspective. To inform future GPITC studies, CS obtained a quote from Global Insight for the cost to purchase base year and forecast year county-level data for the nine GPITC states at the four-digit STCC (Standard Transportation Commodity Classification) code, as well as Mexico and Canada cross-border data. Given the assumed data request parameters provided by CS, Global Insight estimated the data would cost approximately \$65,000 for a base-year forecast and an additional \$20,000 for a future-year forecast.<sup>58</sup>

TRANSEARCH data is widely used by state DOTs and MPOs across the country for a wide range of transportation planning projects. Although several of the GPITC states may have purchased TRANSEARCH data in the past or have expressed interest in purchasing new data, only the Texas and Colorado DOTs have purchased a dataset within the last five years (2003 dataset for Texas and 2004 for Colorado).<sup>59</sup> Given data-sharing limitations, variable base years, lack of full geographic coverage, and limited cross-border data, opportunities to merge previously purchased TRANSEARCH datasets to evaluate commodity flows specific to the GPITC remains limited.

As an alternative to purchasing a TRANSEARCH dataset, however, Global Insight will generate high-level summary reports aggregated from their data specific to the GPITC study area counties for a lesser fee. The GPITC Coalition

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<sup>58</sup> This is a cost estimate only. Modifications to the data request assumptions could alter the price.

<sup>59</sup> Interview with Global Insight, Inc. Business Development Director, September 17, 2008.

can select summary report topics based on their analysis needs, such as value and/or volume of freight transported in the corridor, business-dependent routings, diversion analysis, freight generators, supply chains, and/or potential economic benefits of transportation investment. For the I-95 Coalition, a partnership of transportation agencies along the East Coast to facilitate transportation improvements along I-95 between Florida and Maine to Canada, CS has facilitated the purchase of summary charts, tables, maps, and other data analysis products from Global Insight for multi-state freight planning analysis. A similar approach could be of value to the GPITC Coalition and their DOT partners for filling the truck and rail commodity flows data gaps.

### **Economic Importance of Canada and Mexico to the GPITC**

We used 2007 BTS Transborder Surface Freight Data compiled by the Ports-to-Plains Trade Corridor Coalition to identify the value and mode of international imports and exports passing through GPITC ports of entry. Aggregated by state and port, this data provided information on trade growth with Mexico and Canada relative to recent years and identified key commodities imported and exported by each state. Because this data was aggregated at the state level, however, we do not know how much of the trade originates from the GPITC study area counties. Additional data is required to evaluate specifically the link between Canada, Mexico, and the GPITC economies and how much trade travels along the GPITC as opposed to other key NAFTA corridors.

#### *Suggested Action Plan*

When collecting or purchasing commodity origin-destination data through one of the suggested approaches previously described, inclusion of commodity flow information between Canada, Mexico, and the GPITC study area counties will be critical to understanding the economic ties across national borders. This information will allow the GPITC Coalition and their state DOT partners to understand the interactions between local industries and their Mexico and Canada trading partners as well as identify opportunities to bolster economic development through enhanced connectivity.

### **GPITC Industry Locations and Freight Logistics Patterns**

Another remaining data gap is more detailed information on industry locations and freight logistics patterns within the GPITC study area. While national datasets provide information on agriculture output, commodity flows, and growing industries, local anecdotal information from business and industry stakeholders provides context to support the data. Conducting interviews with industry stakeholders in the nine GPITC states as well as Saskatchewan and Alberta, Canada and the northern states in Mexico would help to identify the highway and rail links that are most heavily used by different industries. Identifying the business impacts of transportation system deficiencies on specific industries can assist the GPITC Coalition and state DOTs to prioritize the infrastructure investments to promote economic development. Future study



efforts can incorporate interview findings and shifts in freight logistics patterns to expand on the economic geography theme mapping conducted for this study.

## 5.0 Next-Step Recommendations

This assessment provides a broad overview of existing and future infrastructure, demographics, socioeconomics, industries, and trade flows that characterize the nine-state, three-nation GPITC corridor. The corridor views presented in this study, along with the qualitative discussions of potential development opportunities and remaining data gaps, are intended to help GPITC stakeholders determine the direction of future research and development activities. After identifying compelling or promising development opportunities to evaluate in more depth, future studies – with a more narrowed focus – can quantify the direct and indirect benefits of any planned transportation improvement in the GPITC.

Based on the findings of this study, CS recommends that TxDOT and other GPITC stakeholders consider the following next-step activities:

- Determine the effects of high-growth industries or commodities on the GPITC's transportation infrastructure and economy. Through effective transportation planning and investment, GPITC partners have the power to reinforce high-growth and emerging industries.
- Assess the transportation impact of energy proposals, especially those related to renewable energy generation and transmission, including the development of a strategy to encourage wind turbine manufacturing in the GPITC through the possible designation and improvement of a heavy-haul route or other findings that would assist wind energy development.
- Similar to the Ports-to-Plains Development and Management Plan that defined and prioritized transportation improvements based on cost/benefit analysis and financial planning, GPITC stakeholders should initiate similar studies for the Heartland and Theodore Roosevelt Expressways. The North Dakota DOT released a request for proposals for a Theodore Roosevelt Expressway development and management plan in 2008.
- Initiate efforts to fill the known corridor data gaps. Understanding the relationship between goods movement, infrastructure needs, and the impact on the economy is critical for identifying future investment opportunities.
- After identifying specific improvements, consider the use of economic benefit analysis tools (such as the Regional Economic Model Inc. [REMI] or Transportation Economic Development Impact System Tredis) to measure the direct and indirect economic effects of potential transportation improvements in the GPITC study area.

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# Appendix A

*Literature Review Library*

# A. Literature Review Library

## Colorado

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# **Appendix B**

*Technical Memorandum #1: Current and Future  
Corridor Views*