North Dakota Strategic Freight Analysis

Regional Strategic Freight Study on Motor Carrier Issues

Developed for North Dakota Department of Transportation

by

Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota

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Message to the Reader

This report is organized into three sections: the executive summary, the main report, and appendices. The executive summary provides the reader with information on the study and findings. The summary consists of background on the study, justification, objectives, and a summary of findings.

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EXECUTIVE SUMMARY

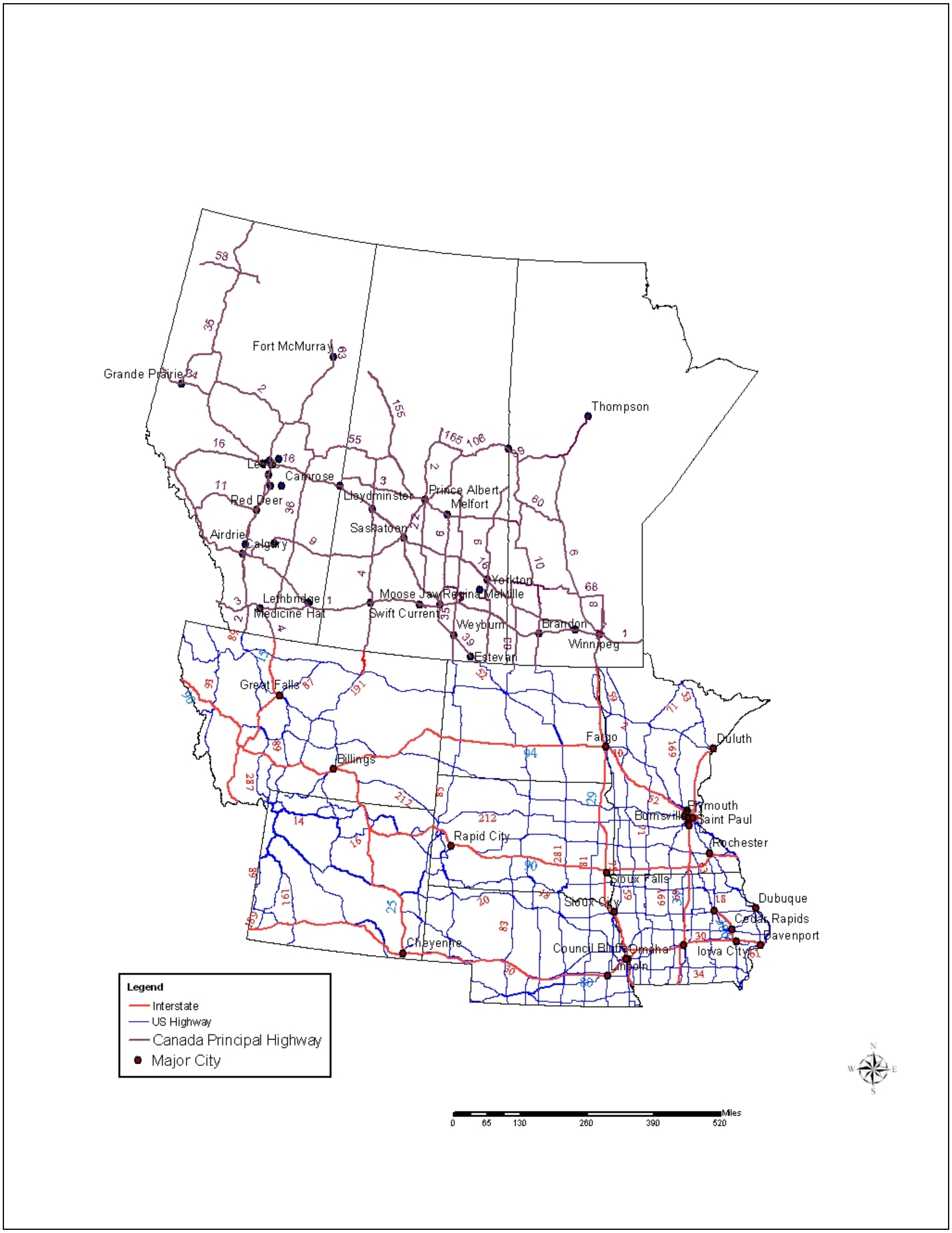
Introduction

Truck transportation plays a vital role in the central North American regional economy. Throughout the region, including the states of Minnesota, Iowa, South Dakota, North Dakota, Montana, Wyoming, and Nebraska and the provinces of Manitoba, Saskatchewan, and Alberta, truck transportation is the first and last mode for moving commodities, raw materials, and finished goods. Much of the region's economy is based on the movement of natural resources, and an efficient truck transportation system is crucial for stimulating economic growth.

Trade within the region, especially since the implementation of the North American Free Trade Agreement (NAFTA), has increased dramatically. In a study released by Northern Great Plains, Inc., the value of trade between many of the states and provinces within the region grew by almost 700 percent in the first five years after the passage of NAFTA. Ever increasing regional trade volumes creates a sense of urgency for states and provinces to develop a dialog that will result in a more efficient and economically competitive truck transportation system.

A myriad of different truck size and weight regulations exist, increasing shipper costs and making the region's businesses less competitive. Truck size and weight regulations are meant to promote safety and to prevent excessive damage to highways and bridges. Truck size and weight regulations are set by the Code of Federal Regulations, Title 23, (CFR 23) for the Interstate System and Primary Federal-Aid Highway System. Truck route designations, along with length, width, and weight limitations, are described in Part 658 of CFR 23. Confusion exists in interpreting some regulations. Therefore, the Federal Highway Administration (FHWA) has a role in deciphering the rules and enforcing compliance by states. Because of "Grandfather Provisions," regulations on truck size and weight are not consistent among bordering states, and Canadian provinces have their own truck regulations.

In 2002, the North Dakota Department of Transportation (NDDOT) published a statewide strategic transportation plan called "TransAction." TransAction Initiative 8 states, "North Dakota will determine the opportunities for, and the economic and safety impacts of, a regional uniform truck size, weight and permitting system." To accomplish the initiative's intent, NDDOT contracted with the Upper Great Plains Transportation Institute to analyze truck size and weight regulations, and permitting processes in the region. This report shares the study's findings and provides an opportunity to improve the region's economic competitiveness by beginning a dialogue on truck issues.



U.S. Federal Aid Highways in the Seven States and Canadian Principal Highway System in the Three Provinces.

Justification

TransAction states, "A complex regulatory environment governs tire and axle loads, gross vehicle weights, vehicle heights and widths, trailer and semi trailer lengths, and combination vehicle lengths." This statement asserts the problems businesses face in trying to ship within the region. An ever-increasing volume of trade is conducted between the region's states and provinces, and it would be beneficial to explore opportunities to harmonize vehicle size and weight regulations and provide a permitting process that would allow for seamless movements of freight.

Objectives

This project's three objectives were to provide:

1. economic and safety information on the impacts of a regional uniform size and weight regulatory and permitting system,
2. information on the differences in size and weight regulations in the region, and
3. information for the different departments of transportation (DOTs) policy makers, and others, allowing them to examine economic costs of restrictions and regulations on motor carriers and their customers.

Summary

Trade is the basis for economic expansion. Traditionally, a large portion of the region's economy is based on natural resource sectors such as farming and mining. Recently, the region has also experienced growth in manufacturing and technology industries. Much of the region is without water transportation and has only limited rail competition and service. Truck transportation provides advantages in terms of accessibility, flexibility, and door-to-door services. Efficient transportation service for these industries is crucial in maintaining, stimulating, and diversifying economic growth.

This study explores the regulatory environment that shippers face moving freight by truck throughout the region and highlights differences in regulations that exist among the region's states and provinces. Truck size and weight regulations in the region's states and provinces are controlled and specified by state departments of transportation and provincial departments of highways, rural municipal councils, major urban transportation agencies, U.S. Department of Transportation, national parks, public works, tribal governments and other government agencies and services. Because of inconsistencies in jurisdictional size and weight regulations, problems exist. This study provides a snapshot of current regulations and conditions. The reader should note that truck size and weight laws are continually evolving.

Permitting information was gathered from the region's states and provinces, which allowed similarities and differences to be identified. Examining the permit regulations in each state and province reveals inconsistencies that prohibit seamless freight transportation. For the region to remain competitive, policy makers and transportation departments in the region should work together to provide a uniform permitting system.

The study also analyzes safety, which is an important issue for truck drivers and owners, communities, and transportation policy makers. Some safety advocates argue that larger trucks are involved in a greater number of crashes than other vehicles, and the severity of these crashes result in more damage, injuries, and fatalities. Motor carriers are a major transportation mode for shipping commodities and other goods in the study area; deaths and injuries involving trucks can be a critical factor affecting transportation costs

and regional economies. High fatality and crash rates can significantly increase economic and social costs and reduce the efficiency of the transportation system. By examining different data sources, the research team determined that the data were not consistent; and therefore, confident crash analysis could not be completed.

The information in this report provides the basis for discussing the inconsistencies that exist for size, weight, and permitting regulations in the region. Cooperation among public and private sector leaders is needed to improve the region's truck transportation system and make the region more competitive.

Findings

1. With the advent of ISTEA in 1991, many federal and state planning documents have since called for more uniformity in truck size and weight regulations.

2. State and provincial truck size and weight regulations and permitting processes are complex, difficult to define, and provide for a less than amicable business environment.
   "A complex regulatory environment governs tire and axle loads, gross vehicle weights, vehicle heights and widths, trailer and semi trailer lengths, and combination vehicle lengths." (TransAction, 2002).

3. Projections of increased freight volumes throughout the region highlight the need for the states and provinces in the study area to consider the development of a regional truck freight transportation system.

4. State and provincial truck size and weight regulations are continually evolving. By identifying and working toward a harmonized set of truck size and weight regulations and a uniform permitting system, the region's economic competitiveness can be improved.

5. Development of a regional truck freight transportation system and harmonization of truck size and weight regulations may reduce truck numbers and create efficiencies for businesses throughout the region.

6. A truck freight transportation system that allows larger trucks may reduce trips and congestion, resulting in overall cost savings. The additional cost of designing and constructing bridges and pavements to carry heavier loads may be offset by cost savings to the business community.

7. In some cases, larger trucks with the correct number and spacing of axles may do less road damage than smaller trucks.

8. Differences between how states collect and report safety data make it difficult to confidently compare truck crash statistics with those of other vehicles.

9. Truck data and the laws of physics may provide evidence that larger trucks cause more damage when crashes occur, but there is no evidence to support a claim of improved safety for a smaller number of larger trucks or larger numbers of smaller trucks.

10. An ever-increasing volume of regional trade creates a sense of urgency for states and provinces to begin a dialog that will result in a more efficient and economically competitive truck transportation system.

11. Inefficiencies exist because of the differences between state and provincial permitting processes. For the region to become more competitive, policy makers and transportation departments in the region should work together to provide a uniform permiting system.

12. And most importantly, cooperation among states, provinces, and private and public sector leaders is needed to bring about a plan for uniform regulations and a seamless truck freight transportation system that enhances the region's economic competitiveness.

1. BACKGROUND, JUSTIFICATION, AND OBJECTIVES

The North Dakota Department of Transportation published a statewide strategic transportation plan in 2002. The plan, titled, "TransAction," was initiated by Governor Hoeven and was carried out by the North Dakota Department of Transportation. The plan was developed using an advisory committee to develop a vision, mission, and goals. Focus group meetings were held with city, county, township organizations, MPOs, and tribal planners. Public involvement was also solicited to determine needs around the state. The planning process produced several initiatives referring to freight transportation and the problems known to exist. The plan's initiatives describe areas of need for North Dakota's transportation infrastructure and impediments that exist in the system. Several of the initiatives in the plan (specifically initiatives 6, 8, and 10) focus on motor carrier issues. These initiatives are the reasons for this study and are described later in this section.

1.1 Background

For many businesses in North Dakota, motor carriers are the only shipping link to the outside world. This project focuses on the regulatory environment and highlights the different regulations carriers and shippers face in moving freight throughout the region. Particularly, this study focuses on regulations of size and weight of commercial trucks. This analysis evaluates the direct and indirect economic impacts motor carriers, and ultimately shippers, face with differences in motor carrier regulations and seasonal load restrictions. The restriction differences between states and provinces provide a less than optimum transportation system, resulting in higher costs, lost trade, and reduced revenues for producers and shippers.

This report focuses on seven contiguous states and three adjoining Canadian provinces. The states are Minnesota, Iowa, South Dakota, North Dakota, Montana, Wyoming, and Nebraska. The provinces are Manitoba, Saskatchewan, and Alberta.

Transportation plays an important role in the local, regional, and national economy. Because a large portion of North Dakota's economy is based on natural resources, efficient transportation service for these resources is crucial for stimulating economic growth in the state. In North Dakota, truck transportation provides accessibility, flexibility, and door-to-door service.

The Motor Carrier Act of 1980 reduced operating regulations on motor carriers and opened the door for entrepreneurs to enter the motor carrier industry. Nationally, these companies now number in the hundreds of thousands and consist of all sizes of companies and many single-truck operations. Increased demand for transportation services resulting in more carriers has created public concern and debate over truck safety.

Truck size and weight regulations are meant to promote safety and prevent excessive wear and tear on highways and bridges. Truck size and weight limitations are set by the Code of Federal Regulations, Title 23 for the Interstate System and Primary Federal-Aid Highway System. Truck route designations along with length, width, and weight limitations are described in Part 658 of CFR 23. Confusion exists in interpreting some regulations. Therefore, the Federal Highway Administration (FHWA) has a role in deciphering the rules and enforcing compliance by states. Because of "grandfather provisions," regulations on truck size and weight are not consistent among bordering states or Canadian provinces. Differences in regulations increase shipper costs and may result in an inefficient transportation system.

1.2 Justification

TransAction describes areas of need for North Dakota's transportation infrastructure and impediments that exist in the system. Initiative 8 describes the multi-jurisdictional problem as "A complex regulatory environment that governs tire and axle loads, gross vehicle weights, vehicle heights and widths, trailer and semi trailer lengths, and combination vehicle lengths." This statement asserts the problems businesses face in trying to ship within the region. Leading trading partners are neighboring states and provinces, and it would be beneficial for the states and provinces to investigate opportunities to harmonize vehicle size and weights or provide a mechanism such as a permitting process allowing for seamless movements of freight. The existing permitting system varies from state or province to another province or state reducing transportation efficiency.

Businesses and carriers are directly affected by truck weight and size restrictions. Motor carriers, farmers, and businesses desire load-restriction-free roads for all-season delivery of commodities and products. Seasonal and year-round road restrictions imposed by states, cities, and counties may result in increased costs through reduced payloads and extra trips for businesses. These restrictions often present confusion, frustration, and additional costs for those trying to transport products within the state or region. In some cases, multiple permits may give a motor carrier the authority to transport freight across different counties and state highways or within the region. However, problems exist in the system of obtaining the necessary permits. A company may have to obtain permits from several jurisdictions to complete a trip, and uniform permits may not be available. This inconvenience is often costly and may result in re-routing or postponing a movement.

1.3 Objectives

This study's three objectives were to provide:

1. economic and safety information on the impacts of a regional uniform size and weight regulatory system,
2. information on the differences in size and weight regulations in the region, and
3. information for the different departments of transportation (DOTs) policy makers, and others, allowing them to examine economic costs of restrictions and regulations on motor carriers and their customers.

2. TRUCK SIZE AND WEIGHT REGULATIONS

Canadian provinces and many U.S. states are looking for opportunities to harmonize truck size and weight standards. The Transportation Equity Act for the 21st Century (TEA 21), enacted June 9, 1998, authorized federal surface transportation programs for highways, highway safety, and transit from 1998 to 2003. The language in TEA 21 encourages regions to harmonize truck size and weight regulations. Size and weight regulations in the region are controlled and specified by state departments of transportation and provincial departments of highways, rural municipal councils, major urban transportation agencies, U.S. Department of Transportation, national parks, public works, tribal governments, and other government agencies and services. The regulations are enforced by law enforcement agencies in both the United States and Canada.

Two current standards that provide widespread application and influence in terms of basic limits are the U.S. Federal Truck Size and Weight Laws (Title 23), and the Roads and Transportation Association of Canada (RTAC) Weight Provisions. The U.S. Federal Truck Size and Weight Laws (Title 23) define size and weight regulations (see Appendix 3) on the Interstate System and National Network (NN). The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) restricts the operation of longer combination vehicles (LCV's) on the Interstate System and commercial motor vehicle (CMV) combinations with two or more cargo-carrying units on the NN to the types of vehicles in use on or before June 1, 1991, subject to whatever state restrictions were in effect on that date. Section 1023 of the ISTEA required states to submit to the Secretary of Transportation a complete list of 1) all operations of LCV's being conducted as of June 1, 1991; 2) state laws, regulations, and any other limitations and conditions, including routing-specific and configuration-specific designations governing the operation of LCV's; and 3) a copy of such laws, regulations, limitations, and conditions. Because of grandfather rights set forth by Title 23 in each state, maximum weights for LCV configurations vary.

- The RTAC weight provisions regulate principal highways in Alberta, Saskatchewan, and Manitoba. Basic differences between the two systems include:
- Basic RTAC limits are higher for tandem axle weights, tridem axle weights, and gross vehicle weights compared to the United States on both interstate and non-interstate highways.
- The RTAC system is vehicle specific, whereas the U.S. system is not (for example, a higher gross vehicle weight limit for an 8-axle B-train compared with an 8-axle A-train).
- The RTAC system controls front steering axle loads (5500 kg or 12,125 lbs. on tractors), whereas the U.S. system generally does not.
- The RTAC system has no explicit bridge formula, whereas the U.S. system uses Bridge Formula B explicitly for controlling gross vehicle weights and tridem axle weights as it relates to axle spreads1 (Montufar and Clayton, 2002).

Table 1 encompasses truck weights and dimensions in the region. A point needing to be established is that Table 1 summarizes regulations on truck size and weights, but these regulations are difficult to decipher from lengthy statutes and regulatory documentation composed by each state and province. The 2000 U.S. Department of Transportation Truck Size and Weight Study summed up the regulations in a quote,

[1] $W = 500 [(LN / N-1) + 12N + 36]$

W = The maximum weight in pounds that can be carried on a group of two or more axles to the nearest 500 pounds
L = The spacing in feet between the outer axles of any two or more consecutive axles
N = The number of axles being considered

“Vehicle size and weight laws in each state and province are continually evolving due to several factors including the nature and extent of natural resources, local industrial development, climate, relative strength of special interest groups, and the national economic condition.” Because of these continual changes, along with conflicts of regulations from different sources, the reader should note that this table is a snapshot of current regulations and conditions. In various parts of Table 1, superscripts representing footnotes explain a weight or dimension exception in which the value may vary depending on various scenarios (Appendix 5).

Table 1 Regulation on Truck Maximum Weight and Dimension

	Width[1] (inches)	Length[2]	Height	Gross Vehicle Weight Interstate Highways	Maximum Gross Vehicle Weight Other Highways16	Single Axle (lbs)	Tandem Axle4 (lbs)	Tridem Axle (lbs) 15	(**) "Routine" Permit Maximum GVW (lbs)	"Routine" Permit Maximum Single Axle / Tandem Axle	(**) Special Review Permit Highest GVW with Sufficient Axles
North Dakota	102	110'	14'[3]	80,000	105,500	20,000	34,000	48,000	103,000	24,000/ 45,000	150,000
South Dakota	102	110'	14'	80,000	129,000[12]	20,000	34,000	43,000	116,000	31,000/ 52,000	Determination on a case by case basis
Minnesota	102[5]	75'	13'6"	80,000	80,000[11]	20,000[7]	34,000	43,000	92,000[6]	20,000/ 40,000	144,000
Montana	102	110'	14'	80,000	131,060	20,000	34,000	46,300	105,500[8]	20,000/ 48,000	126,000
Nebraska	102	105'	14'6"	80,000	95,000	20,000	34,000	42,500	99,000	20,000/ 40,000	110,000
Iowa	102	110'	13'6"	80,000[14]	80,000[18]	20,000	34,000	42,500	100,000	20,000/ 40,000	160,000
Wyoming	102	110'	14'	80,000[17]	117,000	20,000	36,000	42,500	85,000	25,000/ 55,000	135,000
Alberta	102	82'	13'6"	87,082[13]	76,059[13]	20,062[13]	37477[13]	52,910[9]	139,993[13]	20,062/ 37,478 Determination on a case by case basis	Determination on a case by case basis
Manitoba	102	(*) 114'9"/ 75'5"	13'6"	87,082[13]	76,059[13]	20,062[13]	37,477[13]	52,910[9]	137,788[13]	20,062/ 37,478 Determination on a case by case basis	Determination on a case by case basis
Saskatchewan	102[10]	(*) 114'9"/ 75'5"	13'6"	87,082[13]	76,059[13]	20,062[13]	37,477[13]	52,910[9]	137,788[13]	20,062/ 37,478 Determination on a case by case basis	Determination on a case by case basis

2.1 Seasonal Load Restrictions

Permits are available during the spring and winter months in some states and provinces. During spring months, states and provinces in the region experience "spring thaw," in which warmer temperatures cause frost in the ground to melt, thus reducing the maximum allowable weight which can be carried over the roadway (Table 2). States and provinces in the region generally post signs along the highways that are most vulnerable, indicating a lower-weight road. During the winter months, when the underlying road surface is hardened by frost, some states and provinces increase load limits on highways by as much as 10 percent. Carriers that desire to move loads during the 10 percent winter weight increase may obtain a seasonal permit for such movements. Table 2 provides a snapshot of state's and province's spring load restrictions and winter weight premium policies. Nebraska, Iowa, and Wyoming do not have regulations pertaining to spring load restrictions or winter weight premiums. North Dakota, Minnesota, Montana, and Manitoba have spring load restrictions as well as a 10 percent winter premium. South Dakota has spring load restrictions but does not have a winter premium. In Alberta, drive, tandem, and tridem axles are limited to 90 percent, 75 percent, or 50 percent depending on thaw index calculations in the spring. Spring restrictions are also placed in Saskatchewan; and in both Alberta and Saskatchewan, winter weights are based on maximum gross weights on various axle configurations, not a percentage of gross vehicle weight.

Table 2 Seasonal Load Restrictions

	Spring Load Restriction	Winter Premium Weight
North Dakota	Single Axle Tandem Axle Tridem Axle Gross Weight (unit: lbs) Class A Load Restrictions: 18,000 16,000 42,000 105,500 No. 1 Load Restrictions: 15,000 15,000 36,000 80,000 No. 2 Load Restrictions: 12,000 12,000 30,000 65,000 Highway Restrictions : 20,000 17,000 48,000 105,500 * Values show Order 5, effective March 16, 7:00 AM.	10% increase in GVW
South Dakota	The weight per axle may not exceed that allowed by the Load Restriction Map or addendum spring Load Restriction Reports. The maximum weight per axle shall be limited to the smallest of 20,000 pounds per axle or 450 pounds per inch width of tire.	No winter premium weight
Minnesota	The weight on any single axle shall not exceed five tons on a county highway, town road, or city street. The gross weight on consecutive axles shall not exceed the gross weight allowed in restriction reports.	10% increase in GVW
Montana	8 tons (16,000 pound) for a single axle 16 tons (32,000 pound) for tandem axle 600 pound per inch of tire width for steering axle 400 pound per inch of tire width for all other axles which have single tires The maximum weight allowed is determined by ton limit or pound per inch of tire width	10% increase in GVW
Alberta	There are no restrictions on steering axles. However, drive, tandem, and tridem axles are limited to 90%, 75%, or 50% depending on thawing index calculations.	Winter weights are based on maximum gross weights on various axle configurations, not a percentage of gross vehicle weight.
Manitoba	There are no restrictions to primary system or gravel roads. Steering axles are not restricted. For other axles, there are two restriction levels: Level 1 Restriction (Beginning of thaw for 14 days): RTAC routes (90% of basic load), class A1 (90%of basic load), class B1(95% of basic load) Level 2 Restriction (Imposed 14 days after Level 1 and removed 1 week before removal of Level 1): class A1 (65% of basic load), class B1 (65% of basic load).	10% increase in GVW
Saskatchewan	The maximum load on steering axles is 560 pound per inch, to a maximum of 6,060 pound on each wheel or 12,120 pound on the steering axle. Maximum loads on all other wheels will be limited to 350 pounds per inch width of tire to a maximum loading of 3,636 pound per wheel.	Winter weights are based on maximum gross weights on various axle configurations, not a percentage of gross vehicle weight.

2.2 Maximum Weights for Longer Combination Vehicles (LCVs)

Figures 1 and 2 display maximum weights for common Longer Combination Vehicles (LCVs) in states and provinces. As previously mentioned, the LCV freeze instituted in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) prohibits states from increasing LCV weights on the interstate system and also does not allow longer LCVs on the NN.[1] In addition, because of grandfather rights set forth by Federal Truck Size and Weight Laws (Title 23) in each state, weights for LCV configurations vary. Both Iowa and Minnesota prohibit LCV operation in their states. Wyoming prohibits three trailing unit LCVs. Nebraska does not allow cargo- carrying or weighted triple trailer configurations; only empty triple trailer configurations are allowed to travel in the state (Figures 1 and 2).

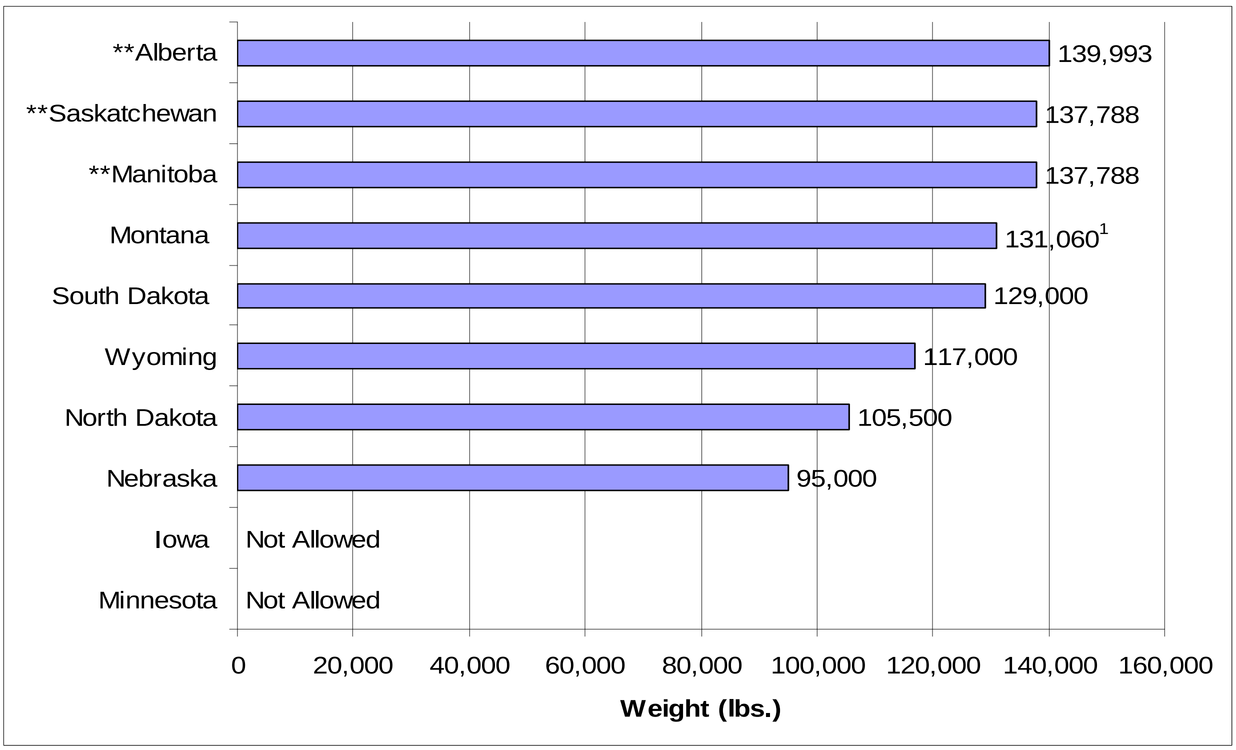


Figure 1 Maximum Weights for Truck Tractor and Two Trailing Units (LCV's)

** Weight was converted from metric measurement which may include rounding error.
137,800 pounds for vehicles operating under the Montana/Alberta Memorandum of Understanding (MOU).

[1] Western Uniformity Scenario Analysis, A Regional Truck Size and Weight Scenario Requested by the Western Governors' Association, The United States Department of Transportation, April, 2004.

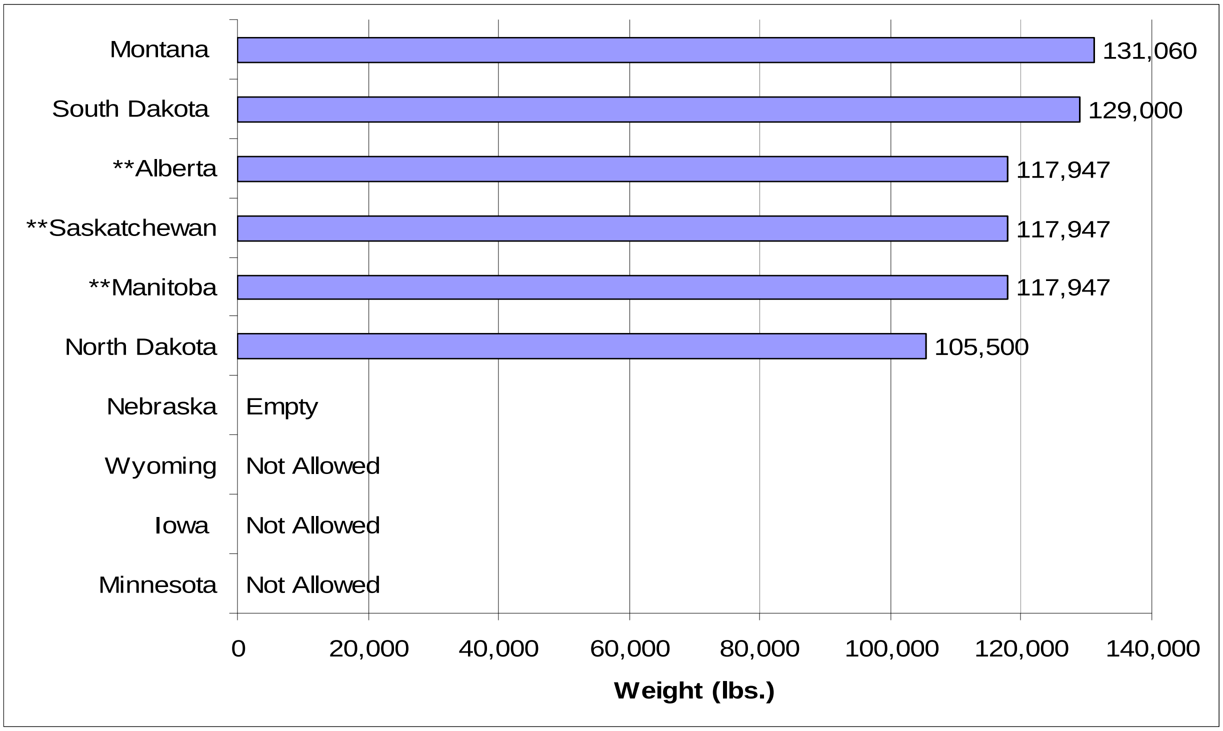


Figure 2 Maximum Weights for Truck Tractor and Three Trailing Units (LCV's)

** Weight was converted from metric measurement, which may include rounding error.

2.3 Maximum Lengths for Longer Combination Vehicles (LCVs)

Figures 3 and 4 graphically display the maximum lengths for common LCVs in states and provinces. The LCV freeze instituted by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) prohibits states from increasing allowable LCV weights on the Dwight D. Eisenhower System of Interstate and Defense Highways, and also does not allow states to lengthen their existing regulations for LCVs on the NN. Because of different grandfather rights in each state, dimensions for LCV configurations vary (Title 23, Appendix 3). Regulations for the length of LCVs varies from 103 feet in North Dakota to 81 feet in Wyoming, with both Iowa and Minnesota prohibiting LCV operations altogether. The state of Wyoming prohibits trucks with three trailing units (Figures 4 and 5).

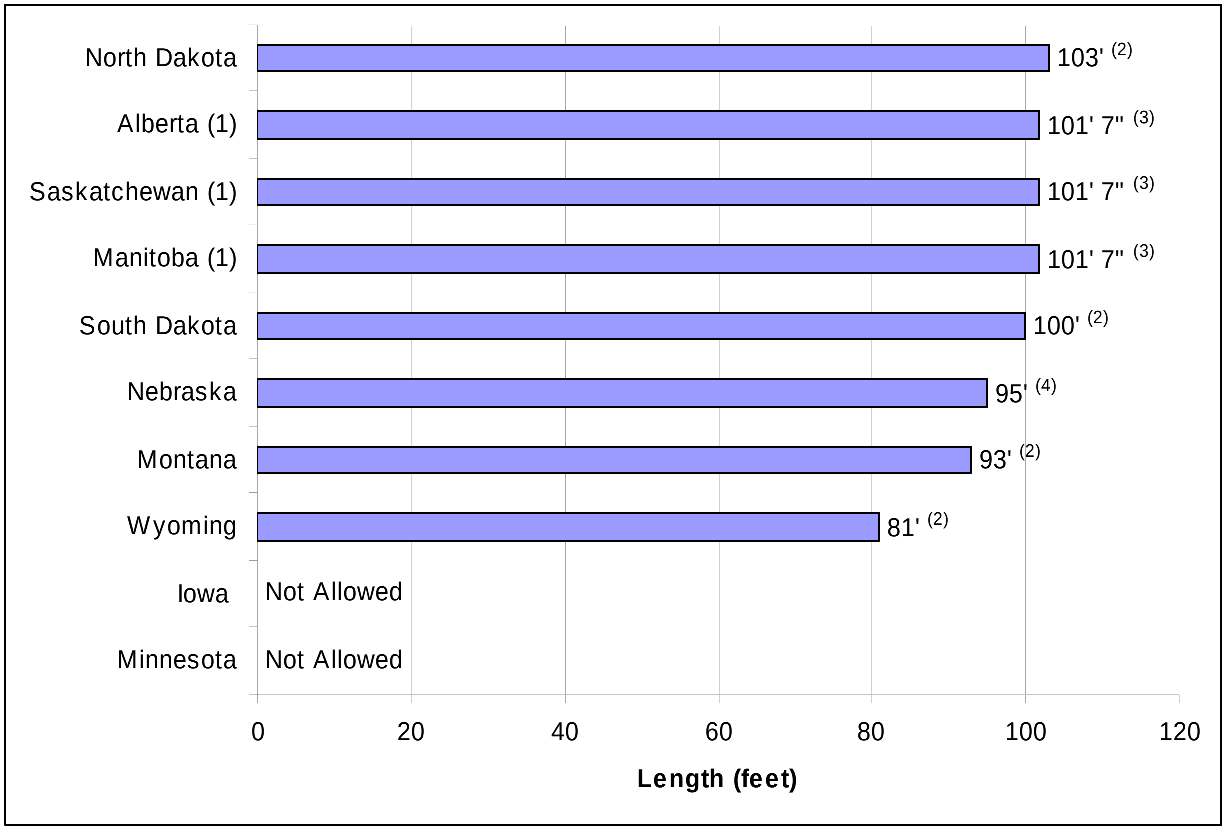


Figure 3 Maximum Length for Longer Combination Vehicles (LCVs) Truck Tractor and Two Trailing Units

1) Overall maximum lengths for Canadian Provinces-Roads and Transportation Association of Canada (RTAC).
2) Combined Trailer Length (CTL).
3) Rocky Mountain Double configuration overall length. The Turnpike Double maximum overall length is 124' 6" in each province.
4) 95 feet for combination units traveling empty. 65 feet for combination units carrying cargo.

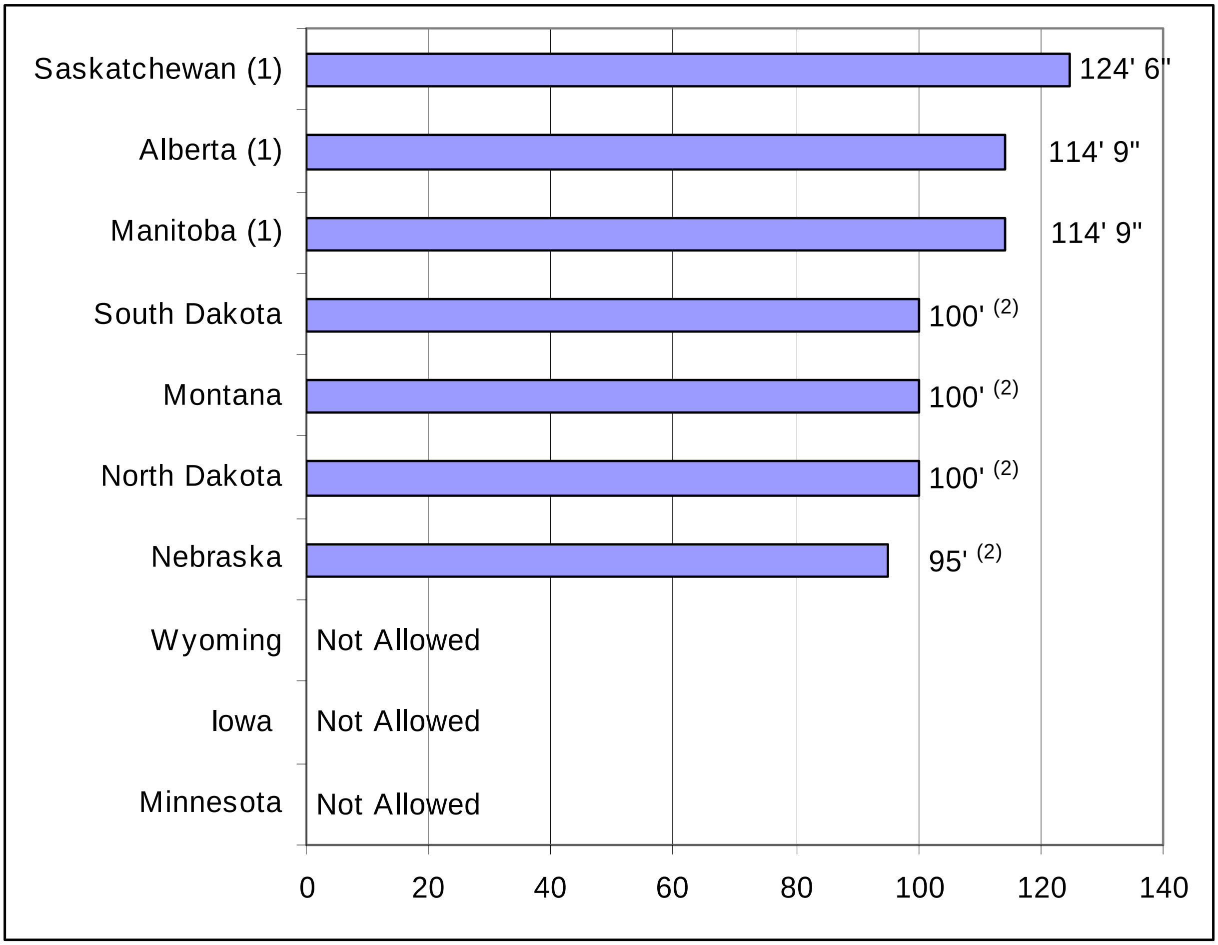


Figure 4 Maximum Length for Longer Combination Vehicles (LCVs) Truck Tractor and Three Trailing Units (Triples)

1) Overall maximum lengths for Canadian Provinces-Roads and Transportation Association of Canada (RTAC).
2) Combined Trailer Length (CTL). In Nebraska, any 2 trailing unit configuration over 65 feet is required to travel empty.

Ten common configurations are allowed to operate throughout the entire region, including the most common truck configuration on American and Canadian highways, which is the 5-axle semi-truck (first ten configurations in Figure 5). There are three truck types shown that may not operate throughout the entire region including the Rocky Mountain Double, the Turnpike Double, and the Triple Trailer Combination.

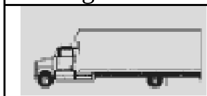
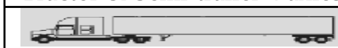
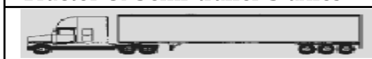
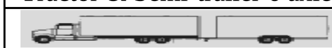
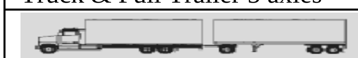
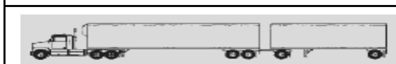
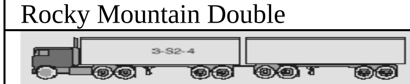
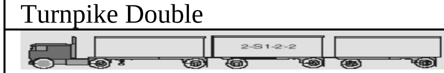
Configuration	ND	SD	MN	NE	IA	MT	WY	MB	SK	AB
 Straight Truck 2 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Straight Truck 3 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Tractor & Semi-trailer 4 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Tractor & Semi-trailer 5 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Tractor & Semi-trailer 6 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Truck & Tandem Pony	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Truck & Tandem Pony	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Truck & Full Trailer 5 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Truck & Full Trailer 6 axles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Twin Trailer Combination	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
 Rocky Mountain Double	✓	✓		✓		✓	✓	✓	✓	✓
 Turnpike Double	✓	✓		✓		✓		✓	✓	✓
 Triple Trailer Combination	✓	✓		✓		✓		✓	✓	✓

Figure 5 Common Truck Configurations by State and Province

(✓) Indicates the configuration can be found in the state.

2.4 Permitting Differences across States and Provinces

In the United States, oversize/overweight permits are needed for 5-axle combination vehicles transporting loads weighing over 80,000 pounds on the NN (National Network). According to CFR 23, states may not limit tire loads to less than 500 pounds per inch of tire or tread width, except that such limits may not be applied to tires on the steering axle. States may not limit steering axle weights to less than 20,000 pounds or the axle rating established by the manufacturer, whichever is greater. In North Dakota, steering axles are limited to 550 pounds per inch width of tire, and generally the practical gross weight is 12,000 pounds. However, the single axle limit is the regulating factor. A single axle is limited to 20,000 pounds, and tandem axles are limited to 34,000 pounds.[2] The legal dimensions for vehicles on the NN are a maximum of 14 feet high, 11 feet wide, and 53 foot trailer length. These weights and dimensions are not applicable to all highways and local limits. Permits may be issued for only non-divisible loads on the NN. State highways and other jurisdictions may require permits for different scenarios.

The Federal Bridge Formula is used by each state to determine acceptable load limits on highway infrastructures. The formula limits the weight carried by groups of axles to reduce the risk of damage to highway bridges. The maximum allowable weight depends on the number of axles and the axle spacing. Spreading axles allows the bridge and pavement to recover from the first group of axles before flexing under the next group of axles. According to the bridge formula, transportation of 80,000 pound gross weight requires a distance between the first and the last axle on the truck to be at least 51 feet.

Vehicle maximum heights and weights vary without permits within each state and province, and some underpass and bridge structures are less than the allowable height of a given truck or load (Table 1). Oversize/overweight permits are required on interstate highways, state highways, and county roads. Single use permits are issued every time a load weighing more than 80,000 pounds is transported on interstate highways, state highways, designated local highways, and other city, county, or township highways.[3] Oversized/overweight permits may be issued for a single trip or annually for unlimited trips.

Tables 3 and 4 list the types of permits and costs associated with obtaining each type of permit for the region. In Montana and the Canadian provinces, permit costs are based on miles or kilometers, respectively. For example, a vehicle traveling in Manitoba is charged $.06 for each kilometer traveled or $18, whichever is greater. Each jurisdiction's terminology varies with regard to the type of permit issued. For example, Nebraska uses the term "Continuous Permit" when a permit is issued to vehicles or combinations of vehicles that move frequently or repeatedly to several destinations within a limited area. Alternatively, Iowa uses the term "Multiple Trip Permits" for those permits that are issued to vehicles that move frequently or repeatedly to several destinations within a limited area.

[2] In Wyoming tandems are limited to 36,000 pounds.
[3] In Minnesota, most city, county, and township roads are considered "9-ton routes" with a maximum gross vehicle weight of 73,280 pounds.

Table 3 Permit Costs (Single Trip)

State/Province	Single Trip	Single Trip Permit Time Available	Single Trip Oversize Only	Single Trip Overweight Only	Single Trip Oversize and Overweight
North Dakota	$20 - Official receipt permit; $10 - Receipt issued "Interstate Only;" $5 - Self Issue "Interstate Only"	72 Hours	$20 Up to- 14'6" Width; 15'6" Height; 120' Length	150,001-160,000 lbs. $30; 160,001-170,000 lbs. $40; 170,001-180,000 lbs $50; 180,001-190,000 lbs. $60; 190,001 lbs and over $70; $.05 per ton per mile is assessed upon the portion of gross vehicle weight exceeding 200,000 pounds.	Varies
South Dakota	$15 Commercial Vehicle	72 Hours	$20	$20	
Minnesota	$15	120 Hours	$135 for width over 14'6" up to 16' during spring load restrictions		
Iowa	$10 oversize permit fee which also includes loads requiring bridge reviews	72 Hours			
Nebraska	$15	72 Hours	$15	$20	$25
Montana	Single trip permit fee for vehicles that do not exceed axle limits: Under 100 Miles $10; 101-199 Miles $30; Over 200 Miles $50	72 Hours	$10	$3.50 for each 5,000 lb. increment overweight moved up to 25 miles that exceed axle limits. For example, a load which is 10,000 lbs. over legal weight and moved 95 miles would result in a $28 permit fee. 5,000 lbs. @ $3.50 x 2 = 10,000 lbs. = $7.00. 95 miles is rounded to 100 miles. $7.00 x 4 (4 25-mile increments are 100) = $28.	
Wyoming	$20 single unit / $40 Combination	96 Hours			

Table 3 continued

State/Province	Single Trip	Single Trip Permit Time Available	Single Trip Oversize Only	Single Trip Overweight Only	Single Trip Oversize and Overweight
Alberta	Varies based on mileage and net weight factors	72 Hours			
Manitoba	$18 or $.06 per kilometer traveled, whichever is greater	24 Hours			
Saskatchewan	$10 or $.06 per kilometer traveled, whichever is greater	24 Hours			

Table 4 Permit Costs (Annual, Multiple, Continuous, and Seasonal Trips) (Permit Definitions in Appendix 6)

State/Province	Annual Oversize	Annual Oversize and Overweight	Multiple Trip	Continuous Trip	Seasonal
North Dakota				N/A	$50 per year
South Dakota	$50	N/A	$5 per month for each designated county, not to exceed $20 for all of the designated counties.	N/A	$50 custom harvest oversize only. $75 custom harvest permit (oversize/overweight).
Minnesota	$120 - Includes vehicles that meet the following criteria: mobile cranes; construction equipment, machinery and supplies; manufactured homes; implements of husbandry; double-deck buses; commercial boat hauling. Implements of husbandry not exceeding 14' width = $24.	Varies from $200-$800 (limited commodities)	Job permit $36 (fee increased if vehicle is also overweight)	N/A	$60 - 10% winter weight increase, sugar beet, potato, and carrot harvest.
Iowa	$25	$300	$200	N/A	
Nebraska				$25	
Montana	$75 for vehicles licensed in Montana.	Vehicles in excess of the oversize/overweight limits are assigned the following fees: up to, but not exceeding 5,000 lbs. = $200.[1] Up to, but not exceeding 10,000 lbs. = $500.[1] Up to, but not exceeding 15,000 lbs. = $750.[1] Up to, but not exceeding 20,000 lbs. = $1,000.[2]		N/A	$25 for 30 days; $50 for 60 days. Renewable for 120 days per calendar year.
Wyoming				N/A	
Alberta				N/A	
Manitoba				N/A	
Saskatchewan				N/A	

[1] No axles to exceed 5,000lbs in excess axle weight.
[2] No tandem to exceed 15,000lbs in excess axle weight.

2.5 Permit Costs by State and Province

Oversize/overweight permits are needed for vehicles transporting loads that weigh 80,000 pounds or are more than 14 feet high, 11 feet wide, or 53 feet long. Each state uses the Federal Bridge Formula to determine load limits on bridges. Vehicle maximum height may vary as some underpasses and bridge structures are constructed at less than 14 feet. Figure 6 shows the single trip permit costs by state and province. The costs indicated are for official receipt single trip permits. The reader should note there are various conditions and exceptions in each jurisdiction, as indicated with an asterisk (*). Annual oversize and overweight, multiple trip, continuous trip, and seasonal permit costs are Tables 3 and 4.

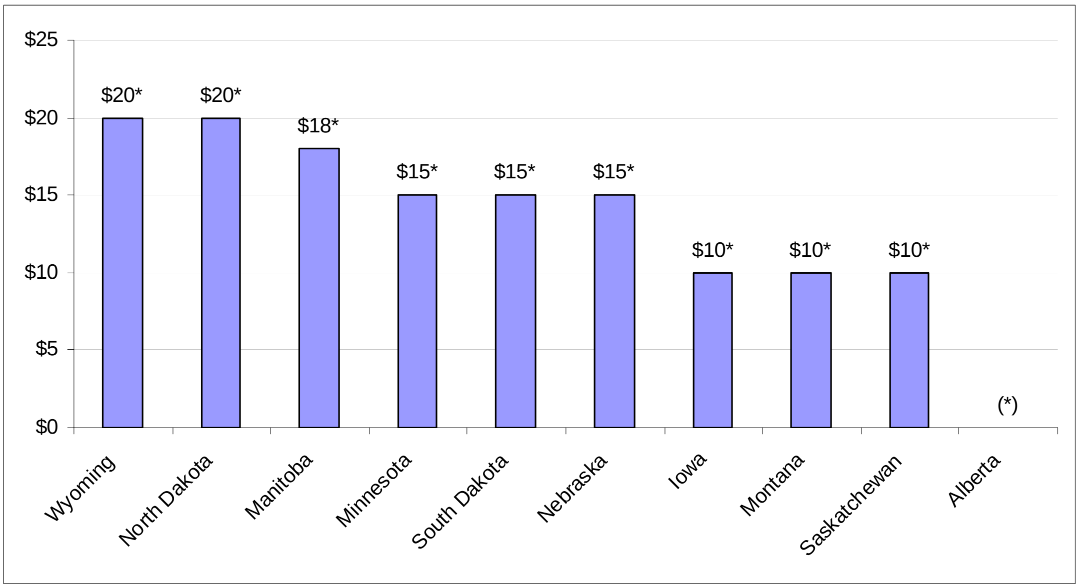


Figure 6 Single Trip Permit Costs by State and Province

*Permit cost structures vary based on mileage, type of issue and configuration (i.e. “Self issue,” “Interstate only,” “Overweight Only,” “Oversize Only,” etc.).

The following is a list of exceptions and conditions in each state and province:

- Alberta permit costs vary based on mileage and net weight factors (see Manitoba and Saskatchewan).
- Manitoba permit costs are $18 or $.06 per kilometer traveled, whichever is greater.
- Saskatchewan permit costs are $10 or $.06 per kilometer traveled, whichever is greater.
- Wyoming permit costs for combination vehicles are $40.
- North Dakota permit costs are $10 for receipt issued “Interstate Only” and $5 for self issued “Interstate Only.” Single trip “Oversize Only” permits are $20 with dimensions up to 14'6" width, 15'6" height, and 120' length. Single trip “Overweight Only” permits are as follows:

150,001-160,000 lbs. $30	160,001-170,000 lbs. $40
170,001-180,000 lbs. $50	180,001-190,000 lbs. $60
190,000 lbs and over $70	

  Five cents per ton mile is assessed upon the portion of Gross Vehicle Weight (GVW) exceeding 200,000 pounds.
- Minnesota single trip “Oversize Only” permits are $135 for width over 14'6" up to 16' during spring load restrictions.
- South Dakota single trip “Oversize Only” and “Overweight Only” permits are $20 each.

- Nebraska single trip “Oversize Only” permits are $15, “Overweight Only” permits are $20, and single trip “Oversize and Overweight” permits are $25.
- Iowa has a $10 permit fee which also includes loads requiring bridge reviews.
- Montana permit fees are $10 under 100 miles, $30 for 101-199 miles, and $50 over 200 miles for vehicles that do not exceed axle limits. An additional $3.50 for each 5,000 pound increment overweight moved up to 25 miles is charged to vehicles that exceed axle weight limits.

Figure 7 shows the maximum useable time for a single trip permit in each state and province. Minnesota and Wyoming permits are issued for the longest times among jurisdictions: 120 hours and 96 hours respectively. Five states (Montana, Iowa, Nebraska, South Dakota, and North Dakota) and Alberta issue single trip permits for 72 hours. Saskatchewan and Manitoba permits are issued for the least amount of time among jurisdictions: 24 hours.

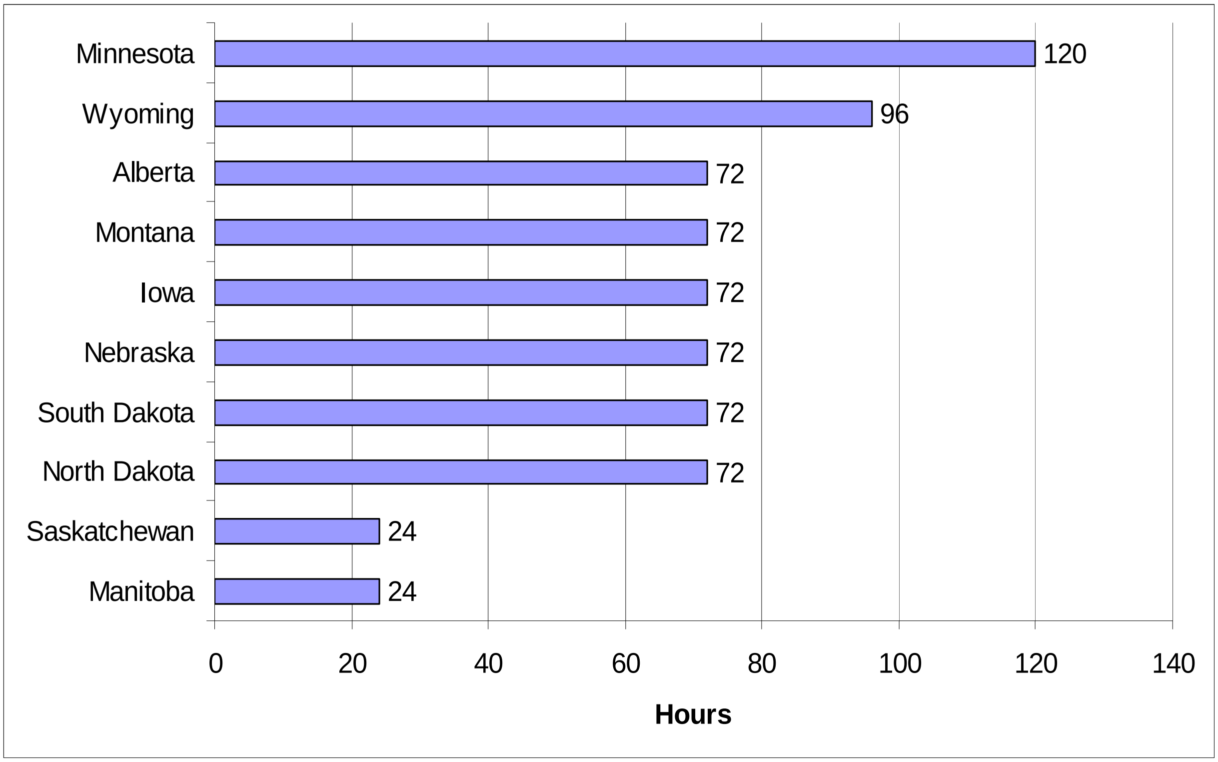


Figure 7 Single Trip Permit Time Available by State and Province

During spring months, states and provinces in the region experience “spring thaw” during which warmer temperatures causes frost in the ground to melt, thus reducing the maximum allowable weight which can be carried over the roadway. States and provinces in the region post restrictions on affected routes. In Montana, for example, signs indicate the tonnage per-axle load allowed on restricted routes. In Montana, the standard spring weight restrictions on the NN are eight tons for single axles and 16 tons for tandem axles. In Minnesota, a five-ton limit is set on most county highways, town roads, and city streets during spring load restriction. During the winter months, when the underlying road surface is hardened by frost, some states and provinces increase load limits on highways by as much as 10 percent. Carriers that desire to move loads during the 10 percent winter weight increase may obtain a seasonal permit for such movements.

In summary, truck regulations from state to state and state to province differ dramatically. There are some commonalities such as the five axle semi which is used and allowed almost exclusively to operate at 80,000 pounds GVW. This section points out the region’s problems in truck size and weight regulation uniformity. Permitting uniformity is also problematic, as there are many variations and costs.

3. PROPOSED INTERREGIONAL CORRIDORS

The region's limited access to water transportation, with the exception of eastern Iowa and eastern Minnesota, and the lack of competitive rail service emphasizes the need for an interregional truck (freight) network. The Federal Highway Administration is predicting freight traffic to double on some highways over the next 20 years. Designating highways as freight corridors for heavy trucks may mitigate the impacts of increased freight volumes. Interregional corridors promote regional, state, and provincial economies by connecting businesses. Corridors also enhance regional tourism and trade by connecting recreational places and businesses. Minnesota Department of Transportation (MNDOT) developed an interregional corridor study in 1999. Minnesota's goal of corridor designation was to "proactively manage the important connections between regional centers in a more cost-effective manner."[4]

MNDOT defined trade centers to develop interregional corridors. The Center for Urban and Regional Affairs (CURA) designed a model ranking regional trade centers (an eight-level hierarchy) from metropolitan areas to hamlets. The model used population and the number and types of business establishments in an area. Level 0 shows the largest population and business establishments. The trade center levels (levels 0 to 3) cover 90 percent of the state's population and 95 percent of the state's employment. CURA defined interregional corridors in seven states (Minnesota, Iowa, Montana, Nebraska, North Dakota, South Dakota, and Wisconsin). MNDOT adopted the model to observe relative growth of trade centers and transportation needs.

Although MNDOT has defined interregional corridors in Minnesota, and some surrounding state DOTs have attempted to construct corridor networks, there is no widely used methodology. Therefore, there are no recognized integrated or interregional corridors in the seven-state area. This study adopted MNDOT's methodology to propose interregional corridors in the study region.

The criteria for a trade center designation in the region used CURA levels 0 to 2. This captures communities or metropolitan areas having high supply and demand of freight shipment. For example, using this criteria North Dakota has eight trade centers including Fargo, Bismarck, Mandan, Jamestown, Dickinson, Grand Forks, Williston, and Minot. Because CURA has not defined trade centers in Wyoming, Alberta, Saskatchewan, and Manitoba, the researchers used population to identify trade centers.[5] The average population for trade center levels 0, 1, 2, and 3 were 653,352, 102,504, 28,142, and 11,036, respectively. This study uses the mean population (19,589) between level 2 and 3 to designate trade centers. Wyoming has four trade centers (Cheyenne, Laramie, Casper, and Gillette) using this method.

[4] The Statewide Interregional Corridor Study, MNDOT (http://www.oim.dot.state.mn.us/projects/irc/index.html)
[5] Trade Centers of the Upper Midwest 1999 Update, William Casey, the CURA

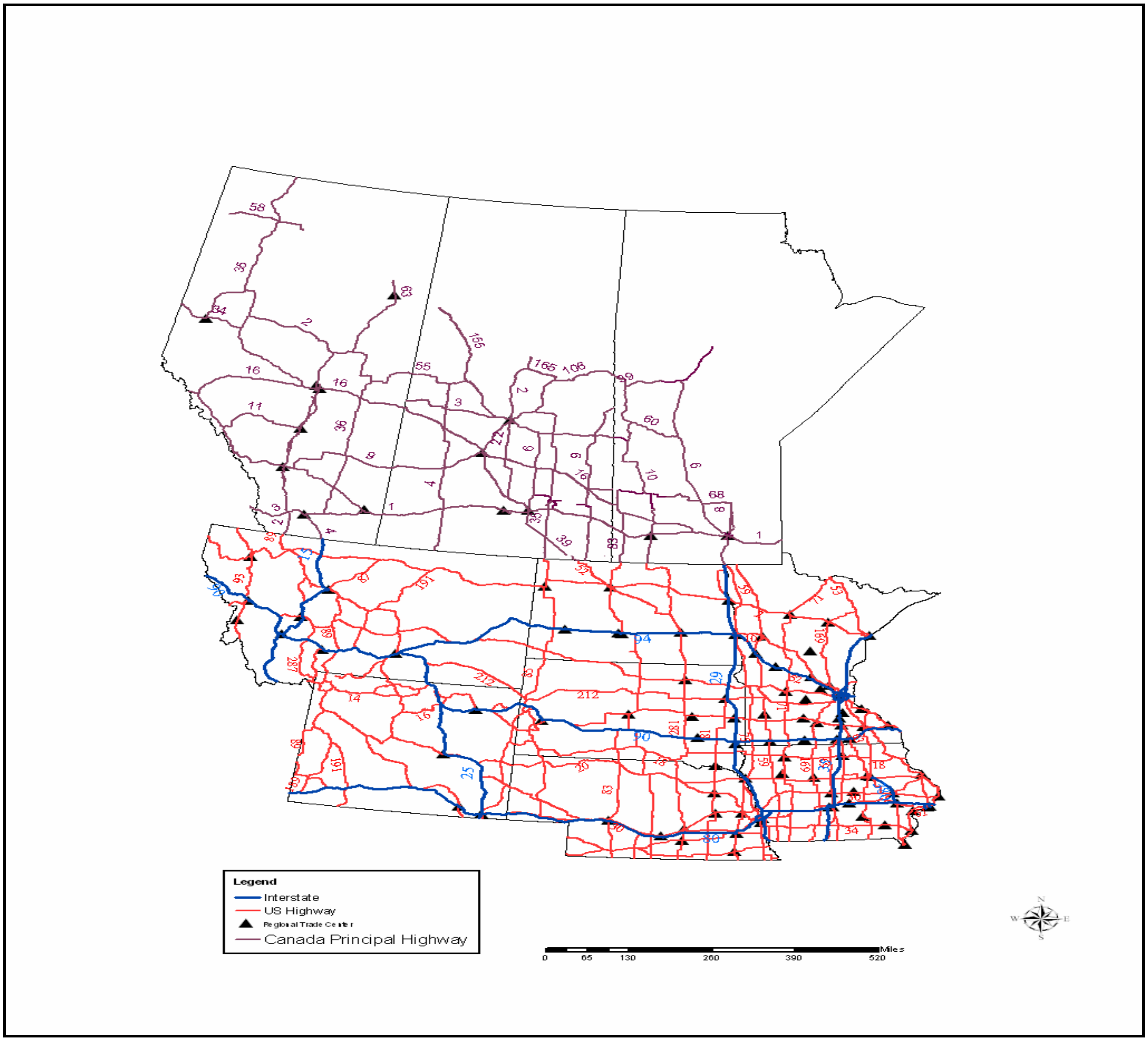


Figure 8 Regional Trade Centers (Level 0-2) and Interstates, U.S. Highways, and Canadian Principal Highways in the Selected Region

An interregional corridor should capture the network with highest freight volumes. This study attempts to identify highway segments with high truck volume and a change of volume over time. Estimated 1998 truck volume on the segments of highways is shown in Figure 9. The Freight Analysis Framework (FAF) Highway Capacity Network Files used their data sources to estimate the average daily trucks. The highway segments with high truck volume can be used to identify potential interregional corridors. For example, the number of average daily trucks on I-80 near Cheyenne was 8,827. Also, I-94 near St. Paul had an average of 5,050 trucks daily.

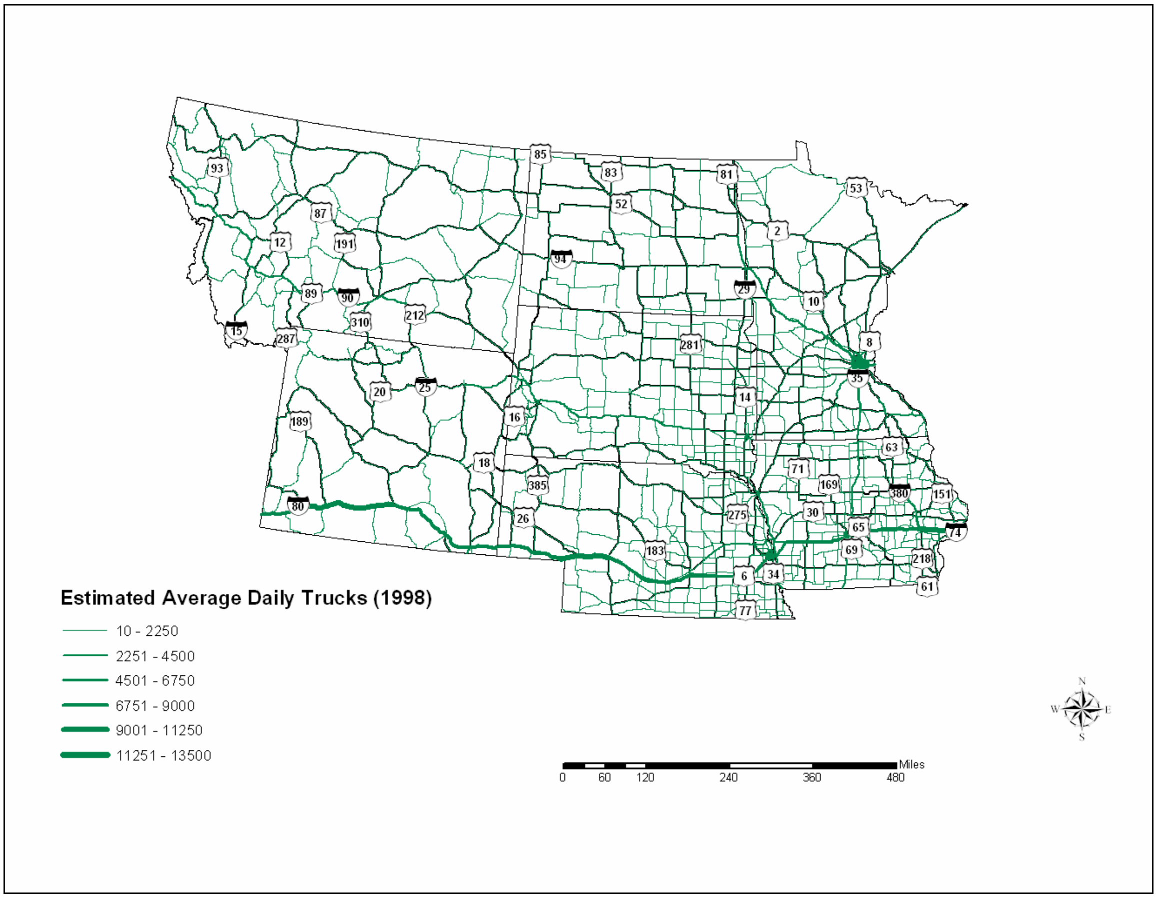


Figure 9 Estimated 1998 Average Daily Trucks in the Seven States

(Source: FAF Highway Capacity Network Files, FHWA)

The FAF Highway Capacity Network Files also provided projected truck volume in 2010 and 2020. Figure 10 shows the average daily trucks on highway segments for projected year 2010.

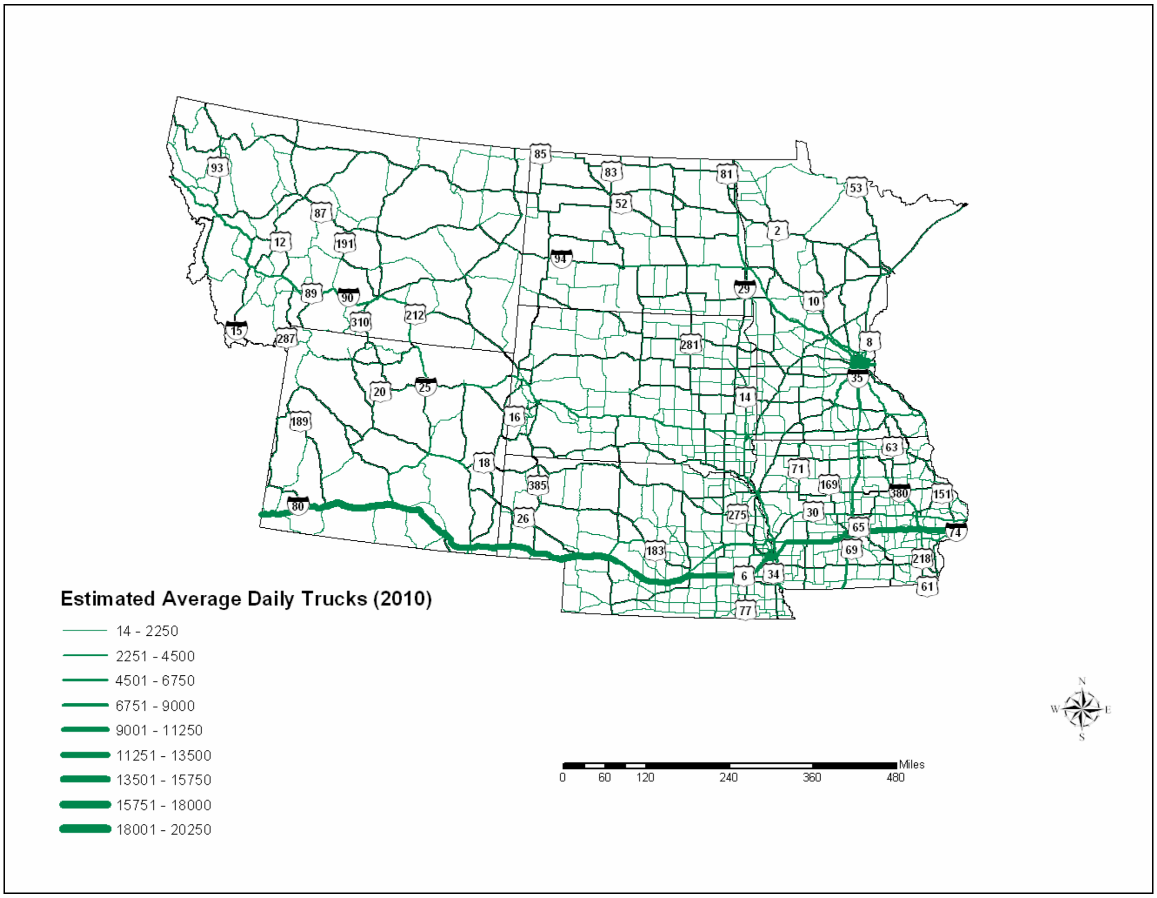


Figure 10 Projected 2010 Average Daily Trucks in the Seven States

(Source: FAF Highway Capacity Network Files, FHWA)

Also, Figure 11 shows the average daily trucks on highway segments for 2020. Figures 10 and 11 show the increases in truck volume over time. Particularly, a significant increase was found in all segments of I-80 in 2020. The 2020 projected daily truck volume on I-80 near Cheyenne (17,037) is more than twice the estimated 1998 daily truck volume (8,827).

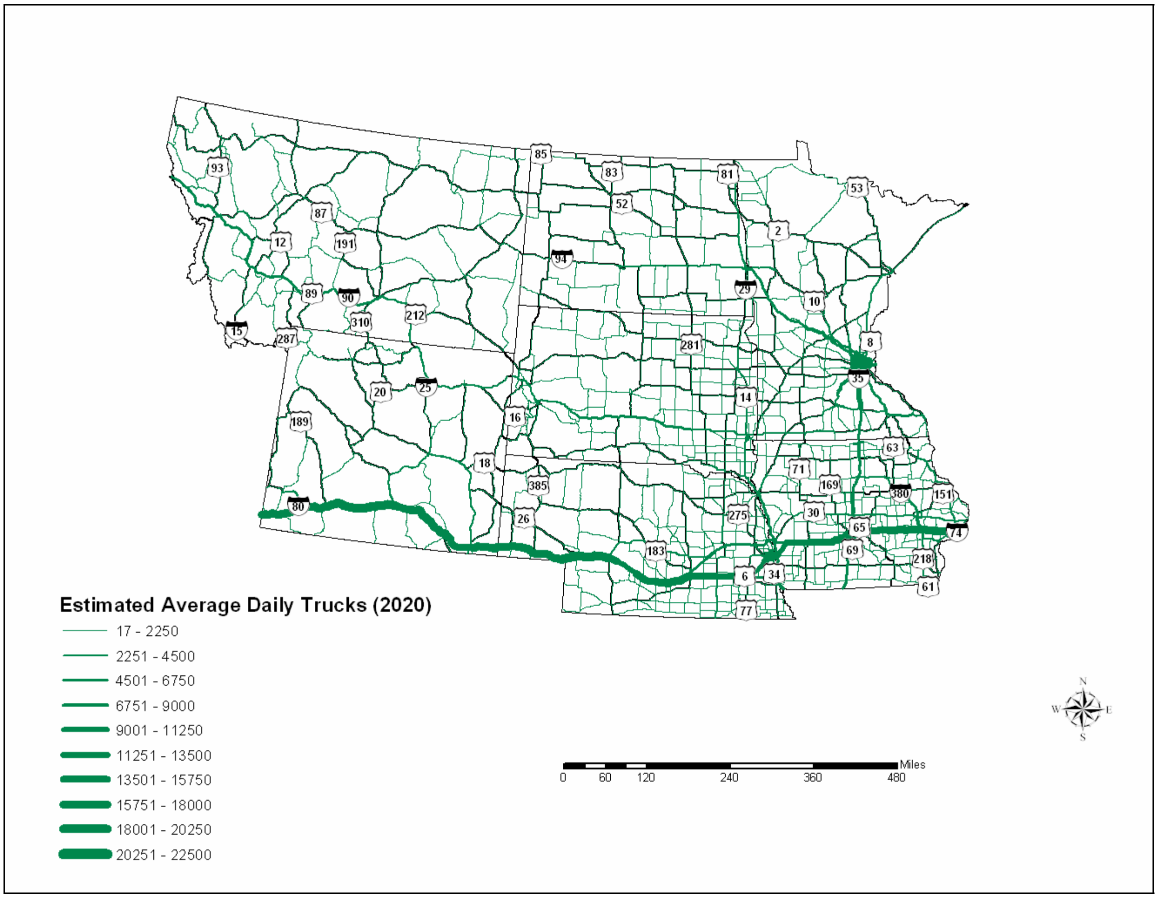


Figure 11 Estimated 2020 Average Daily Trucks in the Seven States

(Source: FAF Highway Capacity Network Files, FHWA)

Figure 12 and Table 5 show selected locations of highway segments and their estimated and projected truck volume. As previously pointed out, high truck volumes are found in all selected segments. For example, average daily truck volume on I-94 near Billings, MT, in 1998, 2010, and 2020 is 800, 1,156, and 1,522, respectively. As shown in the Table 5, Point B on I-80 (near Lincoln, NB) has the largest increase in daily truck volume among the examined nine highway segments. Point B on I-80 shows a 54 percent increase from 1998 to 2010 in projected average daily truck traffic.

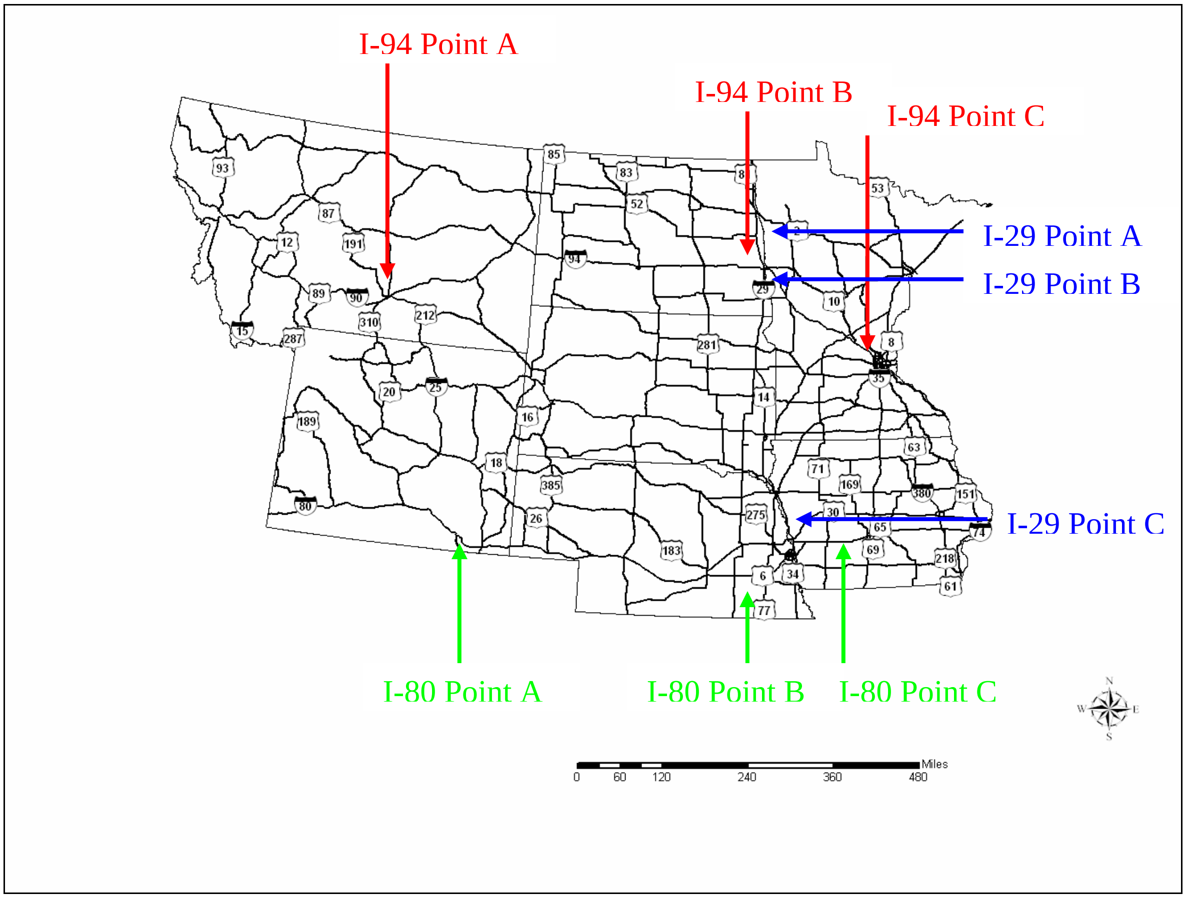


Figure 12 Selected Locations of the Identified Highway Segments for Average Daily Trucks

Table 5 Average Daily Trucks on Identified Highway Segments for Estimated and Projected Years

	Estimated	Projected	
Year	**1998**	**2010**	**2020**
I-94			
Point A (near Billings)	800	1,156	1,522
Point B (near Fargo)	1,801	2,344	2,860
Point C (near St. Paul)	5,050	4,889	6,384
I-29			
Point A (near Grand Forks)	2,239	3,272	4,235
Point B (near Fargo)	2,308	3,358	4,333
Point C (near Omaha)	2,780	3,934	4,938
I-80			
Point A (near Cheyenne)	8,827	12,828	17,037
Point B (near Lincoln)	6,619	10,211	13,483
Point C (near Des Moines)	7,238	10,469	13,647

(Source: FAF Highway Capacity Network Files, Federal Highway Administration)

Further, it shows a 104 percent increase (13,483) for 2020 projected average daily truck traffic. Among the highway groups, I-80 shows the highest increase in average truck volumes from three selected locations. Average increases for 2020 projected daily trucks for I-94, I-29, and I-80 are 58, 84, and 95 percent, respectively.

In summary, the projections of increased freight volumes throughout the region highlight the need for states and provinces to adopt freight corridors for the efficient movement of goods. Harmonization in truck size and weight regulations on these identified routes may reduce truck numbers and provide a more efficient highway network serving businesses throughout the region.

4. A CASE STUDY OF MOTOR CARRIER COSTS AND PAVEMENT IMPACTS

4.1 Costing Model

The trucking industry reflects many aspects of a perfectly competitive industry in that information is easily obtained, entry and exit are not prohibitive, and operators are mostly price takers because of competition. Truck costs or rates for shippers are directly correlated to operating costs incurred either from for-hire operations, or costs incurred from their own fleet. Even though differences exist in operational characteristics for individual trucking entities, both fixed and variable costs can be estimated. Fixed costs are incurred, operating or not, and variable costs increase with distance, time, or both. Fixed costs include equipment depreciation, insurance, license fees and taxes, and any management and overhead costs. Variable costs are labor, fuel, tires, and maintenance and repair.

Motor carrier rates differ from costs based on the supply and demand of transportation services. Rates may be lower or higher than the actual full cost of operating, but in the long run rates are based on operating characteristics such as age and cost of equipment, fuel price, insurance rates, license fees and taxes, and labor. These costs may vary depending on location and operating characteristics. Differences in costs are due to varying equipment prices and the use of that equipment. Varying equipment prices impact depreciation costs, and higher utilization of equipment spreads fixed costs over more miles, resulting in lower fixed costs. Because the trucking industry reflects a perfectly competitive industry, costs provide a good proxy for rates and many times are similar to rates charged.

In determining costs associated with different payloads, both fixed and variable costs need to be included. It could be argued that only variable costs increase as extra trips are needed to haul lower weight payloads based on restrictions for Gross Vehicle Weight (GVW). However, if a shipper is hiring transportation services, all costs are relevant and may be reflected in the rates.

A costing model developed by UGPTI to estimate truck costs allows costs comparisons of different truck configurations and GVWs experienced by a motor carrier moving through the region. The model was developed to cost owner/operator applications, but can be adapted to fit other applications. The original model was formulated to estimate a limited number of truck types and configurations. The model can provide cost estimations for many different truck types, and weights.

The model uses formulas to derive costs for tires, fuel, labor, insurance, sales tax, and license costs. Equipment prices and vehicle weights are determined from tables. The flexibility of the model allows inputs to be changed for the different configurations and provides estimations of costs for those truck types.

Differences in state and provincial size and weight regulations limit what a motor carrier can legally haul. Therefore, any interregional trip is limited to the level of the lowest GVW allowed in any state or province. The cost of shipping is impacted by the differences among states and provinces size and weight regulations.

This case study will simulate differences in estimated shipping costs based on the size and weight regulations for the different states and provinces. A previous section discussed in depth the differences in interregional truck size and weight regulations. The cases will compare the costs for moving through different states with alternate origins and destinations.

First, a simulation will assume a truck needs to move through all states and provinces within the region. The most common over-the-road truck is the 5-axle semi, which is used for the first simulation. A common trailer is the 48' or 53' van. Vans can be either refrigerated (reefer) or not. A reefer hauls less because of the weight of insulation in the roof, walls, and floor and the weight of the refrigeration equipment. The literature review revealed the normal maximum weight for a 5-axle semi in the study area.

The GVW allowed on the U.S. Interstate Highway System in all states is 80,000 pounds. State and provincial highways have differing regulations. For example, North Dakota allows a RMD (Rocky Mountain Double) to operate at 105,500 pounds on designated highways, but Minnesota does not allow these vehicles. Montana allows a double-trailer semi to operate at a maximum of 131,060 pounds with permit and up to 137,800 pounds from Shelby to Sweetgrass.[6] This is a special provision to accommodate Canadian trucks delivering to, or picking up from, the intermodal terminal located in Montana. The extreme differences of weight regulations provide for a less than optimum transportation system and may confuse shippers desiring low-cost interstate or interstate/provincial movements.

However, cost to the shipper is only one component of the truck size and weight debate. Other factors considered in the truck size and weight debate include safety and highway infrastructure preservation. Truck costs were estimated for four different truck types to demonstrate differences in costs.

The first cost estimate is a 5-axle semi operating at 80,000 pounds GVW, the most common truck configuration on the highway as it is legal most everywhere in the continental United States and Canada. Many truck configurations are not loaded to their maximum GVW as they “cube out” before they “weigh out.”[7] Other assumptions made to determine costs are shown in Table 6. These are the variables that need to be estimated before the model can determine costs. The model is most sensitive to equipment usage. This variable is also difficult to estimate, but for commercial truckers it is estimated they operate at least 100,000 miles per year. Other variables may differ depending on location and operation characteristics including fuel, wages, insurance, and taxes and license fees.

[6] The Shelby facility has since closed.

[7] “Cube out” is when a truck trailer’s cubic capacity is filled before it reaches its maximum legal weight. “Weigh out” is when a truck reaches its legal weight before its cubic capacity is filled.

Table 6 Operational and Trip Characteristics and Input Prices for 5-Axle Semi

Miles Per Year	100,000
Trip Distance (Miles)	1,000
Percent Time Loaded	100%
Backhaul Miles	500
Deadhead Miles	0
Adjusted Percent Time Loaded	100%
Payload (Pounds)	53,200
GVW (Pounds)	80,000
Tare Weight (Pounds)	26,800
Labor Rate (Per Mile)	$0.33
Interest Rate (Percent)	8%
Average Speed (Miles Per Hour)	55
Fuel Price (Per Gallon) (8/2004)	$1.55
Maintenance & Repair (Per Mile)	$0.09

The different options available for tractors make it difficult to estimate a universal cost. Tractors capable of operating at or above 80,000 pounds GVW come in a wide range of options and horsepower ratings, varying the costs. A tractor with a “day cab” will sell for considerably less than a tractor with a sleeper unit and all the options that can be added to an over-the-road truck. New semi tractors vary in price from less than $85,000 to more than $125,000.

Because of the variation, assumptions must be made to estimate truck costs. All simulations use the same tractor costs, but trailer and other costs change based on the configuration. The model provides truck costs that can be expressed in different performance measures. Performance measures are the output of the model. Many different measurements can be developed as needed by the user. The measures can be per mile, per hundredweight, per ton, per ton-mile, or unit, or other measures. Table 7 shows the estimated performance measures of a 5-axle semi operating at 80,000 pounds.

Table 7 Performance Measures of a 5-Axle Semi Operating at 80,000 Pounds GVW

Cost Summary	Cost Per Mile	Cost Per Hour	Cost Per Cwt	Cost Per Trip	Cost Per Ton	Cost Per Ton-Mile
Variable Costs						
Fuel	$0.27	$14.89	$0.52	$270.75	$10.35	$0.0104
Labor	$0.33	$18.15	$0.63	$330.00	$12.62	$0.0126
Tires	$0.05	$2.65	$0.09	$48.22	$1.84	$0.0018
Maintenance	$0.11	$6.12	$0.21	$111.34	$4.26	$0.0043
Total Variable Costs	$0.76	$41.82	$1.45	$760.32	$29.08	$0.0291
Fixed Costs						
Equipment Cost	$0.27	$14.74	$0.51	$267.97	$10.25	$0.0102
License Fees and Taxes	$0.03	$1.70	$0.06	$30.83	$1.18	$0.0012
Insurance	$0.07	$3.95	$0.14	$71.85	$2.75	$0.0027
Management and Overhead	$0.11	$5.90	$0.21	$107.22	$4.10	$0.0041
Total Fixed Costs	$0.48	$26.28	$0.91	$477.86	$18.27	$0.0183
TOTAL COSTS	$1.24	$68.10	$2.37	$1,238.17	$47.35	$0.0473

After developing the model, running simulations provides cost estimates for different truck types and weights. Comparing the different truck costs determines the most economical truck types from a shipper's perspective. The lowest cost per ton-mile is the Turnpike Double operating at 137,800 pounds (Table 8). The geographical operation of this truck is extremely limited. It is only allowed on primary highways in Alberta, Manitoba, and Saskatchewan and one route in Montana that allows these heavy Canadian trucks.

Table 8 Ton-Mile Costs for Different Truck Configurations

GVW (pounds)	80,000	94,000	105,500	137,800
	5-Axle	6-Axle	RMD	Turnpike Double
Variable Costs				
Fuel	$0.0104	$0.0090	$0.0093	$0.0072
Labor	$0.0126	$0.0100	$0.0097	$0.0067
Tires	$0.0018	$0.0018	$0.0020	$0.0029
Maintenance	$0.0043	$0.0038	$0.0040	$0.0034
Total Variable Costs	$0.0291	$0.0246	$0.0251	$0.0203
Fixed Costs				
Equipment Cost	$0.0102	$0.0082	$0.0062	$0.0060
License Fees and Taxes	$0.0012	$0.0009	$0.0005	$0.0003
Insurance	$0.0027	$0.0022	$0.0021	$0.0015
Management and Overhead	$0.0041	$0.0033	$0.0032	$0.0022
Total Fixed Costs	$0.0183	$0.0146	$0.0120	$0.0101
TOTAL COSTS	$0.0473	$0.0392	$0.0371	$0.0304

The RMD (Rocky Mountain Double) and the 6-axle semi have similar costs, with the RMD being the more cost effective of the two. The tare weight of the RMD provides only 2,200 pounds more payload than the 6-axle. The 6-axle could be used in all states or provinces covered in the study. Minnesota allows the tridem to operate with a special permit at a GVW of 94,000 pounds.

Table 9 shows the differences in payloads for different configurations. For many products, GVW impacts shipping costs. As previously stated, these costs are directly affected by truck costs. The ratio of payload in the table shows the relationships between the different truck configurations. Using the 5-axle semi with a 53,200 pound base payload and the payloads presented in Table 9 for the other configurations shows the relationships among different truck types and the efficiencies of larger trucks. For example, assume there is 10,000 tons of materials/products to move 250 miles from point A to point B. The movement would require 376 loads with a 5-axle semi at a maximum GVW of 80,000 pounds, 305 loads with the 6-axle semi at 94,000 pounds, 295 loads with the RMD at 105,500 pounds, and 205 loads with the Turnpike Double loaded to 137,800 pounds.

Table 9 Payloads for Truck Types

	5-Axle Semi	6-Axle Semi	RMD	Turnpike Double
Payload	53,200	65,700	67,900	97,800
Tare Weight	26,800	28,300	37,600	40,000
GVW	80,000	94,000	105,500	137,800
Ratio of Payload	1	1.23	1.28	1.84

4.2 Pavement Impacts

This case study identifies four truck configuration scenarios and equivalent single-axle loads (ESALs) for each configuration. Figure 13 displays the gross weight and ESALs on flexible and rigid pavements for each set of axles as well as the total GVW and ESALs for each configuration on flexible and rigid pavement.

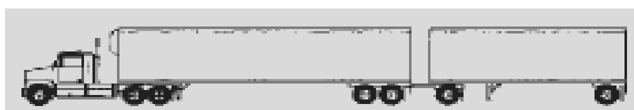
5-Axle Tractor-Semi-trailer

				Total
Weight (lbs)	12,000	34,000	34,000	**80,000 ESALS**
Flexible	0.19	1.09	1.09	**2.37**
Rigid	0.17	1.95	1.95	**4.07**

6-Axle Tractor-Semi-trailer

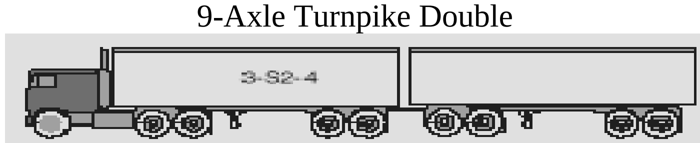
				Total
Weight (lbs)	12,000	34,000	48,000	**94,000 ESALS**
Flexible	0.19	1.09	0.83	**2.11**
Rigid	0.17	1.95	1.68	**3.80**

7-Axle Rocky Mountain Double



						Total
Weight (lbs)	9,000	33,000	31,000	16,250	16,250	**105,000 ESALS**
Flexible	0.06	0.96	0.74	0.66	0.66	**3.08**
Rigid	0.05	1.72	1.31	0.64	0.64	**4.36**

9-Axle Turnpike Double



						Total
Weight (lbs)	12,000	34,000	33,000	30,000	28,800	**137,800 ESALS**
Flexible	0.18	1.09	0.96	0.65	0.55	**3.44**
Rigid	0.17	1.95	1.71	1.14	0.96	**5.93**

Figure 13 Equivalent Single Axle Loads* (ESAL)

* Structural number = 5; slab thickness = 10; terminal serviceability = 2.5

Using the number of loaded and empty trips, equivalent single-axle load (ESAL) factors for each configuration can be calculated for 10,000 tons moved 250 miles.

Calculating gross ESALs and comparing individual truck types on flexible pavement. The 6-axle semi configuration does the least damage followed by the 5 axle semi, RMD, and Turnpike Double respectively for their defined GVWs. However, results change using the total number of trips to haul 10,000 tons 500 miles (calculating loaded and empty movements) from point to point. The combined gross and tare ESAL calculations for flexible pavement using this scenario is lowest for the Turnpike Double configuration, followed by the 6-axle semi, 5-axle semi, and RMD respectively (Table 10). Combined gross and tare ESALs for rigid pavement reveals different results. The combined gross and tare ESALs is lowest for the Turnpike Double configuration, followed by the RMD, 6-axle semi, and 5-axle semi respectively (Table 10).

Gross Vehicle weight varies among the different truck types, thereby affecting payload for different truck configurations. The Turnpike Double, which is not allowed to operate freely throughout the region, provides the lowest operating costs and less pavement damage than the other configurations shown in the 10,000 ton product/material movement scenario.

Case studies for both truck cost and pavement impacts point out that larger heavy trucks may provide lower costs for operating and the least pavement damage. However, LCVs may operate at less than maximum GVW, and in some cases businesses desire to become more efficient by reducing inventory and shipment size. Costs of holding inventory may be much greater than the cost of shipping in smaller lots. Just-in-time manufacturers may want to stock only enough inventory for a set time frame, and will carry safety stock to insure adequate inventory levels. High-cost transportation is offset by the cost savings of lower inventory levels.

Other impediments to larger trucks may also be restricted routes. A truck that needs to move over a designated route to reach a destination may experience a restricted road or bridge limiting the GVW or axle weights of the truck. Bridge Formula B is used by most states to regulate GVW and axle weights on bridges. The formula dictates the needed length of a vehicle and spacing between axles to conform to the formula.

Table 10 Equivalent Single-Axle Load for Truck Types Varying from Lowest Legal to Highest Legal Limit in the Region[8]

	5-Axle Semi	6-Axle Semi	RMD	Turnpike Double
GVW (pounds)	80,000	94,000	105,500	137,800
Gross ESAL Flexible	2.37	2.30	3.08	3.44
Gross ESAL Rigid	4.07	4.67	4.36	5.93
Tare ESAL Flexible	.06	.06	.07	.07
Tare ESAL Rigid	.07	.07	.08	.07
Number of Trips (Max Payload)	376	305	295	205
Number of Trips (Tare Weight)	376	305	295	205
Total Trips (Max Payload and Tare Weight)	752	610	590	410
Gross Total ESALs Flexible per 10,000 Tons Moved 250 Miles	222,744	175,038	226,804	175,869
Gross Total ESALs Rigid per 10,000 Tons Moved 250 Miles	382,519	355,403	321,060	303,170
Tare Total ESALs Flexible per 10,000 Tons Moved 250 Miles	5,639	4,566	5,155	3,579
Tare Total ESALs Rigid per 10,000 Tons Moved 250 Miles	6,579	5,327	5,891	3,579
Combined Gross and Tare ESALs Flexible	228,383	179,604	231,959	179,448
Combined Gross and Tare ESALs Rigid	389,098	360,731	326,951	306,748

Providing corridors to use larger trucks to reduce trips may provide efficiency for businesses and reduce truck traffic. Designing bridges and pavements to carry heavier loads may result in overall cost savings. Pavement and bridge costs may be more than offset by efficiency gains for the business community. Cost savings increase as payloads increase using the costing model developed by UGPTI. Safety concerns provide an obstacle for allowing larger trucks. However, safety data does not provide evidence that larger trucks are less safe than smaller trucks.

[8] Does not include bridge impacts.

5. SAFETY ISSUES ON HEAVY TRUCKS

Road safety is an important issue for drivers, communities, and transportation policy makers. High fatality and crash rates significantly increase costs in the form of human and economic loss for society. A goal listed in TransAction is to provide "safe and secure transportation for residents, visitors, and freight." One of USDOT's strategic goals is to "promote public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage" (USDOT Strategic Plan 2000-05). It is argued by some safety advocates that larger trucks are involved in a greater number of crashes than smaller trucks and the severity of these crashes result in more damage, injuries and fatalities. Consistency in data collection and stratification makes it difficult to support or deny that claim.

5.1 Data

Truck crash data was collected from four sources including Crash Profile Data,[9] Fatality Analysis Reporting System (FARS[10]), Trucks Involved in Fatal Accidents (TIFA[11]) and the North Dakota Department of Transportation. Raw crash data is presented then combined with vehicle miles traveled (VMT). Canada is lacking crash data involving large trucks. Therefore, there is no analysis for Canada.

National statistics reported by the Federal Motor Carrier Safety Administration show that 4,542 large truck crashes resulted in 4,897 fatalities in 2002.[12] The Crash Profile Data reports fatal and non-fatal crash statistics by state. The Crash Profile defines a large truck as a truck with a GVW of 10,000 pounds or higher. Nationally, more than 96,200 large trucks were involved in non-fatal crashes, resulting in 72,590 injuries. In the region, 287 large trucks were involved in fatal crashes with 309 fatalities and 6,360 large trucks were involved in non-fatal crashes resulting in 4,580 injuries (Crash Profile Data, 2002).

5.2 Crash Parameters of Large Trucks vs. Passenger Vehicles in the United States

The Crash Profile Data summarizes crash statistics for large trucks and buses involved in fatal and non-fatal crashes that occurred in the United States13 and are made up of data from the Fatality Analysis Reporting System (FARS) and the Motor Carrier Management Information System (MCMIS). Using this data, a truck weighing more than 10,000 pounds is considered a large truck.

Crash statistics per vehicle miles traveled (VMT) are used to compare crash data. Large trucks have a lower crash rate than passenger vehicles at 46.31 per 100 million truck miles traveled (TMT) versus 78.50 per 100 million VMT. However, passenger vehicles have a lower fatality rate than large trucks at 1.52 per 100 million VMT versus 2.49 per 100 million TMT. And inversely, large truck injuries per 100 million TMT are fewer than passenger car injuries per 100 VMT, 65.36 and 119.26 respectively (Table 11).

[9] Federal Motor Carrier Safety Administration (FMCSA) has operated and maintained the crash profiles since 1993. The crash profiles contain information on crash statistics for large trucks and buses involved in fatal and non-fatal crashes.

[10] The National Highway Traffic Safety Administration (NHTSA) has collected the FARS since 1975. The FARS contains information on all fatal motor vehicle crashes.

[11] University of Michigan Transportation Research Institute (UMTRI) has conducted an annual national survey on fatal accidents involving medium and heavy trucks since 1980.

[12] Crash Profile, http://ai.volpe.dot.gov/CrashProfile/CrashProfileMainNew.asp

[13] http://ai.volpe.dot.gov/CrashProfile/CrashProfileMainNew.asp

Table 11 Crash Parameters for Trucks and Passenger Cars in the United States from 1999 to 2002.

Large Trucks*							
	Crashes**	Fatalities	Injuries	Truck Miles Traveled TMT (Millions)	Crashes per 100 million TMT	Fatalities per 100 million TMT	Injuries per 100 million TMT
1999	99,560	5,380	142,000	202,688	49.12	2.65	70.06
2000	100,573	5,282	140,000	205,520	48.94	2.57	68.12
2001	90,451	5,111	131,000	209,032	43.27	2.45	62.67
2002	94,183	4,897	130,000	214,530	43.90	2.28	60.60
Average	96,192	5,168	135,750	207,943	46.31	2.49	65.36
Passenger Cars							
	Crashes**	Fatalities	Injuries	Vehicle Miles Traveled VMT (Millions)	Crashes per 100 million VMT	Fatalities per 100 million VMT	Injuries per 100 million VMT
1999	2,039,163	38,571	3,175,000	2,470,122	82.55	1.56	128.54
2000	2,051,379	38,695	3,123,000	2,523,346	81.30	1.53	123.76
2001	1,988,496	38,725	2,974,000	2,571,539	77.33	1.51	115.65
2002	1,911,803	39,174	2,863,000	2,624,824	72.84	1.49	109.07
Average	1,997,710	38,791	3,033,750	2,547,458	78.50	1.52	119.26

* Large truck's GVW is 10,000 pounds or higher.
** Total crashes including fatal and injury crashes.
(Source: Crash Profile 2002 Report,
http://ai.volpe.dot.gov/CarrierResearchResults/HTML/2002Crashfacts/2002LargeTruckCrashFacts.htm)

5.3 Regional Crash Parameters of Large Trucks

Wyoming has the highest fatality rate at .36 fatalities per 100 million VMT, while Minnesota has the lowest fatality rate at .16 fatalities per 100 million VMT. Wyoming has the highest injury rate at 4.53 injuries per 100 million VMT, while South Dakota has 0.87 injuries per 100 million VMT (Table 12).

Table 12 Number of Fatalities and Injuries by Large Trucks* in 2002

	# of fatalities	# of injuries	Annual VMT (million)**	Fatalities per 100 million VMT	Injuries per 100 million VMT
ND	19	194	7,336	0.26	2.64
SD	19	74	8,499	0.22	0.87
NE	59	750	18,719	0.32	4.01
MN	86	1,622	54,562	0.16	2.97
IA	68	1,276	30,847	0.22	4.14
MT	26	256	10,395	0.25	2.46
WY	32	408	9,007	0.36	4.53

* Large truck's GVW is 10,000 pounds or higher.
** Vehicle-miles of travel by functional system (table VM-2), Highway Statistics 2002, FHWA
(Source: Crash Profile State Report)

5.4 Crash Parameters of Large Trucks vs. Non-Trucks in North Dakota

This section provides truck crash characteristics in North Dakota. The study uses the most recent four years of crash data (2001-2004) collected from the North Dakota DOT. A truck is defined as having more than two axles with a minimum GVW of 26,000 pounds and excludes pick-ups, farm trucks, and construction equipment. Table 13 shows crash parameters for trucks and other motor vehicles excluding trucks on the National Highway System (NHS)[14] excluding interstates. Trucks have a lower crash rate than other motor vehicles at 74.68 per 100 million TMT versus 193.87 per 100 million VMT. Trucks have lower injury rates per 100 million TMT at 18.21 versus 30.69 per 100 million VMT but higher fatality rates than other motor vehicles at 2.87 per 100 million TMT versus 1.05 per 100 million VMT. This result is consistent with the findings in national crash parameters (Table 13).

[14] NHS includes interstates, other principal arterials, Strategic Highway Network (STRAHNET), major strategic highway network connectors, and intermodal connectors.

Table 13 Crash Parameters for Trucks and Other Motor Vehicles Excluding Trucks on North Dakota National Highway System Excluding Interstates from 2001 to 2004

Trucks							
	Crashes	**Fatalities**	**Injuries**	**Truck Miles Traveled (TMT)**	**Crashes per 100 million TMT**	**Fatalities per 100 million TMT**	**Injuries per 100 million TMT**
2001	140	5	46	233,554,950	59.94	2.14	19.70
2002	168	10	34	245,706,805	68.37	4.07	13.84
2003	218	8	55	249,508,130	87.37	3.21	22.04
2004	202	5	42	243,317,905	83.02	2.05	17.26
Average	182	7	44	243,021,948	74.68	2.87	18.21
Vehicles Excluding Trucks							
	Crashes	**Fatalities**	**Injuries**	**Vehicle Miles Traveled (VMT)**	**Crashes per 100 million VMT**	**Fatalities per 100 million VMT**	**Injuries per 100 million VMT**
2001	2,256	20	387	1,317,628,675	171.22	1.52	29.37
2002	2,661	11	429	1,369,470,530	194.31	0.80	31.33
2003	2,853	9	474	1,379,703,165	206.78	0.65	34.36
2004	2,831	17	386	1,393,378,470	203.18	1.22	27.70
Average	2,650	14	419	1,365,045,210	193.87	1.05	30.69

(Source: North Dakota Department of Transportation)

Table 14 displays crash statistics for trucks and other motor vehicles on North Dakota interstates. Again, the results are very similar to those found in the crash characteristics on non-interstate NHS (Table 13). Trucks have higher fatality rates, at .90 per 100 million TMT, than other motor vehicles at .43 per 100 million VMT. However, in 2001, truck crash fatalities are lower than other motor vehicles with a rate of .63 per 100 million TMT compared to .74 per 100 million VMT (Table 14). For injuries per 100 million TMT and VMT, all observations are lower for trucks than other motor vehicles. Again, the higher fatality and lower injury rates per 100 million TMT for trucks are consistent with the truck crash parameters at the national level (Table 14).

Table 14 Crash Parameters for Trucks and Other Vehicles Excluding Trucks on North Dakota Interstates from 2001 to 2004

Trucks							
	Crashes	**Fatalities**	**Injuries**	**Truck Miles Traveled (TMT)**	**Crashes per 100 million TMT**	**Fatalities per 100 million TMT**	**Injuries per 100 million TMT**
2001	144	2	22	316,694,470	45.47	0.63	6.95
2002	152	4	27	327,132,895	46.46	1.22	8.25
2003	160	3	36	336,700,265	47.52	0.89	10.69
2004	173	3	25	349,867,690	49.45	0.86	7.15
Average	157	3	28	332,598,830	47.23	0.90	8.26
Vehicles Excluding Trucks							
	Crashes	Fatalities	Injuries	Vehicle Miles Traveled (VMT)	Crashes per 100 million VMT	Fatalities per 100 million VMT	Injuries per 100 million VMT
2001	1,078	9	192	1,222,196,285	88.20	0.74	15.71
2002	1,089	4	154	1,276,526,380	85.31	0.31	12.06
2003	1,123	4	161	1,320,097,450	85.07	0.30	12.20
2004	1,243	5	154	1,382,845,000	89.89	0.36	11.14
Average	1,133	6	165	1,300,416,279	87.12	0.43	12.78

(Source: North Dakota Department of Transportation)

Comparing the averages from Table 13 and 14 for crashes, fatalities, and injuries per 100 million miles traveled for both trucks and other motor vehicles shows significantly lower averages on interstate highways versus non-interstate NHS highways. Average crashes per 100 million TMT on interstate highways are 47.23 compared to 74.68 on the non-interstate NHS highways. Average fatalities per 100 million TMT on interstate highways are .90 compared to 2.87 on the non-interstate NHS highways. The average injuries per 100 million TMT on interstate highways are 8.26 compared to 18.21 on the non-interstate NHS highways.

5.5 Cost of Large Truck Crashes

Costs for fatal and non-fatal crashes include medical, property damage, emergency service, travel delay, productivity loss, legal and court, insurance administration, etc. A National Highway Traffic Safety Administration (NHTSA) report[15] considered these factors and calculated economic costs due to roadway crashes in 2000. The study estimates the United States' annual economic costs associated with motor vehicle crashes at $230.6 billion. The total economic cost is estimated from the present value of lifetime costs for 41,821 fatalities, 5.3 million non-fatal injuries, and 28 million damaged vehicles. The main cost factors include $61 billion in lost workplace productivity, $20.2 billion in lost household productivity, $59 billion in property damage, $32.6 billion in medical costs, and $25.6 billion in travel delay costs.[15]

[15] The Economic Impact of Motor Vehicle Crashes 2000, NHTSA 38-02, May 9, 2002
http://www.dot.gov/affairs/nhtsa3802.htm

The Federal Motor Carrier Safety Association (FMSA)[16] examined crashes for large trucks with 10,000 GVW or higher using data from the Fatality Analysis Reporting System (FARS) and the General Estimates System (GES) in 1997. According to the study, the total cost of large truck crashes in 1997 was $24.4 billion. The main cost factors include $13.1 billion in quality-of-life losses, $8.7 billion in productivity losses, $1.5 billion in property damage, $941 million in medical costs, and $58 million in emergency services. The total crash cost of straight trucks is $9.5 billion and the cost of truck tractors is $14.8 billion (Table 15).

Table 15 Crash Costs of Large Trucks* by Truck Type in 1997 (1999 $Millions)

Type of Cost (1999 $Millions)						
Type of Vehicle	**Medical**	**Emergency Services**	**Property Damage**	**Lost Productivity**	**Monetized Quality-of-Life Years**	**TOTAL**
Straight Truck	$460	$25	$676	$3,492	$4,913	$9,566
Truck Tractor	$477	$32	$835	$5,205	$8,188	$14,738
Unknown	$4	$0	$9	$34	$25	$72
All Large Trucks	$941	$58	$1,520	$8,731	$13,127	$24,376

* Large truck's GVW is 10,000 pounds or higher.
(Source: Cost of Large Truck- and Bus-Involved Crashes, FMCSA-MCRT-01-005, March 2001
http://www.fmcsa.dot.gov/documents/ab01-005.pdf)

The study estimated average crash costs for large trucks at $75,637 per crash in 1997. Among the truck types, truck tractors with two or more trailers show the highest cost ($117,309 per crash). Other truck types included straight truck with no trailer at $64,667 per crash and straight trucks towing a trailer at $69,203 per crash, bobtail (tractor without a trailer) at $74,695 per crash, and truck tractor with one trailer at $84,588 per crash.

Using 2003 North Dakota data in the crash profile, annual total truck crash costs were estimated. Truck tractors pulling one trailer have the highest total crash costs at $16.8 million. The total annual truck crash costs are estimated at $28.5 million in 2003 dollars (Table 16).

[16] Cost of Large Truck- and Bus-Involved Crashes, FMCSA-MCRT-01-005, March 2001
http://www.fmcsa.dot.gov/documents/ab01-005.pdf

Table 16 Estimated Annual Crash Costs of Large Trucks* Involved in Fatal and Non-Fatal Crashes in North Dakota (2003)

Vehicle Configuration	Large Trucks involved in Fatal Crashes	Large Trucks involved in non-fatal Crashes	Total Large Truck Crashes	Per-Crash Cost (1999 dollars)	Total Crash Cost in ND (1999 dollars)	Total Crash Cost in ND (2003 dollars using CPI)
Straight Truck	4	83	87	$64,667	$5,626,029	$6,215,293
Straight Truck /Trailers		18	18	$69,203	$1,245,654	$1,376,122
Bobtail		3	3	$74,695	$224,085	$247,555
Tractor/One Trailer	10	170	180	$84,588	$15,225,840	$16,820,578
Tractor/Double and Triple		12	12	$117,309	$1,407,708	$1,555,149
Other**		2	2	$75,637	$151,274	$167,118
Unknown**		25	25	$75,637	$1,890,925	$2,088,978
Total	14	313	327		$25,771,515	$28,470,794

* Large truck's GVW is 10,000 pounds or higher.
** Average large truck crash cost is used ($75,637).
(Source: Crash Profile)

This section compares crash parameters for trucks and other motor vehicles at national and state levels. There is higher fatal and lower injury crash rates for trucks than other motor vehicles per 100 million miles traveled. Because of this inverse relationship, it is difficult to draw a conclusion about truck crash characteristics. Averaging the data, crashes, fatalities and injuries per 100 million miles traveled for both trucks and other motor vehicles reveals significantly lower averages on interstate highways versus non-interstate NHS highways.

6. SUMMARY AND CONCLUSIONS

Transportation plays an important role in the economy. A large portion of the region's economy is based on natural resources. Therefore, efficient transportation service for these resources is crucial for stimulating economic growth in the state. In the region, truck transportation offers advantages in terms of accessibility, flexibility, and door-to-door services.

Specifically, this study explore the regulatory environment shippers face in moving freight throughout the region and highlights differences in regulations that exist among bordering states and provinces. Truck size and weight regulations in the north central states and provinces are controlled and specified by state departments of transportation and provincial departments of highways, rural municipal councils, major urban transportation agencies, U.S. Department of Transportation, national parks, public works, and other government agencies and services. Truck size and weight regulations are meant to promote safety, as well as prevent excessive wear on highways and bridges. However, because of the inconsistencies in size and weight regulations, problems exist for seamless freight transportation. This report provides a snapshot of current regulations and conditions, and the reader should note that vehicle size and weight laws are continually evolving, depending on various scenarios.

Permitting information was gathered from regional states and provinces, which identified and compared similarities and differences. Examining the permit regulations in the region reveals inconsistencies in the permit system that prohibits seamless freight transportation. Because of the inconsistencies across state and provincial borders, it may be advantageous for policy makers and transportation departments in the region to work toward a uniform permitting system.

This study also analyzes truck safety, which is an important issue for drivers, communities, and transportation policy makers. Because motor carriers are a major transportation mode used to ship commodities and other goods in the study area, deaths and injuries by truck can be a critical factor affecting transportation costs and regional economies. High fatality and crash rates can significantly increase economic and social losses and reduce the efficiency of the transportation system. Trucks show higher fatal crash rates and lower injury crash rates than other motor vehicles per 100 million miles traveled. Because trucks have an opposing characteristics for fatal and injury crashes, no conclusions can be drawn about the characteristics of crashes. Crashes, fatalities, and injuries per 100 million miles traveled for both trucks and other motor vehicles are significantly lower on the interstate highway system versus the non-interstate NHS.

The information in this report provides the basis for discussing the inconsistencies that exist for size, weight, and permitting regulations in the region. Cooperation among states, provinces, and government leaders is needed to bring about a plan for uniform regulations and a seamless freight transportation system that enhances commerce within the region.

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Appendix 1. Literature Review

In reviewing the literature, Transportation Research Board's (TRB) Report 267 and 225 provide information about truck size and weight regulations. TRB Special Report 225 was published in 1990 and TRB Special Report 267 was published in 2002. These reports were published 12 years apart and in that time there were very few changes in truck size and weight regulations.

TRB 225

The report was developed from a group effort of transportation professionals. The study focuses on four issues that involve potential changes to federal weight limits for interstate highways:

- "Elimination of existing grandfather provisions,
- Alternative methods for determining gross vehicle weight (GVW) and axle loadings,
- Adequacy of current federal bridge formula, and
- Treatment of specialized hauling vehicles (SHVs)–garbage trucks, dump trucks, and other trucks with short wheelbases that have difficulty complying with the current federal bridge formula."

Grandfather Provisions. Grandfather provisions provide exemptions to federal truck size and weight regulations by allowing certain truck types and movements that were in effect prior to implementation of the federal rules. The study concludes that elimination of the grandfather provisions would increase trucking costs nationally by an estimated 3.7 percent. The costs increases would be concentrated in the Specialized Hauling Vehicles (SHVs), especially in the New England states and in the western states where Rocky Mountain Doubles (RMDs) would be eliminated.

The total number of vehicles required to haul the same amount of freight would increase if grandfather provisions were eliminated, negatively affecting traffic flow and increasing air pollution. The study suggested the positives of removing grandfather exemptions were that enforcement of truck weight and length laws would be standardized simplifying the process of enforcement. Also, elimination of these laws would reduce pavement and bridge wear brought on by heavier trucks. The study stated that even though grandfather provisions may be important to an individual state, they are arbitrary and inequitable in determining means for exemptions to federal regulation.

Alternative Gross Weight and Axle Limits. In 1956, the maximum gross weight on the Interstate System was set at 73,280 pounds. This was changed in 1974 through the Federal-Aid Highway Amendments Act, increasing GVW to 80,000 pounds. The reason for the increase was to conserve energy. The speed limit was also reduced to 55 miles per hour with the same legislation.

The change to 80,000 pounds reduces truck costs because of the higher allowed payload. It is estimated that truck costs would be reduced by 1.6 percent. It is also estimated that the increased GVW would impact bridges over the routes, and some 8,000 bridges at the national level and 22,000 additional bridges on non-primary routes would have to be strengthened, posted, or replaced to accommodate the heavier loads. Pavement costs would not be appreciably changed because axle weights are similar. To reach the heavier weight, trucks would add axles.

At the time of the study, most states strictly regulated truck and trailer length. If the states choose to increase lengths, the cost savings because of more productive trucks could increase dramatically; however, bridge costs would increase and more bridges would have to be weight- posted or replaced.

According to the study, the bridge formula is overly cautious when applied to the Interstate System and less than 1,000 of the 50,000 bridges are constructed with a design load of H-15 or less. If the 30 percent overstress criterion for H-15 bridges was dropped, the bridge formula could allow higher weights for shorter trucks. The opposite is true for non-interstate highways. The study estimates that 120,000 of the 550,000 bridges on the non-interstate highway system do not have the load-carrying capacity for heavier loads and are posted. When bridge formulas are applied to vehicles of more than 80,000 pounds, stresses over the 5 percent threshold may be violated.

Alternatives to the Bridge Formula. The Texas Transportation Institute (TTI) was asked by the Federal Highway Administration (FHA) to develop a new bridge formula. They developed a formula that allowed higher weights for shorter trucks, but is somewhat more restrictive on longer vehicles. This formula was rejected by trucking groups because they believed it was much too cautious.

TTI then developed a modified version of the formula that keeps the 5 percent criterion for HS-20 bridges but drops the 30 percent criterion for the H-15 bridges. This formula allows much higher weights for shorter trucks. A triple-axle truck under the current formula could have a GVW of 56,000 pounds. The proposed formula could increase the GVW to 64,000 pounds. New configurations designed to take advantage of the new formula could gross up to 70,000 pounds. Again, this formula is weight neutral for longer vehicles like TTI's original formula and therefore would be rejected by western truckers using Rocky Mountain Doubles (RMDs) at heavier weights.

TTI proposes a scenario where the TTI HS-20 formula would be applied to trucks with two to six axles, and the original bridge formula would be applied to trucks with seven axles or more. Truckers in western states would still be able to operate under their grandfather provision and SHVs would become more efficient.

The committee developed a variation of the combined TTI HS-20/Formula B approach and provided stronger incentives to operate trucks with more load-bearing axles, discouraged the use of dummy axles, and promoted a more even distribution of weight among axles. Under this alternative, vehicles more than 80,000 pounds can operate at weights permitted by Bridge Formula B (for nine axles) provided that these vehicles meet the following axle weight limits:

- Single axle 15,000 pounds,
- Tractor-drive axles, 34,000 pounds per tandem pair, and
- Other tandem axles, 30,000 pounds per tandem pair.

Canadian Provincial Limits. In 1988, the Canadian Council of Ministers of Transportation and Highway Safety agreed on a common set of limits for tractor trailers and multiple trailer combinations. No bridge formula was used. Instead of a bridge formula, minimum axle spacing was used to spread the load. These provisions are much less restrictive than the United States federal bridge formula and allow much higher weights. An example in the study is of an 8-axle truck double trailer 75 feet in length limited to 109,000 pounds in the United States, but allowed to operate in Canada at 131,000 pounds.

Freightliner Proposal. Another proposal covered in the study was produced by the Freightliner Corporation in 1988. The proposal exempts the steering axle from the bridge formula on combination trucks. The theory is that it would make trucks much more aerodynamic and maneuverable. It would increase load carrying capacity from 12,000 pounds on the steering axle to 14,000 pounds or even up to 20,000 pounds. However, it was discovered that there is a problem with handling and stability when steering axle weights are more than 14,000 pounds. It was concluded that higher weights would have a negative impact on pavements, particularly because steering axles are more damaging to pavements than non-steering axles with dual tires.

Summary

The steering committee for TRB report 225 identifies four alternatives to the bridge formula that may have merit for developing new regulatory policies:

- "The uncapped Formula B would reduce transport costs for freight moving in combinations at or near 80,000 pounds.
- The TTI HS-20 Bridge Formula would reduce transport costs for single-unit trucks and shorter combination vehicles.
- The combined TTI HS-20/Formula B would benefit both single-unit and combination trucks.
- The new approach is similar to the combined TTI HS-20/Formula B approach, but with reduced axle weights for vehicles over 80,000 pounds."

The tradeoff for each scenario is more efficient transportation versus bridge costs. It is concluded that the transport costs savings outweighs the bridge costs by a considerable margin. However, there are problems for highway agencies in obtaining the needed revenue to rebuild or upgrade bridges.

It is also concluded that the Freightliner scenario may have merit if the steering axle weight limit is less than 14,000 pounds. The Canadian Interprovincial Limit (CIL) scenario holds little promise because of the large number of primary bridges that would have to be replaced. The TTI Bridge Formula scenario would also be rejected because it is very similar to the existing bridge formula.

Specialized Hauling Vehicles. Specialized hauling vehicles (SHVs) generally have short wheelbases and special equipment. Many times, more than half of their allowed GVW is tare weight. Examples include garbage and concrete trucks. Because of their short wheel base, the GVW is usually determined by the bridge formula. Because of the need for maneuverability and safety considerations, users of these vehicles cannot just spread the wheelbase to increase GVW permitted.

The study examines a scenario presented by the National Truck Weight Advisory Council (NTWAC), an organization that represents industries involved in heavy hauling of products like construction material, solid waste, forest products and many others. The NTWAC proposes, because of grandfather provisions, that any state should be able to permit for SHVs to operate "at weights up to those that exceed the 'operating rating' of an HS-20 bridge."

"According to the Manual for Maintenance Inspection of Bridges (AASHTO, 1983), the operating rating is the absolute maximum permissible load level to which a bridge may be subjected. Special permits for heavier-than-normal vehicles may be issued only if such loads are distributed so as not to exceed the structural capacity determined by the operating rating of the bridge over which the vehicle will travel."

The study analyzed the NTWAC proposal and assumes:

- "80,000 pounds for a 3-axle single-unit truck with a wheel base of 16' or more,
- 85,000 pounds for a 4-axle single-unit truck with a wheel base of 22' or more, and
- 110,000 pounds for a 5-axle tractor semi-trailer with a wheel base of 36' or more."

The study concludes that the vehicles at the weights listed above would not exceed the operating rating of an HS-20 bridge and are consistent with the NTWAC proposal. It is estimated that the proposal would reduce transport costs by $5.4 billion per year. Another result would be reduced truck traffic, increasing safety overall. Other positive benefits may include fewer dummy axles and incentive for users to bring their vehicles into compliance with these relaxed weight regulations.

The negative side of the NTWAC proposal is the higher pavement and bridge costs. It is estimated that some 167,000 bridges would have to be posted, strengthened, or replaced. If all 167,000 bridges are replaced, the costs were estimated at $3.7 billion per year and if only primary bridges were replaced the costs would still be $1.5 billion per year. Pavement costs under this scenario would increase an estimated $350 million annually. The committee concludes that the NTWAC proposal is overly permissive looking at the broad definition of SHVs used in the study.

Table 17, which is duplicated from the study, shows that for six of the seven scenarios transport costs would decrease. If "grandfather provisions" were eliminated, weight limits would decrease dramatically, impacting the trucking industry and shippers. The largest reduction in shipper costs is elimination of the bridge formula, inserting the Canadian weight limits resulting in an estimated $12 billion transport cost savings in 1990 dollars. The largest increase in pavement costs would also result from the Canadian Interprovincial Weight Limit scenario.

Table 17 Simulates the Estimates the Committee Determined for the Different Scenarios

	Change in Cost ($billion/year)			
Scenario	**Transport**	**Pavements**	**Bridges**	**Total**
Grandfather Clause Elimination	7.8	-0.2	-0.3	7.3
Uncapped Formula B	-2.1	0	-0.7	-1.4
NTWAC Proposal	-5.4	0.4	3	-2
Canadian Interprovincial Limits	-11.7	0.5	2.4	-8.8
TTI HS-20 Bridge Formula	-2.7	0	0.3	-2.4
Uncapped TTI HS-20 Bridge Formula	-5.1	0.1	0.4	-4.6
Combined TTI HS-20 Formula B	-5.2	0	0.9	-4.3

The estimated impacts of the scenarios on total vehicle miles traveled (VMT), fatal accidents, and diversion from rail are summarized in Table 18.

Table 18 Canadian Interprovincial Weight Limit Scenario

Scenario	**Percent Change in Heavy Truck VMT**	**Percent Change in Rail Ton-Miles**	**Change in Number of Fatal Accidents**
Grandfather Clause Elimination	3.2	0.08	350
Uncapped Formula B	-2.2	-2.2	-60
NTWAC Proposal	-1.1	-0.9	-40
Canadian Interprovincial Limits	-6.3	-6.6	-430
TTI HS-20 Bridge Formula	-0.5	0	-40
Uncapped TTI HS-20 Bridge Formula	-2.2	-2.5	-40
Combined TTI HS-20 Formula B	-2.5	-2.5	-110

Study Recommendations

The study finds that increasing truck weights increases efficiency or reduces trucking costs, and those cost savings under the scenarios presented are less than the cost of pavement damage and bridge replacement or maintenance. The study suggests caution in implementing any new regulation because of an inability to find the revenue to upgrade bridges or maintain highways. If new regulations are implemented without the proper funding of highways and bridges, deteriorating highways and bridges will increase vehicle repair costs, reduce fuel economy, cause traffic delays and accidents, and adversely affect comfort.

The study also states that "increasing truck weights has both positive and negative effects on safety and traffic operations. 1) Reduced truck traffic decreases truck-related accidents and congestion. 2) Simply allowing more weight on existing trucks could adversely affect truck operating characteristics and increase accident rates." Other concerns include diversion of rail traffic if truck rates do not increase at the same level as per mile costs. If this new truck traffic is not offset by adequate bridge and highway funding, the end result may be that the final infrastructure costs could exceed the savings in transportation costs.

The study has five recommendations guided by a set of six objectives:

- "To select, from the various proposed changes in truck weight regulations from industry groups and others, the most practical means to realize the productivity benefits of increased truck weights while reducing or eliminating possible adverse effects;
- To make changes in weight limits that would reduce truck accidents and encourage safety improvements in truck design and operation;
- To provide mechanisms to match user fees with added costs for pavements and bridges;
- To promote uniformity in the administration of truck weight regulations;
- To balance the federal interest in protecting the national investment in the interstate system and facilitating interstate commerce with the interest of states in serving the needs of their citizens and industries; and
- To develop proposals that are realistic and feasible, and would have a reasonable chance of being implemented."

Recommendation 1: New Bridge Formula. Congress should replace Bridge Formula B with the following:

W = 1,000 (2L+26) for L<24	If L = 24' then W=74,000 GVW Maximum
W = 1,000 (L/2+62) for L>24	If L = 75' then W= 99,500 GVW Maximum
	If L = 110' then W=117,000 GVW Maximum

Where:
W = the maximum weight in pounds carried on a group of three or more axles.
L = the length of the axle group rounded to the nearest foot. (75' is the current maximum allowed on the Interstate System without a permit) (80,000 pounds GVW is maximum on Interstate System without a permit)

States would have to identify all deficient bridges that must be posted or replaced and costs associated with bringing them up to standard. Taxes on heavy vehicles would be raised to offset the cost of damaged pavement and bridges.

The above formula and examples show extremes in weights because trucks would still be regulated by the axle weight restrictions. For instance under the current formula a 3-axle 22' truck can operate at 52,500, pounds and a 22' 4-axle truck can operate at 56,500, a difference of 4,000 pounds. Under the new recommendation, a 22' 3-axle truck could operate at 54,000 pounds, but the 4-axle 22' truck could operate at 70,000 pounds, a difference of 16,000 pounds.

The above formula is the TTI HS-20 formula. The recommendation in the study is that the formula, along with federal axle limits, would apply to vehicles with GVW of 80,000 pounds or less. A permit program would be developed for vehicles over 80,000 pounds. Recommendation 2 deals with the permit program over 80,000 pounds GVW.

The study estimates the truck costs would decrease by $2.7 billion annually, but $.3 billion would be collected in higher user fees for heavier trucks to cover bridges and pavements. The study estimates the number of bridges that must be posted or replaced would increase by 22,000. Currently 120,000 of the nation's 600,000 bridges are posted. It is estimated that replacing all 22,000 bridges would cost $350 million dollars per year.

Recommendation 2: Special Permit Programs. Congress should adopt the process of exemption so all states could allow trucks to operate at 80,000 pounds without the Grandfather exemption. "Rather all states should be allowed to establish permit programs for heavier vehicles, provided that such programs included provisions to control the characteristics and operations of permit vehicles. Key features of the program would be designated routes, maximum weights, fee structures, and safety restrictions for permit vehicles."

Recommendation 3: Grandfather Rights. "Congress should take no action to restrict grandfather rights that have already been claimed by states, but should prevent future expansion of these claims."

If recommendations 1 and 2 are adopted, motor carriers that operate LCV in states under a grandfather rule may operate in any state that chose to set up such a process.

Recommendation 4: Increased Enforcement. Increased enforcement of weight and size regulations would benefit state agencies in the form of reduced pavement and bridge damage. Increased enforcement would benefit the trucking industry in the form of not having to compete with illegally loaded trucks. The study recommends the federal government study the issue and attempt to educate local law enforcement and judges as to the damage that can occur from overweight vehicles.

Recommendation 5: Regional Cooperation in Standardizing Limits and Permit Practices. "States should pursue opportunities for standardizing limits and permit practices at the regional level."

Regions similar in industry, terrain, weather, and other variables should attempt to standardize truck size and weight regulations for the economies of the region. The study lists the ongoing efforts in western states to standardize operations allowing for LCV operations, and agreement among northeastern states to implement a common set of procedures for issuing oversize weight permits for trucks.

TRB Report 267

The Transportation Equity Act for the 21st Century directed the Secretary of Transportation to request that the (Transportation Research Board) TRB "conduct a study regarding the regulation of weights, lengths, and widths of commercial motor vehicles operating on federal-aid highways to which federal regulations apply and develop recommendations regarding any revisions to law and regulations that the Board determines appropriate."

With this directive, TRB formed the "Committee for the Study of the Regulation of Weights, Lengths, and Widths of Commercial Motor Vehicles" to conduct this study. The committee presented conclusions and recommendations based on performances of existing regulations.

According to the executive summary, a problem that exists with this type of study, and found by previous attempts to study truck size and weight issues, is the lack of information needed to conduct sound benefit cost analysis in regard to truck size and weight issues. Because of the information void and the nature of such a complex task, risks will undoubtedly accompany any regulatory decisions based on study results. The committee believes that this risk is unnecessary if "basic research for conducting evaluation and monitoring became a permanent component of the administration of the regulations."

The committee provided post-study conclusions:

1. "Opportunities exist for improving the efficiency of the highway system through reform of the federal truck size and weight regulations. Such reform may entail allowing larger trucks to operate."

The committee states that the federal standards for truck size and weight regulation resulted from a series of historical happenings instead of a set of clear objectives and evaluations of possible alternatives. The committee's opinion is that in many instances the regulations are a poor fit to the needs of international commerce. Furthermore, their effectiveness is being eroded by ever-expanding numbers and types of special exemption that are awarded without proper analysis of consequences. The awarding of those exemptions creates an environment where, many times, freight traffic bypasses interstate highways to use less restrictive secondary roads, where the costs generated by that traffic are many times much higher. The committee's belief is that the greatest deficiency of the present environment may be that it discourages private-public sector innovation aimed at improving highway efficiency and reducing the total costs of truck traffic. The present vehicle regulations are inflexible, and shippers and transportation providers do not pay for all the costs they generate.

2. "Appropriate objectives for federal truck size and weight regulations are to facilitate safe and efficient freight transportation and interstate commerce, to establish highway design parameters, and to manage consumption of public infrastructure assets."

The committee contends that legislative history indicates that the objectives listed above are consistent with the intentions of Congress in enacting regulations. Therefore, the objectives are worthwhile and truck size and weight regulations by the federal government contribute to achieving that end, and regulations should be complemented by other policies to reach the same goals. With that in mind, any analysis of federal size and weight regulation should take into account how they affect all costs of highway transportation.

3. "Changes in truck size and weight regulations made in coordination with complementary changes in the management of highway system offer the greatest potential to improve the functioning of the system."

The committee suggests that a better control of existing and future truck traffic is by "coordinating practices in all areas of highway management: design and maintenance of pavement and bridges; highway user regulations, including vehicle and driver regulations related to safety; and highway user fees." The committee's opinion is that the imposition of cost-based user fees is a regulatory approach that could usefully supplement or maybe partially replace size and weight regulations. The goal is to provide a more efficient control of public and private costs of truck transportation.

4. "The methods used in past studies have not produced satisfactory estimates of the effect of changes in truck weights on bridge costs."

Previous studies have not analyzed proposed changes in truck size and weight and the risk of bridge failure or decreases in useful life. They instead estimate the costs of maintaining the existing relationship of legal loads to bridge design capacity with bridge replacement. The replacement of bridges is the largest cost component in making the case for or against larger trucks. The committee concludes that replacements would reduce risks only marginally. It has also concluded that quantitative evaluation has not been studied to assess the possible alternative methods of attaining risk reduction with fewer costs.

5. "It is not possible to predict the outcomes of regulatory changes with high confidence."

The committee sees merit in developing models to analyze the cost of operating trucks of different type and design. The data and models may never adequately replicate how institutions, markets, and technology would react to regulatory changes. However, this is not argument for inaction, because maintaining the status quo guarantees lost opportunities for cost reduction.

6. "It is essential to examine the safety consequences of size and weight regulation. Research and monitoring needed to understand the relationship of truck characteristics and truck regulations to safety and other highway costs are not being conducted today."

The understanding of these relationships is needed to improve highway design, vehicles, safety management, pollution control programs, and provide a base for truck size and weight regulations. A problem identified by the committee is the lack of progress in reducing uncertainty in the last decade and longer. The ability to predict impacts of change would be to allow tests to evaluate the impacts and performance.

Some technologies exist for changing large trucks to improve performance and safety. Some of these are being brought to bear in the form of enforcement tools; however, other logical and promising technologies are deemed too risky to pursue because of the knowledge gap.

7. "Although violations of size and weight regulations may be an expensive problem, monitoring of compliance with the regulations is too unsystematic to allow the costs involved to be estimated."

There is a need for observation of the frequency and impacts of oversize and overweight vehicles to evaluate costs. Enforcement methods and effectiveness also need to be measured. Again, the study states that the technology for low-cost monitoring is available.

Recommendations of TRB 267

1. Establishment of the Commercial Traffic Effects Institute

This organization would observe and evaluate performance of trucks and monitor effects of truck size and weight on the highway, bridges, environment, and the safety of the motoring public. The institute could recommend systematic changes in truck size and weight regulation and monitor the results.

The objective of the institute would be to reduce the private and public costs of truck transportation. The institute should provide innovations and technological change to the industry and regulatory environment.

2. Evaluation of the consequences of changes in truck size and weight regulations through pilot studies.

Congress should allow the Secretary of Transportation to allow pilot studies on providing exceptions for vehicles operating with different limits for experimental purposes. This controlled program would allow for longer term studies to evaluate impacts of new regulation.

3. Immediate changes in federal regulations

Federal law should allow any state to participate in a federally advised permit program for vehicles heavier than current federal regulations. This program would be done in conjunction with states.

The goal would be to present opportunities for multi-state agreements on truck size and weight permits. Fostering multi-state agreements should further the evolution toward more rational and homogenous standards or regulation nationally. The committee recommended size and weight provisions.

4. Longer combination vehicles

5. Routes and roads to which federal standards should apply

6. Research

Impact of Changes in Truck Weight Regulations (MT DOT)

Several studies investigate the economic effects of truck weight regulations. A study[17] conducted by the Montana Department of Transportation estimated the impact of truck weight regulations on the state's economy. The study adopted four scenarios with maximum allowable weights of 80,000, 88,000, 105,500, and 128,000 pounds. According to the study, the 80,000 pound maximum weight is 32 percent lower than the federal standard enacted across the United States in 1982 on the interstate system (117,500 pounds). The 128,000 pound maximum weight is 10 percent higher than the 1982 federal standard and is derived from a proposal by Alberta (A north-south trucking corridor for the western United States). The study estimates economic changes based on allowable gross weights in these scenarios.

The study discusses three models that can be used to estimate cost impacts for the scenarios. The first model shows the direct physical effects on highways. The approach used in the study is based on assumptions that the maximum gross vehicle weight (GVW) affects the different truck configurations used and traffic streams. Therefore, traffic demands of truck configurations influence the performance and infrastructure of the highway. Particularly, the maximum GVW is assumed to affect pavement and bridge costs. For pavement costs, the study uses a damage model based on the Equivalent Single Axle Load (ESAL) concept.[18] The ESAL demands are calculated by route (interstate, primary, secondary, and urban roads), and then relative overlay costs for each scenario are estimated.

Table 19 shows the estimated total costs for the four scenarios derived from the first model. The costs are compared to baseline costs for the maximum GVW limit (117,500 pounds).

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[17] Impact of Changes in Truck Weight Regulations on Montana's Economy (FHWA/MT-98-006/8142) Feb., 1999, MTDOT.

[18] AASHTO Guide for Design of Pavement Structures, AASHTO, 1993.

Table 19 Relative Infrastructure Costs by Scenario

Item	Relative Infrastructure Costs by Scenario, $/year (millions)				
	80,000 Pounds	88,000 Pounds	105,500 Pounds	Existing	128,000 Pounds
Pavement	1.51	0.83	-0.51	0	0.71
Bridges	0	0	0	0	0.90
Total	1.51	0.83	-0.51	0	1.61

(Source: Impact of Changes in Truck Weight Regulations on Montana's Economy)

The study finds an increase in truck volumes and costs for the 80,000, 88,000, and 128,000- pound scenarios compared to the maximum GVW limit of 117,500 pounds, while the 105,500-pound scenario showed reduced costs. As shown in the table, the maximum cost ($1.5 million per year) is found for the 80,000-pound scenario. The total costs are derived from pavement costs for all scenarios except the 128,000-pound scenario, where both bridge impacts and pavement costs are identified. The 128,000-pound scenario considers that the current bridge system provides an acceptable level of safety, serviceability and durability with the current weight limit. The estimated bridge cost for the 128,000-pound scenario is $.9 million.

The study also provides a case study showing the narrower economic impact of maximum GVWs in selected industries. The case study investigates specific products in agriculture, forestry and wood products, extractive industries, construction, and retail trade sectors. They include milk, wheat, livestock, sugar beets, crude oil, talc, logs, wood chips, sand, gravel, cement, retail food, and motor fuel. The study identifies truck configurations and travel streams for these products and then estimates the total infrastructure (pavement and bridge) and transportation costs. The economic impacts of the maximum GVWs on the total costs are found to vary based on product characteristics and the nature of the industry. The largest changes in transportation costs are shown for heavy and bulky commodities. These products include milk, sugar beets, talc, wood chips, cement, and motor fuel. The lowest cost increases are found for products/industries that already widely use trucks that weigh 80,000 pounds or less. Industries serving local markets (e.g. sand, gravel, cement, retail food, and retail fuel) are most likely to increase their prices in response to increases in transportation costs. The study stated that "businesses serving such markets would all be affected equally, allowing them to collectively increase their prices, and the magnitude of the required increases to cover costs were not large enough to suggest dramatic reductions in product demand." On the other hand, for industries serving regional or national markets, companies would find it difficult to pass any cost increases to their customers because their competitors may not experience the same cost increases. Wheat, cattle, sugar beets, crude oil, talc, and wood chips would be a good example for these industries. The study also states that "outcomes in this case could range from reductions in production to terminating operations in Montana."

Finally, the Input-Output (IO) model is used to estimate costs in Montana's economy. The IO model was developed by Regional Economic Modeling, Inc. of Amherst, Massachusetts.[19] The model captured the economic effects of the maximum GVW limits in 53 industries and estimates changes in Montana's Gross State Product (GSP). The IO model estimates changes in infrastructure costs (government spending on highways), net farm income (proprietors' and other labor income for the farm sector), and factor productivity for the 49 non-farm sectors. The results of the model are shown in Figure 14. The 80,000 and 88,000 pound scenarios showed similar characteristics and magnitude. The estimated reduction of GSP at

[19] Treyz, George I. (1993), Regional Economic Modeling: A Systematic Approach to Economic Forecasting and Policy Analysis, Boston, Kluwer Academic Publishers.

the 80,000 or 88,000 pound scenarios are approximately $50 million within five years (0.4 percent of GSP). For the 128,000 pound scenario, the GSP benefit is $5 million within five years (0.08 percent of GSP).

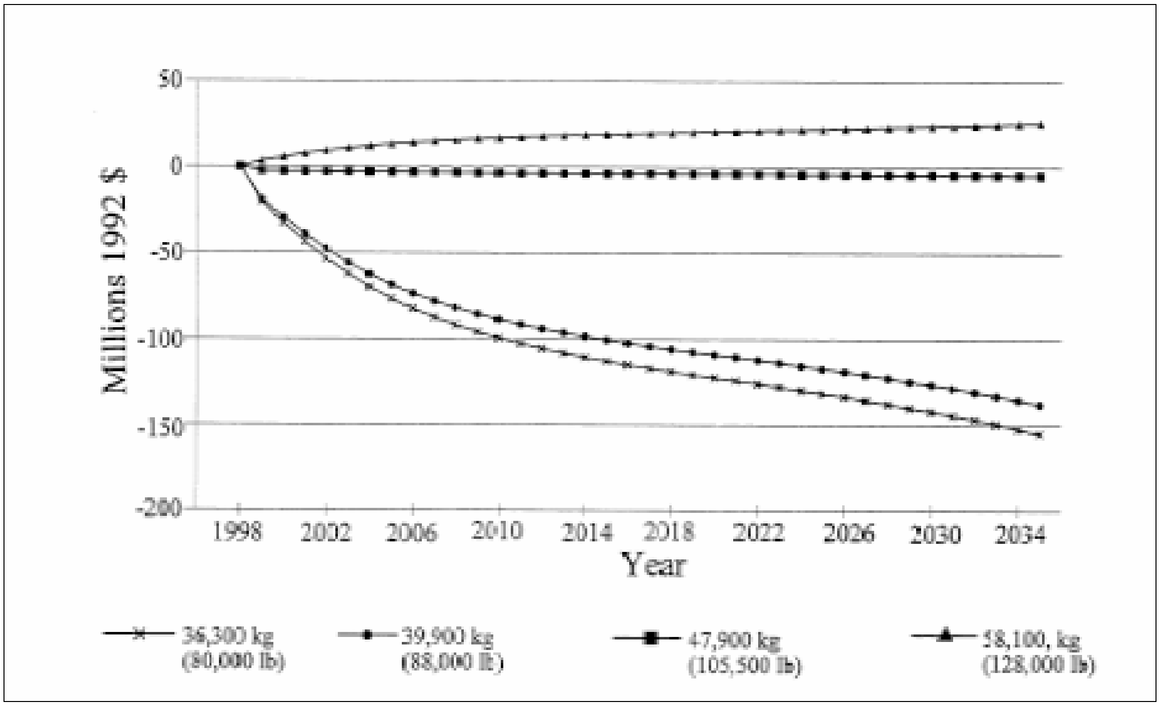

Figure 14 Changes in GSP for All Scenarios Compared to the Baseline, Measured in Dollars

(Source: Impact of Changes in Truck Weight Regulations on Montana's Economy)

The study provides insight to the potential benefits and costs associated with maximum weight limits. It uses various models to capture the economic impacts of the weight limits on pavement and bridge costs as well as GSP. Although it shows useful tools and information, the model lacks accurate estimations. The estimations are based on the assumption that changes in the maximum weight limits affect the percentage of the different configurations. Therefore, the study converts the number of large trucks (such as Rocky Mountain Doubles or Triples) to the number of small trucks (such as 5-axle tractors) to haul the same amount of commodities with different weight limits. It is difficult to conduct precise conversion derived from changes in maximum weight limits. For example, some trucks haul a less-than-full truckload and will not need to be converted to two small trucks with reduced maximum weight limits. Also, the conversion would vary based on the size and weight of commodities. For these reasons, sensitivity analysis should be adopted. For instance, various conversion scenarios could be used to show variance in pavement costs.

Western Uniformity Scenario Analysis (US DOT)

The western United States has, for many years, had Longer Combination Vehicles (LCV) operating under various state truck size and weight limits. These differing state regulations have played an important role in the efficiencies of the trucking industry and for shippers in the region. In an effort to determine the effects of increasing truck size and weight limitations and making them uniform across the region, the

Western Governors' Association (WGA) requested an additional analysis to the United States Department of Transportation's (U.S. DOT) Comprehensive Truck Size and Weight (CTS&W) Study.[20] The WGA requested the "Western Uniformity Scenario," an analysis to assess the impacts of lifting the longer combination vehicle size and weight freeze initiated in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The WGA asked for this analysis to measure the impacts of truck size and weights limited only by the federal axle load limits, the federal bridge formula, and a maximum gross vehicle weight limit of 129,000 pounds. Figure 15 illustrates the states included in the analysis.

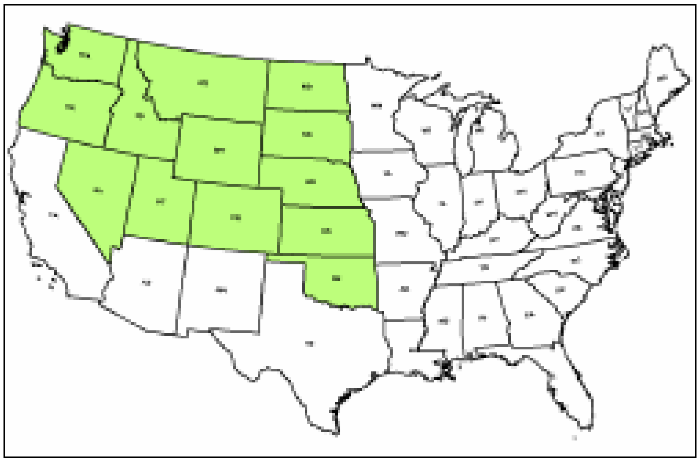

Figure 15 Western Uniformity Scenario States

(Source: Western Uniformity Scenario Analysis, A Regional Truck Size and Weight Scenario Requested by the Western Governor's Association, April, 2004)

Most states in the scenario currently do not allow the truck size and weight limitations analyzed in the study, but several states indicated that even if permitted to do so, they would not increase truck size and weight to the scenario's limits.

Several major conventional and LCV combinations are used in the study. The major conventional truck combinations included the 5-axle tractor semi-trailer and the twin 28.5 foot double or STAA21 double. Major LCV combinations in the scenario include 1) 7-axle double or Rocky Mountain Double (RMD), 2) 8-axle B-train double, 3) 10-axle resource hauling double, 4) 9-axle Turnpike Double (TPD) and 5) triple trailer combination. The scenario states already allow some Longer Combination Vehicles but not all the scenario LCVs analyzed in this study. The scenario analysis itself focuses on estimating the impacts of removing the LCV freeze on 3 LCVs, 1) Rocky Mountain Doubles (RMD), 2) Turnpike Doubles (TPD) and 3) Triple-Trailer Combinations (Triples). Two scenario cases are developed for different trailer lengths resulting in 'High Cube' and 'Low Cube' cases. Figure 16 illustrates the LCVs vehicle combinations used in the scenario analysis.

[20] Western Uniformity Scenario Analysis, A Regional Truck Size and Weight Scenario Requested by the Western Governors' Association, The United States Department of Transportation, April, 2004.
[21] In 1982, the federal government passed the Surface Transportation Assistance Act (STAA). This act required states to allow larger trucks on the National Network, which is comprised of the Interstate system plus the non-Interstate Federal-aid Primary System. Larger trucks include 1) doubles with 28.5-foot trailers, 2) singles with 48-foot semi-trailers and unlimited kingpin-to-rear axle (KPRA) distance, 3) unlimited length for both vehicle combinations, and 4) widths up to 102 inches.

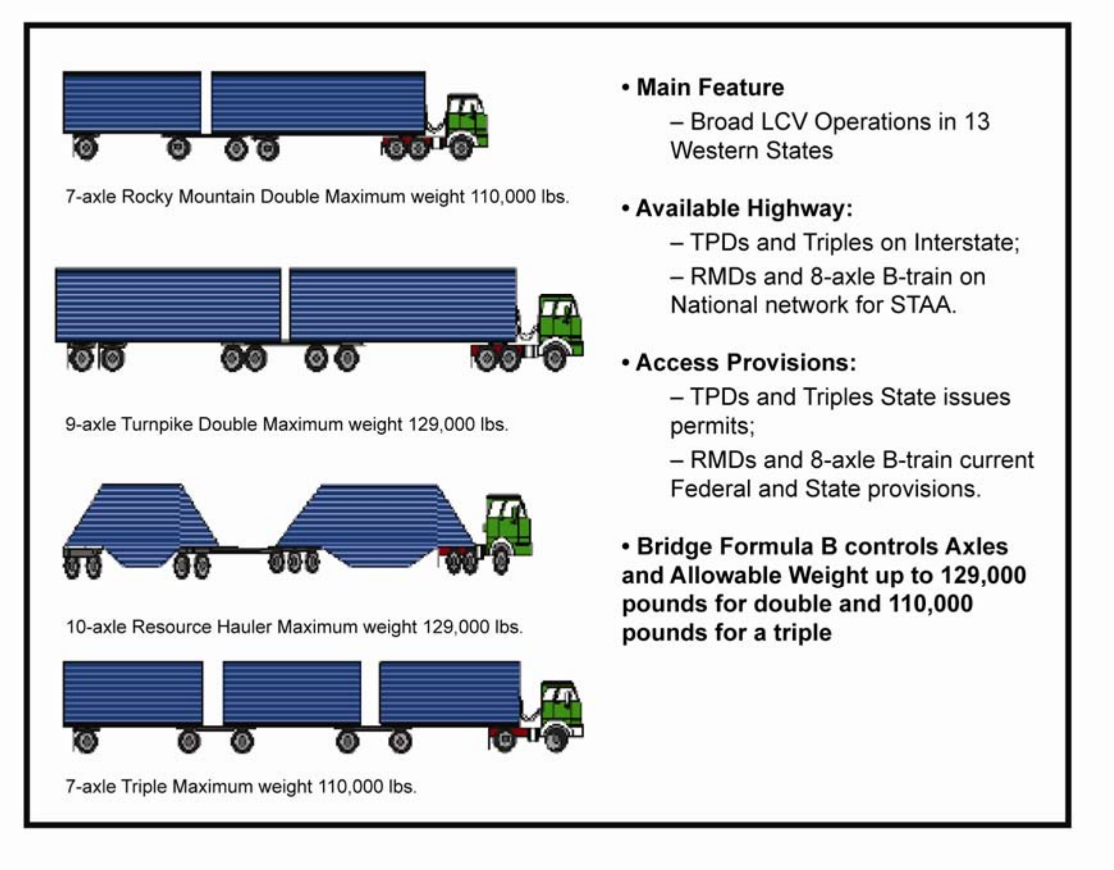

Figure 16 Western Uniformity Scenario LCV Combinations

(Source: Western Uniformity Scenario Analysis, A Regional Truck Size and Weight Scenario Requested by the Western Governor's Association, April, 2004)

Several highway networks are considered in the analysis, and the report notes that the scenario states have a higher percentage of rural highways than the United States as a whole. The highway networks utilized in the study include the National Network (NN) for large trucks designated pursuant to the STAA of 1982, the current networks on which LCVs now operate, and highway networks assumed to be available for each type of LCV. The scenario highway networks uses the NN system for the RMD and the Interstate Highway System for the TPD's and triples. Extensive highway routing maps were created meeting each state's truck size and weight regulations.

The study uses the year 2000 for the base case. The scenario analysis year is 2010 and employs traffic forecasts developed utilizing economic forecasts by Global Insights and the year 2000 traffic characteristics. Traffic characteristics include vehicle class, operating weight, commodity, origin and destination, and highway functional class. Scenario impacts are estimated for:

- Freight diversion
- Shipper costs
- Pavement costs
- Bridge costs
- Roadway geometry

- Safety
- Traffic operations
- Environmental quality
- Energy consumption
- Rail Industry competitiveness

Estimated Scenario Impacts

Freight Distribution and Shipper Costs

The study notes the current situation for shippers in the western region with the disparity among each state's truck size and weight limitations.

> "Often shippers must study each state's regulations and then design a vehicle to match the state with the most restrictive truck size and weight rules to avoid costly re-configuration at the borders."[22]

The changes analyzed by the scenario mean cost structure changes for shippers. The analyses specifically involve changes in mode choice and truck configuration with impacts to shippers as well as pavements, safety, fuel consumption, air and noise pollution.

Freight distribution is allocated using the base case year 2000 VMT as developed for study vehicles and the scenario year 2010 VMT as forecast by Global Insight commodity-specific demand-based forecasting. Truck analysis included short-haul, long-haul and triples scenarios. Freight traffic is assigned to the truck configuration with the lowest cost as determined by the load size and market rates.

The study's shipper cost analysis notes that changes in truck size and weight affect shipper transportation and inventory costs. The scenario case only calculates the changes in shipper's transportation costs using the changes in VMT between the base and scenario case.

Rail traffic is diverted to trucks in the scenario case when the truck variable cost is lower then the rail variable cost. Moreover, in the scenario, rail shippers benefit when railroads reduce their rates to keep traffic that is costed at above the truck variable cost but below the railroad's revenue. The 2000 STB waybill is used for rail variable costs and revenue.

Two alternative maximum lengths are used in the scenario for the longest double trailers. The 'low-cube' alternative restricts the longest double to 95-foot combined trailer length while the scenario's 'high-cube' alternative allows 101-foot combined trailer length.

All VMT is lower for the 2010 scenario than in the base case year 2000 for all highway classifications, as larger loads result in fewer VMT. In the low-cube case there is a 9.5 percent decline in the number of VMT as compared to the base case. The percentage of the VMT in LCVs increases in the scenario, mostly due to the shift from tractor-semitrailer configurations to LCVs.

In the high cube case, which uses the longer turnpike double, VMT is reduced by 25.5 percent. Again, significant increases are seen in the number of VMT shifting to LCVs. For example, specialized freight

[22] Ibid., page II-10

(bulk, tank, flatbed) in the base case have 12.7 percent movement in LCVs while in the high cube case of the scenario, 96.1 percent of this freight group move in LCVs. All commodity and traffic-flow combinations show substantial shifts to LCVs in the scenario case with the high-cube case showing the greatest changes.

Small impacts on rail traffic are estimated for both the high and low cube case, in contrast to the national truck size and weight study. Only .22 percent of the rail carload miles and .07 percent of rail intermodal miles divert to truck.

Shippers experience lower transportation costs by switching to LCVs in the scenario analysis. The savings to shippers is summarized in Table 20.

Table 20 Western Uniformity Scenario Shipper Cost Savings

	Western Uniformity Scenario	
	Low-Cube Case	**High-Cube Case**
Truck-to-Truck		
Dollars (millions)	$1,190	$2,036
Percent Change	2.3%	3.9%
Rail-to-Truck		
Dollars (millions)	$2.3	$3.2
Percent Change	0.01%	0.01%
Rail Discount		
Dollars (millions)	$26	$48
Percent Change	0.06%	0.11%

(Source: Western Uniformity Scenario Analysis, a Regional Truck Size and Weight Scenario Requested by the Western Governor's Association, April, 2004)

As shown in the table, shippers changing to LCVs in the scenario case save $1,190 million in the low-cube case and $2,036 million in the high-cube case. Shippers switching from rail to truck save $2.3 million in the low-cube case and $3.2 million in the high-cube case. Rail shippers who continue to ship on rail experience reduced rail rates to remain competitive with increased LCV traffic. These shippers save $26 million in the low-cube case and $48 million in the high-cube case. Total savings in the low-cube case is $1,218.3 million and $2,087.2 million in the high-cube case.

Pavement Impacts

The National Pavement Cost Model is used to estimate the scenario pavement impacts. The different axle-truck configurations and the weight of the traffic are the important components of the model and produce the pavement improvement needs for the truck configuration being analyzed. Changes among the axle and weight configurations provide the analytical comparisons for the scenario and estimate the pavement impacts of the scenario as compared to the base case.

Small pavement impacts were observed. The low-cube analysis showed a slight decrease of 0.4 percent in pavement costs over the 20-year period of pavement cost analysis. The high-cube case showed a 4.2 decrease in pavement costs over the 20 years. This study reports that this small impact is not surprising since the proposed scenario does not change the axle weight limits which are the major factor in pavement damage assessments.

Bridges

The western scenario states require bridges to meet the Federal Bridge Formula B (BFB) standard. Moreover, of the 90,000 bridges in the 13 states, about 25 percent are on the National Truck Network for Large Trucks on which the scenario trucks operate. The incremental costs for improving or replacing bridges that become 'overstressed' in the scenario case are the costs associated with the increased bridge load stress as compared to the base case.

For estimating bridge costs or investment needs, the study assumes that bridges overstressed by 15 to 20 percent when compared to the base case would require replacement or strengthening. Under this assumption, the scenario estimates for bridge costs are between $2.329 billion and $4.125 billion.

Roadway Geometry

This section of the study analyzes roadway ramps, interchanges and intersections. The introduction of longer LCVs would require improvements to roadway ramps and interchanges and intersections, particularly for safety reasons. Longer LCVs need additional roadway lane space for turning, thereby increasing safety concerns. The additional turning space is needed to counter 'offtracking,' which occurs when a vehicle's rear wheels do not follow and track its front wheels. Roadway geometric data existed for two states in the scenario, Kansas and Washington. An analysis of this data, expanded to the entire research region, showed costs of $420 million in the low-cube case and $775 million in the high-cube case.

Safety

The study focuses on two research aspects of truck safety: vehicle safety performance and crash data. The truck configurations studied include van, tank, and hopper trailer-body types. Vehicle safety performance analysis uses three measures of a truck's crash risk:

- Static rollover threshold
- Rearward amplification
- Load transfer ratio

The static rollover threshold analysis shows that all the configurations tested have a good to excellent rating for static threshold ratings, with the van body types rating the lowest.

The rearward amplification examination studies the effects on the trailer of rapid tractor movements or steering. The tractor-semitrailer connections examined include the "A-train," "B-train," and "C-train." The "A-train" is the most commonly used connection but is the most susceptible to excessive trailer movement. The poorest-rated configurations noted in the report are the Triple A-Train van and the Rocky Mountain Double, hopper loaded at 105,500 pounds. The Triple-trailer combination has a significant 39 percent improvement in rearward amplification when a "C-train" connection is used.

The load transfer ratio is a measure of the proximity to rollover as the load is being transferred to one side of the vehicle to the other. A high load transfer ratio (approaching 1) means that a rollover is likely. The study quotes a Canadian performance standard that recommends a load transfer ratio should not exceed .6

for moving, loaded vehicles.[23] B-train and C-train configurations are the most stable of the base and scenario vehicles with the Triple A-train van having a load transfer ratio of 1 indicating the vehicle would have rolled over during the test maneuver.

The study's crash database analysis includes the review of prior studies to determine if a casual relationship between truck size and weight and crash rates has been found or established. Seven recent statistical studies of multi-trailer combination vehicle safety were examined. The studies, taken as a whole, have a wide range of estimated crash rates because of the different data, methodologies and time frames. The report noted that these differences highlight the difficulties in analyzing a small sample of vehicles and getting reliable and accurate VMT and crash data for each vehicle type.

An update to the crash database is reported in the study. This part of the report analyzes 1995-1999 fatal involvement and travel data but is still limited by the difficulties encountered in the previous studies including 1) past safety data may not predict future safety, and 2) LCVs cannot be isolated from STAA doubles in the data. In the scenario region, single trailer combinations' fatal crash rate is 2.88 per 100 million VMT and 3.13 per 100 million VMT for multi-trailer combinations.

The study concludes that it is not possible to accurately predict the changes in crash rates due to the scenario. It points out, however, the public concern with additional LCV traffic and the importance of addressing public safety issues despite the lack of substantial data and/or crash rate analysis.

Traffic Operations

The study notes that large trucks negatively impact traffic in several ways. Large trucks reduce the 'quality' of traffic flow impacting the fluid movement of the surrounding traffic. Moreover, large trucks have an impact on crash severity because of the increased weight of the truck in the collision. In general, traffic operations will degrade with increased truck traffic.

The study continues by noting the effect of a large truck's slower acceleration and/or speed maintenance as a factor in large trucks' impacts on traffic. As reported in the paper, the Comprehensive Trucks Size and Weight Study (CTS&W) Volume III shows that crash involvement might be 15-16 times more likely with a speed difference of 20 miles an hour compared to no speed difference. Because of this, crash risks increase significantly with increasing speed differences between vehicles. Large trucks, with reduced capacity to accelerate or maintain speed compared to other vehicles, contribute to the increased crash risk. In addition, large trucks contribute to longer passage times at intersections and longer passing times for other vehicles.

The scenario impacts on traffic operations generally predict a small decrease in traffic delay and congestion costs with some degradation to passing, lane changing, low-speed off-tracking, and intersection traffic operations. Longer combination vehicles reduce total truck VMT, which results in the decreases in traffic delay and congestion costs, while the longer vehicles degrade the other traffic operations factors.

[23] Recommended Regulatory Principles for Interprovincial Heavy Vehicle Weights and Dimensions, Vehicle Weights and Dimensions Study Implementation Planning Subcommittee, final release September, 1987.

Energy and Environment

The impacts of truck size and weight limitation changes for trucks and LCVs include energy consumption, air quality, global warming, and noise emissions. To present valid comparisons among the various truck configurations, the scenario assumes that each truck configuration operates at the same speed under the same conditions. Moreover, the report also notes that fuel usage does not increase on a one-to-one relationship with vehicle weight. In other words, the longer configuration at the same weight does not increase fuel consumption.

The scenario impacts show that energy consumption in both the low-cube and the high-cube case decrease from the base case. The low-cube energy consumption decreased 3.2 percent, while the high-cube case decreases 12.1 percent. Emissions are assumed to decrease equivalently to the decrease in energy consumption. Noise costs are reduced 1.4 percent for the low-cube case and 9.7 percent for the high-cube case. Air pollution costs are not estimated because the Environmental Protection Agency's models do not incorporate the different vehicle classes in the scenario.

Rail

The study analyzes the impacts on railroads of the increase in LCVs as envisioned by the scenario. LCVs may reduce transportation costs to shippers currently utilizing railroads for those commodities that may be hauled by both modes by providing a more competitive environment between the two modes. Two models are used in the analysis, the DOT's Intermodal Transportation and Inventory Cost (ITIC) Model, and an Integrated Financial Model. The ITIC model assumes that railroads reduce their rates to compete with increased truck productivity, while the financial model uses changes in income statements to measure the effect of any changes in a railroad's financial condition.

The study estimates small losses to the major railroads in the region and theorizes that a larger loss was prevented by the transloading requirements and costs of LCVs at the regional boundaries in the scenario. However, the study notes that any business would attempt to make adjustments to maintain the base-case financial conditions whether through changes to rates, services, and/or investments.

Conclusions

This study considers the impacts of a group of western states increasing their truck size and weight limitations. The study estimates shippers would experience substantial benefits from increased LCVs, and additional benefits would be seen in reduced fuel consumption, emissions, and noise related costs. Long-term highway infrastructure costs and improvements, while not necessary immediately, are estimated to total between $300 million and $2 billion.

Safety issues are addressed by the study, but the data necessary for an informed analysis does not exist. The study recommends that before any substantial increase is allowed for LCVs, the western states should initiate methods for monitoring LCV safety issues. The study also notes that safety issues include minimum standards for LCV stability and control as well as adequate maintenance programs.

The study concludes that the DOT sees no federal compelling interest to change truck size and weight limits unless there is strong support to do so from state officials. The report suggests that strong state support to change truck size and weight limits is not currently apparent.

Appendix 2. Truck Regulations and Exceptions

U.S. Code of Federal Regulation Title 23 explains so-called "Grandfather Provisions" which allow states to permit truck size and weight on the Interstate System if that state had provisions in place prior to July 1, 1956, and meets other rules that will be discussed. Also the bridge design criteria as in H-15, HS20, and HS-25, and Bridge Formula B will be presented.

Title 23-S127

The laws put in place to protect the National Network of Highways (NN) and the Interstate system from oversize and overweight trucks is known by the industry as Title 23. Section 127 of Title 23 provides for the weight regulations passed by Congress. The law states that a single axle may not exceed 20,000 pounds, a tandem axle may not exceed 34,000 pounds, and a combination vehicle may not exceed 80,000 pounds. States in which vehicles exceeding the federal gross limit and were in operation before the enactment of the federal limit were allowed to "grandfather" truck size and weight regulations exceeding the Title 23 limits.

These states may continue to use the limits they had in place, if they meet the axle criteria and do not exceed Bridge Formula B.[24] This applies to state permit operations as well as to general state limits. The federal regulation exemptions were set in both 1956 and 1973 based on interpretation of the state laws (Appendix 1).

Bridge Design Criteria H-15, HS-20, & HS-25

The weight and distances of axle groups can directly affect the stress level of bridges. The American Association of State Highway and Transportation Officials (AASHTO) developed truck type classifications for the design of highway bridges. An H-15 vehicle is a truck with one 6,000-pound axle and one 24,000-pound axle. The total weight of the vehicle is 30,000 pounds (15 tons) and the two axles are separated by 14 feet. The number (15) after "H" stands for the number of tons (15 tons). An HS-20 truck is a truck with one 8,000 pound axle and two 32,000 pound axles. The total weight of an HS-20 truck is 36 tons. The "S" stands for semi-trailer combination, which adds in the additional weight. For heavier trucks, some states designed for HS-25 loads, which are 25 percent larger than the HS-20 loads. Figure 5 shows these AASHTO design trucks. The figure shows the weight and length of axles for H-15 and HS-20 loads.

The HS-20 bridge load design was introduced in the 1940s and has been required as a minimum for bridges erected on the interstate system. The design criteria determines the strength or load- carrying capacity of a bridge. Bridge Formula B, is based on assumptions that the design loading can be safely exceeded for different types of bridges (Comprehensive Truck Size and Weight Study, 1995). Bridge Formula B assumes that a 30 percent overstress for an H-15 bridge and 5 percent overstress for an HS-20 bridge are safe.

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[1]W = 500 [(LN / N-1) + 12N + 3

W = The maximum weight in pounds that can be carried on a group of two or more axles to the nearest 500 pounds

L = The spacing in feet between the outer axles of any two or more consecutive axles

N = The number of axles being considered

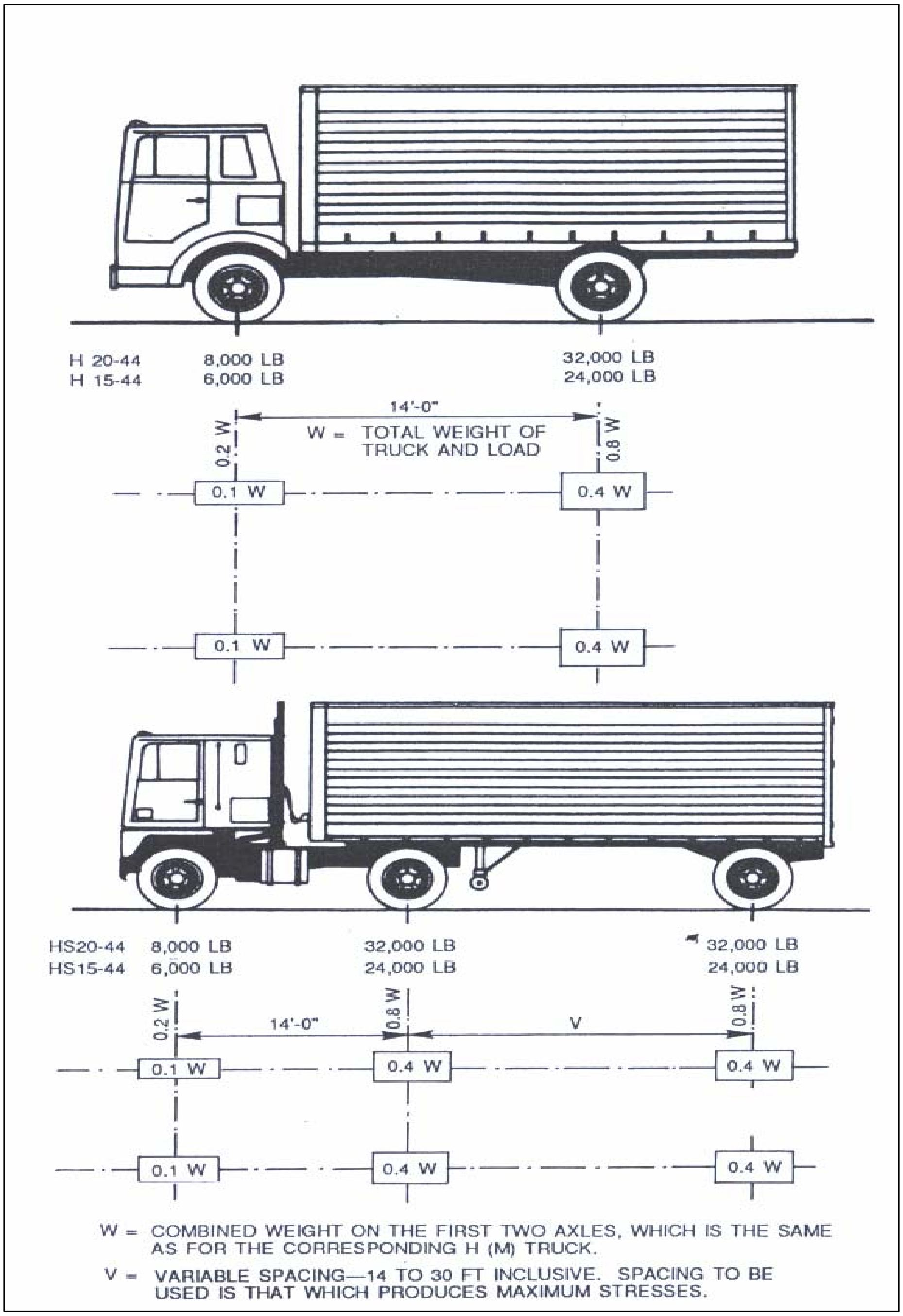


Figure 17 AASHTO Design Vehicles

(Source: Truck Weight Limits, Special Report 225)

The overstress criteria can be applied to design bridges on the Interstate system. The overstress criteria relate to the point at which a structural member (a load-carrying component) of a bridge undergoes permanent deformation, that is, the bridge member does not return to its original size or shape after the load is removed.[25] Specifically, "yield stress" is the stress level at which this permanent deformation occurs. The "inventory rating" is 55 percent of the yield stress, and the "operating rating" is 75 percent of the yield stress. Loadings less than 5 percent over the design stress would function for 50 years or more without the need for replacement. These stress levels are demonstrated in Figure 18.

Figure 18 Relationship of Overstress Criteria to Design Stress and Bridge Ratings

(Source: Comprehensive Truck Size and Weight (CTS&W) Study, 2000)

The federal bridge formula known as Bridge Formula B was derived because vehicles will stress bridges, and the bridge formula will regulate those stresses. The American Association of State Highway and Transportation Officials (AASHTO) recommends that the minimum design load be HS-20. However HS-15, a much lighter design load, has been used on many bridges on non-interstate highways. The federal bridge formula was designed to avoid exceeding design stresses by more than 5 percent in HS-20 design bridges and 30 percent in HS-15 design bridges.

It is important to point out that different truck configurations provide different stresses. Axle spacing and total weights affect bridge performance and expected useful life of bridges. Therefore, care is needed in adopting increases in truck size and weight.

[25] Comprehensive Truck Size and Weight (CTS&W) Study, FWHA, USDOT, 2000

Appendix 3.

FEDERAL TRUCK SIZE AND WEIGHT LAWS (TITLE 23—HIGHWAYS)
Chapter 1—Federal-Aid Highways
Subchapter I—General Provisions

Sec. 127. Vehicle Weight Limitations—Interstate System

(a) In General.—No funds shall be apportioned in any fiscal year under section 104(b)(1) of this title to any state which does not permit the use of The Dwight D. Eisenhower System of Interstate and Defense Highways within its boundaries by vehicles with a weight of 20,000 lb carried on any one axle, including enforcement tolerances, or with a tandem axle weight of 34,000 lb, including enforcement tolerances, or a gross weight of at least 80,000 lb for vehicle combinations of five axles or more. However, the maximum gross weight to be allowed by any state for vehicles using The Dwight D. Eisenhower System of Interstate and Defense Highways shall be 20,000 lb carried on one axle, including enforcement tolerances, and a tandem axle weight of 34,000 lb, including enforcement tolerances and with an overall maximum gross weight, including enforcement tolerances, on a group of two or more consecutive axles produced by application of the following formula:

$$W = 500[LN/(N - 1) + 12N + 36]$$

where W equals overall gross weight on any group of two or more consecutive axles to the nearest 500 lb, L equals distance in feet between the extreme of any group of two or more consecutive axles, and N equals number of axles in group under consideration, except that two consecutive sets of tandem axles may carry a gross load of 34,000 lb each providing the overall distance between the first and last axles of such consecutive sets of tandem axles (1) is 36 ft or more, or (2) in the case of a motor vehicle hauling any tank trailer, dump trailer, or ocean transport container before September 1, 1989, is 30 ft or more: Provided, That such overall gross weight may not exceed 80,000 lb, including all enforcement tolerances, except for vehicles using Interstate 29 between Sioux City, Iowa, and the border between Iowa and South Dakota or vehicles using Interstate 129 between Sioux City, Iowa, and the border between Iowa and Nebraska, and except for those vehicles and loads which cannot be easily dismantled or divided and which have been issued special permits in accordance with applicable state laws, or the corresponding maximum weights permitted for vehicles using the public highways of such state under laws or regulations established by appropriate state authority in effect on July 1, 1956, except in the case of the overall gross weight of any group of two or more consecutive axles on any vehicle (other than a vehicle comprised of a motor vehicle hauling any tank trailer, dump trailer, or ocean transport container on or after September 1, 1989), on the date of enactment of the Federal-Aid Highway Amendments of 1974, whichever is the greater. Any amount which is withheld from apportionment to any state pursuant to the foregoing provisions shall lapse if not released and obligated within the availability period specified in section 118(b)(1) of this title. This section shall not be construed to deny apportionment to any state allowing the operation within such state of any vehicles or combinations thereof, other than vehicles or combinations subject to subsection (d) of this section, which the state determines could be lawfully operated within such state on July 1, 1956, except in the case of the overall gross weight of any group of two or more consecutive axles, on the date of enactment of the Federal-Aid Highway Amendments of 1974. With respect to the state of Hawaii, laws or regulations in effect on February 1, 1960, shall be applicable for the purposes of this section in lieu of those in effect on July 1, 1956. With respect to the state of Colorado, vehicles designed to carry two or more precast concrete panels shall be considered a nondivisible load. With respect to the state of Michigan, laws or regulations in effect on May 1, 1982, shall be applicable for the purposes of this subsection. With respect to the state of Maryland, laws and regulations in effect on June 1, 1993, shall be applicable for the purposes of this subsection. The state of Louisiana may allow, by special permit, the operation of vehicles with a gross vehicle weight (GVW) of up to 100,000 lb for the hauling of sugarcane during the harvest season, not to exceed 100 days annually. With respect to Interstate 95 in the state of New Hampshire, state laws (including regulations) concerning vehicle weight limitations that were in effect on January 1, 1987, and are applicable to state highways other than the Interstate System, shall be applicable in lieu of the requirements of this subsection. With respect to that portion of the Maine Turnpike designated Interstate 95 and 495, and that portion of Interstate 95 from the southern terminus of the Maine Turnpike to the New Hampshire state line, laws (including regulations) of the state of Maine concerning vehicle weight limitations that were in effect on October 1, 1995, and are applicable to state highways other than the Interstate System, shall be applicable in lieu of the requirements of this subsection.

(b) Reasonable Access.—No state may enact or enforce any law denying reasonable access to motor vehicles subject to this title to and from the Interstate Highway System to terminals and facilities for food, fuel, repairs, and rest.

(c) Ocean Transport Container Defined.—For purposes of this section, the term “ocean transport container” has the meaning given the term “freight container” by the International Standards Organization (ISO) in Series 1, Freight Containers, 3rd Edition [reference number IS0668-1979(E)] as in effect on the date of the enactment of this subsection.

(d) Longer Combination Vehicles.—

(1) Prohibition.—

(A) General continuation rule.—A longer combination vehicle may continue to operate only if the longer combination vehicle configuration type was authorized by state officials pursuant to state statute or regulation conforming to this section and in actual lawful operation on a regular or periodic basis (including seasonal operations) on or before June 1, 1991, or pursuant to section 335 of the Department of Transportation and Related Agencies Appropriations Act, 1991 (104 Stat. 2186).

(B) Applicability of state laws and regulations.—All such operations shall continue to be subject to, at the minimum, all state statutes, regulations, limitations and conditions, including, but not limited to, routing-specific and configuration-specific designations and all other restrictions, in force on June 1, 1991; except that subject to such regulations as may be issued by the Secretary pursuant to paragraph (5) of this subsection, the state may make minor adjustments of a temporary and emergency nature to route designations and vehicle operating restrictions in effect on June 1, 1991, for specific safety purposes and road construction.

(C) Wyoming.—In addition to those vehicles allowed under subparagraph (A), the state of Wyoming may allow the operation of additional vehicle configurations not in actual operation on June 1, 1991, but authorized by state law not later than November 3, 1992, if such vehicle configurations comply with the single axle, tandem axle, and bridge formula limits set forth in subsection (a) and do not exceed 117,000 pounds GVW.

(D) Ohio.—In addition to vehicles which the state of Ohio may continue to allow to be operated under subparagraph (A), such state may allow longer combination vehicles with three cargo carrying units of 28

1/2 ft each (not including the truck tractor) not in actual operation on June 1, 1991, to be operated within its boundaries on the 1-mi segment of Ohio State Route (SR)7 which begins at and is south of exit 16 of the Ohio Turnpike.

(E) Alaska.—In addition to vehicles which the state of Alaska may continue to allow to be operated under subparagraph (A), such state may allow the operation of longer combination vehicles which were not in actual operation on June 1, 1991, but which were in actual operation prior to July 5, 1991.

(F) Iowa.—In addition to vehicles that the state of Iowa may continue to allow to be operated under subparagraph (A), the state may allow longer combination vehicles that were not in actual operation on June 1, 1991, to be operated on Interstate 29 between Sioux City, Iowa, and the border between Iowa and South Dakota or Interstate 129 between Sioux City, Iowa, and the border between Iowa and Nebraska.

(2) Additional state restrictions.—

(A) In general.—Nothing in this subsection shall prevent any state from further restricting in any manner or prohibiting the operation of longer combination vehicles otherwise authorized under this subsection; except that such restrictions or prohibitions shall be consistent with the requirements of sections 31111-31114 of title 49.

(B) Minor adjustments.—Any state further restricting or prohibiting the operations of longer combination vehicles or making minor adjustments of a temporary and emergency nature as may be allowed pursuant to regulations issued by the Secretary pursuant to paragraph (5) of this subsection, shall, within 30 days, advise the Secretary of such action, and the Secretary shall publish a notice of such action in the Federal Register.

(3) Publication of list.—

(A) Submission to Secretary.—Within 60 days of the date of the enactment of this subsection, each state

(i) Shall submit to the Secretary for publication in the Federal Register a complete list of (I) All operations of longer combination vehicles being conducted as of June 1, 1991, pursuant to state statutes and regulations;

(ii) All limitations and conditions, including, but not limited to, routing-specific and configuration-specific designations and all other restrictions, governing the operation of longer combination vehicles otherwise prohibited under this subsection; and

(iii) Such statutes, regulations, limitations, and conditions; and

(iv) Shall submit to the Secretary copies of such statutes, regulations, limitations, and conditions.

(B) Interim list.—Not later than 90 days after the date of the enactment of this subsection, the Secretary shall publish an interim list in the Federal Register, consisting of all information submitted pursuant to subparagraph (A). The Secretary shall review for accuracy all information submitted by the states pursuant to subparagraph (A) and shall solicit and consider public comment on the accuracy of all such information.

(C) Limitation.—No statute or regulation shall be included on the list submitted by a state or published by the Secretary merely on the grounds that it authorized, or could have authorized, by permit or otherwise, the operation of longer combination vehicles, not in actual operation on a regular or periodic basis on or before June 1, 1991.

(D) Final list.—Except as modified pursuant to paragraph (1) (C) of this subsection, the list shall be published as final in the Federal Register not later than 180 days after the date of the enactment of this subsection. In publishing the final list, the Secretary shall make any revisions necessary to correct inaccuracies identified under subparagraph (B). After publication of the final list, longer combination vehicles may not operate on the Interstate System except as provided in the list.

(E) Review and correction procedure.—The Secretary, on his or her own motion or upon a request by any person (including a state), shall review the list issued by the Secretary pursuant to subparagraph (D). If the Secretary determines there is cause to believe that a mistake was made in the accuracy of the final list, the Secretary shall commence a proceeding to determine whether the list published pursuant to subparagraph (D) should be corrected. If the Secretary determines that there is a mistake in the accuracy of the list the Secretary shall correct the publication under subparagraph (D) to reflect the determination of the Secretary.

(4) Longer combination vehicle defined.—For purposes of this section, the term "longer combination vehicle" means any combination of a truck tractor and two or more trailers or semitrailers which operates on the Interstate System at a GVW greater than 80,000 lb.

(5) Regulations regarding minor adjustments.—Not later than 180 days after the date of the enactment of this subsection, the Secretary shall issue regulations establishing criteria for the states to follow in making minor adjustments under paragraph (1)(B).

(E) Operation of Certain Specialized Hauling Vehicles on Interstate 68.—The single axle, tandem axle, and bridge formula limits set forth in subsection (a) shall not apply to the operation on Interstate 68 in Garrett and Allegany counties, Maryland, of any specialized vehicle equipped with a steering axle and a tridem axle and used for hauling coal, logs, and pulpwood if such vehicle is of a type of vehicle as was operating in such counties on United States Route (US) 40 or 48 for such purpose on August 1, 1991.

(F) Operation of Certain Specialized Hauling Vehicles on Certain Wisconsin Highways.—If the 104-mi portion of Wisconsin SR 78 and US51 between Interstate 94 near Portage, Wisconsin, and Wisconsin SR 29 south of Wausau, Wisconsin, is designated as part of the Interstate System under section 103(c)(4)(A), the single axle weight, tandem axle weight, GVW, and bridge formula limits set forth in subsection (a) shall not apply to the 104-mi portion with respect to the operation of any vehicle that could legally operate on the 104-mi portion before the date of the enactment of this subsection.

(G) Operation of Certain Specialized Hauling Vehicles on Certain Pennsylvania Highways.—If the segment of US 220 between Bedford and Bald Eagle, Pennsylvania, is designated as part of the Interstate System, the single axle weight, tandem axle weight,GVW, and bridge formula limits set forth in subsection (a) shall not apply to that segment with respect to the operation of any vehicle which could have legally operated on that segment before the date of the enactment of this subsection.

Sec. 141. Enforcement of Requirements

(a) Each State shall certify to the Secretary before January 1 of each year that it is enforcing all State laws respecting maximum vehicle size and weights permitted on the Federal-aid primary system, the Federal-aid urban system, and the Federal-aid secondary system, including the Interstate System in accordance with section 127 of this title. Each State shall also certify that it is enforcing and complying with the provisions of section 127(d) of this title and section 31112 of title 49.
(b) (1) Each State shall submit to the Secretary such information as the Secretary shall, by regulation, require as necessary, in his opinion, to verify the certification of such State under subsection (b) of this section.

(2) If a State fails to certify as required by subsection (b) of this section or if the Secretary determines that a State is not adequately enforcing all State laws respecting such maximum vehicle size and weights, notwithstanding such a certification, then Federal-aid highway funds apportioned to such State for such fiscal year shall be reduced by amounts equal to 10 per centum of the amount which would otherwise be apportioned to such State under section 104 of this title.

(3) If within one year from the date that the apportionment for any State is reduced in accordance with paragraph (2) of this subsection the Secretary determines that such State is enforcing all State laws respecting maximum size and weights, the apportionment of such State shall be increased by an amount equal to such reduction. If the Secretary does not make such a determination within such one-year period, the amounts so withheld shall be reapportioned to all other eligible States.

(c) The Secretary shall reduce the State's apportionment of Federal-aid highway funds under section 104(b)(4) in an amount up to 25 per centum of the amount to be apportioned in any fiscal year beginning after September 30, 1984, during which heavy vehicles, subject to the use tax imposed by section 4481 of the Internal Revenue Code of 1986, may be lawfully registered in the State without having presented proof of payment, in such form as may be prescribed by the Secretary of the Treasury, of the use tax imposed by section 4481 of such Code. Amounts withheld from apportionment to a State under this subsection shall be apportioned to the other States pursuant to the formulas of section 104(b)(4) and shall be available in the same manner and to the same extent as other Interstate funds apportioned at the same time to other States.

Appendix 4. Fatal Truck Crash Characteristics

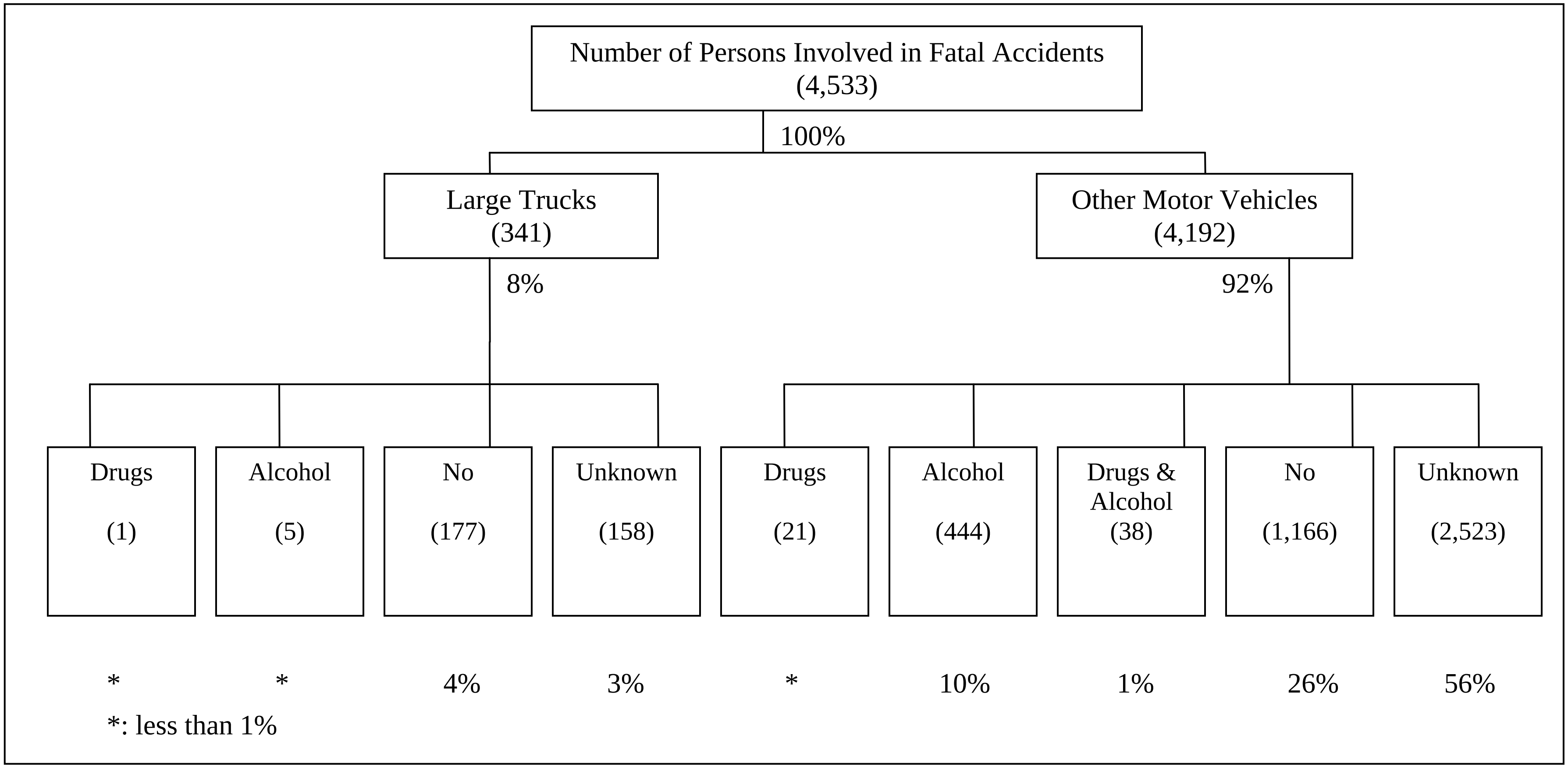


Figure 19 Number of Persons Involved in Fatal Accidents with Drugs or Alcohol in the Region (No Canadian Provinces) in 2002

(Source: FARS)

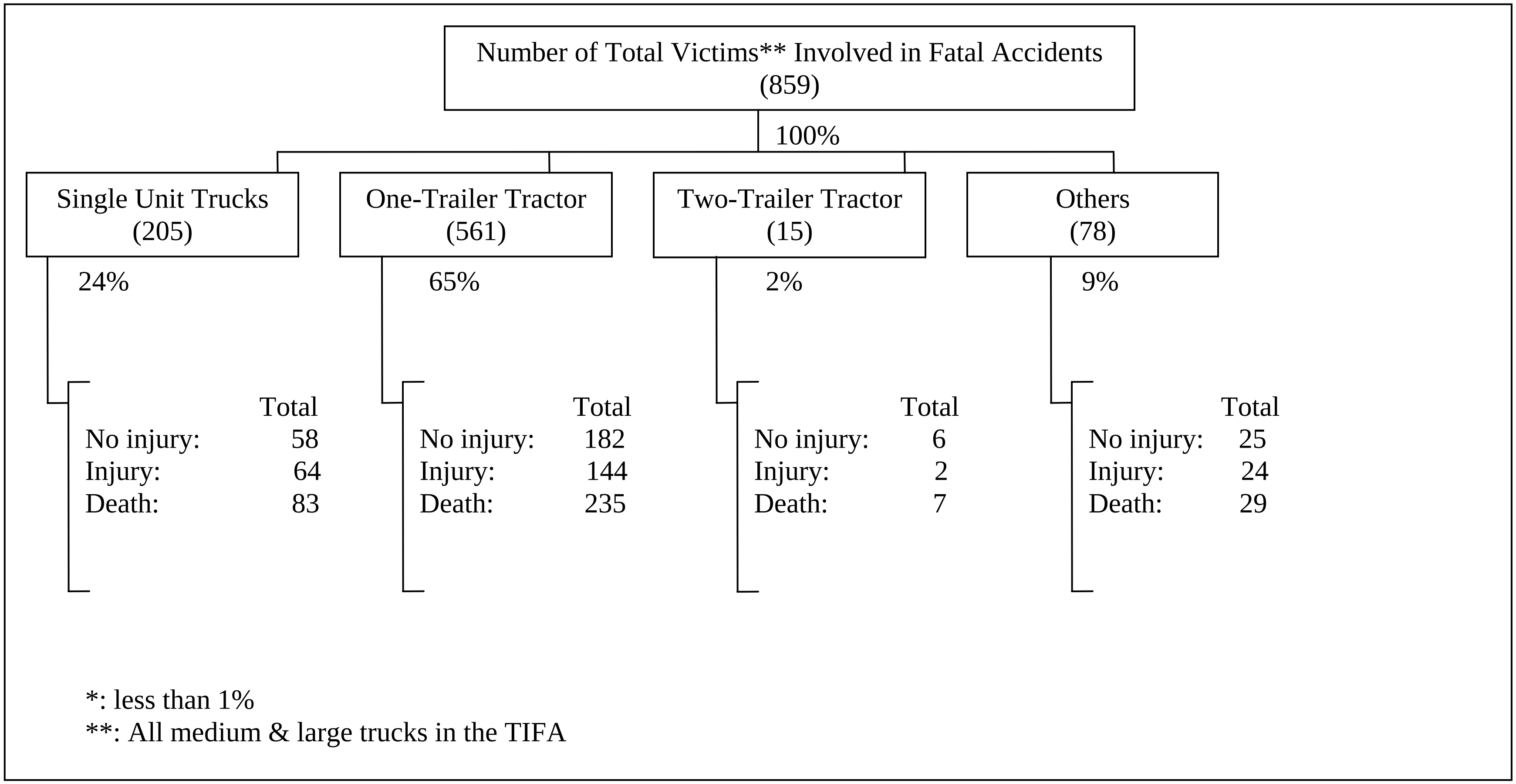


Figure 20 Number of Total Victims by Fatal and Injured Truck Accidents in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

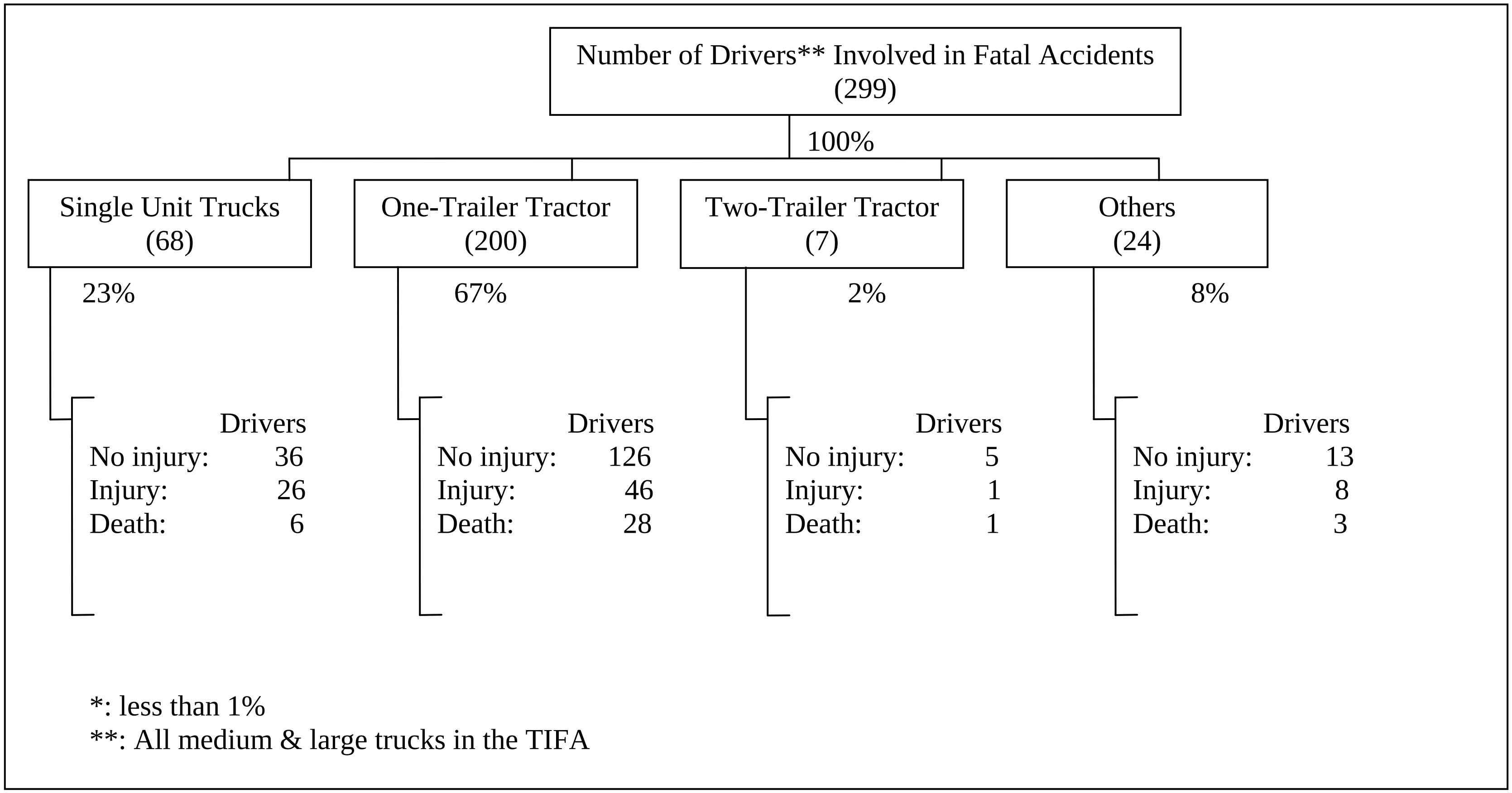


Figure 21 Number of Truck Drivers Involved in Fatal and Injured Accidents in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

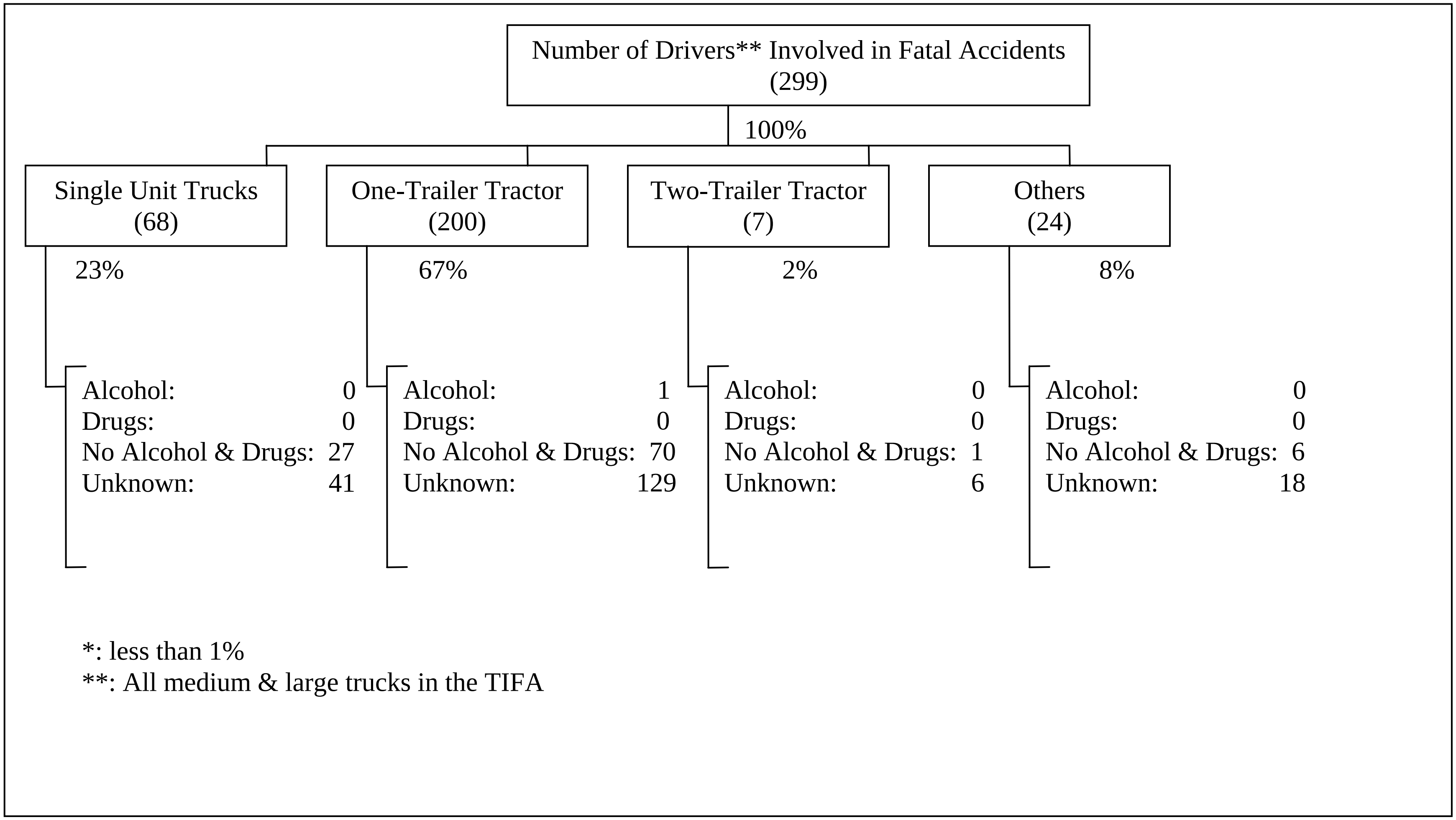


Figure 22 Number of Truck Drivers Involved in Fatal Accidents by Drug and Alcohol Involvement in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

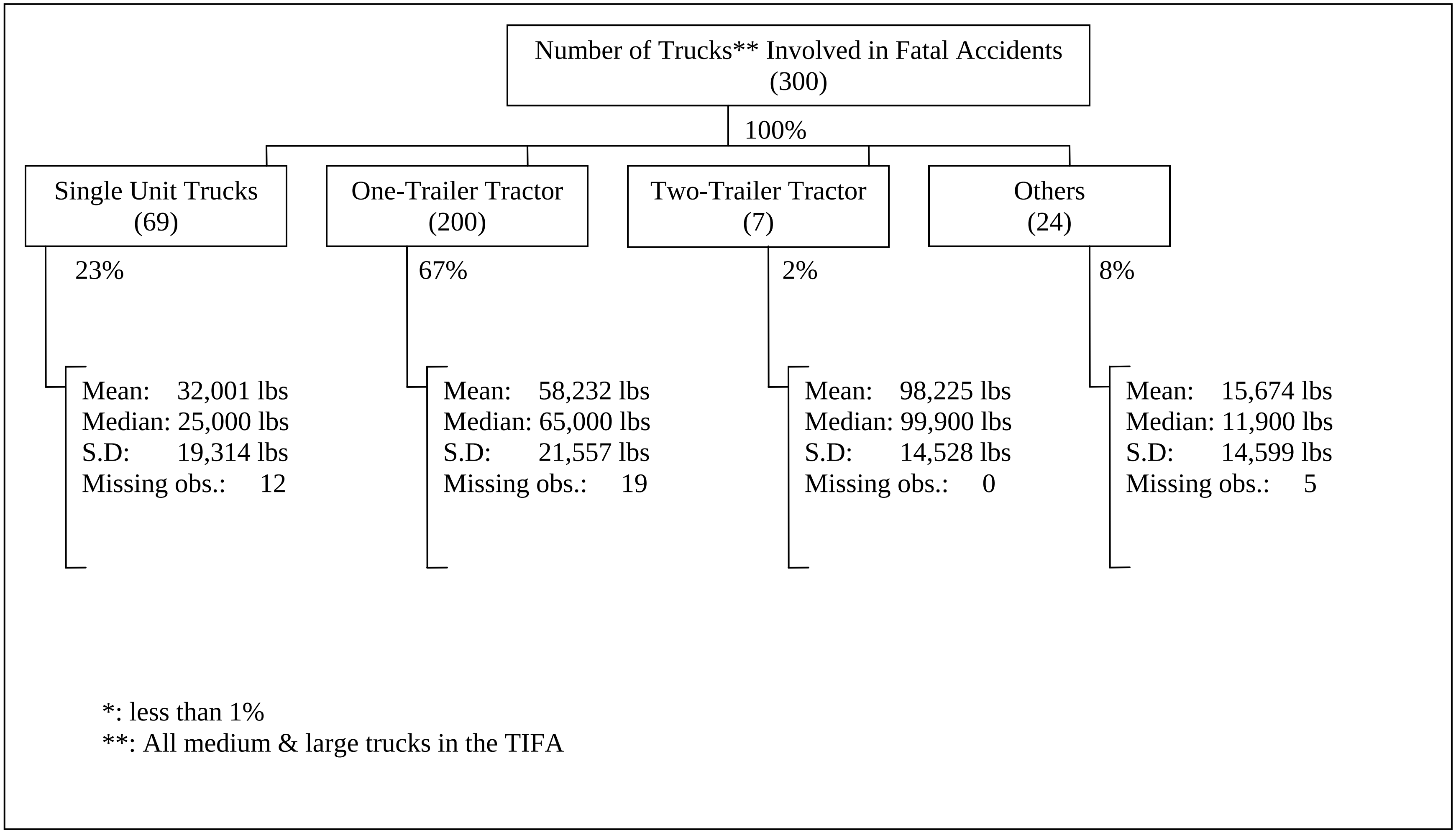


Figure 23 Number of Trucks Involved in Fatal Accidents by Gross Combination Weight in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

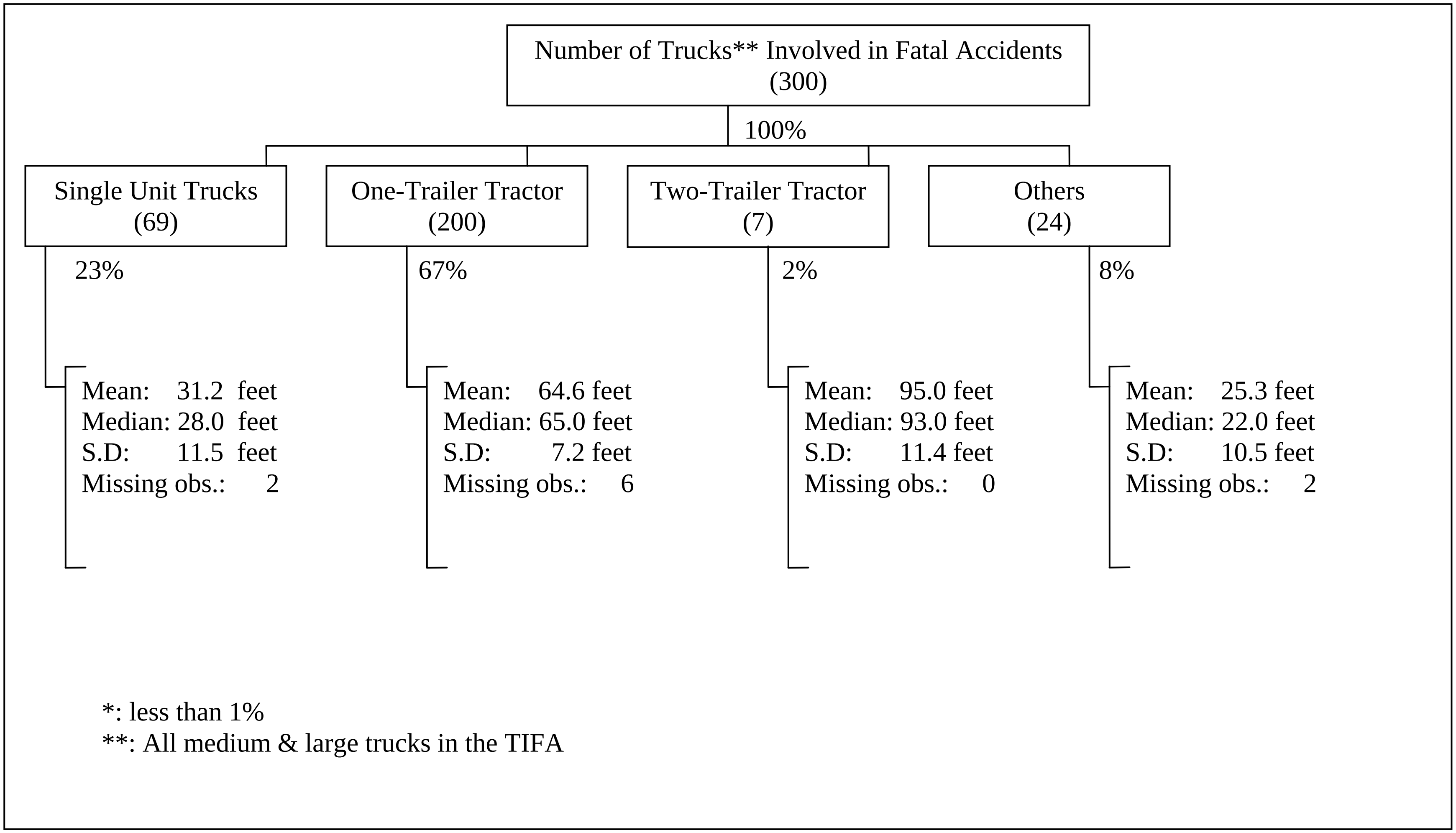


Figure 24 Number of Trucks Involved in Fatal Accidents by Total Length of Vehicle in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

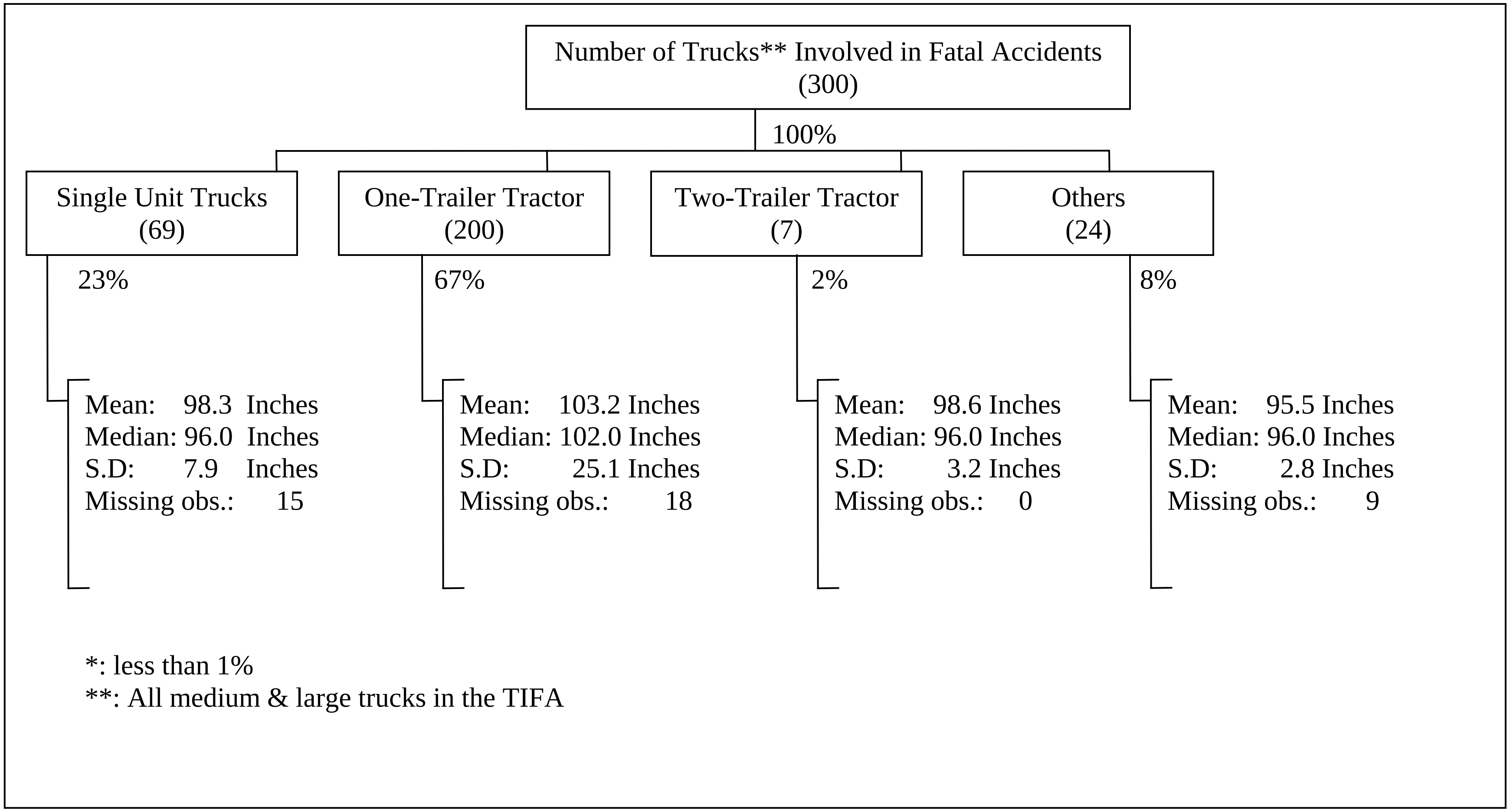


Figure 25 Number of Trucks Involved in Fatal Accidents by Total Width of Vehicle in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

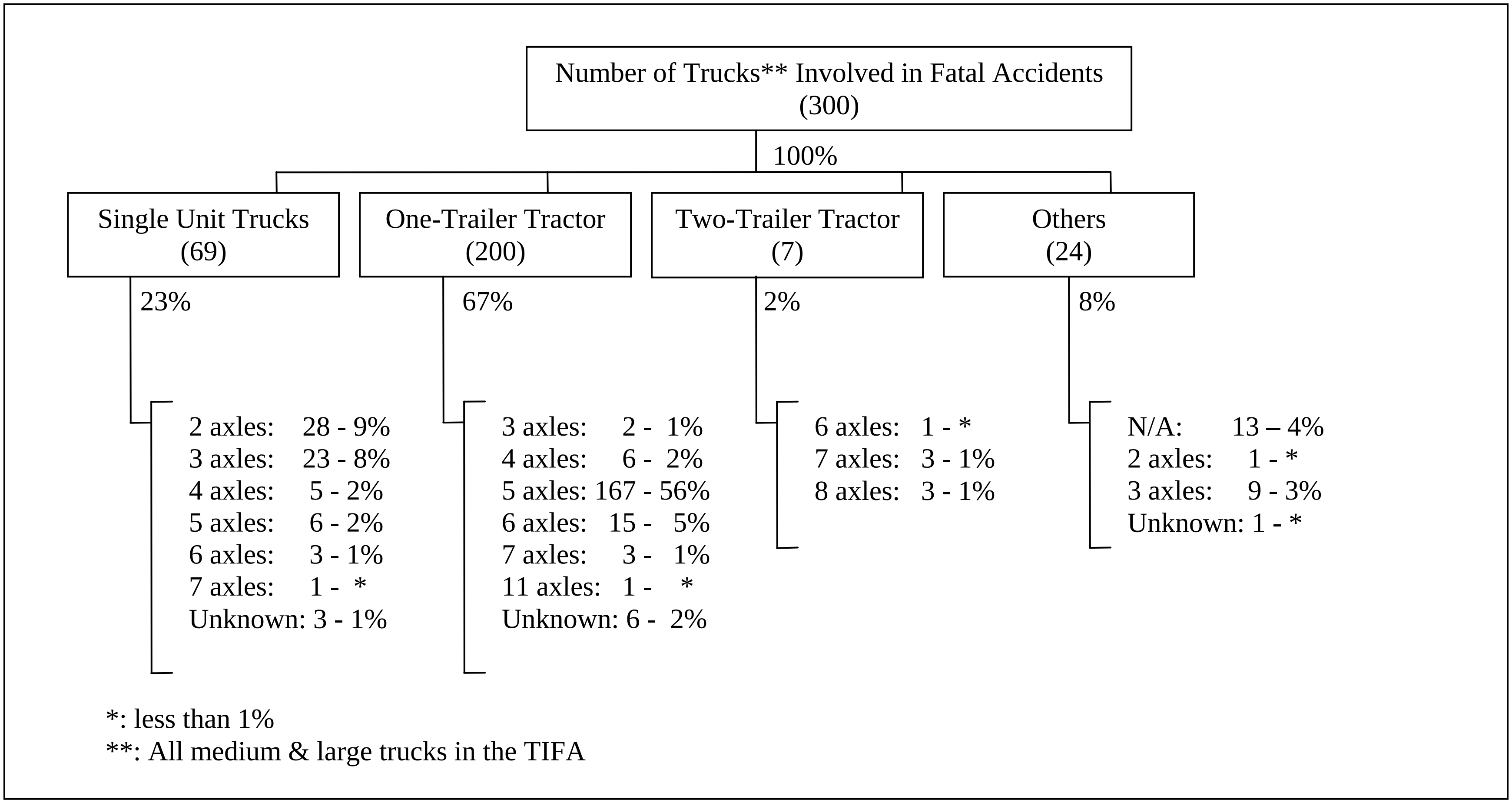


Figure 26 Number of Trucks Involved in Fatal Accidents by Number of Axle in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

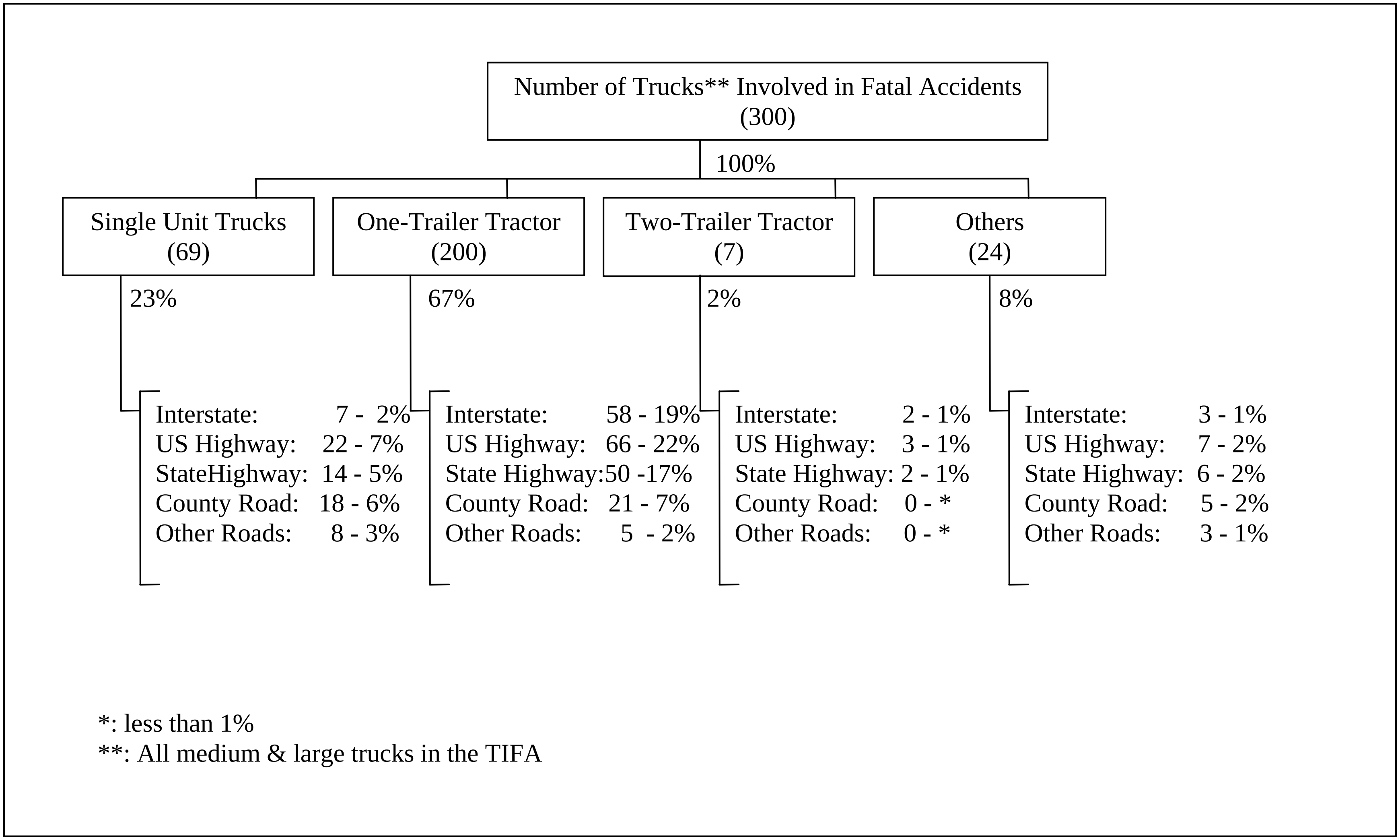


Figure 27. Number of Trucks Involved in Fatal Accidents by Highway Class in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

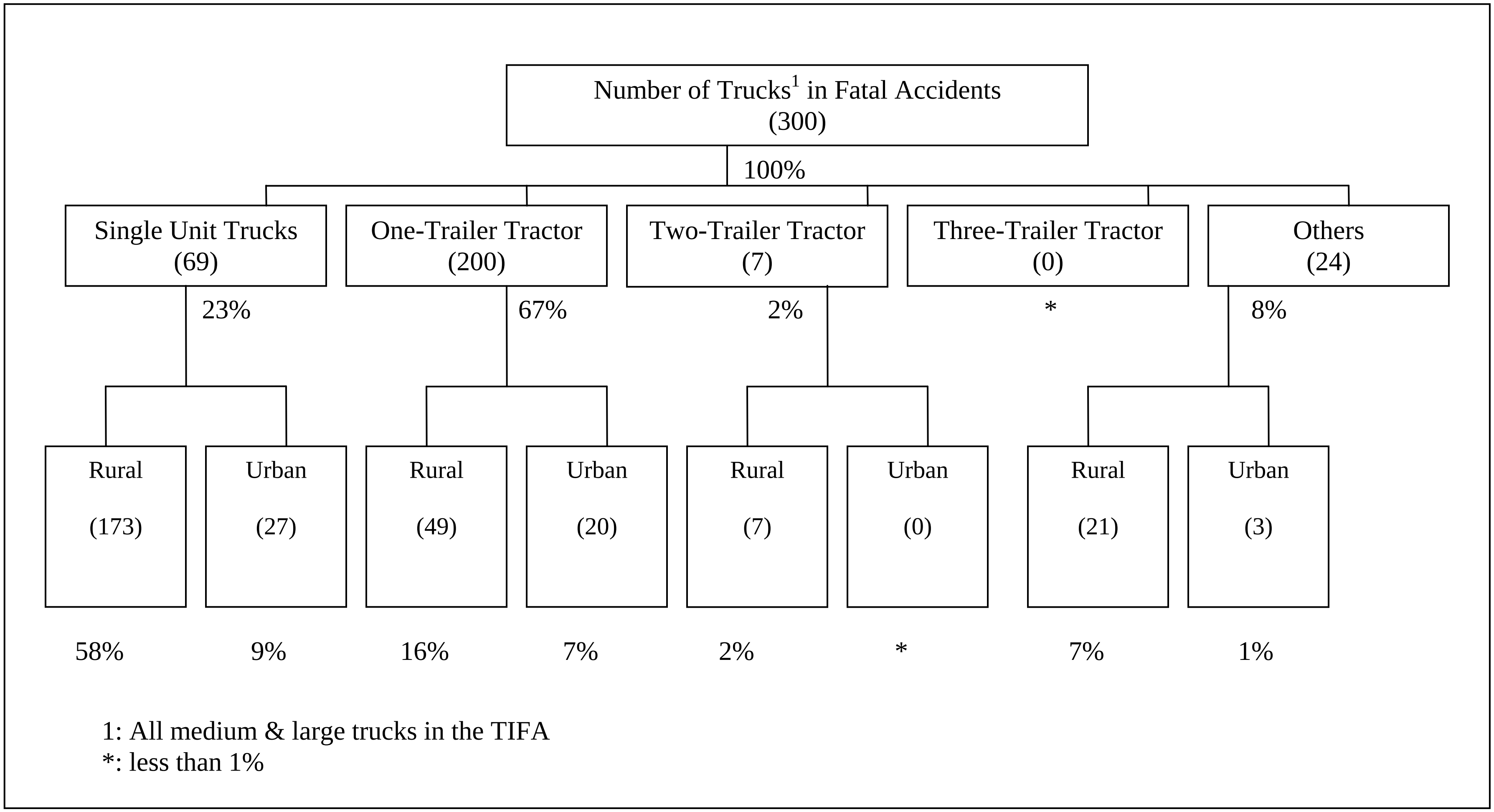


Figure 28 Number of Trucks in Fatal Accidents by Truck Type/Road Location (Rural vs. Urban) in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

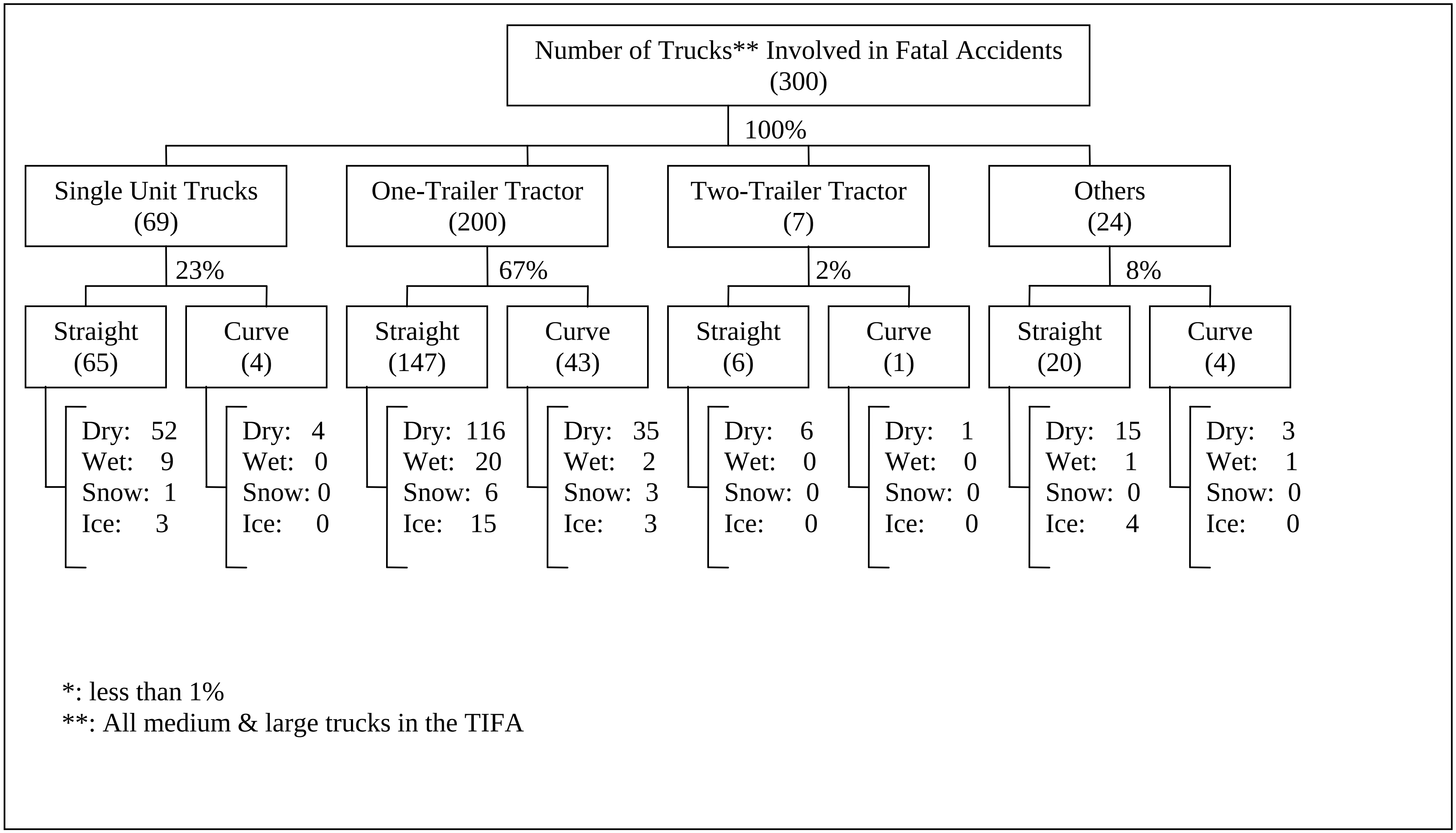


Figure 29 Number of Trucks Involved in Fatal Accidents by Road Condition in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

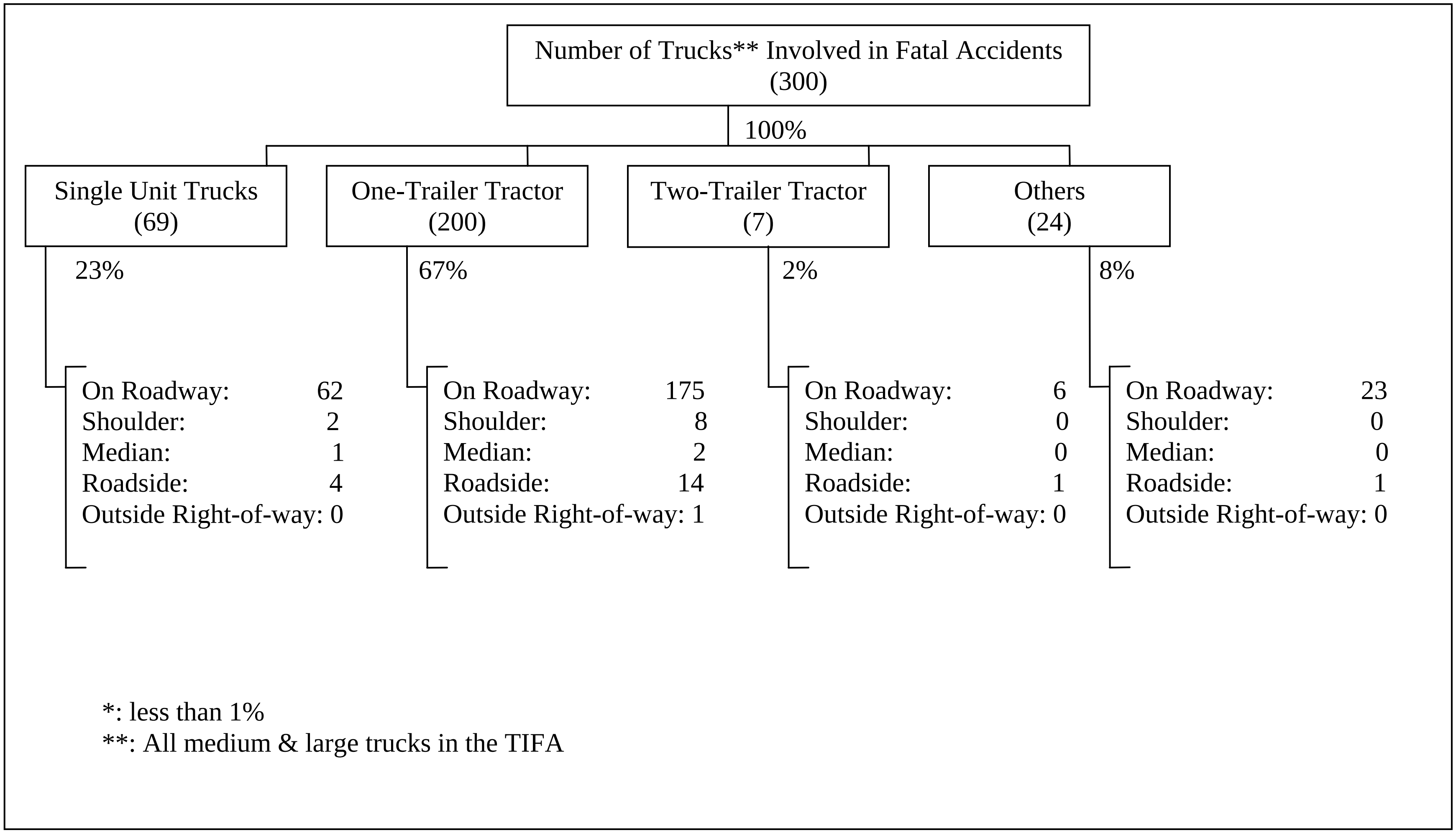


Figure 30 Number of Trucks Involved in Fatal Accidents by Road Location in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

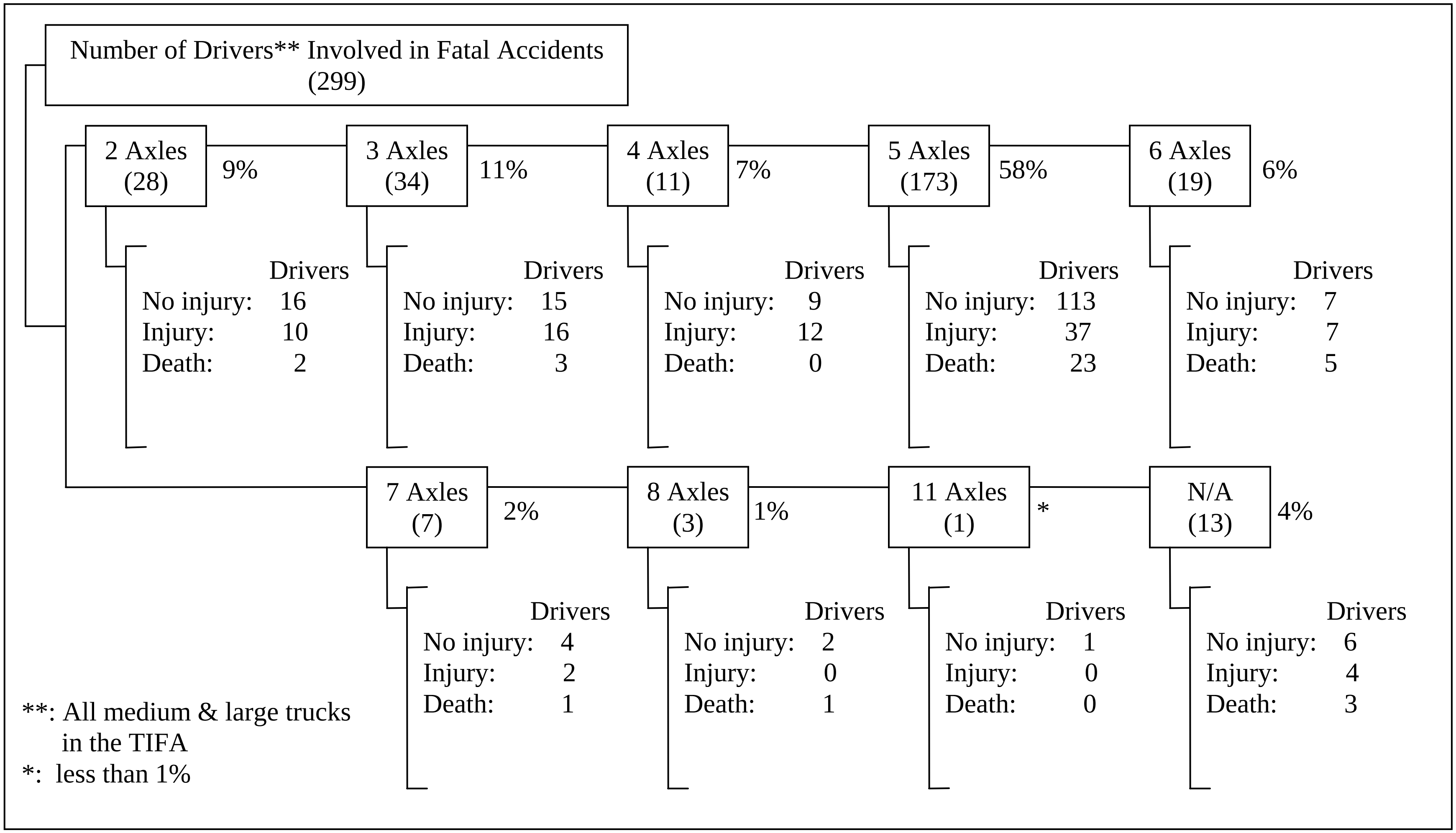


Figure 31 Number of Truck Drivers Involved in Fatal and Injured Accidents by Number of Axles in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

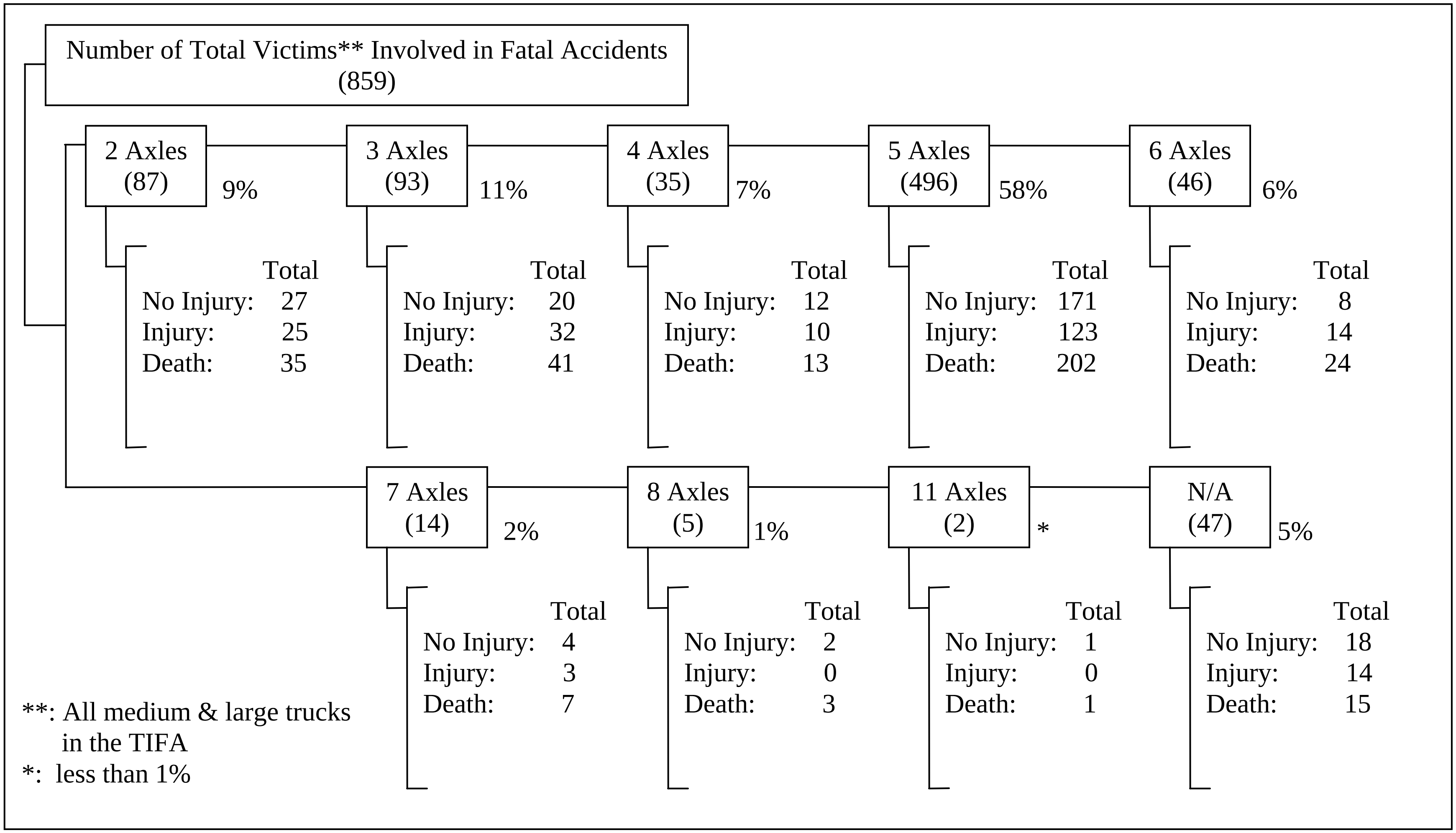


Figure 32 Number of Total Victims by Fatal and Injured Truck Accidents by Number of Axles in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

Table 21 Number of Large Trucks* Involved in Fatal Crashes by Vehicle Type/State in 2002

Vehicle Configuration	**U.S. Total**	**7 States Total**	**Percentage of U.S. Total**	**ND**	**SD**	**MN**	**MT**	**WY**	**NE**	**IA**
Single Unit Truck, 2 axle, 6 tire	485	22	4.5%	4	2	7	2	4		3
Single Unit Truck, 3+axle	429	32	7.5%	1		13	3	2		13
Truck/Trailers	196	12	6.1%			3	3	2	1	3
Truck/Tractor (bobtail)	103	3	2.9%	1	1	1				
Tractor/Semi-trailer	2867	197	6.9%	12	12	48	10	18	49	48
Tractor/Double	151	6	4.0%		1		2		3	
Tractor/Triple	3	0	0.0%							
Other	6	1	16.7%			1				
Unknown	302	14	4.6%			5	2	1	6	
Total	4542	287	6.3%	18	16	78	22	27	59	67

(Source: Crash Profiles)
* Large truck's GVW is greater than or equal to 10,000 pound.

Table 22 Number of Large Trucks* Involved in Non-Fatal Crashes by Vehicle Type/State in 2002

Vehicle Configuration	**U.S. Total**	**7 States Total**	**Percentage of U.S. Total**	**ND**	**SD**	**MN**	**MT**	**WY**	**NE**	**IA**
Single Unit Truck, 2 axle, 6 tire	12355	624	5.1%	42	10	339	55	23	147	8
Single Unit Truck, 3+axle	10629	570	5.4%	57	25	231	65	19	167	6
Truck/Trailers	12,346	950	7.7%	5	26	184	153	17	103	462
Truck/Tractor (bobtail)	3,336	80	2.4%	4	2	1	18	4	34	17
Tractor/Semi-trailer	46,178	3498	7.6%	131	129	1107	245	605	479	802
Tractor/Double	2,813	215	7.6%	11	7	22	38	84	24	29
Tractor/Triple	131	3	2.3%				1		2	
Unknown	2085	153	7.3%	1		59	3	1	87	2
Missing	6,368	267	4.2%	20	1	209	14			23
Total	96,241	6360	6.6%	271	200	2152	592	753	1043	1349

(Source: Crash Profiles)
* Large truck's GVW is greater than or equal to 10,000 pound.

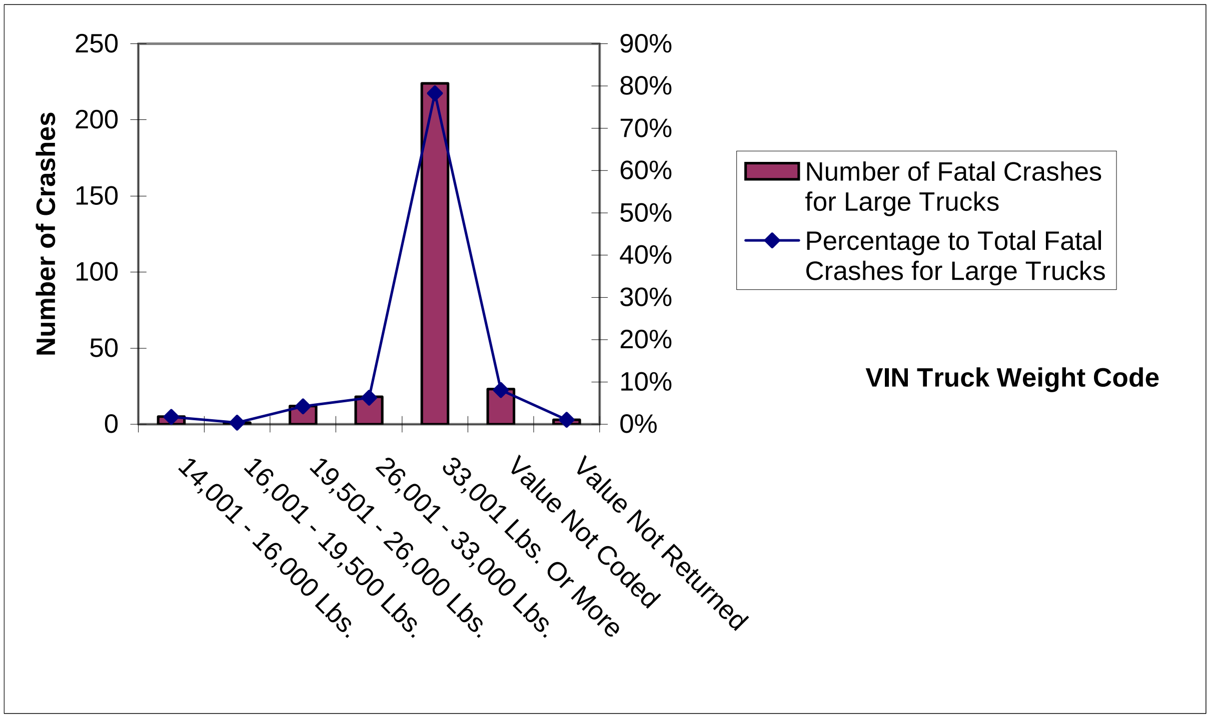


Figure 33 Number of Fatal Crashes for Large Trucks by VIN Truck Weight Code in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

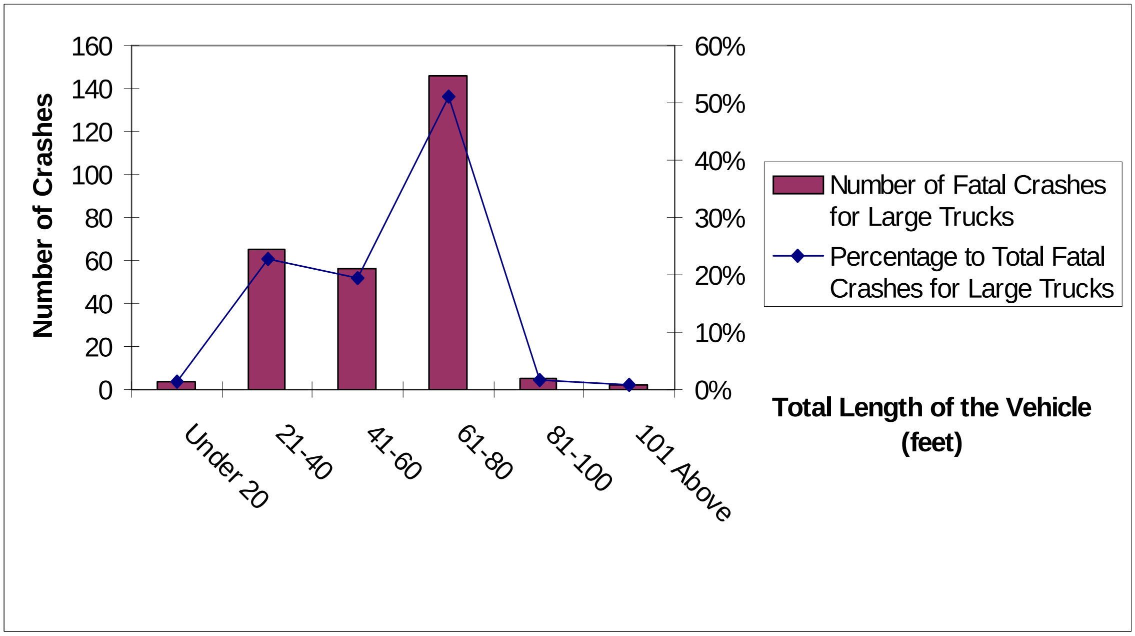


Figure 34 Number of Fatal Crashes for Large Trucks by Total Length of the Vehicle in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

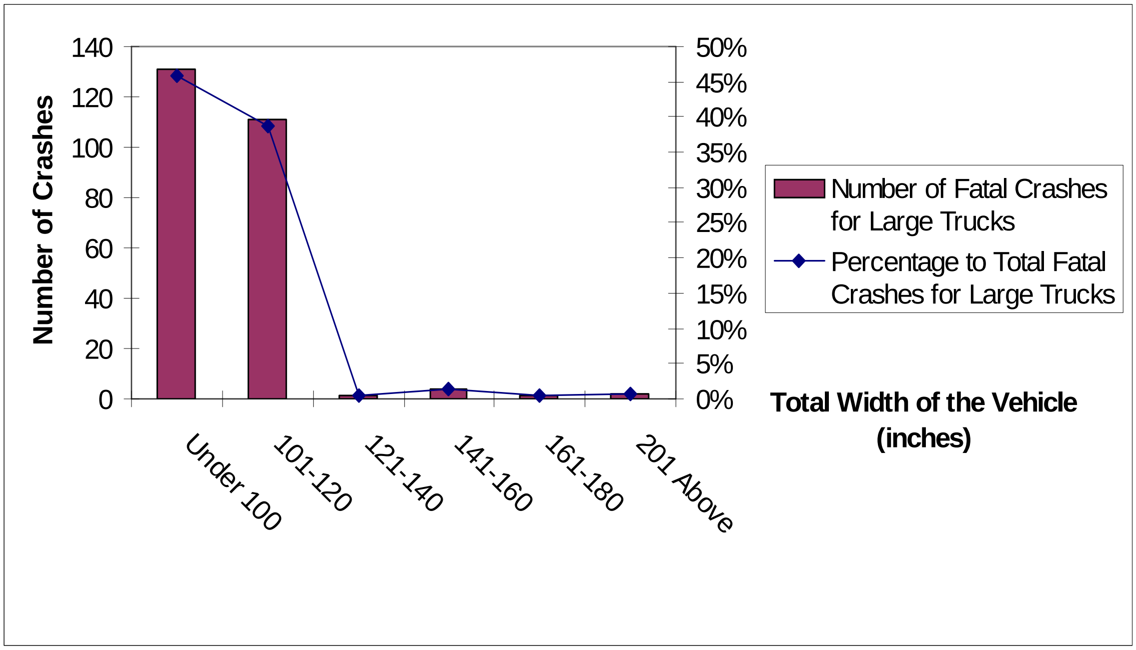


Figure 35 Number of Fatal Crashes for Large Trucks by Total Width of the Vehicle in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

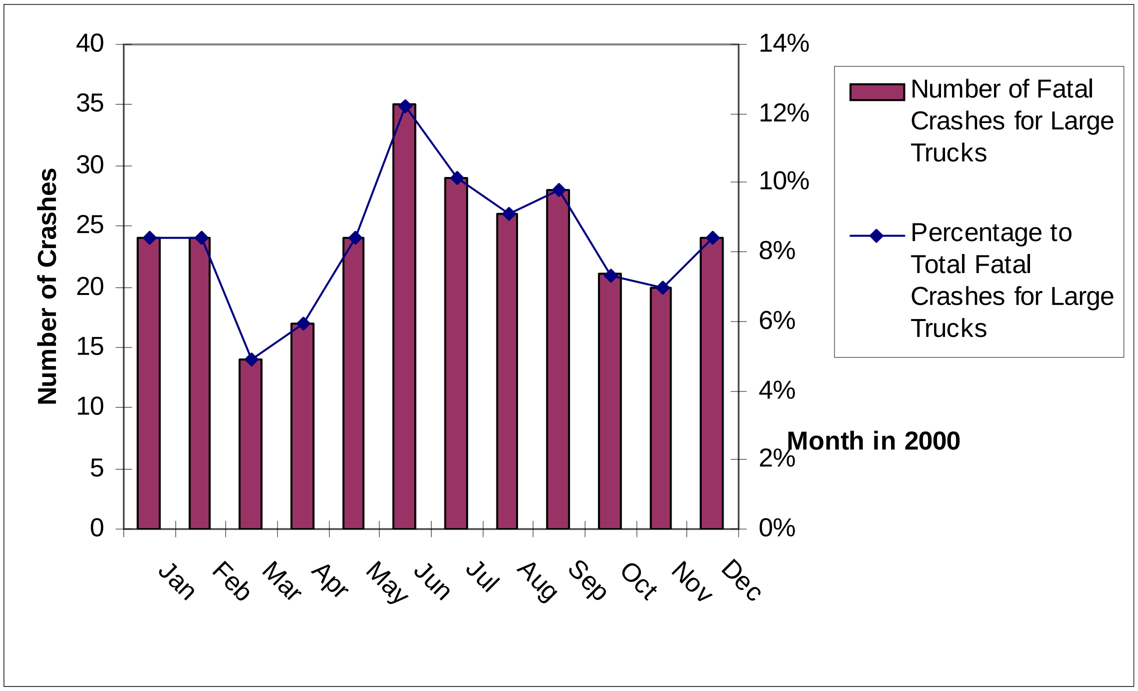


Figure 36 Number of Fatal Crashes for Large Trucks by Month in the Region (No Canadian Provinces) in 2000

(Source: TIFA)

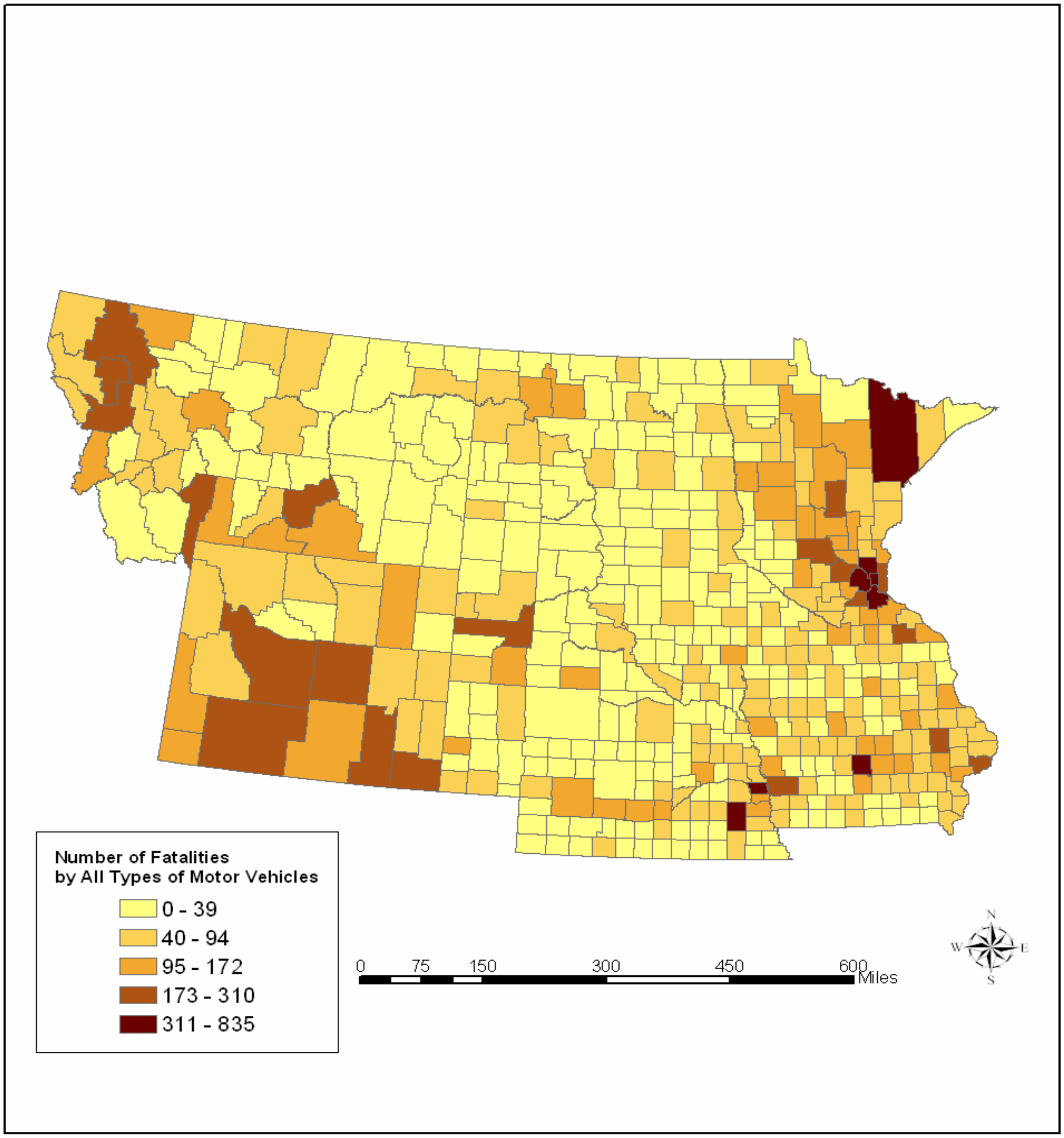


Figure 37 Number of Fatalities by All Types of Motor Vehicles from 1997 to 2001 in the Region (No Canadian Provinces)

(Source of Data: FARS, NTAD)

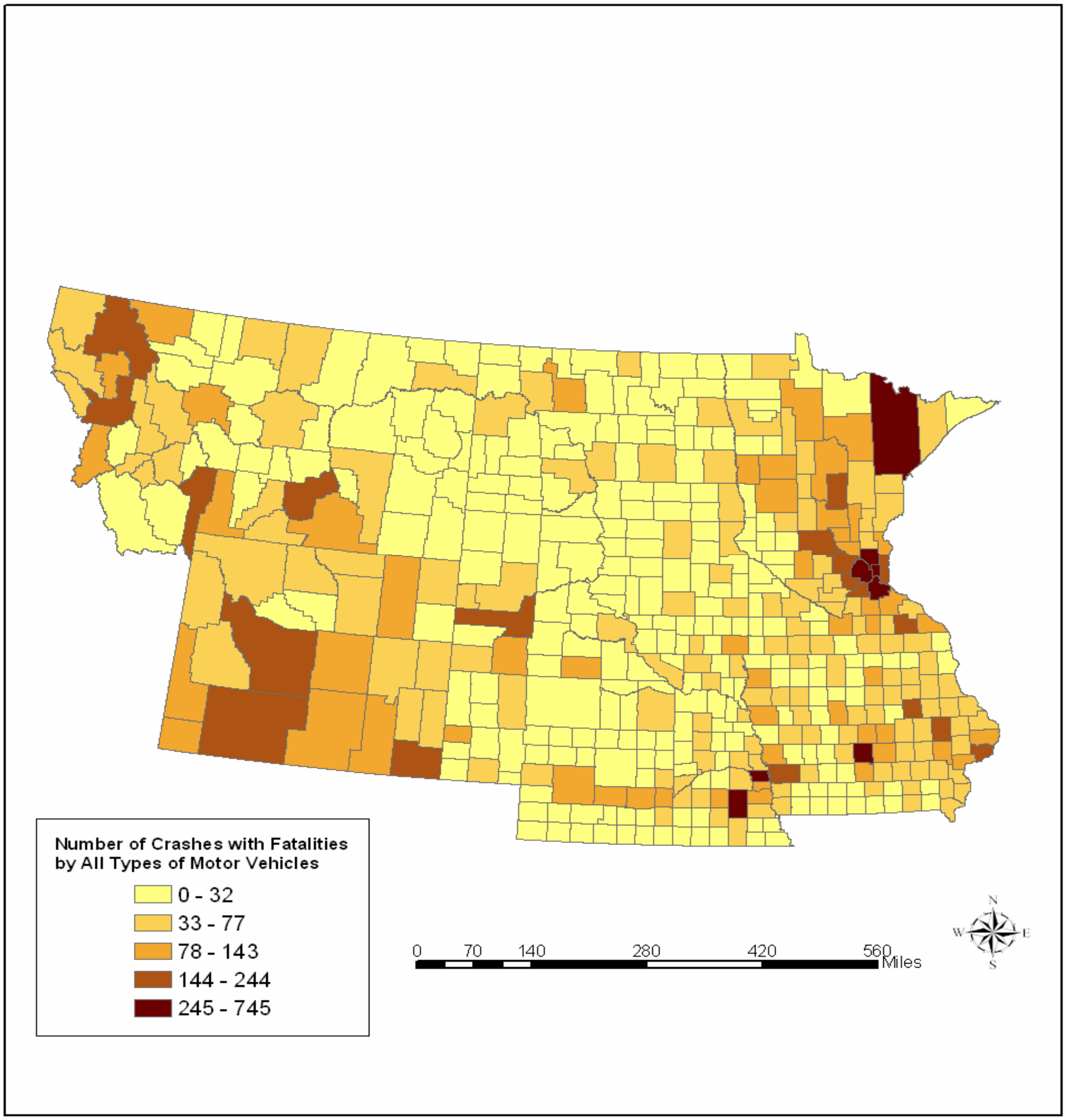


Figure 38 Number of Fatal Accidents by All Types of Motor Vehicles from 1997 to 2001 in the Region (No Canadian Provinces)

(Data: FARS, NTAD)

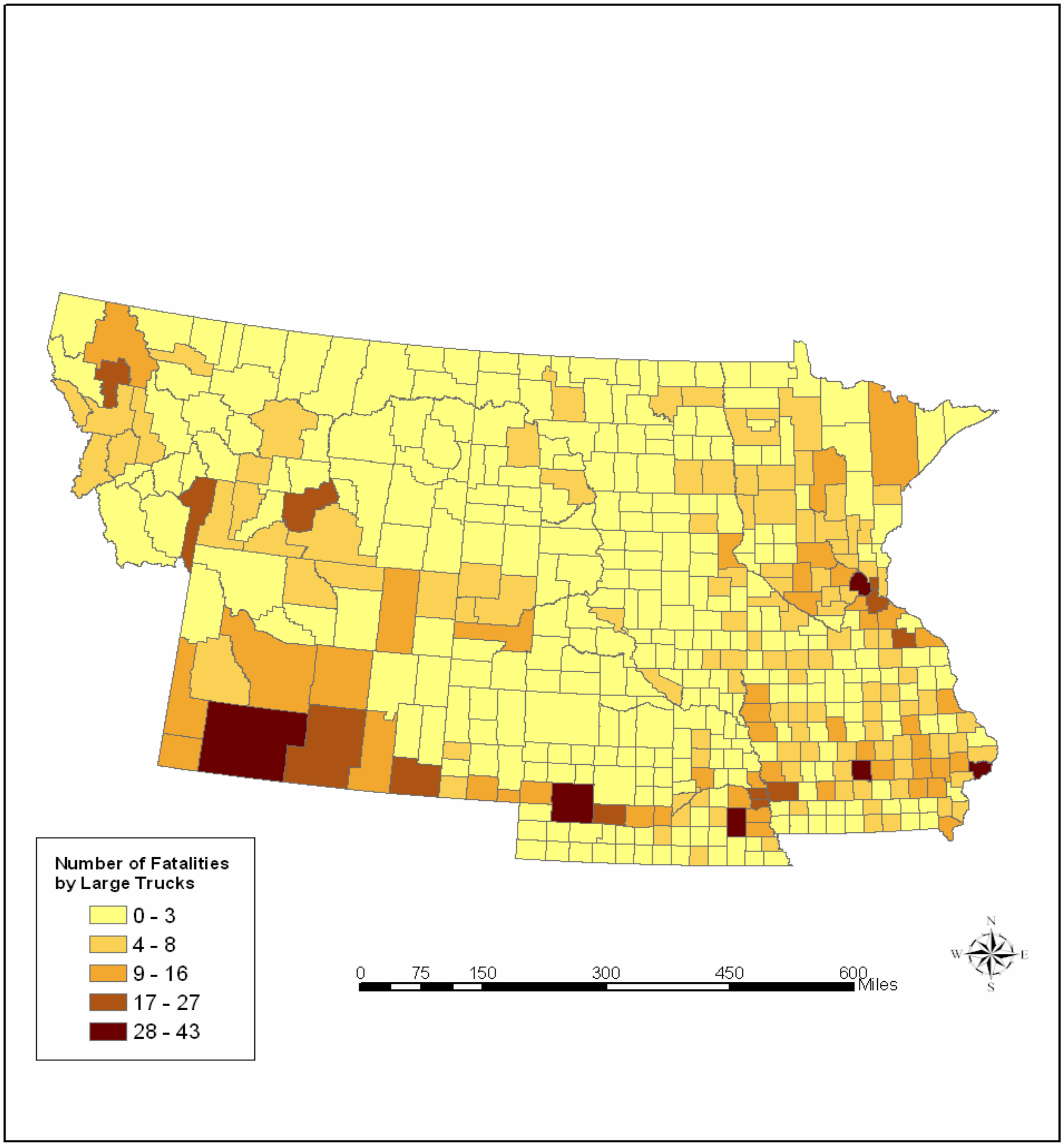


Figure 39 Number of Fatalities by Large Trucks from 1997 to 2001 in the Region (No Canadian Provinces)

(Data: FARS, NTAD)

Appendix 5. Footnotes of Table 1

(Region's Truck Size and Weight Regulations)

* In the Canadian provinces of Saskatchewan and Manitoba, the first length (left) is the Roads and Transportation Association of Canada (RTAC) vehicle guideline. The second length (right) is the non-RTAC vehicle guideline, which includes a 5-axle truck-tractor and semi-trailer.

** "Routine" Permit GVW: is the highest weight a 5-axle unit can gross before special (other than routine) review and analysis of an individual movement is required. The Special Review Permit is the highest gross weight any unit with sufficient axles can gross before special review is required.

1. Width limitation does not include special cases in certain states that allow moving farm machinery/equipment without permit during daylight hours.

2. Maximum length any given configuration with exceptions for the following in which length limitations do not apply:

a) building moving equipment

b) emergency tow trucks towing disabled lawful combinations of vehicles to a nearby repair facility.

c) vehicles and equipment owned and operated by the Armed Forces of the United States or the National Guard.

d) structural material of telephone, power, and telegraph companies.

e) truck-mounted haystack moving equipment, provided such equipment does not exceed a length of 56 feet.

f) safety and energy conservation devices and any additional length exclusive devices as determined by the highway patrol for the safe and efficient operation of commercial motor vehicles. Length exclusive devices are appurtenances at the front or rear of a commercial motor vehicle semitrailer or trailer, whose function is related to the safe and efficient operation of the semitrailer or trailer.

3. The limitation does not apply to vehicles that are at most 15'6" high when all of the following apply:

a) the vehicle is an implement of husbandry and is being moved by a resident farmer, rancher, dealer, or manufacturer.

b) the trip is at most 60 miles.

c) the trip is between sunrise and sunset.

d) none of the trip is on an interstate highway.

4. Axles spaced over 40 inches apart and less than 8 feet apart.

5. Exclusive of rear view mirrors or temporary load securement devices that may extend an additional three inches on each side of the vehicle or load.

6. Any vehicle combination with five or more axles with minimum spacings. Special permit over 80,000 lbs.

7. The value is for designated highways (Interstates, U.S. highways. MN state truck highways and certain designated local highways). Weight limit for non-designated highways (all other streets and county roads within the state) is 18,000 pounds.

8. Maximum allowable gross weight for vehicles operating under the Montana/Alberta Memorandum is 137,800 pounds.

9. Tridem axle weights (RTAC A-train) depend on inter-axle spacing. (All weights converted from metric measurement which may include rounding error).
   52,910 pounds - 11'8" to 12'1"
   50,706 pounds - 9'8" to 11'8" (In Alberta maximum weight remains 52,910 at this axle spacing)
   46,297 pounds - 7'8" to 9'8"

10. Width exceptions (house trailer during daylight hours only - 10'; mirrors may extend on each side of the vehicle and additional 8"; tie-down or load securing devices may extend an additional 4" on either side of the vehicle).

11. Maximum gross vehicle weight on most city, county, and township roads is 73,280 lbs.

12. The maximum is directly controlled by the Federal Bridge Formula. The maximum practical gross is 129,000 lbs, given the state's length laws.

13. Weight was converted from metric measurement, which may include rounding error.

14. 96,000 pounds for construction and livestock vehicles. Special permit issued for vehicles over 80,000 pounds.

15. 9' Spacing.

16. Maximum according to individual state trucking handbook weight tables with proper axles and spacing.

17. Bridge Formula B used. With proper number of axles and spacing up to 117,000 lbs. can be moved on the interstate as well as primary and secondary highways.

18. Iowa allows vehicles from South Dakota and Nebraska access to terminals that are located within the corporate limits of Sioux City and its commercial zone as shown in 49 CFR 1048.101 on November 28, 1995. 129,000 pounds when entering Sioux City from South Dakota or South Dakota from Sioux City; 95,000 pounds when entering Sioux City from Nebraska or Nebraska from Sioux City. These vehicles must be legal in the state from which they enter Iowa.

Appendix 6. Definitions for Different Types of Permits

Single Trip - Single trip permits are required for legal size divisible load vehicles or combinations of vehicles exceeding the federal gross vehicle weight cap of 80,000 pounds for movement on the Interstate highway system. A single trip permit is issued for the movement of a vehicle or combination of vehicles with or without loads from a single point of origin to a single destination.

Single Trip Oversize Only - A permit issued for the movement of a vehicle or combination of vehicles with or without loads from a single point of origin to a single destination. A single trip oversize permit may be issued to vehicles or loads that are non-divisible or over the height, width, or length limits set forth by an individual state.

Single Trip Overweight Only - A permit issued for the movement of an "overweight only" vehicle or combination of vehicles from a single point of origin to a single destination. The specific vehicle or combination of vehicles meets dimension limits but exceeds weight limits set forth by an individual state.

Single Trip Oversize and Overweight - A permit issued for the movement of vehicles originating from a single point of origin to a single destination in which the vehicle or combination of vehicles exceeds legal state limits in any combination of the height, width, length, and weight.

Annual Oversize - A permit issued for vehicles or combinations of vehicles carrying indivisible loads such as manufactured homes, mobile cranes, or other items where it is not possible to further reduce the dimensions of the load. Annual oversize permits are prorated and are generally valid for a period no less than one calendar quarter and no more than one calendar year.

Annual Oversize and Overweight - A permit issued for vehicles or combinations of vehicles carrying indivisible loads where the overall dimensions and weight of the load exceeds legal limits set by each individual state or province. Annual oversize and overweight permits are prorated and are generally valid for a period no less than one calendar quarter and no more than one calendar year.

Multiple Trip - Term used by several states that refers to a permit issued to a overweight or oversize vehicle or combination of vehicles that moves frequently within a limited area with or without loads.

Continuous Trip - Term used by Nebraska Department of Roads that refers to a permit used for frequent or repeated movement of a vehicle or combination of vehicles, with or without loads, to several locations within a limited area. A continuous permit is essentially the same as what other states and provinces refer to as an annual permit. The continuous permit is designated for a time period not exceeding one year.

Seasonal - In most states and provinces, seasonal harvest permits may be issued to oversize/overweight vehicles or combinations of vehicles hauling seasonally harvested products from the field where they are harvested to market, storage, or stockpile within a reasonable distance. As an example, in Nebraska, vehicles or combinations of vehicles can be up to 15 percent heavier than the maximum weight and up to 10 percent greater than the maximum length set by law and are allowed to move for distances up to 120 miles (Nebraska Truck Information Guide). The distance limitation may be waived for vehicles or combinations of vehicles when carrying dry beans from where they were harvested, to another distant location when the dry beans are not normally stored in the local area. Vehicles carrying sugar beets in Nebraska are allowed a 25 percent greater length than the maximum allowed by Nebraska law. The state of Nebraska has an overweight exception for seasonally harvested products in which no permit26 is required for vehicles or combinations of vehicles hauling grain or other seasonally harvested products from the field where such products are harvested to market, storage, stockpile or factory up to 70 miles. These provisions do not apply to the Interstate system.

[26] The owner of the agricultural product must sign a statement indicating the origin and destination and submit it to the driver to be carried in the loaded vehicle.

Appendix 7. Truck Travel Scenario Analysis Across the Region

Introduction

Truck travel scenarios across states and provinces provide insight into the inconsistent and complex truck size and weight regulations in the region (North Dakota, South Dakota, Minnesota, Iowa, Montana, Wyoming, and Nebraska and the provinces of Manitoba, Saskatchewan, and Alberta). This non-uniform regulatory system may decrease payloads and increase travel times for trucks, resulting in a less than optimum truck transportation system. Increased transportation costs make the region's products less competitive, reducing trade opportunities and stifling the region's economy.

Total travel time includes the time spent in weigh stations as well as the travel time on the selected routes based on truck size and weight regulations. Further, regulations restrict the entry of certain truck types (e.g., LCVs in MN and IA), increasing the number of trips to haul the same load. The objective of the travel scenario analysis is to identify weight and size regulations as well as permit costs for specific vehicles. The scenarios point out problems of inconsistent truck weight and size regulations for shippers crossing state and provincial borders.

Specific goals of this analysis are to:
- build hypothetical freight travel scenarios in the study region,
- provide truck weight and size regulation information and permit needs associated with each scenario, and
- graphically show the restricted travel.

The findings of this scenario analysis will develop an understanding of inconsistent truck weight regulations in the region.

Travel Scenarios

Configurations used for the case studies include a 5-axle semi, LCVs, twin trailers, and Canadian A and B trains. The study examines common large tractor-trailer combinations. A non-divisible load is assumed for the single trailer in scenarios one and two. Other scenarios have one or three trailing units, and therefore weight regulations for divisible loads are applied. The study examines travel permissibility for U.S. LCVs in the provinces as well as Canadian vehicles (Canadian A and B trains) in the states.

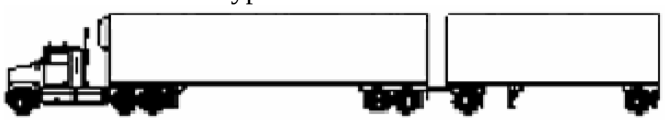
Scenario 1 Truck Type.

Single trailer, 5 axles, 53’ trailer, 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles).

Scenario 2 Truck Type.

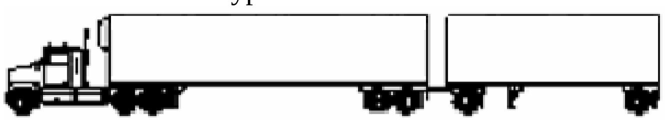
Single trailer, 5 axles, 53’ trailer, 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles).

Scenario 3 Truck Type.



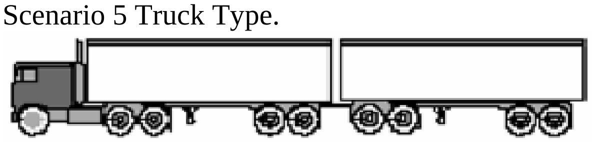
Rocky Mountain Double, 7 axles, 45’ and 26’ trailers, 105,500 pounds (12,000 pound steering axle, two 30,000 pound tandem axles, two 16,750 pound single axles).

Scenario 4 Truck Type.



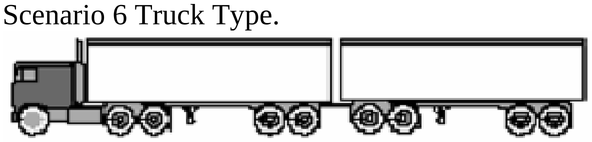
Rocky Mountain Double, 7 axles, 45’ and 26’ trailers, 105,500 pounds (12,000 pound steering axle, two 35,000 pound tandem axles, two 11,750 pound single axles).

Scenario 5 Truck Type.



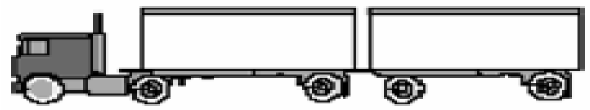
Turnpike Double, 9 axles, two 45’ trailer, 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles).

Scenario 6 Truck Type.



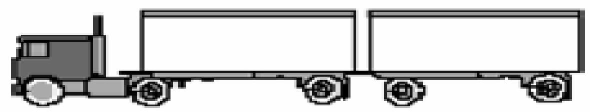
Turnpike Double, 9 axles, two 45’ trailer, 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles).

Scenario 7 Truck Type.



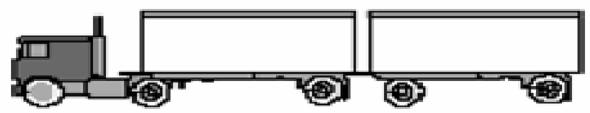
Twins 28.5 foot double, 5 axles, two 28.5’ trailers, 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles).

Scenario 8 Truck Type.



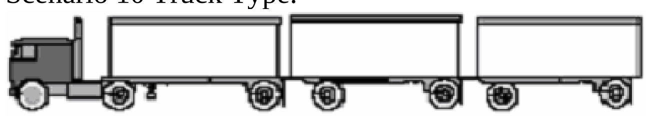
Twins 28.5 foot double, 5 axles, two 28.5’ trailers, 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles).

Scenario 9 Truck Type.



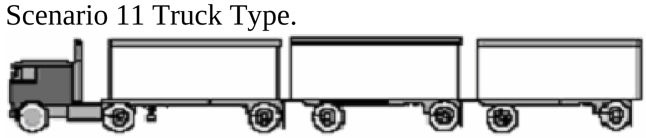
Twins 33 foot double, 5 axles, two 33’ trailers, 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles).

Scenario 10 Truck Type.



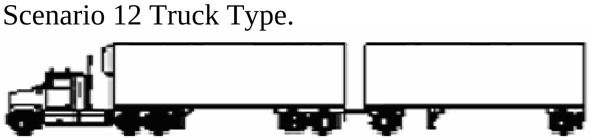
Triples, 7 axles, three 26’ trailers, 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles).

Scenario 11 Truck Type.



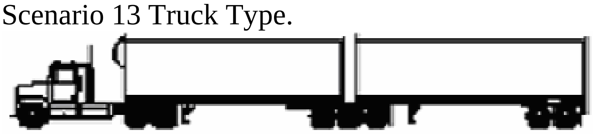
Triples, 7 axles, three 26’ trailers, 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles).

Scenario 12 Truck Type.



Canadian A-train, 7 axles, two 28’ trailers, 112,000 pounds (12,000 pound steering axle, two 30,000 pound tandem axles, two 20,000 pound single axles).

Scenario 13 Truck Type.



Canadian B-train, 8 axles, two 28’ trailers, 112,000 pounds (12,000 pound steering axle, two 30,000 pound tandem axles, one 40,000 pound tridem axle).

Origin/Destination State and Provincial Pairs

Figures 40 through 52 display the origin/destination (O/D) pairs for the 13 freight travel scenarios. The first scenario is the 5-axle semi (single trailer) with 80,000 pounds originating in North Dakota and terminating in other states and provinces. The axle loads and GVW do not exceed the legal weights in the region destination state or province (Figure 40). These scenarios included 100 miles in North Dakota and another 100 miles in the destination state/province (a single trip). Distance traveled is required because permit fees are based on distance in some states and provinces. The O/D pairs provide information on what vehicles are allowed and what types of permits are required in the origin and destination state or province.

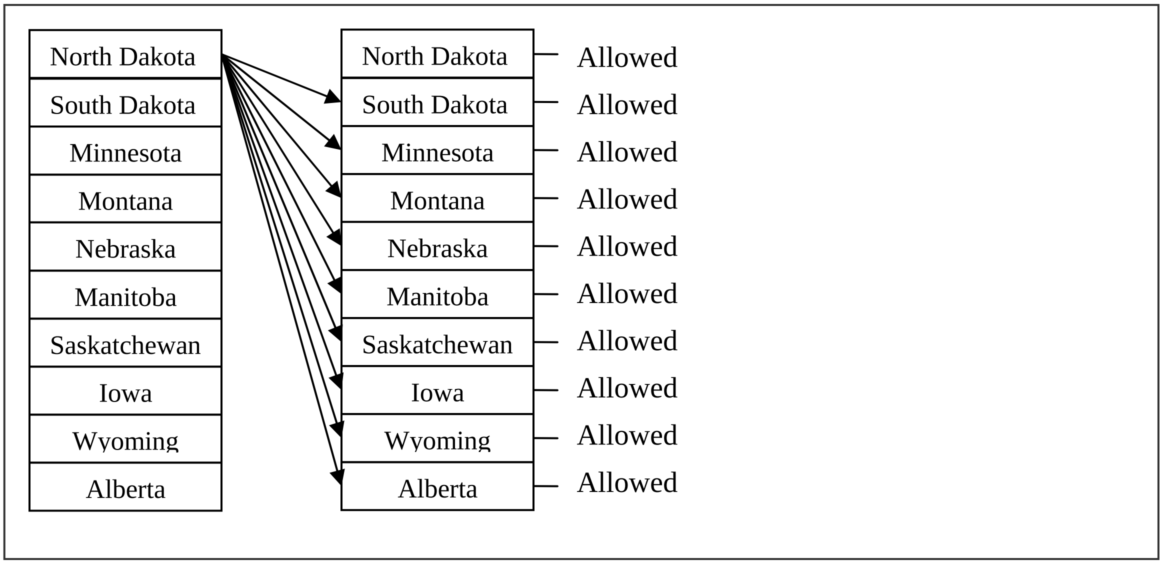


Figure 40 Scenario for a Single Trailer (5 axles, 53’ trailer, 80,000 pounds, 12,000-pound steering axle, two 34,000-pound tandem axles)

Scenario 2 is a 5-axle semi loaded at 88,000 pounds GVW. The GVW exceeds the legal weights in all seven states, and therefore, the trailer cannot enter the states. However, the states provide a weight permit for a non-divisible load. The single trip fee varies from state to state. A fixed single permit is issued in North Dakota, Minnesota, Nebraska, Iowa, and Wyoming, while an incremental permit fee by ton-mile is issued in South Dakota and Montana. For Canadian provinces, the vehicle is allowed without a permit (17,000 kilograms of legal tandem axle weight is rounded up to 38,000 pounds).

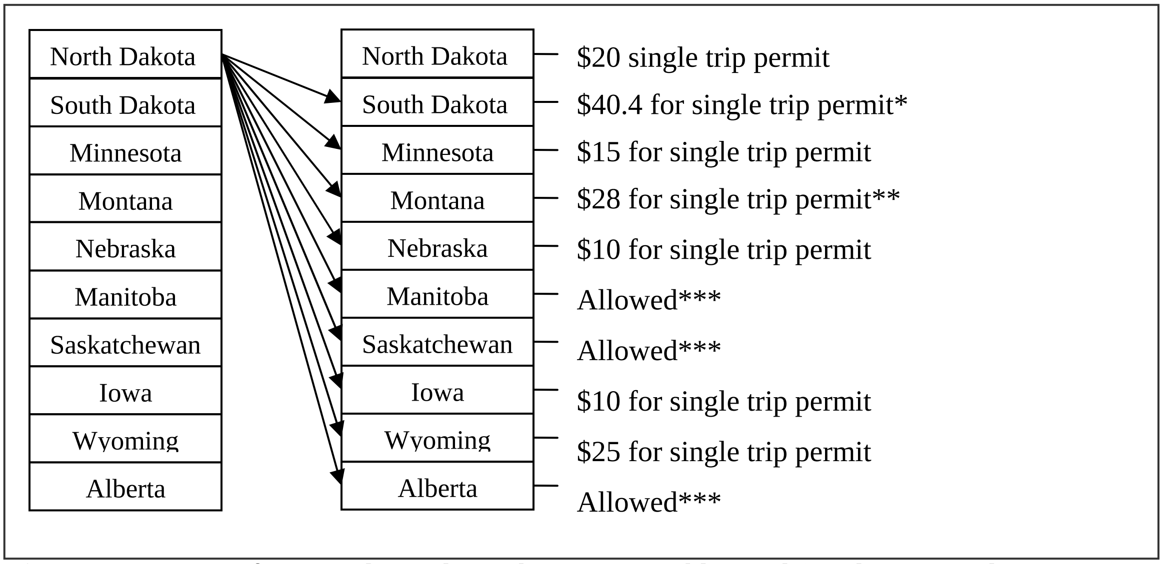


Figure 41 Scenario for a Single Trailer with None-Divisible Load (5 axles, 53' trailer, 88,000 pounds, 12,000-pound steering axle, two 38,000-pound tandem axles)

* $40.4 = $15 + $25 (overweight) + $0.002*2(tons)*100(miles) for five axles.
** $7 per 25 miles.
*** 17,000 kilograms of legal tandem axle weight is rounded up to 38,000 pounds.

Scenario 3 is a 7-axle Rocky Mountain Double (RMD) loaded to105,500 pounds. The RMD has one 12,000-pound steering axle, two 30,000-pound tandem axles, and two 16,750-pound single axles with a 78-foot axle spacing. The truck is within the legal tandem axle load, therefore it is allowed in North Dakota, South Dakota, Montana, and Wyoming. A $10 Interstate permit is required on North Dakota Interstates, and a $25 LCV permit is needed in South Dakota. The RMD is legal in the Canadian provinces and can be permitted under the Energy Efficient Motor Vehicles (EEMV) Partnership Agreement. Currently, four Canadian provinces (Alberta, Saskatchewan, Manitoba, and Quebec) allow LCVs (Canada uses the term EEMV instead of LCV).[27] The agreement specifies truck configurations, routes and times of operation (Appendix 7-1). Annual EEMV permits are issued under this agreement. The EEMV permit cost is $300 Canadian per year in Alberta, $160 Canadian per year in Manitoba, and $300 Canadian per year in Saskatchewan. One permit covers the company's entire EEMV fleet.

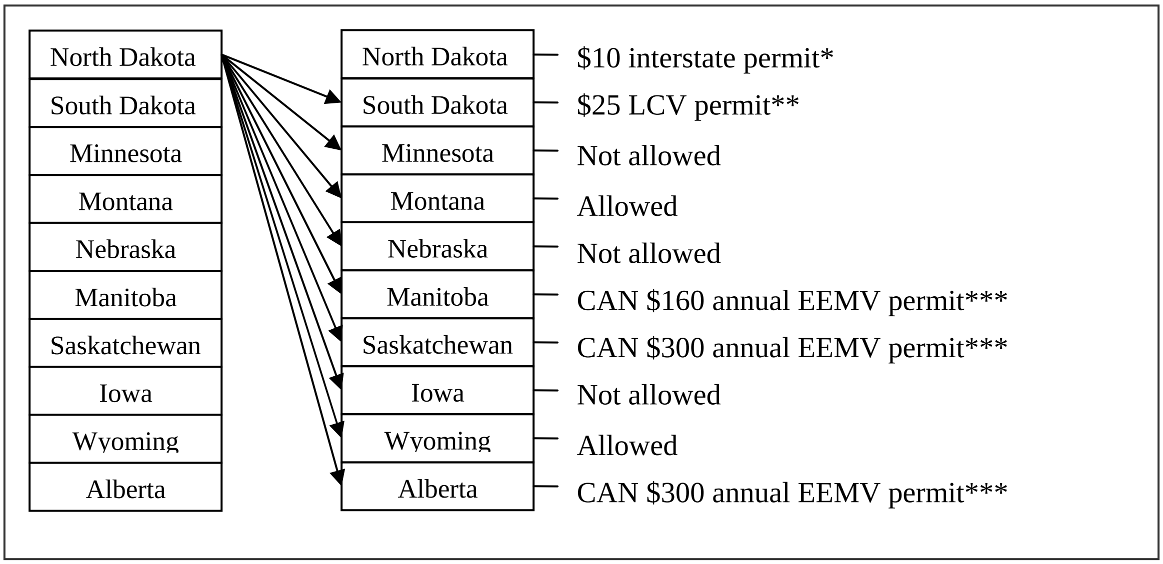


Figure 42 Scenario for a Rocky Mountain Double (seven axles, 105,500 pounds, 12,000-pound steering axle, two 30,000-pound tandem axles, two 16,750-pound single axles)

* Receipt issued interstate permit. $5 self issue permit can be used.
** LCV self-issuing permits are also available in a book of ten permits ($100 per book). LCVs are allowed on all interstates and some segments of U.S. and state highways.
*** The permit is for the company's entire EEMV fleet. It is allowed on approved Rocky Mountain Double routes.

[27] Schulman, Heavy Truck Weight and Dimension Limits in Canada, http://www.railcan.ca/documents/news/374/2003_09_23_heavyTruckWxD_en.pdf

The fourth truck type scenario is a RMD with tandem axles loaded to 35,000 pounds and the single axles loaded to 11,750 pounds and 78 feet of axle spacing. Among the US states, only Wyoming allows travel of this RMD. A tandem axle is allowed at 36,000 pounds in Wyoming; other states only allow 34,000 pounds except for non-divisible loads. The study assumes that the RMD is legal length. The total length of the RMD trailers including connecting mechanism does not exceed 81 feet and in Wyoming; the longer trailer does not exceed 48 feet.

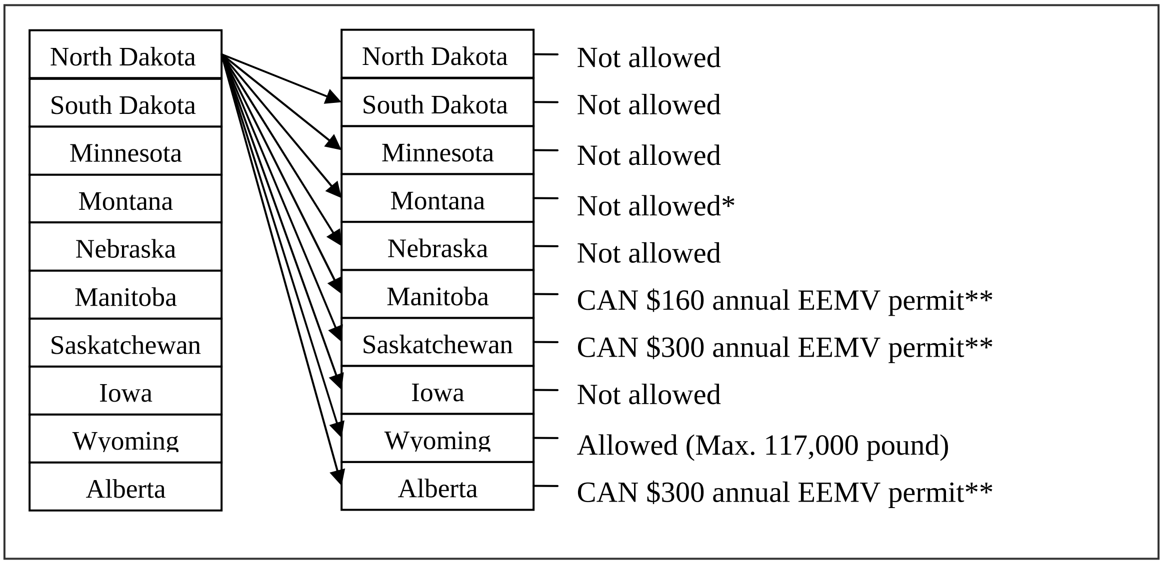


Figure 43 Scenario for a Rocky Mountain Double (seven axles, 105,500 pounds, 12,000-pound steering axle, two 35,000-pound tandem axles, two 11,750-pound single axles)

* The travel is allowed with a permit under the Montana/Alberta Memorandum of Understanding (MOU) only on I-15 between Sweetgrass, Alberta and Shelby, Montana, (see Appendix 2).

** The permit is for the company's entire EEMV fleet. It is allowed on approved RMD routes.

The fifth truck type is a Turnpike Double operating at 105,500 pounds (Figure 44). A Turnpike Double cannot operate in Minnesota, Iowa, and Wyoming. The Turnpike Double can travel on South Dakota Interstates and approved highways with a LCV permit. The maximum LCV GVW is 129,000 pounds in South Dakota.

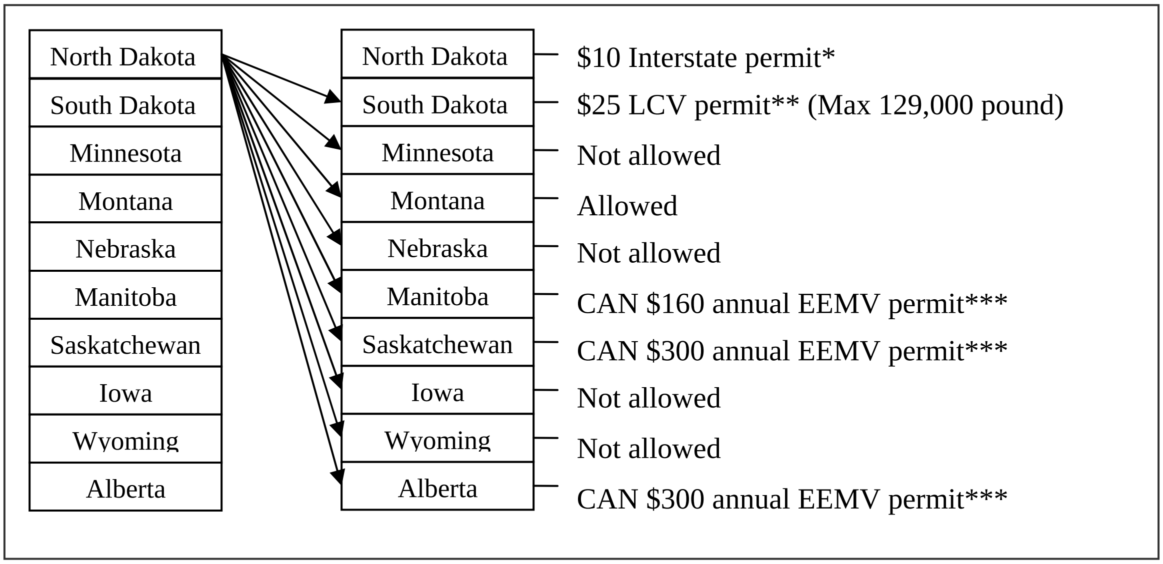


Figure 44 Scenario for Turnpike Double (nine axles, 105,500 pounds, 12,000-pound steering axle, four 23,375-pound tandem axles)

* Receipt issued interstate permit. $5 self issue permit can be used.
** LCV self-issuing permits are also available in a book of ten permits ($100 per book).
LCVs are allowed on all interstates and some segments of U.S. and state highways.
*** Entire EEMV fleet and allowed only on approved routes.

Scenario 6 is a Turnpike Double with 132,000 pounds. The steering axle is 12,000 pounds, and the tandem axle is loaded at 30,000 pounds. This truck at 132,000 pounds and a divisible load is not allowed in the United States. This Turnpike Double is allowed only in the Canadian provinces with an EEMV permit.

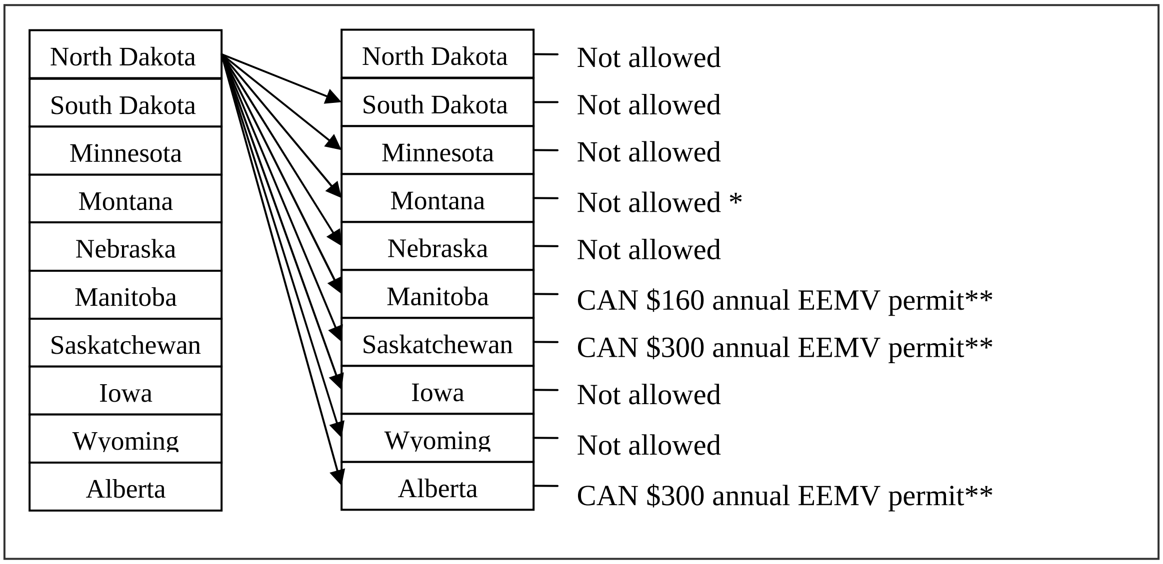


Figure 45 Scenario for a Turnpike Double (nine axles, 132,000 pounds, 12,000-pound steering axle, four 30,000-pound tandem axles)

* The travel is allowed with a permit under the Montana/Alberta Memorandum of Understanding (MOU) only on I-15 between Sweetgrass, Alberta and Shelby, Montana, (see Appendix 2).

** The permit is for the company’s entire EEMV fleet.
It is allowed on approved Turnpike Double routes.

The next truck is a 28.5-foot twin trailer configuration operating at 80,000 pounds. The steering axle is loaded to 12,000 pounds and the single axles are 17,000 pounds each. The distance between axle centers is 51 feet; this twin trailer truck may operate in the region. The twin trailer configuration is also allowed in the three Canadian provinces without a permit.

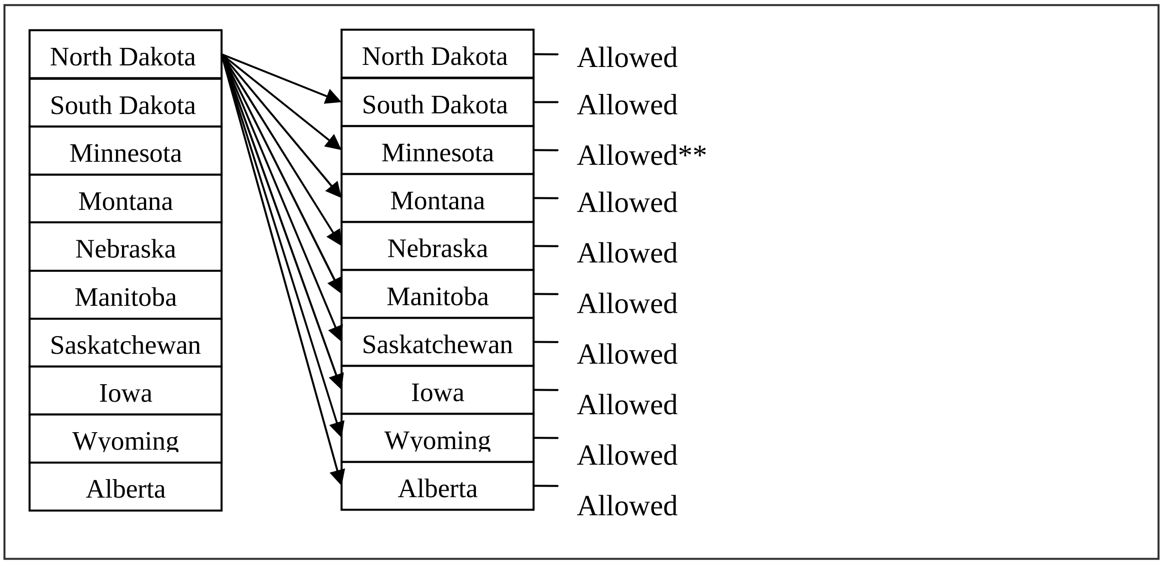


Figure 46 Scenario for a Twin 28.5 Foot Trailer Configuration* (five axles, 80,000 pounds, (12,000-pound steering axle, and four 17,000-pound single axles)

* The distance between axle centers is 51 feet.
** Twin 28.5 foot trailer configuration is allowed only on designated twin trailer routes.

Scenario 8 is a 28.5-foot twin trailer configuration operating at 82,000 pounds (Figure 47). Within the region, North Dakota, South Dakota, Montana, and Wyoming allow this configuration with or without a permit. This twin trailer configuration meets the maximum GVW in the weight tables. The configuration is allowed in the provinces without a permit.

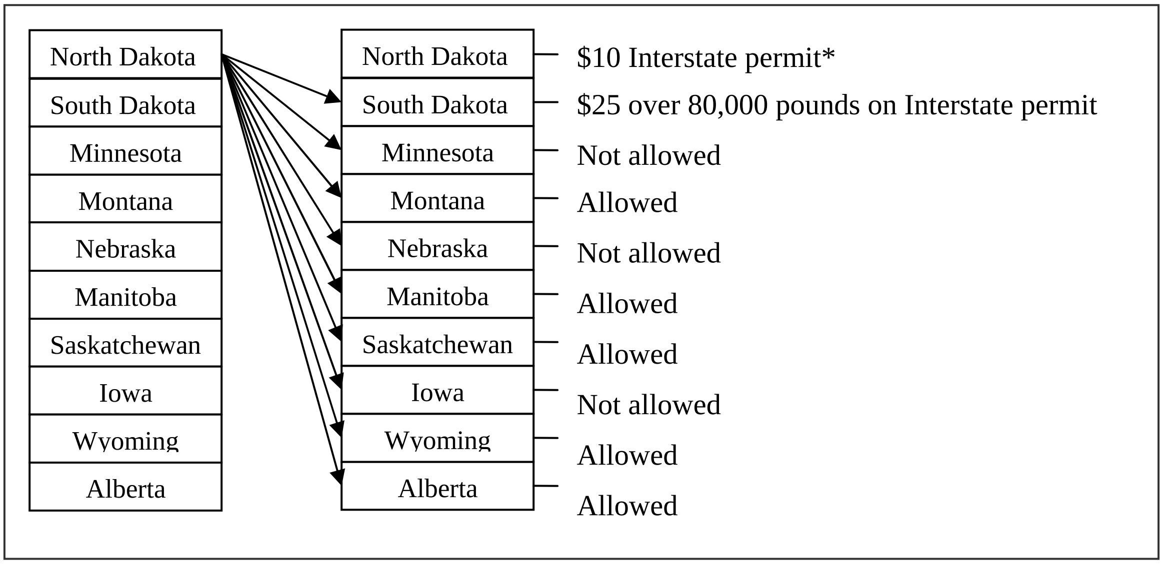


Figure 47 Scenario for a Twin 28.5 Foot Trailer Configuration (five axles, 82,000 pounds, 12,000-pound steering axle, four 17,500-pound single axles)

* Receipt issued Interstate permit. A $5 self-issue permit can be used.

The next truck is a 33-foot twin trailer configuration operating at 82,000 pounds (Figure 48). Four states (North Dakota, South Dakota, Montana, and Wyoming) allow the 33-foot twin with or without a permit. Montana requires an over-dimensional permit for the 33-foot twin configuration. The 33-foot is allowed in the provinces without a permit.

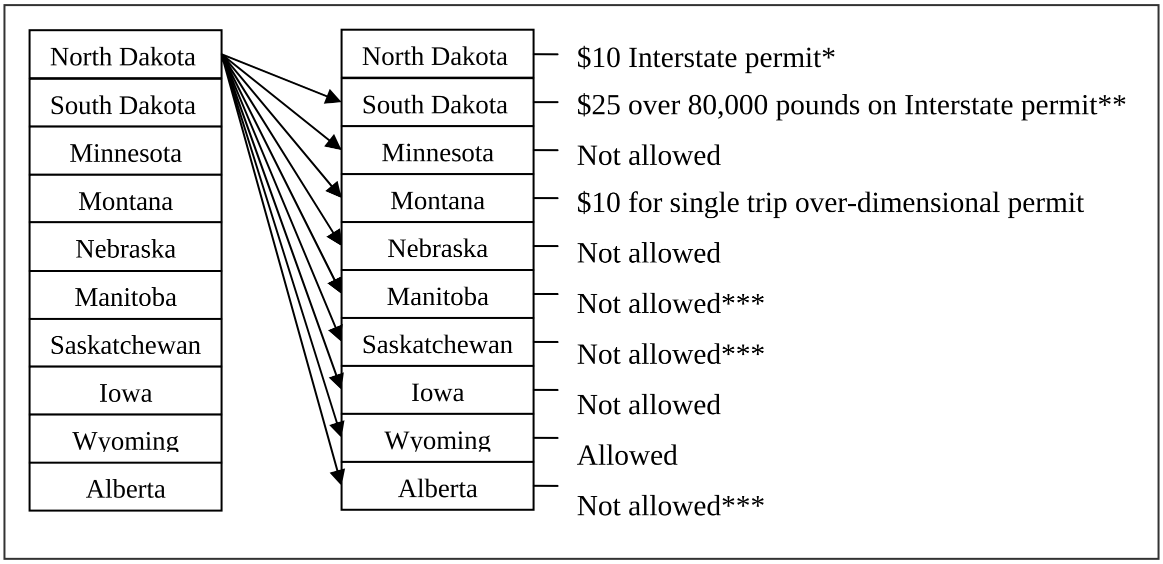


Figure 48 Scenario for a Twin 33 Foot Trailer Configuration (five axles, 82,000 pounds, 12,000-pound steering axle, four 17,500-pound single axles)

* Receipt issued Interstate permit. A $5 self-issue permit can be used.
** A permit is not needed on U.S. and state highways.
*** The maximum box length (from the front of the lead trailer to the end of the rear trailer) is 20 meters (65.5 feet).

The next truck type is triple trailers with 80,000 pounds (Figure 49). Regardless of axle load and maximum weight, triple configurations are not allowed in Minnesota, Iowa, and Wyoming. Also, Nebraska allows only empty triples. South Dakota requires a LCV permit while North Dakota and Montana allow the triple trailers without a permit. The Canadian provinces allow this triple trailer configuration with annual EEMV permit.

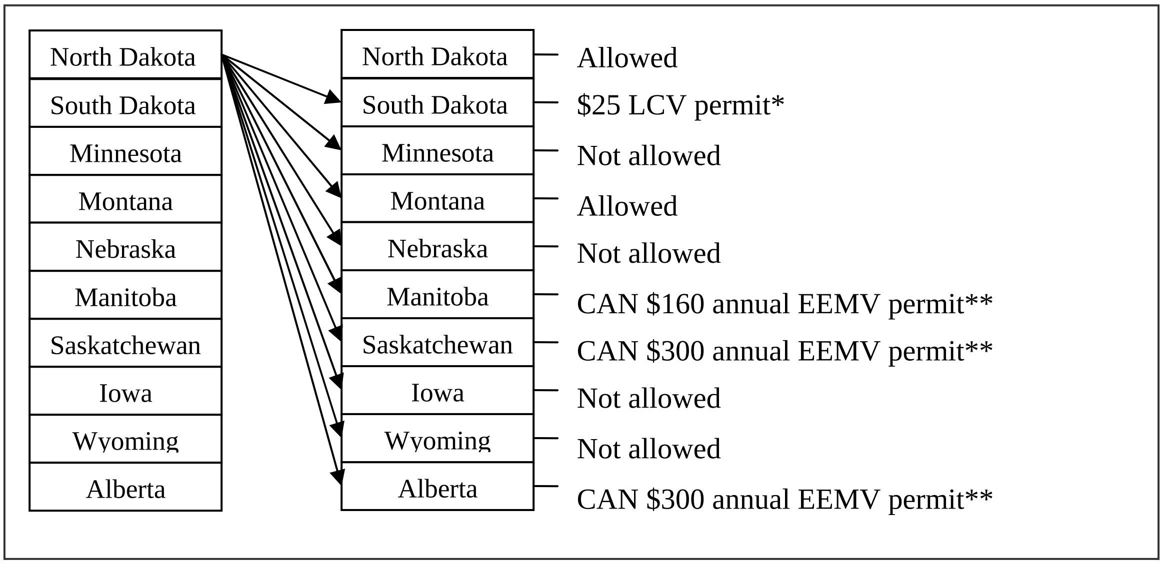


Figure 49 Scenario for a Triple Trailer Configuration (seven axles, 80,000 pounds, 12,000-pound steering axle, six 11,333-pound single axles)

* LCV self-issuing permits are also available in a book of ten permits ($100 per book).
** The permit is for the company's entire EEMV fleet.
It is allowed on approved triple routes.

Another scenario is a triple trailer configuration operating at 132,000 pounds (Figure 50). This triple is not allowed in any of the states or provinces in the region. For the Canadian provinces, the maximum GVW for triples is 117,700 pounds. However, the Canadian provinces have a winter weight allowance without permit. For example, Alberta allows an extra 1100 pounds for a single axle and 2200 pounds for a tandem axle using the winter allowance (no winter allowance for a tridem). However, the winter allowance cannot be used to increase the maximum GVW.

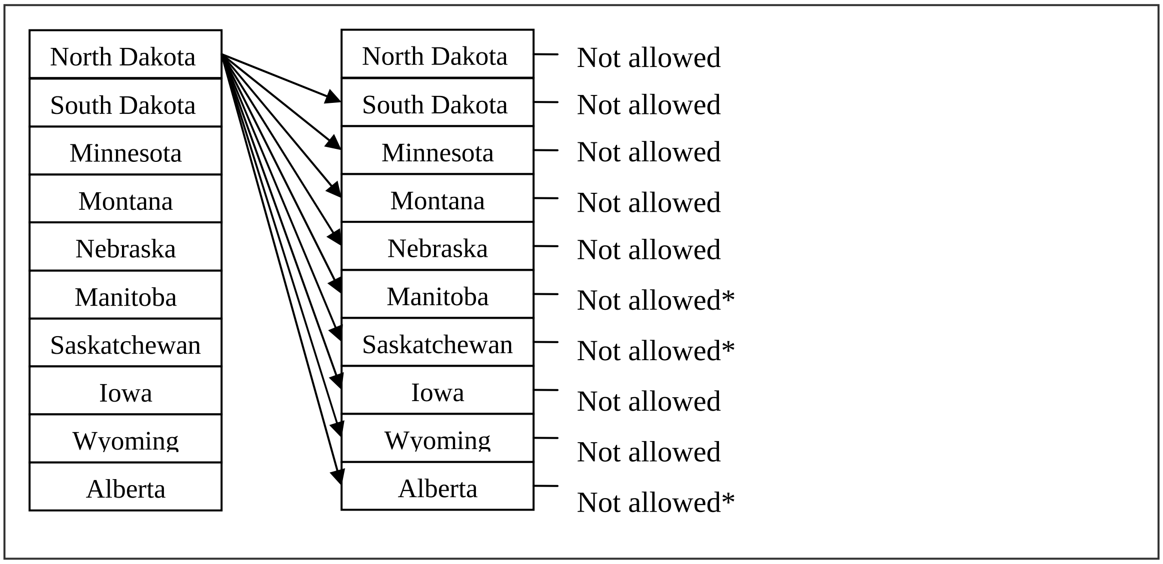


Figure 50 Scenario for a Triple Configuration (seven axles, 132,000 pounds, 12,000-pound steering axle, six 20,000-pound single axles)

* The maximum GVW for triples is 117,700 pounds.

Canadian A and B trains are the next truck type scenarios (Figures 51 and 52). The states convert these Canadian vehicles to two trailing units and then apply their size and weight regulations to determine their maximum weight allowance. No state allows the Canadian A and B truck configurations with 112,000 pounds. The Canadian A and B trains can travel in some states only when the winter premium is applied. For example, winter permit costs are $20 in ND.

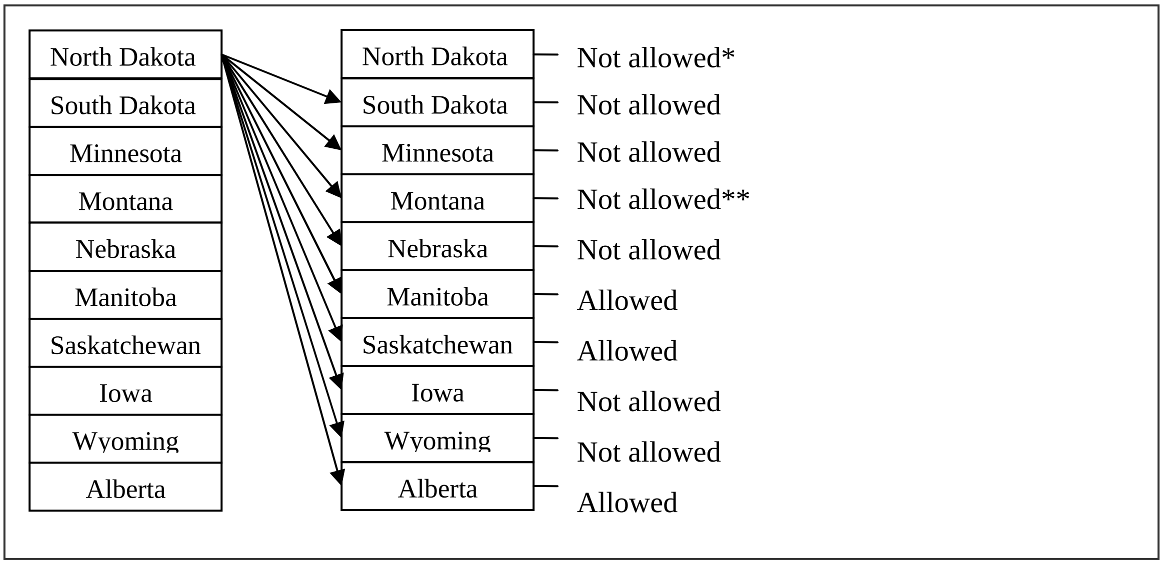


Figure 51 Scenario for a Canadian A Train (seven axles, 112,000 pounds, 12,000-pound steering axle, two 30,000-pound tandem axles, two 20,000-pound single axles)

* Allowed with $20 wintertime permit (state highways only).

** The travel is allowed with a permit under the Montana/Alberta Memorandum of Understanding (MOU) only on I-15 between Sweetgrass, Alberta and Shelby, Montana (see Appendix 2).

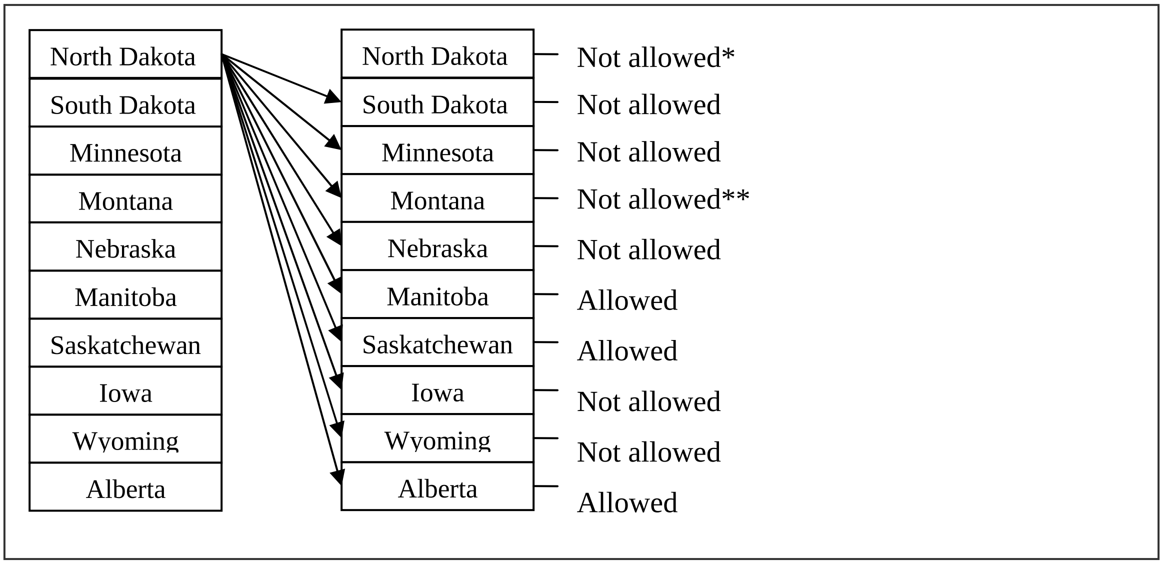


Figure 52 Scenario for a Canadian B Train (eight axles, 112,000 pounds, 12,000-pound steering axle, two 30,000-pound tandem axles, one 40,000-pound tridem axle)

* $20 wintertime permit (state highways only).
** The travel is allowed with a permit under the Montana/Alberta Memorandum of Understanding (MOU) only on I-15 between Sweetgrass, Alberta and Shelby, Montana (see Appendix 2).

Scenarios for City-Pair Routes

This section provides scenarios for six city-pair routes. The selected six city-pair routes include 1) Edmonton, AB, to Winnipeg, MB, 2) Helena, MT, to St. Paul, MN, 3) Cheyenne, WY, to Des Moines, IA, 4) Edmonton, AB, to Cheyenne, WY. 5) Winnipeg, MB, to Des Moines, IA, and 6) Saskatoon, SK, to Lincoln, NE. The section shows maps identifying the route and tables showing single trip permit costs.

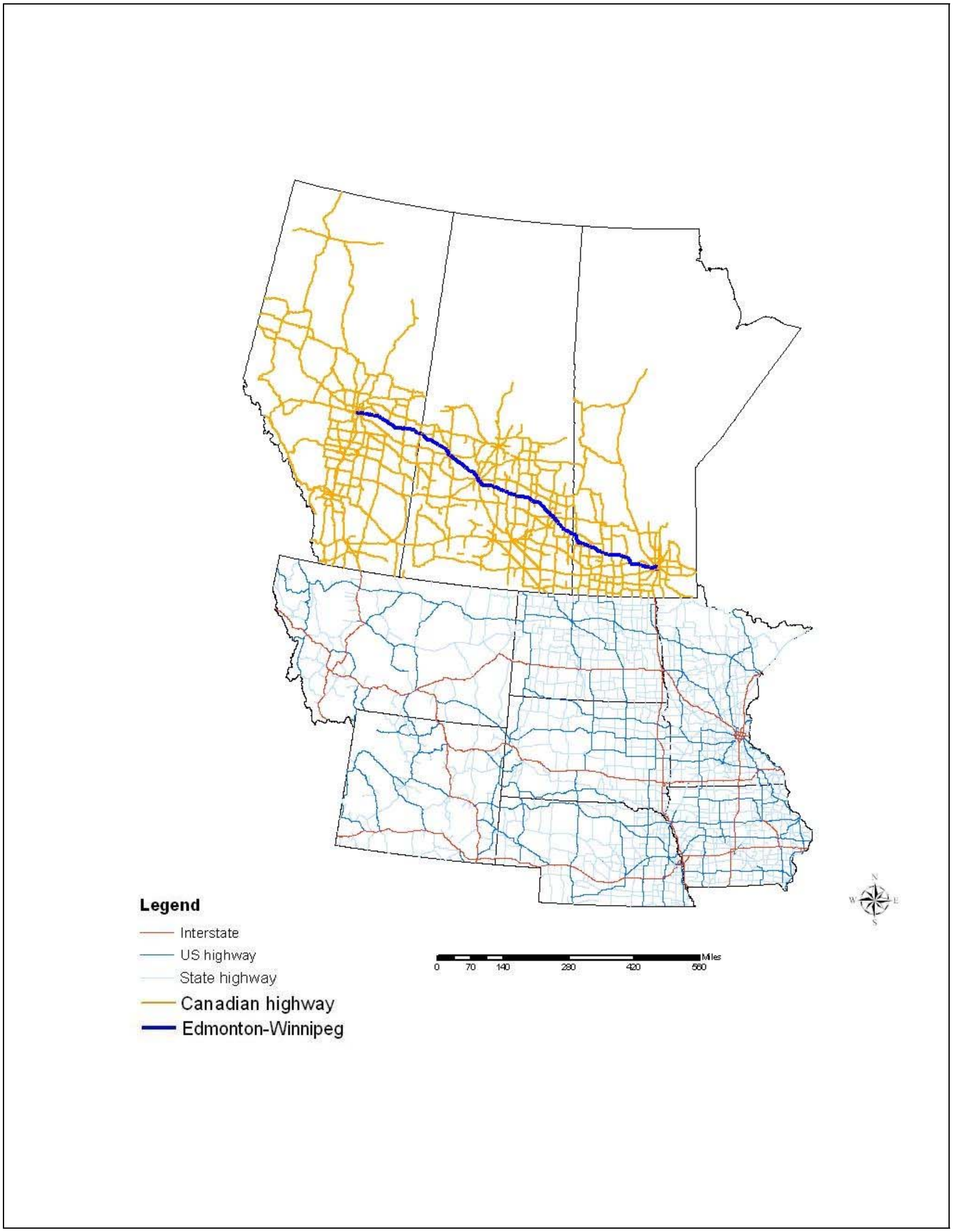
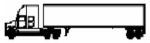
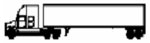
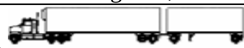
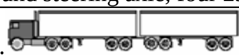
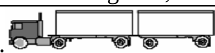
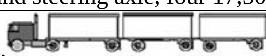
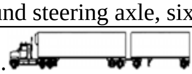
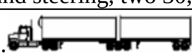


Figure 53 Edmonton, AB, to Winnipeg, MB

Table 23 Scenarios from Edmonton, AB, to Winnipeg, MB, for Different Truck Types

Travel Scenarios	Single Trip Permit for the Travel Segment			Total Permit Cost
	Edmonton, AB	Saskatchewan	Winnipeg, MB	
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	CAN $300	CAN $300	CAN $160	CAN $760 (annual)
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound single axles)	CAN $300	CAN $300	CAN $160	CAN $760 (annual)
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	CAN $300	Not allowed	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	CAN $300	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	CAN $300	Not allowed	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	No permit required	No permit required	No permit required	$0
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	No permit required	No permit required	No permit required	$0

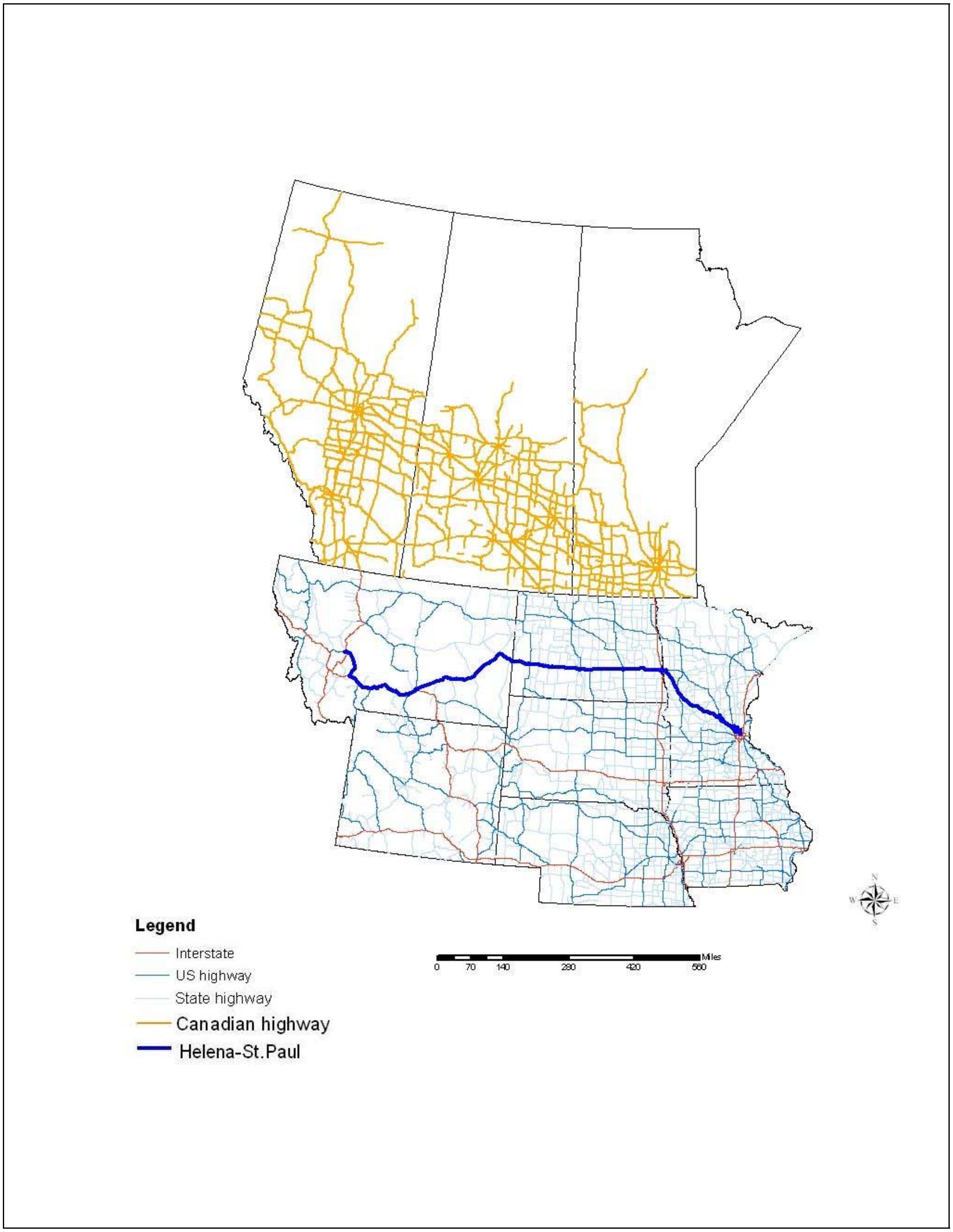
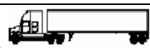
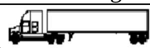
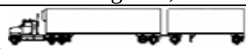
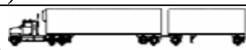
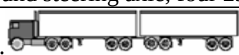
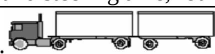
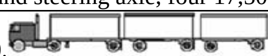
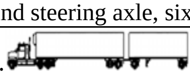


Figure 54 Helena, MT, to St. Paul, MN

Table 24 Thirteen Scenarios from Helena, MT, to St. Paul, MN

Travel Scenarios	Single Trip Permit for the Travel Segment			Total Permit Cost
	Helena, MT	North Dakota	St. Paul, MN	
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	$56 = $7*8 (8 = 200/25 miles)	$20	$15	$91
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	No permit required	$10	Not allowed	Not allowed
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound singles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	Allowed	$10	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	$10	Not allowed	Not allowed
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	$10	$10	Not allowed	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	No permit required	No permit required	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	Not allowed	Not allowed	Not allowed	Not allowed

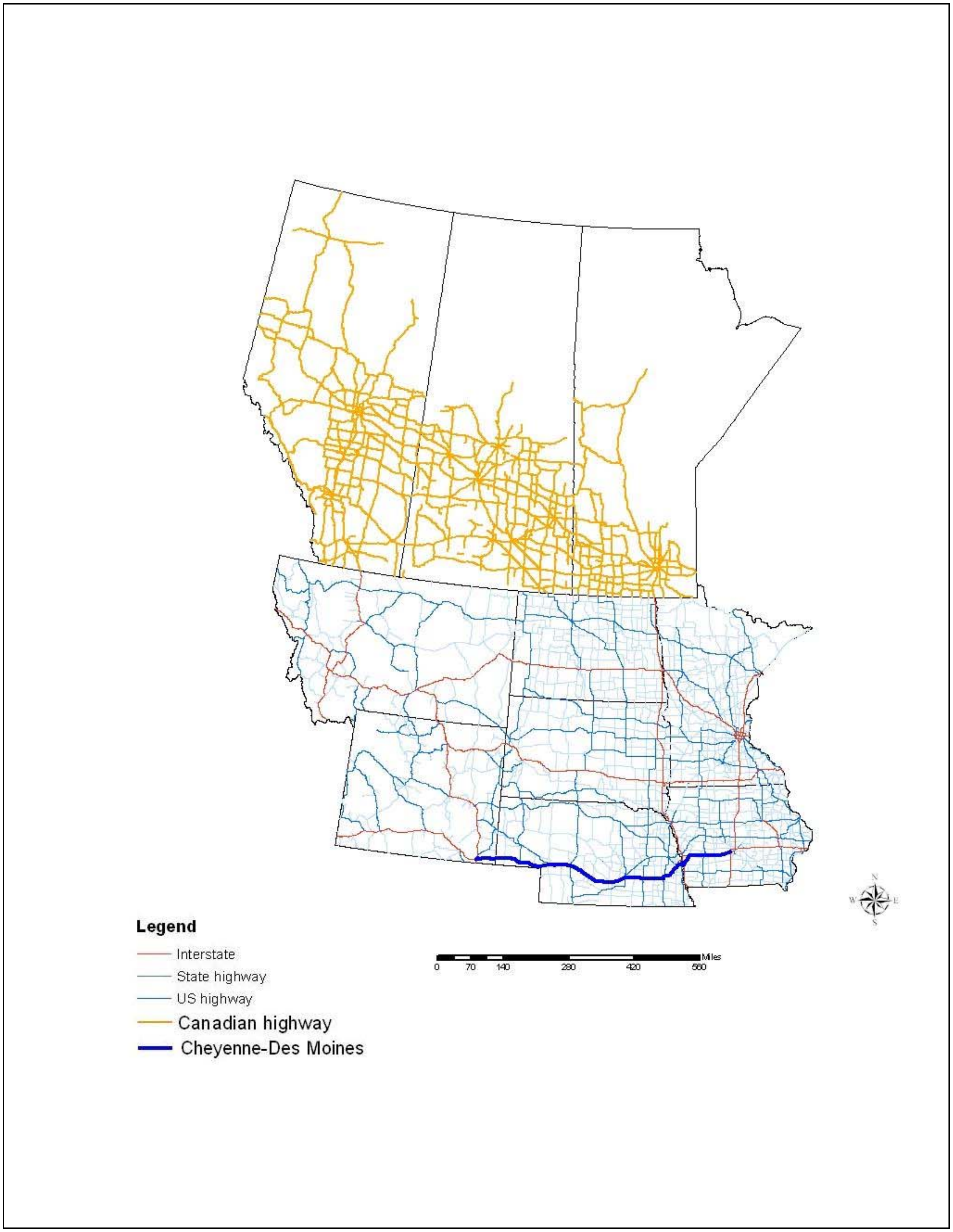
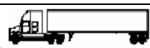
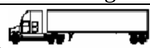
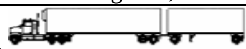
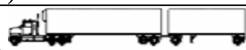
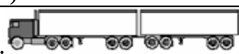
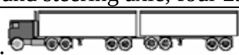
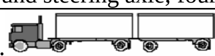
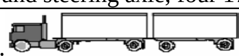
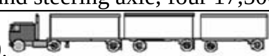
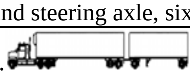


Figure 55 Cheyenne, WY, to Des Moines, IA

Table 25 Scenarios from Cheyenne, WY, to Des Moines, IA

Travel Scenarios	Single Trip Permit for the Travel Segment			Total Permit Cost
	Cheyenne, WY	Nebraska	Des Moines, IA	
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	$25	$10	$10	$45
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound single axles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	Not allowed	Not allowed	Not allowed	Not allowed

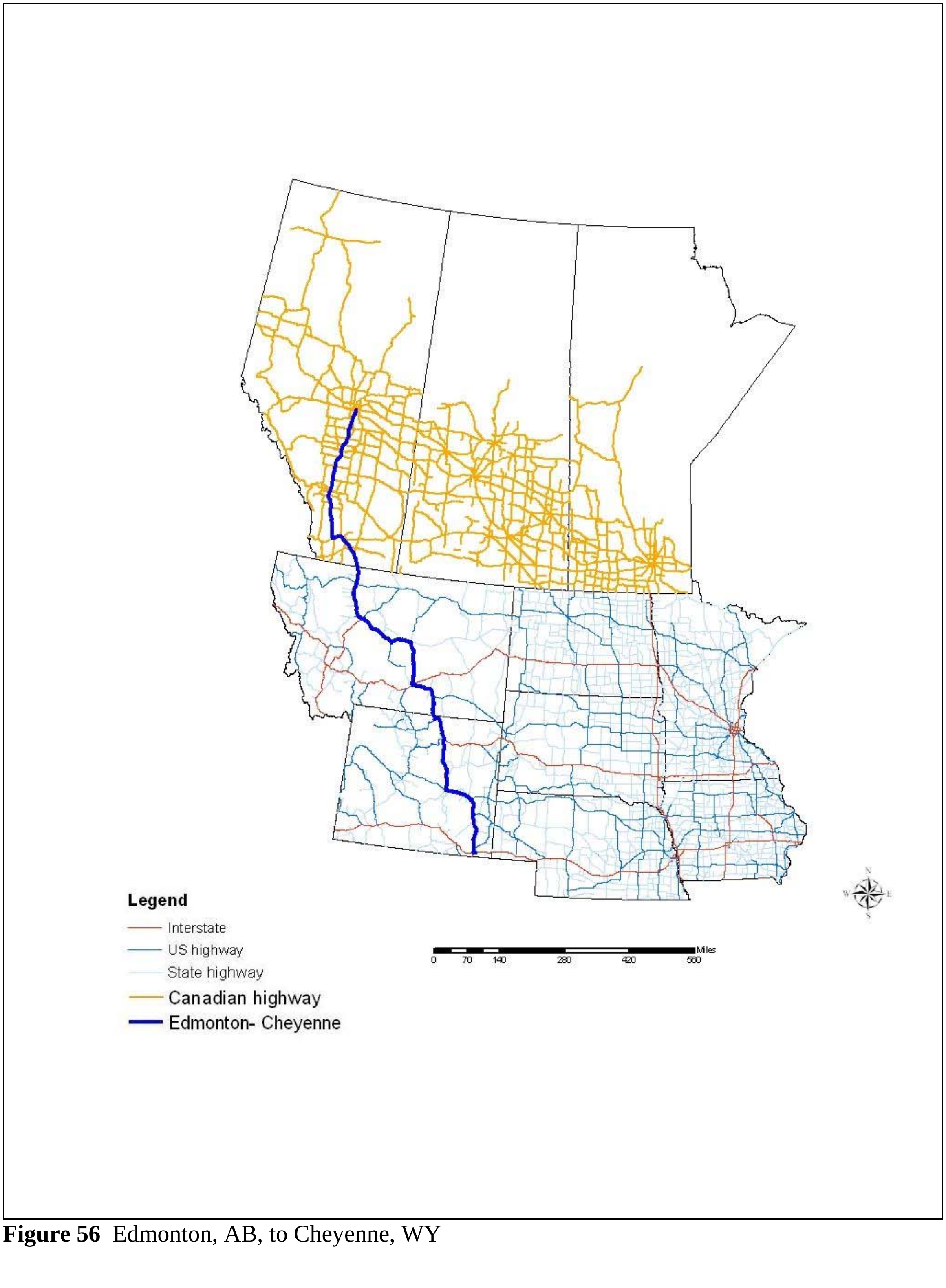
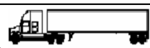
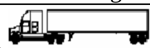
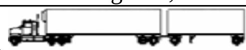
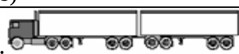
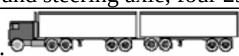
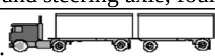
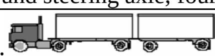
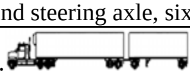


Figure 56 Edmonton, AB, to Cheyenne, WY

Table 26 Scenarios from Edmonton, AB, to Cheyenne, WY

Travel Scenarios	Single Trip Permit for the Travel Segment: Edmonton, AB	Montana	Cheyenne, WY	Total Permit Cost
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	No permit required	$126 = $7*18 (18 =450/25 miles)	$25	$151
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	CAN $300	No permit required	No permit required	CAN $300 (annual)
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound single axles)	CAN $300	Not allowed	No permit required	Not allowed
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	CAN $300	Allowed	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	CAN $300	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	Not allowed	$10	No permit required	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	CAN $300	No permit required	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	No permit required	Not allowed	Not allowed	Not allowed

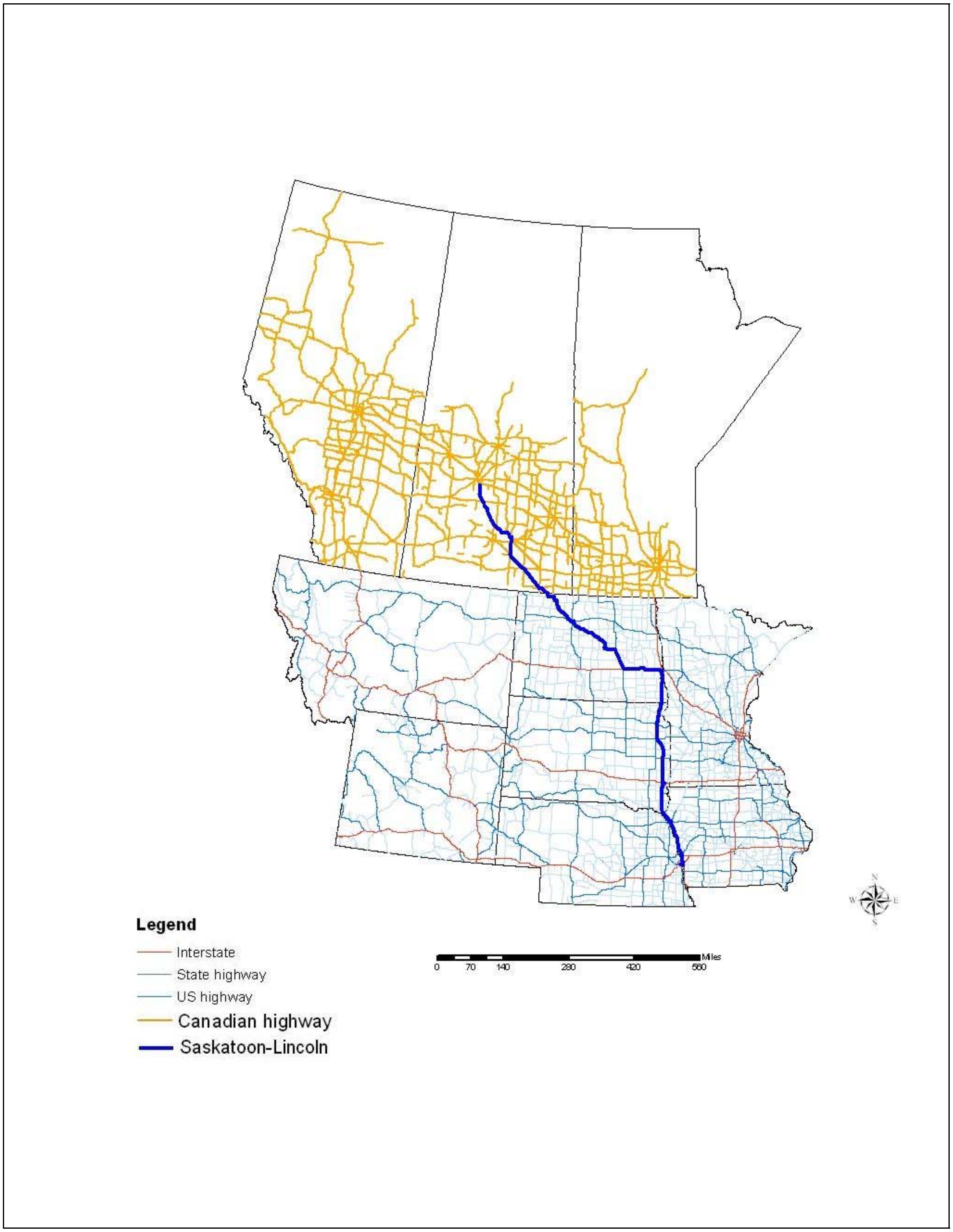
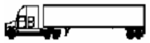
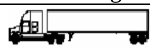
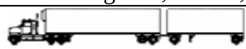
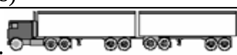
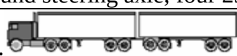
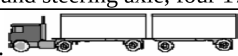
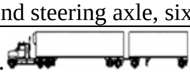


Figure 57 Saskatoon, SK, to Lincoln, NE

Table 27 Scenarios from Saskatoon, SK, to Lincoln, NE

Travel Scenarios	Single Trip Permit for the Travel Segment				Total Permit Cost
	Saskatoon, SK	North Dakota	South Dakota	Lincoln, NE	
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	No permit required	$20	$41*	$10	$71
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	CAN $300	$10	Not allowed	Not allowed	Not allowed
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound single axles)	CAN $300	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	Not allowed	$10	$25	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	$10	$25	Not allowed	Not allowed
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	Not allowed	$10	$25	Not allowed	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	Not allowed	No permit required	$25	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	No permit required	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	No permit required	Not allowed	Not allowed	Not allowed	Not allowed

*$41 = $15 + $25 for overweight + $0.002*2tons*250miles for five axles.

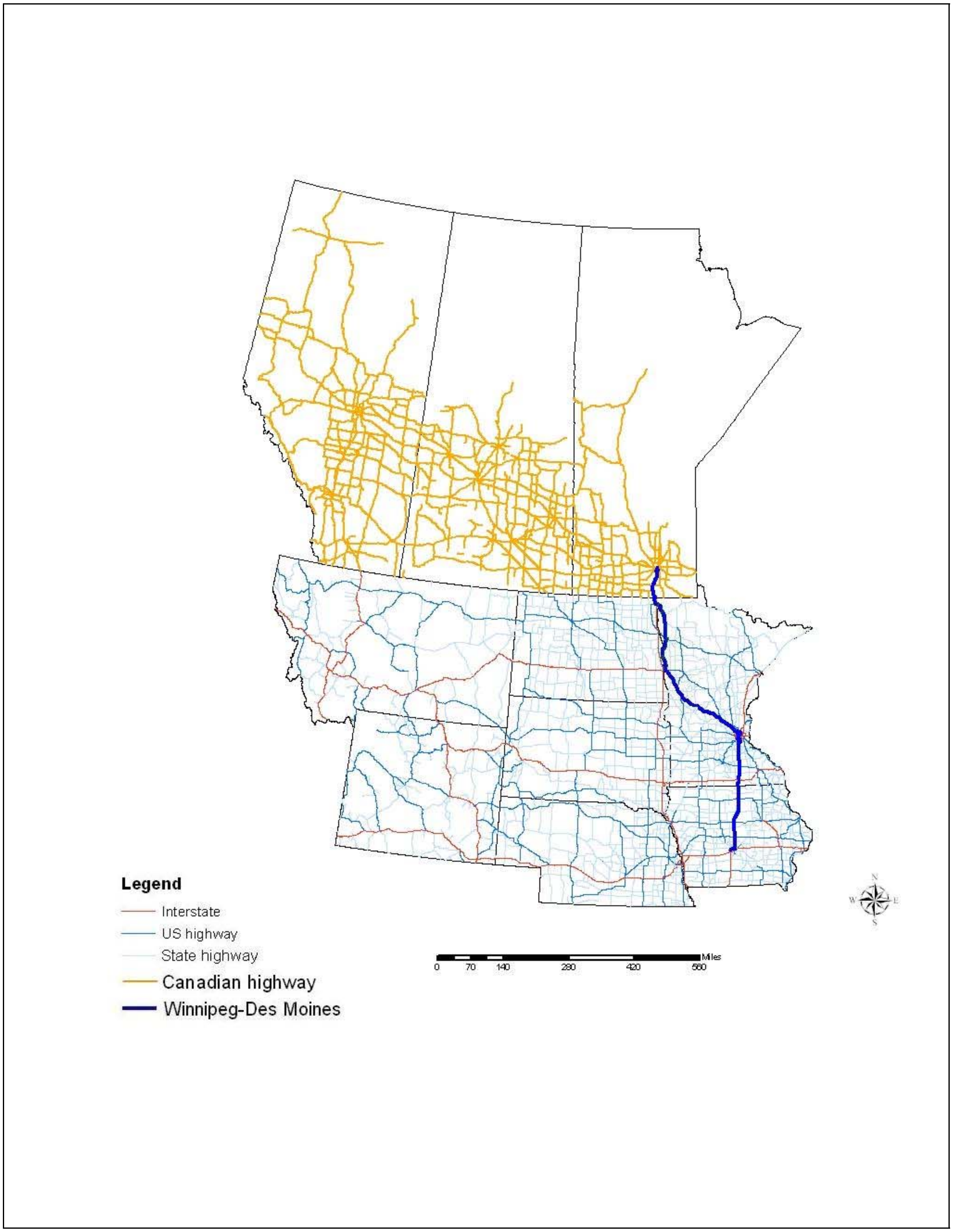
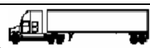
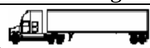
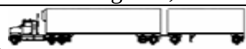
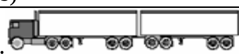
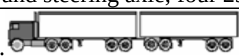
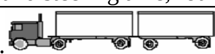
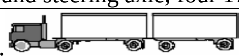
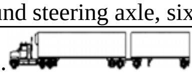


Figure 58 Winnipeg, MB, to Des Moines, IA

Table 28 Thirteen Scenarios from Winnipeg, MB, to Des Moines, IA

Travel Scenarios	Single Trip Permit for the Travel Segment			Total Permit Cost
	Winnipeg, MB	Minnesota	Des Moines, IA	
Scenario 1.  Single Trailer 80,000 pounds (12,000 pound steering axle, two 34,000 pound tandem axles)	No permit required	No permit required	No permit required	$0
Scenario 2.  Single Trailer 88,000 pounds (12,000 pound steering axle, two 38,000 pound tandem axles)	No permit required	$15	$10	$25
Scenario 3.  RMD 105,500 pounds (12,000 pound steering, two 30,000 pound tandems, two 16,750 pound single axles)	CAN $160	Not allowed	Not allowed	Not allowed
Scenario 4.  RMD 105,500 pounds (12,000 pound steering, two 35,000 pound tandems, two 11,750 pound single axles)	CAN $160	Not allowed	Not allowed	Not allowed
Scenario 5.  Turnpike Double 105,500 pounds (12,000 pound steering axle, four 23,375 pound tandem axles)	CAN $160	Not allowed	Not allowed	Not allowed
Scenario 6.  Turnpike Double 132,000 pounds (12,000 pound steering axle, four 30,000 pound tandem axles)	CAN $160	Not allowed	Not allowed	Not allowed
Scenario 7.  Twins 28.5 foot 80,000 pounds (12,000 pound steering axle, four 17,000 pound single axles)	No permit required	No permit required	No permit required	$0
Scenario 8.  Twins 28.5 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 9.  Twins 33 foot 82,000 pounds (12,000 pound steering axle, four 17,500 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 10.  Triples 80,000 pounds (12,000 pound steering axle, six 11,333 pound single axles)	CAN $160	Not allowed	Not allowed	Not allowed
Scenario 11.  Triples 132,000 pounds (12,000 pound steering axle, six 20,000 pound single axles)	Not allowed	Not allowed	Not allowed	Not allowed
Scenario 12.  Canadian A Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, two 20,000 pound singles)	No permit required	Not allowed	Not allowed	Not allowed
Scenario 13.  Canadian B Train 112,000 pounds (12,000 pound steering, two 30,000 pound tandems, one 40,000 pound tridem)	No permit required	Not allowed	Not allowed	Not allowed

Thirteen Scenarios for All Highways

This section provides figures with the 13 scenarios for all interstates, U.S. and state highways. Green, blue, and red lines depict travel allowed without a permit, travel allowed with a permit, and travel not allowed, respectively. Because these figures demonstrate generalized routes, they do not capture load restriction and construction.

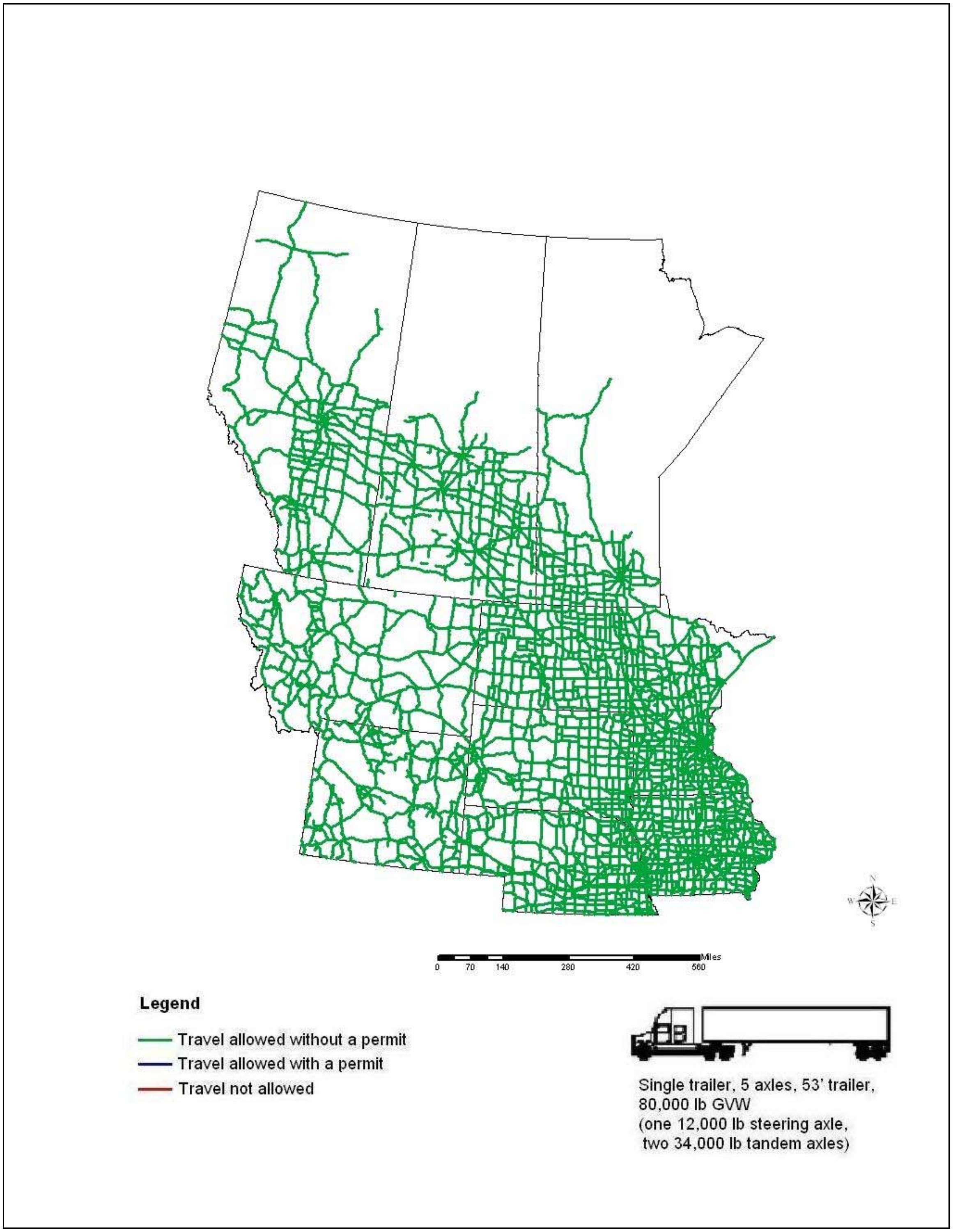


Figure 59 Scenario 1 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

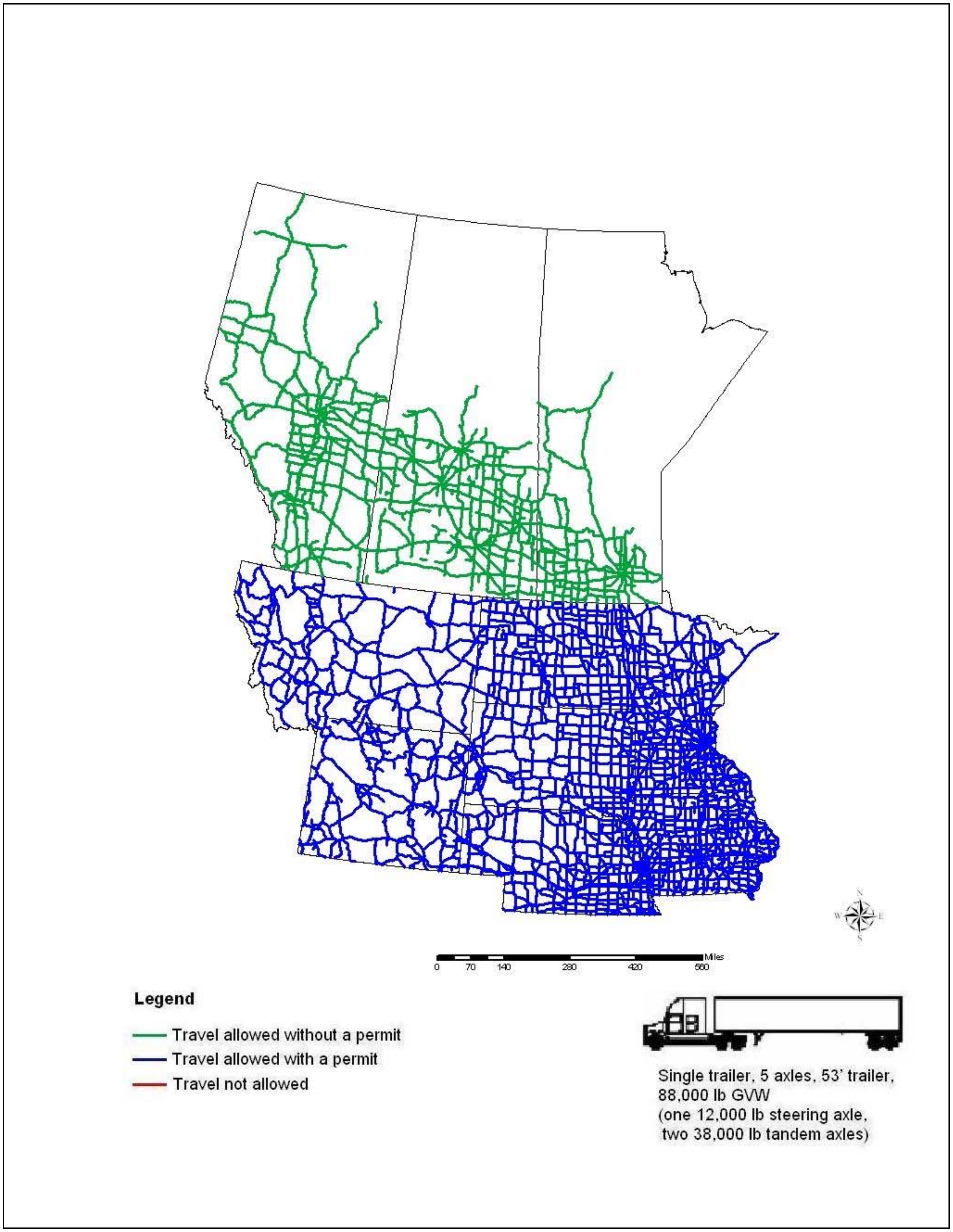


Figure 60 Scenario 2 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

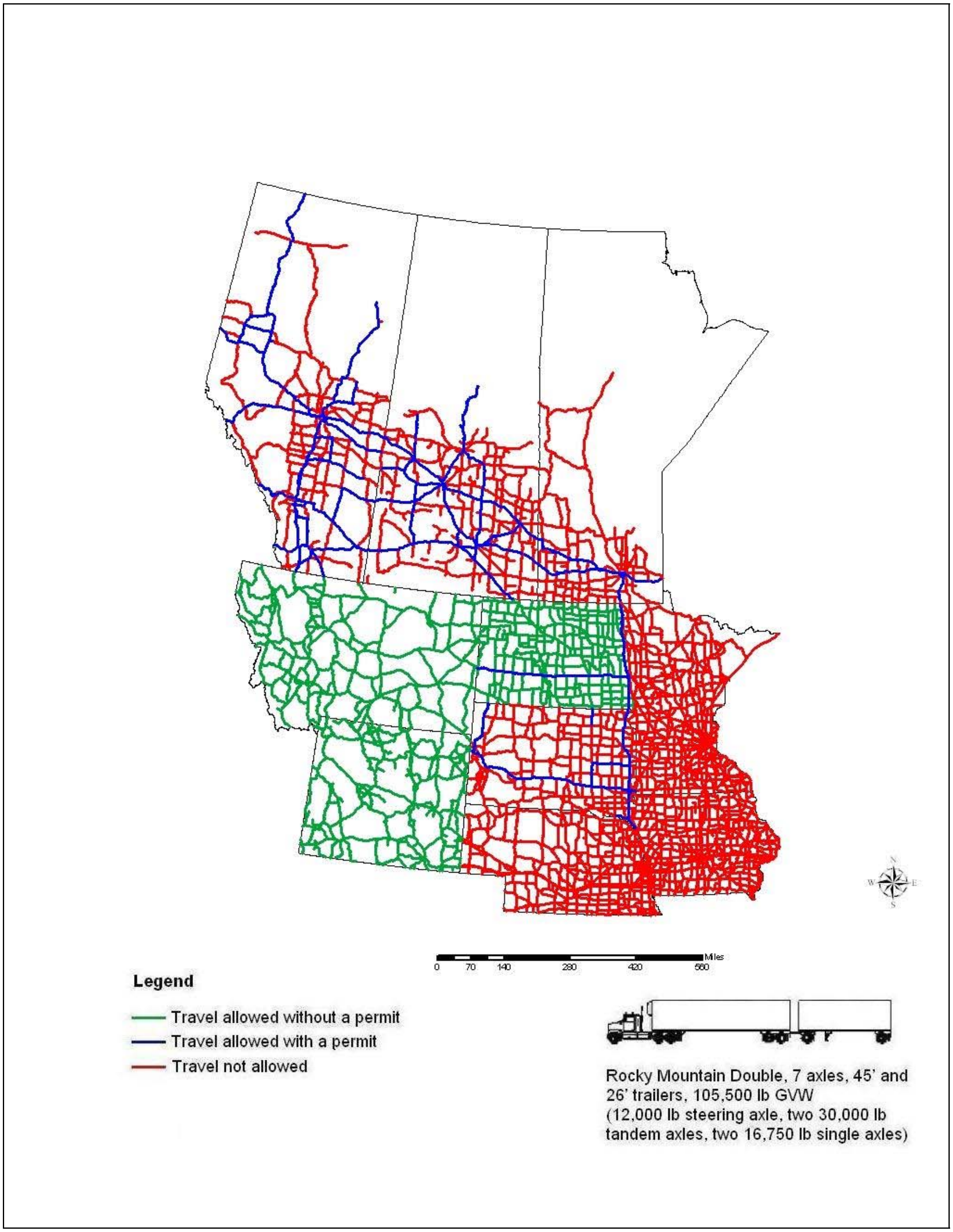


Figure 61 Scenario 3 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian Provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

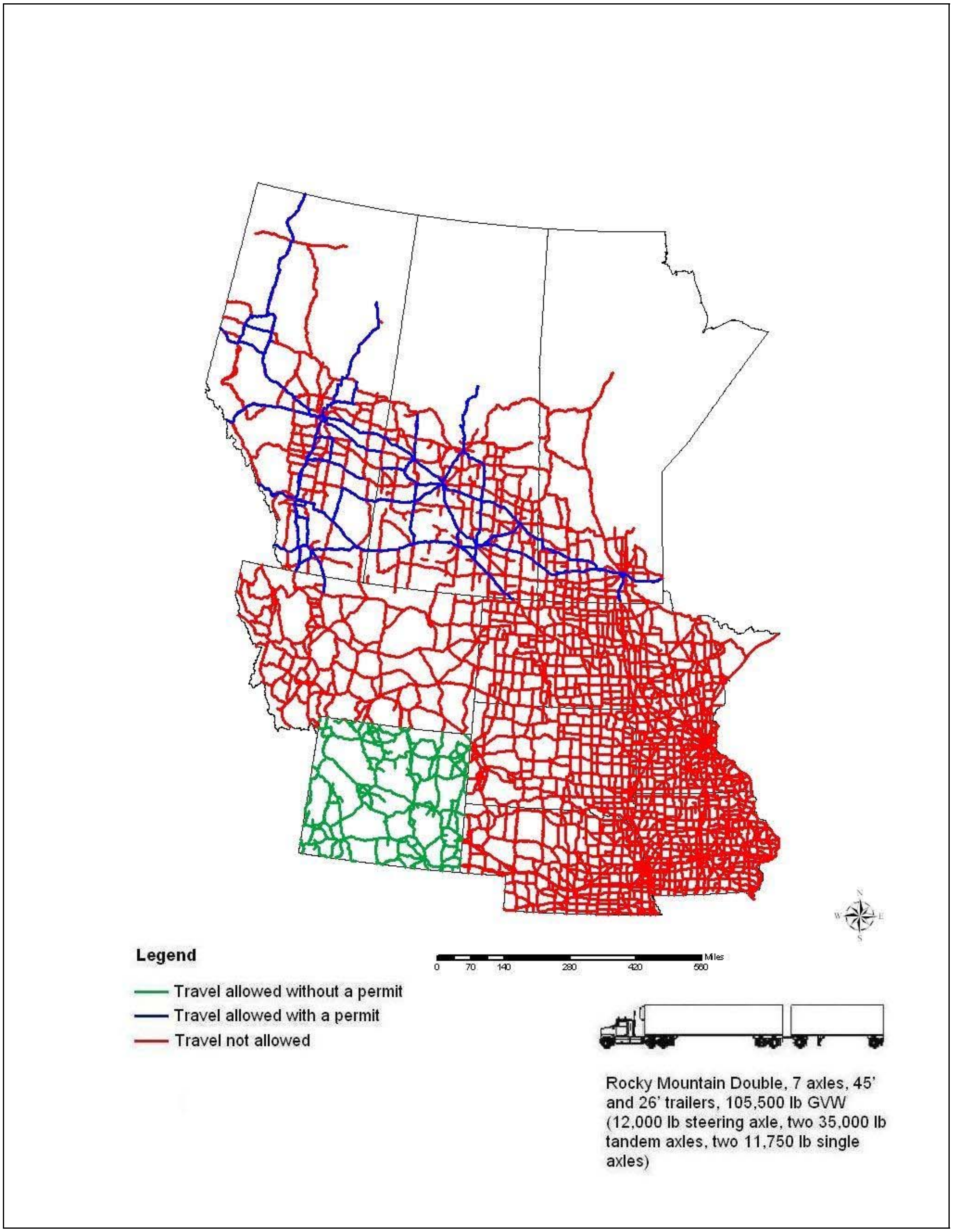


Figure 62 Scenario 4 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian Provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

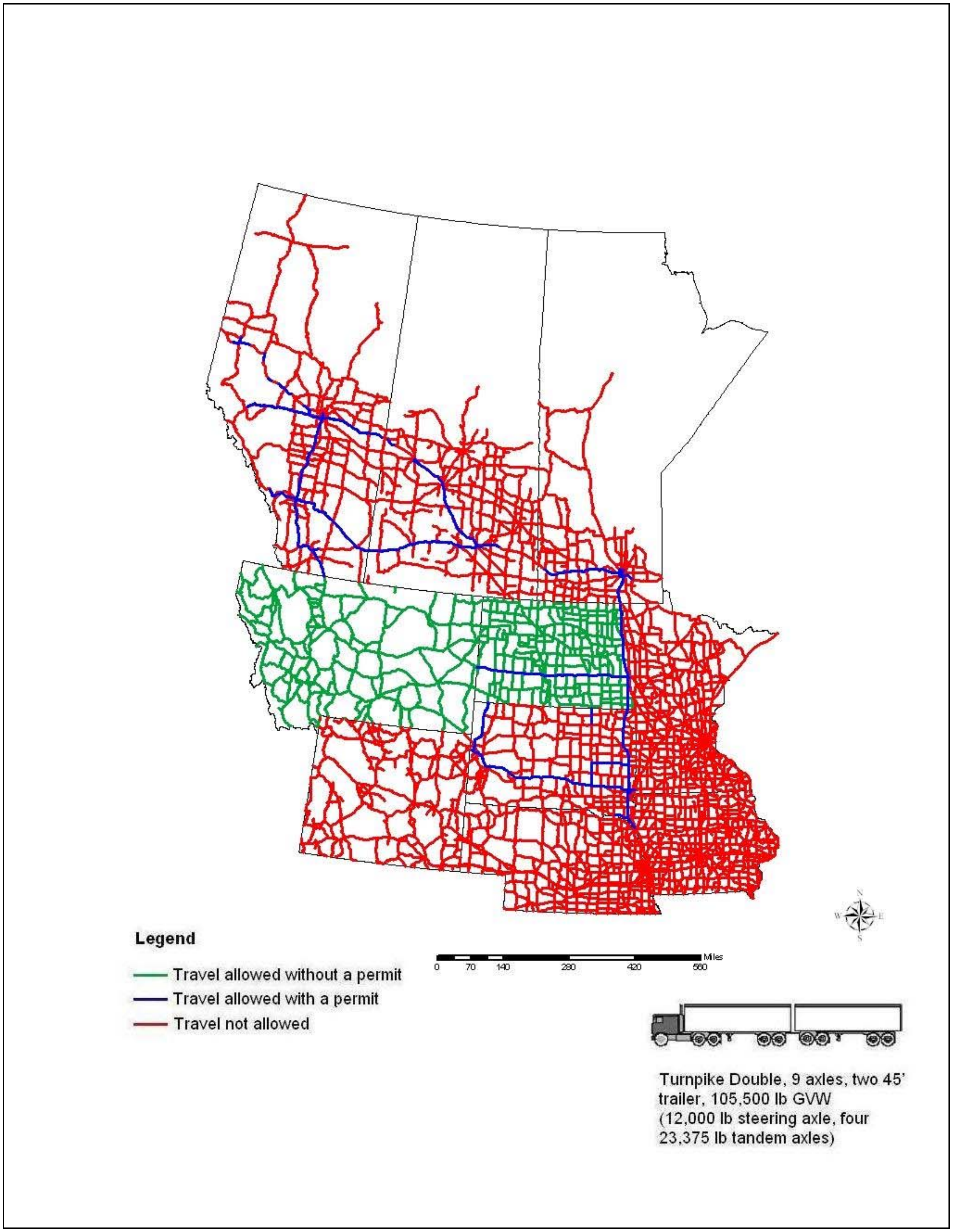


Figure 63 Scenario 5 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian Provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

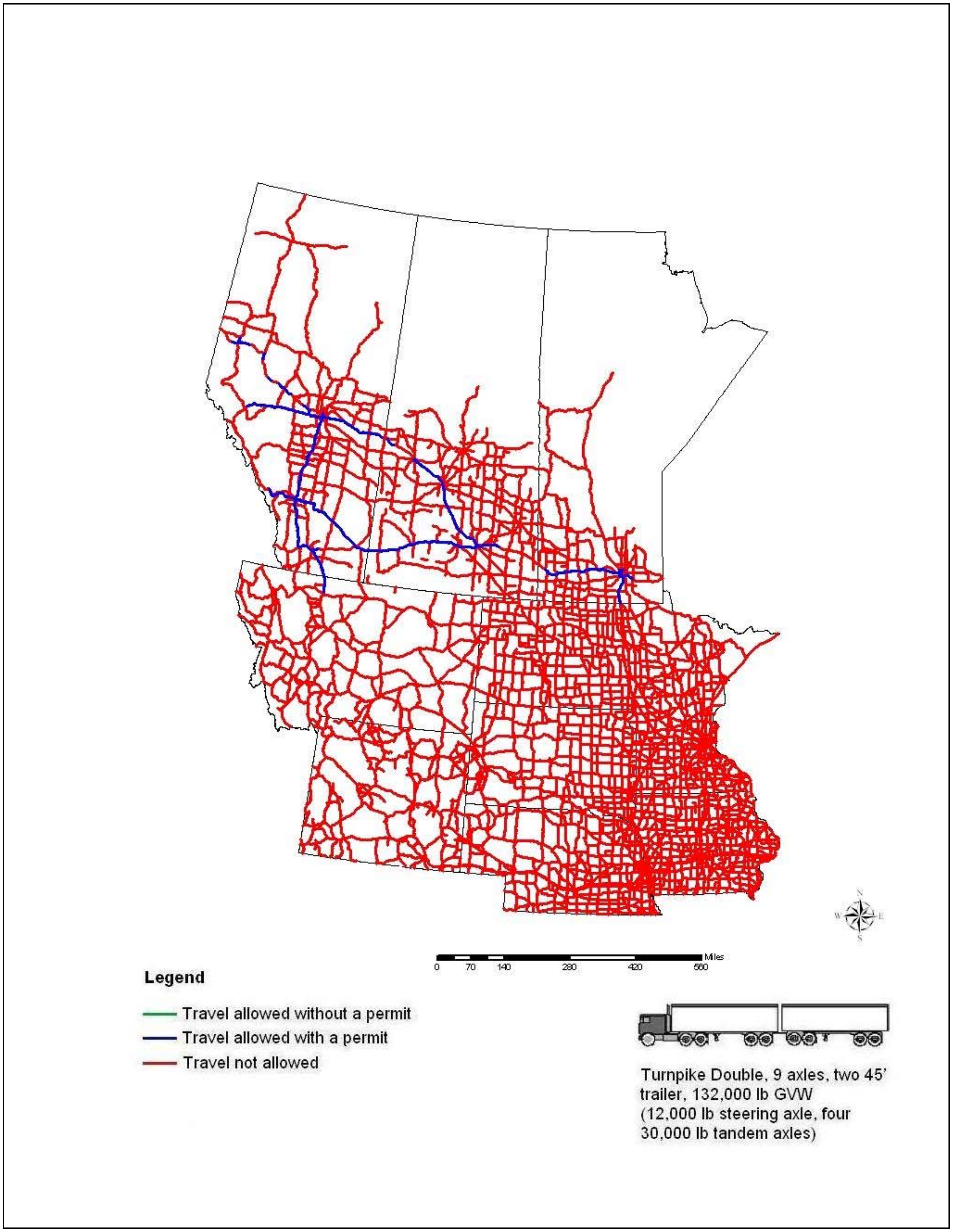


Figure 64 Scenario 6 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian Provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

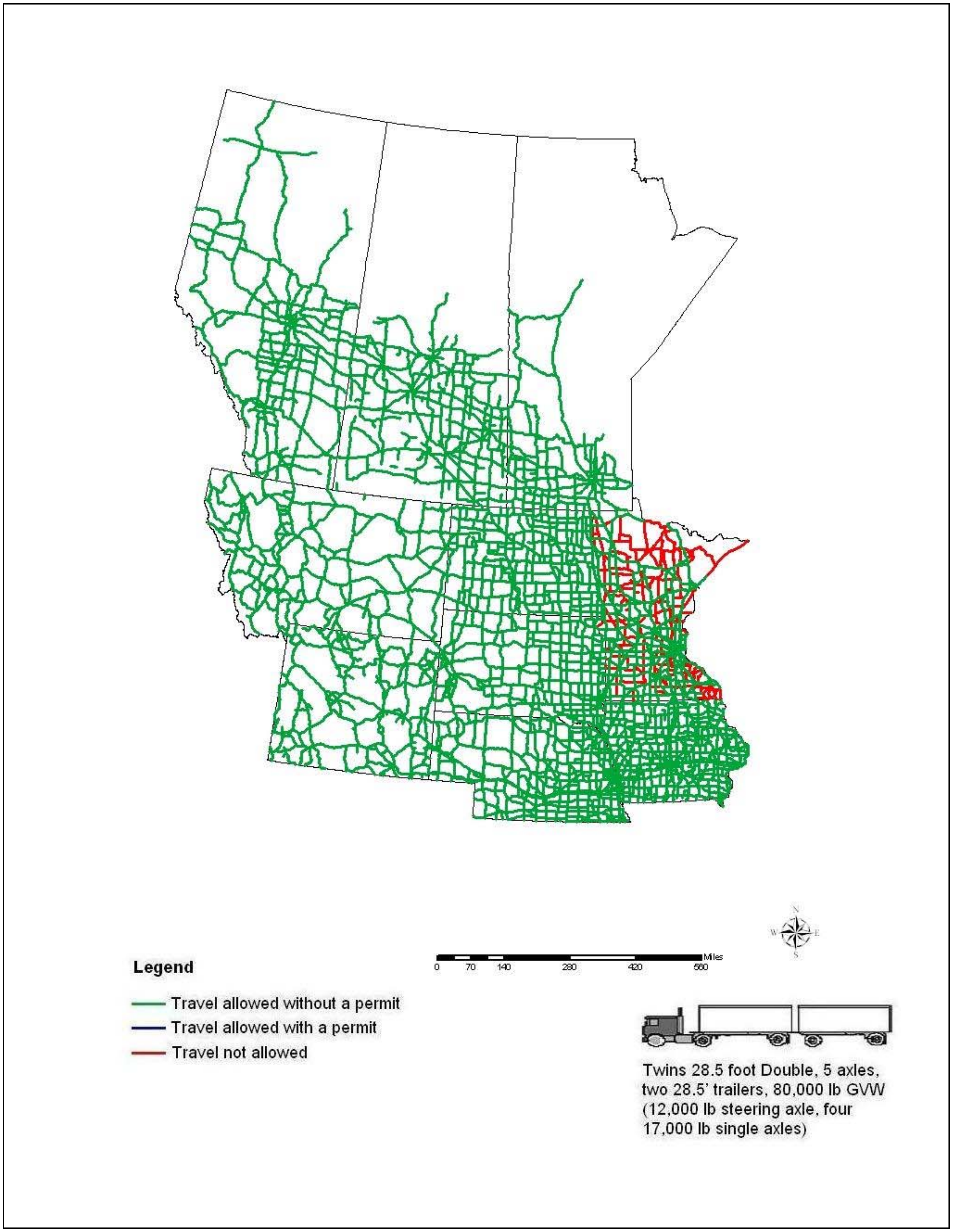


Figure 65 Scenario 7 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

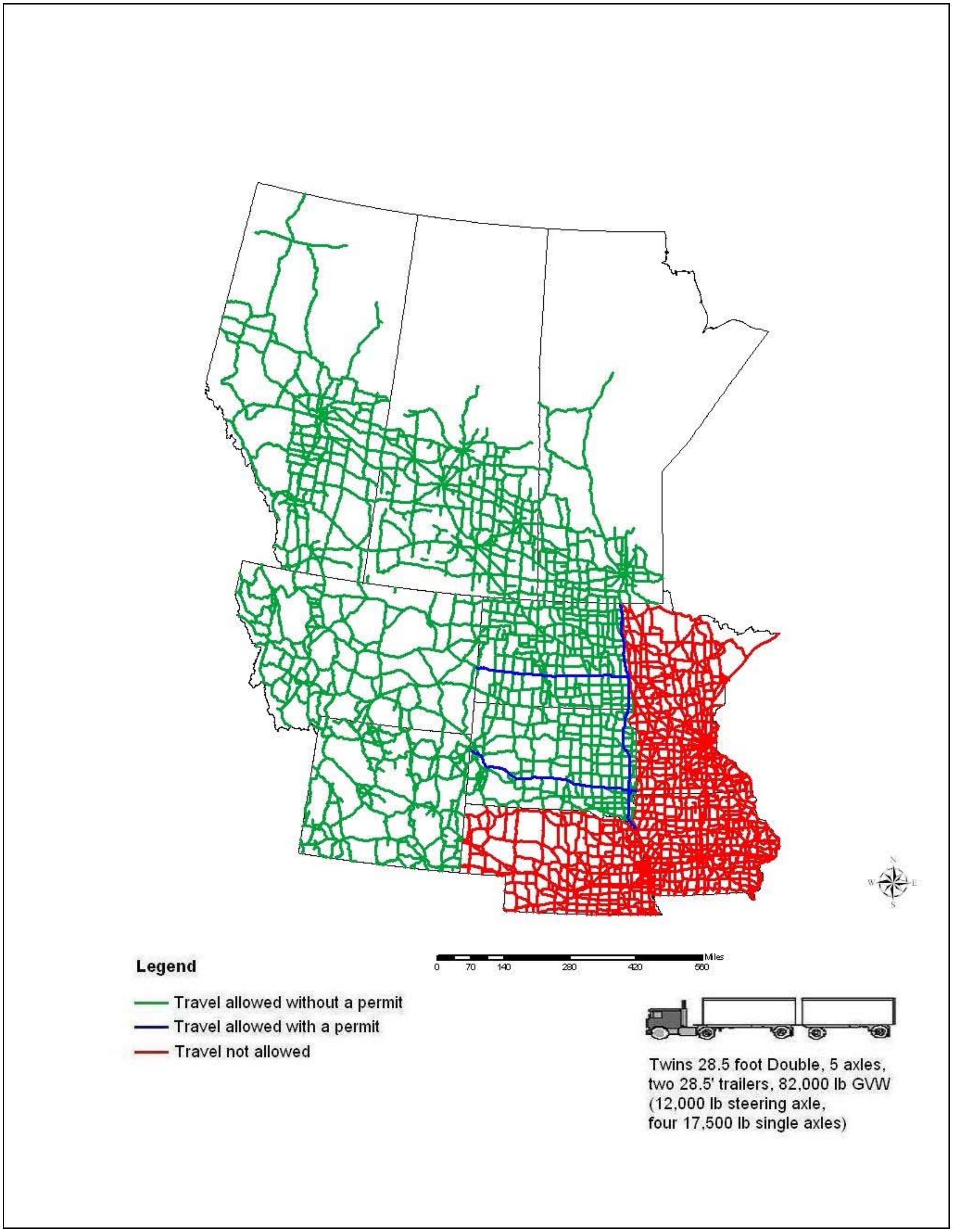


Figure 66 Scenario 8 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

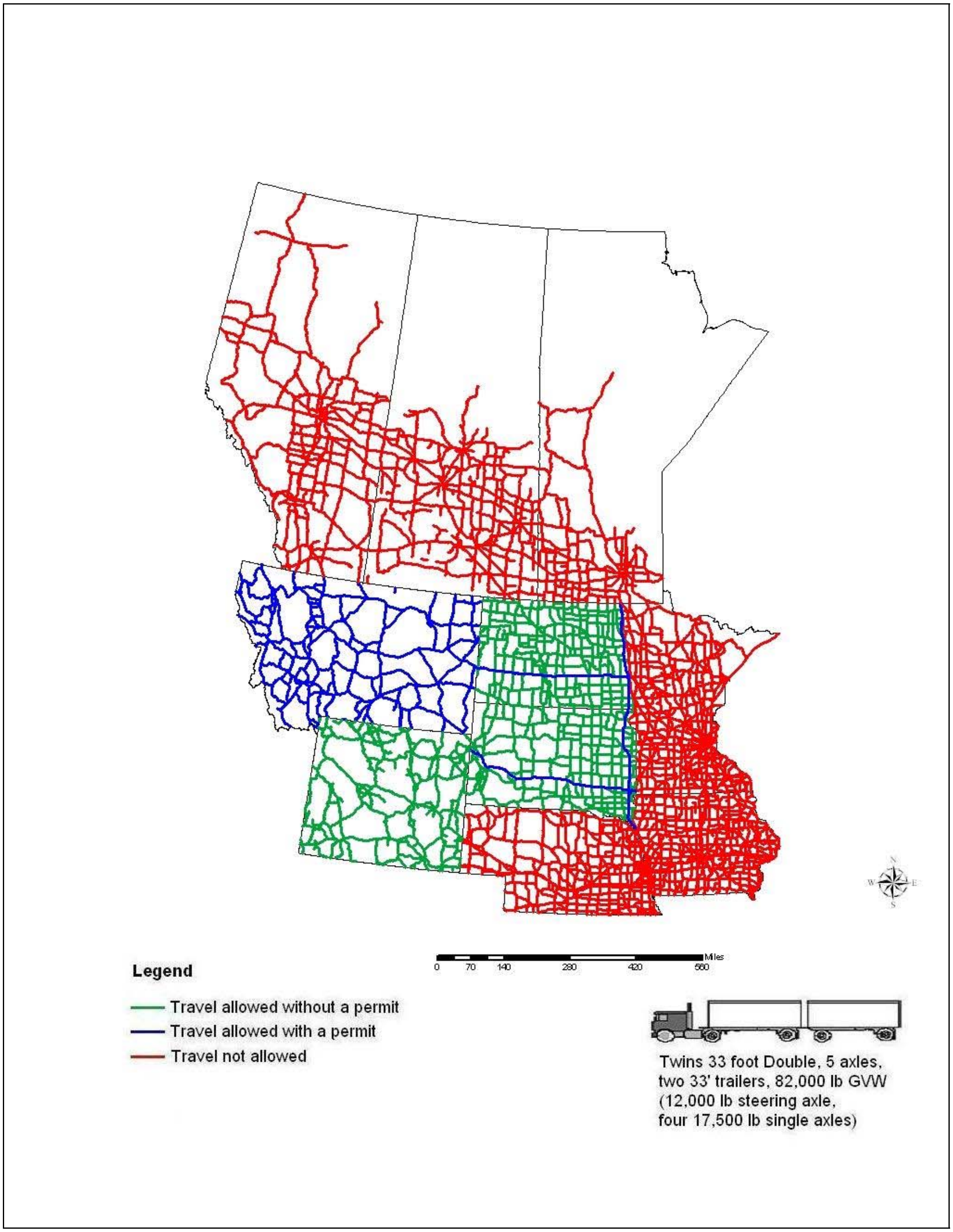


Figure 67 Scenario 9 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

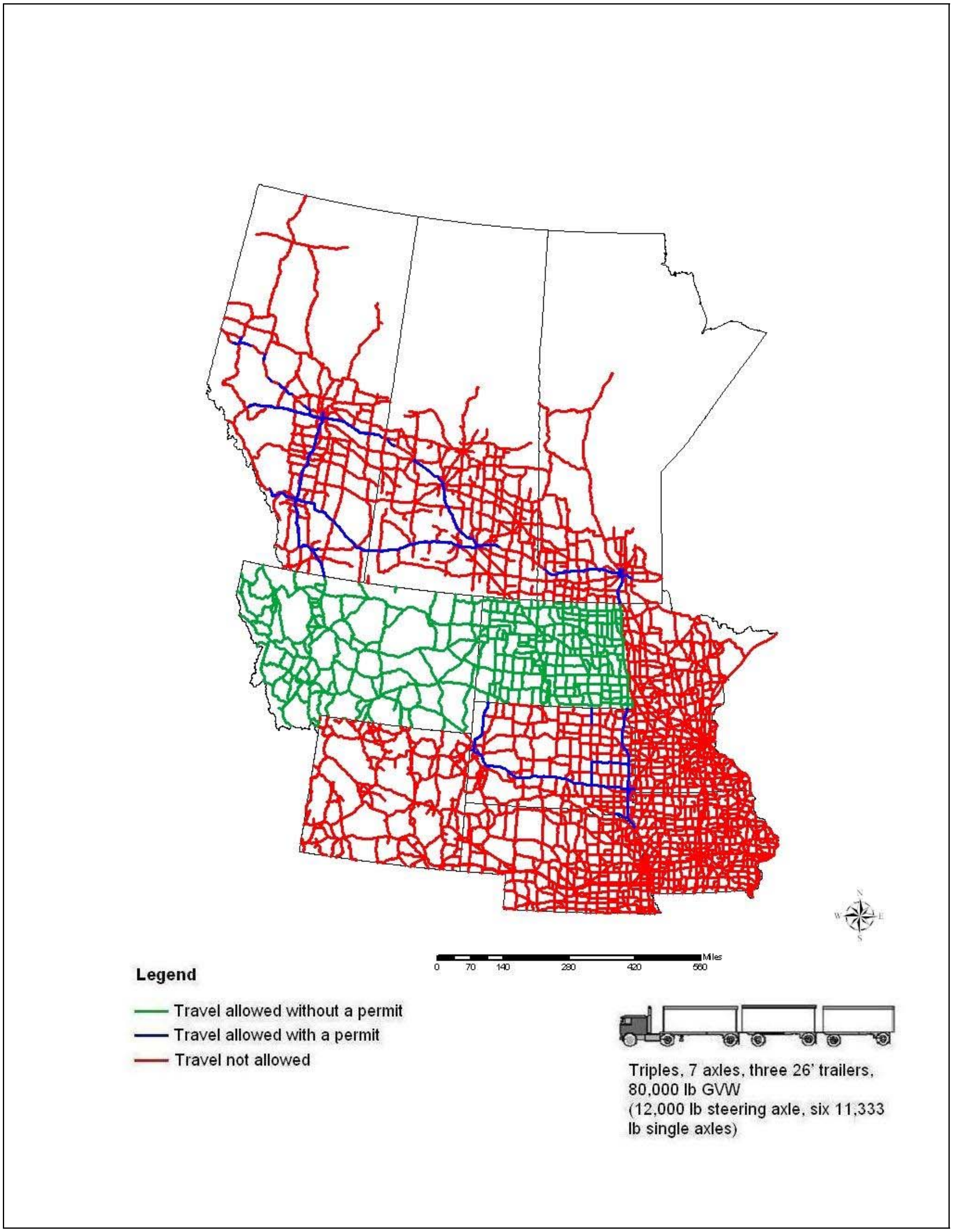


Figure 68 Scenario 10 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

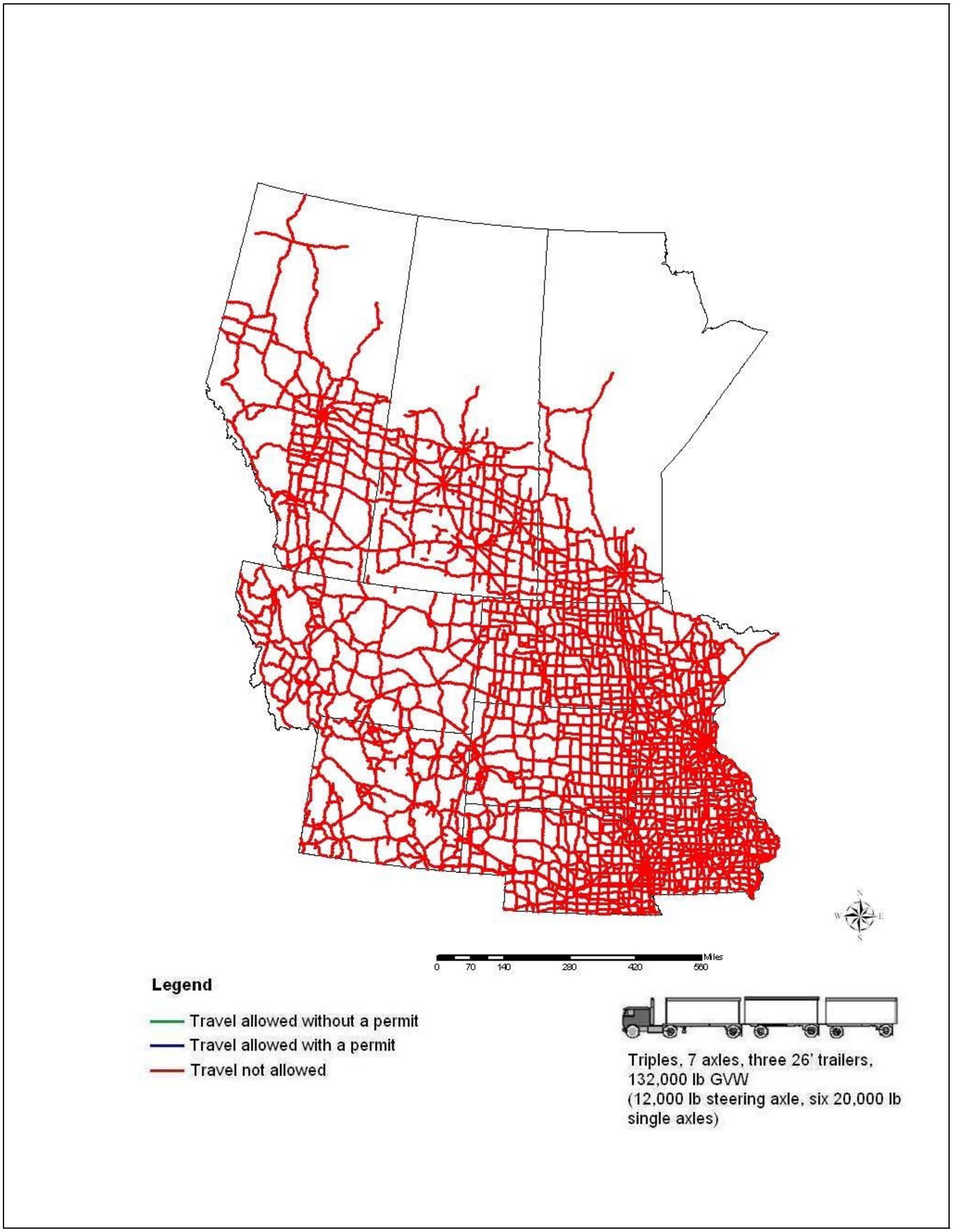


Figure 69 Scenario 11 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

* Canadian provinces have hours of service limitations on LCV routes (minor, seasonal, statutory holiday hours, etc. may apply. See Appendix 1).

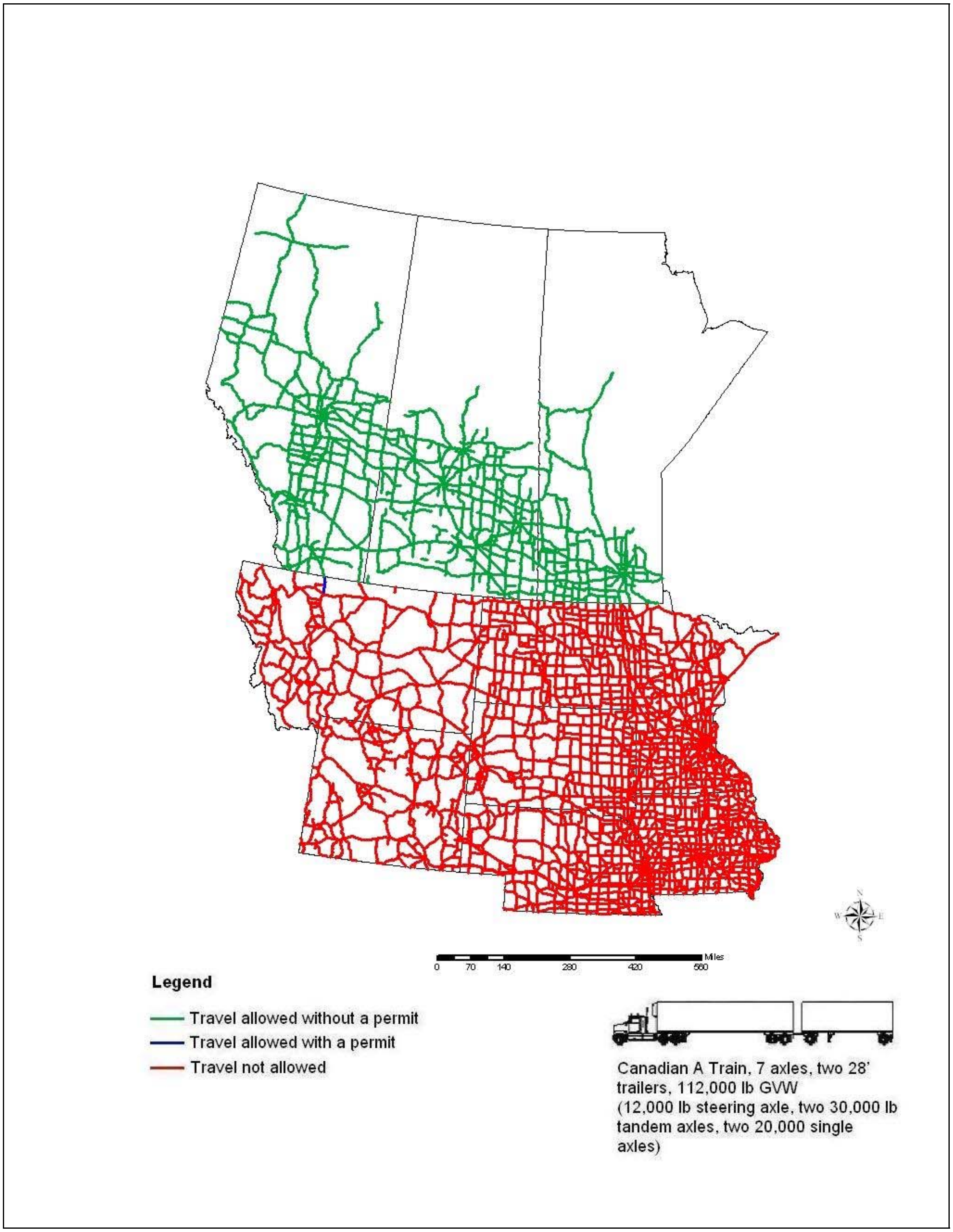


Figure 70 Scenario 12 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

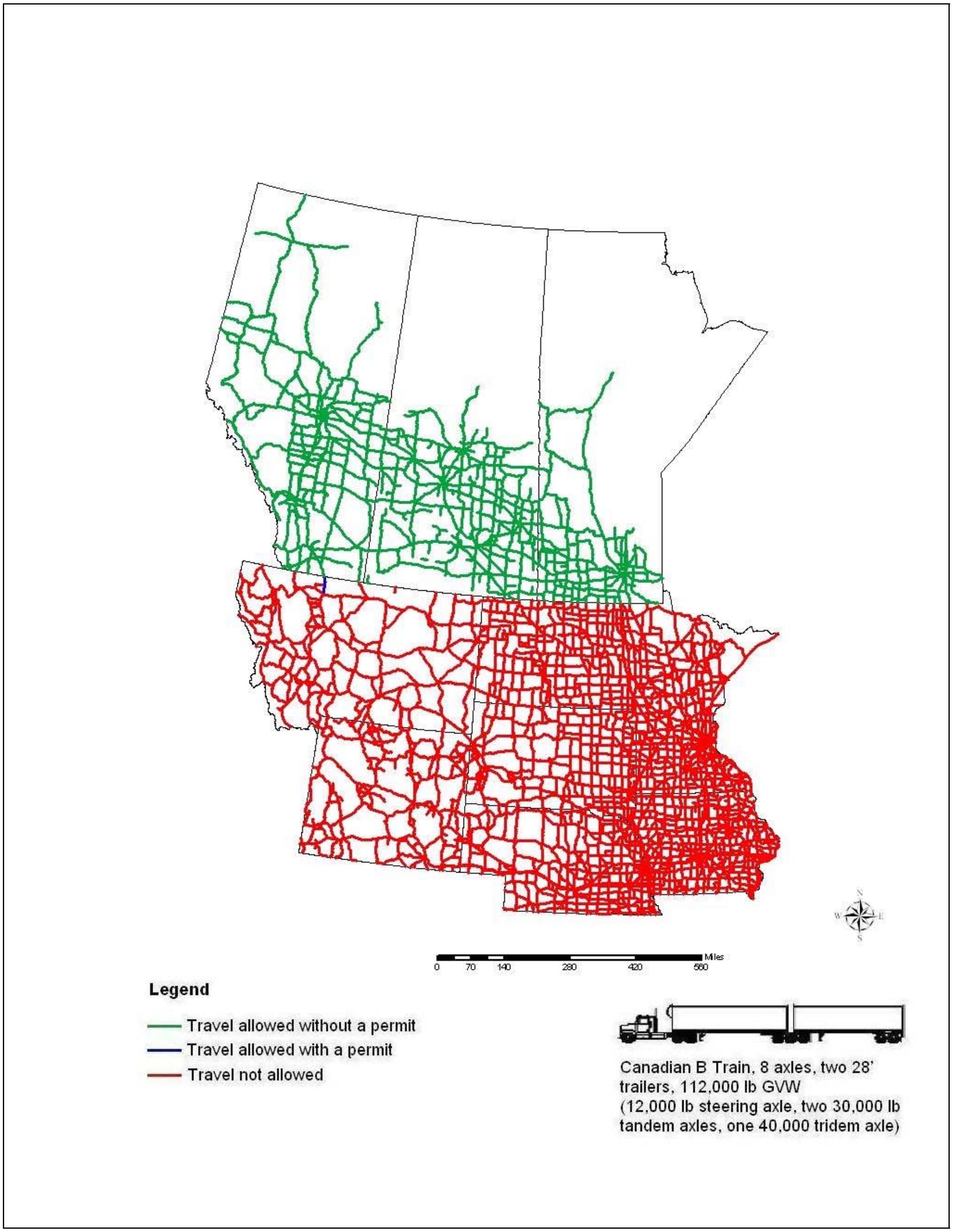


Figure 71 Scenario 13 for All Interstates, U.S. and State Highways, and Major Canadian Highways (Expressways and Major Roads)

Conclusions

This study provides insight into inconsistencies in truck size and weight regulations across states and provinces in the region. These inconsistencies stifle the truck transportation system, reducing competitiveness of the region. The truck travel scenarios for the different truck types traveling across the region point out the problems shippers and transportation providers face in moving from state to state, state to province, or vice versa. Some truck configurations are allowed in one state or province and not allowed in bordering states or provinces. The freight travel scenario maps display the inconsistent truck regulatory environment. For example, Minnesota and Iowa do not allow a Rocky Mountain Double regardless of its weight. The Strategic Freight Study on Motor Carrier Issues points out the efficiency of larger trucks. Another example is that triple trailers are very limited in their operation and are only allowed to move freely in Montana and North Dakota.

Larger trucks may reduce trucking cost and do less road damage. LCVs can reduce road damage and shipping costs by reducing trip numbers because of the increased payload. Truck regulations throughout the region may reduce the efficiency of freight flows and reduce the competitiveness of our region.

Appendix 7-1. Approved Canadian LCV Routes

A LCV with legal size and weight is allowed on all Interstate routes in South Dakota. According to SD legislature administrative rules (70:03:01:65), a LCV may travel only on U.S. and state highways routes approved by the SD DOT. The designated LCV routes are:

- U.S. Highway 281 from the North Dakota border to the intersection of U.S. Highway 281 and Eighth Avenue in the north part of Aberdeen;
- State Trunk Highway 50 from Interstate 29 to the intersection of State Trunk Highway 50 and Burleigh Street in the east part of Yankton;
- U.S. Highway 85 from the North Dakota border to Interstate 90 north of Spearfish;
- The U.S. Highway 14 bypass from Interstate Highway 29 to the intersection of U.S. Highway 14 and the U.S. Highway 14 bypass on the west side of Brookings;
- U.S. Highway 14 from the intersection of the U.S. Highway 14 bypass and U.S. Highway 14 on the west side of Brookings to the intersection south of Wolsey of U.S. Highway 281 and U.S. Highway 14; and
- U.S. Highway 281 from Interstate Highway 90 to the intersection south of Wolsey of U.S. Highway 281 and U.S. Highway 14.

Alberta, Saskatchewan, and Manitoba also have designated LCV routes.

ALBERTA LCV ROUTES

Hours of operation: operation will be allowed 24 hours per day except in the following cases:

- On all highways, movement will not be allowed:
    - After 4 p.m. on Dec. 24 and Dec. 31,
    - At anytime on Dec. 25 and Jan. 1, and
    - From 4 p.m. to 8 p.m. on Dec. 26
- On multi-lane highways, within 40 km of the city limits of the cities of Calgary and Edmonton:
    - For a long weekend when Canada Day falls on a Friday, movement will not be allowed – traveling outbound from 4 p.m. to 8 p.m. on the preceding Thursday, and traveling inbound from 4 p.m. to 8 p.m. on the Sunday
    - For a long weekend when Victoria Day, August Civic Holiday, Labor Day or Thanksgiving Day falls on a Monday, movement will not be allowed – traveling outbound from 4 p.m. to 8 p.m. on the Friday, and traveling inbound from 4 p.m. to 8 p.m. on the Monday.
- On two-lane highways:
    - For weekends with no special holiday on the Friday or the Monday, movement will not be allowed from 4 p.m. to 8 p.m. on the Friday and Sunday.
    - For a long weekend when a special holiday falls on a Friday, movement will not be allowed on the preceding Thursday and from 4 p.m. to 8 p.m. on the Sunday.
    - For a long weekend when a special holiday falls on a Monday, movement will not be allowed from 4 p.m. to 8 p.m. on the Friday and Sunday.
    - Note: the three conditions above do not apply to Highway 35.
    - In addition to the conditions above, movement will not be allowed on individual two-lane highways as follows:

Highway	Location	Hours	Days
Highway 28	Jct. 28A to Jct. 63	7 a.m. to 9 a.m. 4 p.m. to 7 p.m.	Mon.-Sat.
Highway 28A	Edmonton to Jct. 28	7 a.m. to 9 a.m. 4 p.m. to 7 p.m.	Mon.-Sat.

From the Friday before the Victoria Day Weekend to Tuesday following the Labour Day Weekend:

Highway	Location	Hours	Days
Highway 15	Edmonton to Jct. 21	7 a.m. to 11 a.m. 10 a.m. to 10 p.m.	Mon.-Sat. Sun.
Highway 3	AB/BC border to Jct.22	12 a.m. to 5 p.m.	Fri.-Sat.
Highway 22	Jct. 1 to Jct. 1A	1 p.m. to 3 p.m. 1 p.m. to 8 p.m.	Sat. Sun.

From the Tuesday following the Labour Day Weekend to Thursday before the Victoria Day Weekend:

Highway	Location	Hours	Days
Highway 15	Edmonton to Jct. 21	8 a.m. to 7 p.m. 10 a.m. to 7 p.m. 12 p.m. to 7 p.m.	Mon.-Fri. Sat. Sun.

Rocky Mountain Doubles

- All multi-lane highways with four or more driving lanes.
- The following two lane highways:
  - Highway #1A – Calgary to Jct. 22
  - Highway #1A – Jct. 1 (Chestermere) to Calgary
  - Highway #2 – U.S. Border to Jct. 5
  - Highway #2 – Jct. 642 to Jct. 18
  - Highway #2 – Jct. 49 (west of Donnelly) to Jct. 43
  - Highway #2A – Jct. 2 (Leduc) to Jct. 2 (near Morningside)
  - Highway #3 – All
  - Highway #4 – U.S. Border to Lethbridge
  - Highway #5 – Jct. 2 to Lethbridge
  - Highway #8 – Calgary to Jct. 22
  - Highway #9 – Jct. 36 to Saskatchewan
  - Highway #11A – Jct. 2 to Gaetz Avenue (Red Deer)
  - Highway #12 – Jct. 2 to Veteran
  - Highway #13 – Jct. 2A to Camrose
  - Highway #14 – Edmonton to Saskatchewan Border
  - Highway #15 – Edmonton to Jct. 45 (South of Bruderheim)
  - Highway #16 – West of Hinton to East Jasper Park Gates
  - Highway #17 – Jct. 14 South to the Saskatchewan Border
  - Highway #18 – Jct. 2 to Westlock
  - Highway #21 – Jct. 12 to Jct. 13
  - Highway #22 – Jct. 8 to Jct. 1
  - Highway #22 – Jct. 1 to Jct. 1A
  - Highway #22X – Calgary to Jct. 24
  - Highway #23 – Jct. 2 to Jct. 3
  - Highway #28 – Jct. 28A to Jct. 63

- Highway #28 – Jct. 63 to Jct. 36
- Highway #28A – Edmonton to Jct. 28
- Highway #35 – Jct. 2 to NWT border
- Highway #36 – Jct. 1 to Jct. 9
- Highway #36 – Jct. 14 to Jct. 16
- Highway #36 – Jct. 28 to Lac La Biche
- Highway #39 – Jct. 2 to Calmar
- Highway #43 – Jct. 16 to BC border
- Highway #49 – Jct. 43 (Valleyview) to Jct. 2 (West of Donnelly)
- Highway #49 – Jct. 2 (near Rycroft) to McLennan
- Highway #52 – Jct. 5 to Raymond
- Highway #53 – Jct. 2 to Rimbey
- Highway #55 – Jct. 63 to Athabasca
- Highway #63 – Jct. 28 to Ft. McMurray
- Highway #69 – Jct. 63 to South Industrial Park in Ft. McMurray
- Highway #901 – Jct. 22X to Jct. 1

Turnpike Doubles and Triples

- All multi-lane highways with four or more driving lanes
- Highway #1A from the Calgary City limits east to Jct. Highway #1
- Highway #11A from Highway #2 east to Gaetz Avenue, Red Deer, except between 7 a.m. to 9 a.m. and 4 p.m. to 6 p.m. on weekdays
- Highway #4 at Milk River

Weather

1. For multi lane highways:

   a. LCVs shall not cross oncoming lanes where visibility does not allow it to be done safely.

   b. Where there is accumulated snow on the highway or when the highway is icy, LCV's shall not pass any other vehicle unless that vehicle is traveling at a speed of less than 70 km/hr.

   c. Where a highway becomes impassible due to icy or slippery conditions, LCV's will obey all advisories posted by the authority of Alberta Transportation.

2. For two lane highways, LCV's shall not operate during adverse weather or driving conditions (including but not limited to rain, snow, sleet, ice, smoke, fog, or other conditions) which:

   a. Obscure or impede the drivers ability to drive in a sale manner, or

   b. Prevent the driver from driving with reasonable consideration for the safety of persons using the highway.

The company is required to make a reasonable effort to determine the driving conditions on the route. Vehicles must not be dispatched when adverse conditions are known to be present on the route. Drivers encountering unexpected adverse conditions must stop at the next safe location (or as directed by an authorized Alberta Transportation staff member or a peace officer) and wait for the adverse conditions to abate.

***Special Holidays**

1. Special holiday means Good Friday, Victoria Day, Canada Day. August Civic Holiday, Labour Day, Thanksgiving Day, and Remembrance Day.

MANITOBA LCV ROUTES

Rocky Mountain Doubles

- Provincial Trunk Highway (PTH) #1W – City of Winnipeg limits to Manitoba/Saskatchewan border
- PTH #1E – City of Winnipeg limits to Manitoba/Ontario border
- PTH #3 – City of Winnipeg limits to PTH #100
- PTH #5 – PTH #1W to 5.0 kilometer south
- PTH #7 – City of Winnipeg limits to PTH #101
- PTH #12 – PTH #1E to the town of Steinbach
- PTH #16 – PTH #1W to the town of Shoal Lake
- PTH #29 – PTH #75 to Manitoba/U.S. border
- PTH #75 – City of Winnipeg limits to PTH #29
- PTH #100 – PTH #1E to PTH #1W
- PTH #110 – PTH #1W to Richmond Avenue (Brandon)
- PTH #221 – City of Winnipeg limits to PTH #101
- Victoria Avenue – PTH #110 to 17th Street
- Richmond Avenue – PTH #110 to Maple Leaf access

Turnpike Doubles & Triples

- PTH #1W - City of Winnipeg limits to Virden
- PTH #1E – City of Winnipeg limits to PTH #12
- PTH #3 – City of Winnipeg limits to PTH #100
- PTH #5 – PTH #1W to 5.0 kilometer South
- PTH #7 – City of Winnipeg limits to PTH #101
- PTH #12 – PTH #1E to the town of Steinbach
- PTH #29 – PTH #75 to Manitoba/U.S. Border
- PTH #75 – City of Winnipeg limits to PTH #29
- PTH #100 – PTH #1E to PTH #1W
- PTH #101 – PTH #1E to PTH #1W
- PTH #110 – PTH #1W to Richmond Avenue (Brandon)
- PTH #221 – City of Winnipeg limits to PTH #101
- Victoria Avenue – PTH #110 to 17th Street (Brandon)
- Richmond Avenue – PTH #110 to Maple Leaf access

Hours of Operation

- Normal hours of operation
  - 9 p.m. on Sunday to 4 p.m. on Friday
  - 9 p.m. on Friday to 11 a.m. Saturday
  - 9 p.m. on Saturday to 11 a.m. Sunday
- No movement will be allowed after 4 p.m. on days preceding a statutory holiday
- No movement will be allowed on statutory holidays. Statutory holidays are defined as:
  - New Years Day (January 1)
  - Good Friday (the Friday preceding Easter Sunday)
  - Victoria Day (the Monday of the May Long Weekend)
  - Canada Day (July l)
  - Labour Day (the first Monday in September)
  - Thanksgiving Day (the second Monday in October)
  - Christmas Day (December 25)
- Movement will be allowed on the following statutory holiday:
  - Boxing Day (December 26) travel may commence at 11 p.m. on Christmas Day (December 25)
- Between the Tuesday following the September long weekend (Labour Day) and the Thursday preceding the May long weekend (Victoria Day), long combination vehicles will be allowed to travel on their designated routes 24 hours a day, seven days a week. Note: No movement will be allowed as stated in conditions 2 and 3 above.

SASKATCHEWAN LCV ROUTES

Rocky Mountain Doubles

Routes with Minor Reduced Hours

The day preceding and the concluding day of a Statutory Holiday Weekend and Statutory Holidays that fall on weekdays from 12 p.m. to 11 a.m., and from 9 p.m. to 12 p.m. Allowable EEMV operation during all other times.

- Highway 9 North from Whitewood to Stockholm
- Highway 80 East from Stockholm to Esterhazy
- Highway 9 West from Stockholm and continuing North to Yorkton
- Highway 6 North from Regina to Melfort
- Highway 3 East from Melfort to Junction at Highway 23
- Highway 35 North from Tisdale to Nipawin
- Highway 4 North from Rosetown to Biggar
- Highway 14 East from Biggar to Saskatoon
- Highway 14 Northwest from Biggar to Wilkie
- Highway 29 Northeast from Wilkie to North Battleford
- Highway 14 West from Wilkie to Highway 17 and North to Alberta Highway Junction 14/Saskatchewan Highway Junction 40

Routes with Year Round Reduced Hours

- Monday – Friday:
  - 12 p.m. to 7 a.m.
  - 9 p.m. to 12 p.m.

- Saturdays, Sundays, and Statutory Holidays:
  - 12 p.m. to 9 a.m.
  - 9 p.m. to 12 p.m.

- Highway 7 Northeast from Delisle to Saskatoon
- Highway 11 Northeast from Saskatoon to Prince Apoundert
- Highway 2 North from Prince Apoundert to LaRonge
- Highway 39 Northwest from North Portal to Estevan

Routes with Seasonal Reduced Hours

- From the May Long Weekend to the September Long Weekend:
  - 12 p.m. to 9 a.m.
  - 9 p.m. to 12 p.m.

- From the September Long Weekend to the May Long Weekend Fridays and Sundays:
  - 12 p.m. to 11 a.m.
  - 9 p.m. to 12 p.m.

- Mondays to Thursdays and Saturdays:
  - 12 p.m. to 12 p.m.

- The day proceeding and the concluding day of a Statutory Holiday Weekend and Statutory Holidays that fall on weekdays:
  - 12 p.m. to 11 a.m.
  - 9 p.m. to 12 p.m.

- Highway 39 Northwest from Estevan to the Junction of Trans Canada Highway 1
- Highway 6 from Corinne to Regina
- Trans Canada Highway 1 East from Indian Head to the Manitoba border
- Trans Canada Highway 16 East from Saskatoon to the Manitoba border
- Highway 10 Northeast from Balgonie to Yorkton
- Highway 3 Northwest from Melfort to Prince Apoundert
- Highway 4 North from Swift Current to Rosetown
- Highway 7 West from Delisle to the Alberta border
- Trans Canada Highway 1 West from North Battleford to Marshall
- Highway 4 North from North Battleford to Meadow Lake

Routes with Statutory Holiday Hours of Restriction

Four-lane divided and selected two-lane highways from 12 p.m. to 12 a.m. and from 9 p.m. to 12 p.m. Allowable EEMV operation during all other times.

- Trans Canada Highway 16 West from Marshall to the Alberta border
- Trans Canada Highway 1 East from Gull Lake to Indian Head
- Trans Canada Highway 16 East from North Battleford to Saskatoon
- Highway 11 Southeast from Saskatoon to Regina

50 Kilometer Commuter Zone

- Monday to Friday on two-lane highways:
    - 12 p.m. to 7 a.m.
    - 9 a.m. to 4 p.m.
    - 7 p.m. to 12 p.m.

- Saturdays and Sundays on two-lane highways
    - 12 p.m. to 12 p.m.

Saskatoon 50 kilometer zone

- Highways 41, 16, 11, and 7

Regina 50 kilometer zone

- Highway 6 North and South and Highway 10

Turnpike Doubles & Triples

Existing EEMV Route

- Trans Canada Highway 1 West from Indian Head to Gull Lake
- Highway 11 Northwest from Regina to Saskatoon

Partnership Routes

- Trans Canada Highway 16 West from Saskatoon to North Battleford
- Trans Canada Highway 16 West from Maidstone to the Alberta border
- Trans Canada Highway 1 West from Gull Lake to the Alberta border
- Trans Canada Highway 1 East from Indian Head to Wolseley

Haul Restrictions

- No hauling on Statutory Holidays from 12:00 noon to 9:00 p.m.

Appendix 7-2. Sweetgrass/Shelby Weight Agreement

Maximum Axle Weights for Canadian Weights

Carriers operating under the Alberta-Shelby Agreement must be licensed to the maximum gross weight allowed on the combination.

Tractor semi trailer (5-axle)	88,000 lbs
A-Train	118,000 lbs
A-Train (7-axle)	126,000 lbs
B-Train (8-axle)	138,000 lbs

20,000 lbs on a single-axle with dual tires
37,500 lbs on a tandem axle
46,300 lbs on a 9' tridem
50,700 lbs on a 10' tridem

General permit conditions

- Issued the same way as a regular overweight permit. Use all spacings and weights.
- Utilize maximum weights on permit unless the driver gives you actual axle weights (unless splitting trailers in Shelby).
- Must include "W" in the load codes.
- Permit is for weight only. Must also have an oversize permit for any combination of vehicles.
- If vehicle has a term permit, include that number on the Alberta/Shelby weight permit. Some carriers will split their Super-B trailers in Shelby or Oilmont and continue on. They must be legal weights past Shelby. In this instance, the permit destination should say "split at Shelby or Oilmont."
- Canadian officers are at the Coutts Scale 24 hours a day. The trip permit can be faxed to the scales to be picked up by the driver if a Montana Officer is not present.
- Routing information for the permit is: AB/MT I-15 to Shelby or Shelby to AB/MT I-15.

Trip Permits

- Permits are for one-way only. If reloading and returning with another Canadian weight, they must purchase another permit.
- If not prorated for enough weight. Must also include $50 truck permit.
- Permit is valid between Sweetgrass and Shelby (or Shelby to Sweetgrass).

Term Permits

- Issued the same as a term or quarterly overweight permit.
- Must be prorated in Montana for maximum weight legally hauled with a permit.
- Super-B's require a 5,000 lb. overweight permit, and the cost is $195.50 per quarter or $750.00 per year the Alberta/Shelby Agreement is the vehicle analysis for the term weight permit.
- Five-axle combinations require a 5,000 lb. overweight permit, and the cost is $60 per quarter or $200 per year.