

# Highway Weight Limits

Wisconsin Department of  
Transportation

Presentation to Special Committee on  
Weight Limits

September 22, 2006

# Weight Law 101:

- **348.02** Applicability of Chapter
  - ◆ Vehicles owned or operated by or for a governmental agency
  - ◆ To the vehicle and any load which it is carrying
  - ◆ Does not apply to road machinery actually engaged in construction maintenance of a highway within the limits of the project
  - ◆ Does not apply to a combination of vehicles in an emergency towing operation

# 348.15(1) Weight Limitations on Class “A” Highways

- Class “A” Highways include all state trunk highways and connecting highways and those county trunk highways, town highways, and city and village streets or portions thereof that have not been designated as Class “B” pursuant to s.349.15

- **348.15(3)(b)**

- ◆ 20,000 pounds on a single axle
- ◆ Except 13,000 pounds on the steering axle of a truck tractor

- **348.15(3)(c)**

- ◆ The gross weight imposed on the highway by any group of 2 or more axles may not exceed the maximum gross weights identified in the table
- ◆ The table is based upon the distance between axles and the number of axles in a group

# Vehicle Not in Combination

## MAXIMUM WEIGHT LIMITATIONS CHART Vehicle Not In Combination

Column **A** - Distance in Feet between foremost and rearmost axles of a group

Column **B** - 2 consecutive axles: of a 2-axle vehicle;  
OR of any vehicle having a total of 3 or more axles

Column **C** - 3 consecutive axles: of a 3-axle vehicle;  
OR of any vehicle having a total of 4 or more axles

Column **D** - 4 consecutive axles: of a 4-axle vehicle;  
OR of any vehicle having a total of 5 or more axles

Column **E** - 5 consecutive axles: of a 5-axle vehicle;  
OR of any vehicle having a total of 6 or more axles

Column **F** - 6 consecutive axles of any vehicle having a total  
of 6 or more axles

Column **G** - 7 consecutive axles: of a 7-axle vehicle;  
OR of any vehicle having a total of 7 or more axles

Column **H** - 8 consecutive axles: of an 8-axle vehicle;  
OR of any vehicle having a total of 8 or more axles

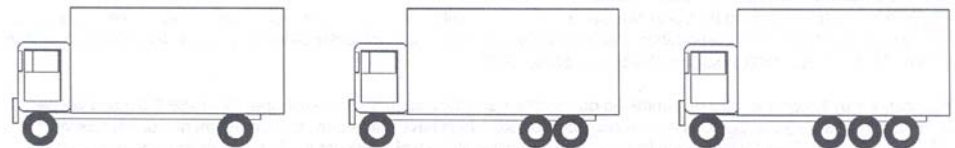
Maximum Gross Weight in Pounds on a Group of Axles

A - Feet	B - 2 axles	C - 3 axles	D - 4 axles	E - 5 axles	F - 6 axles	G - 7 axles	H - 8 axles
4	34,000						
5	34,000						
6	34,000						
7	34,000	37,000					
7.5-8	35,000	38,500					
8.1-8.4	38,000	42,000					
9	39,000	43,000					
10	40,000*	43,500					
11		44,500					
12		45,000	55,500				
13		46,000	60,000				
14		46,500	60,500				
15		47,500	61,500				
16		48,000	62,000	64,200			
17		49,000	63,000	71,700			
18		49,500	63,500	72,200			
19		50,500	64,500	73,000			
20		51,500	65,000	73,000	73,000		
21		52,200	66,000	73,000	73,000	73,000	
22		52,900	66,500	73,000	73,000	73,000	
23		53,600	67,500	73,000	73,000	73,500	
24		54,300	68,500	73,000	73,000	74,000	
25		55,000	69,000	73,000	73,000	74,500	80,000
26		55,700	69,500	73,000	73,000	75,000	80,000
27		56,500	70,500	73,000	73,000	76,000	80,000
28		57,100	71,300	73,000	73,000	76,500	80,000
29		58,000	72,000	73,000	73,000	77,000	80,000
30		58,500	72,700	73,000	73,000	77,500	80,000
31		59,500	73,000	73,000	73,000	78,000	80,000
32		60,000**	73,000**	73,000**	73,000**	78,500	80,000**
33						79,500	
34						80,000***	

**Instructions:** Use this chart to determine maximum gross weight in pounds, on a group of axles for a vehicle not in combination, on Class "A" highways. See examples of vehicles below.

\* Maximum at 10 or more feet between axles  
 \*\* Maximum at 32 or more feet between axles  
 \*\*\* Maximum at 34 or more feet between axles

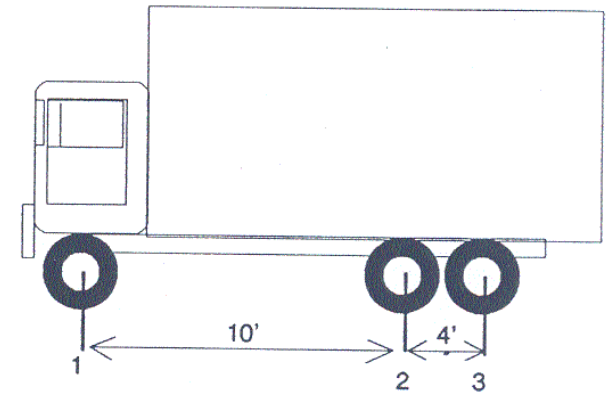
20,000 pounds for a single axle



# Vehicle Not in Combination

## Example No. 2

1. Maximum weight that may be imposed by any axle of this vehicle is 20,000 lbs.
2. Maximum weight by the group of axles 1 and 2 with 10 feet spacing is 40,000 lbs.
3. Maximum weight by the group of axles 2 and 3 with 4 feet spacing is 34,000 lbs.
4. Maximum weight by the group of axles 1, 2 and 3 with a total spacing of 14 feet is 46,500 lbs.





# Vehicle in Combination

## MAXIMUM WEIGHT LIMITATIONS CHART Combination of Vehicles

Column A - Distance in Feet between foremost and rearmost axles of a group  
 Column B - 2 consecutive axles of any combination of vehicles having a total of 3 or more axles  
 Column C - 3 consecutive axles of any combination of vehicles having a total of 4 or more axles  
 Column D - 4 consecutive axles of any combination of vehicles having a total of 5 or more axles

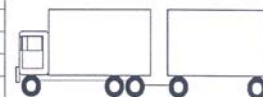
Column E - 5 consecutive axles of any combination of vehicles having a total of 5 or more axles  
 Column F - 6 consecutive axles of any combination of vehicles having a total of 6 or more axles  
 Column G - 7 consecutive axles of any combination of vehicles having a total of 7 or more axles  
 Column H - 8 consecutive axles of any combination of vehicles having a total of 8 or more axles

Maximum Gross Weight in Pounds on a Group of Axles

A - Feet	B - 2 axles	C - 3 axles	D - 4 axles	E - 5 axles	F - 6 axles	G - 7 axles	H - 8 axles
4	34,000						
5	34,000						
6	34,000						
7	34,000	37,000					
7.5-8	35,000	38,500					
8.1-8.4	38,000	42,000					
9	39,000	43,000					
10	40,000*	43,500	48,500				
11		44,500	49,500				
12		45,000	50,000				
13		46,000	50,500	62,500			
14		46,500	51,500	62,500			
15		47,500	52,000	62,500			
16		48,000	52,500	62,500			
17		49,000	53,500	63,200	64,000		
18		49,500	54,100	64,400	65,000		
19		50,500	55,100	65,000	65,500		
20		51,500	56,000	65,700	66,000		
21		52,200	56,800	66,900	66,900	73,000	
22		52,900	57,600	67,700	67,700	73,000	
23		53,600	58,400	68,900	68,900	73,500	
24		54,300	59,200	70,000	70,000	74,000	
25		55,000	60,000	71,000	71,000	74,500	80,000
26		55,700	60,800	72,000	72,000	75,000	80,000
27		56,500	61,600	72,800	72,800	76,000	80,000
28		57,100	62,400	73,000	73,000	76,500	80,000
29		58,000	63,200	73,000	73,000	77,000	80,000
30		58,500	64,000	73,000	73,000	77,500	80,000
31		59,500	64,000	73,000	73,000	78,000	80,000
32		60,000**	64,000	73,000	73,000	78,500	80,000**
33			64,000	73,000	74,000	79,500	
34			64,500	73,000	74,500	80,000***	
35			65,500	73,000	75,000		
36			66,000	73,000	75,500		
37			66,500	73,000	76,000		
38			67,500	73,000	77,000		
39			68,000	73,000	77,500		
40			68,500	73,000	78,000		
41			69,500	73,500	78,500		
42			70,000	74,500	79,000		
43			70,500	75,000	80,000		
44			71,500	75,500	80,000		
45			72,000	76,000	80,000		
46			72,500	77,000	80,000		
47			73,500	77,500	80,000		
48			74,000	78,000	80,000		
49			74,500	78,500	80,000		
50			75,500	79,500	80,000		
51			76,000****	80,000****	80,000****		

Instructions: Use this chart to determine maximum gross weight in pounds, on a group of axles for a combination of vehicles, on Class "A" highways. See examples of combination of vehicles below.

- \* Maximum at 10 or more feet between axles
- \*\* Maximum at 32 or more feet between axles
- \*\*\* Maximum at 34 or more feet between axles
- \*\*\*\* Maximum at 51 or more feet between axles

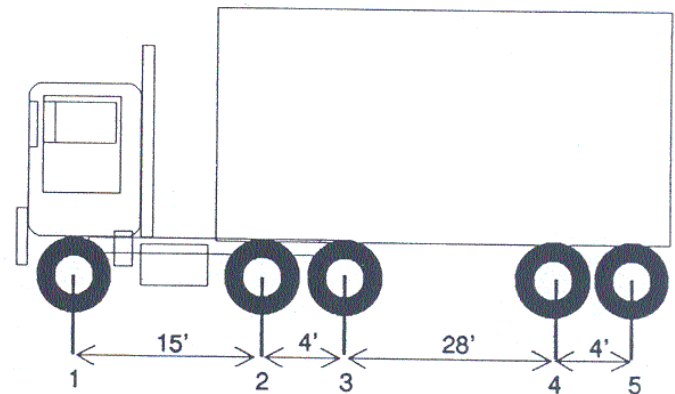


2 consecutive sets of tandem axles may impose on the highway a gross load of 34,000 pounds each if the overall distance between the first and last axles of such consecutive sets of tandem axles is 36 feet or more [348.15(3)(d)]

# Vehicle in Combination

## Example No. 4

1. Maximum weight that may be imposed by a truck tractor steering axle is 13,000 lbs. By any other axle, 20,000 lbs.
2. Maximum weight by the group of axles 1 and 2 is 33,000 lbs.
3. Maximum weight by the group of axles 2 and 3 with 4 feet spacing is 34,000 lbs.
4. Maximum weight by the group of axles 4 and 5 with 4 feet spacing is 34,000 lbs.
5. Since there is 36 feet between the group of axles 2, 3, 4 and 5 each consecutive set of tandem axles may impose 34,000 lbs. To attain 80,000 lbs., the remaining 12,000 lbs. may be imposed only by axle no. 1.
6. Maximum weight that this vehicle may impose is 80,000 lbs. See chart on previous page (axles 1 to 5 have 51 feet spacing).





# Weight Exemptions by Statute

- **348.15(3)(bg)** Milk, Dairy Supplies, Dairy Products
- **348.15(3)(br)** Peeled or unpeeled forest products cut crosswise, metal scrap
- **348.15(3)(bv)** Septage
- Increase in axle or axle group weights only
- Vehicle or combination vehicle cannot exceed 80,000 pounds
- Not valid on the Interstate

# Special or Seasonal Weight Limitations

- **348.17(1)** Cannot exceed special weight limitation postings
- **348.17(3)** Energy Emergency
- **348.17(5)** Agricultural Crops
  - ◆ September 01 through November 30
  - ◆ Corn, Soybeans, Potatoes, Vegetables and Cranberries
- **348.175** “Frozen Road Law”

# Overweight Permits

## ■ Single Trip Permits

- ◆ S.348.26(2) thru (7), 6 types of permits
- ◆ Approximately 45,000 issued per year – 15,000 overweight
- ◆ Valid for non-divisible loads only
- ◆ Each route is evaluated and approved by DOT for State highway and Interstate

## ■ Multiple Trip Permits

- ◆ S. 348.27(2) thru (14), 15 types of permits
- ◆ Approximately 15,000 issued per year, number of truck trips unknown
- ◆ Valid for both non-divisible and divisible loads
- ◆ Carrier is responsible for route clearance

# Single Trip Permits

- Fees – \$20 (90k gvwt) to \$450 (over 500k gvwt)
- Weights – no absolute maximum gvwt; tandem axle maximum 65k
- Issuance Process – evaluation by computer, DMV staff, Bridge engineers and Regional traffic engineers depending size, weight and route
- Local Control – WisDOT does not approve travel of overweight single trip permits off STH or Interstate
- Spring Thaw – certain highways are off-limits but permits are not suspended

# Multiple Trip Permits

- Fees - \$65 to \$1,050 (varies by months of operation x weight)
- Weights – varies by type of permit; 90k to 170k is the range
- Issuance Process – application on-line or surface mail; yes or no chiefly a question of commodity or vehicle eligibility
- Operating Control – frequency of use up to the carrier; local control over use of roads varies widely
- Spring Thaw – divisible multi-trip permits suspended, except if exempt by statute

# Multiple Trip – Divisible Load Permits

- General Permit s.348.27(3) & Chapter Trans 230 – issued by DOT for State Highway; locals may issue for own roads.
  - ◆ Typical use is to authorize military vehicle or fire truck testing

# Multiple Trip – Divisible Load Permits

- Seed Potato Permit s.348.27(9t) & Chapter Trans 258 – issued only by DOT on a restricted corridor; if local roads are required, carrier must provide written permission when applying. Maximum gvw is 90,000 lbs., Michigan axle weights required. Minimum of 6 axles required.
  - ◆ This is the only divisible load statutorily exempt from Spring Thaw suspension



# Multiple Trip – Divisible Load Permits

- Michigan/Wisconsin Border Permit s.348.27(9) & Chapter Trans 253 – issued only by DOT; locals give written permission for use of specified roads.
  - ◆ Valid in 11 mile zone and on US 2 into Ashland
  - ◆ Valid only for logs on Ashland extension; valid for any load elsewhere
  - ◆ Maximum gvwt is 154k, higher weight allowed on Ashland extension; Michigan axle weights required
    - ◆ Michigan issues a reciprocal permit for Wisconsin carriers

# Multiple Trip – Divisible Load Permits

- Garbage, Refuse & Recyclable Scrap Permits s.348.27(9r),(12) & Chapter Trans 269 – issued only by DOT; valid on any class of roadway unless road is posted. No maximum gvw; no axle spacing specification; 42k allowed on a tandem
  - ◆ Trans Rule definitions of “recyclable scrap” and “compactor equipped” are convoluted and often challenged

# Multiple Trip – Divisible Load Permits- Raw Forest, Fruits & Vegetables Permit

## ■ Raw Forest Products, 348.27(9m),1. & Trans 259

- ◆ 90k gvwt; 12 ½% over legal axle weight
- ◆ Transport from woods or staging to processing
- ◆ Valid for any RF as defined in s.348.01(2)(bt)
- ◆ Valid on I-39
- ◆ Expires January 2011

## ■ Fruits & Vegetables, s.348.27(9m),1.2.3.

- ◆ 90k gvwt; 12 ½% over legal axle weight
- ◆ Valid on I-39 for most loads
- ◆ Transport from field to storage or processing
  - ◆ Potatoes from storage to processing, or from field to railhead

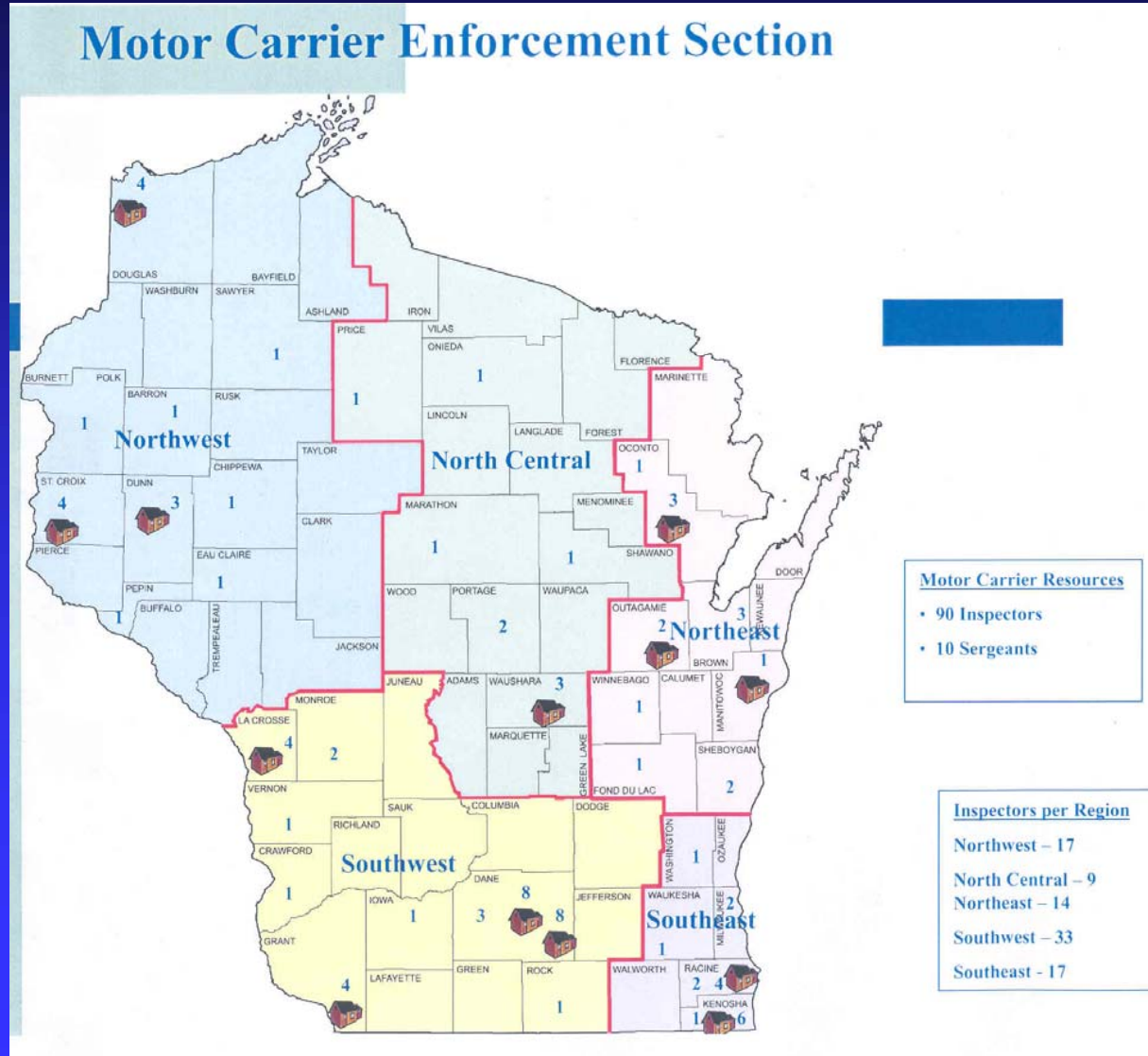
# Multiple Trip – Divisible Load Permits

- Act 167 Permit, s.348.27(a) 4. issued only by DOT; valid on local roads but not valid on interstate.
  - ◆ Maximum gvw 98k; six axles required; axle weight maximum is 18k, 13k on steer axle.
  - ◆ Valid for any raw forest product as defined in s.348.01(2)(bt)

# Summary Points

- Wisconsin allows heavier vehicles to operate on multiple trip permits than IL, IA, & MN
- Fees for overweight permits have not been increased in 20+ years
- Wisconsin issues more types of divisible load permits than neighboring states
- Local control of operation varies too much
- Original justification for weight exemptions now questionable
- “Grandfathers” & special exemptions may be lost

# Enforcement of Weight Laws by State Patrol



# SWEF – Safety and Weight Enforcement Facility

- 13 Permanent Facilities located on major routes
- Technology use
  - ◆ WIM
  - ◆ AVI
  - ◆ Virtual Weight Station
  - ◆ Infra-Red Cameras



# Mobile Operations

- 27 SUV's
- Portable Scales
- Patrol Areas
  - ◆ Seasonal
  - ◆ Industrial
  - ◆ Traffic Volume
  - ◆ SWEF By-Pass Routes
  - ◆ Complaints

# Vehicles Weighed (2005)

■ Static Scales	398,156
■ WIM Scales	738,520
■ Portable Scales	346
■ Private Scales	<u>236</u>
■ <b>Total</b>	<b>1,137,840</b>

# Overweight Enforcement Data (2005)

- 5,182 Overloads Detected
- 856 In excess of 80,000 pounds
- 13,495,436 Total Pounds

# Act 167: 30-Day Record

Date	Gross	County	Axle Code
8/9/2006	102,000	Rusk	5-S
7/20/2006	100,780	Polk	6-S
7/25/2006	100,460	Bayfield	6-S
8/2/2006	100,360	Chippewa	5-S
7/31/2006	100,300	Sawyer	6-S
7/26/2006	99,780	Pine	6-S
8/1/2006	99,660	Sawyer	6-S
8/4/2006	99,640	Washburn	6-S
8/3/2006	99,600	Sawyer	6-S
7/26/2006	99,440	Chippewa	6-S
7/25/2006	99,060	Bayfield	6-S
8/8/2006	99,020	Pine	6-S
7/31/2006	98,940	Taylor	6-S
8/4/2006	98,840	Washburn	6-S
8/9/2006	98,760	Washburn	5-S
8/1/2006	98,700	Washburn	5-S
8/3/2006	98,700	Sawyer	6-S
7/31/2006	98,600	Bayfield	6-S
7/26/2006	98,580	Bayfield	6-S
8/9/2006	98,580	Washburn	6-S
8/2/2006	98,520	Wood	6-S
7/20/2006	98,500	Clark	6-S
7/25/2006	98,480	Iron	6-S
8/2/2006	98,480	Bayfield	6-S

# Impacts of Truck Weights on Roads

- Highways are designed to accommodate projected vehicle loads
- Heavy vehicle axle loads drive the design of pavements and bridges
- Highway life is related to magnitude and frequency of axle loads

# Design Considerations

- Designs need to be costs effective; designing for higher loads translates to higher construction costs
- Anticipate expected loads and frequencies over planned life cycle of the pavement or bridge
- When actual loads exceed design criteria roadway life is reduced and costs increase

# Key Design Factors

- Anticipated truck traffic controls pavement design
- Factors vary for pavements and bridges
  - ◆ Pavements
    - ◆ Focus on equivalent single-axle load or ESAL
  - ◆ Bridges
    - ◆ Gross load (GVW)
    - ◆ Number of loadings
    - ◆ Number, spacing and weight of individual axles
- In either case, exceeding design criteria results in premature failure or reduced service life



# Effects of Heavy Vehicles on Pavements

- Conventional 5 axle tractor semi-trailer at 80,000 GVW is about 2.4 ESALs
- Increasing the load by 12.5% to 90,000 GVW increases pavement damage by 70% to 4.1 ESALs
- Pavement Damage increases at a geometric rate with weight increases

# Effect of Additional Axles on Pavement Impacts

- Additional axles reduce ESALs benefiting the pavement
- This benefit has limits:
  - ◆ at higher speeds the cumulative loadings of closely spaced axles result in concentrated loading and higher induced pavement

# Effect of Additional Axles on Bridge Impacts

- Dependent on axle spacings
- Impacts are specific to each bridge
  - ◆ Span length
  - ◆ Design and construction details
- Bridges are susceptible to catastrophic failure and must be protected
- Bridges are susceptible to fatigue failure reducing service life of existing bridges

# Highway Safety Considerations

- Weight regulations affect safety:
  - ◆ The volume of truck traffic (number of trips)
  - ◆ Truck performance, configuration, and design
    - ◆ Heavier trucks have higher center of gravity
    - ◆ Braking and acceleration affected but can be mitigated or overcome with right equipment
    - ◆ Heavier trucks can affect trip numbers and miles
  - ◆ Route selection
    - ◆ May shift to highways with different safety factors

# Seasonal Affects on Truck Impacts

- For pavements, damage reduced when ground frozen
- Conversely, when pavements are thawing and wet, significantly more damage results
- Bridges do not benefit from frozen conditions
  - ◆ In fact, some bridges may be more susceptible to failure in cold weather

# Roadway System Issues

- State highway issues could be addressed with significant additional investment
- Heavier vehicles will need access on local roads
  - ◆ Less likely to be able to accommodate those loads
  - ◆ Far more miles to consider

# Additional Issues

- Substantial public policy and cost issues
- Impacts are unavoidable, but can be planned for with sufficient resources and coordination
- Plans should be compatible with adjoining states to serve regional and national needs