Rail Capacity

Chapter 9

Chapter 9: Rail Capacity

Moving many agricultural products to market in an efficient and cost-effective manner requires adequate rail capacity. Rail capacity constraints can force traffic from rail to barge or truck. When traffic is forced to trucks, it usually results in increased transportation costs and increased damage to the highway system. Because agricultural shippers are price-takers, who receive a price for their commodity net of transportation costs, increased transportation costs come directly out of producer incomes. Increased damage to the local and state highway systems is paid for by taxes, which comes from local residents, many of whom are agricultural producers.

Agricultural shippers and consumers have been concerned about the capacity of railroads to serve their needs for several years. Forecasts of demand for rail transportation for growing fields such as energy and intermodal transportation predict increasing demand. Some studies, such as one by Cambridge Systematics, indicate that railroads currently have few constraints in infrastructure capacity.[181] The same study found capacity will be constrained in the future unless investments are made in infrastructure. The recession, however, has delayed the effect of such constraints as much as 5 years.[182] A March 2009 report by Christensen Associates states that, although projections by individual researchers and agencies vary, the overall growth of traffic is widely accepted and only the magnitude of growth is in question.[183] The magnitude may be largely determined by railroad pricing policies, which can either encourage or discourage traffic growth.

Rail capacity requirements must be examined in light of the characteristics of agricultural movements rather than aggregate models and investment strategies. The production and marketing characteristics of agricultural products create special needs and different criteria to evaluate capacity. Testimony and shipper complaints emphasize the seasonal needs of agriculture, the density of those movements in specific corridors, and the perishable nature of the products being moved.

Determining rail capacity is not simple; it reflects the complexity of the issue. Capacity depends on the availability and productivity of trackage, power units, the size of the railcar fleet by type of railcar, terminal capacity, intermodal facilities, engineers and crew, and more. It is not enough to evaluate capacity at the aggregate rail corridor level, which has been done in various studies. The needs of agriculture and the regional variation of agricultural production, and often nodes of congestion on the rail line, require attention to specific components in the capacity framework. Building capacity for peak movements is expensive and could be inefficient. Any excess capacity during some times of the year has to be balanced against the value of peak service needs.

Investing in the system to provide capacity occurs in various ways. The Christenson study identified three components needed to achieve necessary rail capacity:

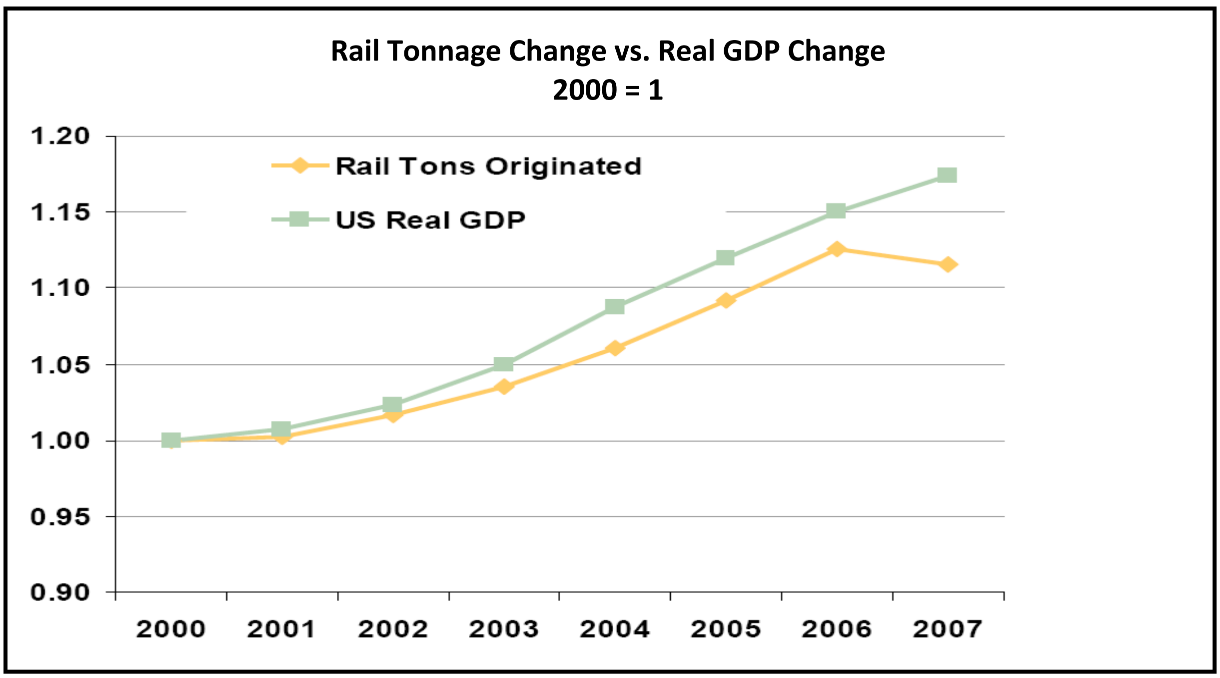
- Investment in technology to improve the productivity and efficiency of the current infrastructure
- Repairs, maintenance, and replacement of current infrastructure
- Investment in new infrastructure[184]

The first two components are examined in this chapter to determine the performance of the rail system relative to the needs of agriculture. The chapter pays attention to miles of track, average train speed, train and car type, terminal dwell times, and railcar fleet availability, now and in the future. The third component, investment, will be discussed in Chapter 10: Rail Investment.

Demand and Transportation Capacity

The growth in rail tonnage, except for 2007, closely follows the growth of production—real (inflation adjusted) gross domestic product (GDP)—in the United States (Figure 9-1). This trend is consistent with various estimates of expected growth in the overall demand for transportation services, as is discussed in other sections of this report. During 2007, however, due to high fuel prices and roadway congestion, freight traffic would have been expected to shift from truck to rail. Consequently, rail traffic should have increased rather than decreased as shown in Figure 9-1.

Figure 9-1: Change in rail tonnage and real gross domestic product, 2000 to 2007

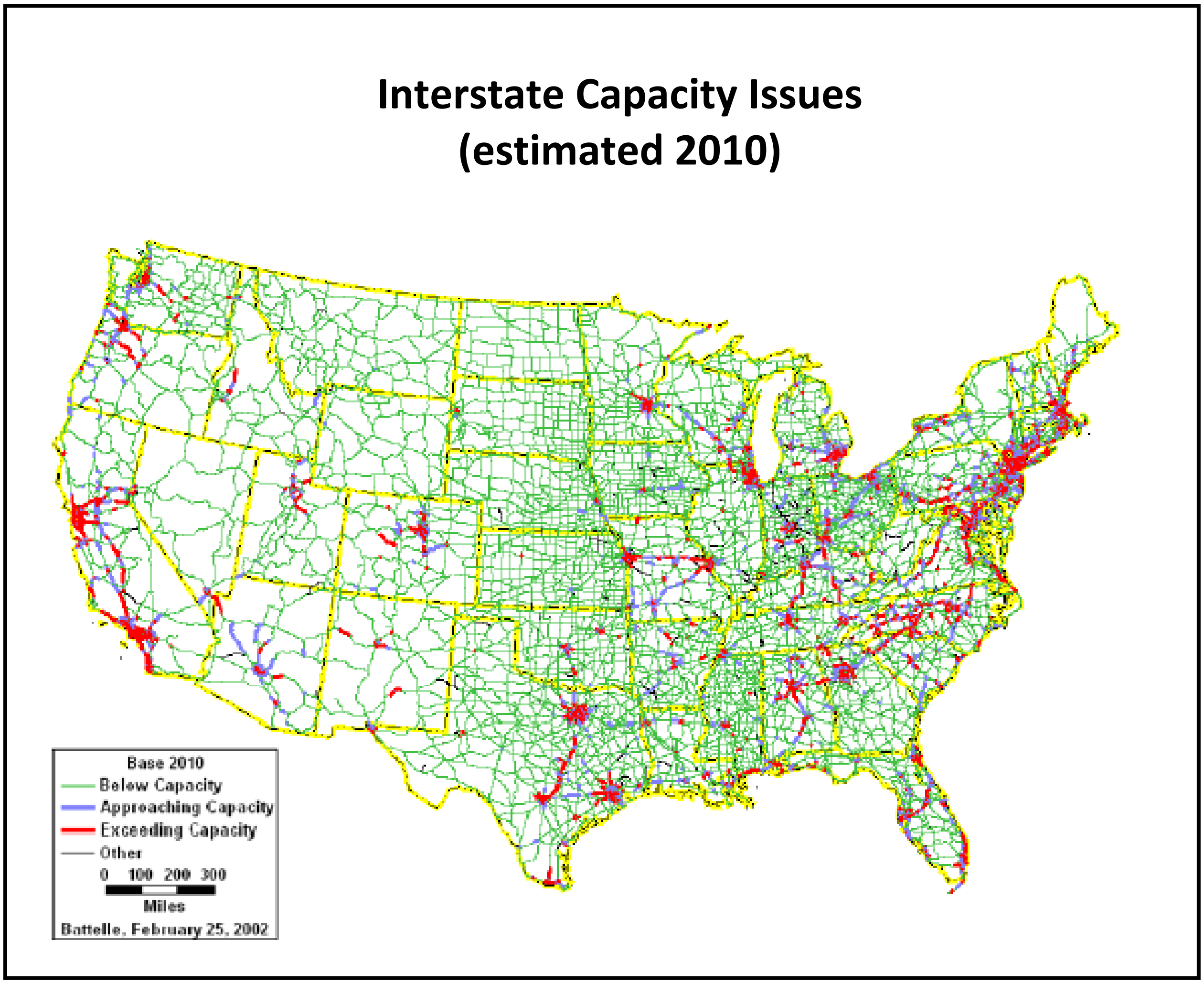


Source: Norbridge, Inc. analysis of BEA data

In January 2009, Norbridge, Inc. examined the inhibitors to rail carload and intermodal share growth.[185] The Norbridge study found that other factors besides rail capacity constrain the movement of traffic from highway to rail**:** a lack of service and high rail prices. Lack of service and high rail prices are issues that can be associated with both rail capacity and railroad market power. For example, railroads are moving 20-25 percent less traffic in 2009, but tariff rates have remained high.

The following two figures are estimates used in a Federal Highway Administration study of interstate highway capacity and rail capacity. By 2010, interstate highway capacity is expected to be constrained in areas with dense population and commercial activity, denoted by the red lines in Figure 9-2. Much of the highway system in the Western U.S. is still under capacity, even projected to 2010. As highways reach capacity constraints, increased pressure may result in shipments moving to railroads, at least to some degree.

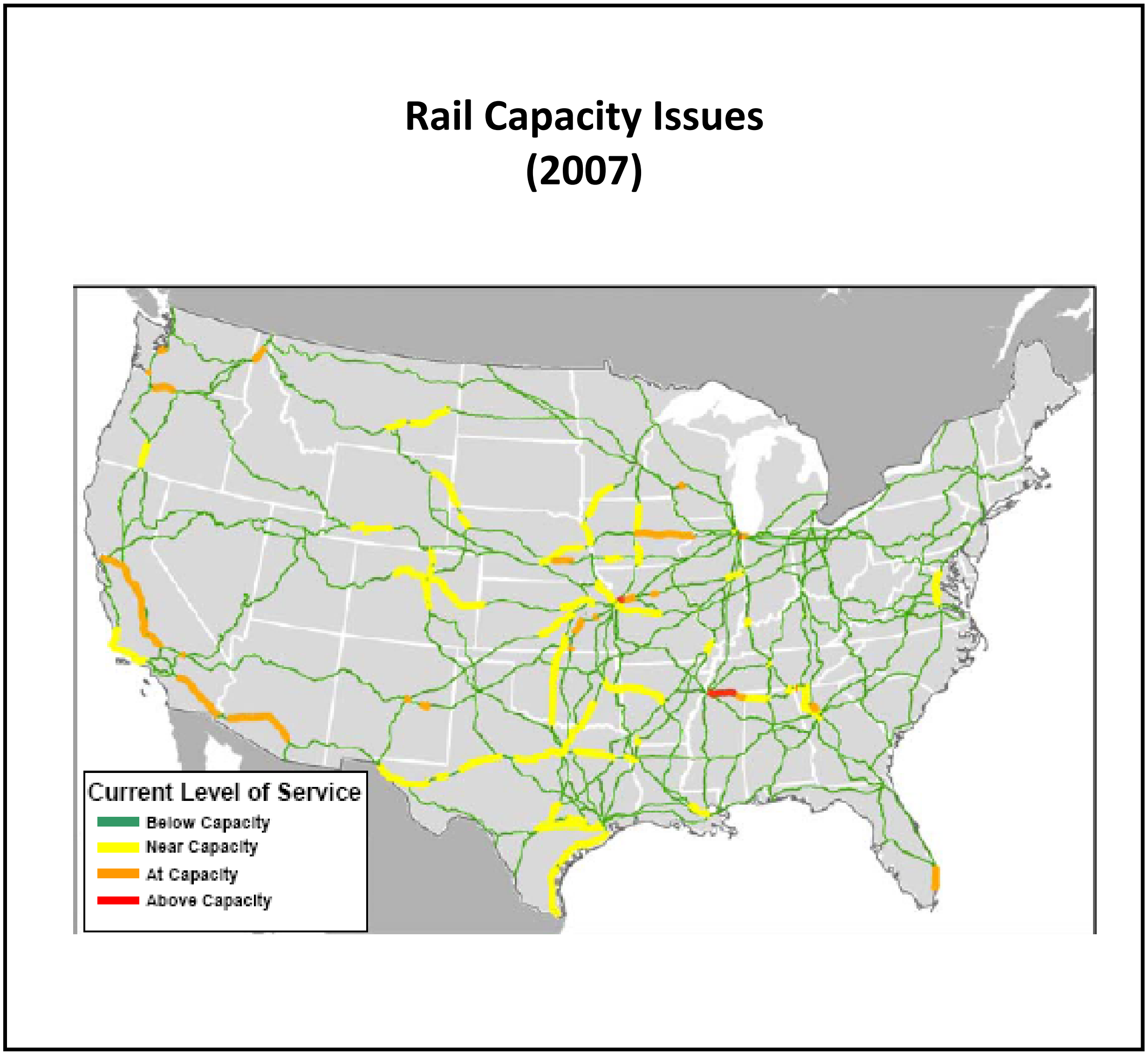
Figure 9-2: Estimated interstate capacity to 2010



Source: FHA, National Rail Freight Infrastructure Capacity and Investment Study; Texas Transportation Institute

Figure 9-3 depicts rail capacity in the year 2007. Few sections of the rail network were above aggregate capacity at that time. The brown lines indicate rail lines in the United States where traffic is at capacity; the yellow lines are lines approaching capacity. Only in extreme rural or agricultural areas was there much track that was below capacity (green lines). Again, this evaluation is based on annual aggregate volumes, not peak or seasonal movements or congestion nodes.

Figure 9-3: Rail capacity in 2007



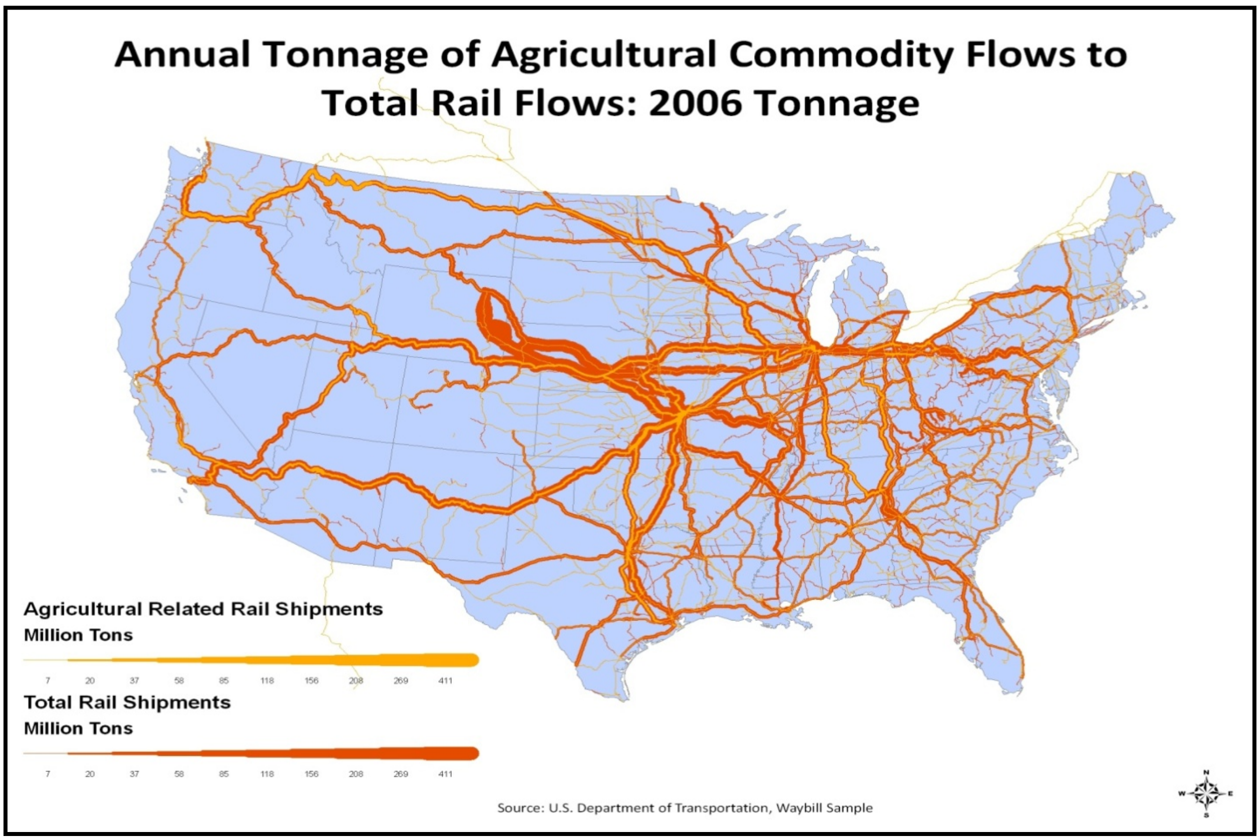
Source: FHA, National Rail Freight Infrastructure Capacity and Investment Study; Texas Transportation Institute

Agricultural Demand and System Usage

The overall rail system may be unconstrained in the aggregate, but agriculture cares about constraints to specific corridors. The ratio of annual tonnage of agricultural commodities to total rail flows on all major corridors in the United States for 2006 is shown in Figure 9-4.

Agricultural commodities are by far the majority of the movements in some sections of the nation, such as on many Midwestern secondary rail lines and several primary rail corridors. The long distance movements of agricultural products from the Midwest production areas to the Pacific Northwest and to Los Angeles/Long Beach, CA, dominate the movement on the northern BNSF rail line and its line from Chicago through the Southwest. Agricultural products also dominate traffic on the BNSF and UP rail lines from Chicago and Kansas City to the Houston region. The heavy total shipments out of Wyoming to the Midwest locations near or on the Mississippi are due to the volume of coal shipments for energy and power plants.

Figure 9-4: Rail commodity flow map of total vs. agricultural component



Source: U.S. Department of Transportation, Waybill Sample

Factors Influencing Rail Performance

These factors influence train speeds and terminal dwell times:

- Changes in demand for rail transportation leading to rail line congestion
- Rail merger integration resulting in operational difficulties and congestion
- The availability of train-crew personnel
- Extreme weather

As train speed increases and terminal dwell times decrease, rail capacity increases. Although general inferences are possible, comparisons between years and railroads must be made with care given changing data definitions and individual operating characteristics of the railroads.

Demand-Based Rail Congestion

Excess demand for rail transportation often results in congestion on rail lines and in switching yards. Because rail capacity cannot be expanded rapidly, congestion on the rail lines and at switching terminals slows trains. As rail lines and switching yards become congested, their capacity is lower than when the lines are fluid, in much the same way that traffic backs up on a busy highway due to crowding. Access to rail lines and switching yards, however, is more tightly controlled than access to the highway; rail traffic controllers keep trains a specified distance apart and control entry to the rail network.

Relative efficiency decreases and marginal costs could increase rapidly as portions of the rail network approach capacity. For instance, train speeds slowed in 2006 as demand increased in response to a robust economy (see discussion below). Since then, the demand for rail transportation has slowed, particularly during the last half of 2008 and early 2009, and train speeds have increased. This reduction in demand eliminated the congestion that slowed service from 2003 through 2006.

Rail Mergers

Although reporting on train speeds and terminal dwell times did not begin until 1999, nearly all major rail mergers since 1990 have resulted in operational difficulties that have slowed train speeds and increased terminal dwell times for the merging railroads, and sometimes for the entire railroad network. For example, the western rail crisis of 1997–98, which occurred as a result of the September 1996 merger of Union Pacific (UP) and Southern Pacific railroads, involved a severe railroad operational meltdown. Operational difficulties stemming from the merger slowed rail service on UP and other railroads over the entire West. Many UP lines—particularly in the Houston region—came to a near-standstill for months. Another example is the merger difficulties that occurred subsequent to the June 1, 1999, division of Conrail between CSX Transportation (CSXT) and Norfolk Southern (NS). These operational problems lasted about a year. The merger of the Burlington Northern and the Atchison, Topeka, and Santa Fe railroads in 1996 also resulted in integration difficulties.

Availability of Train Crews

The lack of train crew members also results in congestion and slower train speeds. Due to changes in Federal law in 2003 allowing railroad employees to retire 2 years early, at age 60, the number of retiring train crews increased substantially—just prior to the 2004 economic recovery. During late 2003 and 2004, UP, CSXT, and Canadian Pacific Railways (CP) experienced more line congestion and service issues due to early retirement than the other major railroads because they did not begin hiring replacement crews as soon as the other railroads; they did not anticipate the increased rail demand stimulated by the 2004 economic expansion.

Newly hired train crews require approximately 6 months of training before they are qualified as conductors and another 6 months of training before they can operate trains as engineers. Because there were too few crew personnel, trains occupied sidings awaiting crew. This slowed train speeds because sidings are used to allow moving trains to wait while a train traveling in the opposite direction passes. Filling the sidings with trains awaiting crews meant that there were fewer sidings available to accommodate passing trains.

Weather Events

Extreme weather events affect train speeds and congestion. One of the best examples was the aftermath of Hurricanes Katrina and Rita from September 2005 through March 2006. After the hurricane, rail lines, bridges, and yards in the New Orleans region had to be repaired or replaced. In addition, there was a spike in demand for rail transportation of bulk commodities because navigation on the lower Mississippi River was halted for a month. Other weather events affecting short-term railroad performance and capacity include floods, mudslides, buckling of rail due to excessive heat, and blizzards.

Train Speed

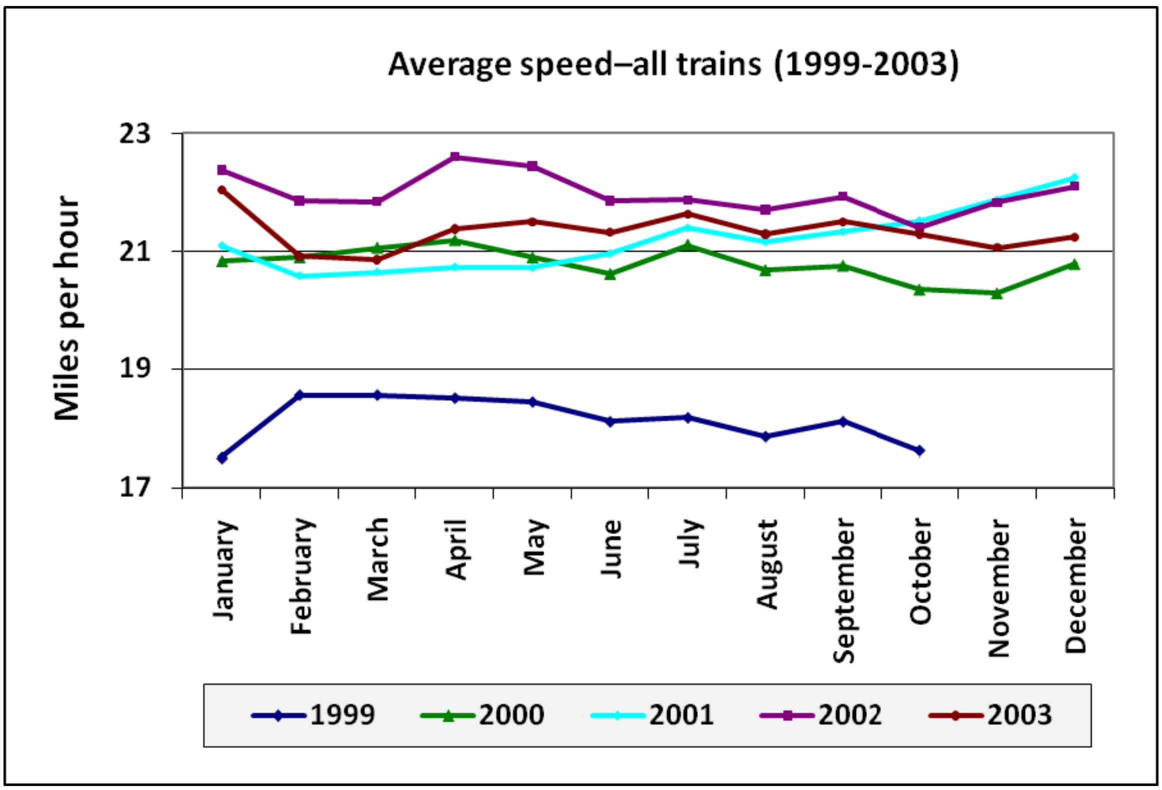
Rail capacity constraints were common from 2003 through the first half of 2006. Weaker demand for rail freight transportation beginning in late 2006 and a recession beginning in December 2007 resulted in adequate capacity for agricultural products during the harvest of 2006, and from 2007 through the first half of 2009.[186] However, capacity constraints are expected to occur again when the economy recovers. The following data on train speeds and terminal dwell times shows the effects of these capacity constraints.

Train Speeds 1999-2003

An evaluation of rail capacity includes consideration of the effective utilization of tracks and rolling stock by the speed of the trains. Faster trains mean more output per dollar spent in rolling stock, less congestion, and more rail capacity to handle the demand. The following series of graphs from the AAR Rail Performance Measures reveals the various dimensions of performance in realized train speed.[187]

Train speed rose consistently for every single year except 2003, especially from the low performance in 1999 where the average train speed never reached 19 miles per hour (Figure 9-5). Average speeds reached almost 23 miles per hour for several months in 2002, and over 22 miles per hour in late 2001, both of which are almost 30 percent faster than 1999 speeds. Note the seasonal variation each year.

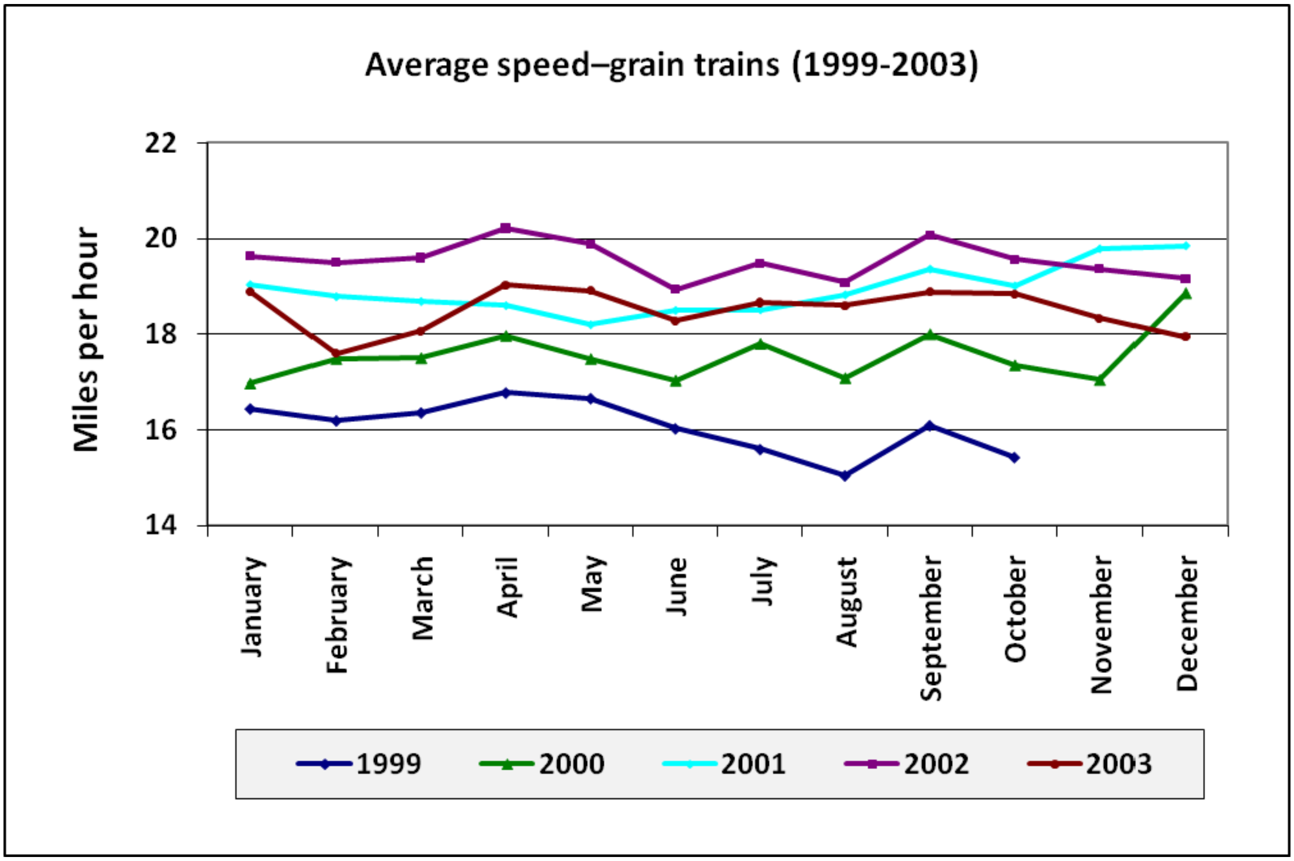
Figure 9-5: Average train speed, all trains, 1999–2003



Source: AAR

The average speed of grain trains during the same period is significantly lower than that of all trains, but with the same improvement over time (Figure 9-6). Grain trains were moving at speeds sometimes below 16 miles per hour in 1999 but improved to as much as 20 miles per hour in 2002. Again, there was a consistent improvement in speed from year to year except 2003, when rail capacity constraints first became apparent.

Figure 9-6: Average train speed for grains, 1999-2003

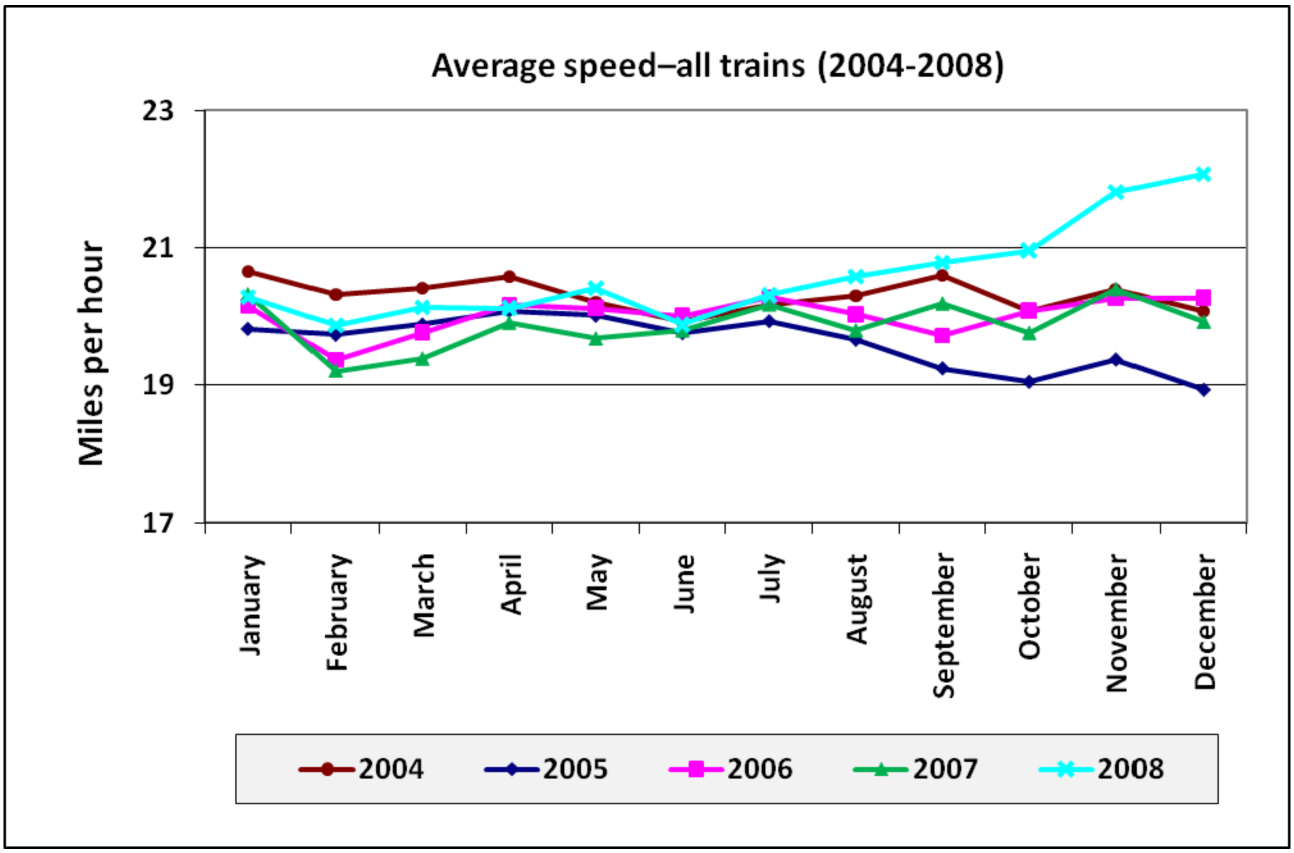


Source: AAR

Train Speeds 2004-2008

For the last five years, train speeds have been more stable, both within the year and from year to year. Although it may appear that the economies of current technology and logistics have been exhausted, gains in train speeds and rail capacity are expected due to positive train control and electronically-controlled pneumatic braking technologies. The average speed of all trains, with the exception of the last five months in 2008, shows a decrease since 2004 due to demand-based rail congestion—particularly during the harvest months of 2005—and early railroad retirements (Figure 9-7). Train speeds averaged about 20 miles per hour.

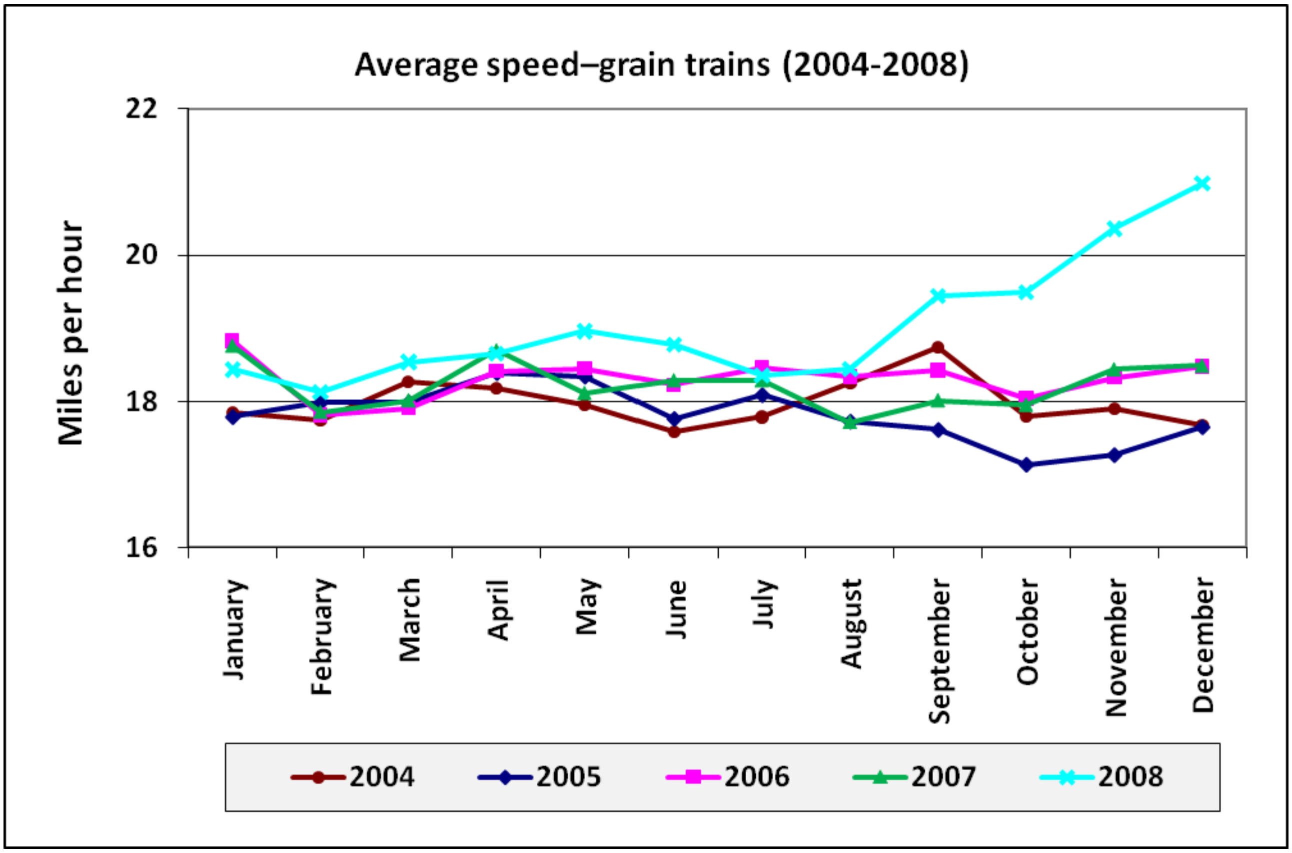
Figure 9-7: Average train speed (all trains) from 2004-2008



Source: AAR

The performance of grain trains was similar to that of other trains from 2004 to 2008 (Figure 9-8). Improvement is seen in 2008, almost all year. The earlier years were stable, consistently around 18 miles per hour, again slightly less than other trains. Rail traffic declined during 2008. Combined with prior investments in new rail capacity, this eliminated congestion on the rail network, resulting in faster trains.

Figure 9-8: Average train speed for grains, 2004-2008

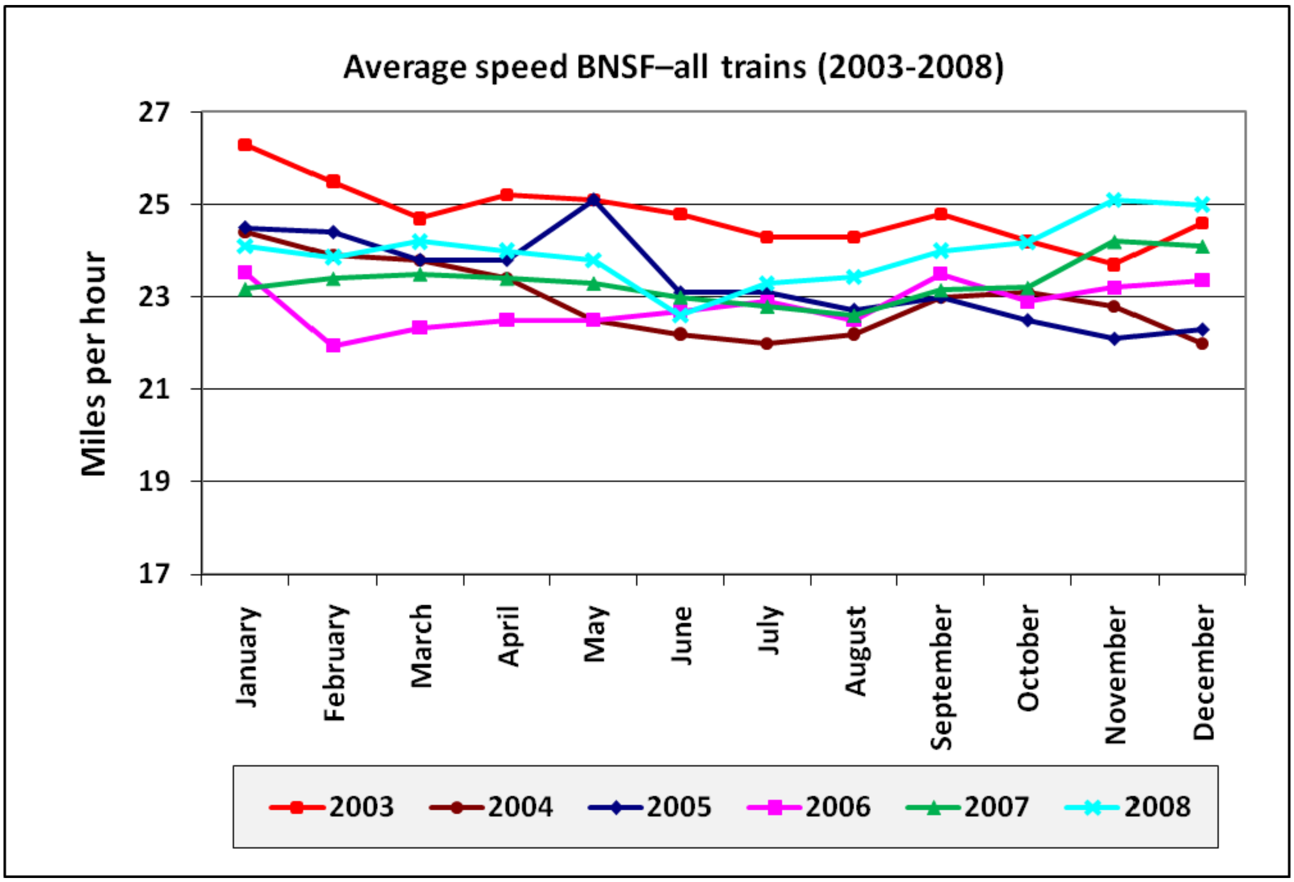


Source: AAR

BNSF and UP Train Speeds

The two railroads that move the most grain—BNSF and UP—are examined below. Train speeds on BNSF over the past five years have been significantly better than that of the overall rail industry. BNSF trains averaged about 24 to 25 miles per hour, compared to 20 to 23 miles per hour for the rail industry, 10 to 20 percent faster (Figure 9-9). This higher speed probably reflects earlier investments in rail capacity as well as the increased use of unit trains and the longer hauls on this line. It is interesting that 2003 was the year of the best train speed performance, followed by 2008. Even though capacity constraints began to appear in 2003 for the railroad industry as a whole, BNSF benefitted from prior investments in "excess" rail capacity. BNSF train speeds during the last quarter of 2008 were even faster than those during the last quarters of 2003 and 2007, both good years for BNSF.

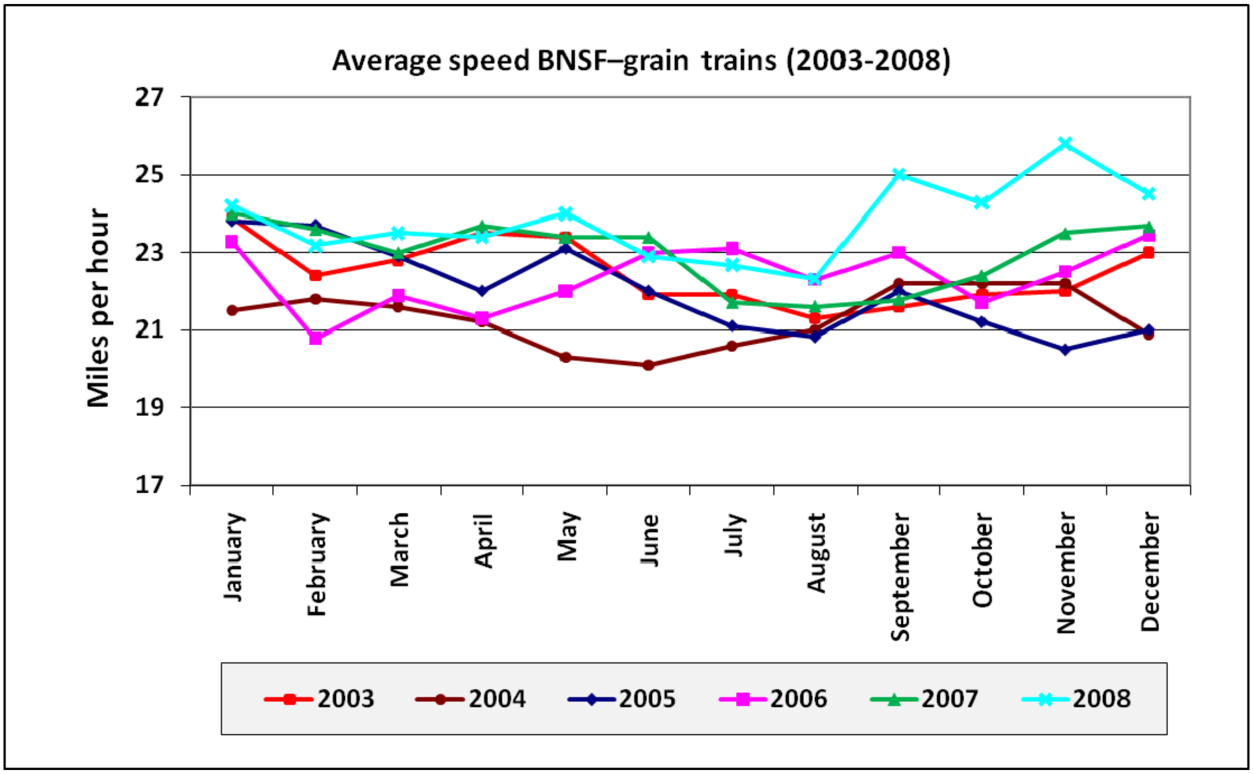
Figure 9-9: Average BNSF Railway train speed (all trains), 2003-2008



Source: AAR

Figure 9-10 shows grain trains on BNSF had the highest speeds in 2008, followed by 2007. Demand-driven rail congestion was particularly bad in 2004 and continued through much of 2006. The effects of Hurricanes Katrina and Rita in 2005 can be seen in October through December of 2005 and early 2006. Winter storms during February 2006 caused a sharp drop in train speeds. Demand-driven congestion due to abnormally high wheat and sorghum exports combined with fertilizer imports drove grain train speeds down from July to October 2007. Grain train speeds have been abnormally high since September 2008 due to the drop in demand for rail transportation, which reduced congestion.

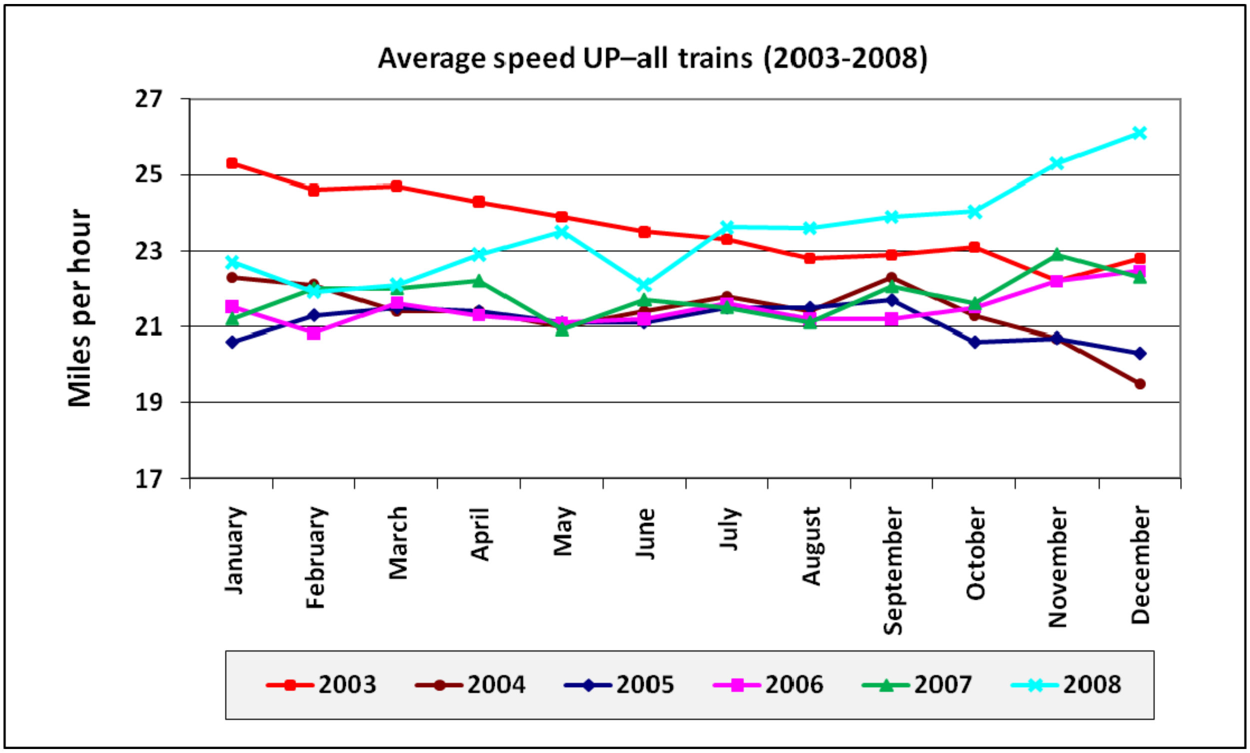
Figure 9-10: Average BNSF Railway train speed for grain, 2003-2008



Source: AAR

The Union Pacific's fastest year was 2003, but speeds since the last half of 2008 have surpassed prior levels (Figure 9-11). The speeds in 2008 have shown dramatic improvements over the years from 2004 to 2007, increasing from an average of 21 miles per hour from May 2004 to August 2007 to nearly 24 miles per hour in 2008, with a high of 26 in December. The steady deterioration of train speeds during 2003, which continued through 2005, were due to crew shortages combined with increased demand for rail transportation during 2004 through 2005.

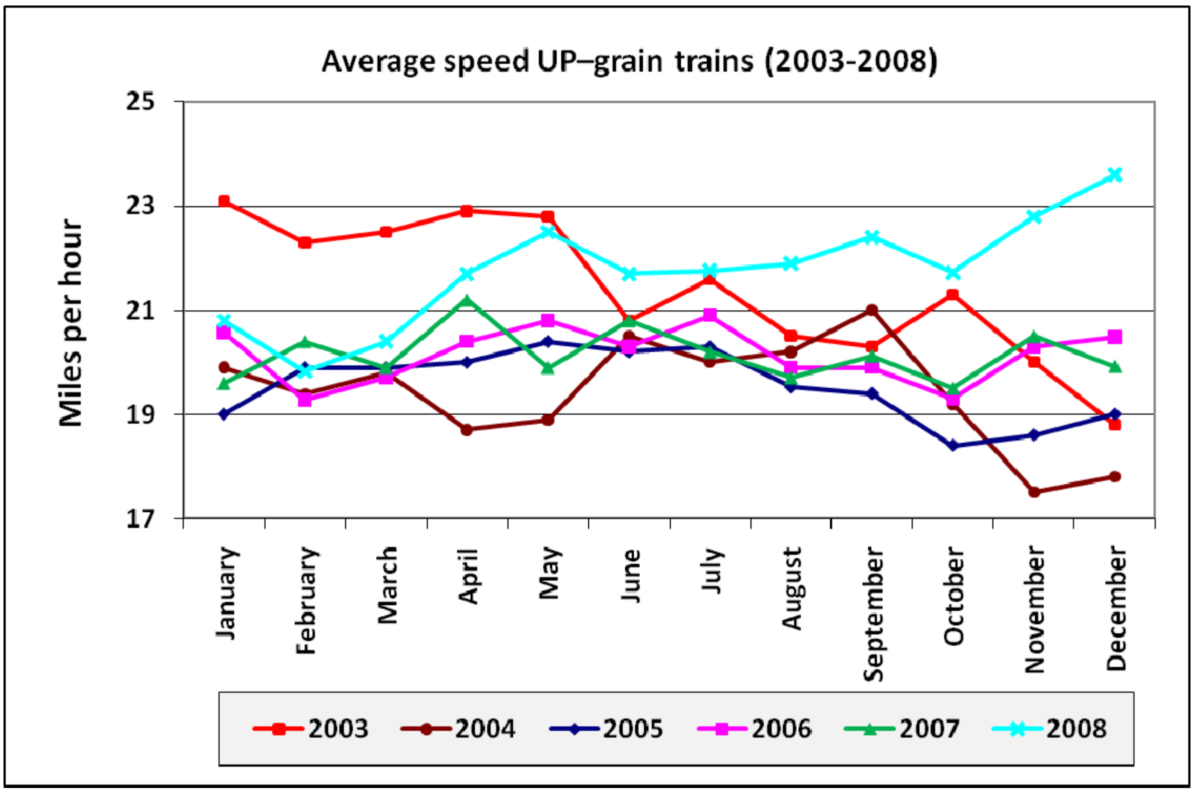
Figure 9-11: Average Union Pacific train speed (all trains), 2003-2008



Source: AAR

Grain train speed on UP varied more by year and within the year than the speed of other UP trains; 2003 was the best year until 2008 (Figure 9-12). UP's grain train speed, however, is still about 2 miles per hour, or 10 percent, slower than BNSF grain trains. The effects of Hurricanes Katrina and Rita can be seen during the last quarter of 2005. Demand-driven rail congestion continued through most of 2006 resulting in slow grain trains. Speeds began to recover during late 2007 and continued throughout 2008. By the end of 2008, train speeds on UP exceeded prior levels as decreased demand reduced congestion and investments were made in rail capacity during that time. Note the demand-driven seasonal decrease in train speeds during the last quarters of 2003 and 2004.

Figure 9-12: Average Union Pacific train speed for grains, 2003-2008



Source: AAR

Overall, it is evident that the railroads have been successful in improving the speed of their trains, for all trains as well as for grain movements. The improvement from year to year is not as evident within the past five years, though 2008 did offer some improvements. This suggests that past speed improvements may not be sustainable unless positive train control and electronically-controlled pneumatic brake technologies fulfill their potential.

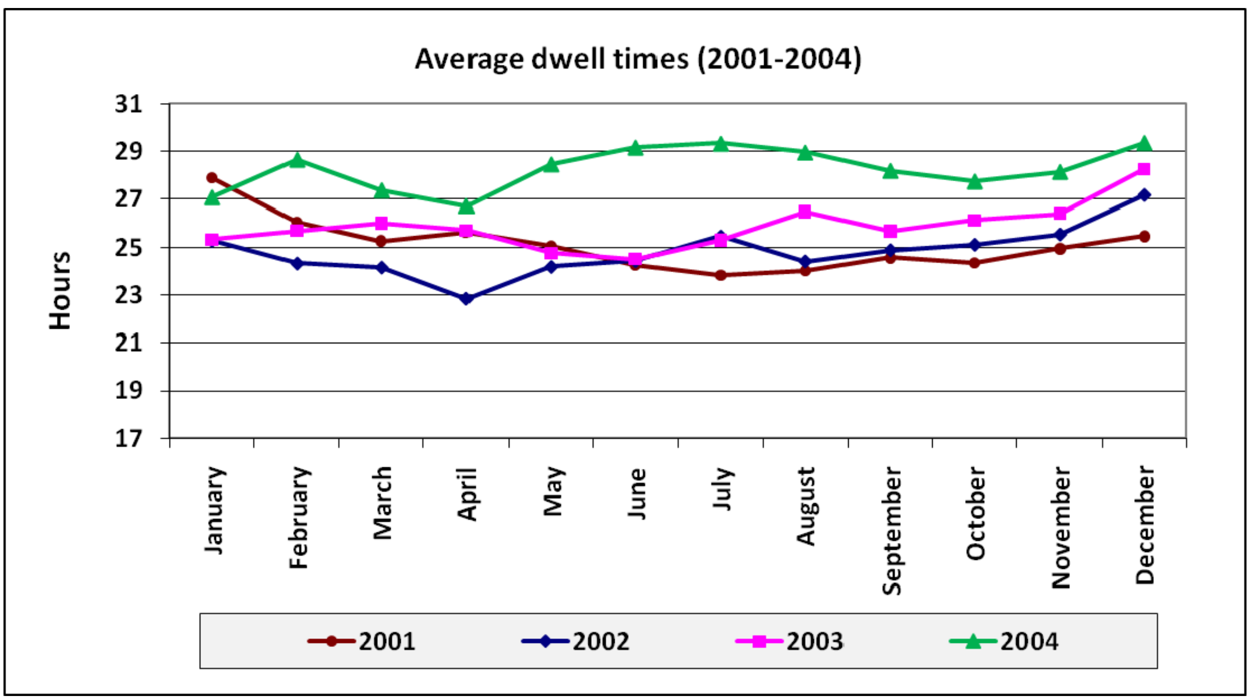
Dwell Times in Terminals

When cars and power units are not moving, they are not available to provide service and capacity to shippers. The length of time that cars spend in switching terminals is an indicator of lost capacity if the dwell time is more than that necessary to switch the car to the proper train. Dwell time is an indication of efficiency within the terminal and it discloses problems, such as terminal congestion, that are affecting the efficiency and performance of the railroad. Terminal dwell time, though, does not pinpoint the cause of any such inefficiency. The AAR Railroad Performance Measures (RPM) information utilized for train speeds also tracks and reports the terminal dwell times for the industry and individual railroads. The series of graphs below provide a review of that performance.

Railroad Industry Terminal Dwell Times

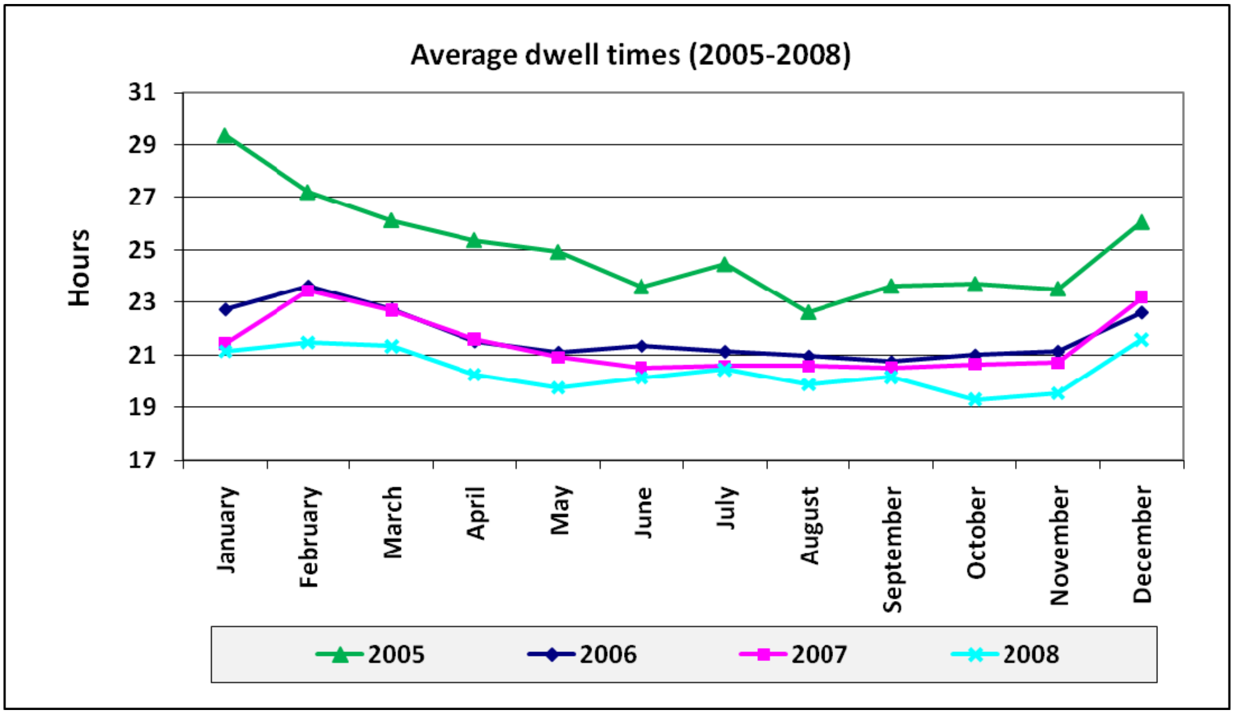
The first two graphs below examine the dwell times for two time periods. From 2001 to 2004, dwell times steadily increased, which causes the capacity of the rail system to decline (Figure 9-13). The subsequent period sees a steady improvement in terminal dwell times, with 2008 having the lowest average dwell times (Figure 9-14). The years 2003, 2004, and parts of 2005 saw higher average dwell times, especially for BNSF and UP.[188] The causes of the overall and seasonal variation in dwell times will be discussed later in this section.

Figure 9-13: Average train dwell times, 2001-2004



Source: AAR

Figure 9-14: Average train dwell times, 2005-2008

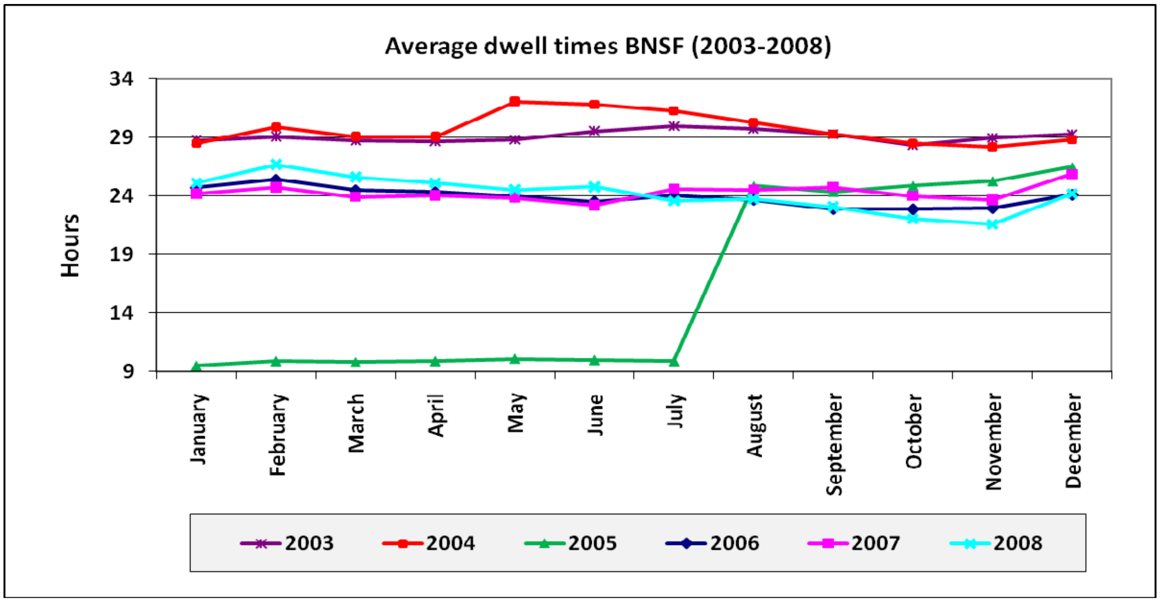


Source: AAR

BNSF Terminal Dwell Times

The average dwell times for individual railroads are shown in the figures below. BNSF changed its method of calculating terminal dwell time from January 2005 through July 2005, resulting in reported dwell times in early 2005 that are not comparable to the rest of its reported data (Figure 9-15). It averages 24 hours of terminal dwell time in recent years, with a steady performance for the past four years. As with the overall industry, 2003 and 2004 saw high dwell times, possibly due to demand-driven traffic increases or the effects of early railroad retirement. Note that the dwell times increase at the end of each year, when substantial amounts of grain and Christmas merchandise demand is being shipped.

Figure 9-15: Average train dwell times for BNSF Railway, 2003-2008

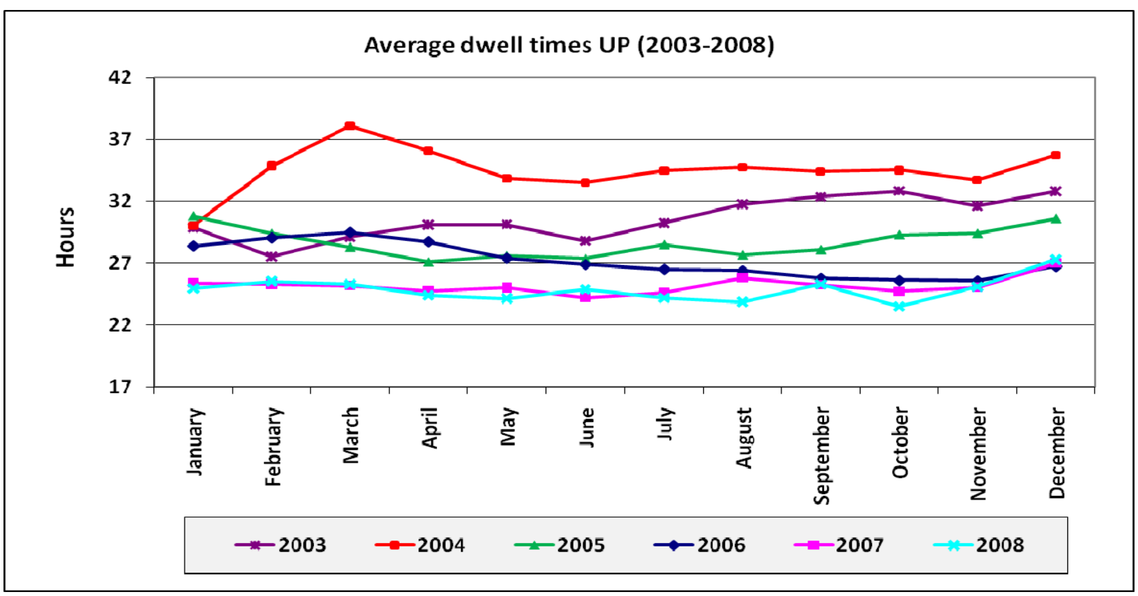


Source: AAR

UP Terminal Dwell Times

UP has a similar performance over the years but spends more overall time in terminals than does BNSF, recently averaging 24 to 25 hours, but with more seasonal variation (Figure 9-16). Again, higher dwell times during 2003–04 appear related to early retirements and increased demand, resulting in increased time railcars spend in the switching yard. UP also shows a consistent increase in terminal dwell times at the end of each year, when demand increases.

Figure 9-16: Average train dwell times for Union Pacific, 2003-2008

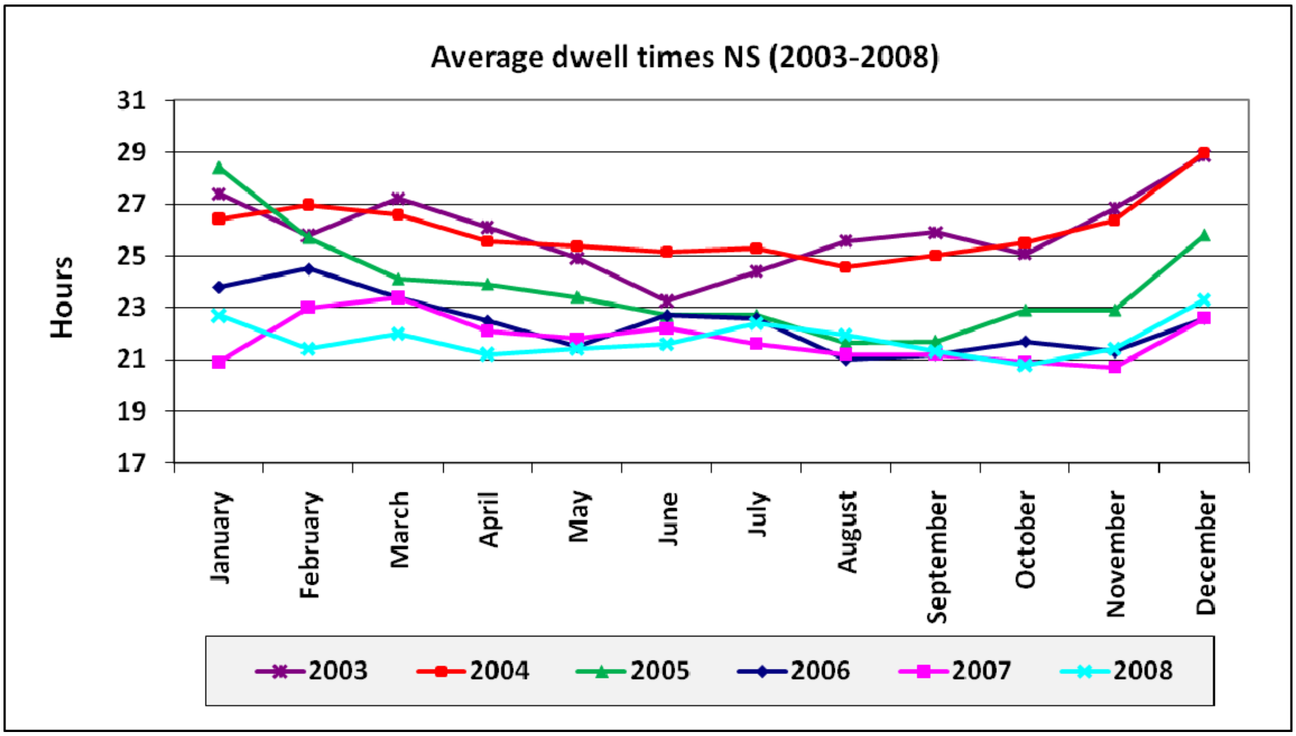


Source: AAR

Terminal Dwell Times for NS, CSX, and CN

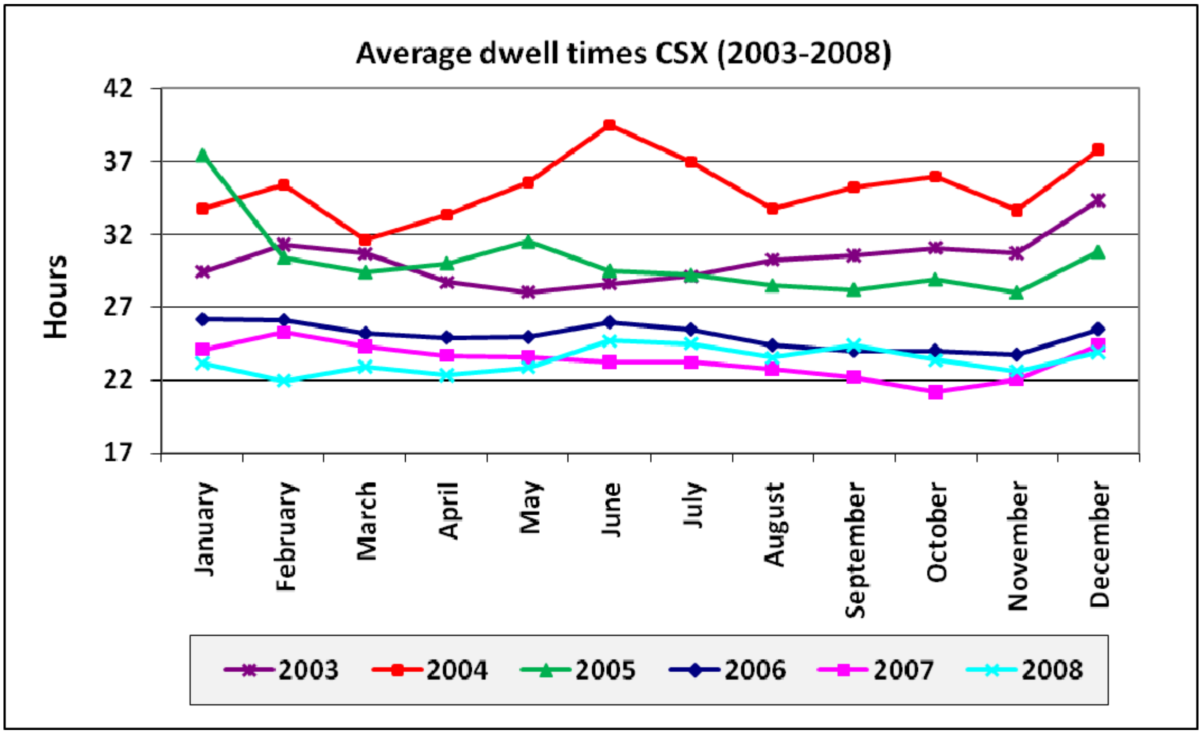
Data for the three eastern railroads are presented in the following graphs. The dwell time for NS and CSX both average 22 to 23 hours in the terminal in recent years (Figures 9-17 and 9-18). CSX has shown the greatest improvement in terminal dwell times over the years, although both railroads have improved, especially in recent years. 2003 and 2004 were less efficient, though to a lesser degree than the western railroads. Railroad retirements, and possibly increased rail demand, may have resulted in the higher terminal dwell times during those years. Both railroads show marked increases in dwell time during the high demand Christmas season.

Figure 9-17: Average train dwell times for Norfolk Southern, 2003-2008



Source: AAR

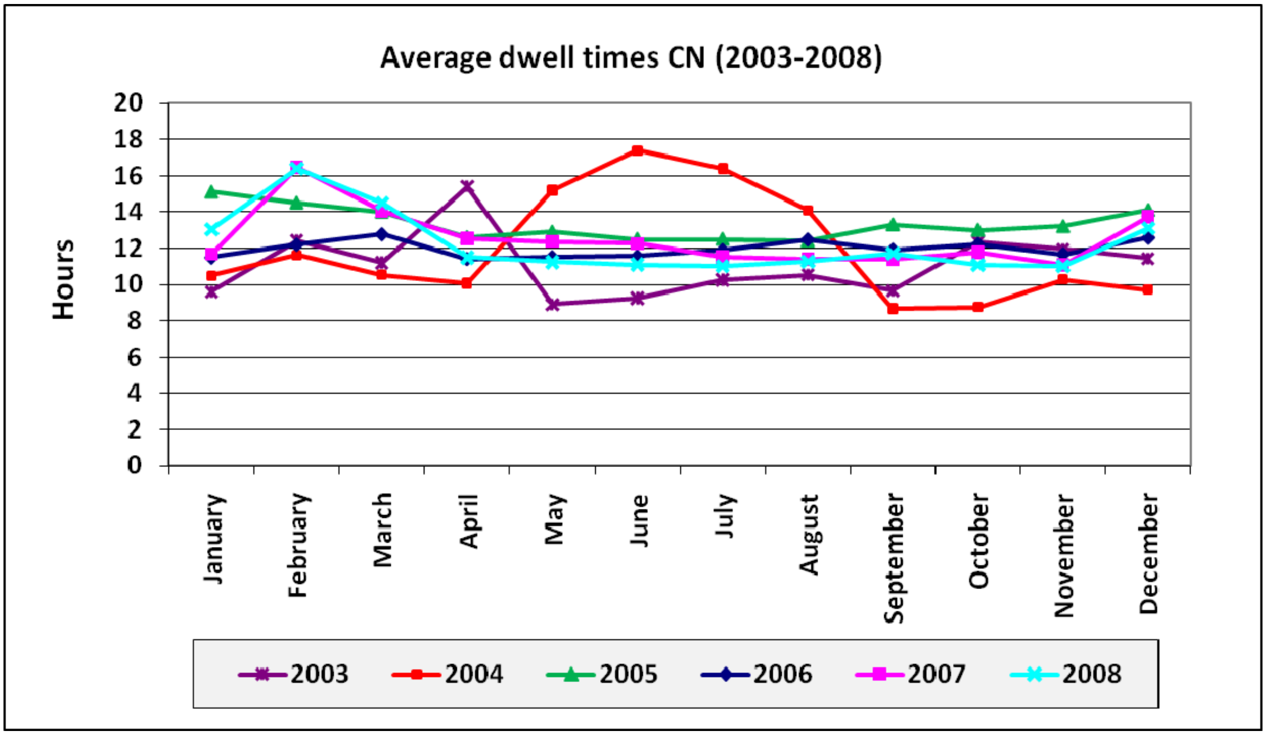
Figure 9-18: Average train dwell times for CSX, 2003-2008



Source: AAR

CN has had the most consistent performance of all the railroads. Its terminal dwell time is currently about 12 hours, significantly below the other railroads, and it has been at almost this level throughout the entire six-year period, with the exception of 4 months during 2004 (Figure 9-19). The sharp increase in terminal dwell time in April 2003 may be due to a rail strike. The increase in 2004 could be due to either increased demand or a short period awaiting replacement train crews to be trained.

Figure 9-19: Average train dwell times for CN, 2003-2008



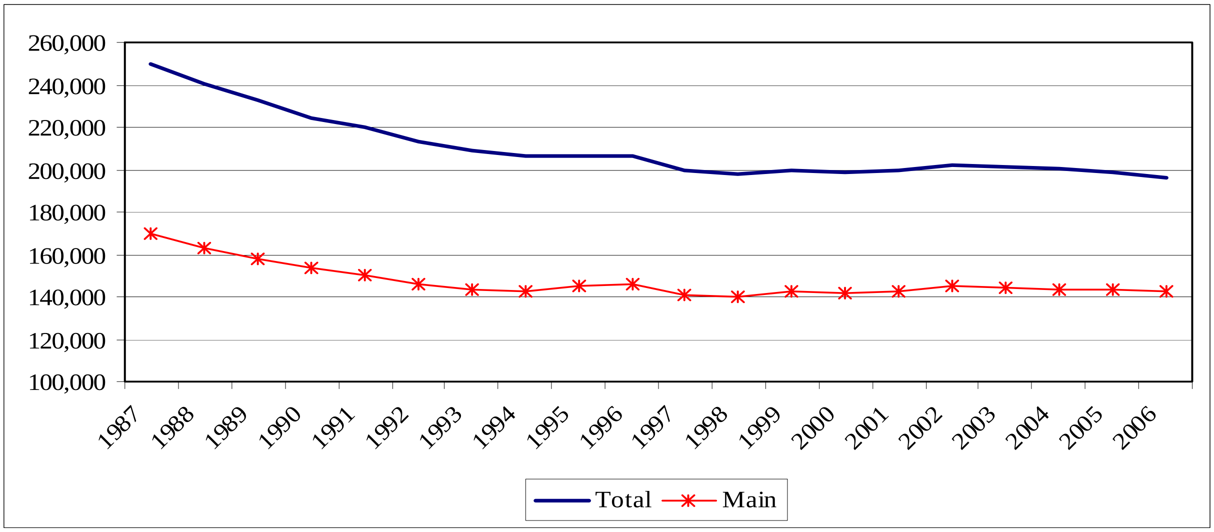
Source: AAR

Miles of Track

One of the primary influences on overall capacity is the amount of track available to the railroad system. The Christensen study used the R-1 annual reports of the Class I railroads to examine capacity at the aggregate level. Selected tables and graphs from this study are shown below.[189] Note that these are only aggregate indicators and the geographical dispersion, seasonal availability, or functional use (switching or line haul, for example) of the tracks is not examined here. These latter characteristics determine the amount of rail capacity actually available for agricultural shipments, not just aggregate miles. However, the total miles are still indicators of capacity over the system.

Total miles of Class I railroad track decreased rather dramatically and steadily from 1987 to about 1998 and has remained steady at about 200,000 miles since then (Figure 9-20). The miles of main-line track decreased until 1993 and have remained steady, at slightly more than 140,000 miles, since then.

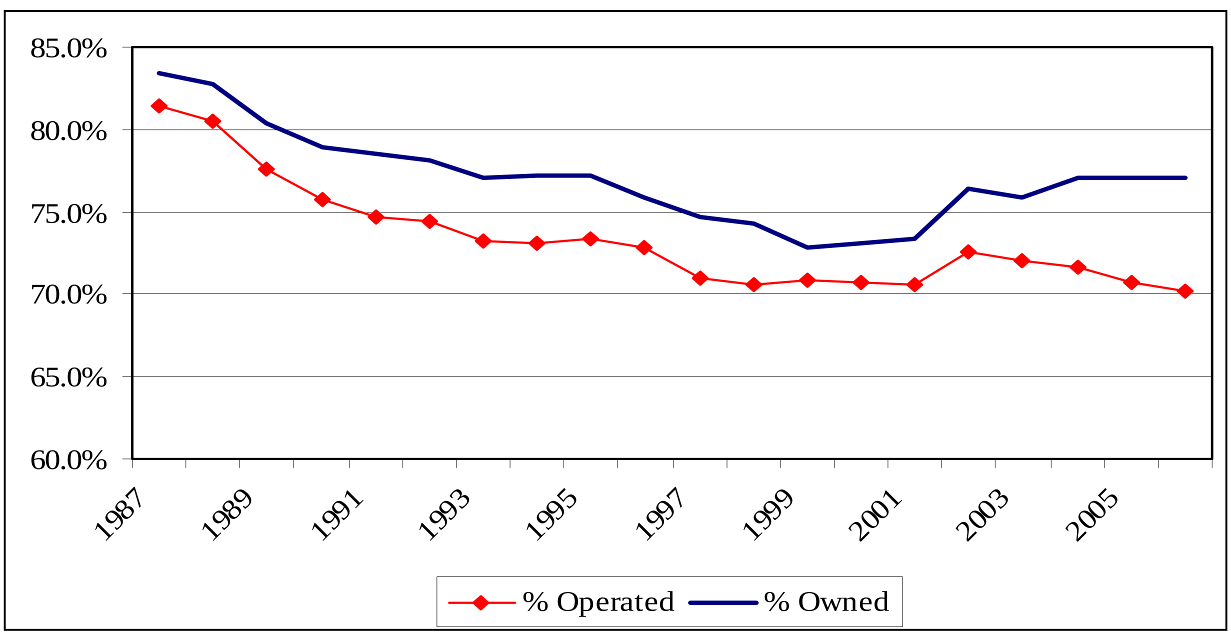
Figure 9-20: Miles of track of Class I Railroads, 1987-2006



Source: Laurits R. Christensen Associates, Inc.

The percentage of track miles owned by Class I railroads decreases through 1999, then increases due to the purchase of several regional railroads by Class I railroads (Figure 9-21). By the end of 2007, short line and regional railroads operated nearly 46,000 main line miles of track, a little more than 30 percent of the U.S. railroad network. Short line and regional railroads often provide rail service to rural shippers on lines that otherwise would have been abandoned.

Figure 9-21: Percent of track miles owned and operated by Class I Railroads, 1987-2006



Source: Laurits R. Christensen Associates, Inc.

The ton-miles handled by the railroads have increased from 919 billion in 1980 to 1,771 billion in 2007, a rise of 93 percent. During this same period, the route miles operated have decreased from 197,804 miles in 1980 to only 140,695 miles in 2007.[190] Each route mile during 2007 carried an average of 171 percent more ton-miles—nearly triple the traffic—than in 1980. This shows an increased usage of rail lines, which has benefited the railroads financially, but has also contributed to rail congestion.

Analysis of Rail Equipment Statistics

Rail capacity is also a function of the number of railcars and locomotives available to shippers. This section discusses the ownership of railcars and looks at freight car acquisitions, the railcar fleet, and locomotives.

Percentage of Privately-Owned Railcars

Railroads are relying more and more on privately-owned cars to provide the capacity to handle shipper demand, shifting the investment burden from carriers to shippers. The total share of privately-owned cars on line for these Class I railroads has steadily increased every year from 48.4 percent in 1999 to 52.7 percent in 2007 (Table 9-1). The major railroads—BNSF, CSX, KCS, and UP—rely on privately-owned cars for over 50 percent of their traffic: 56.8, 54.4, 56.4 and 58 percent, respectively. The number of system-owned cars on line has decreased proportionally.

Table 9-1: Percent of privately owned railcars on line, 1999–2007

Year	BNSF	CN	CP	CSX	KCS	NS	UP	Total
1999	51.1%	38.1%	36.2%	48.4%	54.1%	39.1%	58.0%	48.4%
2000	51.4%	43.9%	37.2%	47.8%	54.9%	41.1%	57.5%	48.9%
2001	51.8%	45.1%	40.8%	48.0%	53.2%	41.7%	59.6%	50.2%
2002	51.8%	47.3%	43.2%	48.3%	55.2%	38.8%	60.6%	50.5%
2003	52.6%	48.0%	41.3%	49.5%	54.0%	39.1%	60.8%	51.0%
2004	53.0%	45.1%	41.1%	50.4%	55.6%	40.5%	61.3%	51.4%
2005*	53.8%	46.1%	42.5%	50.5%	56.1%	41.5%	62.4%	52.1%
2006	55.1%	46.5%	40.5%	52.0%	55.8%	44.4%	56.3%	51.2%
2007	56.8%	46.3%	41.5%	54.4%	56.4%	45.8%	58.0%	52.7%

*Statistics for 2005 only cover January through September.
Source: Laurits R. Christensen Associates, Inc.

Freight Car Acquisitions

The shift of railcar investments to non-Class I firms is also dramatically shown in the following table from the AAR as developed in Christensen (Table 9-2). They identified six different time periods for analysis, but the major finding is that Class I railroads have not been significant contributors to the freight car acquisitions in the industry. The highest years of Class I railroad purchases were in the 1981-85 period, at 23 percent of the acquisitions, while the last five time periods have averaged slightly over 12 percent. It can be noted that in the 1996-2000 period significant increases occurred by both Class I railroads and the other investors. Overall, other investors provided about 88 percent of all new acquisitions.

Table 9-2: Freight railcar acquisitions, 1981–2007

Year	Total	Class I Railroads	Others	% Class I Railroads	% Others
1981-85	18,651	5,549	13,101	23.0%	77.0%
1986-90	21,871	2,794	19,078	11.2%	88.8%
1991-95	39,070	4,882	34,188	11.4%	88.6%
1996-00	62,794	10,728	52,067	15.7%	84.3%
2001-05	39,928	5,850	34,078	12.6%	87.4%
2001-07	48,218	6,647	41,571	12.5%	87.5%

Source: Laurits R. Christensen Associates, Inc.

The Railcar Fleet

Table 9-3 shows characteristics of the car fleet that have implications regarding capacity and the provision of capacity. Total cars in the fleet have decreased from 1.7 million in 1976 to 1.39 million in 2007. A modest increase has occurred from 2004 through 2007. The number of new cars has varied widely, from 12.4 to 86.7 thousand. The average from 2005 through 2007 has been a little less than 70 thousand per year, a significant increase over the average for the thirty-year period.

The capacity of the car fleet in tons has increased nearly 14 percent, even though the number of railcars has decreased by more than 18 percent. The number of ton-miles, however, increased nearly 93 percent from 1980 through 2007. It is apparent that railcars in 2007 were loaded more often than in 1976, with shorter cycle times. Due to the increase in the number of shuttle trains and unit trains since 1976, and their widespread use, this appears to be a reasonable conclusion.

Although the number of cars has decreased, the average age of the cars has increased, indicating that older cars are still being maintained on the lines. Overall, the number of cars on line is swelling, increasingly paid for by shippers, as the average car gets older. Both the average and total capacity in tons is increasing.

Table 9-3: Selected railcar fleet statistics, 1976-2007

Year	Total Cars (millions)	New Cars (thousands)	Avg. Age (years)	Avg. Capacity (tons)	Fleet Capacity (million tons)
1976	1.70	53.6	14.6	73.8	125.5
1980	1.71	86.7	14.9	78.5	134.2
1984	1.49	12.4	16.3	84.1	125.3
1988	1.24	22.5	17.7	87.4	108.4
1992	1.17	25.8	19.2	90.6	106.0
1993	1.17	35.2	19.5	91.3	106.8
1994	1.19	48.8	19.7	92.0	109.5
1995	1.22	60.9	19.9	92.9	113.3
1996	1.24	57.9	19.9	95.6	118.5
1997	1.27	50.4	20.0	96.5	122.6
1998	1.32	75.7	19.8	97.2	128.3
1999	1.37	74.2	20.1	98.2	134.5
2000	1.38	55.8	20.4	98.7	136.2
2001	1.31	34.3	20.9	99.1	129.8
2002	1.30	17.7	21.2	99.7	129.6
2003	1.28	32.2	21.9	100.1	128.1
2004	1.29	46.9	22.3	100.5	129.6
2005	1.31	68.6	22.3	101.2	132.6
2006	1.35	74.7	22.5	102.0	137.7
2007	1.39	63.2	22.5	102.8	142.9

Source: Laurits R. Christensen Associates, Inc.

Locomotives

The number of power units available to Class I railroads has increased in most years, and is up 34 percent since 1992. The aggregate horsepower of those locomotives also has steadily increased, 71.5 percent greater today than in 1992. Most of these units are new rather than rebuilt, and the average power has increased to 3,516.5 horsepower. Four percent of the fleet has consisted of new units, with some annual variation (Table 9-4).

Table 9-4: Selected locomotive fleet statistics, 1992-2007

Year	Units In Service	Aggregate Horsepower (millions)	Purchased & Leased New	Rebuilt Acquired	HP/Unit	%New
1992	18,004	49.5	321	139	2,749.4	1.8%
1993	18,161	50.4	504	203	2,775.2	2.8%
1994	18,505	52.4	821	393	2,831.7	4.4%
1995	18,812	55.1	928	201	2,929.0	4.9%
1996	19,269	57.5	761	60	2,984.1	3.9%
1997	19,684	60.2	743	68	3,058.3	3.8%
1998	20,261	63.3	889	172	3,124.2	4.4%
1999	20,256	64.8	709	156	3,199.1	3.5%
2000	20,028	65.3	640	81	3,260.4	3.2%
2001	19,745	64.7	710	45	3,276.8	3.6%
2002	20,506	69.3	745	33	3,379.5	3.6%
2003	20,774	70.9	587	34	3,412.9	2.8%
2004	22,015	76.1	1121	5	3,456.7	5.1%
2005	22,779	79.0	827	84	3,468.1	3.6%
2006	23,732	82.7	922	158	3,484.7	3.9%
2007*	24,143	84.9	902	167	3,516.5	3.7%

*Preliminary values are reported for 2007.
Source: Laurits R. Christensen Associates, Inc.

The three most common indicators of capacity are the miles of rail line, the cars on line, and the power units. Investments or changes in these categories indicate the growth or shrinkage of rail capacity. For example, the aggregate railcar capacities in tons and the aggregate locomotive horsepower have both increased.

Annual Class I Railroad Capital Expenditures

Table 9-5 indicates changes in annual expenditures for major capacity indicators. Investment choices vary in any one year but significant variation occurs from year to year. The averages reveal that variation, suggesting investment decisions are at least partially responsive to short-term market pressures.

Table 9-5: Changes in annual expenditures for Class I Railroads, 1988-2006

Year	Road	Locomotive	Cars	Total Equipment	Grand Total
1988	13.9%	87.5%	24.7%	44.7%	14.4%
1989	-4.7%	14.9%	43.5%	13.1%	8.5%
1990	4.1%	-12.9%	-31.7%	-16.2%	-7.3%
1991	-11.0%	13.6%	-11.2%	7.0%	-4.3%
1992	14.4%	-43.0%	13.0%	-20.0%	6.8%
1993	2.1%	51.3%	55.3%	45.8%	20.2%
1994	12.0%	19.4%	30.2%	22.7%	11.2%
1995	14.7%	32.5%	33.5%	30.1%	12.7%
1996	6.6%	5.8%	-28.7%	-6.2%	13.6%
1997	5.5%	12.7%	-29.7%	-2.6%	2.8%
1998	16.8%	0.5%	22.9%	7.9%	8.8%
1999	-9.2%	-12.1%	1.2%	-6.1%	-17.2%
2000	2.3%	-60.8%	2.5%	-37.0%	-15.8%
2001	-2.8%	-13.5%	-98.4%	-39.8%	-3.4%
2002	4.9%	13.7%	-65.5%	0.8%	9.2%
2003	-1.8%	31.4%	6.9%	24.1%	6.6%
2004	8.0%	-19.1%	32.5%	0.1%	5.8%
2005	8.2%	-32.1%	9.2%	-23.7%	10.8%
2006	26.4%	32.2%	50.2%	36.0%	14.3%
Averages	**Road**	**Locomotive**	**Cars**	**Total Equipment**	**Grand Total**
1987-1992	3.4%	12.0%	7.7%	5.7%	3.6%
1992-1997	8.2%	24.3%	12.1%	18.0%	12.1%
1997-2002	2.4%	-14.4%	-27.5%	-14.9%	-3.7%
2002-2006	10.2%	3.1%	24.7%	9.1%	9.4%

Source: Laurits R. Christensen Associates, Inc.

In a recent study, Cambridge Systematics used DOT's Freight Analysis Framework to examine overall railroad infrastructure needs compared to expected rail transportation demands. They found that only 1 percent of lines were over capacity and that 88 percent were below capacity. However, that study did not examine the multiple components of capacity as was done above. Aggregate analysis is an incomplete evaluator of the specific capacity needs of shippers, especially agricultural shippers.

Rural rail network lines have declined, and abandonments by Class I railroads, short lines, and regional companies continue. The push to trainload operations has increased overall capacity while making individual shippers and smaller elevator firms carry the cost of assembly of those unit train volumes. Guaranteed railcar ordering systems provide efficiency, but at increased cost. Determining effective capacity available to agriculture is complex and cannot be separated from service issues, rate levels, structure, and competition for traffic.

Conclusions

Adequate rail capacity is necessary to move agricultural products to market in an efficient and cost-effective manner. Rail capacity constraints force traffic from rail to truck, increasing transportation costs and damage to highways.

Capacity constraints were common from 2003 through the first half of 2006. Weaker demand for rail freight transportation beginning in late 2006, and a recession that began in December 2007 resulted in adequate rail capacity for agricultural products during the harvest of 2006, and from 2007 through the first half of 2009. However, capacity constraints are expected to occur again when the economy recovers.

Increased use of the rail lines, which has benefited the railroads financially, has also contributed significantly to rail congestion. Each route mile during 2007 carried, on average, 171 percent more traffic in ton-miles—nearly three times the traffic—than in 1980.

By the end of 2007, short line and regional railroads operated nearly 46,000 main line miles of track, a little more than 30 percent of the U.S. railroad network. Short line and regional railroads often provide rail service to rural shippers on lines that otherwise would have been abandoned.

The capacity of the car fleet in tons has increased nearly 14 percent from 1976 to 2007, even though the number of railcars has decreased by more than 18 percent. The ton-miles increased nearly 93 percent from 1980 through 2007, indicating that railcars in 2007 were loaded more frequently than in 1976 due to shorter cycle times. The number of engines available to the Class I railroads has increased 34 percent since 1992. The aggregate horsepower of those locomotives also has steadily increased, up 71.5 percent since 1992.

Railroads are relying more and more on privately-owned cars to provide the capacity to handle shipper demands, shifting the investment burden from the carriers to the shippers. Since 1981, shippers and other investors have provided 88 percent of all new railcar acquisitions.

Rail capacity requirements need to be examined and considered in light of the characteristics of agricultural movements rather than aggregate models and investment strategies. Testimony, shipper complaints and economic analysis indicates the seasonal needs of agriculture and the density of those movements in specific corridors, as well as the perishable nature of the products being moved.