

# Railroads and Grain

ASSOCIATION OF AMERICAN RAILROADS

MAY 2018

## Summary

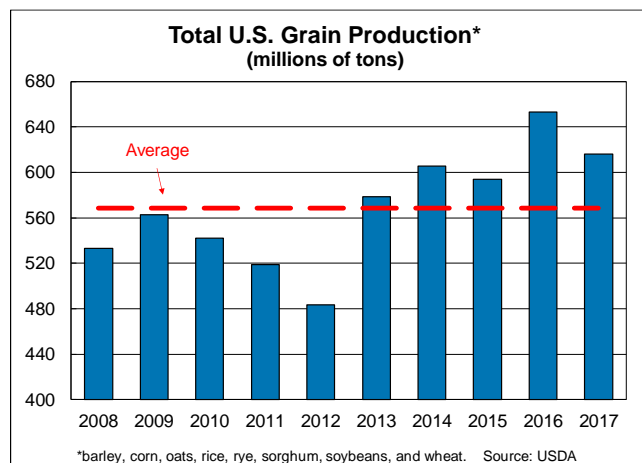
Railroads are critical to grain transportation. In 2017, U.S. Class I railroads originated 1.46 million carloads of grain (5.1 percent of total carloads) carrying 144.1 million tons (8.9 percent of total tons). Grain is also a key commodity for scores of short line and regional freight railroads. Railroads also haul large amounts of grain-related food products, such as soybean cake and meal, corn syrup, flour, prepared animal feed, and dried distillers grains.

## Overview of Grain

The United States is the world's biggest grain producer — average annual U.S. grain production from 2008 to 2017 was 569 million tons<sup>1</sup> — but what crops are grown, where, and in what quantities, and how, when, and to where they are transported, are determined by a complex interaction of factors. These factors include weather and soil conditions, but also a complicated interplay of many entities — including farmers, various transportation modes and providers, elevator operators, grain marketing companies, grain consumers large and small (both in the United States and abroad), as well as local, national, and foreign governments.

Most grain is grown to be eaten, usually by animals that are eventually eaten by humans (e.g., cows, pigs, and chickens) or by humans directly, and often after being processed in one way or another (wheat is milled into flour, soybeans are crushed to produce soybean oil and soybean meal, corn is milled to produce corn starch which is further processed to produce corn syrup, and so on).

Some aspects of the grain market are generally predictable — e.g., poultry farms in the southern United States will always need large amounts of grain for feed — but many aspects of the grain market are more volatile. For example, large fluctuations in grain production are common from one year to the next. Just from 2012 to 2017, U.S. grain production ranged from 483 million tons to 653 million tons.



<sup>1</sup> Data on grain production and consumption herein come from the U.S. Department of Agriculture's National Agricultural Statistics Service, especially its annual crop production summary reports, and/or from the USDA's Economic Research Service's periodic outlook reports for the various types of grain.

Moreover, the various types of grain have unique characteristics and are also marked by volatility. Corn, for example, is grown in large quantities in many different states, but mainly in the Midwest. It accounted for 65 percent of U.S. grain production, on average, from 2008 to 2017. However, because the amount of corn produced can change significantly from year to year, the corn share of U.S. grain production ranged from 62 percent to 67 percent and the volume produced varied by 123 million tons. Corn consumption patterns change too. In 2008, feed accounted for around 43 percent of U.S. corn consumption and ethanol for about 31 percent. In 2017, feed accounted for 37 percent and ethanol for 38 percent.

<b>U.S. Grain Production by Type of Grain</b> (millions of tons)										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Barley	5.8	5.5	4.4	3.8	5.3	5.3	4.4	5.3	4.9	3.4
Corn	338.6	366.6	348.5	346.1	301.1	387.2	398.0	380.9	424.1	408.9
Oats	1.4	1.5	1.3	0.9	1.0	1.0	1.1	1.4	1.0	0.8
Rice	10.1	10.8	12.0	9.1	9.9	9.4	11.0	9.5	11.1	8.8
Rye	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2
Sorghum	13.2	10.7	9.7	6.0	6.9	11.0	12.1	16.7	13.4	10.2
Soybeans	89.0	100.8	99.9	92.8	91.3	100.7	117.8	117.8	128.9	131.7
Wheat	75.0	66.5	66.2	60.0	67.6	64.0	60.8	61.9	69.3	52.2
<b>Total</b>	<b>533.3</b>	<b>562.6</b>	<b>542.1</b>	<b>518.8</b>	<b>483.2</b>	<b>578.9</b>	<b>605.4</b>	<b>593.8</b>	<b>653.0</b>	<b>616.3</b>

Source: USDA

Soybeans, meanwhile, accounted for 19 percent of U.S. grain production from 2008 to 2017, far less than corn, but the soybean share varied from 17 percent to 21 percent. Over that period, exports accounted for 47 percent of soybean utilization — more than three times the export share for corn. Most of the rest was crushed at processing plants throughout the country to produce soybean oil and soybean meal. Soybeans are generally grown in large quantities in the same states that produce large quantities of corn.

Wheat, on the other hand, is grown mainly (depending on the type of wheat) in the northern tier of U.S. states, including the Dakotas, Montana, and Idaho, or the plains of Kansas, Oklahoma, and Texas. Wheat accounted for 11 percent of U.S. grain production from 2008 to 2017. Over the past 10 years, 46 percent of U.S. wheat utilization has gone to exports, about the same as soybeans and far more than corn. Wheat that is not exported is usually processed to produce food for human consumption, including bread, pastries, and pasta.

Major grains do not necessarily follow similar production patterns. For example, U.S. soybean production fell in 2012 from 2011, then rose from 2013 to 2015. U.S. wheat production, meanwhile, rose in 2012 from 2011, then was lower again from 2013 to 2015. Production of soybeans rose in 2017 over 2016 but production of corn and wheat fell. Hot dry spells or floods may suppress grain yields in one region, while other regions might be enjoying average or exceptional growing conditions at the same time.

Further complexity in grain markets comes from the difficulty in forecasting crop size, even when the forecasts are made close to harvest time. This makes planning that much more difficult for those involved in grain logistics. Timing adds yet more complexity. Those who possess grain seek to sell it to the highest bidder. At harvest, a farmer might choose to sell his or her crop immediately — perhaps to a local processor or local elevator — or the farmer might decide to store all or part of the crop on the farm in anticipation of a better price later. Likewise,

an elevator might choose to sell the grain to, say, an overseas buyer, or could instead choose to store the grain in anticipation of a better deal later on.

Like U.S. grain production, U.S. grain exports fluctuate because they are a function of many different market and non-market factors. For exports, these include crop yields in competing grain exporting countries, economic conditions in importer countries, exchange rates, grain prices, government policies, and ocean freight rates. All of these can change significantly from one year to the next or even from month to month, resulting in grain exports that can vary tremendously. Total U.S. grain exports averaged 139 million tons per year from 2008 to 2017, but during this period exports ranged from 113 million tons to 164 million tons.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Corn	59.2	52.4	55.7	50.3	34.5	26.3	54.5	49.0	61.5	58.1
Rice	4.2	3.8	4.9	4.1	4.2	4.2	3.7	4.3	4.3	4.3
Sorghum	5.8	4.1	4.2	3.7	1.9	2.3	7.9	10.8	7.5	6.2
Soybeans	37.3	44.5	46.6	37.9	48.1	43.4	54.6	53.1	63.6	61.2
Wheat	33.1	24.2	30.4	36.2	28.4	36.2	28.0	23.4	26.4	30.1
Other	0.1	0.0	0.6	0.6	0.7	0.6	0.8	0.8	0.6	0.7
<b>Total</b>	<b>139.7</b>	<b>129.0</b>	<b>142.5</b>	<b>132.8</b>	<b>117.7</b>	<b>113.0</b>	<b>149.7</b>	<b>141.4</b>	<b>163.9</b>	<b>160.6</b>

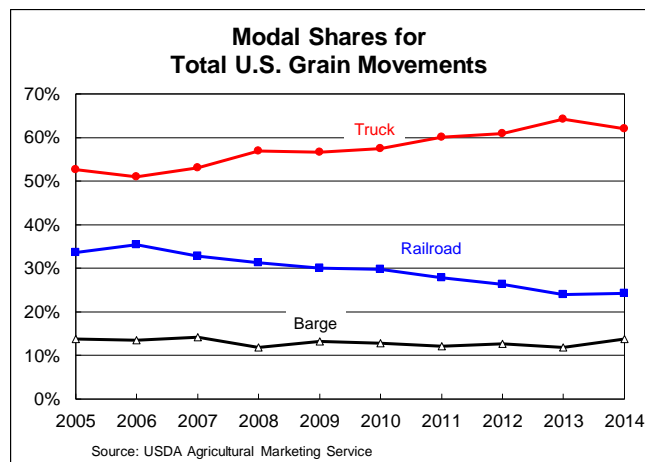
Source: USDA

### Grain Transportation

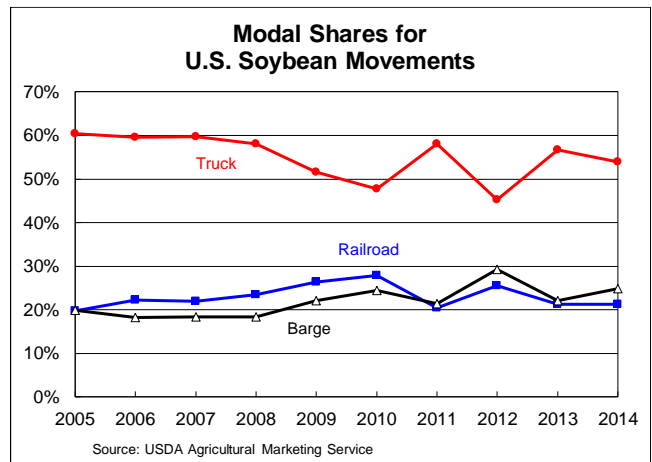
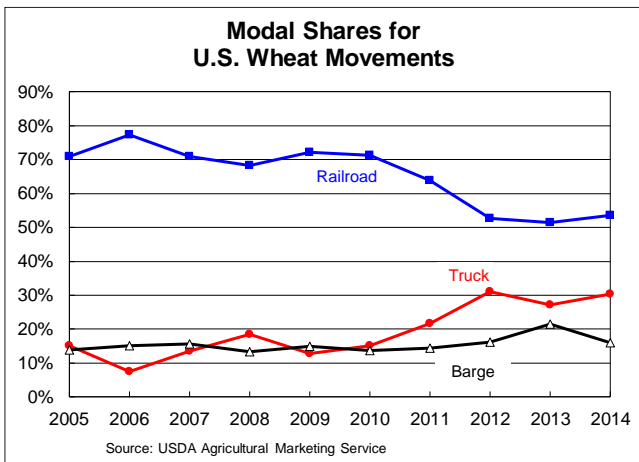
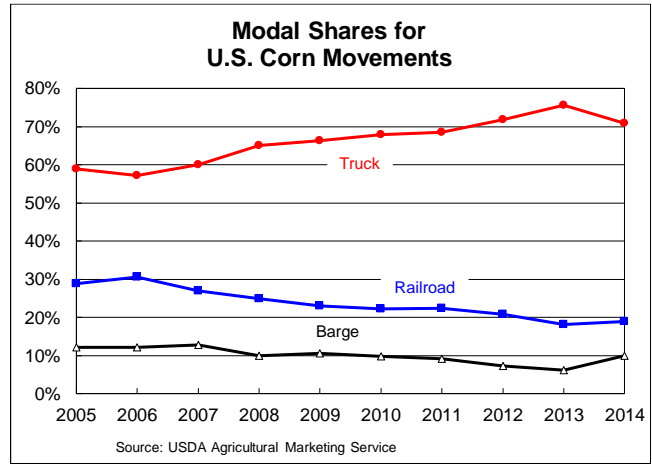
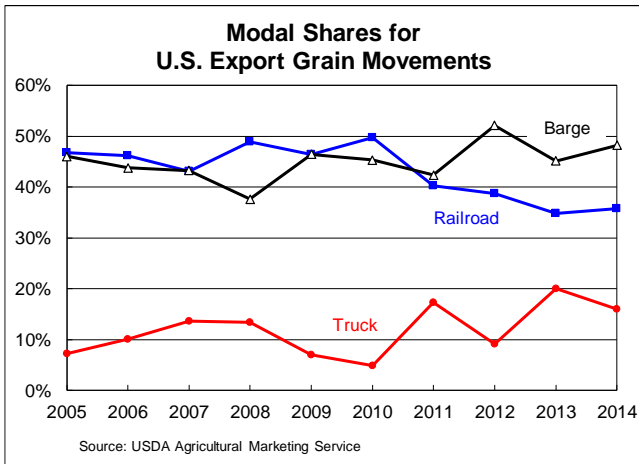
The nature of U.S. grain production and consumption patterns means that the grain logistical chain in the United States must be complex and resilient. As noted above, grain production, movement to storage, and movement out of storage to domestic and export markets depend on a variety of interconnected factors.

Railroads, along with barges and trucks, are a critical part of the grain logistical chain. The fact that this chain generally functions smoothly is a testament to the tremendous efforts that transportation providers, including railroads, put forth in support of their grain-related customers.

Today, grain shippers benefit from strong competition among railroads, trucks, and barges to carry grain. According to USDA data, the truck share of total U.S. grain transport was 62 percent in 2014 (the most recent year for which data are available at this writing), compared with just 24 percent for railroads and 14 percent for barges (see the nearby chart). The fact that the truck share has been trending higher — it was 51 percent in 2006 — is strong evidence of the intensity of the competition that railroads face for grain traffic.



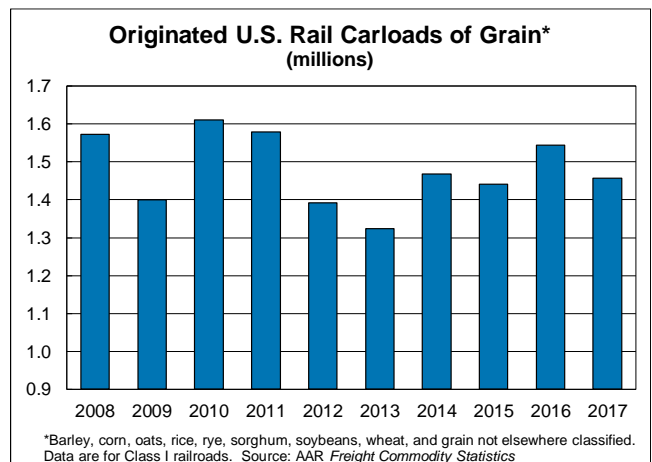
Much of the growth in the truck share of corn movements over the past decade is attributable to local shipments of corn to ethanol plants, but even for wheat and soybeans, railroads clearly face intense competition for their services.

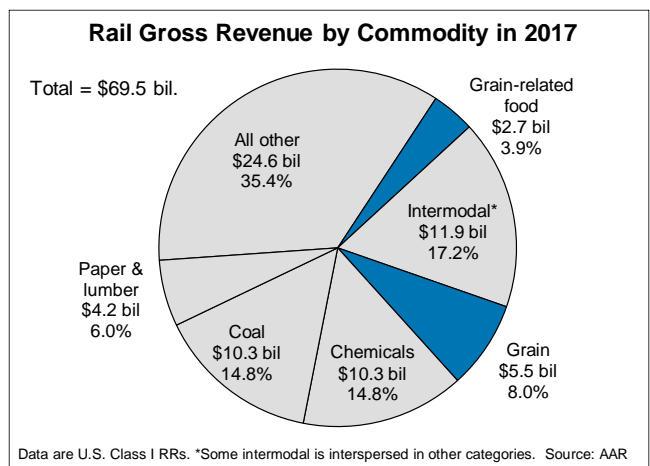
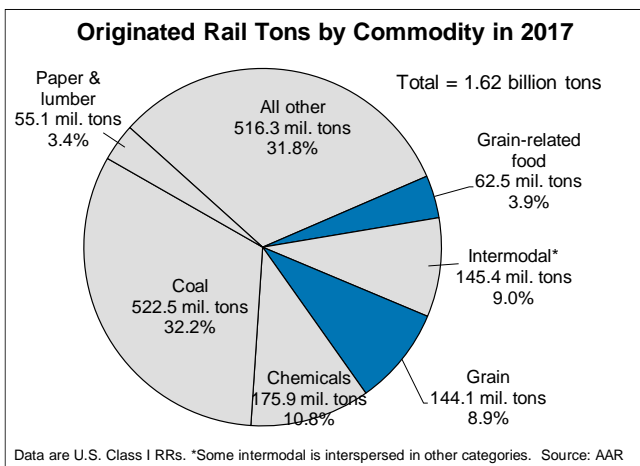
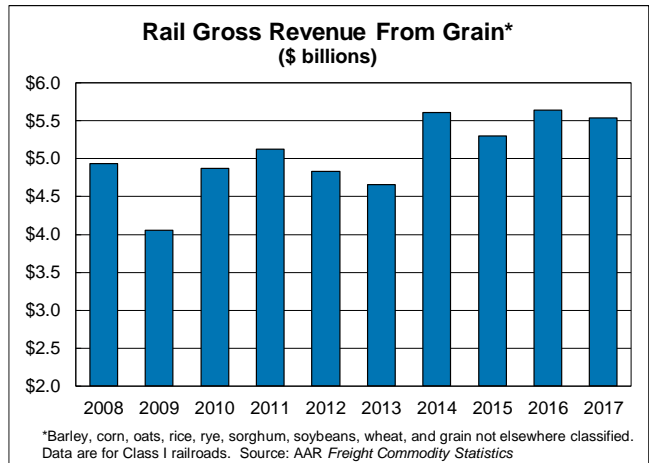
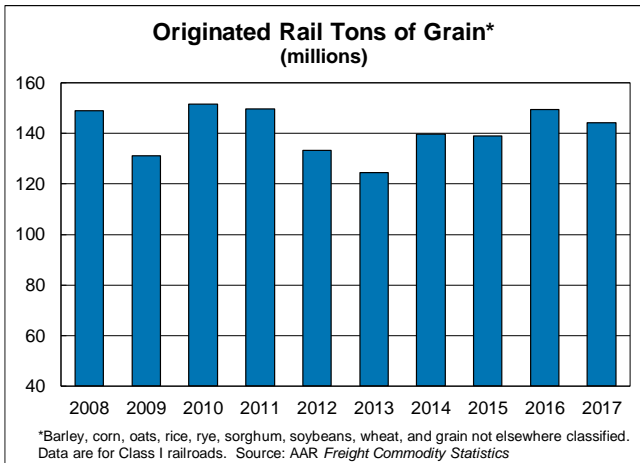


### Overview of Railroads and Grain

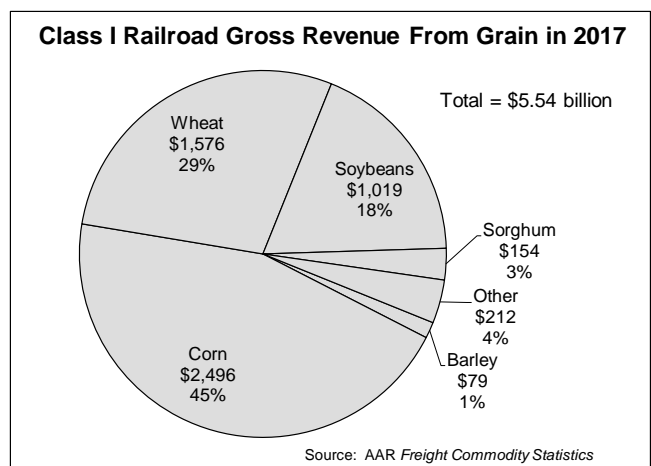
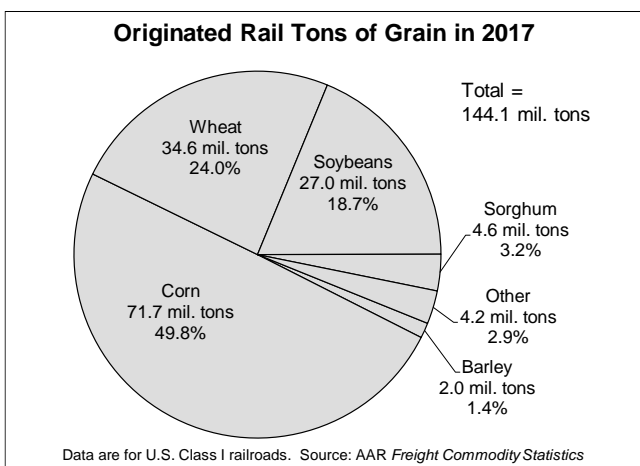
In 2017, Class I railroads originated 1.46 million carloads of grain (5.1 percent of total carloads) carrying 144.1 million tons (8.9 percent of total tonnage) and earning gross revenue of \$5.5 billion (8.0 percent of total revenue). There is always some year-to-year volatility in rail grain volumes.

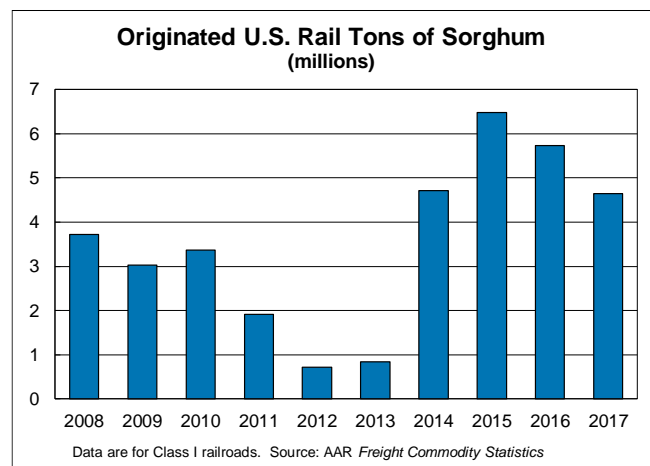
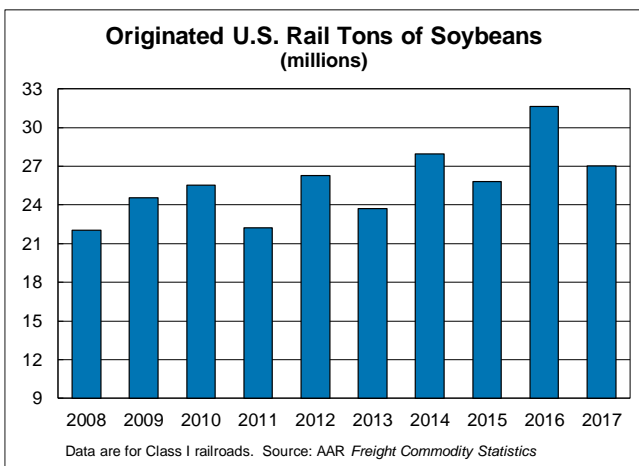
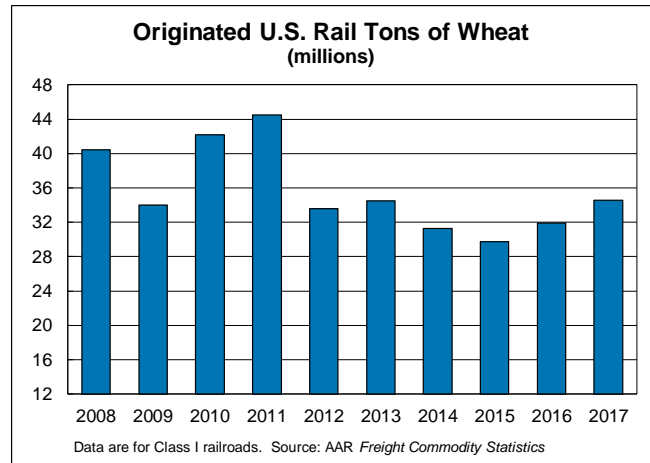
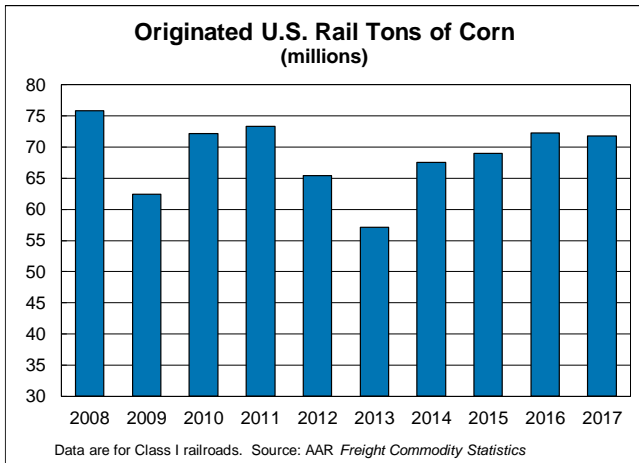
In addition, grain-related food products — which consist of a wide variety of commodities such as flour, animal feed, soybean oil, and corn syrup — typically account for another 4 percent or so of rail tonnage and revenue.





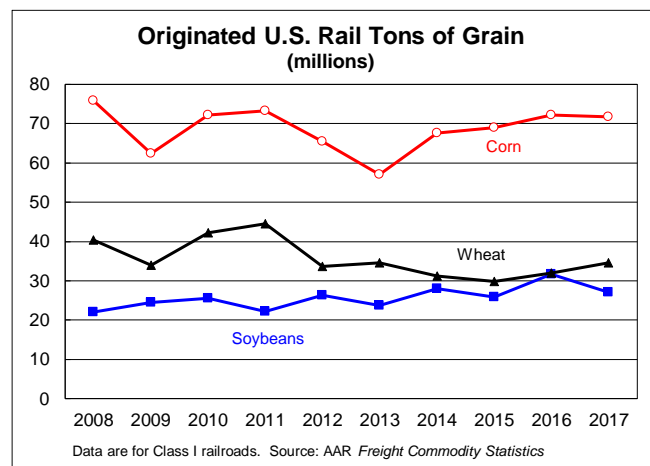
U.S. freight railroads carry more corn than any other type of grain. From 2008-2017, corn accounted, on average, for 68.7 million tons (49 percent of total rail grain tonnage) and \$2.2 billion in gross revenue (44 percent of total grain revenue), well ahead of wheat (35.7 million tons, \$1.4 billion) and soybeans (25.7 million tons, \$940 million).





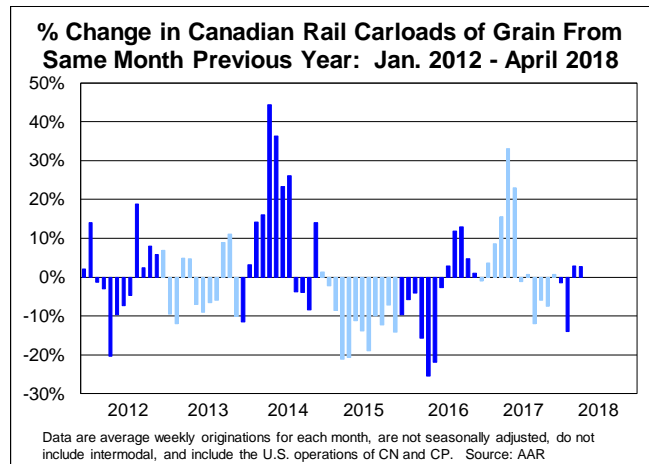
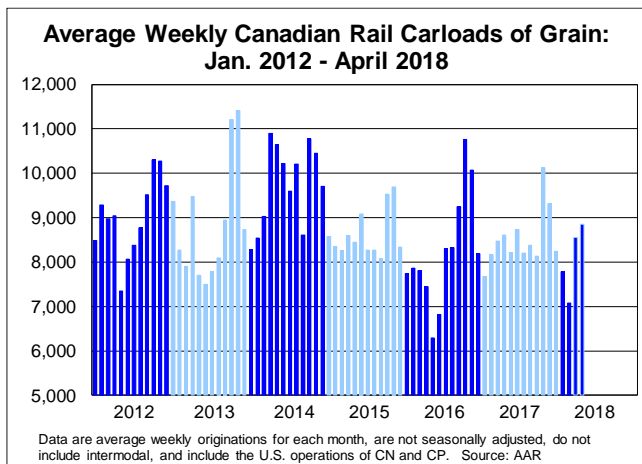
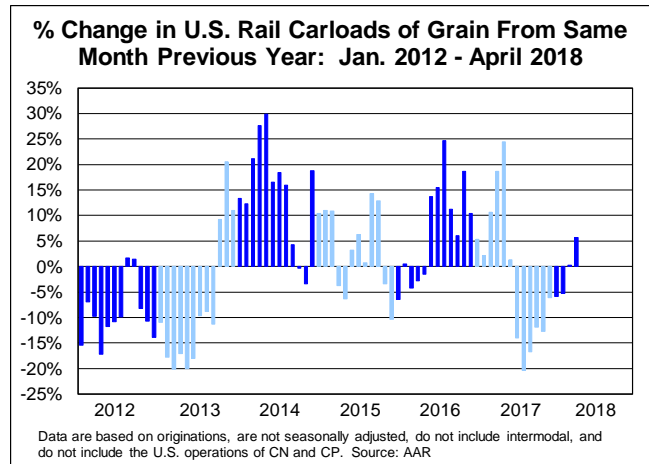
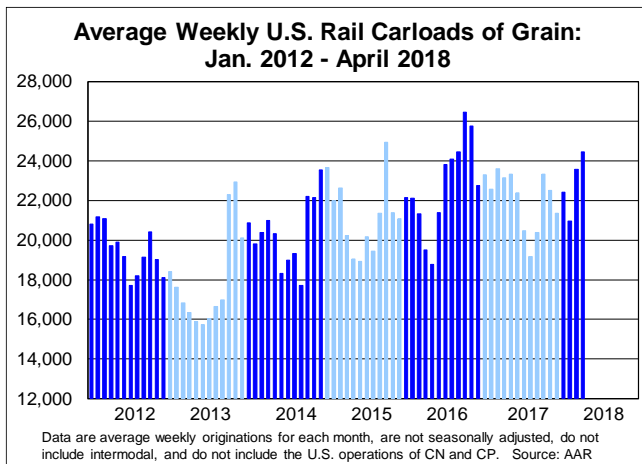
The share of rail grain traffic by type of grain varies from year to year depending on how much of the various grains are produced and the market dynamics associated with the various types of grain.

Top states for rail originations of grain include Illinois, Minnesota, Nebraska, and North Dakota, which together account for around half of all originated rail tons of grain. Top states in terms of rail terminations of grain include Washington, Texas, Illinois, and California, which together typically account for nearly half of all rail grain terminations.



The charts below and on the top of the next page show average weekly rail grain carloads by month through April 2018 for U.S. and Canadian railroads.<sup>2</sup>

<sup>2</sup> Monthly rail traffic data come from a different source, and thus do not exactly match, rail traffic data taken from the source used for other traffic charts in this paper.



## The Railroad Grain Car Fleet

The amount of grain transported within a region or by an individual railroad can be highly cyclical and volatile from week to week. From January 2010 through April 2018, U.S. and Canadian railroads together originated an average of 29,934 carloads of grain per week, but the peak week (39,163 carloads) was 87 percent higher than the lowest week (20,968 carloads).

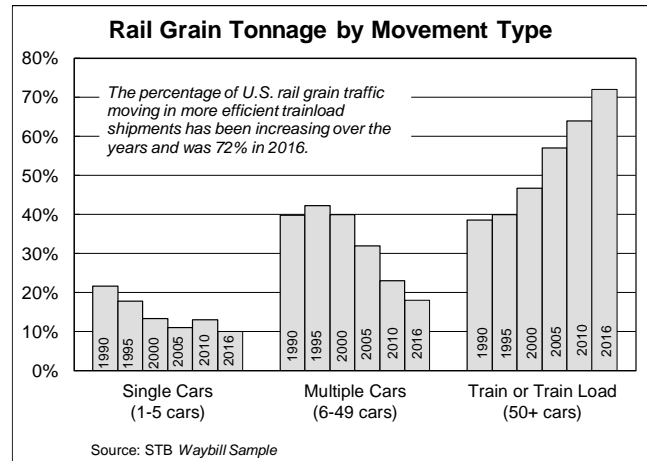
When demand is particularly high (often during or immediately following harvests), so-called shortages of rail grain cars might occur. During these periods, not all grain shippers who want rail cars are able to obtain them easily. Conversely, during periods of relatively low demand, it is common for thousands of grain cars to sit idle on rail sidings, sometimes for long periods.

Railroads know that adequate grain car capacity is critical to efficient grain marketing and transportation, which is why they and other freight car providers work hard to supply a rail car fleet that is as large as can be justified economically. Moreover, when car shortages do occur, railroads and others work diligently to move as much grain as possible as quickly as possible. As of year-end 2017, the North American railroad grain car fleet consisted of nearly 283,000 cars (owned by railroads and non-railroads) with a capacity of 1.43 billion cubic feet.

In recent years, new grain cars have been added to the fleet. New cars generally can carry more grain than the cars they replace, making a focus solely on the number of cars in the fleet misleading. Moreover, because of improvements in utilization through efficiency improvements like shuttle trains, a rail grain car today typically moves more grain than in the past.

## Rail Service Options

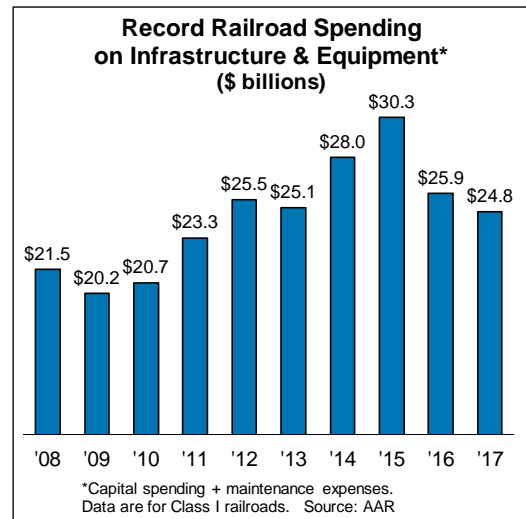
Railroads offer various service options (single car, multiple cars, trainload, or shuttle trains) to grain shippers, and data show a clear trend toward more efficient grain movements. Single car movements (typically defined as 1–5 cars) accounted for 22 percent of total U.S. grain carloads in 1990; in 2016, they were 10 percent. Multiple car shipments (6–49 cars) fell from 40 percent in 1990 to 18 percent in 2016. Trains with 50 or more cars include conventional trainload and shuttle trains; they rose from 39 percent in 1990 to 72 percent in 2016. Large, more efficient long-hauls for grain drive down costs. The continuing trend toward such shipments is driven by competition and reflects market forces that call for grain transportation to be as efficient as possible.



## Continued Spending Back Into the Rail Network

In the future, transportation demand will grow. Recent forecasts from the Federal Highway Administration found that total U.S. freight shipments will rise from an estimated 18.1 billion tons in 2015 to 25.5 billion tons in 2040 — a 41 percent increase.

Freight railroads are preparing for this future demand today. Unlike trucks, barges, and airlines, which travel mainly on infrastructure that the government provides and pays for, America’s privately owned freight railroads operate almost exclusively on infrastructure that they own, build, maintain, and pay for themselves. In recent years, America’s freight railroads have been putting more money back into their networks than ever before. From 1980 through 2017, they spent more than \$660 billion — their own funds, not taxpayer funds — on renewal, maintenance, and expansion of their infrastructure and equipment. That’s more than 40 cents out of every rail revenue dollar.



In the years to come, railroads will be asked to continue to grow capacity for grain and other current and potential customers. Additional spending on capacity can only be made if rail earnings are robust enough to attract the capital needed to pay for it.

## Conclusion

America’s freight railroads do a remarkable job meeting the needs of an extremely diverse set of shippers. The vast majority of rail shipments, including grain shipments, arrive in a timely manner, in good condition, and at competitive rates. Railroads look forward to continuing to meet the needs of grain shippers safely and efficiently.