



IMPACTS OF THE 2019 UPPER MISSISSIPPI RIVER FLOODING ON BARGE MOVEMENTS IN THE UPPER MIDWEST REGION

REPORT HIGHLIGHTS

- St. Louis Harbor was closed for 38 consecutive days between May and June, the longest period recorded at a given lock and dam on the river this year.
- Approximately 85 different commodities weighing 119 million tons are transported up and down the river via barges annually. Agricultural commodities (mainly corn and soybeans) account for about 45 percent of that freight.
- From March through June, we estimate that approximately 6.3 million tons of grains worth almost a billion dollars went unshipped due to disruptions to barge traffic.

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EXECUTIVE SUMMARY

IN 2019, severe and widespread flooding stopped barge traffic and disrupted the movement of about 85 different types of commodities along the Upper Mississippi River (UMR). Additional impacts included damages to Coast Guard infrastructures as well as losses in productivity due to the inability to navigate waters. The flooding began in early March with heavy snowmelt mixed with rainfall and persisted over the following months with continuous heavy rainfall. St. Louis Harbor was closed for 38 consecutive days between May and June; the longest period recorded for the year at a given lock and dam on the river.

This report estimates the direct economic value of the unshipped agricultural commodities as well as the loss in productivity and damage to USCG infrastructures due to this year's floods. Due to unavailable data on the other top commodities shipped along the UMR, this report focuses solely on grain data. Using the most recent barge movement data from the US Army Corps of Engineers, we found that the dominant source for barge freight in 2017 were corn and soybean. Agricultural commodities encompass more than 45 percent of the freight that is moved up and down the river system annually. Of the 119 million tons of freight moving along the river, approximately 64 percent of it (mostly corn and soybean) enters the main stem of the UMR via the Illinois River.

In order to estimate the potential value of corn and soybean not transported in March through June of this year due to flooding, we took a 5-year average (2014-2018) of total corn and soybean volumes for those months and subtracted it from the reported 2019 volumes. The difference in volume between the two was then multiplied by the 2019 season average prices for corn and soybean obtained from current the United States Department of Agriculture (USDA) Economic Research Service Crop Outlook reports. Due to the floods, we estimate that approximately 5.2 million tons of corn and 1.1 million tons of soybeans valued at \$668 million and \$305 million respectively were not transported.

INTRODUCTION

THE UPPER MISSISSIPPI RIVER SYSTEM (UMR) is the segment of the Mississippi River upstream of Cairo, Illinois. It begins at Lake Itasca in northern Minnesota and flows 1,300-miles to Cairo, where it converges with the Ohio River to form the Lower Mississippi River.¹ This waterway encompasses several significant tributaries such as the Missouri and Illinois Rivers and links the

states of Minnesota, Iowa, Wisconsin, Illinois, and Missouri. The UMR features 29 locks and dams that help sustain a permanent 9-foot channel for commercial navigation, and 19 ports. Of these ports, 11 lie along the main stem of the Mississippi River, 5 along the Illinois River, and 3 along the Missouri River.

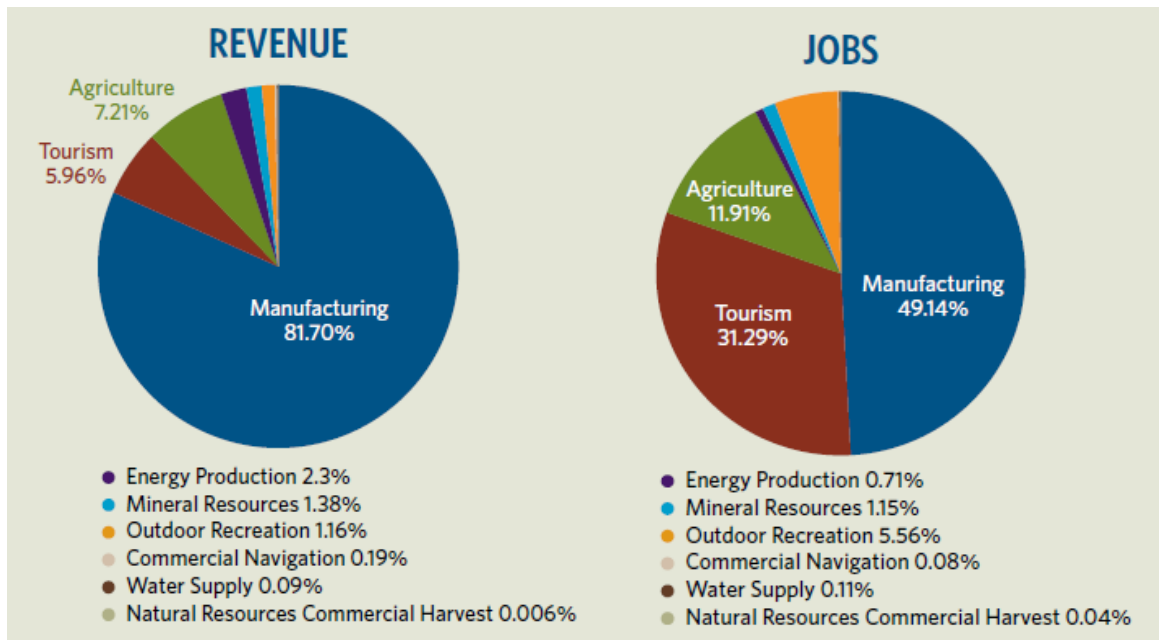


Figure 1. The Upper Mississippi River System (includes the Minnesota, St. Croix, Illinois, Missouri, and Kaskaskia Rivers)

¹
https://www.umesc.usgs.gov/umesc_about/about_umrs.html

There are approximately 30 million people in the UMR basin who rely on the river as a source of drinking water, food, transportation, power production, recreation, and employment. According to a 2016 UMR economic report, the main stem of the river directly supports nine significant and interrelated economic sectors: Manufacturing, Tourism, Agriculture, Commercial Navigation, Mineral Resources, Energy Production, Outdoor Recreation, Water Supply, and Commercial Harvest.

Energy Production, Outdoor Recreation, Water Supply, and Commercial Harvest. Combined, these nine economic sectors support over 1 million jobs and create more than \$345 billion in revenue annually within the 133-county corridor (see Figure 2). The manufacturing, tourism, and agricultural sectors account for 95 percent of the revenue and 92 percent of the jobs.²



Sector	Revenue	Jobs
Manufacturing	\$282.5 billion	562,228
Agriculture	\$25 billion	136,000
Tourism	\$20.6 billion	358,000
Energy Production	\$8 billion	8,100
Mineral Resources	\$4.8 billion	13,115
Outdoor Recreation	\$4 billion	64,000
Commercial Navigation	\$673 million	1,000
Water Supply	\$320 million	1,300
Natural Resources Commercial Harvest	\$21.7 million	500
Totals	\$345.9 billion	1,140,435

Figure 2. Economic Profile of the Upper Mississippi River Corridor. Source: Upper Mississippi River Main stem Economic Profile (2016). Totals in table may not sum due to rounding.

² <http://www.umrba.org/umr-econ-profile.pdf>

Commercial navigation along the UMR continues to play a vital role to the economic growth of both the regional and national economies. It remains the most cost-effective, safe and environmentally friendly means to transport bulk freight in the region. This sector generates \$673 million in revenue and provides approximately 1,000 jobs annually. Approximately 85 commodities weighing more than 118 million tons are transported along the river system via barges each year. It is important to note that although the commercial navigation sector accounts for less

than 1 percent of the revenue and jobs generated in the UMR, it is imperative to the economic activities of the manufacturing, agriculture, energy, and mineral resources sectors. The UMR Economic report notes that, ***“Commercial navigation provides tremendous direct and indirect economic value by supporting shipping and receiving jobs within these sectors. Shipments on the UMR account for a significant share of the nation’s total inland waterway shipments.”*** (Upper Mississippi River Main stem Economic Profile, page 2)

“The economic sectors in the UMR support over 1 million jobs and create more than \$345 billion in revenue annually.”

SECTION 1: 2019 FLOODING OF THE UPPER MISSISSIPPI RIVER

WIDESPREAD MAJOR FLOODING along the UMR has been persistent since late February of this year. A mixture of conditions including saturated and frozen soils from the cold winter, heavy snowfall followed by heavy rainfall created the

longest flood records in several locations. Over the past few months, several gauges along the river system reached or surpassed historical crest records.³

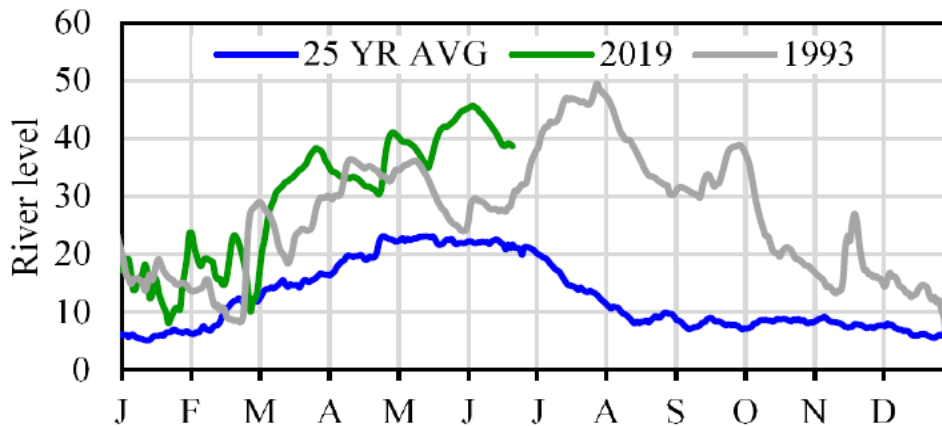


Figure 3. Mississippi River Levels at St. Louis. The River Level is Measured by Gauge Height (in feet). Source: USDA-AMS Grain Transportation Report for the Week Ending on June 27, 2019.

Flood levels exceeded those recorded in the great flood of 1993 from March through June (see Figure 3). As a result, the Captain of the Port (COTP) closed more than 500 miles of river to boat and barge traffic for about 50 days. St. Louis Harbor (includes Lock 27) experienced the longest consecutive days of closure (38) in late

May through early July. To date, the main stem of the UMR, St. Louis Harbor, Illinois River and Missouri River have been closed a total of 18, 51, 34 and 45 days respectively (see Figure 4). In general, various segments of the river were closed from March through early July.

Location	Total Number of Days Closed	Most Consecutive Number of Days Closed	Dates of Most Consecutive Days Closed
UMR (south side of Lock 18 to northside of Lock 26)	18	18	6/1 to 6/19
St. Louis Harbor (north side of Lock 27)	51	38	5/24 to 7/1
Illinois River	34	23	5/27 to 6/19
Missouri River	45	22	3/15 to 4/6

Figure 4. Total Number of Days the rivers in the UMR system were closed due to Flooding in 2019. Data provided by USCG Sector UMR in August 2019.

³https://www.ams.usda.gov/sites/default/files/media/GT_R06272019.pdf#page=2

SECTION 2: FREIGHT MOVEMENT ALONG THE UPPER MISSISSIPPI RIVER

COMMERCIAL NAVIGATION on the UMR has always been essential to the economic development of the region. The Manufacturing, Tourism, Agriculture, Commercial Navigation, Mineral Resources, Energy Production, Outdoor Recreation, Water Supply, and Commercial Harvest sectors that it directly supports generate billions in revenue and millions in jobs annually. Using the most recent data available from the US Army Corps of Engineers (USACE), we found that 85 different types of commodities weighing approximately 119 million tons were transported along the UMR via barges in 2017 (see Figure 5).

Approximately 75 percent of the commodities transported on the UMR are moving downstream, and that includes the main commodities: corn, soybeans, coal/lignite, sand/gravel, and cement/concrete. Combined, they account for 58 percent of the of freight movement along the UMR system (see Figure 6). Agriculture (>45%) is the top industry moving freight by tonnage (not value) followed by mineral resources (>21%). The main goods moving upstream are nitrogenous fertilizer, coal/lignite, cement/concrete, and sand/gravel.

Top 10 Commodities Moving Up and Down the Upper Mississippi River in 2017 (Short Tons)

Row Labels	Downbound/West/South	Upbound/East/North	Grand Total
Corn	24,998,133	23,658	25,021,791
Soybeans	17,793,465	43,278	17,836,743
Coal & Lignite	8,527,884	3,192,907	11,720,791
Sand & Gravel	5,203,563	1,945,223	7,148,786
Cement & Concrete	4,051,129	2,731,308	6,782,437
Animal Feed, Prep.	5,587,905	20,075	5,607,980
Nitrogenous Fert.	146,877	4,289,389	4,436,266
Petroleum Coke	3,348,683	175,045	3,523,728
Alcohols	2,809,003	233,719	3,042,722
Limestone	2,097,596	640,165	2,737,761
All Others	15,055,457	15,839,638	30,895,095
Grand Total	89,619,695	29,134,405	118,754,100

Figure 5. Top 10 Commodities moving up and down the UMR (MN to Mouth of Ohio River) in 2017 (Short Tons). Source of Data: US Army Corps of Engineers, [Waterborne Commerce Statistics Center](#). Accessed August 2019.

In 2017, 85 different types of commodities weighing approximately 119 million tons were transported along the UMR via barges. Forty-five percent of that freight was agricultural commodities; mostly corn and soybeans.

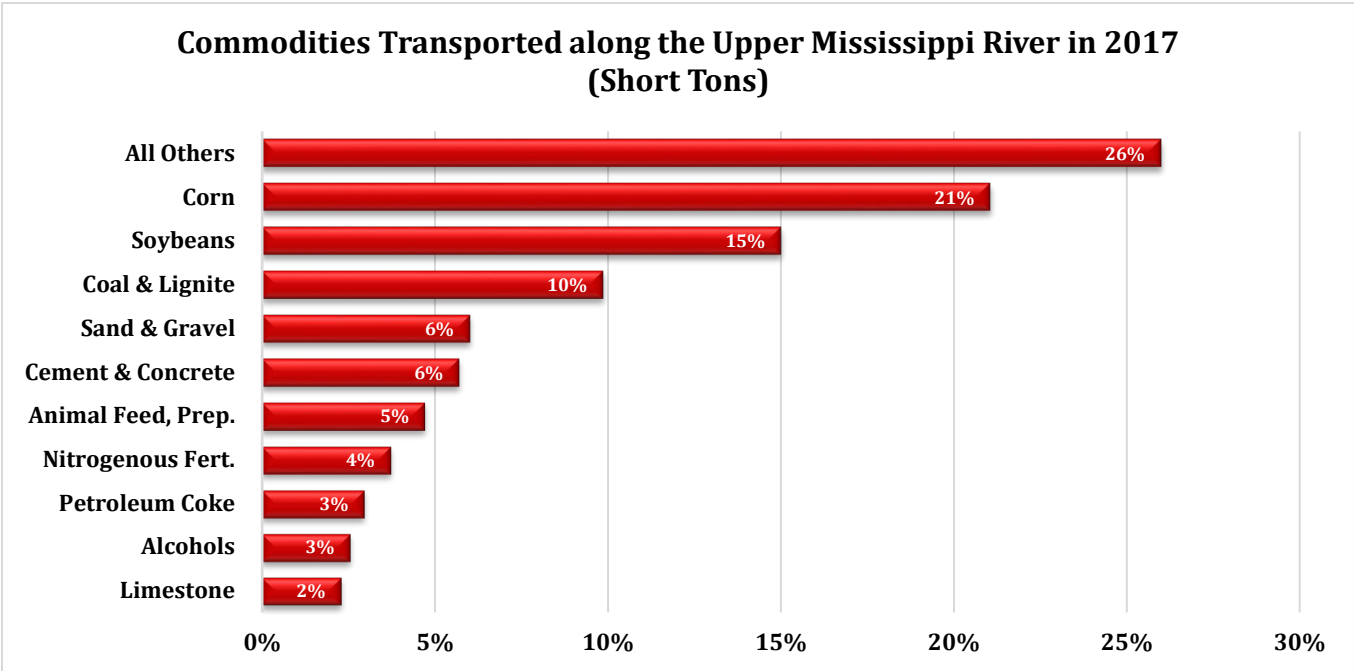
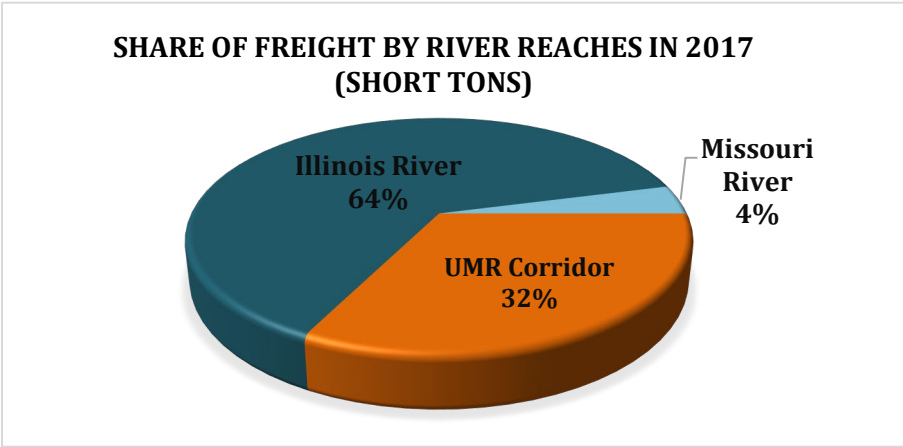


Figure 6. Top 10 Commodities Transported along the Upper Mississippi River (MN to Mouth of Ohio River) in 2017. Source of Data: US Army Corps of Engineers, Waterborne Commerce Statistics Center. Accessed August 2019.



The Illinois River carries approximately 64 percent of the freight within the UMR (see Figure 7); most of which are corn, soybeans, and animal feed preparations. This tributary accounts for approximately 61 percent of corn and 44 percent of soybeans moving down the UMR. The data highlights the importance and role of the Illinois River in the transportation of goods on the UMR.

Figure 7. Share of Barge Freight by River Reaches in 2017. The main stem of the UMR includes data from smaller tributary rivers. Source: US Army Corps of Engineers, Waterborne Commerce Statistics Center. Accessed August 2019.

SECTION 3: AGRICULTURAL TRADE ON THE UPPER MISSISSIPPI RIVER

FOR ALMOST 200 YEARS, the main land use in the UMR region has been agriculture.⁴ This sector generates billions in revenue and hundreds of thousands of jobs annually. The interconnected commercial barge system is important to national trade as barges carry 30 to 40 million tons of grains from the US Corn Belt region downstream through the ports St. Louis, New Orleans, and South Louisiana where it is then shipped to international markets.⁵ The primary types of commercial grain crops are cereals and legumes, notably corn and soybeans within the UMR system. The main importers of corn are Mexico (31%) and Japan (26%). These 2 countries are responsible for 57 percent of export sales in the

current 2018-2019 marketing year. With regards to soybean, 39 percent of export sales are to China (29%) and Mexico (10%).⁶

The navigation season on the UMR generally begins on March 22 and closes around December.⁷ Peak grain movements downstream typically takes place during the months of June through September. Corn and soybeans are planted from late April to early May and harvested in September. A farmer can then choose to sell them immediately after harvest or store them in grain silos until the spring. This seasonality trend is reflected in Figure 8 below. In comparison to previous years, barge movements of grains were significantly lowest in 2019.

⁴ <https://www.nps.gov/miss/riverfacts.htm>

⁵ <https://pdfs.semanticscholar.org/2ac4/90d6e75a24a25530cbce7f893d69807d046.pdf>

⁶

<https://www.ams.usda.gov/sites/default/files/media/GTR08082019.pdf>

⁷ <https://www.ams.usda.gov/sites/default/files/media/GTR04192018.pdf>

Total Grain Volumes For Mississippi River (Locks 27) 2014-2019

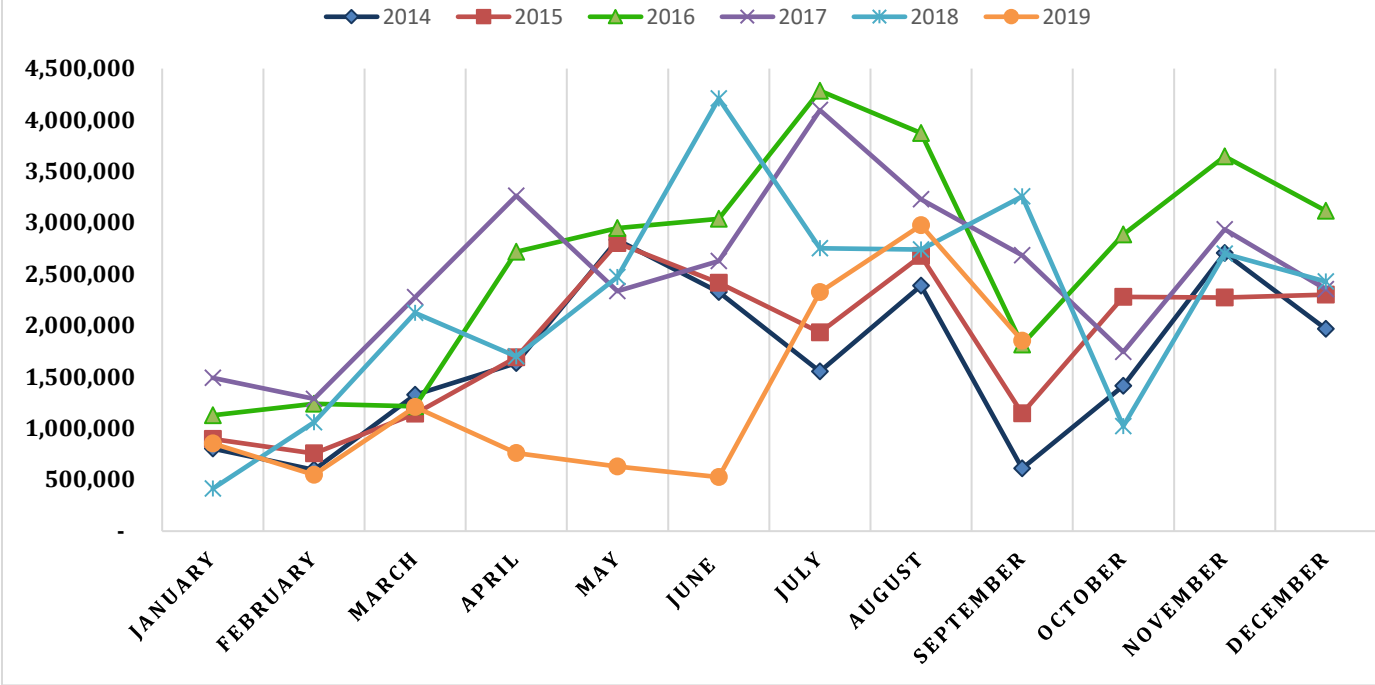
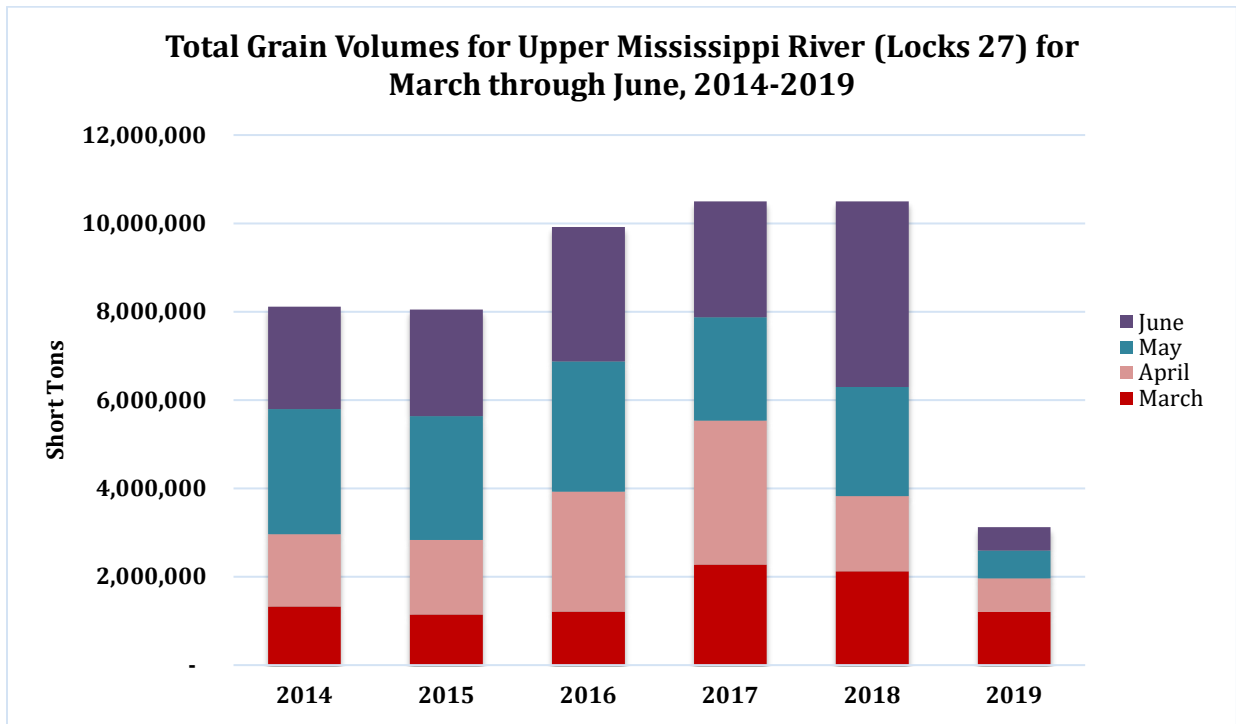


Figure 8. Comparison of Total Grain Volumes (Short Tons) Transported on the Mississippi River (Locks 27) from 2014-2019. Source of Data: USDA Agricultural Marketing Service, [Grain Transportation Report Datasets](#), Table and Figure 10 (last accessed in October, 2019).

The remainder of this section focuses on estimating the quantity of unshipped total grains and the value of unshipped corn and soybeans due to lock, dam, and port closures caused by the floods over the past 4 months. We used data from the USDA-Agricultural Marketing Services' Grain Transportation Report to estimate the amount of total grains, corn, and soybean not transported in March through June. We then took a 5-year

average (2014-2018) of total grains, corn, and soybean volumes for those months and subtracted it from their reported 2019 volumes. The difference in volume between the two was then multiplied by the 2019 season average prices for corn and soybean obtained from the most recent USDA-Economic Research Service Market Outlooks. The tables beneath each graph depict the calculations described above.



	2014	2015	2016	2017	2018	2019	% Change from 2018	5-year Average	Estimated Total Unshipped Total Grains in 2019 (short tons)
March	1,325,859	1,142,064	1,213,452	2,275,024	2,123,369	1,206,522	-43%	1,615,954	409,432
April	1,634,955	1,690,864	2,717,397	3,263,880	1,699,050	760,400	-55%	2,201,229	1,440,829
May	2,833,012	2,802,957	2,947,338	2,333,328	2,471,758	628,500	-75%	2,677,679	2,049,179
June	2,324,560	2,414,888	3,037,468	2,625,970	4,207,430	525,850	-88%	2,922,063	2,396,213
Grand Total	8,118,386	8,050,773	9,915,655	10,498,202	10,501,607	3,121,272	-70%		6,295,653

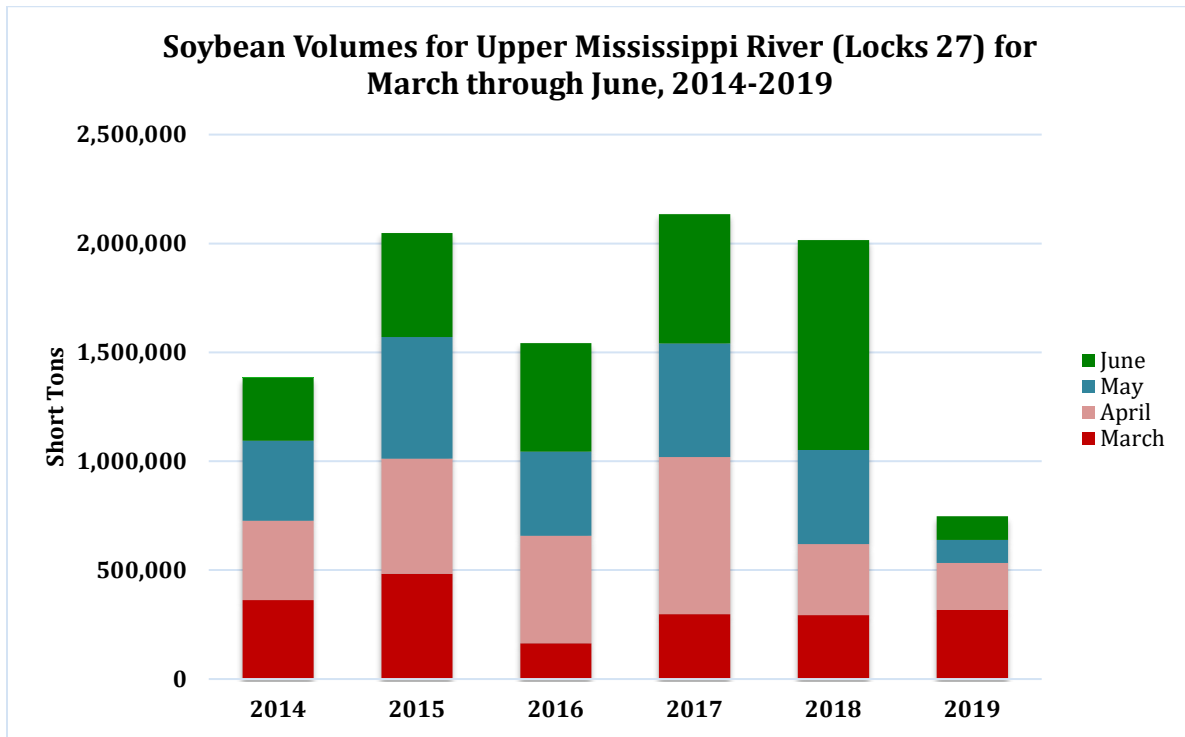
Figure 9. Total Grain Total Grain Volumes (short tons) Transported along the Mississippi River (Locks 27) from March through June in 2014-2019. Source of Data: Agricultural Marketing Service, Grain Transportation Report Datasets, Table and Figure 10 (last accessed in October, 2019).

Total grain volumes transported between March and June were 70 percent (7.4 million tons) lower than last year’s amounts for the same time period. The sharp increase in grain volumes observed in July (see Figure 8) is due to the reopening of the locks and dam at the St. Louis Harbor, which

allowed barge traffic to flow after being closed for 38 consecutive days. We estimate that approximately 6.3 million tons of grains went unshipped during the four month flooding period (see Figure 9).

Soybean volumes fell below the 5-year average for 3 out of 4 months during the flooding. We estimate that approximately 1.1 million tons of

soybeans valued at \$305 million went unshipped during this period (see Figure 10).

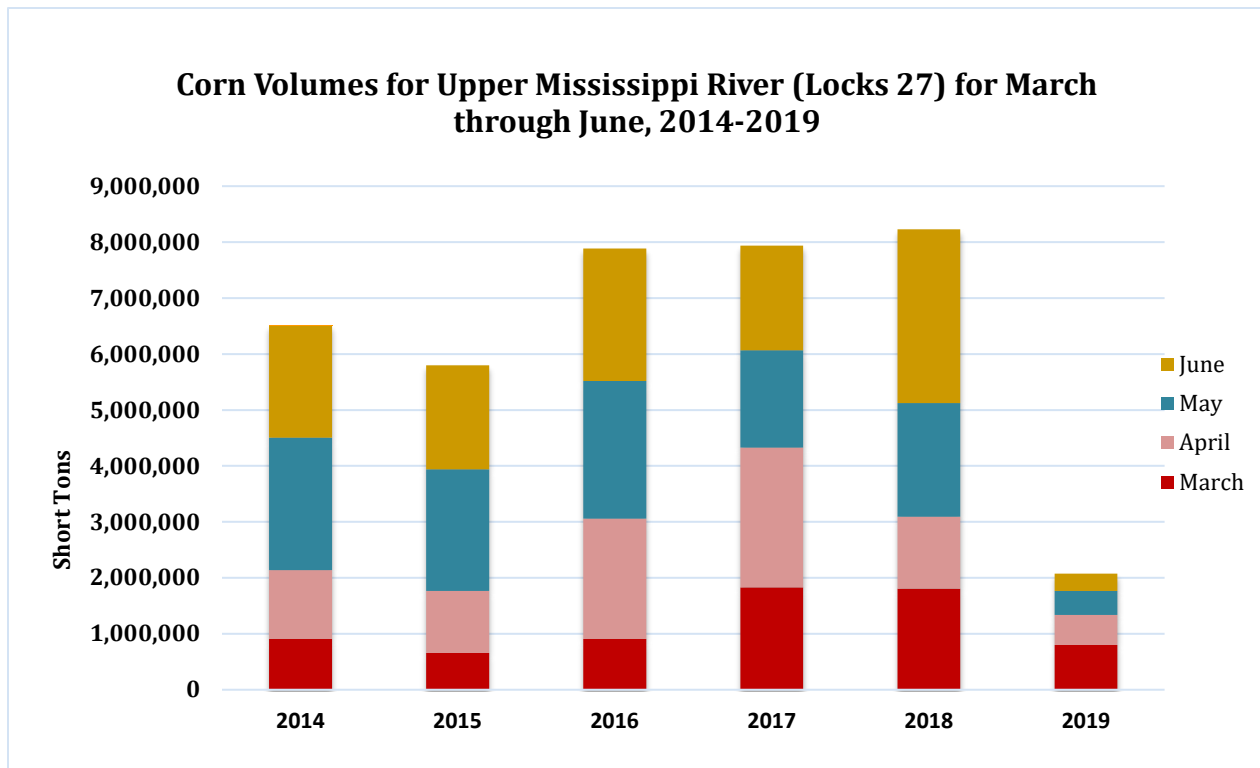


	2014	2015	2016	2017	2018	2019	% Change from 2018	5-year Average	Estimated Unshipped Soybeans in 2019 (short tons)	Estimated Unshipped Soybeans in 2019 (bushels)	Estimated Value of Unshipped Soybeans
March	362,136	482,896	163,800	297,600	293,364	316,822	8%	319,959	3,137	104,563	\$888,784
April	364,876	528,720	493,454	721,437	326,700	216,700	-34%	487,037	270,337	9,010,346	\$76,587,937
May	367,600	558,640	387,448	521,323	431,150	105,500	-76%	453,232	347,732	11,589,914	\$98,514,271
June	289,324	478,200	498,268	593,872	964,224	108,500	-89%	564,778	456,278	15,207,732	\$129,265,725
Total	1,383,936	2,048,456	1,542,970	2,134,232	2,015,438	747,522			1,077,484	20,704,823	\$305,256,718

Figure 10. Total Soybean Volumes Transported on the Mississippi River (Locks 27) from March through June in 2014-2019. Sources of Data: Soybean volume is from the Agricultural Marketing Service, [Grain Transportation Report Datasets](#), Table and Figure 10 (last accessed in October, 2019). Soybean Season Average Price of \$8.50 per bushel is from the Economic Research Service, [Oil Crops Outlook](#) (released on 9/16/2019).

Total shipment of corn for the 4 month period was less than 50 percent of the total amounts shipped over the last 5 years, for the same time. The highest change from the previous year was

seen in June (90 percent less volume). We estimate that approximately 5.2 million tons of corn valued at \$668 million went unshipped this year due to flooding (see Figure 11).



	2014	2015	2016	2017	2018	2019	% Change from 2018	5-year Average	Estimated Unshipped Corn in 2019 (short tons)	Estimated Unshipped Corn in 2019 (bushels)	Estimated Value of Unshipped Corn
March	907,323	659,168	908,252	1,829,724	1,803,632	800,600	-56%	1,221,620	421,020	15,030,407	\$54,109,465
April	1,230,611	1,105,244	2,151,445	2,500,568	1,287,800	536,600	-58%	1,655,134	1,118,534	39,931,650	\$143,753,938
May	2,365,112	2,176,417	2,456,914	1,738,780	2,031,294	428,200	-79%	2,153,703	1,725,503	61,600,471	\$221,761,697
June	2,003,588	1,858,740	2,370,900	1,868,798	3,105,870	312,000	-90%	2,241,579	1,929,579	68,885,977	\$247,989,519
Total	6,506,634	5,799,569	7,887,511	7,937,870	8,228,596	2,077,400			5,194,636	116,562,528	\$667,614,619

Figure 11. Total Corn Volumes Transported on the Mississippi River (Locks 27) from March through June in 2014-2019. Sources of Data: Corn Volume is from the Agricultural Marketing Service, [Grain Transportation Report Datasets](#), Table and Figure 10 (last accessed October, 2019). Corn Season Average Price of \$3.60 per bushel is from the Economic Research Service, [Feed Crops Outlook](#) (released on 9/16/2019).

For 2019, we estimate that approximately 1.1 million tons of soybeans valued at \$305 million, and 5.2 million tons of corn valued at \$668 million went unshipped via barges due to severe floods.

CONCLUSION

THE COAST GUARD IS RESPONSIBLE FOR PROVIDING MISSION SUPPORT across the vast expanse of the UMR, which is a key transportation highway for commercial shipments of grains, fertilizers, manufacturing, and energy products. Although this report does not capture and quantify the totality of the economic impacts of this year's record-breaking floods, it does present relevant and updated information on key features of the UMR. It corroborates existing information that the UMR makes a substantial contribution to the regional and national economy. Agricultural products accounted for more than 45 percent of

all commodities shipped on the river in 2017 and significant disruptions such as this year's floods can have widespread and lasting economic effects on a regional, national, and global scale. We estimate that over 6 million tons of agricultural products valued at almost one billion dollars went unshipped in the months that normal markets dictate. More importantly, this report highlights the significance and value of having the Coast Guard in the UMR region to support the array of activities that directly contribute to the region's economic sustainability and growth.