Executive Summary

ECONOMIC IMPORTANCE OF INLAND WATERWAYS TO U.S. AGRICULTURE

USDA U.S. Department of Agriculture

U.S. Department of Transportation Volpe Center

About this Report

The United States has approximately 25,000 miles of inland, intracoastal, and coastal waterways, of which 12,000 miles are designated as commercially active. Supporting this infrastructure are 191 lock sites and 237 active lock chambers, which are essential for managing river elevation changes and maintaining commercial navigability. U.S. inland and intracoastal waterways border or traverse 38 States and play a vital role in facilitating the domestic and international movement of many commodities, particularly bulk commodities and agricultural products. Even States without direct access to commercially active waterways benefit from them through intermodal connections (such as to rail and truck).

Figure 1: Waterways and States of Focus

The purpose of this report is to provide an analysis of the economic importance of U.S. inland waterways in transporting agricultural commodities, in support of the U.S. Department of Agriculture (USDA). This report examines the role of U.S. inland waterways in supporting agricultural exports and estimates the contributions of agricultural transportation to the broader U.S. economy. It updates and enhances a 2019 study prepared for USDA on similar topics, by enlarging the number of states and commodities considered, and using the more recent data on waterways and their planned investments provided by the U.S. Army Corps of Engineers.

Key Findings

- Stakeholders view the inland waterways as a safe, efficient, reliable, and cost-effective transportation option for moving agricultural commodities.
- **211,500 jobs** are provided by the inland waterway transportation services industry.
- **$30 billion** in GDP is generated annually by the inland waterway transportation services industry and supporting industries.
- **120,000 jobs** are created by the soybean, corn, and wheat farming sectors through exporting their commodities on the U.S. inland waterways.
- **$17 billion** in GDP is generated by the soybean, corn, and wheat, industries which rely on the inland waterways to export their commodities.
- **8,000 additional jobs** generating $1 billion in GDP annually would be created by expanding key locks along on the inland waterway system.
- U.S. inland waterways are vital to maintaining America's competitive position in global agricultural markets by providing a logistical advantage over major competitors, like Brazil.

Stakeholder Outreach

This report sought stakeholder feedback to gather broader perspectives on the use of inland waterways for agricultural transportation and identify needs and opportunities for improving the use of these waterways. The outreach effort provided opportunities for stakeholders to share input on trends, opportunities, and challenges related to the use of U.S. inland waterways for agricultural freight. The outreach process involved reaching out to selected stakeholders and facilitating informal telephone conversations to obtain input.

USDA and the project team collaborated to identify and select stakeholders. The selected stakeholders represented industries that heavily rely on inland waterways to move agricultural freight, as well as stakeholders involved in inland waterways decision-making and planning activities. The team held a total of nine discussions with 12 stakeholders. Groups represented in the discussions included State transportation agencies, industry/trade associations, agricultural producers, shippers, ports, and freight logistics service providers.

Table 1: Organizations Participating in Outreach Discussions

ORGANIZATION	PRIMARY GEOGRAPHIC AREA DISCUSSED	PRIMARY COMMODITY(IES) REPRESENTED
Illinois Corn	Midwest	Corn
Soy Transportation Coalition	Midwest	Soy
Washington Grain Commission	Pacific Northwest	Grain
Oregon Wheat	Pacific Northwest	Wheat
Washington Wheat	Pacific Northwest	Wheat
Marquis Energy	Midwest	Ethanol
Cargill	Midwest	Wheat, Soybeans, Corn, Cotton, Specialty Grains, Palm Oil
Bruce Oakley	Midwest	N/A
CBG Enterprises, Inc.	Midwest	Grain, Soybeans, Feed
Arkansas Waterways Commission	Midwest	N/A
Oklahoma Department of Transportation	Midwest	N/A
Tulsa Ports	Midwest	Wheat, Soybeans, Steel, Fertilizer, other Chemicals

Recurring Themes

Safety, efficiency, and cost-effectiveness

Many stakeholders described inland waterways as offering a highly safe, efficient, reliable, and cost-effective transport option for their businesses. One stakeholder commented that: "if there wasn't an inland waterway system and barge capabilities, [I believe] the price of transportation would go up substantially." However, several stakeholders noted that costs have been fluctuating due to changing weather patterns, and global political events.

Reliability and resilience

Several stakeholders noted that the overall reliability offered by U.S. inland waterways transport was a critical advantage that distinguished U.S. markets from global competitors. For example, one stakeholder commented that while "U.S. wheat is rarely the cheapest in the world, it is known for reliability and quality. Reliability and quality are how we distinguish ourselves [especially] when entering new markets." Some noted that the reliability offered by inland waterways was critical to their business models. One stakeholder stated: "there is no mode of transportation that can absorb the tonnage that the river system carries."

Economic competitiveness

Nearly all stakeholders emphasized the importance of inland waterways to business operations, jobs, and economic competitiveness. Many stakeholders noted that inland waterways helped their industries gain access to broader regional or global economic markets. Others noted that barging offered reliability and capacity that other modes could not accommodate.

Operational and economic impacts of disruptions

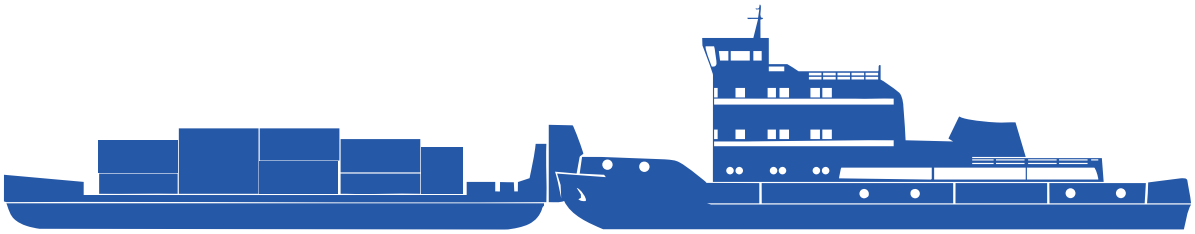
Stakeholders noted that unanticipated disruptions could have particularly far-reaching and cascading impacts. Because agricultural products can quickly spoil, disruptions on the river can mean wasting product with associated cost impacts. One stakeholder noted that when a certain lock closed, the "entire upper reaches of the river would be closed and result in hundreds of millions of dollars lost."

Increased funding and more predictable funding levels

Many stakeholders expressed that current funding levels for inland waterways are inadequate. They described investment needs that would help ensure a high level of performance for inland waterways and maximize the system's ability to contribute to economic competitiveness. Specific investment needs mentioned by stakeholders included dredging to make waterways deeper and capable of carrying heavier loads, and rehabilitation or replacement of aging infrastructure, especially dams and locks. Several stakeholders noted the importance of considering redundancy as an investment priority.

How much does an average barge tow?

Barges are one of the most efficient ways to move bulk or breakbulk goods over long distances. For example, a 15-barge tow can move:



22,500 tons **767,500 bushels** **6,804,000 Gallons**

To carry the same amount of cargo as one 15-barge tow, you would need:

225 jumbo hopper railcars

2.25 100-railcar trains

866 semi-trucks

"Often competitiveness is addressed as a relationship to cost. Cost is important, but timeliness and reliability are also part of competitiveness. Inland waterways bring all of this to the table in a way that other modes don't."

-Industry/Trade Association Discussion Participant

"It's difficult for people to realize the advantage [of inland waterways] because they aren't at a disadvantage."

Industry/Trade Association Discussion Participant

Economic Impact Modeling

The inland waterways network significantly contributes to the U.S. economy and serves as a vital transportation network for numerous industries. Table 2 estimates the overall economic contributions of U.S. inland waterway transportation services.

The movement of agricultural commodities along inland waterways contributes to the Nation's economy through providing job opportunities and connecting U.S. industries to domestic and international markets. Moving agricultural commodities over inland waterways is important to the economies of many States as well as the Nation's overall economic health. Figure 2 shows the waterways moving the highest volume of agricultural goods.

- Direct effects: Economic activity occurring within the industry being analyzed.
- Indirect effects: Economic activity generated by industries supplying inputs to the industry being analyzed.
- Induced effects: Economic activity arising from household spending of wages and salaries earned in the industry being analyzed and its supplying industries.

Figure 2: Inland Waterways with Significant Agricultural Tonnage

Table 2: Economic Contributions of Inland Waterways Transportation Services, U.S. Totals, 2022

IMPACT TYPE	JOBS	LABOR INCOME	GDP	OUTPUT
Direct	26,177	$3,384,487,000	$7,822,867,000	$23,450,192,000
Indirect	106,033	$8,244,732,000	$12,590,074,000	$24,408,414,000
Induced	79,259	$5,172,137,000	$9,447,430,000	$16,760,293,000
Total	**211,583**	**$16,815,967,000**	**$29,894,134,000**	**$64,720,126,000**

Soybean Export Economic Impacts

In 2022, an estimated 28.0 million tons of soybeans were shipped on inland waterways that border or transverse the 18 States analyzed. Of this total, approximately 23.8 million tons (or approximately 85 percent) were exported to international markets. Table 3 shows the economic impacts of the production of these soybeans for export via the inland waterways.

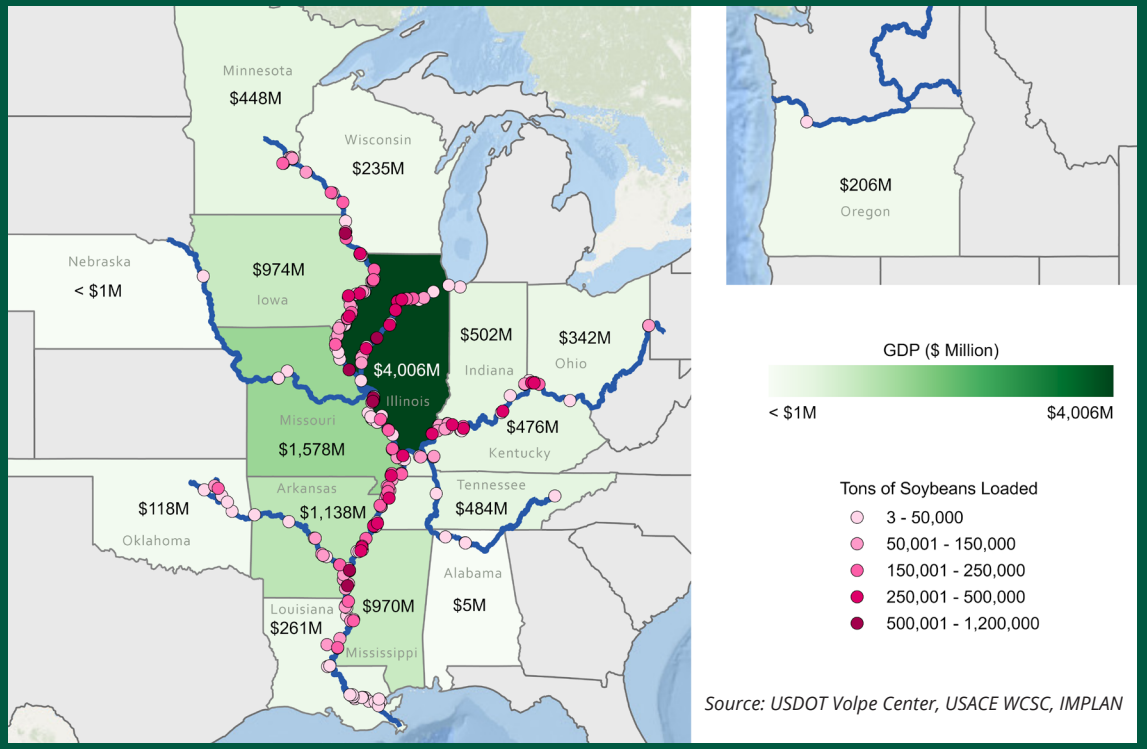


Figure 3: Outgoing Soybean Shipment Volumes by Location and GDP Contributions from Soybean Exports for Selected States

Table 3: Economic Contributions of Soybean Exports via Inland Waterways for Select States, 2022

IMPACT TYPE	JOBS	LABOR INCOME	GDP	OUTPUT
Direct	22,967	$3,118,379,000	$8,401,274,000	$12,689,372,000
Indirect	16,032	$807,062,000	$1,466,332,000	$2,954,221,000
Induced	17,859	$1,021,897,000	$1,876,506,000	$3,236,549,000
Total	**56,858**	**$4,947,338,000**	**$11,744,112,000**	**$18,880,142,000**

Corn Export Economic Impacts

An estimated 28.8 million tons of corn were shipped along inland waterways in 2022 from the States analyzed, with 23.8 million tons exported internationally. The percentage of corn shipped on inland waterways that was ultimately exported ranged from 70 to 90 percent for most of the analyzed States. Table 4 shows the economic impacts of the production of corn for export via the inland waterways.

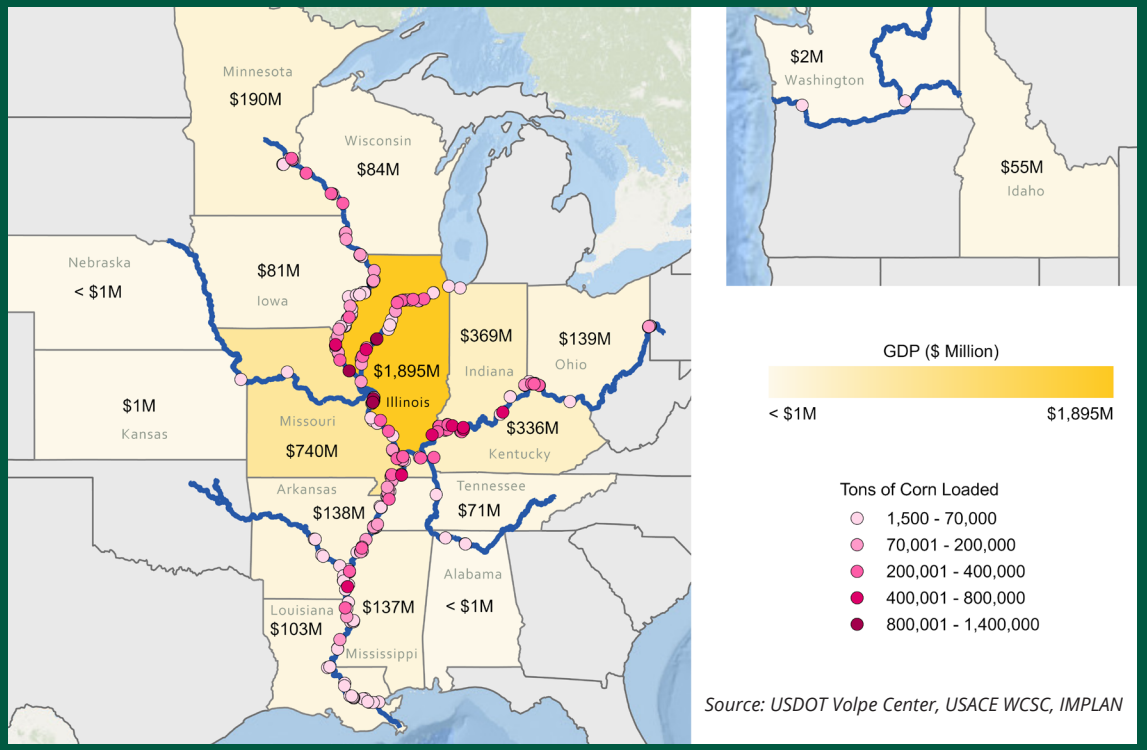


Figure 4: Outgoing Corn Shipment Volumes by Location and GDP Contributions from International Corn Exports for Selected States

Table 4: Economic Contributions of Corn Exports via Inland Waterways for Selected States, 2022

IMPACT TYPE	JOBS	LABOR INCOME	GDP	OUTPUT
Direct	23,199	$1,051,287,000	$1,783,842,000	$6,006,667,000
Indirect	15,960	$886,107,000	$1,594,353,000	$3,143,071,000
Induced	8,942	$530,931,000	$961,095,000	$1,645,958,000
Total	**48,101**	**$2,468,325,000**	**$4,339,290,000**	**$10,795,694,000**

Wheat Export Economic Impacts

In 2022, an estimated 9.8 million tons of wheat were shipped on inland waterways from the States analyzed, with approximately 6.5 million tons exported internationally. For most of the analyzed States, the percentage of wheat exported internationally after being shipped on inland waterways ranged from 45 to 98 percent. Table 5 shows the economic impacts of the production of wheat for export via the inland waterways.

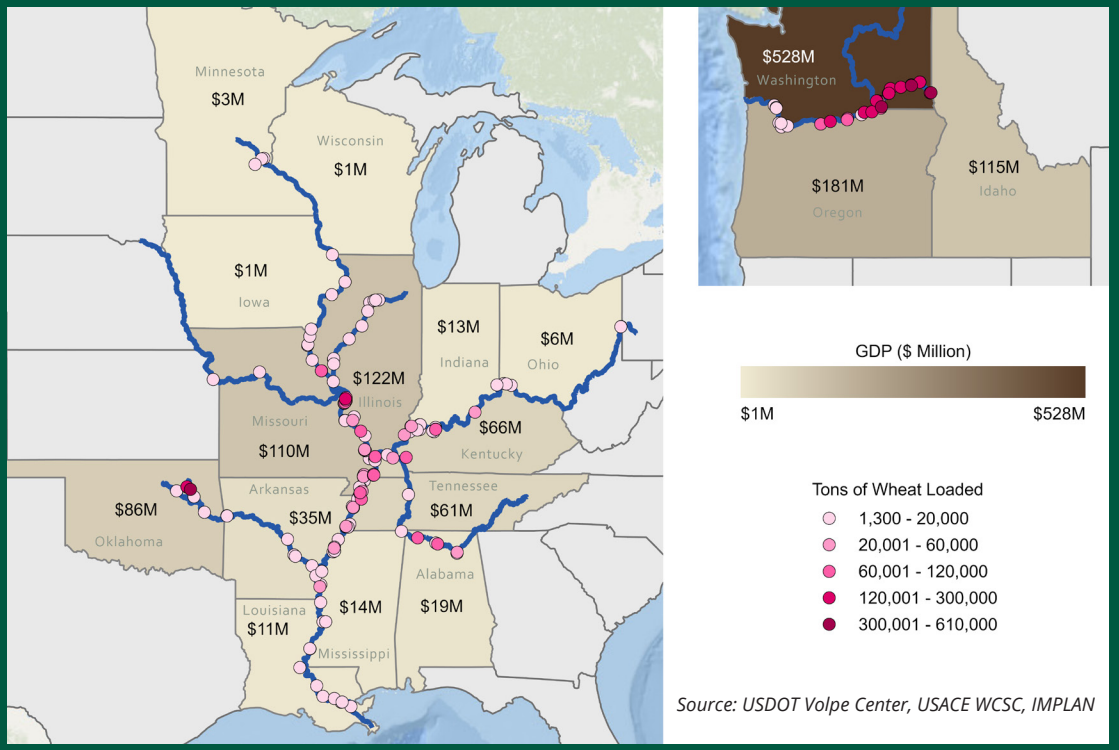


Figure 5: Outgoing Wheat Shipment Volumes by Location and GDP Contributions from International Wheat Exports for Selected States

Table 5: Economic Contributions of Wheat Exports via Inland Waterways for Selected States, 2022

IMPACT TYPE	JOBS	LABOR INCOME	GDP	OUTPUT
Direct	7,101	$289,232,000	$549,808,000	$1,790,955,000
Indirect	6,271	$316,237,000	$536,643,000	$1,027,526,000
Induced	2,505	$150,916,000	$285,156,000	$480,946,000
Total	**15,876**	**$756,386,000**	**$1,371,607,000**	**$3,299,427,000**

Investment Modeling

Multiple modeling techniques were applied to evaluate the economic impacts of several investment scenarios. Specifically, three capacity expansion scenarios developed by USACE were assessed. Each scenario outlines specific infrastructure projects over the next 20 years, along with their anticipated completion dates.

CIS Investment Scenarios

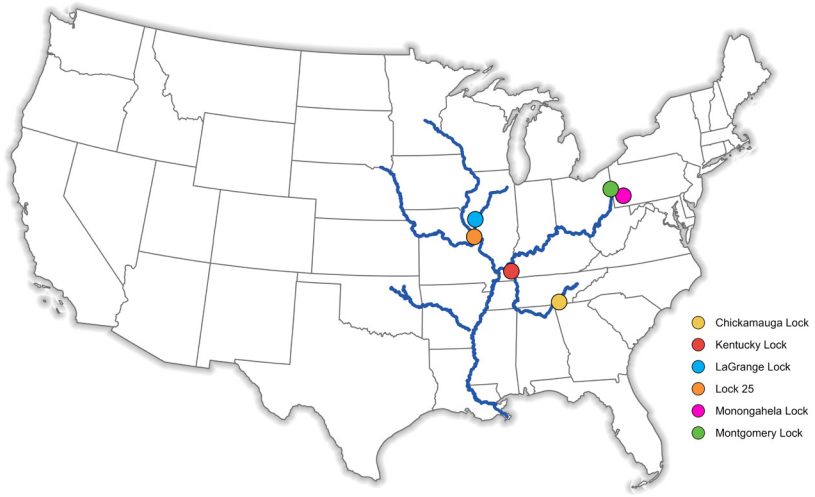
- Constrained: Completes 8 investment projects by 2045. Follows historical funding trends and assumes each project will have multiple construction contracts.
- Accelerated: Completes 9 investment projects by 2045. Provides funding such that new lock construction projects are completed in eight years or less.
- Enhanced: Completes 10 investment projects by 2045. Provides funding such that each project will need only one construction contract.

Table 6:
Annual Economic Impact of Investment by CIS Scenario, Metric, and Impact Type

METRIC	IMPACT TYPE	CONSTRAINED	ACCELERATED	ENHANCED
Jobs[1]	Direct	277	866	1,062
	Indirect	1,165	3,647	4,471
	Induced	695	2,175	2,666
	Total	2,137	6,688	8,199
GDP (Million)	Direct	$61.45	$192.26	$235.70
	Indirect	$132.01	$413.07	$506.41
	Induced	$77.22	$241.65	$296.25
	Total	$270.68	$846.97	$1,038.37
Output (Million)	Direct	$226.78	$709.50	$869.83
	Indirect	$262.92	$822.74	$1,008.67
	Induced	$135.58	$424.25	$520.12
	Total	**$625.28**	**$1,956.49**	**$2,398.62**

1 When reporting cumulative employment effects over time, report as job-years rather than the number of jobs. One job-year equals one job actively employed for one year; sum across years to obtain the total job-years.

Figure 6: Selected CIS Project Locations



Description of the CIS

Developed through coordination between the Inland Waterways Users Board (IWUB), the Office of Management and Budget and USACE, the CIS fulfills a statutory requirement to develop a 20-year (2025 – 2045) capital investment strategy for the inland and intracoastal fuel-taxed waterways. The CIS also acts as a planning framework that informs the budget process; the CIS does not represent a funding commitment. The CIS includes three scenarios: Constrained, Accelerated, and Enhanced.

Disruption Scenarios

Without timely investment, the inland waterway network faces increasing risks of failure due to aging infrastructure, natural events, or other issues. These vulnerabilities can lead to unplanned outages and disruptions, threatening the reliability of inland waterways transportation. The impacts of a disruption were estimated using the Volpe-developed Freight Transportation Optimization Tool.

- Route 1 follows 22,500 tons of soybeans traveling from Scott County, Iowa, to New Orleans, Louisiana. This is a high-volume route for many agricultural commodities due to the presence of significant port infrastructure in Scott County cities such as Davenport, Bettendorf, and Buffalo. According to the WCSC, the most common destination for soybeans traveling along this route is New Orleans.
- Route 2 follows 6,000 tons of wheat moving along inland waterways from Whitman County, Washington, to Portland, Oregon. Like Route 1, Route 2 describes a high-volume route for shipping agricultural goods; Whitman County is the largest wheat-producing county in Washington. Whitman County also has access to the Ports of Clarkston and Lewiston, as well as rail routes from Pullman that stretch across the State, allowing for strong multimodal transportation access. Portland receives the most agricultural tonnage from ports in Whitman County compared to other destinations and serves as the point for international export from the region.

" At many locations, there's only one lock so an unexpected closure means that no cargo can move up or down the river and there really isn't a backup plan."

-Industry/Trade Association Discussion Participant

"[Inland waterways] are grossly underfunded and this leads to reliability issues– if you don't have reliable water infrastructure, it really hurts economic opportunitysn't true for inland waterways."

State Agency Discussion Participant

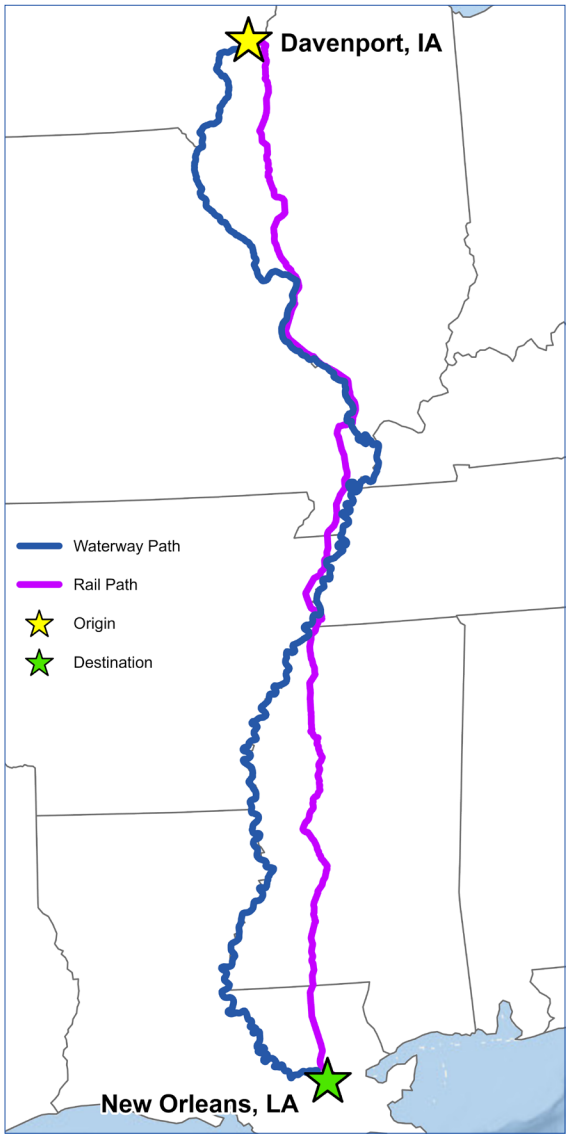
Davenport to New Orleans

The analysis shows that shipping soybeans by rail would be associated with additional transportation costs and additional emissions. It would also be associated with potentially adverse safety outcomes (a statistically higher level of injuries and fatalities). The Route 1 analysis only shows the difference at the margin between one flotilla's worth of goods that is diverted to rail, assuming rail rates are held constant and rail capacity remains available. In reality, significantly more tonnage moves between Route 1's origin and destination in any given year. A disruption affecting the waterways along Route 1 would increase rail rates as rail capacity becomes constrained by increased demand. In 2022, nearly half a million tons of agricultural commodities—including approximately 340,000 tons of soybeans and over 120,000 tons of corn—moved over the waterways from Scott County to river terminals in Louisiana. Current rail capacity along that segment is not designed to absorb a high level of diversion from these waterways. A disruption on these waterways for a significant period would exacerbate the economic, safety, and other impacts.

Table 7: Scott County, IA, to New Orleans, LA Route Metrics

Scott County, IA to New Orleans, LA	Via Inland Waterways	Via Rail
Vehicle Loads	1 flotilla (15 barges)	225 rail cars
Network Miles Traveled	1,305 miles	930 miles
Vehicle-Miles Traveled	1,305 miles	209,301 miles
Ton-Miles Traveled	29,362,500	20,925,000
Transport Cost	$852,258	$911,411
CO2 (kg)	401,666	409,524
NO_x (kg)	4,064	4,143
CO (kg)	1,049	1,071
PM10 (kg)	98.5	101
Injuries Estimated	0.0013	0.0877
Fatalities Estimated	0.0005	0.0091

Figure 7: Route 1 Optimal Routes with and without Access to Inland Waterways



Whitman County to Portland OR

Similar trends seen in the Route 1 analysis can be observed in the shift from water to rail in the Route 2 analysis. The only exception is that in the Route 2 analysis, the path traveled via waterways is shorter than the path traveled via rail. The Route 2 analysis focuses on the impact of diverting only a single flotilla's worth of goods to rail, but there are broader implications from this scenario given the amount of tonnage that flows along this route in reality. In 2022 alone, more than 150,000 tons of agricultural commodities were transported from Whitman County to export terminals on the western side of the State via the inland waterways.

Figure 8: Route 2 Optimal Routes with and without Access to Inland Waterways

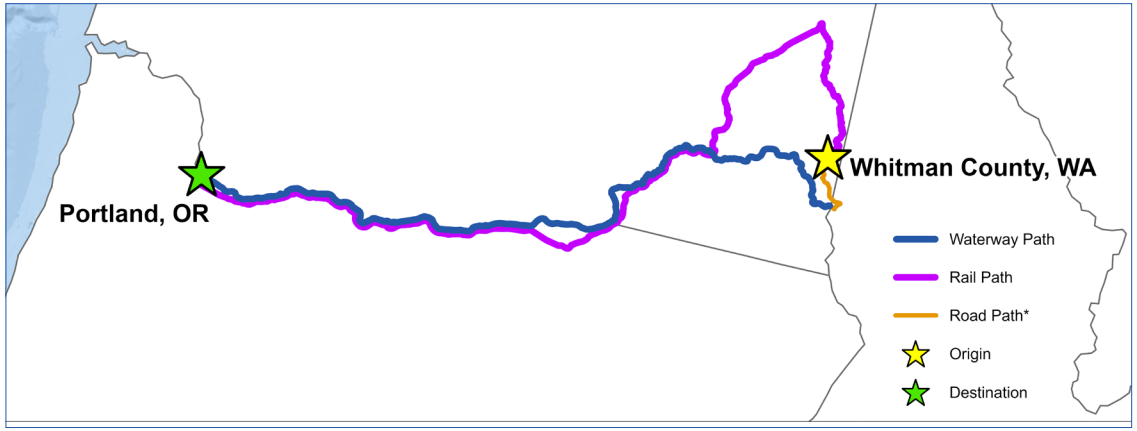


Table 8: Whitman County, WA, to Portland, OR, Route Metrics

Whitman County, WA – Portland, OR	Via Inland Waterways	Via Rail
Vehicle Loads	1 flotilla (4 barges)	60 rail cars
Network Miles Traveled	354 miles	441 miles
Vehicle-Miles Traveled	354 miles	26,540 miles
Ton-Miles Traveled	2,124,000	2,646,000
Transport Cost	$95,354	$115,290
CO2 (kg)	29,098	51,083
NOx (kg)	294.4	524
CO (kg)	76	135
PM10 (kg)	7	13
Injuries Estimated	0.00011	0.01221
Fatalities Estimated	0.00003	0.00128

U.S. Export Market

The U.S. inland waterway system plays a critical role in supporting agricultural exports and sustaining the Nation's competitive position in global markets. This extensive network provides a high-capacity, low-cost transportation system for bulk commodities and links major interior production hubs to coastal export terminals. As a result of this system, the U.S. maintains a strong market presence in global agricultural commodity markets.

Soybeans currently account for the largest share of U.S. agricultural exports. Key drivers of demand for U.S. soybean exports include U.S. export prices, competition from other exporters, global demand, as well as macroeconomic and geopolitical conditions. Historically, China has been the largest single purchaser of U.S. soybeans, and in this key market, Brazil is the U.S.'s largest competitor.

Figure 9:
Common U.S. Soybean Export Shipping Route: Davenport, Iowa, to Shanghai, China

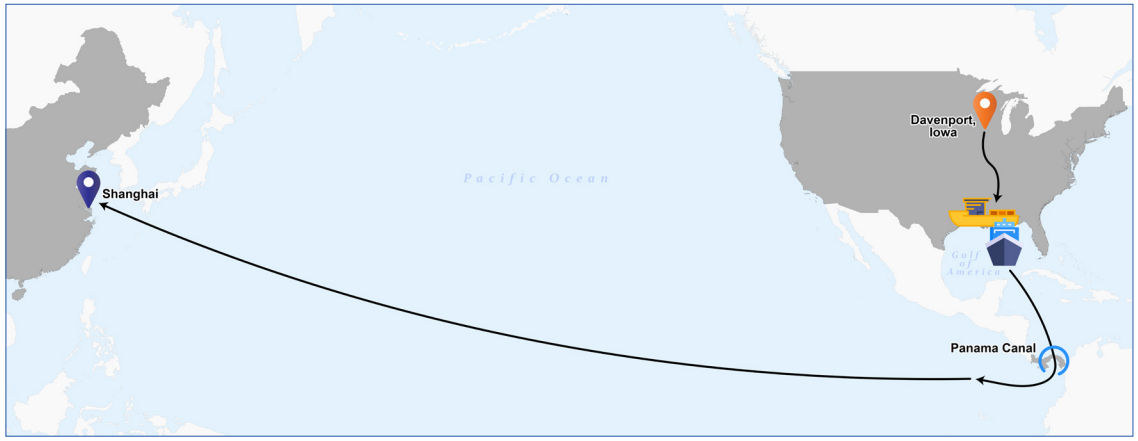
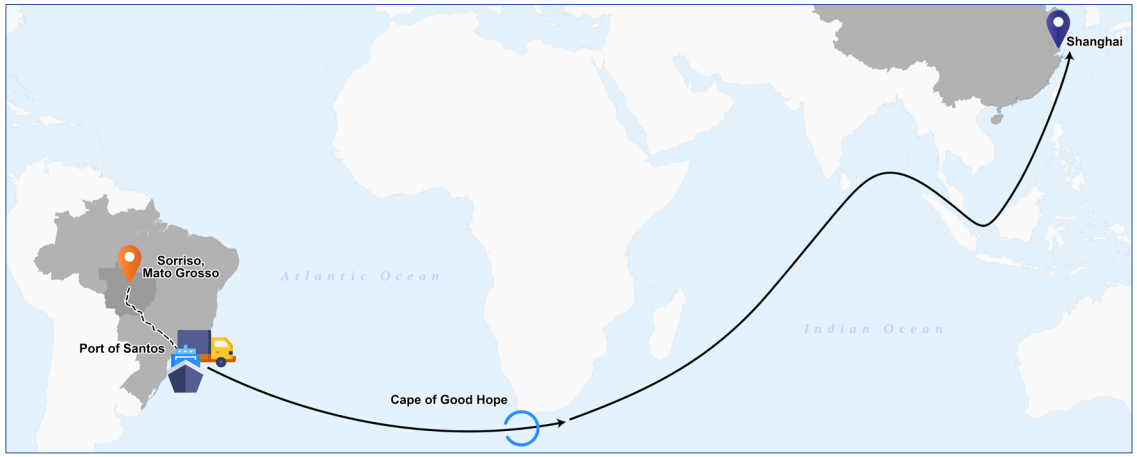


Figure 10:
Common Brazil Soybean Export Shipping Route: Sorriso, Brazil, to Shanghai, China



U.S., Brazil, and China

Historically, barges traversing inland waterways have carried the largest share of U.S. soybean export tonnage compared to rail and truck. A significant share of soybean barge traffic flows along the Mississippi and Illinois Rivers, which link major production areas in the Midwest with the Gulf of America, where soybeans are loaded onto ocean vessels bound for international markets. Figure 11 shows the most common point of export for soybeans coming from the U.S.

As of 2023, 42% of U.S. soybean exports were bound for China; a percentage that has grown significantly over the last 20 years. However, in the 2010's the U.S. began ceding shares of the Chinese soybean market to Brazil due to several of Brazil's competitive advantages, including favorable exchange rates, trade relationships and policies, expanded acreage, and targeted infrastructure improvements. Figure 12 shows the share of Chinese soybean imports coming from the U.S. and Brazil.

Figure 11: U.S. Soybean Exports: Origin Customs Districts (1995-2023)

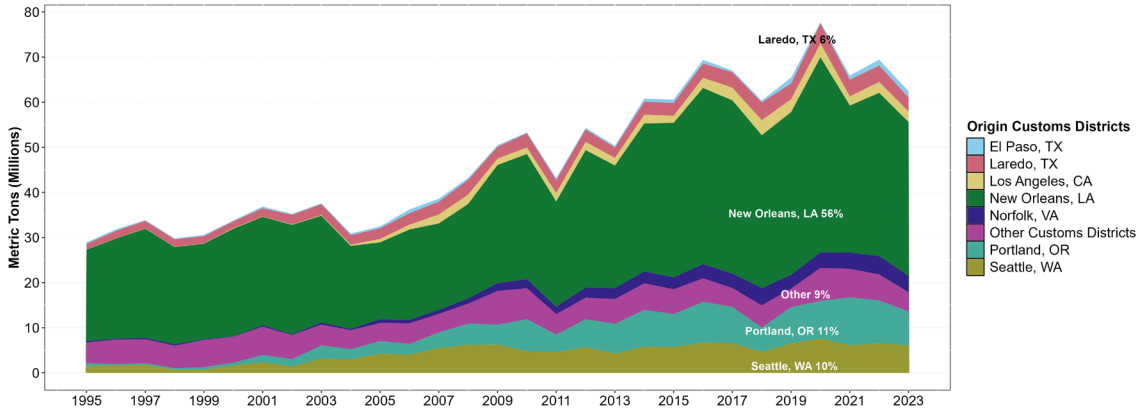
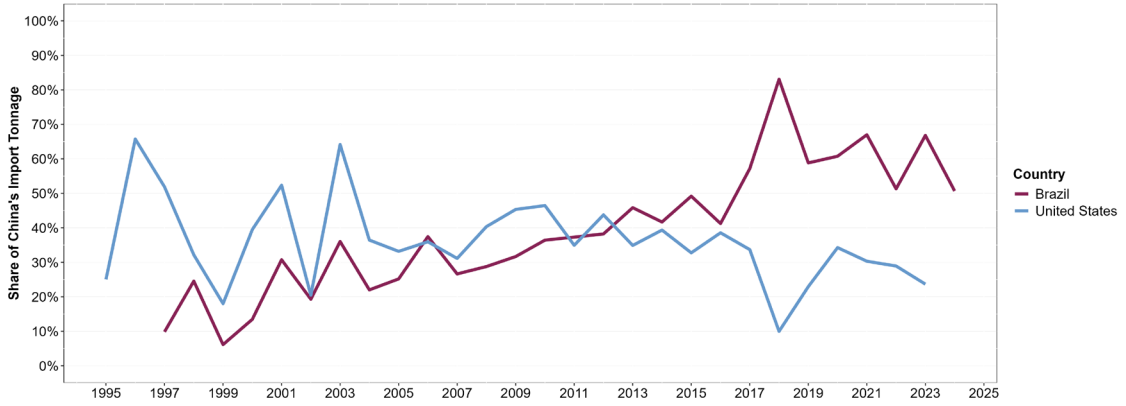


Figure 12: U.S. and Brazil Share of China's Soybean Import Tonnage (1995-2023)



Cost Advantages

Input costs play a key role in shaping the price competitiveness of soybean exports from the U.S. and Brazil. Brazil has historically had lower production costs (noted as farm value in the figure below) than the U.S., while the U.S. has had lower inland transportation costs. Figure 13 shows the breakdown of cost components affecting the price in China for U.S. soybeans from Davenport, IA, and Brazilian soybeans from Sorriso.

For soybeans exported to Shanghai, per-metric ton inland transportation costs have been lower for product from Davenport than from Sorriso, both in absolute terms and as a share of landed costs. This disparity stems from Brazil's reliance on trucks to move soybeans long distances to southern ports, which have historically handled most exports.

Although the U.S. currently benefits from lower inland transportation costs, Brazil's ongoing infrastructure investments have improved access between export terminals and production regions and expanded capacity at major ports. These developments are eroding the U.S. transportation cost advantage for soybeans (and other crops). The U.S. must continue upgrading infrastructure, particularly inland waterways, to maintain its competitive position in global soybean markets.

Figure 13: Export Cost Comparison: U.S. and Brazil

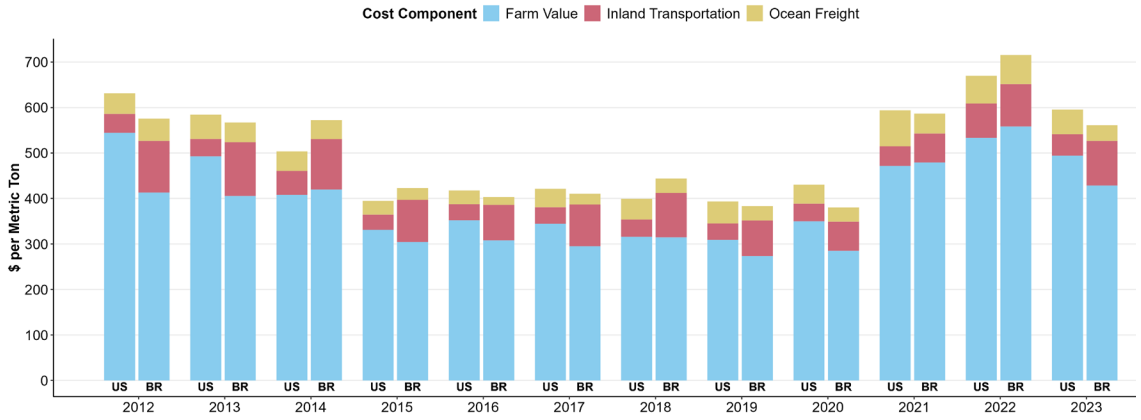
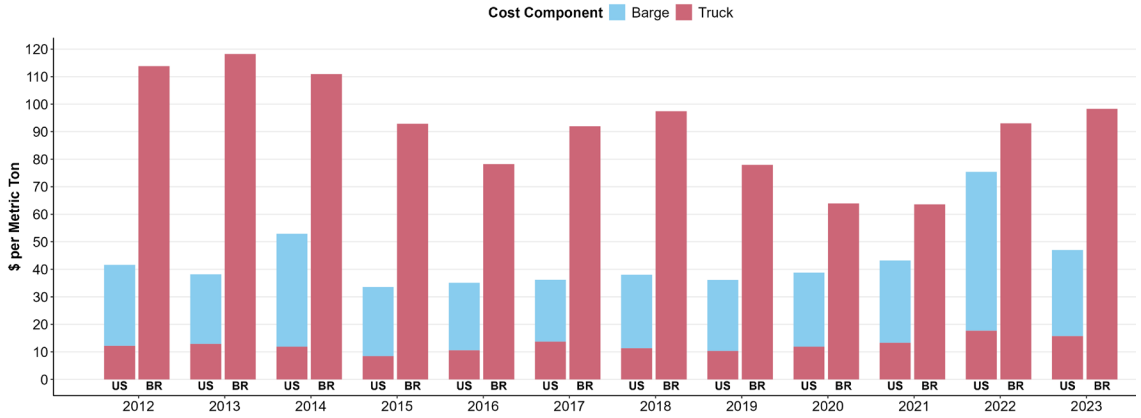


Figure 14: Soybean Inland Transportation Costs: U.S. and Brazil



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