SFRP

State Freight & Rail Plan

Condition and Performance

DRAFT

Introduction

The condition and performance of Missouri's multimodal freight system plays a vital role in supporting the state's economy, linking producers to markets and connecting communities to the global supply chain. As a central hub in the national freight network, Missouri supports the movement of goods across highways, railroads, inland waterways and air cargo facilities. This chapter presents a comprehensive analysis of the condition, reliability and safety of the freight transportation system across all modes.

The analysis evaluates physical infrastructure conditions, bottlenecks, level of service (LOS), safety performance and system constraints that influence freight mobility. It draws from state and federal data sources, stakeholder interviews and prior planning efforts. This data is measured against the goals, objectives and performance measures detailed in **4.02 Truck Parking Technical Memorandum** to assess the freight transportation system.

Scope and Data Sources

This chapter synthesizes findings from a variety of sources, including but not limited to:

- S&P Global's Transearch database
- Surface Transportation Board (STB) waybill data
- The Federal Highway Administration (FHWA) Freight Bottleneck Tool
- Missouri Department of Transportation (MoDOT) Tracker performance system
- MoDOT's Highway-Rail Grade Crossing State Action Plan (SAP)
- United States (U.S.) Army Corps of Engineers (USACE) waterway data
- U.S. Coast Guard (USCG) marine safety records
- Stakeholder input

All data reflects the most recent available reporting (2020-2024) and is organized by freight mode. All Transearch data is reported in 2023 numbers or 2043 projections.

Freight System Overview

Missouri's freight network spans four primary transportation modes: highways, rail, inland waterways and air cargo. Together, these modes form a cohesive and competitive freight system with modal flexibility for shippers and receivers.

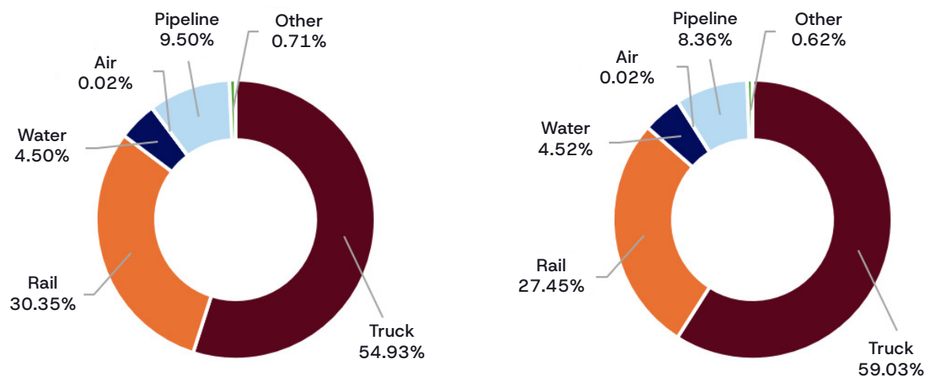
- **Highways:** Missouri's highway network includes over 33,000 miles of state-owned roads with critical freight corridors, such as Interstates 70, 44, 29, 55 and 49, forming the backbone of truck freight movement. Missouri is home to 1,521 miles of the National Highway Freight Network (NHFN).
- **Railroads:** The state is served by five Class I railroads, multiple short line railroads and major intermodal terminals. These rail assets link at hubs in St. Louis and Kansas City to provide nationwide connectivity and direct access to seaports on all three coasts, in addition to Mexico and Canada.
- **Waterways:** Missouri boasts 1,050 miles of navigable waterways, including segments of the Mississippi and Missouri Riversand is home to 19 public port authorities and one port commission. Missouri's ports also provide multimodal connectivity via roadway and rail links.
- **Air Cargo:** While Missouri's air cargo footprint is smaller than its surface modes, it is an essential transportation means for high-value and time-sensitive freight. Airports in St. Louis (STL), Kansas City (MCI) and Springfield (SGF) provide commercial air cargo service, while several regional and business airports offer specialized logistics support.

More than 1.1 billion tons of freight were shipped to, from or within Missouri in 2023 and volumes are expected to grow to 1.30 billion tons by 2043, with 2023 and 2043 freight values of $1.70 trillion and $2.30 trillion, respectively.[1] Whether by rail, truck, barge or air cargo, these networks not only sustain key industries but also support tens of thousands of jobs in logistics, warehousing and operations. The 2023 and forecasted 2043 modal split by tonnage and value is shown in **Figure 1** and **Figure 2**.

Source: MoDOT

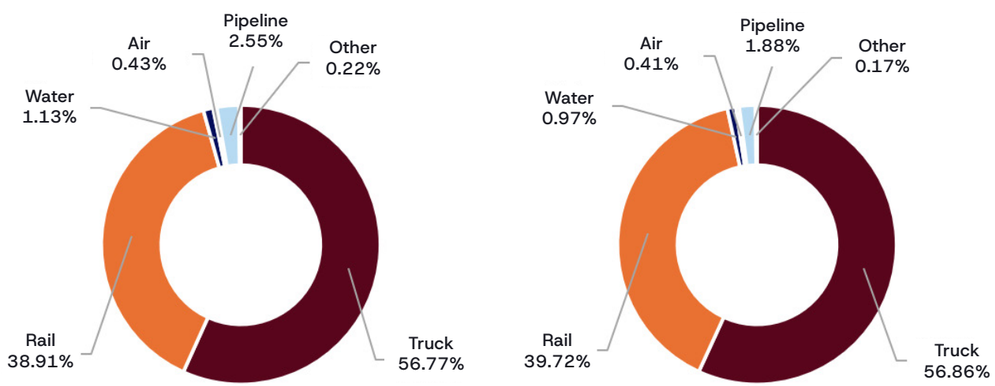
[1] Data from Transearch (2023), calculations by GFT (2025).

Figure 1 – Modal Split by Tonnage, 2023 (left) and 2043 (right)



Source: GFT Analysis of Transearch Data, 2023.

Figure 2 – Modal Split by Value, 2023 (left) and 2043 (right)



Source: GFT Analysis of Transearch Data, 2023.

Highway

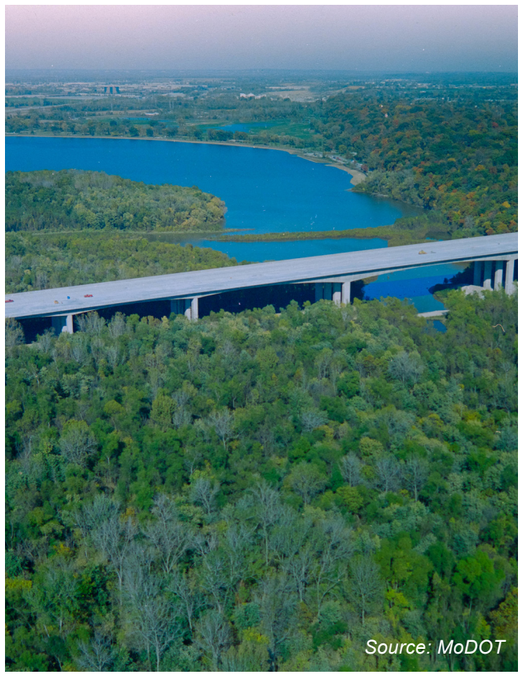
Highways form the backbone of Missouri's freight system, carrying the majority of goods by tonnage and value. Highways also link the state's producers, consumers and distribution centers to regional, national and global markets. Missouri contains over 5,500 miles of major highways, over 18,000 miles of minor highways and over 10,000 bridges on the state highway system. Despite significant investments, recurring congestion, pavement deterioration and truck parking shortages remain challenges that impact reliability and safety. This section reviews highway system conditions, identifies freight bottlenecks using national datasets, such the FHWA Freight Bottleneck Tooland evaluates safety, crash data and performance metrics to assess how well Missouri's highway network is serving freight needs.

Overview

Missouri has the seventh largest state highway system in the U.S., totaling 33,814 centerline miles. Each day, 80.80 million miles are driven and 1.50 million tons of freight are hauled on this system.[2] Missouri's state highway network is divided into major routes, minor routes and low-volume routes. Major highways, which include interstates, comprise 5,555 miles, or 16% of the total 33,814 highway miles in Missouri, but account for 77% of the system's traffic. Part of the state system includes the NHFN that is essential for long-haul freight movement, as well as last-mile connectivity to rail terminals, ports and airports as shown in **Figure 3**.

The St. Louis Regional Freightway developed the St. Louis Regional Needs Analysis and Freight Development Plan in 2017. This study evaluated the freight-related role of roadway assets beyond the interstate system, identifying important freight corridor segments. The corridors are classified as Freight Connectors, Intra-Regional Connectors and Emerging Connectors, totaling 112 segments across the region.

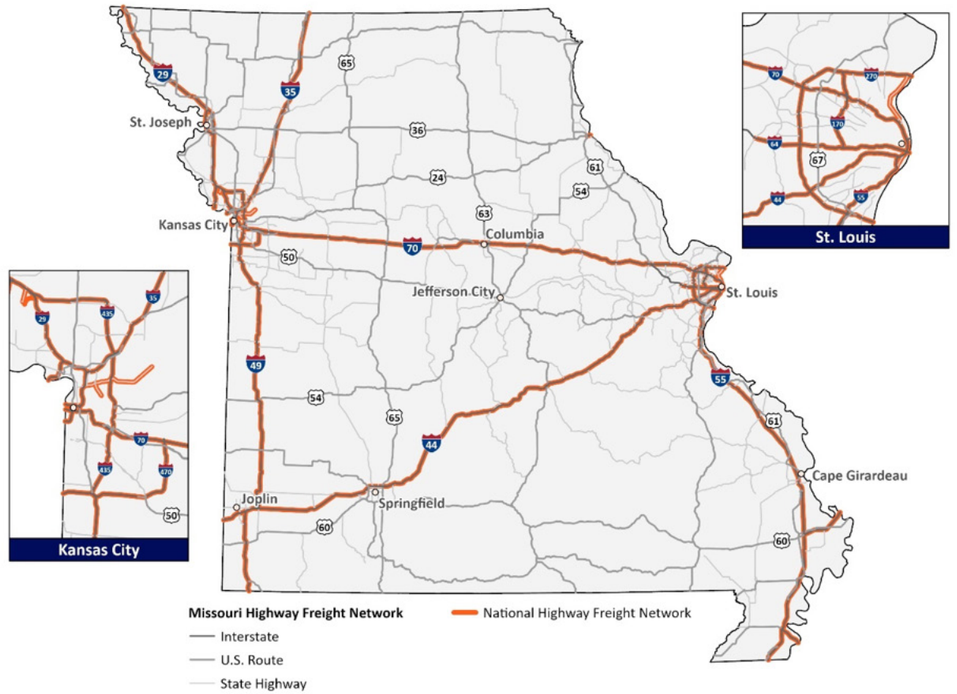
This plan complements the Missouri State Freight and Rail Plan (SFRP) by focusing on the non-interstate roadway connections that support and enhance access to key freight assets, such as intermodal rail yards and ports. Together, they provide a more comprehensive view of the multimodal freight network.



Source: MoDOT

[2] FHWA, "Table VM-2 – Highway Statistics 2023," Policy Information, accessed June 20, 2025, https://www.fhwa.dot.gov/policyinformation/statistics/2023/vm2.cfm.

Figure 3 – Missouri Highway and National Highway Freight Networks

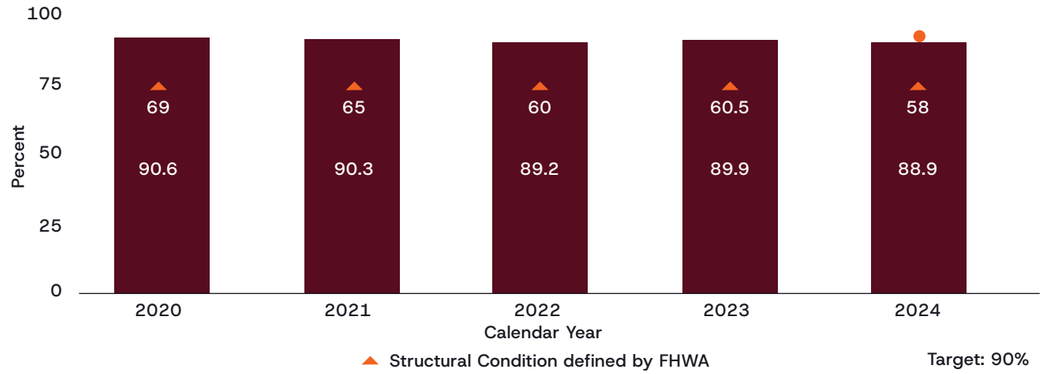


Source: FHWA, 2025.

Level of Service

Missouri's state highway system is generally in good condition. Since 2021, major highways in good condition decreased from 90 to 89%, slightly below the state target of 90% (see **Figure 4**). Recently passed legislation to increase funding for interstate improvements is likely to increase major highway conditions to exceed the state target in coming years.

Figure 4 – Percent of Major Highways in Good Condition, 2020–2024



Source: MoDOT, Condition of State Highways - 5c, 2025.

From a level of service (LOS) perspective, Missouri's highways continue to experience congestion and reliability issues despite relatively strong pavement conditions. High truck volumes on interstates and at key interchanges reduce efficiency and increase travel times, particularly in urban areas. First- and last-mile connections to ports, rail terminals and airports also experience localized bottlenecks. While recent improvements have addressed some of these constraints, growth in e-commerce and freight demand is expected to put additional strain on highway capacity, underscoring the need for continued monitoring and targeted investments.

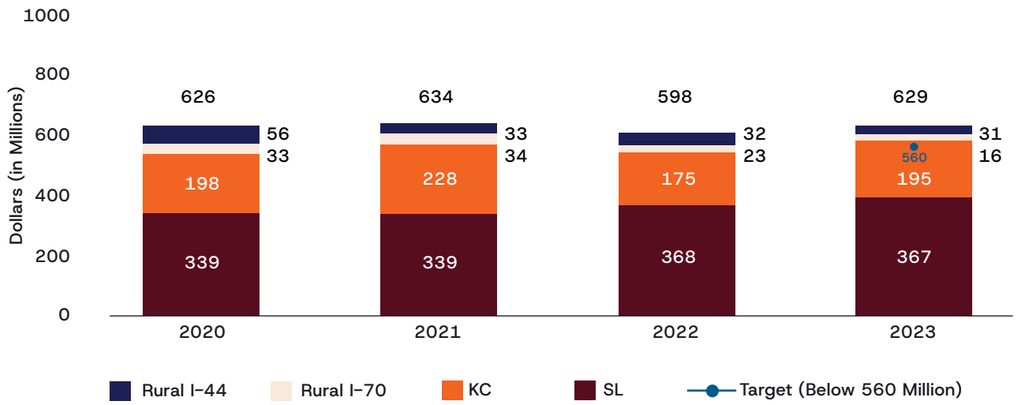
St. Louis and Kansas City are two major freight centers in Missouri that experience the most congestion in the state. The state target is no more than 10 additional minutes of travel time during peak rush hour conditions. For the third quarter of 2025, the most recent Missouri Tracker reliability data, St. Louis reported the morning peak was 8 seconds less and the evening peak was 40 seconds greater than peak targets.[3] In Kansas City, the morning peak was 8 seconds greater and the evening peak was 57 seconds greater than peak targets.[42]

Congestion has financial costs that are passed on to drivers and consumers. In 2023, the estimated cost of congestion in St. Louis, Kansas City and rural I-70 and I-44 freight corridors was $629 million, surpassing the statewide target by $69 million. The total cost of congestion saw a large increase from 2022, as seen in **Figure 5**, returning to levels previously seen in 2020 and 2021.

[3] MoDOT, "Reliability on Major Routes -4a," accessed October 2, 2025, https://www.modot.org/reliability-major-routes-4a.

[3] MoDOT, "Reliability on Major Routes -4a," accessed October 2, 2025, https://www.modot.org/reliability-major-routes-4a.

Figure 5 – Cost of Congestion on Selected State Roads, 2020–2023



Source: MoDOT, Cost and Impact of Traffic Congestion -4b, 2025.

While peak congestion is predictable, there is unplanned congestion that also impacts reliability of the state highway system. Traffic incidents lock travel lanes and temporarily reduce the number of vehicles that can travel on the road. Traffic crashes are the most impactful source of unplanned congestion. Two major freight corridors, I-70 and I-44, have higher than expected crash rates, indicating a need for improvements.

The speed of incident clearance is essential to the highway system returning to normal conditions and improving the reliability of the system. Delays on the highway network can lead to missed intermodal connections, scheduling conflicts or cascading disruptions throughout the freight system.

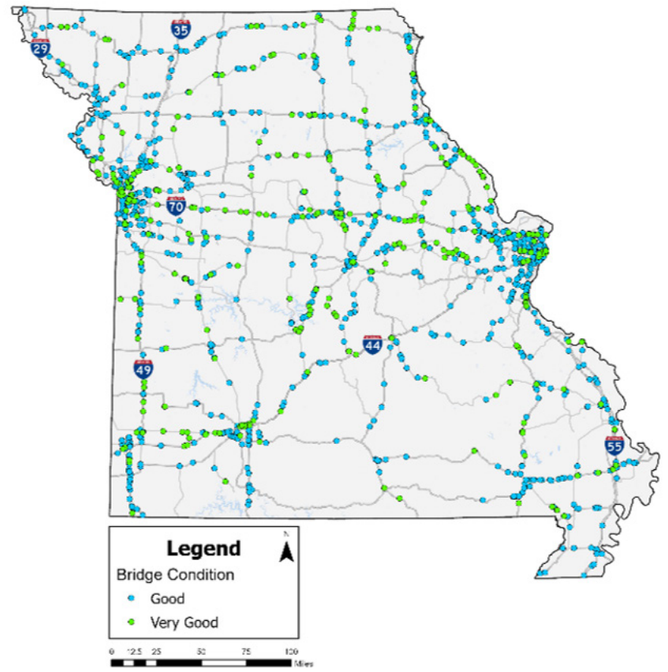
To monitor and improve this aspect of system performance, MoDOT tracks trends in incident clearance. One key performance measure tracked by MoDOT is how quickly MoDOT and emergency responders remove obstructions and restore normal operations.[5] MoDOT set targets on average time to clear incidents, which account for the number of incidents and the actual time to clear. The 2024 actual average clearance times for St. Louis (28.40 minutes), Kansas City (30.40 minutes) and Springfield (33.50 minutes) were slightly higher than the targets, which range from 25.00 to 29.60 minutes. In contrast, the actual clearance times for rural I-70 (72.20 minutes) and rural I-44 (85.10 minutes) were much higher than the target clearance time of 60 minutes. In contrast, the actual clearance times for rural I-70 (72.20 minutes) and rural I-44 (85.10 minutes) were much higher than the target clearance time of 60 minutes.

[5] MoDOT, "Average Time to Clear Traffic Incidents -4c," accessed October 2, 2025, https://www.modot.org/average-time-clear-traffic-incidents-4c.

Bridges

In addition to the huge network of highways, Missouri has 10,427 bridges and culverts of varying sizes, including 209 major bridges that are longer than 1,000 feet. In 2024, the average bridge age in Missouri was 50 years. From 2019 to 2024, the number of bridges in poor condition was reduced from 8.6% to 7.2%.[6] This improvement from 2019 to 2024 reflects investments made through MoDOT's asset management program and the Governor's Focus on Bridges program. To combat aging infrastructure, MoDOT has a target of no more than 900 bridges being in poor condition. **Figure 6** shows the location of Missouri bridges in good or very good condition, while **Figure 7** shows the location of Missouri bridges in fair, poor or very poor condition.[7]

Figure 6 – Missouri Bridges in Good or Very Good Condition

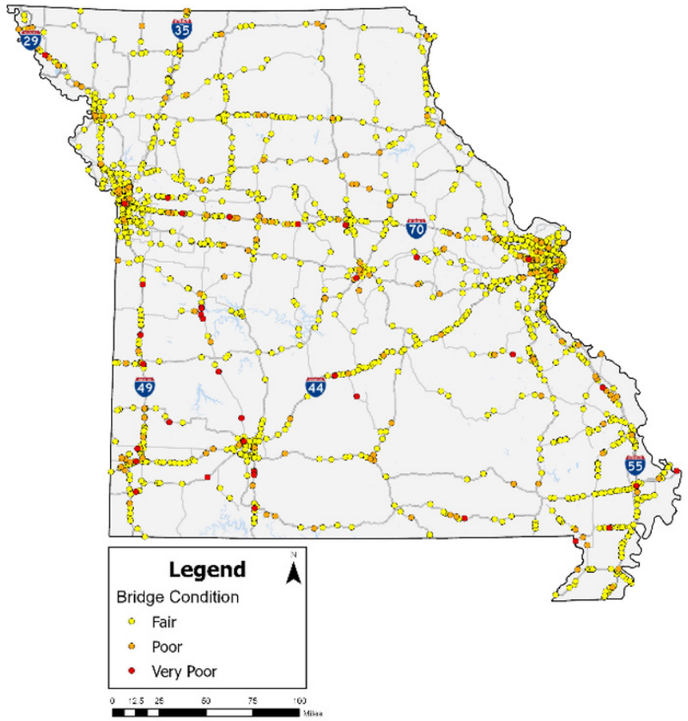


Source: MoDOT Bridge Dataset, 2025.

[6] MoDOT, "Condition of State Bridges -5a," accessed June 5, 2025, https://www.modot.org/condition-state-bridges-5a.

[7] Both figures exclude bridges without ratings.

Figure 7 – Missouri Bridges in Fair, Poor or Very Poor Condition



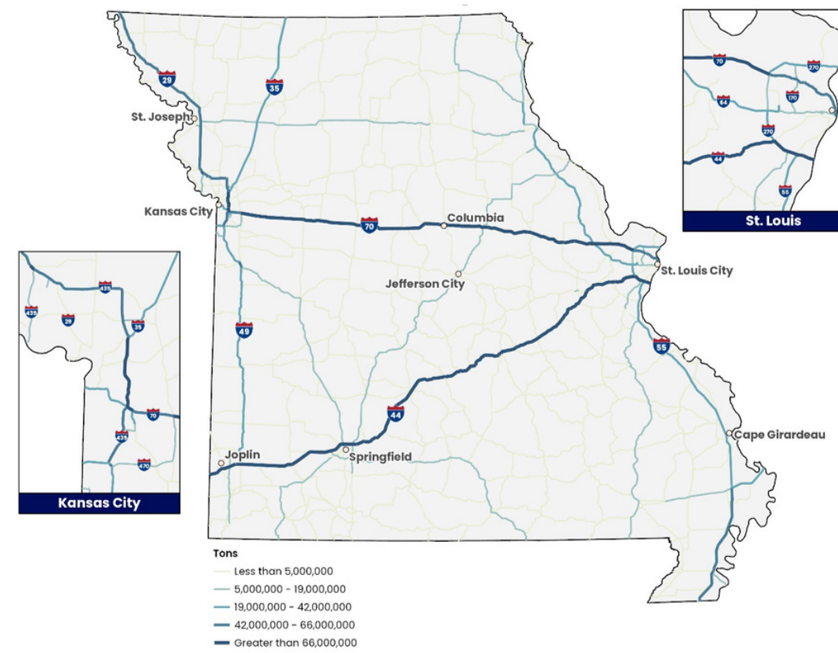
Source: MoDOT, Bridge Dataset, 2025.

The performance of all state bridges is important to review versus those only on the National Highway System (NHS) or NHFN due to the importance of agriculture to the state and the significant barrier a weight-posted or closed bridge can have on freight movements. Bridges in poor or very poor condition often have weight limit postings to maintain safety while avoiding closing the structure. Weight-limited bridges require farmers to choose between making more trips with lighter loads to market or taking detours to travel on roads with no load-posted bridges. Both options increase the farmers' transportation cost and lower available profits.

Truck Freight

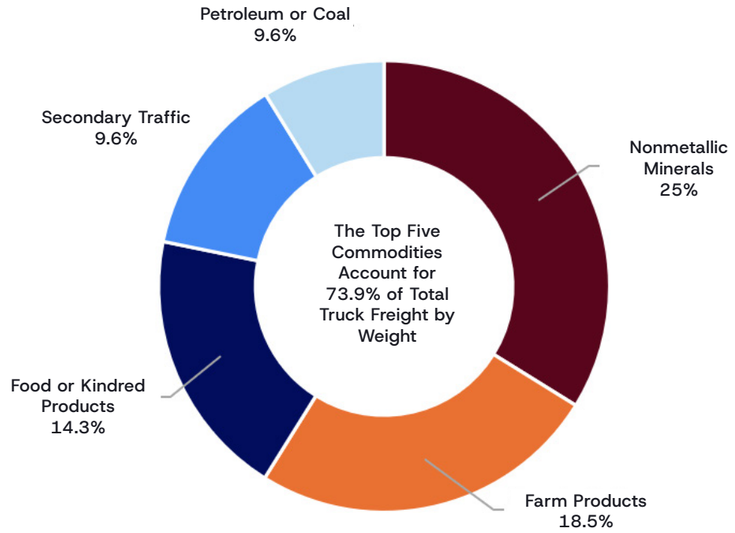
The state's central location and extensive highway network make it a critical crossroad for long-haul freight moving east-west and north-south across the country. More specifically, truck movements account for 55% of the total freight tonnage and are forecasted to increase to 59%, from 624 million in 2023 to 765 million in 2043.[1] **Figure 8** shows the state's 2023 cargo flows and **Figure 9** shows the 2023 top five truck freight commodities by tonnage.

Figure 8 – Truck Cargo Flows, 2023



Source: GFT Analysis of Transearch Data, 2023.

Figure 9 – Top Five Commodities by Weight (Percent) for Truck Freight, 2023



Source: GFT Analysis of Transearch Data, 2023.

Bottlenecks

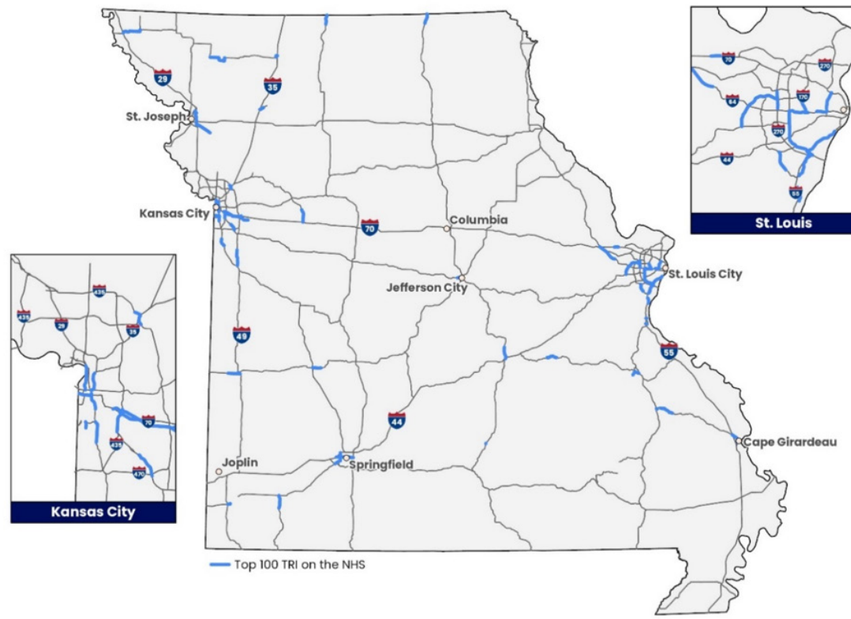
The American Transportation Research Institute (ATRI) publishes an annual report evaluating the top truck bottlenecks. The evaluation methodology involves comparing an assumed free-flow speed of 55 mph to the measured truck speed, then multiplying the difference by the hourly vehicle volume to obtain an hourly freight congestion value. The total freight congestion value is the summation for 24 hours in the day. Missouri has two locations listed in the top 100 truck bottlenecks: I-64/I-55 at I-44 in St. Louis and I-70/I-670 at U.S. 71 in Kansas City. While informative, the congestion value does not measure reliability, a key factor for freight shippers when planning routes for cargo.

The FHWA measures bottlenecks through six different indicators. The industry standard for measuring freight bottlenecks is the Truck Reliability Index (TRI), which compares the 95th percentile travel time to the 50th percentile travel time for specific times of the day.[8] The TRI scores begin at one, indicating a perfectly reliable system and scores greater than one indicating an unpredictable system. However, reliability does not indicate free-flow traffic. For example, a roadway can be heavily congested, but if it is consistent and predictably congested, it will have a favorable TRI score. **Figure 10** shows Missouri NHS segments included in the

[8] Truck Reliability Index is also known as Truck Travel Time Reliability Index (TTTRI).

top 100 bottleneck locations based on TRI scores. **Table 1** lists the top 10 bottlenecks with congestion cost and Freight Analysis Framework (FAF) commodity values. A full list of the top 100 bottlenecks is included in **Appendix A**.

Figure 10 – Missouri National Highway System Segments with Top 100 Truck Reliability Index Scores



Source: GFT Analysis of FHWA Bottleneck Tool, 2025.

Table 1 – Top 10 Truck Reliability Index Bottlenecks on the National Highway System in Missouri

Rank	Truck Reliability Index Value	Roadway	District	Congestion Cost	Freight Analysis Framework Value
1	3.16	I-670	Kansas City	$2.4M	$28.2B
2	2.33	U.S. 169	Northwest	$1.4M	$1.2B
3	2.22	I-64	St. Louis	$4.5M	$29.2B
4	2.08	U.S. 169	Northwest	$1.8M	$1.2B
5	2.07	U.S. 61	St. Louis	$0.2M	$0.4B
6	1.89	I-70	Kansas City	$5.1M	$44.1B
7	1.82	I-270	St. Louis	$2.5M	$32.5B
8	1.77	U.S. 40	Kansas City	$0.1M	$0.4B
9	1.77	U.S. 50	St. Louis	$0.1M	$2.2B
10	1.72	MO-72	Southeast	$0.1M	$1.1B

Source: GFT Analysis of FHWA Bottleneck Tool, 2025.

FHWA tracks interstate truck travel through its Truck Travel Time Reliability Index (TTTRI), with each state establishing a two- and four-year target and a goal of all states trending to a value of 1.00.[9] Missouri has a target TTTRI of 1.45, with the most recently reported TTTRI of 1.23 in 2022 compared to 1.30 in 2019. Based on this metric, Missouri's interstates are more reliable than Illinois, Oklahoma, Tennessee and Kentucky, while slightly less reliable than Iowa, Nebraska, Kansas and Arkansas.

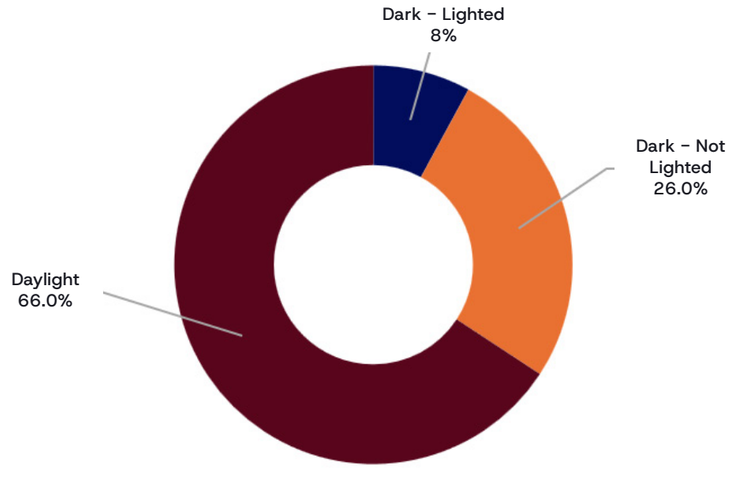
Safety

The Missouri State Highway Patrol (MSHP) manages the Missouri Crash Analysis Reporting System (MCARS), which is a comprehensive resource of traffic crashes. Highway freight-related crashes include those that involve a single truck, a combination of trucks and personal vehicles and/or trains. Per the MCARS, there were 136,838 total crashes in Missouri in 2023,

[9] FHWA, "Transportation Performance Management," accessed October 6, 2025, https://www.fhwa.dot.gov/tpm/reporting/state/state.cfm?state=Missouri

of which 15,453 (11.30%) involved a Commercial Motor Vehicle (CMV). CMVs are only slightly overrepresented in the expected share of fatalities with 130 (13.10%) fatalities in 2023. A summary of light conditions at the time of fatal CMV crashes is provided in **Figure 11**.

Figure 11 – Light Conditions for Fatal Commercial Motor Vehicle Crashes, 2023



Source: GFT Analysis of MHSP data, 2023.

When compared to 2019 data, the 2024 total number of crashes involving CMVs decreased by 1.97% and fatal crashes decreased by 2.42%. This indicates safer operations, thanks to Missouri's multi-disciplined approach to achieving safer roads through education, public policy, enforcement, engineering and emergency response.

Existing Performance Metrics

The highway condition and performance assessment provides a snapshot of current assets. The assessment measures pavement and bridge condition, congestion and roadway safety factors that highlight how the system is performing.

Highway performance is guided by the six SFRP goals: stewardship, safe, prosperous, reliable, connected and innovative. The new goals and their associated metrics, are described in the **Goals, Objectives and Performance Metrics chapter.**

Rail

Additional Considerations: Military Vehicle Size, Weight and Infrastructure Needs

Military freight movements often involve oversized and overweight vehicles, including tanks, armored personnel carriersand heavy transport equipment. Missouri's infrastructure planning must provide adequate pavement strength, bridge load ratingsand route clearances to support movement of these vehicles. Strategic Highway Network (STRAHNET) and Strategic Rail Corridor Network (STRACNET) routes are prioritized for investment to maintain these capabilities. In addition, MoDOT's Freight and Highway Safety Divisions coordinate with the MSHP to streamline oversize/overweight permitting processes for military convoys and to manage temporary closures or route adjustments during deployment activities.

Freight trains are a vital component of Missouri's multimodal transportation network, providing cost-effective, long-haul movement of bulk goods, manufactured products and intermodal containers, while also sharing corridors with passenger train services. This section examines the condition and performance of Missouri's rail system, including bottlenecks, LOS and safety considerations.

Overview

Missouri consistently ranks among the top rail states in the nation, carrying the fourth-largest volume of freight tonnage in the country. In 2023 alone, 7.30 million railcars carried 344.90 million tons of freight valued at $663 billion, representing nearly 39.20% of the total value of goods shipped in the state.[10]

Missouri has the 11th-largest rail network in the U.S., with approximately 3,800 miles of track (in addition to 2,500 miles of railyard track) and more than 6,500 public and private highway-rail crossings (4,381 public and 2,183 private).[8] The state is served by 20 freight railroads,

[10] MoDOT,"Missouri Highway-Rail Grade Crossing State Plan," 2022, https://www.modot.org/sites/default/files/documents/MoDOT_SAP_JAN_2022_REV0927.pdf.

including five Class I carriers: Burlington North Santa Fe Railway (BNSF), Canadian Pacific Kansas City (CPKC), CSX, Norfolk Southern (NS) and Union Pacific Railroad (UP). Further, 15 short line railroads maintain 566 miles of track, providing critical first- and last-mile service to rural shippers and local industries. Collectively, these railroads moved 30% of all freight in Missouri in 2023and volumes are projected to increase in the future.

The state's rail infrastructure extends beyond mainline tracks, encompassing thousands of highway-rail grade crossings, active and inactive spurs and shared freight-passenger corridors. This extensive rail system provides a foundation for Missouri's economy and workforce.

Rail Freight

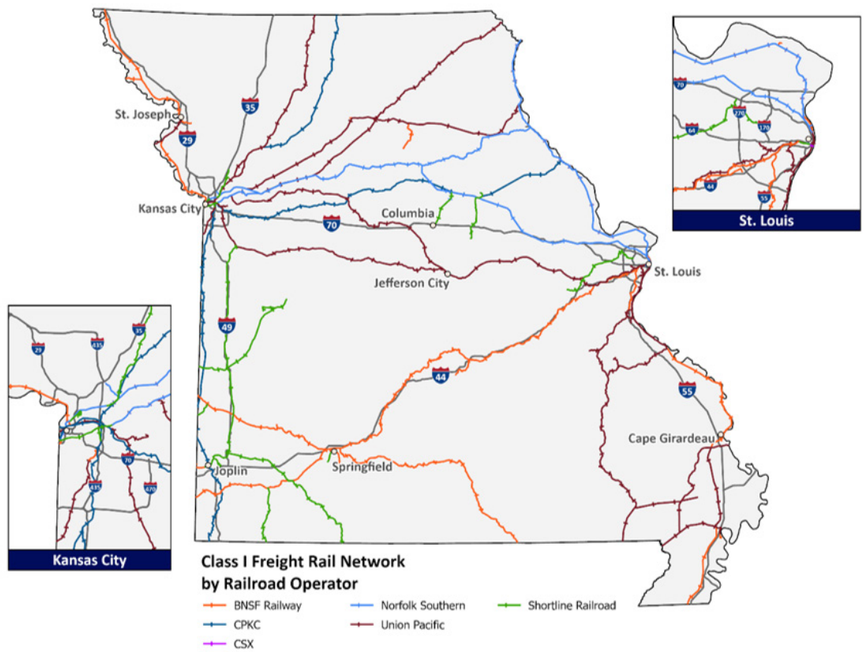
Rail carries the second largest share of goods in Missouri by both weight and value. Kansas City and St. Louis anchor this rail system as nationally significant hubs, ranked the second- and sixth-largest rail transportation centers in the nation, respectively, with concentrations of key intermodal and switching facilities.[11] These hubs connect Missouri to domestic shippers, Canadian and Mexican trade partners and global markets through ocean ports. Railroads support industries such as agriculture, chemicals, mining and automotive manufacturing, while ensuring efficient connections between producers and consumers. In 2023, around 345 million tons of rail freight moved in Missouri, reflecting 30% of all freight movement. This freight volume is forecast to increase in 2043 to 356 million tons, but the relative share is forecast to decrease slightly to 27%.

In 2022, Missouri ranked sixth nationally in freight rail employment, emphasizing the sector's economic footprint on Missouri freight movements.[12] **Figure 12** shows the Missouri rail freight network and **Figure 13** shows the top five commodities by tonnage transported via rail in 2023.

[11] MoDOT, "Freight Railroads," accessed October 6, 2025, https://www.modot.org/freight-railroads

[12] Association of American Railroads, "Missouri State Fact Sheet, 2023," https://www.aar.org/wp-content/uploads/2025/01/AARMissouri-State-Fact-Sheet.pdf.

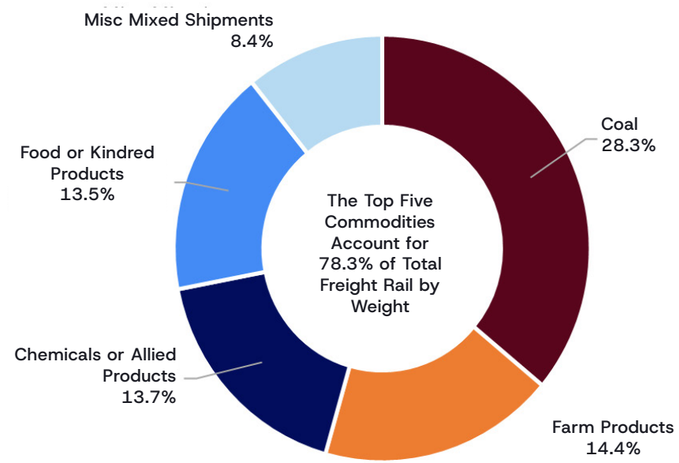
Figure 12 – Missouri Rail Freight Network



Source: MoDOT, Freight Railroads, 2025.

Source: MoDOT

Figure 13 – Top Five Commodities by Weight (Percent) for Freight Rail, 2023



Source: GFT Analysis of Transearch Data, 2023.

Level of Service

Understanding rail system performance in Missouri requires both quantitative measures of capacity and qualitative input from rail carriers. While LOS is not defined uniformly across the rail industry, carriers in Missouri generally assess system performance through data such as operational restrictions, volume-to-capacity balance and intermodal terminal congestion.

Discussions with Class I operators highlighted recurring bottlenecks in urban areas, such as Kansas City, St. Louis and Sedalia. Several railroads highlighted that much of their traffic in Missouri is passing through rather than having an origin or destination within the state, emphasizing the state's strategic role in national freight corridors. NS, UP and CPKC all stressed that performance issues in Missouri can affect service well beyond state lines. Railroads also noted that intermodal and yard congestion, low-profile crossings and bridge clearance limitations can create localized constraints that affect throughput. Railroad stakeholder feedback emphasized that LOS is ultimately reflected in service reliability to customers and that coordination with MoDOT on project prioritization and early planning is critical to addressing capacity constraints before they become more costly chokepoints, as further discussed in the Bottlenecks/Chokepoints section below. Class I railroad stakeholders identified specific locations where freight mobility and safety concerns negatively impact operations and LOS, as summarized in **Table 2**.

Table 2 – Rail Chokepoints Identified by Stakeholders

Location	Freight Mobility/Safety Concern
Grain Valley and Nowell	Blocked crossings caused by sidings intersecting major roadways; need for siding relocation to improve freight and community mobility.
Various Locations	Railroad-owned highway overpasses present maintenance and jurisdiction challenges; slow orders impact reliability.
High Hill/I-70	Bridge strike due to lack of vertical clearance created major infrastructure failure; resulted in rail rerouting and interstate closure, disrupting both freight and highway mobility.
Hannibal Area	River crossing capacity constraints create operational challenges.
Pevely Crossing, MO (DOT 445875R)	Low-profile crossing design causes vehicles to get stuck; creates recurring blockage and safety risks.
NuCor Steel near Sedalia (Washington St.)	Increased freight and passenger traffic at grade crossing; safety risks for adjacent school and housing; bridge constraints limit emergency vehicle access.
Southwest Ave. Bridge, DeSoto Sub (St. Louis)	Vertical clearance limitations; bridge upgrades needed to support freight efficiency.
Missouri River Runner Route	Corridor capacity enhancements and siding expansion needed to support freight and passenger mobility.
Independence Ave. (Kansas City)	Grade separation functions adequately currently; insufficient track capacity for future growth.
Springfield	Chokepoint coming in and out of intermodal facilities in the area.

Source: GFT Discussions at Rail Stakeholder Meetings.

Bottlenecks/Chokepoints

Railroad bottlenecks, commonly referred to as “chokepoints,” are locations along the freight rail network that constrain efficiency and contribute to the delay in the movement of goods. These chokepoints can be broadly categorized into two types: structural and operational. Structural chokepoints include physical constraints, such as low-clearance bridges and track segments with weight limits or slow orders. Operational or congested chokepoints arise from issues like limited capacity at intermodal yards, scheduling conflicts or shared-use corridors where freight and passenger trains compete for track time.

Structural Chokepoints

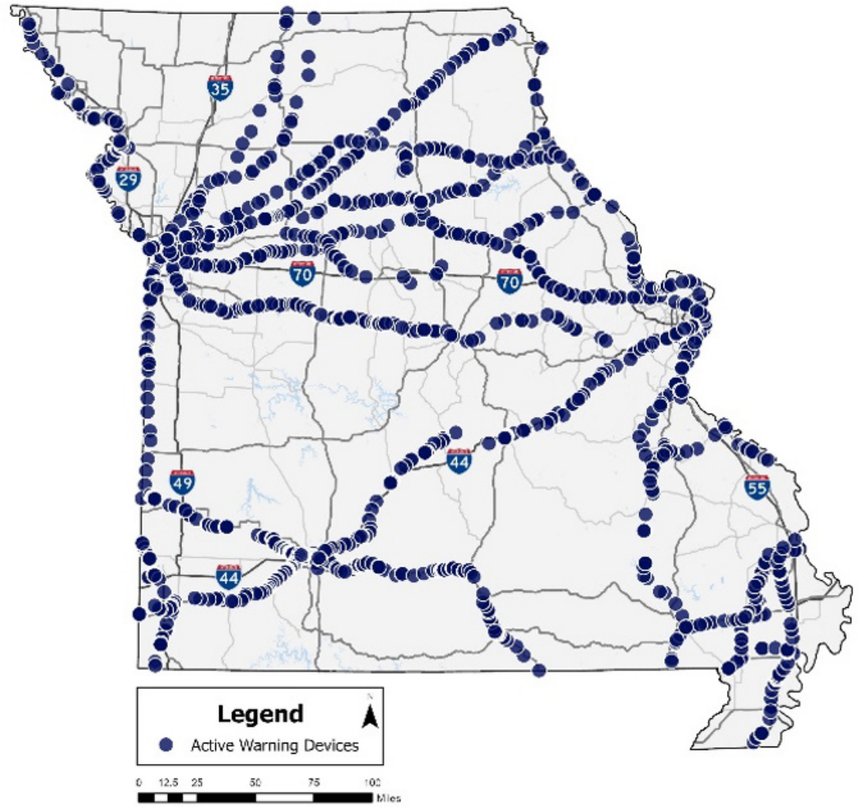
- **Low-Clearance Areas and Bridges with Size Restrictions:** Bridges can lead to chokepoints by limiting capacity through slow orders as bridges age, limited ability to add additional trackage and height restrictions. Both UP and BSNF provide guidance on the permanent vertical clearance under a structure, with the minimum allowable clearance being 23 feet 4 inches (UP) or 23 feet 6 inches (BNSF).[13]
- **Slow-Order Tracks:** Permanent slow-order track segments require trains to slow down below normal operating speed, disrupting scheduled movements and increasing total travel time. Because trains spend more time traversing the slow-order segment, fewer trains can move through that segment, creating a bottleneck effect. This effect can be exacerbated in already congested areas, such as near intermodal facilities or on shared corridors.
- **Weight-Limit Tracks:** The industry standard maximum railcar weight, including the weight of commodities and the railcar, is 286,000 pounds. Weight-restricted segments limit the flow of higher-capacity trains and can create chokepoints, especially in otherwise high-capacity corridors or near terminals and interchange points. While most of Missouri’s rail freight network can accommodate heavy axle railcars, there are a few segments with a weight restriction. Additionally, the short line rail carriers noted multiple segments with less than the 286,000-pound capable rail, which can limit their ability to serve customers.

[13] BNSF, “Union Pacific Railroad - BNSF Railway Guidelines for Railroad Grade Separation Projects,” published January 5, 2016, https://www.bnsf.com/bnsf-resources/pdf/in-the-community/uprr-bnsf-joint-guidelines-railroad-grade-separation-projects.pdf.

Operational Chokepoints

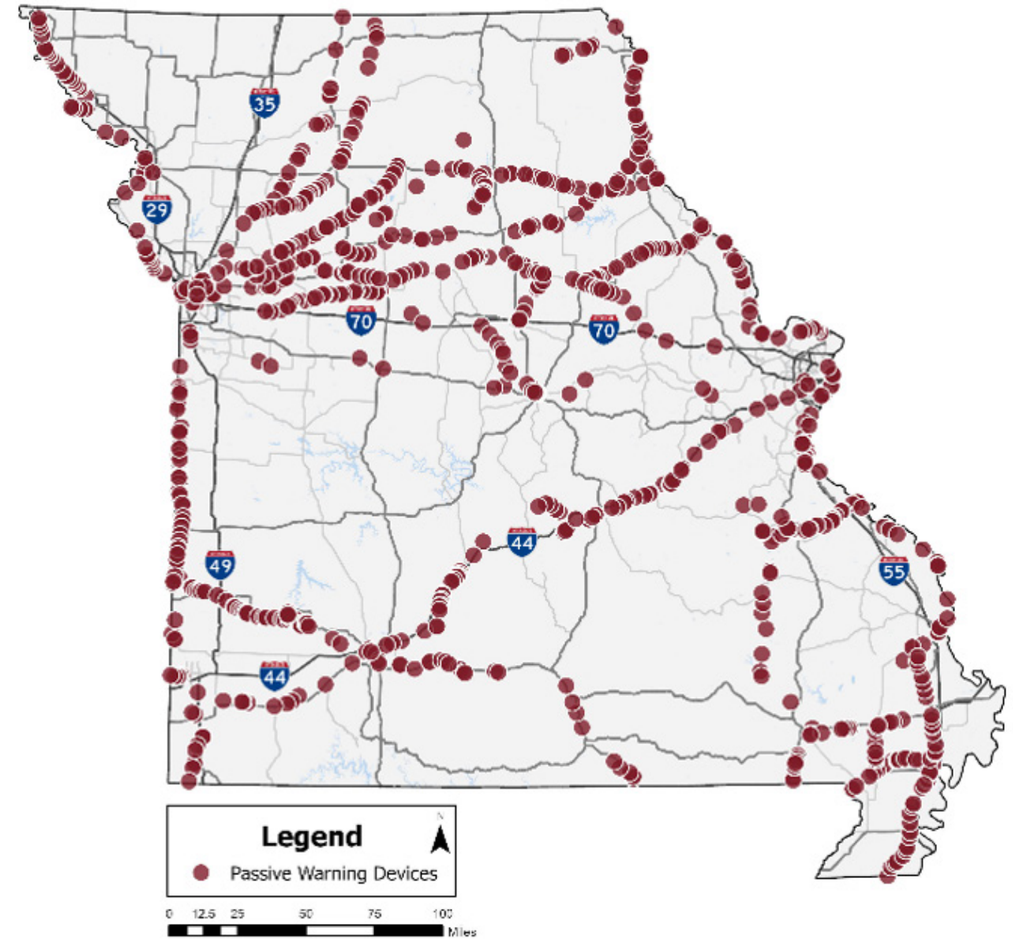
- **At-grade Crossings:** Trains often reduce speed when approaching at-grade crossings in populated or high-traffic areas, increasing overall travel time and reducing network efficiency. These crossings also risk being occupied, which can disrupt both rail and truck freight movement. While a single crossing may have minimal impact, the cumulative effect of multiple at-grade crossings can create significant chokepoints that constrain capacity and delay freight flow. **Figure 14** and **Figure 15** illustrate the density of active and passive warning at-grade crossings across Missouri, respectively. This highlights areas of higher concentration and safety features that can increase the potential for delays and operational disruption.

Figure 14 – Active Warning At-Grade Crossings



Source: GFT Analysis of Federal Railroad Administration (FRA) Crossing Inventory Data, 2025.

Figure 15 – Passive Warning At-Grade Crossings

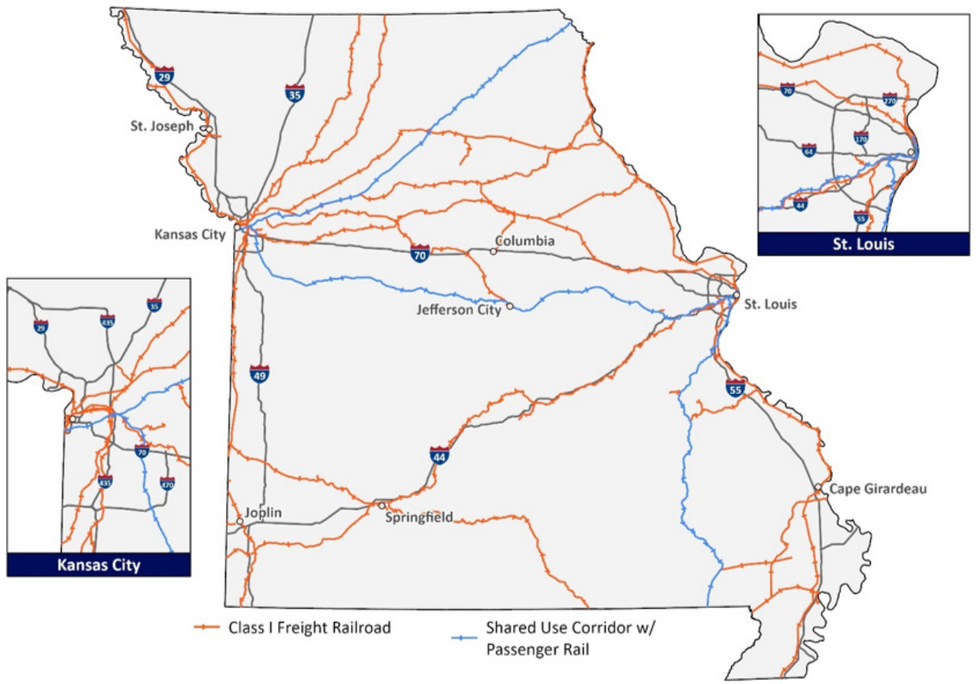


Source: GFT Analysis of FRA Crossing Inventory Data, 2025.

Shared-Use Corridors: Competing interest between freight and passenger rail can pose operational challenges along shared use corridors. Four passenger routes exist in Missouri: the Texas Eagle, Southwest Chief, Lincoln Service and the Missouri River Runner. Passenger rail generally requires strict on-time performance windows, which can constrain freight movement and reduce available capacity for heavier or slower trains. These operational restrictions increase the likelihood of service delays and can create chokepoints. **Figure 16** depicts shared-use rail corridors in Missouri.

- **Operational Challenges:** A number of unexpected operational challenges can also contribute to the presence of chokepoints. Delays at interchange points can occur when traffic volumes exceed the handling capacity of junctions. Railyards and intermodal facilities can become congested when inbound volumes exceed processing capacity. Other circumstances, such as documentation issues or misplaced railcars, can delay individual shipments.

Figure 16 – Shared-Use Rail Corridors



Source: FRA, 2025.

Safety

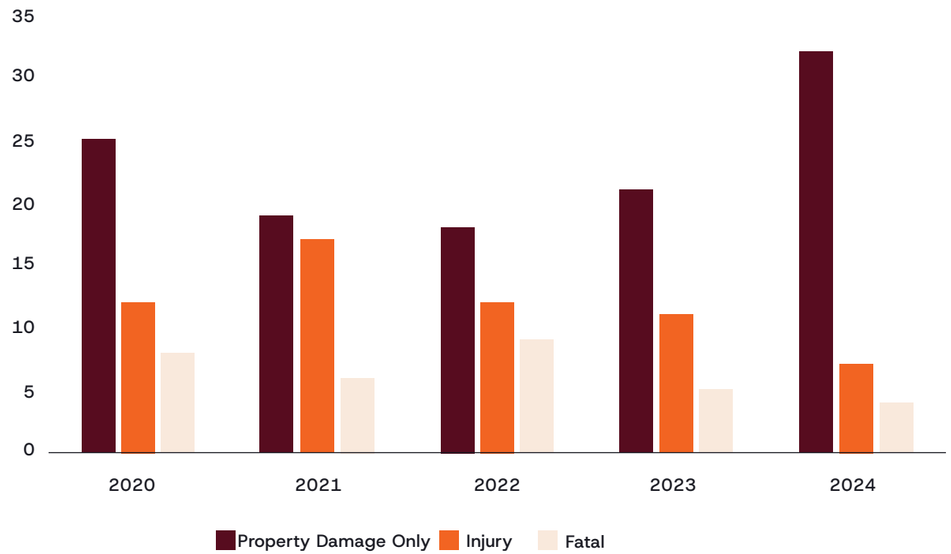
The safety of all who use Missouri's transportation network is MoDOT's number one priority. Rail safety performance is a critical factor in evaluating both operational reliability and public risk. System characteristics, such as the design and level of protection at grade crossings and public awareness about rail safety, directly influence outcomes. Active Grade Crossings have active warning and control devices, such as bells, flashing lights and gates, in addition to passive warning devices, such as crossbucks, yield or stop signs and pavement markings. Passive Grade Crossings have only passive warning devices. Active warning and control devices can help improve the safety of at-grade rail crossings and MoDOT strongly supports the installation of active warning systems at high-risk locations. However, conversations with Class III railroads indicate that limited financial resources to maintain the active warning system often prevent these short line operators from making necessary upgrades. As emphasized in rail safety discussions with Class I railroads, "the safest crossing is a closed crossing."[14]

Highway-rail at-grade crossings represent points of mode and user conflict carrying inherent risks, such as collisions, occupied crossings, trespassing and disrupted access to emergency services. The public reports when a train is blocking an at-grade crossing, revealing impacts to train arrivals, emergency access, public mobility or freight delivery. Since 2020, there have been 2,764 blocked-crossing reports in the state of Missouri. The majority of these incidents involved UP trains (60%), followed by BSNF (19%). Nearly 25% of these crossings were blocked anywhere from one hour to more than one day. While blocked crossings were lowest in 2020, likely due to a decrease in road users, a steep decrease of 73% was observed in blocked crossing reports since 2021, reflecting the collaborative focus of the railroads and MoDOT to identify solutions for this issue.

Missouri maintains 3,311 public at-grade highway-rail grade crossings, many of which are located on key freight corridors in both urban and rural areas. Over the past five years, there were a total of 59 injuries and 32 fatalities at at-grade crossings, as shown in **Figure 17**. In 2023, there were 11 injuries and 4 fatalities, a 14% decrease and 33% increase, respectively, from 2019. These numbers have remained consistent, except in 2022 when a truck collided with an Amtrak train at an at-grade crossing causing the train to derail and leading to 4 fatalities and 123 injuries.

[14] GFT's Railroad Stakeholder Meeting Conversation, 2025.

Figure 17 – Public Highway-Rail Grade Crossings Incidents by Severity, 2020-2024



Source: MoDOT, 2025.

To mitigate safety concerns and improve outcomes, Missouri participates in a range of activities, including:

- **Missouri Highway-Rail Grade Crossing State Action Plan (SAP):** The SAP identifies highway-rail and pathway-rail grade crossings that have experienced recent incidents and identifies specific strategies for improving safety at grade crossings.
- **Education and Outreach:**
  - Rail Safety Week: Missouri promotes education and messaging about highway-rail safety during Rail Safety Week, an industry-led initiative focused on promoting rail safety during a dedicated week in June.
  - Operation Lifesaver: Missouri adopted the Operation Lifesaver program, a non-profit organization committed to preventing collisions, injuries and fatalities on railroad tracks and at highway-rail grade crossings. Missouri Operation Lifesaver promotes rail safety through public awareness campaigns and education initiatives.
- **Funding Programs:** MoDOT receives federal and state funding to support investments in

highway-rail grade crossing safety improvements through programs such as the Railway-Highway Crossing Program (Section 130) and the Grade Crossing Safety Account (GCSA). In 2023, Missouri allocated $50 million from the general revenue fund to address passive rail crossings across the state.

Existing Performance Metrics

The condition and performance assessment of rail underscores the importance of Missouri's freight and passenger rail system in supporting industry, safety and mobility. The performance metrics described in the Goals and Objectives Chapter will be used to assess the condition and performance of the rail freight system.

Ports and Waterways

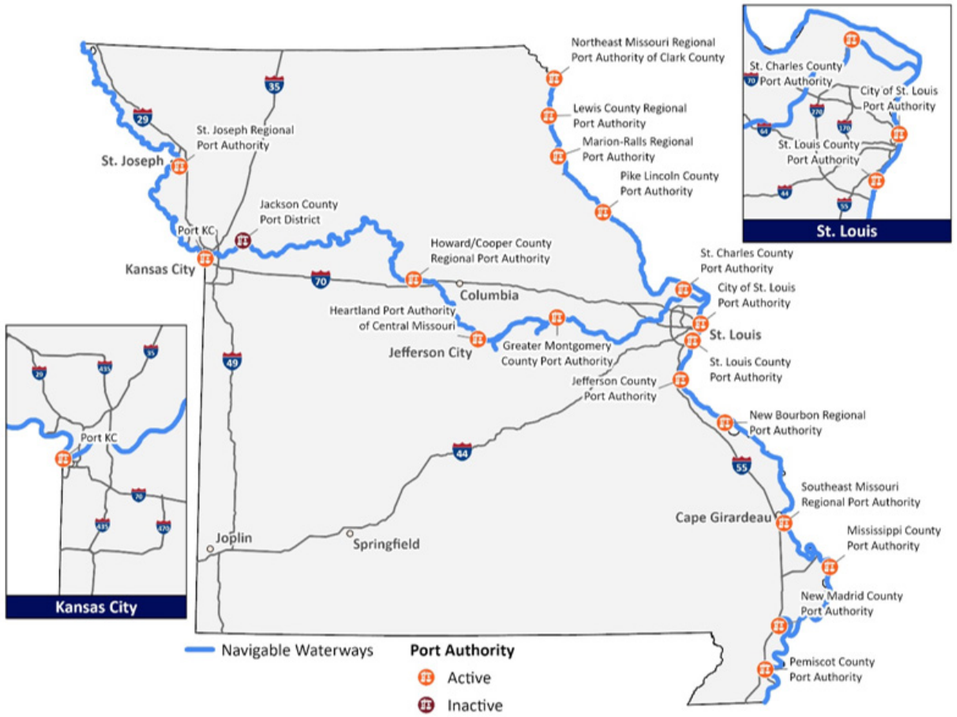
Missouri's rivers provide a cost-effective and energy-efficient freight option, playing a role in reducing highway congestion by diverting heavy loads from roadways. This section reviews the condition of the state's port and waterway system, key chokepoints, safety and regulatory issues and the adequacy of existing metrics to measure both the economic and systemwide benefits of waterborne freight.

Overview

An annual average of $19.20 billion in cargo1 is transported on waterways in or adjacent to Missouri. The state has 1,050 miles of navigable rivers, including almost 500 river miles of the Mississippi River and over 550 river miles of the Missouri River. Missouri statutes allow for the formation of port authorities. MoDOT's waterways unit assists cities and counties in forming port authorities to foster local economic development. MoDOT also assists in capital and administrative funding for public port authorities, along with other technical assistance.

The 19 public port authorities and more than 200 private terminals moved 5% of the state's total freight onto or off the Missouri and Mississippi Rivers, reducing the number of trucks on the roadways by more than 2 million. Missouri's public port authority locations are shown in **Figure 18**.

Figure 18 – Missouri Public Port Authorities and Navigable Waterways



Source: Data from MoDOT, 2025.

Missouri has four nationally designated marine highways, which generally shadow the interstate highway system along the Mississippi and Missouri Rivers, as shown in **Figure 19**. Designated marine highways can receive preferential treatment for federal assistance from the U.S. Department of Transportation's (USDOT's) Maritime Administration (MARAD). The marine highway system has been designed to expand the use of the nation's waterways to relieve congestion, reduce air emissions and generate other public benefits by increasing the efficiency of freight movement within the surface transportation system.

Marine highways serving Missouri include the following:

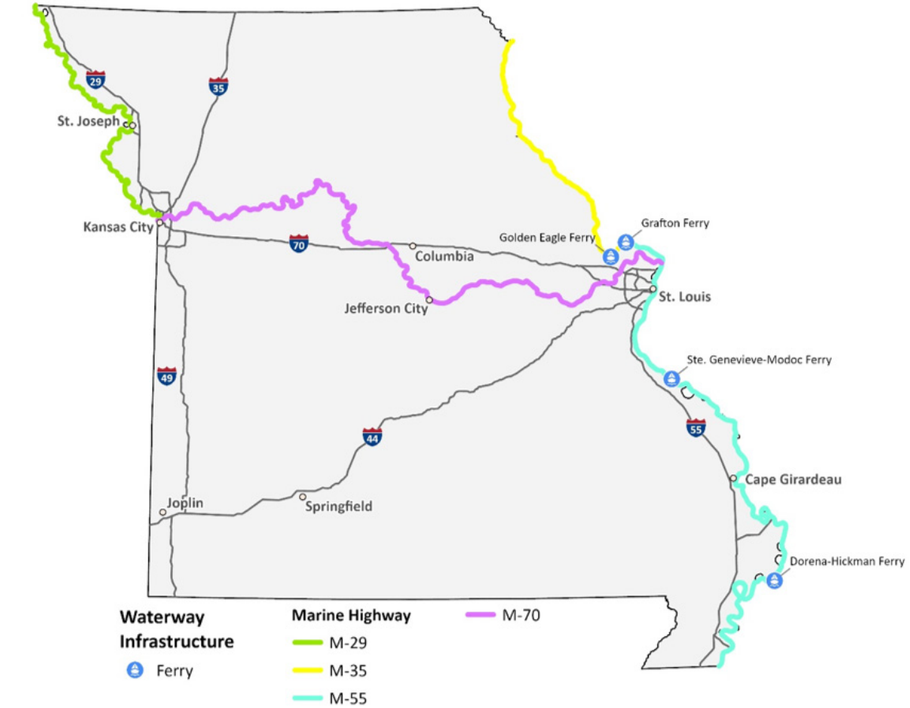
- M-29 consists of the Missouri River from Kansas City to Sioux City, Iowa.
- M-70 consists of the Missouri River from Kansas City to St. Louis.
- M-35 includes the Upper Mississippi River from the Twin Cities to St. Louis.
- M-55 includes the Illinois River from Chicago to St. Louis, then the entirety of the Mississippi River downriver (south) of St. Louis to the Gulf.

Figure 19 – U.S. Marine Highway Routes

Source: U.S. Maritime Administration (MARAD), U.S. Marine Highway Program Routes Map, 2025.

Missouri also has four toll ferry services that cross the Mississippi River: Golden Eagle, Grafton, Ste. Genevieve-Modoc and Dorena-Hickman. The Golden Eagle Ferry is privately owned and operated; the Grafton Ferry is privately operated with the landings maintained by St. Charles County (Missouri) and the City of Grafton (Illinois); the Ste. Genevieve-Modoc Ferry is privately operated, but it is owned by the New Bourbon Regional Port Authority (Missouri), with the Illinois Department of Transportation owning and maintaining the Illinois landing; the Dorena-Hickman Ferry is owned and operated by the Mississippi County Port Authority (Missouri). The locations of Missouri's ferry services are shown in **Figure 20**. These ferries often transport freight trucks, reducing the number of miles traveled on the highways.

Figure 20 – Ferry Locations and U.S. Marine Highways in Missouri

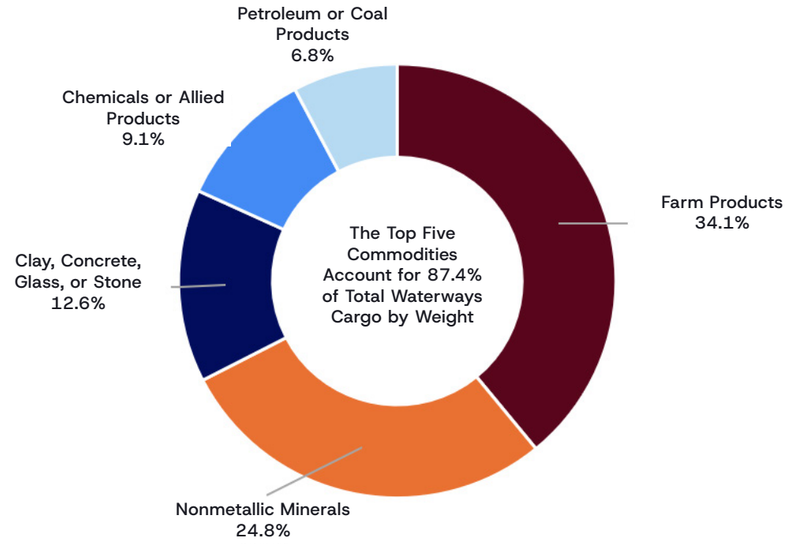


Source: MARAD, 2025; MoDOT, 2025.

Waterborne Freight

Commodities transported by barge on the Missouri River include agricultural products, fertilizers, petroleum products, road salt, aggregates and iron/steel. The top five commodities by tonnage (%) transported by barge on Missouri waterways are presented in **Figure 21**. The Mississippi River continues to be a key transportation option for a variety of agricultural products, as well as other bulk materials including aggregates, petroleum products, chemicals and building materials.

Figure 21 – Top Five Commodities by Weight (Percent) for Waterways, 2023



Source: GFT Analysis of Transearch Data, 2023.

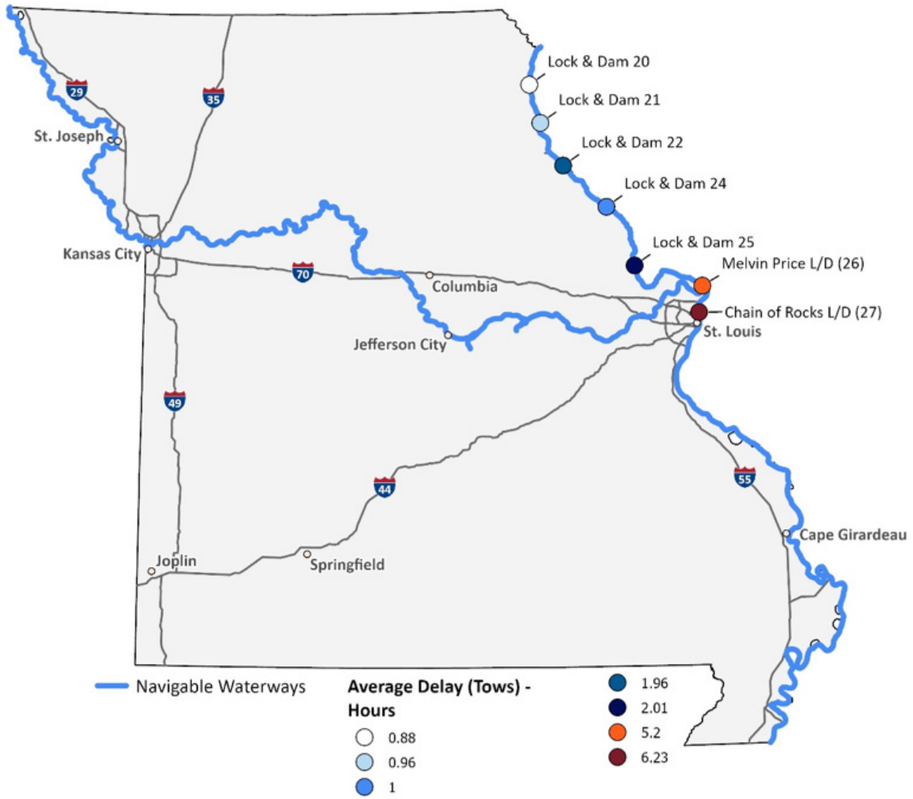
In 2023, 51.10 million tons of freight were moved on waterways through or adjacent to Missouri, of that, 32 million tons of freight originated on Missouri waterways. By 2043, Missouri waterways freight tonnage is forecast to increase to 58.60 million tons, which is a cumulative increase of 14.50% and a compounded annual growth rate of 0.7%. The value of this freight is expected to increase to $22.60 billion by 2043, which is a cumulative increase of 17.50% over 2023 freight value. Note, this freight moves on Missouri waterways, but it does not necessarily originate or terminate at a Missouri public port or private river terminal.

Level of Service

The current average age of the seven Mississippi River locks/dams in Missouri is 77 years, or an average of 84 years when the newest lock/dam is excluded. With a design lifespan of 50 years, maintenance and repairs of the locks/dams have the potential to negatively impact barge freight mobility more frequently. When they occur, impacts are primarily in the form of delays in processing barge tows through the locks or the locks not being available at all for a period of time, either of which causes cargo owners to consider a modal shift to rail or truck.

For reference, a barge(s) and accompanying push boat are referred to as a “barge tow” in the industry. When a barge tow arrives at a lock, it is registered to the queue by the lock personnel. The USACE defines “delay” as the time a barge tow spends in the queue awaiting lockage. Based on USACE Lock Performance Monitoring System (LPMS) data, the average delay per barge tow in 2023 at each of the seven Mississippi River lock/dams in Missouri is shown in **Figure 22**.

Figure 22 – Lock Average Delay, 2023



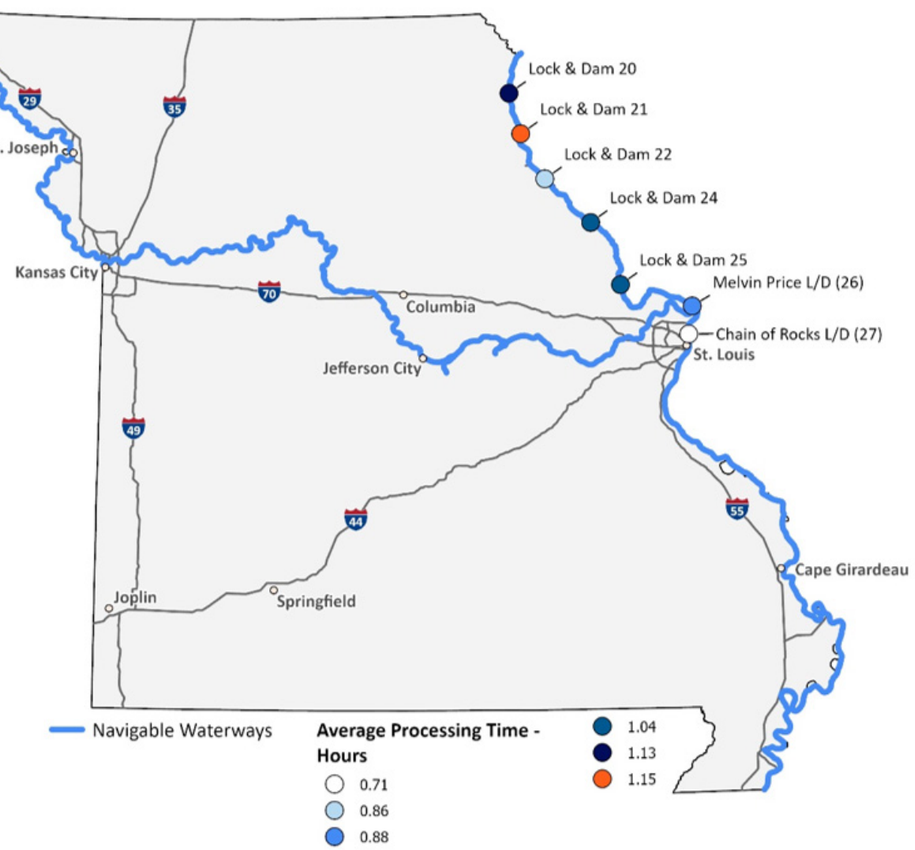
Source: USACE, Lock Performance Monitoring System (LPMS) Dataset, 2023.

As indicated, the average delay per barge tow is generally lower at upstream locks and higher at downstream locks. This is expected, as the downstream locks are effectively the bottlenecks of the system – all barge traffic with an origin upriver of St. Louis and a destination downriver of St. Louis (or vice versa) must pass through Locks and Dam 27, for example. As shown in **Figure 22**, the average delay per barge tow at Lock and Dams 20, 21 and 24 is about one

hour, Lock and Dams 22 and 25 is about two hours and Lock and Dams 26 and 27 is over five hours per barge tow.

Per USACE nomenclature, lock processing time starts when a barge tow reaches the front of the queue and begins the process of “locking through.” Processing time ends when a barge tow completes “locking through” and has completely exited the lock. Based on USACE data, the average processing time per barge tow in 2023 at each of the seven Mississippi River lock/dams in Missouri is shown in **Figure 23.** As indicated, all seven of the Missouri locks had an average processing time of about one hour per barge tow.

Figure 23 – Lock Average Processing Time, 2023



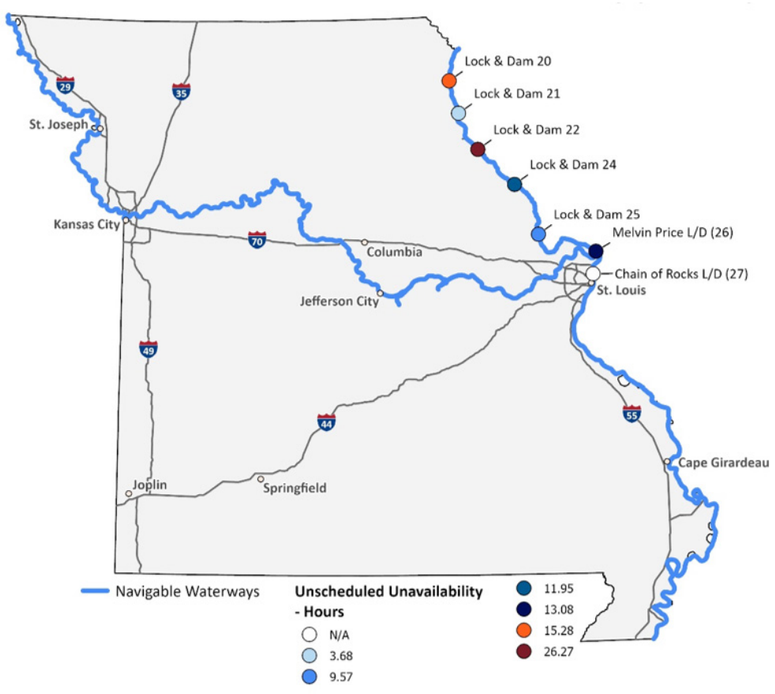
Source: USACE, LPMS Dataset, 2023.

In addition to the preceding lock performance metrics, the USACE also tracks the amount of time each lock is unavailable to process barge tows (i.e., the lock is shut down). Further, the USACE tracks both scheduled and unscheduled lock unavailability time.

Scheduled lock unavailable time generally corresponds to planned maintenance and/or proactive repairs. The USACE minimizes the impact of scheduled lock unavailable time by disseminating notice of planned outages to barge operators in advance, allowing barge operators to plan accordingly.

However, unscheduled lock unavailability can have significant negative impacts on barge operators and freight mobility. Based on USACE data, the average unscheduled unavailable time in 2023 at each of the seven Mississippi River locks/dams in Missouri is shown in **Figure 24**. Note, unscheduled unavailable time in 2023 for Lock and Dam 27 was not available from the USACE data. Unscheduled unavailable time in 2023 for the other six locks ranged from about 4 hours (Lock and Dam 21) to over 26 hours (Lock and Dam 22), with an average of about 13 hours.

Figure 24 – Unscheduled Lock Unavailable Time, 2023



Source: USACE, LPMS Dataset, 2023.

For reference and to add context to the unscheduled unavailability time, USACE Rock Island District locks in Missouri (Lock and Dams 20, 21 and 22) operate 24 hours per day, seven days per week during the navigation season, which is generally early March through early December and St. Louis District locks in Missouri (Lock and Dams 24, 25, 26 and 27) operate 24 hours per day, seven days per week year-round. Thus, considering the potential total operational hours, an average of about 13 hours of unscheduled unavailable time per lock is relatively low.

Extended periods of high or low river levels can have a significant negative impact on waterborne freight levels of service. During periods of high river levels, barge transportation can be impacted by vertical clearance reduction under bridges. More commonly, high river levels can also produce dangerous currents that may result in barge traffic being completely shut down for safety reasons by the USCG. During periods of low river levels, the navigation channel width and/or depth can be reduced. Narrowed channel width often results in narrower barge tows (i.e., fewer barges per tow) and reduced navigation channel depth often results in barges being light-loaded (i.e., loaded at less than full capacity) to reduce barge draft. Both scenarios, especially when barge tows must be both narrowed and light-loaded, result in reduced system efficiency.

Another issue that can have a significant negative impact on waterborne freight levels of service is sedimentation. Particularly during periods of high river levels, sediment can be deposited in the navigation channel and the slackwater harbors in which some of Missouri's ports operate on the Mississippi River. During subsequent periods of low river levels, the built-up sediment effectively decreases the navigation channel and/or slackwater harbor depth needed for normal barge operations.

For reference, a slackwater harbor is a natural or man-made harbor area that is typically perpendicular to a river and provides an operations area generally free from river current. To maintain adequate operational depth, particularly during periods of low river levels, slackwater harbors must be dredged periodically. Maintenance dredging is typically a large expenditure for slackwater harbor ports, but without it, barges cannot be filled to maximum capacity, thus decreasing efficiency and revenue for ports and/or their tenants. In extreme cases, a slackwater harbor can become completely inaccessible without maintenance dredging.

A similar scenario is realized when sediment build-up occurs within a river's navigation channel, resulting in the need for dredging. Again, without dredging sediment that has built up in the navigation channel, it may not be feasible to fill barges to maximum capacity, thus decreasing efficiency and revenue for ports and/or their tenants. In extreme cases, a shallow area within the navigation channel caused by sedimentation could completely shut down that portion of the river to navigation. The portion of the Missouri River that traverses Missouri, as well as the portion of the Mississippi River south of the St. Louis area, relies on river training

structures (dikes, revetments, etc.) to self-scour the navigation channel, maintain depths and minimize the need for dredging. For this reason, maintenance of the river training structures is essential to maintaining adequate navigation channel depth on the Missouri River and the portion of the Mississippi River downriver from the St. Louis area. Maintenance of river training structures and navigation channel depth/dredging is the responsibility of the USACE.

Bottlenecks/Chokepoints

The Mississippi River is free flowing with no locks and dams downriver (south) of St. Louis. Navigation on this portion of the river is generally free of the bottlenecks/ chokepoints described above and typically only impacted negatively by periods of very high or very low river levels caused by flooding or drought, respectively. However, upriver of St. Louis, Mississippi River flow and navigation channel depth is regulated by a series of 29 locks and dams and as stated previously, seven of these locks and dams span the Missouri/Illinois border.

Per the USACE, each of the seven Mississippi River locks/dams in Missouri has one lock chamber that measures 600 feet long by 110 feet wide. Each of the two most downriver locks/dams (26 and 27) has a second lock chamber that measures 1,200 feet long by 110 feet wide, with the smaller lock chamber used as a backup during outages of the larger lock chambers. The engineering design of a second larger lock chamber is currently underway at the most downriver lock/dam that currently has only one smaller lock chamber (25). The locations and lock chamber lengths for the seven locks/dams in Missouri are shown in **Figure 25**. The smaller lock chambers limit the number of barges that can be processed during each lock cycle, forcing large barge tows to be broken apart, thus decreasing the efficiency of the system.

Source: MoDOT

Figure 25 – Lock/Dam Locations and Lock Chamber Lengths

Source: USACE Geospatial Open Data, Locks Dataset, 2025.

According to the USACE, five of the Mississippi River locks/dams in Missouri began operations between 1935 and 1940, one began operations in 1953 and the most recently constructed lock/dam of the seven (26) began operations in 1989. Considering all seven locks/dams in Missouri, as stated previously, the average age is 77 years, or an average of 84 years when the newest lock/dam is excluded. The design lifespan of the locks/dams is 50 years, so all but the newest are well beyond their expected lifespan.

Each of the seven Mississippi River locks/dams in Missouri represent potential bottlenecks. The smaller lock chambers at five of the locks/dams are currently considered bottlenecks and decrease waterway transportation system efficiency, because they limit the number of barges that can pass through the lock at one time. Further, due to the age of this infrastructure, all seven of the Mississippi River locks/dams in Missouri can also become chokepoints when unplanned repairs are required. These situations effectively shut down all navigation through whichever lock/dam requires repairs.

Similar to the portion of the Mississippi River downriver from St. Louis that is free of locks/dams, the portion of the Missouri River in Missouri is free of locks/dams and relies on river training structures (dikes, revetments, etc.) to maintain adequate depth in the navigation channel. For this reason, bottlenecks/chokepoints on the Missouri River in Missouri are typically only created by periods of very high or very low river levels caused by flooding or drought, respectively.

Safety

A review of available USCG data[15] indicates only two incidents occurred on waterways in or adjacent to Missouri in the last two decades (2004 to 2024). Both incidents involved the loss of life of a barge crew member when they fell overboard into the Mississippi River while transiting a lock/dam. One incident occurred in 2022 at Lock/Dam 25 and the other incident occurred in 2023 at Lock/Dam 27. Although these incidents are tragic, the low total number of incidents indicates that barge transportation on the inland waterway system is relatively safe.

Existing Performance Metrics

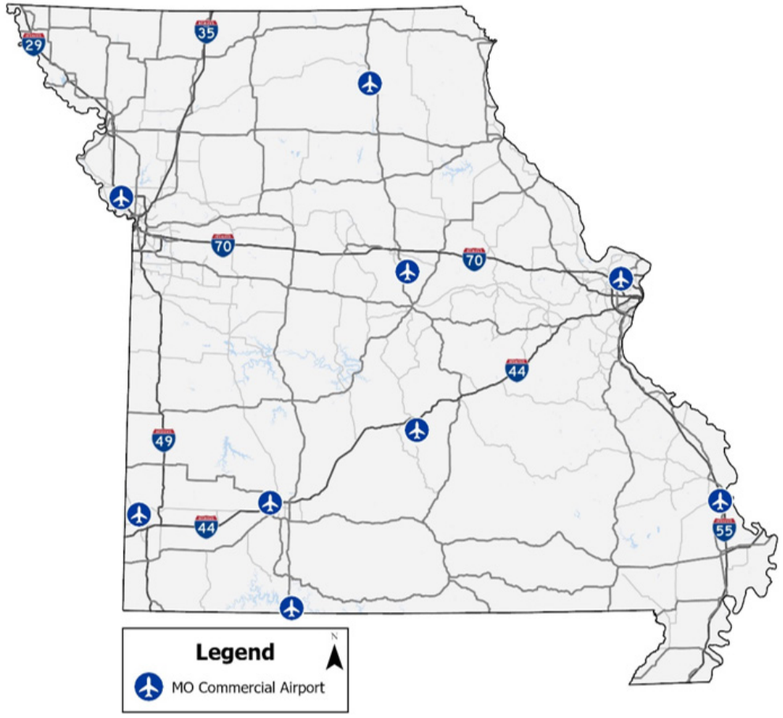
The ports and waterways condition and performance assessment highlights the value of ports and waterways in moving commodities efficiently and linking the state to global trade. The performance metrics described in **4.02 Truck Parking Technical Memorandum** will be used to assess the condition and performance of the waterborne freight system.

Aviation

Missouri's aviation system plays a strategic role in the state's freight network, moving relatively small volumes of cargo by weight but disproportionately high-value goods that support e-commerce, manufacturing and time-sensitive supply chains. Stakeholders emphasized that while aviation offers competitive advantages in speed and value, the sector continues to face infrastructure constraints, funding gaps and workforce shortages that influence overall performance. In assessing condition and performance, this section examines air cargo trends, key bottlenecks and safety considerations. The locations of Missouri's commercial airports are shown in **Figure 26**.

[15] Data from USCG, "Marine Casualty Reports," accessed August 13, 2025, https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Office-of-Investigations-Casualty-Analysis/Marine-Casualty-Reports/.

Figure 26 – Commerical Airports in Missouri



Source: MoDOT, 2025.

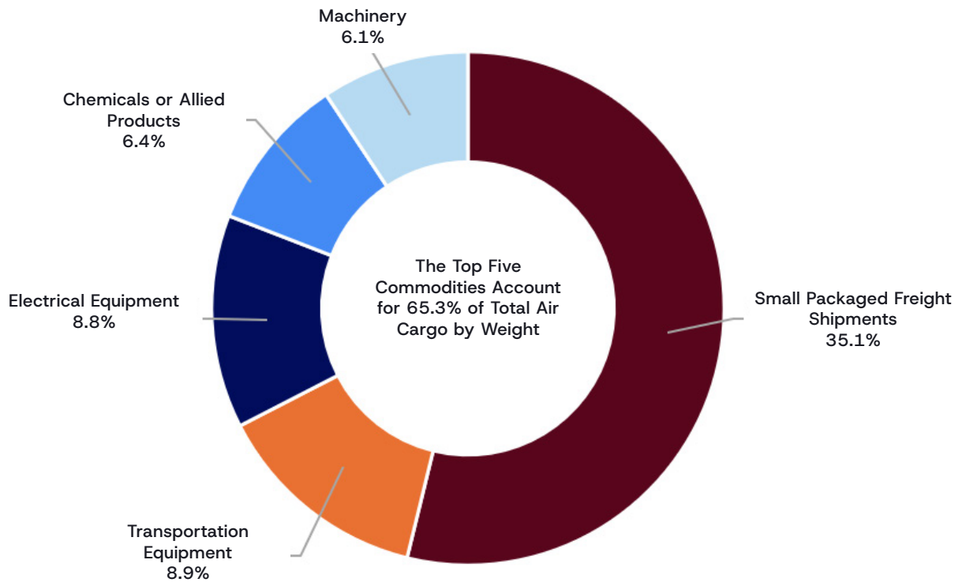
Air Cargo

Missouri has 120 public-use airports, with only three of those handling freight cargo. Missouri's three freight airports are Kansas City International Airport (MCI), St. Louis Lambert International Airport (STL) and Springfield-Branson National Airport (SGF), which combined support the transportation of over 400 million pounds of freight each year. STL, the region's primary cargo airport, moved 160 million pounds of cargo in 2023 for dedicated freight carriers such as UPS, FedEx, Amazon, DHL and more, as well as belly cargo moved on passenger airlines. In the same year, SGF moved 31.2 million pounds for dedicated daily freight carriers such as FedEx and UPS, whereas MCI moved 233.5 million pounds of total freight. MCI's primary cargo carriers also include FedEx, Amazon, UPS and DHL.

While the overall volume of freight moved by air in Missouri is relatively modest compared to other modes, it represents a disproportionately high value per ton. Understanding the types of goods that move by air provides additional insight into aviation's role in the multimodal system.

Figure 27 highlights the top five commodities carried by air, illustrating the concentration on high-value, time-sensitive products that depend on fast and reliable delivery.

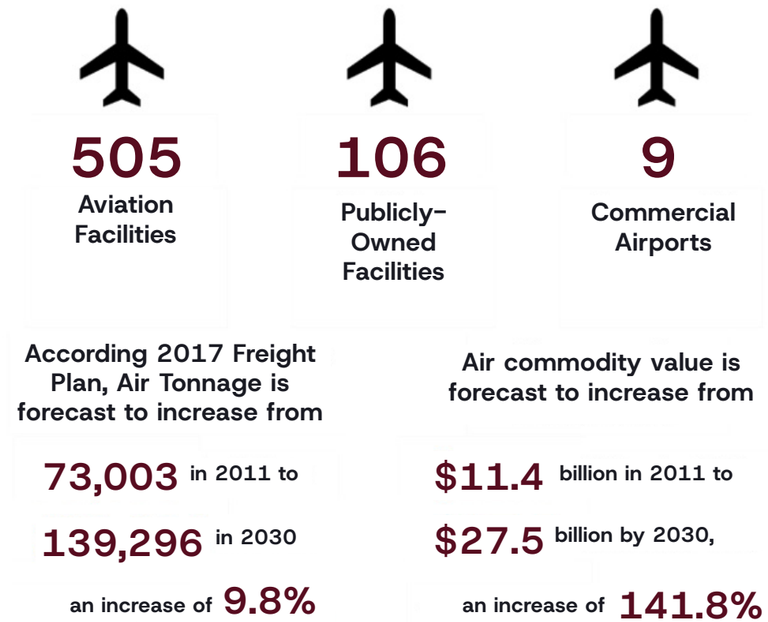
Figure 27 – Top Five Commodities by Weight (Percent) for Air Cargo, 2023



Source: GFT Analysis of Transearch Data, 2023.

As shown in **Figure 28**, according Transearch data, air tonnage is forecast to increase from 207,031 in 2023 to 280,244 in 2043, an increase of 35.40%. Moreover, air commodity value is forecast to increase from $7.20 billion in 2023 to $9.40 billion by 2043, an increase of 30.50%.

Figure 28 – Existing Facilities and Air Tonnage (2023) and Value Forecasts (2043)



Source: GFT Analysis of Transearch Data, 2023.

In 2023, SGF was ranked as the 123rd busiest airport in the U.S., STL ranked as 34th and MCI was ranked as 40th. On average, the Aviation program totals $30-35 million per year. For fiscal year (FY) 2025, MoDOT received appropriations of $98.10 million in federal funds and $38.40 million in state funds to support rehabilitation and capital projects and improvements mostly focused on the general use airports, with the three cargo airports receiving funds directly from Federal Aviation Administration (FAA).

Air Cargo Bottlenecks

Although not considered bottlenecks in a traditional sense, Missouri's air cargo sector faces several infrastructure and funding-related bottlenecks that constrain growth. The most pressing challenges include aging cargo ramps in need of major reconstruction, cargo apron areas that are already nearing capacity and access limitations to connecting rail and truck facilities. While recent investments have supported improvements at some facilities, stakeholders emphasized that funding programs, such as FAA/Air Improvement Program (AIP), often prioritize passenger-related infrastructure over cargo needs, leaving gaps in support for freight-focused projects. These constraints highlight the need for additional investment in air cargo infrastructure to meet the growing demands of e-commerce, express delivery and belly cargo operations.

Safety

There have not been any crashes in Missouri associated with major passenger or air cargo carriers. Aviation safety measures, such as crash rates or statistics, are challenging to quantify. For example, many of the aircraft that fly over the state and have an emergency or incident are not based in Missouri. Additionally, an aircraft incident over Missouri does not necessarily reflect any infrastructure or service issues in the state.

Existing Performance Metrics

The aviation condition assessment highlights the statewide importance of airports in supporting passenger travel and freight movement. The performance metrics described in **4.02 Truck Parking Technical Memorandum** will be used to assess the condition and performance of the air freight system.