IOWADOT

STATE FREIGHT PLAN

AUGUST 2022

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LAST AMENDED JANUARY 2023

IOWA DOT

CONTENTS

Acknowledgments

The Iowa State Freight Plan was developed by the Iowa Department of Transportation (Iowa DOT) in coordination with the Iowa Transportation Commission, Iowa Freight Advisory Council, and other public and private freight stakeholders in the state. Leadership and clear direction are necessary for making strategic decisions and investments that will better support the economic competitiveness of the state and nation. The Iowa DOT recognizes this necessity and the need to further integrate freight considerations into the statewide transportation planning and programming processes.

The primary purpose of the Iowa State Freight Plan is to document the immediate and long-range freight planning activities and investments in the state. More specifically, it will provide guidance on how to address issues, adapt to emerging trends, and invest strategically in the freight system to grow a stronger economy, strengthen the nation's competitive advantage, and enhance the quality of life for Iowans.

The Iowa State Freight Plan also serves as a platform for connecting Iowa's freight-related initiatives and a tool for supporting informed decision-making aimed at addressing the ongoing challenges of today's freight system and supply chains. This plan will:

- Address each of the five modes of the freight transportation system – aviation, highway, pipeline, railroad, and waterway;
- Support the implementation of the state long-range transportation plan, Iowa in Motion;
- Align with national freight goals; and
- Meet requirements of the federal Infrastructure Investment and Jobs Act (IIJA).

On behalf of the Iowa DOT and Iowa Freight Advisory Council, we extend our gratitude and appreciation to all who contributed to the development of the Iowa State Freight Plan and its future implementation.

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Acronyms

CID	Eastern Iowa Airport
COFC	Container-on-Flatcar
CRFC	Critical Rural Freight Corridor
C-STEP	County-State Traffic Engineering Program
CUFC	Critical Urban Freight Corridor
DDG	Dried Distillers Grains
DOD	Department of Defense
DOT	Department of Transportation
DSM	Des Moines International Airport
ELD	Electronic Logging Device
FAC	Freight Advisory Council
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation Act
FFY	Federal Fiscal Year
GDP	Gross Domestic Product
HND	Highways for National Defense
HOS	Hours of Service
ICAAP	Iowa Clean Air Attainment Program
ICE	Infrastructure Condition Evaluation
IIJA	Infrastructure Investment and Jobs Act
IMFN	Iowa Multimodal Freight Network
ISRP	Iowa State Rail Plan
iTRAM	Iowa Travel Demand Model
ITS	Intelligent Transportation Systems
LIFTS	Linking Iowa's Freight Transportation System
MAASTO	Mid America Association of State Transportation Officials
MAFC	Mid-America Freight Coalition
MRPEIWI	Mississippi River Ports of Eastern Iowa and Western Illinois
NFSP	National Freight Strategic Plan
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NMFN	National Multimodal Freight Network
OSOW	Oversize/Overweight
PCI	Pavement Condition Index
PHFS	Primary Highway Freight System
PTC	Positive Train Control
RAC	Rail Advisory Committee
RISE	Revitalize Iowa's Sound Economy
RND	Railroads for National Defense
RRLG	Railroad Revolving Loan and Grant Program
RUTF	Road Use Tax Fund
STRACNET	Strategic Rail Corridor Network
STRAHNET	Strategic Highway Network
TEAP	Traffic Engineering Assistance Program
TOFC	Trailer-on-Flatcar
TPIMS	Truck Parking Information Management System
UMRBA	Upper Mississippi River Basin Association
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USMCA	United States-Mexico-Canada Agreement
U-STEP	Urban-State Traffic Engineering Program
VCAP	Value, Condition, and Performance
VHT	Vehicle-Hours Traveled

Compliance with Infrastructure Investment and Jobs Act and Section 70202 of title 49, United States Code

An identification of significant freight system trends, needs, and issues with respect to the state.	Chapter 3, Industries and commodities Chapter 4, Planning considerations
A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state.	Chapter 5, Action plan
When applicable, a listing of - (A) multimodal critical rural freight facilities and corridors designated within the state under section 70103 of title 49 (National Multimodal Freight Network); and (B) CRFCs and CUFCs designated within the state under 23 U.S.C. 167 (National Highway Freight Program).	Chapter 2, System inventory and performance
A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals described in 49 U.S.C. 70101(b) and the national highway freight program goals described in 23 U.S.C. 167.	Chapter 1, Introduction Chapter 5, Action plan
A description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of the freight movement, were considered.	Chapter 4, Planning considerations Chapter 5, Action plan
In the case of roadways on which travel by heavy vehicles, including mining, agricultural, energy cargo or equipment, and timber vehicles, is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration.	Chapter 2, System inventory and performance Chapter 5, Action plan
An inventory of facilities with freight mobility issues, such as bottlenecks, within the state, and for those facilities that are state owned or operated, a description of the strategies the state is employing to address those freight mobility issues.	Chapter 2, System inventory and performance Chapter 5, Action plan
Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.	Chapter 2, System inventory and performance Chapter 5, Action plan
A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched.	Chapter 5, Action plan

The most recent commercial motor vehicle parking facilities assessment conducted by the State under subsection (f).	Chapter 5, Action plan
The most recent supply chain cargo flows in the State, expressed by mode of transportation.	Chapter 3, Industries and commodities
An inventory of commercial ports in the State.	Chapter 2, System inventory and performance Appendix 1, Freight-generating facilities
If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party under section 70104.	Chapter 5, Action plan
The impacts of e-commerce on freight infrastructure in the State.	Chapter 4, Planning considerations
Considerations of military freight.	Chapter 2, System inventory and performance
Strategies and goals to decrease - (A) the severity of impacts of extreme weather and natural disasters on freight mobility, (B) the impacts of freight movement on local air pollution, (C) the impacts of freight movement on flooding and stormwater runoff, and (D) the impacts of freight movement on wildlife habitat loss.	Chapter 1, Introduction Chapter 5, Action plan
Consultation with the State Freight Advisory Committee, if applicable.	Chapter 5, Action plan

1. INTRODUCTION

1.1 Plan purpose | 1.2 Impact on the economy | 1.3 Federal transportation bills and national freight goals

Importance of Freight Planning

The United States currently enjoys an unrivaled comparative and competitive advantage over the rest of the world due to its production capacity and ability to transport at low costs.

Thanks to an abundance of natural resources and arable land, the U.S. can produce vast amounts of agricultural commodities, energy products, minerals, and raw materials. The U.S. also has a world-class freight transportation system with multiple transportation modes, lower costs, and greater reliability that provides American businesses the ability to move products and materials much more efficiently than elsewhere in the world.

Unfortunately, the competitive advantage is shrinking due to deteriorating infrastructure, increased congestion, and shifting supply chains. The transport of goods and services is the backbone of the economy and investments in basic transportation infrastructure strengthen economic vitality. A safe, efficient, and convenient freight transportation system is a necessity not only for Iowa, but the entire nation.

1.1 Plan purpose

Leadership and clear direction are necessary for making strategic decisions and investments that will better support the economic competitiveness of the state and nation. The Iowa Department of Transportation (Iowa DOT) recognizes this necessity and the need to further integrate freight considerations into the statewide transportation planning and programming process.

The primary purpose of the Iowa State Freight Plan (State Freight Plan) is to document the immediate and long-range freight planning activities and investments in the state. More specifically, it will provide guidance on how to address issues, adapt to emerging trends, and invest strategically in the freight system to grow a stronger economy, strengthen the nation's competitive advantage, and enhance the quality of life for Iowans.

The State Freight Plan serves as a platform for connecting Iowa's freight-related initiatives and a tool for supporting informed decision-making aimed at addressing the ongoing challenges of today's freight system and supply chains. This plan will:

- Address each of the five modes of the freight transportation system – aviation, highway, pipeline, railroad, and waterway;
- Support the implementation of the state transportation plan, Iowa in Motion;
- Align with the national freight goals; and
- Meet the requirements of the Infrastructure Investment and Jobs Act (IIJA).

How the plan is used – the state's role

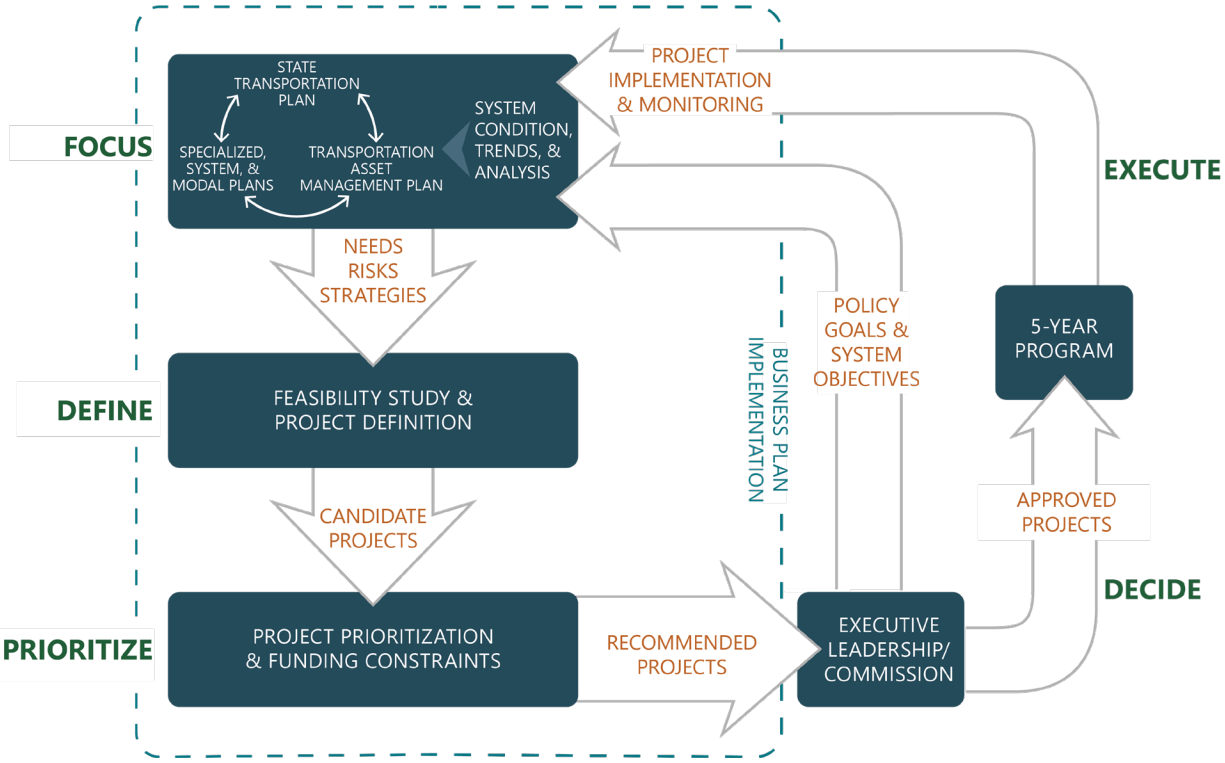
The State of Iowa has an important role in supporting and overseeing Iowa's freight system and it is the responsibility of the Iowa DOT to support the safe, efficient, and convenient movement of goods by:

- Working collaboratively with industry to improve infrastructure and supply chain efficiency and resiliency through groups such as the Iowa Freight Advisory Council;
- Developing, maintaining, and utilizing data and tools to analyze the freight system and identify bottlenecks that inhibit supply chain efficiency or raise costs to shippers and consumers;
- Assisting local planning entities with further incorporating freight considerations into their planning and programming processes; and
- Providing targeted funding and financial assistance to support freight projects that provide benefits to the economy.

In recent years, the Iowa DOT has embarked on numerous freight planning activities to help improve freight movement. The State Freight Plan is a way to connect each of these initiatives and allow them to move forward toward a common goal of optimal freight transportation in the state.

Each of Iowa's freight-related initiatives plays a role in a collaborative planning and programming process. Figure 1.1 illustrates in more detail how the State Freight Plan relates to the variety of additional plans and tools the department utilizes to ultimately inform the development of the Five-Year Program. These include the state transportation plan, more specialized plans (e.g., State Freight Plan and Transportation Asset Management Plan), system evaluation tools (e.g., Infrastructure Condition Evaluation tool), and project-level evaluation tools (e.g., Project Prioritization).

Figure 1.1: Relationship between elements of the planning and programming process



Source: Iowa DOT

The State Freight Plan is used to assist the department in making informed transportation decisions and investments by:

- Inventorying Iowa's freight transportation assets, the conditions of these assets, and the freight-dependent industries and supply chains the assets support;
- Identifying the locations of multimodal bottlenecks to be addressed;
- Documenting demographic, economic, and freight trends and what these mean for Iowa in the future; and
- Developing strategies and improvements to be implemented in order to maintain and improve the freight transportation system.

This document is also developed to support the state transportation plan. More specifically, the goals, implementation strategies, improvements, and performance measures in the State Freight Plan will align with the four Iowa DOT system objectives (Figure 1.2) documented in the state transportation plan.

Figure 1.2: Iowa DOT system objectives

Source: Iowa DOT

1.2 Impact on the economy

Efficient and reliable transportation options power the creation of wealth in the state and nation, unleashing the opportunity for economic activity. The state's economy is dependent on a robust and diverse transportation system to move products to a global marketplace. This system has long been a competitive advantage for businesses in Iowa and remains so today as the state continues to be a major player in the global economy.

The performance of the freight transportation system affects economic productivity in several ways. Changes in the cost and the quality of freight movement affect both the amount of freight transport that firms buy and the ways in which they use it. At the most basic level, a drop in the cost of goods movement means more will be sold. This will most likely take the form of an expanded area for obtaining inputs, materials, and intermediate products, as well as for shipping final products. Lower cost transport increases the market that can be served from a given facility. Figure 1.3 traces the links from an improvement in freight transport to a higher standard of living.

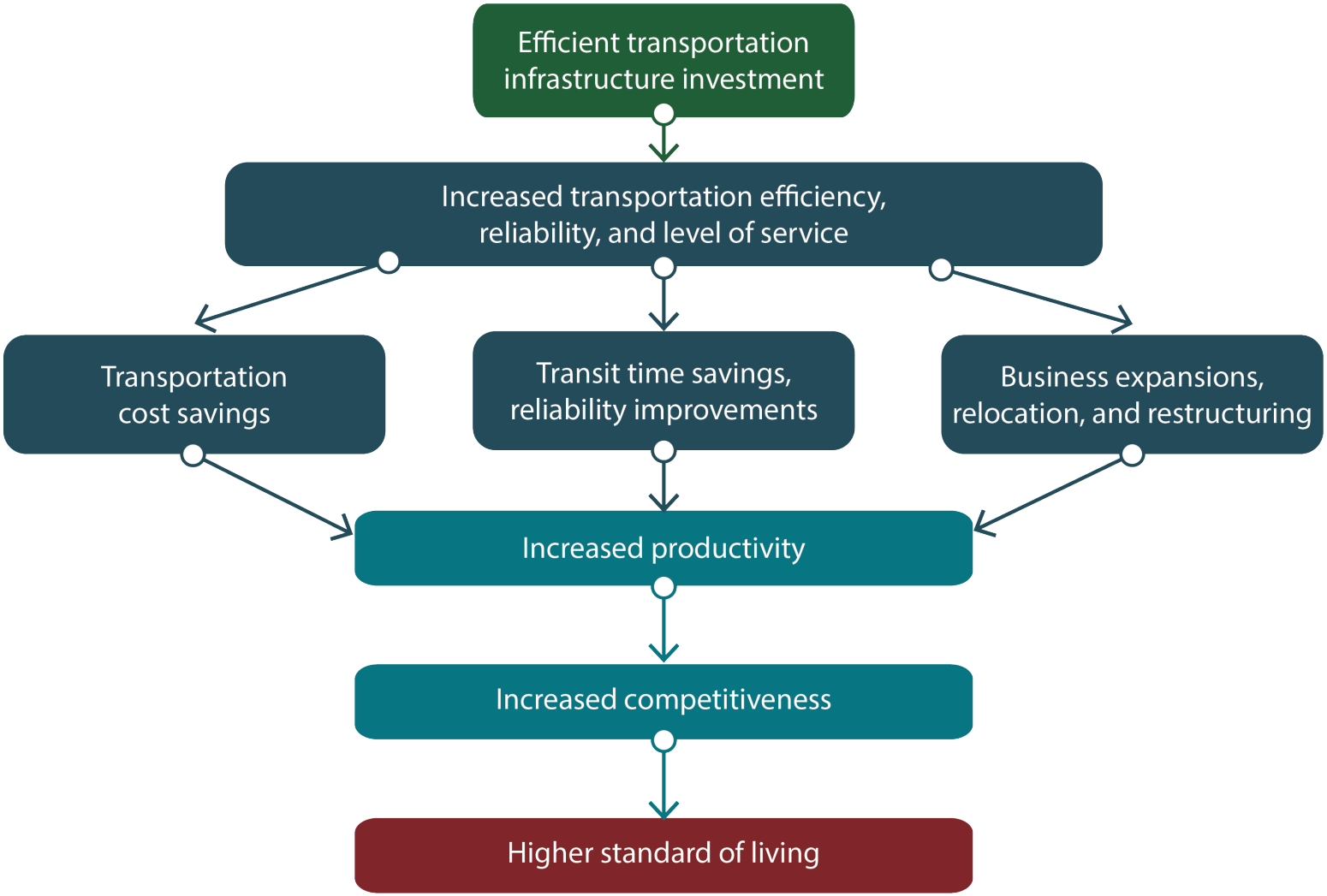
Improvements in the quality of transportation (i.e., efficiency and reliability) result in reduced transit times and greater reliability of delivery times. Both of these, especially the latter, impact the way in which firms design their logistics systems. These improvements also open the door for transportation cost savings, as well as potential business expansions and restructuring. Lower transit times increase the "reach" of facilities such as factories and distribution centers; if these facilities can be more widely spaced, a given market area can be served with fewer facilities. Since fewer facilities for a given flow of goods means more volume per facility, investment costs and operating costs may be reduced.

Thus, when firms consider their logistics arrangements and the design of their distribution systems, they will take into account improved freight transport to develop lower-cost systems. The result can be more productivity, increased competitiveness with other businesses, and in turn, a higher standard of living for the area as more capital is invested in the region.

> By continuing to maintain and invest in the freight transportation system, public and private transportation providers can increase competitiveness for Iowa businesses, strengthen the economy, and raise the quality of life for Iowa citizens.

Iowa's freight transportation system boasts a central geographic location and an abundance of transportation options. As a producer-state, meaning one that transports more goods out-of-state than it receives into the state, and a relatively rural state, this transportation flexibility provides shippers and businesses a strong comparative advantage. This fosters the ability to efficiently and competitively serve domestic and global markets via single or multiple modes of transportation. Iowa's network of interstates, rail infrastructure, pipelines, airports, and barge routes combine to provide cost-competitive transportation choices to serve and access markets outside the state. In addition, Iowa is consistently named as one of the lowest cost domestic locations for manufacturing in the country. Combining manufacturing output with the massive volume of agricultural products creates a surprisingly large demand for cost-competitive multimodal and intermodal systems.

Figure 1.3: Transportation and the economy



Source: ICF Consulting, 2010 and Beyond: A Vision of America's Transportation Future

1.3 Federal transportation bills and national freight goals

Fixing America's Surface Transportation (FAST) Act

The FAST Act was signed on December 4, 2015. With this reauthorization, states that receive funds under 23 U.S.C. 167 National Highway Freight Program (NHFP) were required to develop state freight plans that show a comprehensive plan for immediate and long-range planning activities and investments of the state with respect to freight.

In addition, the FAST Act created a National Multimodal Freight Network (NMFN) with the intent of strengthening the contribution of this network to the economic competitiveness of the country. It also required the development of a National Freight Strategic Plan (NFSP) and encouraged states to create and utilize state freight advisory committees.

Effective two years after the date of enactment of the FAST Act, a state was not able to obligate NHFP funds unless the state had developed a freight plan in accordance with 49 U.S.C. 70202 of the FAST Act.

IIJA

IIJA was signed on November 15, 2021 and built on the freight initiatives of the FAST Act, including the extension of NHFP funding and the identification of additional requirements for state freight plans.

These plans must be updated every four years and meet 17 requirements outlined in IIJA for approval. The table on pages 6-7 identifies the plan section(s) where each requirement is addressed.

NHFP – Creates a formula program where each state receives funds (in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs) to be spent on freight projects on the National Highway Freight Network (NHFN), with some flexibility to include intermodal projects.

NMFN – A network of airports, highways, railroads, and waterways identified as critical freight corridors that should be targeted for investment with the intent of strengthening the contribution of this network to the economic competitiveness of the country. See Chapter 2, System inventory and performance.

NHFN – The highway portion of the NMFN which consists of the Primary Highway Freight System (PHFS), Critical Rural Freight Corridors (CRFCs), Critical Urban Freight Corridors (CUFCs), and the remainder of the Interstate Highway System not already designated as part of the PHFS. See Chapter 2, System inventory and performance.

NFSP – Defines the U.S. Department of Transportation's vision and goals for the national multimodal freight system, assesses the condition and performance of the freight system and barriers to freight system performance, and defines strategies to achieve its vision and goals.

National freight goals

IIJA requires a state freight plan to include a description of how the plan will improve the ability of the state to meet the National Multimodal Freight Policy goals described in 49 U.S.C. 70101(b) and the NHFP goals described in 23 U.S.C. 167. These were summarized in a single list to be addressed throughout the State Freight Plan (see Table 1.1).

Table 1.1: National freight goals

To identify and invest in infrastructure improvements, policies, and operational innovations
To improve the safety, security, efficiency, and resiliency of multimodal freight transportation
To achieve, maintain, and improve the state of good repair on the NMFN
To use innovation and advanced technology to improve the safety, efficiency, and reliability of the NMFN
To improve the economic efficiency and productivity of the NMFN
To improve the reliability of freight transportation
To improve the short- and long-distance movement of goods
To improve the flexibility of states to support multi-state corridor planning and the creation of multi-State organizations to increase the ability of states to address multimodal freight connectivity
To reduce the adverse environmental impacts of freight movement on the NMFN
To pursue the goals described in this subsection in a manner that is not burdensome to state and local governments

Source: U.S. Department of Transportation

The NFSP, released in September 2020, also identified a vision and goals for the Nation's multimodal freight system and defined objectives to achieve those goals (see Table 1.2). The State Freight Plan will address each of these three sets of goals, and Table 1.3 shows alignment between the NFSP goals and the Iowa DOT system objectives (see Figure 1.2).

In addition to aligning with the national freight goals, Iowa DOT will consider the potential regulatory impact of all initiatives and how these could act as hindrances to freight movement.

Table 1.2: National Freight Strategic Plan goals and objectives

Goal	Strategic objective
Safety *Improve the safety, security, and resilience of the national freight system.*	• Support the development and adoption of automation, connectivity, and other freight safety technologies
	• Modernize safety oversight and security procedures
	• Minimize the effects of fatigue and human error on freight safety
	• Reduce conflicts between passenger and freight traffic
	• Protect the freight system from natural and human-caused disasters and improve recovery speed
Infrastructure *Modernize freight infrastructure and operations to grow the economy, increase competitiveness, and improve quality of life.*	• Fund targeted investments in freight capacity
	• Improve consideration of freight in transportation planning
	• Prioritize projects that improve freight intermodal connectivity, and enhance freight flows on first- and last-mile connectors and at major trade gateways
	• Advance freight system management and operation practices
	• Improve job growth and economic competitiveness in rural and urban communities
	• Mitigate the impacts of freight movement on communities
Innovation *Prepare for the future by supporting the development of data, technologies, and workforce capabilities that improve freight system performance.*	• Support the development and adoption of automation and vehicle-to-everything technology
	• Support the safe deployment of unmanned aircraft system technology
	• Streamline regulations to improve governance, efficiency, and economic competitiveness
	• Improve freight data, modeling, and analysis tools and resources
	• Strengthen workforce professional capacity
	• Invest in freight research
	• Support regulatory frameworks that foster freight innovation

Source: U.S. Department of Transportation

Table 1.3: Comparison of National Freight Strategic Plan objectives and Iowa DOT system objectives

Safety Improve safety, security & resilience	**Iowa DOT System Objectives**			
	Safety	**Sustainability**	**Accessibility**	**Flow**
Technologies	■			■
Oversight & security procedures	■	■		
Fatigue & human error	■			
Passenger & freight traffic conflicts	■		■	■
Resiliency	■		■	■

Infrastructure Modernize infrastructure & operations	**Iowa DOT System Objectives**			
	Safety	**Sustainability**	**Accessibility**	**Flow**
Freight capacity investments	■		■	■
Transportation planning		■	■	
Connectivity & enhancement projects			■	■
System management & operations	■	■	■	■
Economic competitiveness		■		
Community impact mitigation	■	■		

Innovation Develop data, technologies & workforce	**Iowa DOT System Objectives**			
	Safety	**Sustainability**	**Accessibility**	**Flow**
Automation	■			■
Unmanned aircraft system technology	■	■	■	■
Streamlined regulations		■		■
Data, modeling & analysis tools		■	■	■
Workforce capacity	■	■		
Research investment	■	■	■	■
Regulatory frameworks				■

Source: U.S. Department of Transportation and Iowa DOT

2. SYSTEM INVENTORY & PERFORMANCE

2.1 Mode comparison | 2.2 Freight networks | 2.3 Inventory and performance by mode

Figure 2.1: Iowa freight transportation system

8 commercial airports

106 other service airports

9,621-mile Primary Highway System

115,509 total miles of roadways

46,664 miles of pipelines

Multiple pipeline operators

17 railroad companies operating in the state

3,804 miles of rail lines

63 barge terminals

491 miles of navigable waterways

Freight shippers have the convenience of multiple modal options for moving goods and material in the state of Iowa. The 160,000-mile multimodal freight transportation system is comprised of multiple air cargo facilities, a well-developed highway system, a large web of pipelines, an extensive rail network, two bordering navigable waterways, and hundreds of freight-related facilities to assist in the movement of freight.

The most critical freight infrastructure in Iowa is designated as part of multiple freight networks. However, there are additional components of the air, highway, pipeline, railroad, and waterway networks that complement these designated freight networks, acting as first-mile/last-mile connections.

The following section will provide an inventory of the infrastructure and facilities that make up this freight system and how they interact to increase the efficiency of goods movement through the state, region, nation, and world. Numerous metrics will be reviewed to summarize the performance of each. Note that an inventory of pipelines in Iowa is included, but due to the nature of the mode and availability of information, pipelines are not compared to other modes and there is limited reporting on performance.

2.1 Mode comparison

Transportation costs play a large role in the decisions of Iowa shippers. Having various transportation options allows for cost savings and opportunities to optimize supply chains as each mode has different characteristics that may make the efficient transport of certain commodities ideal for one mode but not another.

Aviation handles the most time-sensitive and lowest weight cargo and has the highest shipping costs.

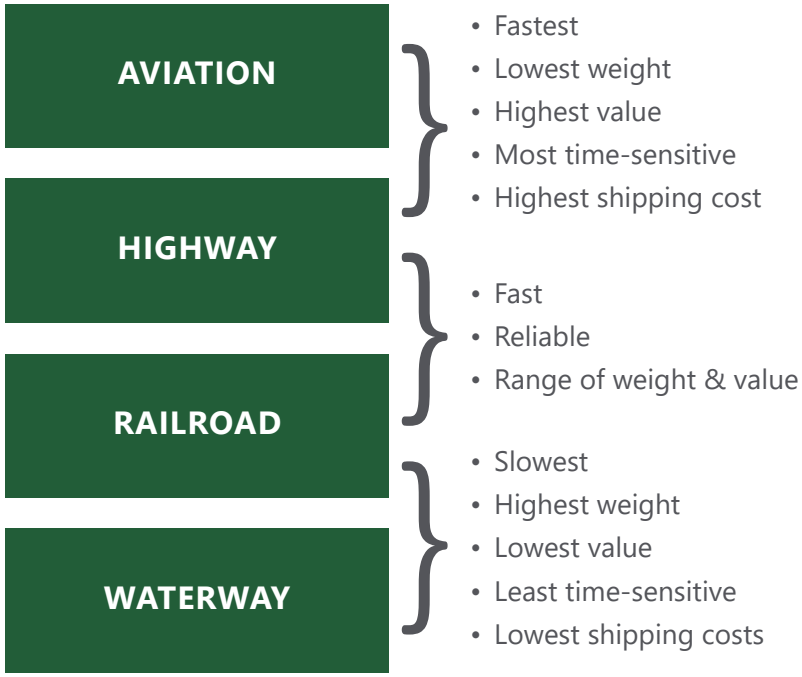
Most freight in Iowa is carried on the **Highway** system. Although trucking movements are typically more expensive than rail or water transport, it is the most flexible. Trucks generally move small amounts of a few hundred pounds all the way up to 50,000 pounds per shipment. Truckload service providers move products using equipment such as dry van, flatbed, hopper, tank, and refrigerated trailers.

Railroad movements are generally less expensive than trucking and more fuel-efficient but are more restricted by the privately-owned networks the trains move on. This mode is well suited for moving large volumes of freight between two shipping points and, like trucks, uses dry car, flatbed, hopper, and refrigerated equipment.

Transporting commodities via **Waterway** is the slowest and least flexible of the freight modes. However, it is the most fuel-efficient, cheapest, and can handle the largest volumes per trip. One barge can handle as much as 70 trucks or more than 16 rail cars.

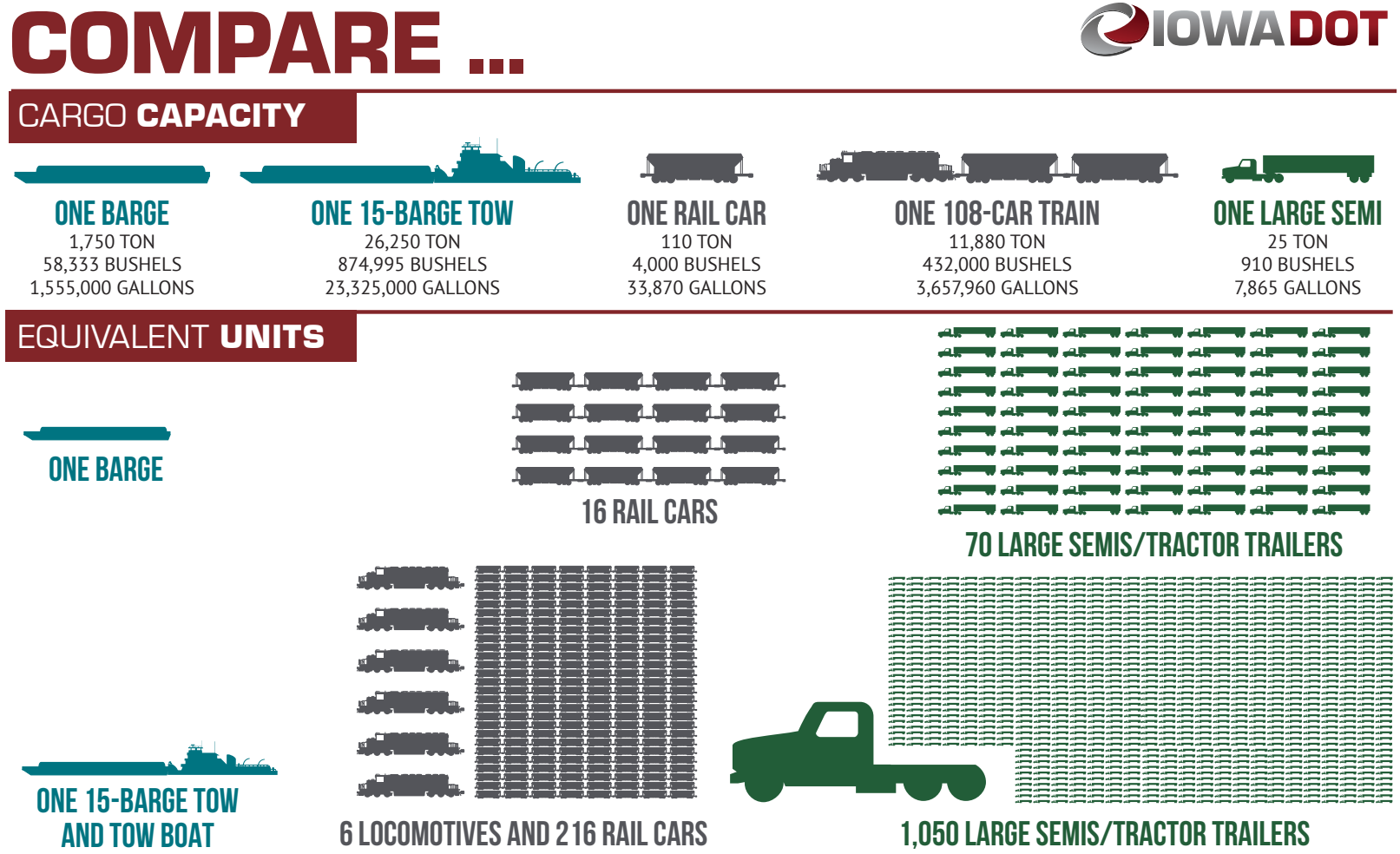
Figure 2.2 and Figure 2.3 compare the different freight modes by price and tonnage capacity, showing which modes can handle certain types of commodities most efficiently.

Figure 2.2: Freight price comparisons



Source: Iowa DOT

Figure 2.3: Freight tonnage comparisons



Source: Iowa DOT

Purpose of Designating Freight Networks

The most critical freight infrastructure in Iowa is designated as part of two freight networks - the National Multimodal Freight Network (NMFN), designated at the federal level, and the Iowa Multimodal Freight Network (IMFN), designated at the state level.

The NMFN consists primarily of infrastructure of national and international significance and the IMFN consists of infrastructure critical to state and regional commerce.

Strategic military networks, specifically the Strategic Highway Network (STRAHNET) and Strategic Rail Corridor Network (STRACNET), are also designated to prioritize infrastructure and connectivity needs for national defense.

These different freight networks are used to:

- Inform freight transportation planning,
- Develop department policies for these corridors related to design and use,
- Recognize corridors to protect and enhance for improved freight movement, and
- Assist with strategically directing resources and investments to improve performance.

2.2 Freight networks

IMFN

Iowa DOT designated the IMFN to compliment the NMFN by also identifying infrastructure critical to the state and region, including airports, highways, railroads, and inland waterways.

Table 2.1: Iowa Multimodal Freight Network criteria and designations

Mode	Designation requirement(s)	Iowa designations
Aviation	Top cargo airports	• Des Moines International Airport • Eastern Iowa Airport
Highway	30% truck traffic, 1,000 annual average daily truck traffic, or 1,000 oversize/ overweight permitted loads annually	• 4,027 miles of Interstate, U.S., and Iowa routes
Railroad	5 million tons per mile or direct connection to intermodal container facility	• Roughly 2,400 miles of Class I and II rail lines
Waterway	Marine highways	• M-29 Marine Highway (Missouri River) • M-35 Marine Highway (Mississippi River)

Source: Iowa DOT

Figure 2.4: Iowa Multimodal Freight Network

Source: Iowa DOT

The National Highway Freight Network (NHFN) is the highway portion of the NMFN and the system eligible for National Highway Freight Program (NHFP) funds distributed to the states annually. The NHFN includes the following four subsystems of roadways.

Primary Highway Freight System (PHFS)

A network of highways designated at the federal level and identified as the most critical highway portions of the U.S. freight transportation system.

Other Interstates Not On PHFS

These highways consist of the remaining portion of Interstate roads not included in the PHFS. These routes provide important continuity and access to freight transportation facilities.

Critical Rural Freight Corridors (CRFC)

Public roads not in an urbanized area that provide access and connection to the PHFS and the Interstate from other important ports, public transportation facilities, or other intermodal freight facilities.

Critical Urban Freight Corridors (CUFC)

Public roads in urbanized areas that provide access and connection to the PHFS and the Interstate from other ports, public transportation facilities, or other intermodal freight facilities.

NMFN

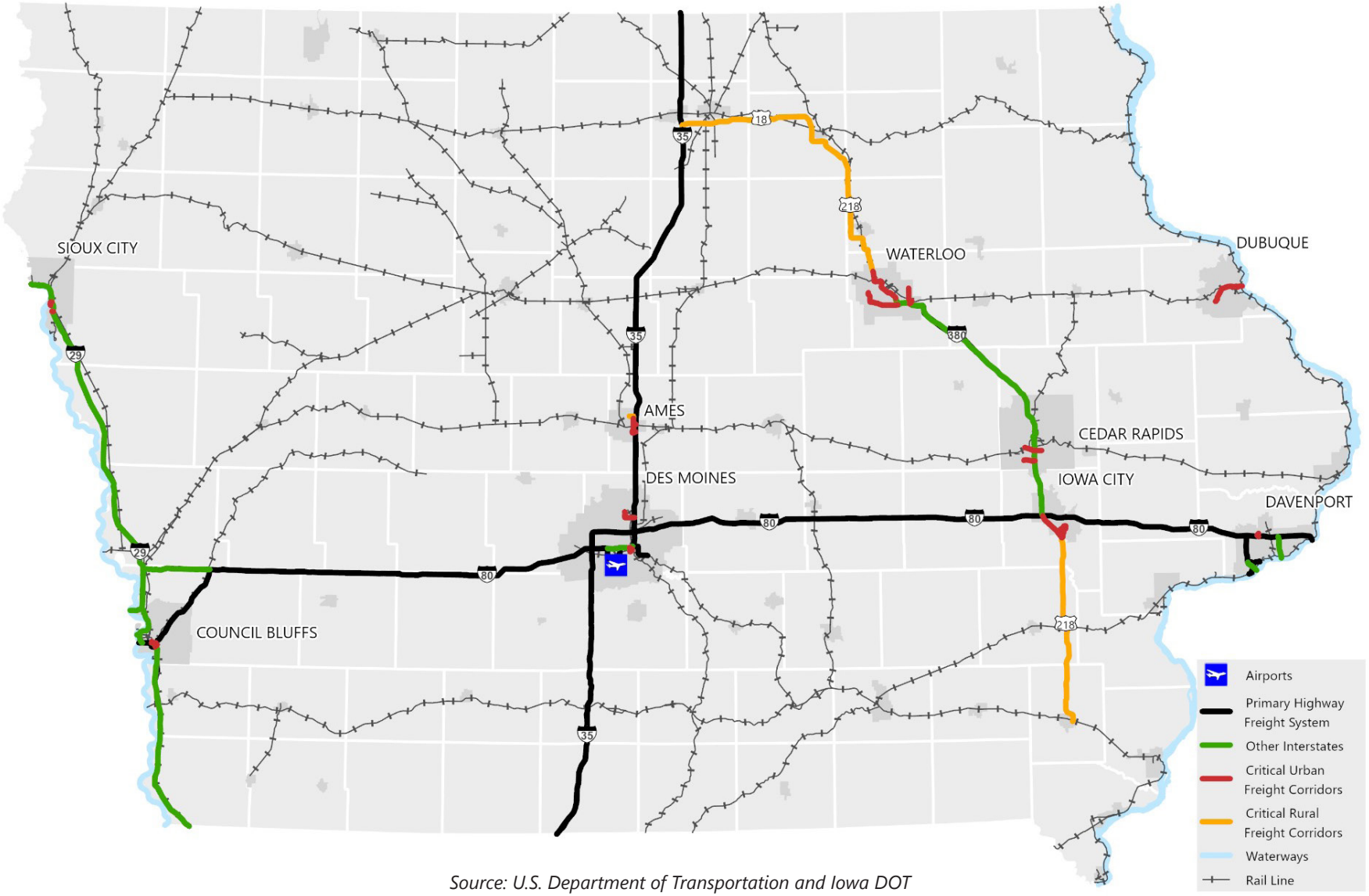
The Fixing America's Surface Transportation (FAST) Act formed the NMFN with the intent of strengthening the contribution of this network to the economic competitiveness of the country. It includes air, highway, railroad, and waterway infrastructure critical to freight movement.

Table. 2.2: National Multimodal Freight Network criteria and designations

Mode	Designation requirement(s)	Iowa designations
Aviation	Top 50 cargo airports	• Des Moines International Airport
Highway	National Highway Freight Network	• 1,005 miles of the Primary Highway Freight System • Critical Rural and Critical Urban Freight Corridors and other Interstates
Railroad	Class I railroads and other strategic Class II and III railroads	• 3,324 miles of Class I rail lines
Waterway	Major coastal ports, inland and intercoastal waterways, Great Lakes, St. Lawrence Seaway, and coastal and ocean routes	• M-29 Marine Highway (Missouri River) • M-35 Marine Highway (Mississippi River)

Source: U.S. Department of Transportation and Iowa DOT

Figure 2.5: National Multimodal Freight Network



Source: U.S. Department of Transportation and Iowa DOT

Table 2.3: Primary Highway Freight System in Iowa

Route	Start Point	End Point	Miles
I-29	I-80	I-80	2.9
I-35	Missouri/Iowa Line	Iowa/Minnesota Line	218.6
I-80	Nebraska/Iowa Line	I-29	0.9
I-80	I-29	I-35	119.4
I-80	I-35	Iowa/Illinois Line	169.0
I-235	I-35	Iowa 28	3.8
I-235	Iowa 163	I-80	3.7
I-280	US 61	I-81	6.5
U.S. 61	IA4R (local)	I-280	1.6
Iowa 28	IA7A (local)	I-235	2.6
Iowa 163	IA9L (local)	I-235	1.4
		Total	**530.4**

Source: U.S. Department of Transportation

Table 2.4: Other Interstate routes in Iowa

Route	Start Point	End Point	Miles
I-29	Missouri/Iowa Line	I-80 (East)	48.6
I-29	I-80 (West)	Iowa/South Dakota Line	100.5
I-74	I-80	Iowa/Illinois Line	5.4
I-129	Nebraska/Iowa Line	I-29	0.3
I-235	Iowa 28	Iowa 163	6.3
I-280	U.S. 61	Iowa/Illinois Line	3.0
I-380	U.S. 218	I-80	73.3
I-480	Nebraska/Iowa Line	I-29	0.7
I-680	Nebraska/Iowa Line	I-29 (South)	16.5
I-880	I-29 (North)	I-80	3.0
		Total	**257.6**

Source: U.S. Department of Transportation

The National Highway Freight Network (NHFN) is the system eligible for National Highway Freight Program (NHFP) funds distributed to the states annually. The NHFN includes the following four subsystems of roadways.

- Primary Highway Freight System (PHFS)
- Other interstates not on PHFS
- Critical Rural Freight Corridors (CRFC)
- Critical Urban Freight Corridors (CUFC)

Table 2.5: Intermodal Connectors included in the Primary Highway Freight System

ID	Facility Name	Facility Description	Miles
IA4R	Quad Cities Container Terminal (Davenport)	S. Rolff St, Rockingham Rd (Iowa 22), between the Terminal and I-280	2.7
IA5P	Harvest States Peavey (Davenport)	Iowa 22 between the Terminal and I-280	2.2
IA6L	Amoco Pipeline Distribution Center (Council Bluffs)	U.S. 275 (eastern ramp termini I-29 to South Expressway), then North to the Westbound ramp terminus of I-29/80	1.9
IA7A	Des Moines International Airport	Fleur Dr between MLK Jr Pkwy and relocated Iowa 5 and Park Ave (63rd to Fleur Dr)	8.1
IA9L	Vandalia Rd Pipeline (Des Moines)	E. 30th St/Vandalia Rd (Iowa 163 to U.S. 65)	4.3
		Total	**19.2**

Source: U.S. Department of Transportation

Table 2.6: Critical Rural and Critical Urban Freight Corridors in Iowa

Urban Area	Route	Start Point	End Point	Miles
Critical Rural Freight Corridors				
-	U.S. 18, U.S. 218	I-35	Waterloo urbanized area boundary	78.5
-	U.S. 218	Poweshiek St	U.S. 34	45.7
-	N. Dayton Ave, Riverside Rd	Old Bloomington Rd	Stagecoach Rd	1.5
			Total CRFC	**125.7**
Critical Urban Freight Corridors				
Sioux City	S. Patton St	I-29	Blvd of Champions	1.2
Sioux City	Aviation Blvd	I-29	Discovery Blvd	0.4
Council Bluffs	S. Expressway, 23rd Ave, 29th Ave	I-29/I-80	Grain elevators	1.7
Council Bluffs	Iowa 92, Harry Langdon Blvd, South Ave	I-29	IAIS intermodal yard	1.3
Ames	E. 13th St, N. Dayton Ave	I-35	Old Bloomington Rd	2.2
Ames	Dayton Ave	U.S. 30	E. 13th St	2
Ames	U.S. 30, S. Dayton Ave, SE 18th St	I-35	S. Dayton Ave	1.3
Des Moines	U.S. 69, Maury St, SE 15th, E. MLK Jr Pkwy, SE 18th St	I-235	Dean Ave	3.2
Des Moines (Ankeny)	Iowa 160, SW State St	I-35	SW Ordnance Rd	3.9
Cedar Falls/Waterloo	U.S. 218	I-380	Waterloo urbanized area boundary	10.7
Waterloo	Plaza Dr, Dubuque Rd, Elk Run Rd	I-380	Newell St	4.6
Cedar Falls/Waterloo	U.S. 20, Iowa 58	I-380	Greenhill Rd	9.4
Cedar Rapids	U.S. 30	C Street SW	Edgewood Rd SW	4.3
Cedar Rapids	Wright Bros Blvd SW	I-380	Cessna Pl SW	2.8
Iowa City	U.S. 218	I-80	Poweshiek St	8.5
Iowa City	Old Highway 218 S	U.S. 218	Gringer Ag	1.5
Iowa City	Iowa 1, U.S. 6, Gilbert St, Court St	U.S. 218	Front St	3.7
Dubuque	U.S. 20	Iowa/Illinois Line	Swiss Valley Rd	8.6
Davenport	Iowa 130, Hillandale Rd, Enterprise Way	I-80	Davenport Transload Facility	1.1
			Total CUFC	**72.4**

Source: Iowa DOT

STRAHNET

The Highways for National Defense (HND) program identifies highway infrastructure needed by DOT to fulfill its mission and ensures the readiness capability of this infrastructure. HND monitors the 64,200-mile STRAHNET system, which consists of public highways that provide access, continuity, and emergency transportation of personnel and equipment in times of peace and war. It includes the entire 48,482 miles of the Dwight D. Eisenhower National System of Interstate and Defense Highways and 14,000 miles of other non-Interstate public highways on the National Highway System. The STRAHNET also contains roughly 1,800 miles of connector routes, linking over 200 military installations and ports to the primary highway system.

STRACNET

The Railroads for National Defense Program (RND) ensures the readiness capability of the national railroad network to support defense deployment and peacetime needs. The RND Program established the STRACNET, an interconnected and continuous rail line network consisting of over 36,000 miles of track serving over 120 defense installations. These lines provide main line corridor throughput capability as well as access to major defense contractors, logistics sites, and military facilities critical to national defense.

Strategic military networks

It is important to prioritize infrastructure and connectivity needs for strategic routes and other corridors that connect to U.S. Department of Defense (DOD) facilities and handle military freight.

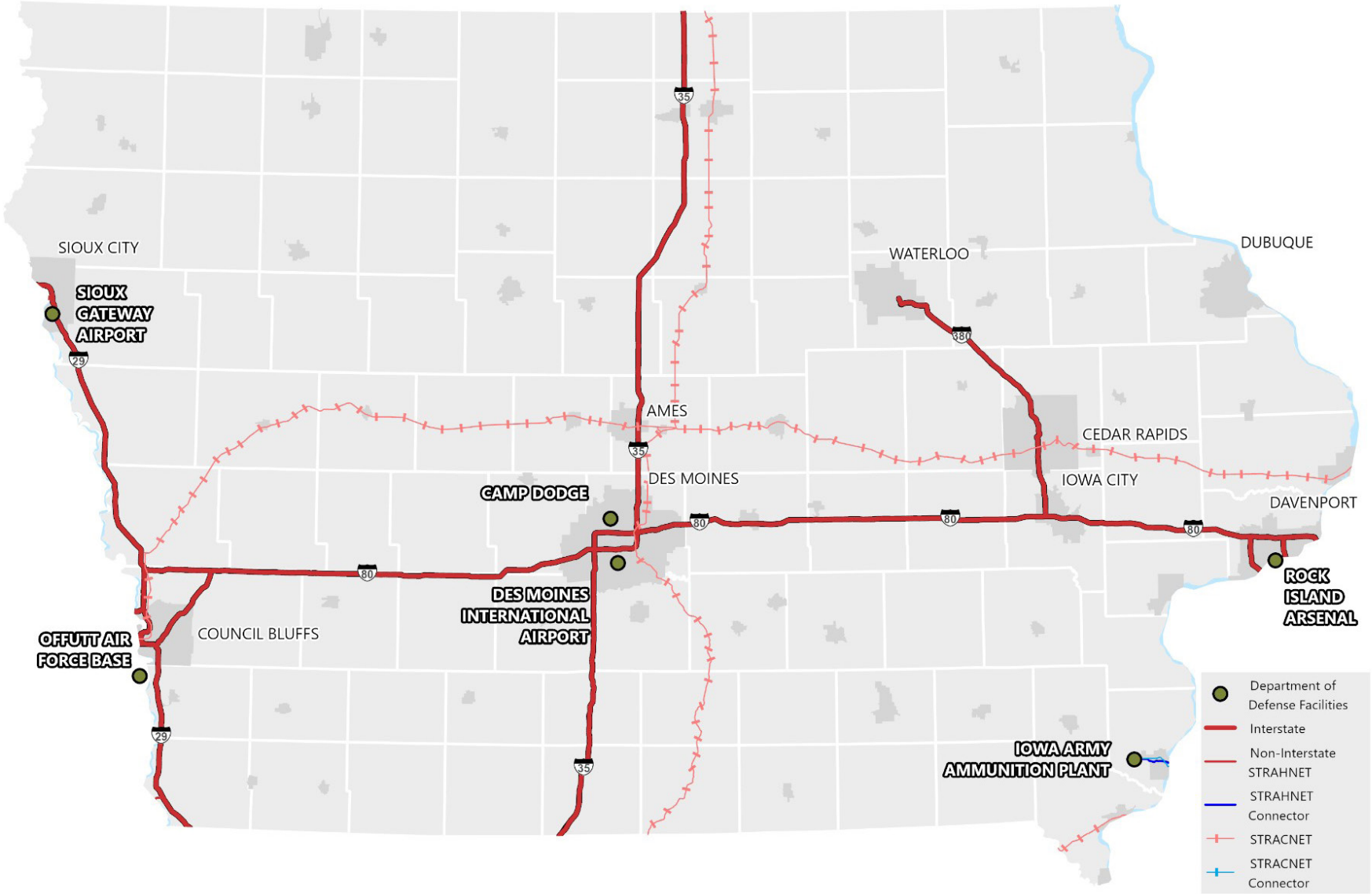
DOD facilities include military bases, ports, and depots. The road and rail networks (e.g., STRAHNET and STRACNET) that provide access and connections to these facilities are essential to national security as they support the quick logistics movement of vehicles and materials by allowing for large loads that are common to military freight.

Table. 2.7: Iowa strategic military networks and installations

Component	Iowa designations
Strategic Highway Network (STRAHNET) routes	• Interstate Highway System (all routes) • Iowa 2 (NE border to I-29)
STRAHNET connectors	• U.S. 34 (Iowa Army Ammunition Plant to IL border)
Strategic Rail Corridor Network (STRACNET) routes	• Union Pacific (NE border at Council Bluffs to IL border at Clinton) • Union Pacific (MO border at Lineville to MN border at Northwood) • BNSF (MO border near Argyle to IL border at Fort Madison)
Military installations	• Iowa Army Ammunition Plant (Middletown) • Camp Dodge (Johnston) • Des Moines International Airport • Sioux Gateway Airport • Rock Island Arsenal (IL) • Offutt Air Force Base (NE)

Source: U.S. Military Surface Deployment and Distribution Command Transportation Engineering Agency

Figure 2.6: Iowa strategic military networks and installations



Source: U.S. Military Surface Deployment and Distribution Command Transportation Engineering Agency

2.3 Inventory and performance by mode

In this section, an inventory will be provided for freight transportation modes and freight-generating facilities. The following metrics will be used to summarize the performance of each.

- Condition
- Utilization
- Safety
- Reliability

Although the different modes making up Iowa's transportation system can be classified by multiple different national and state "networks," the IMFN will be the primary focus of the system inventory and performance reporting.

Intermodal containers at Iowa facility. (Source: Iowa DOT)

Aviation

From larger air cargo facilities at commercial airports to point deliveries by smaller aircraft at other airports throughout Iowa, air cargo service provides fast and reliable movement of time-sensitive freight. An airport's role in the aviation system depends on the type of facilities and services provided, as well as the aviation demand. Commercial airports provide regularly scheduled commercial airline service and have the services/facilities to support a full range of general aviation activity.

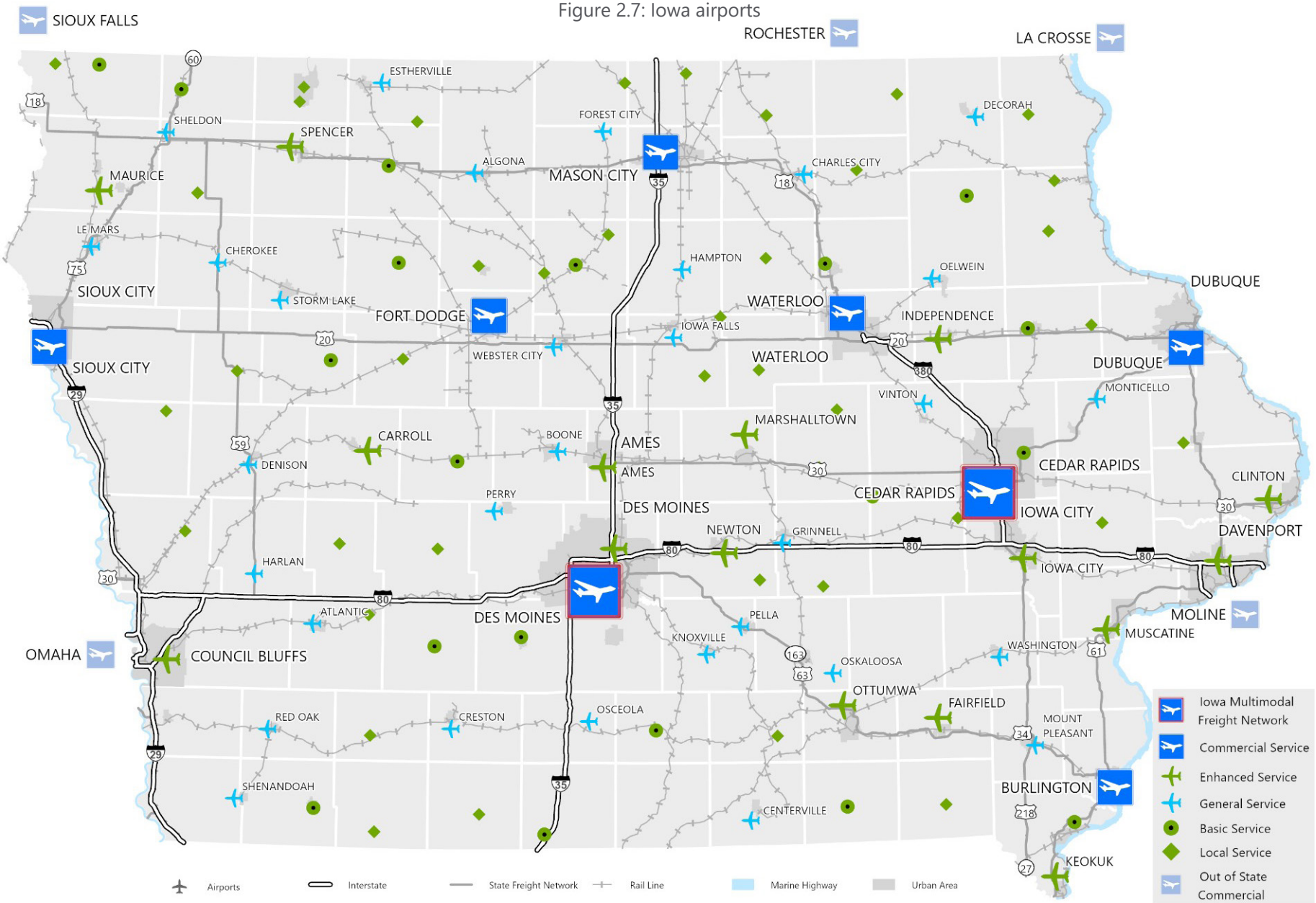
Nearly all aviation freight reported in Iowa is moved by scheduled commercial air passenger carriers and dedicated air cargo carriers (e.g., Amazon, FedEx, and UPS) at the eight commercial airports. Although most of the airports in the state handle cargo to some extent, over 99% of reported tonnage moves through the Des Moines International Airport (DSM) and the Eastern Iowa Airport (CID).

Table 2.8: Iowa commercial airports

FAA ID	City	Name
BRL	Burlington	Southeast Iowa Regional
CID	Cedar Rapids	Eastern Iowa
DSM	Des Moines	Des Moines International
DBQ	Dubuque	Dubuque Regional
FOD	Fort Dodge	Fort Dodge Regional
MCW	Mason City	Mason City Municipal
SUX	Sioux City	Sioux Gateway
ALO	Waterloo	Waterloo Regional

Source: Iowa DOT

Figure 2.7: Iowa airports



Source: Iowa DOT

Condition

One of the goals identified in the Iowa Statewide Aviation System Plan (2021) is to provide an airport system that meets existing and future user needs. More specifically, the goal highlights maintaining adequate infrastructure (e.g., runway pavement, terminal buildings, storage buildings, etc.) to allow for continued use by a variety of users. Pavement inspections tracking Pavement Condition Index (PCI) regularly take place at all paved airports.

Utilization

Over 130 million pounds of air cargo is moved through airports in Iowa every year. Aviation freight services are used primarily for the timely transportation of cargo into and out of Iowa.

More than 99 percent of Iowa's air cargo travels through two commercial airports (DSM and CID). The other six commercial airports (Burlington, Dubuque, Fort Dodge, Mason City, Sioux City, and Waterloo) share the less than 1 percent remaining.

Express carriers such as FedEx and UPS Inc. hold the major aviation freight presence in Iowa. To a large degree, the movement of air cargo is contingent upon the business decisions of these private carriers. In recent years, increased fuel expenses and changes in business models have resulted in reduced aviation freight activity in Iowa. However, with an expanded UPS facility at CID, and a new FedEx facility and the addition of Amazon at DSM, more growth is expected.

Safety

There have not been any crashes in Iowa associated with major air cargo carriers. Aviation safety measures such as crash rates or statistics are challenging to report for multiple reasons. Many of the aircraft that fly over the state and may have an emergency or incident are not based in Iowa. Also, an aircraft incident in Iowa does not necessarily reflect any infrastructure or service issues with airports in the state.

Reliability

Air cargo coming into and out of the state is not limited at any Iowa airports, and capacity exists to accommodate growth of freight in the future. Therefore, no air cargo bottlenecks were identified.

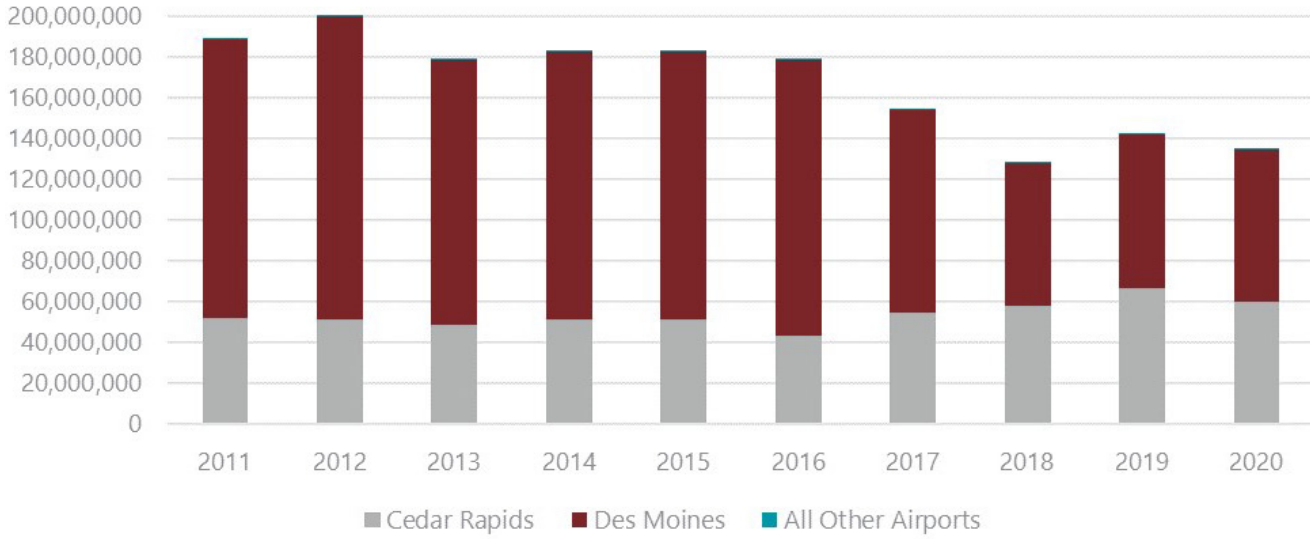
Additionally, the state's eight commercial service airports provide adequate coverage to potential air cargo shippers. When nearby out-of-state commercial airports (e.g., Omaha, Sioux Falls, Rochester, La Crosse, and Moline) are considered, nearly the entire state has access to a commercial airport within a 90-minute drive.

UPS freight aircraft (Source: IanDewarPhotography - stock.adobe.com)

Aviation Bottlenecks

Air cargo coming into and out of the state is not limited at any Iowa airports, and capacity exists to accommodate growth of freight in the future. Therefore, no air cargo bottlenecks were identified.

Figure 2.8: Total air cargo (tons), 2011-2020



Sources: Iowa airports

Table 2.9: Total air cargo (tons) by commercial airport, 2011-2020

	Burlington	Cedar Rapids	Des Moines	Dubuque	Fort Dodge	Mason City	Sioux City	Waterloo	Total
2011	0	52,321,653	135,797,823	100,948	47,499	4,733	0	0	**188,272,656**
2012	0	51,434,903	148,241,365	74,741	7,763	2,768	369	300	**199,762,209**
2013	0	48,812,039	129,470,911	73,788	1,016	1,155	2,421	2,453	**178,363,783**
2014	0	51,698,793	130,790,339	2,712	0	32	1,596	850	**182,494,322**
2015	0	51,609,506	130,817,962	5,373	0	0	1,188	559	**182,434,588**
2016	0	43,663,080	134,551,878	934	0	0	7,589	650	**178,224,131**
2017	0	54,768,529	99,052,046	15,010	0	0	2,557	4,627	**153,842,769**
2018	0	57,852,712	69,972,176	170	0	0	3,919	1,508	**127,830,485**
2019	0	66,863,002	74,972,162	0	0	0	6,699	348	**141,842,211**
2020	0	59,844,805	74,871,567	0	0	0	2,076	354	**134,718,802**

Sources: Iowa airports

Highway

The state's public roadway system is comprised of more than 115,000 miles with approximately 25,000 bridge structures, offering an extremely accessible network that provides a high level of mobility for freight movement. Additionally, Iowa has truck parking spaces located at rest areas, weigh stations, and alternative service locations (e.g., truck stops) around the state to improve safety and efficiency of the trucking industry.

While the size of the state's roadway system has not increased considerably in recent years, the infrastructure burden remains significant. Freight tonnage in Iowa is moved primarily by truck and most commodity movements by aviation, pipeline, rail, and water are intermodal in nature and usually begin and/or end with a truck movement.

Iowa's highway system can be classified by multiple different highway networks such as the Primary Highway System that includes the Interstate System, as shown in Table 2.10, as well as networks not shown such as the Commercial and Industrial Network, National Highway System, Federal Highway Administration Intermodal Connectors, etc. However, the highway portion of the IMFN, which includes 4,027 miles of the Primary Highway System, will be the focus of the system inventory and performance reporting.

The condition and performance of these roadways, first mile/last mile connections, and service locations is critical to the overall efficiency of supply chains and the entire freight system.

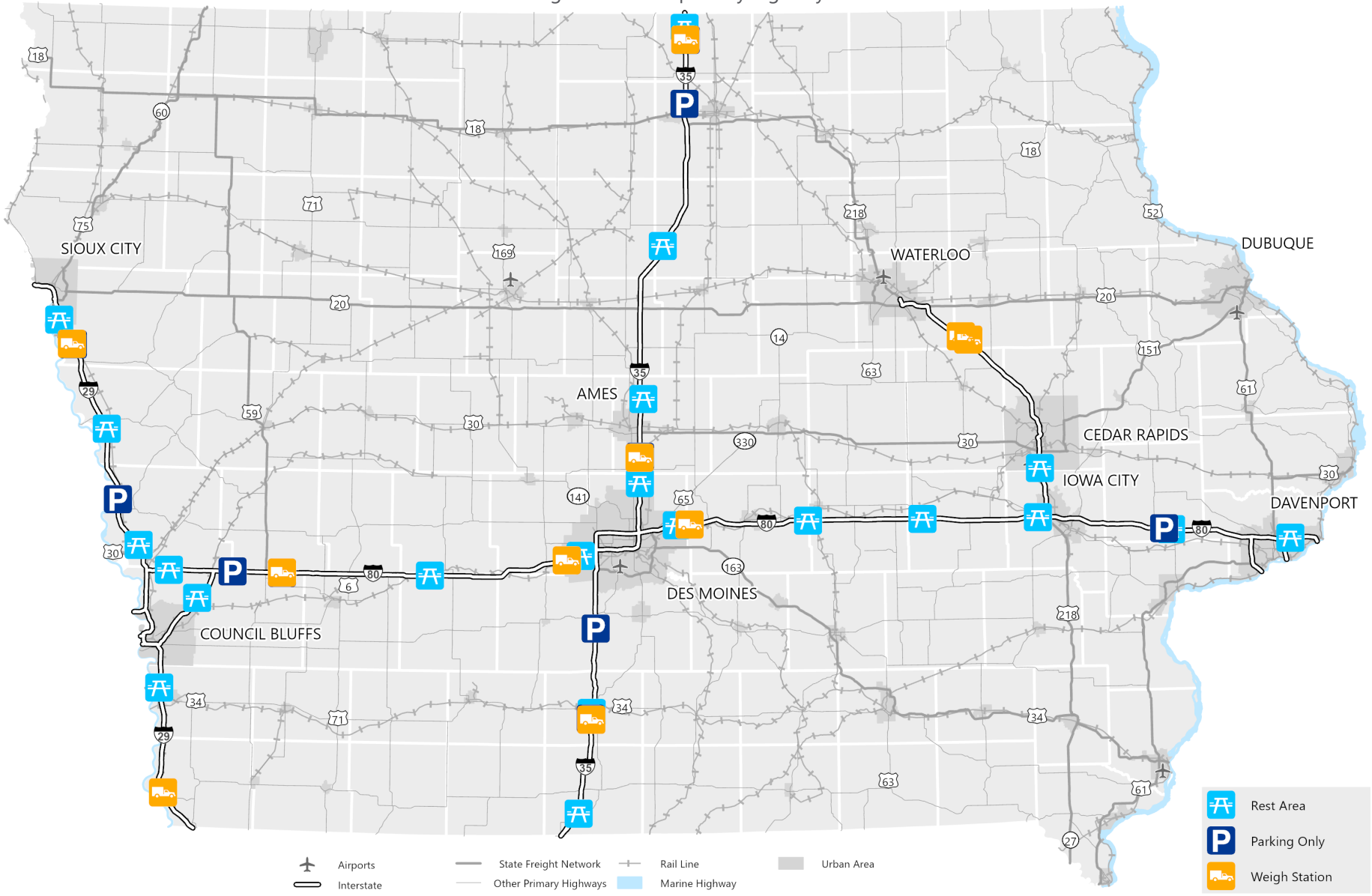
Table 2.10: Iowa primary roadway system by classification

Classification	Miles	Description
Public roadways	115,509	All roadways ranging from eight-lane Interstates and four-lane divided facilities, to paved secondary roads, gravel roads, and municipal streets
Primary highways	9,621	Roads such as Interstate system, U.S. and State routes that are under the jurisdiction of Iowa DOT
Interstate System	1,157	Primary highways providing connections to the national transportation network and major metropolitan areas
Iowa Multimodal Freight Network	4,027	Primary highways critical to state and regional commerce to be protected and enhanced for efficient freight movement

Source: Iowa DOT

Trucks at road check. (Source: Iowa DOT)

Figure 2.9: Iowa primary highways



Source: Iowa DOT

Condition

The Infrastructure Condition Evaluation (ICE) tool was developed by the Iowa DOT to aid in the evaluation of the state's Primary Highway System by using a composite rating calculated from seven different criteria – passenger, single-unit truck, and combination truck annual average daily traffic; congestion index value, International Roughness Index; PCI; and Bridge Condition Index.

While each of these individual criteria indicates a different component, the collective offers the ability to evaluate the service and structural condition of roadway segments with a single composite rating. This composite rating was calculated for each road segment by applying a standardized normalization and weighting process.

Utilization

The overwhelming majority of freight tonnage in Iowa is moved by trucks on the state's highway system. Truck traffic in the state is primarily concentrated on the Interstates and IMFN, with the heaviest being on I-80 between Iowa City and Davenport, I-35/80 through the Des Moines metro area, and I-29/80 through Council Bluffs.

Iowa also issues a significant number of oversize/overweight (OSOW) permits each year. This traffic is mostly concentrated across the Interstate system as well, with the heaviest being on I-80. One of the major non-Interstate OSOW routes in the state is U.S. 59 that runs north/south in western Iowa. This is the result of multiple height-restricting overhead structures on I-29, which forces larger loads to utilize U.S. 59, a road with few overhead structures.

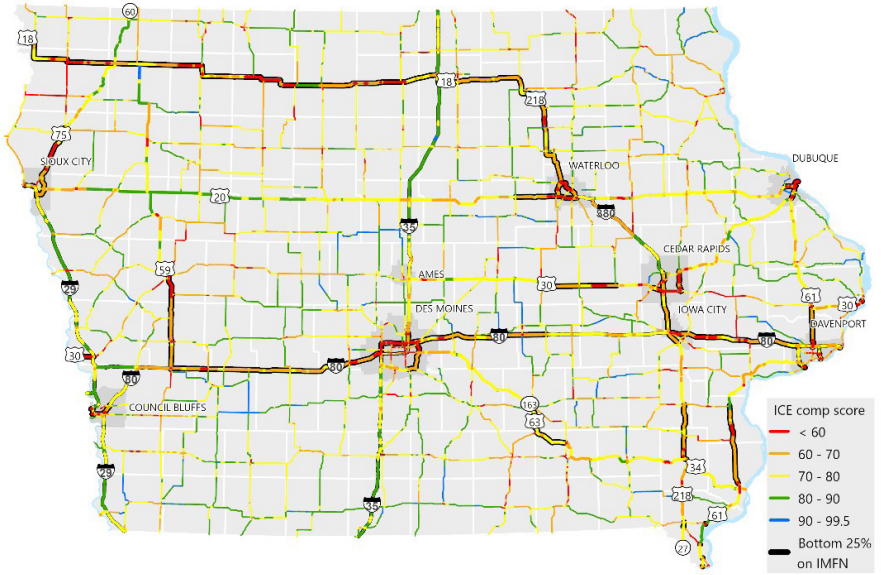
Due to their overall size and weight, traditionally sized and OSOW trucks have more of an impact on the condition and operations of the roadways than personal vehicles and these numbers must be monitored so solutions can be considered as traffic volumes increase.

Safety

Highway freight-related crashes include those that involve single-unit trucks, combination trucks, and/or trains. Freight-related crashes consistently represent around eight percent of all highway crashes, but the resulting fatalities are typically 20 percent of total fatalities resulting from all highway crashes.

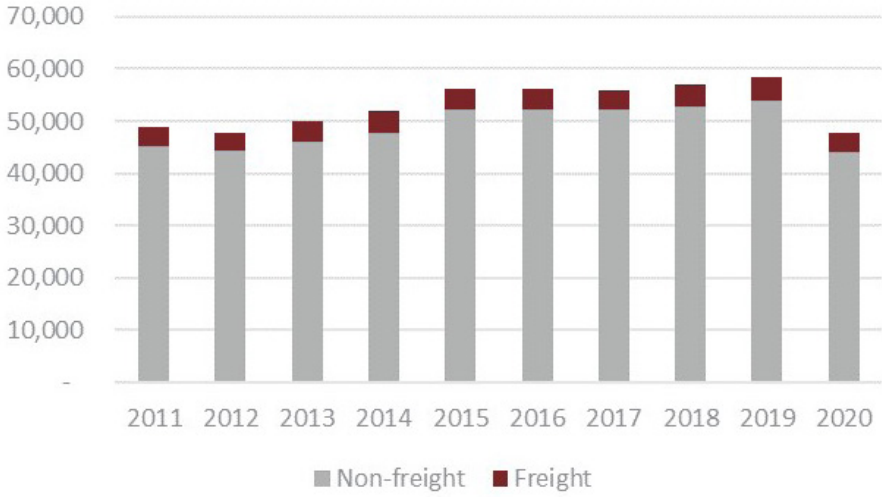
On average, freight-related crashes are evenly divided between rural and urban areas. However, 70 to 80 percent of fatalities resulting from freight-related crashes are in rural areas versus 20 to 30 percent in urban areas.

Figure 2.10: Infrastructure Condition Evaluation rating



Source: Iowa DOT

Figure 2.11: Highway crashes, 2011-2020

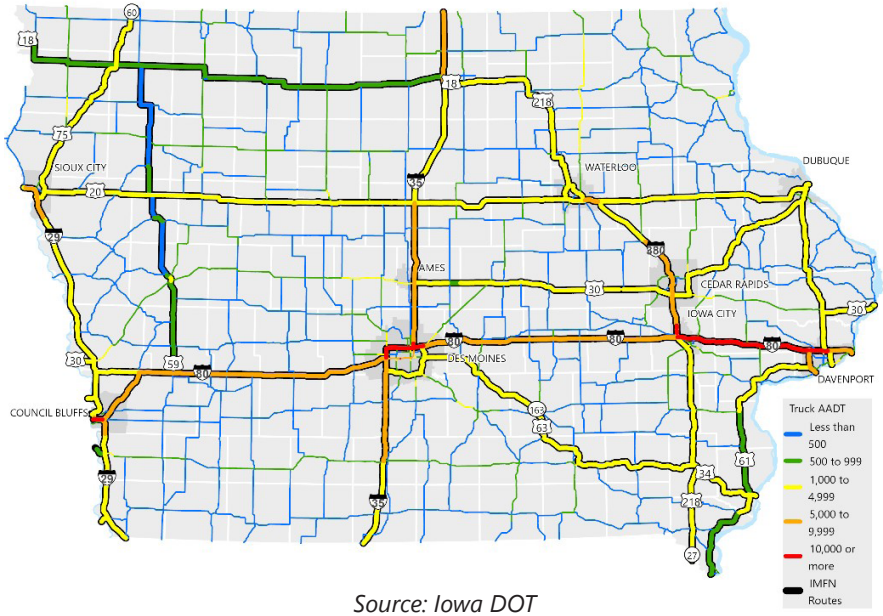


Source: Iowa DOT

Figure 2.12: Highway fatalities, 2011-2020

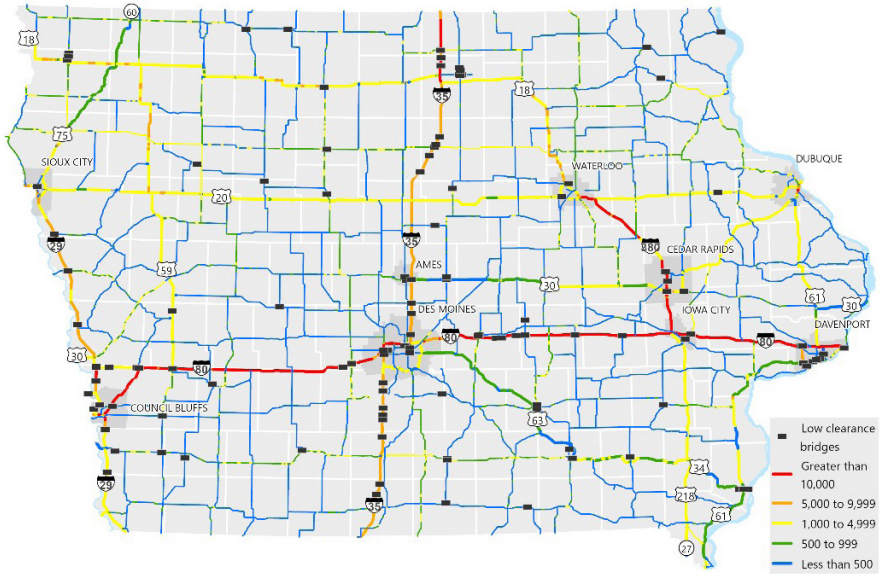
Source: Iowa DOT

Figure 2.13: Truck traffic



Source: Iowa DOT

Figure 2.14: Oversize/overweight truck traffic



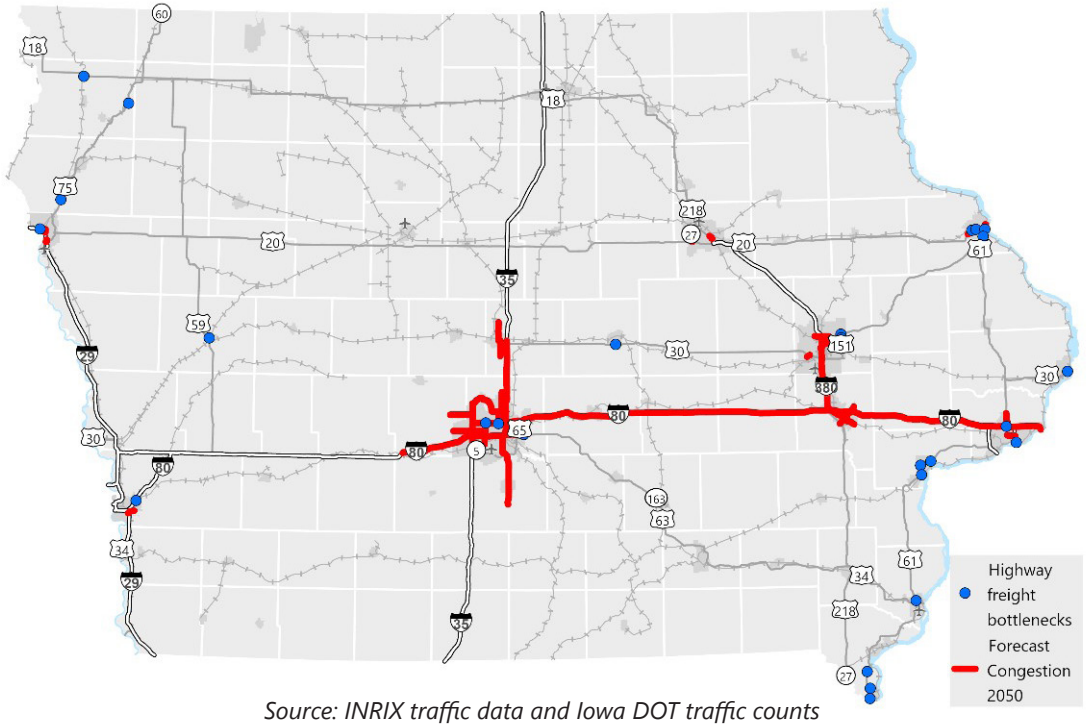
Source: Iowa DOT

Reliability

INRIX travel speed data, acquired by cellphone and global positioning systems data, was used to identify highway bottlenecks. Bottleneck conditions are determined by comparing current reported speeds to reference speeds for each segment of road. Reference speed values are provided for each segment and represent the 85th percentile observed speed for all time periods with a maximum value of 65 mph. A bottleneck occurrence is defined in this analysis as a time interval where the average traffic speed is less than or equal to 60 percent of the reference speed. The annual total bottleneck duration per mile is calculated for each segment to represent recurring congestion, and the worst five percent of the overall network is identified. Of those locations among the worst five percent (by duration per mile), locations where the duration is one standard deviation or higher were initially identified as a bottleneck. The 27 locations on the highway portion of the IMFN were identified as highway freight bottlenecks. These locations were verified by Iowa DOT District Transportation Planners and the Iowa Freight Advisory Council.

Capacity needs at the statewide level were also evaluated based on current conditions and anticipated future traffic. For both time frames, a volume-to-capacity (V/C) ratio was used, which estimates how much capacity remains on a roadway based on how much traffic it carries and how much traffic it could carry. A roadway's capacity varies based on factors such as the number of lanes, classification of the roadway, number and frequency of accesses, and surrounding land use. The V/C ratio is an indicator of highway capacity sufficiency.

Figure 2.15: Highway freight bottlenecks



Source: INRIX traffic data and Iowa DOT traffic counts

Table 2.11: Highway freight bottlenecks

	City	Location	Segment length (miles)	Bottleneck minutes/mile
1	Hull	U.S. 18 at U.S. 75	0.39	576,743
2	Hospers	400th Street at Iowa 60	1.37	2,212,836
3	Hinton	U.S. 75 at C60*	0.45	298
4	Sioux City	U.S. 77 at I-29	0.01	322,172
5	Council Bluffs	U.S. 6/Kanesville Boulevard at I-80	0.32	681,358
6	Denison	U.S. 59 at Iowa 39	0.01	1,318,122
7	Des Moines	Iowa 28/Merle Hay Road at I-80/35	0.11	2,074,782
8	Des Moines	Iowa 415/NW 2nd Avenue at I-80/35	0.17	1,087,158
9	Altoona	NE 70th Street at Iowa 163	0.03	8,354,943
10	Marshalltown	Iowa 14 at U.S. 30	0.04	748,215
11	Marion	U.S. 151 at Iowa 13	0.06	1,741,501
12	Marion	U.S. 151/Iowa 13 at Iowa 100	0.14	8,145,963
13	Cedar Rapids	U.S. 151/Iowa 13 at Mt Vernon Road	0.66	13,541,271
14	Dubuque	U.S. 20 at NW Arterial	0.03	1,165,967
15	Dubuque	U.S. 20 at John F Kennedy Road	0.02	1,965,023
16	Dubuque	U.S. 20 at U.S. 61/U.S. 151	0.01	1,268,577
17	Dubuque	U.S. 52 at U.S. 61/U.S. 151	0.01	14,357,435
18	Clinton	U.S. 30 at U.S. 67	0.12	512,472
19	Davenport	U.S. 61 at I-80*	0.13	2,382
20	Davenport	U.S. 67 at I-74	0.16	296,664
21	Muscatine	U.S. 61 at Iowa 38	0.10	2,648,475
22	Muscatine	Iowa 22 at U.S. 61	0.02	19,002,289
23	Muscatine	U.S. 61 at Grandview Ave and Dick Drake Way	0.09	6,061,731
24	Burlington	Mt Pleasant Street at U.S. 61	0.13	2,286,496
25	Keokuk	U.S. 218 at U.S. 61	0.11	1,917,954
26	Keokuk	U.S. 61 at U.S. 218 and Wirtz Lane*	0.02	556,611
27	Keokuk	U.S. 61 at U.S. 136	0.01	4,269,800

*Location added due to operational issues not reflected in bottleneck minutes/mile

Source: Iowa DOT

Pipeline

Pipelines are the dominant mode of transportation for liquid and gaseous energy commodities, typically transporting raw materials from areas of production to refineries and plants or moving finished products to terminals, power plants, and other end users.

There are approximately 42,216 miles of gas (distribution and transmission) and 4,448 miles of liquid pipelines in Iowa. This network supplies commodities such as anhydrous ammonia, crude oil, liquefied petroleum gas, and natural gas for residential and industrial consumption. Nearly all natural gas is delivered by pipeline directly to consumers. Liquefied petroleum/gas and anhydrous ammonia are usually delivered to above ground terminals where the product is shipped by truck to the final point of consumption.

Pipelines comprising the network include large diameter lines carrying energy products to population centers, as well as small diameter lines that deliver natural gas to businesses and households. The energy products carried in pipelines fuel everyday life in the state and nation. They heat homes, power the industrial base, dry crops, and enable our daily commutes. Pipelines are typically labeled as one of the safest modes for transporting energy products because they are usually underground and away from the general public.

Iowa ranks fourth in the nation in consumption of liquefied gas in the form of propane, due primarily to the use in drying corn after harvest and heating one in eight households. Iowa is also the only non-crude oil-producing state among the top five energy-consuming states on a per capita basis, mainly due to the state's relatively small population and its energy-intensive industrial sector (U.S. Energy Information Administration).

Condition

Specific condition information was not available. However, pipelines are regularly inspected and all leaks or incidents are investigated.

Utilization

Utilization numbers were not available.

Safety

From 2011 to 2020, there were a total of 84 pipeline incidents in Iowa, resulting in 3 injuries and $24,827,158 in repair fees.

Reliability

Despite the construction of new pipeline capacity in some parts of the country, energy infrastructure bottlenecks still exist. Limitations in Iowa are typically related to propane terminals and storage areas during high-demand seasons. Specific pipeline bottlenecks were not identified.

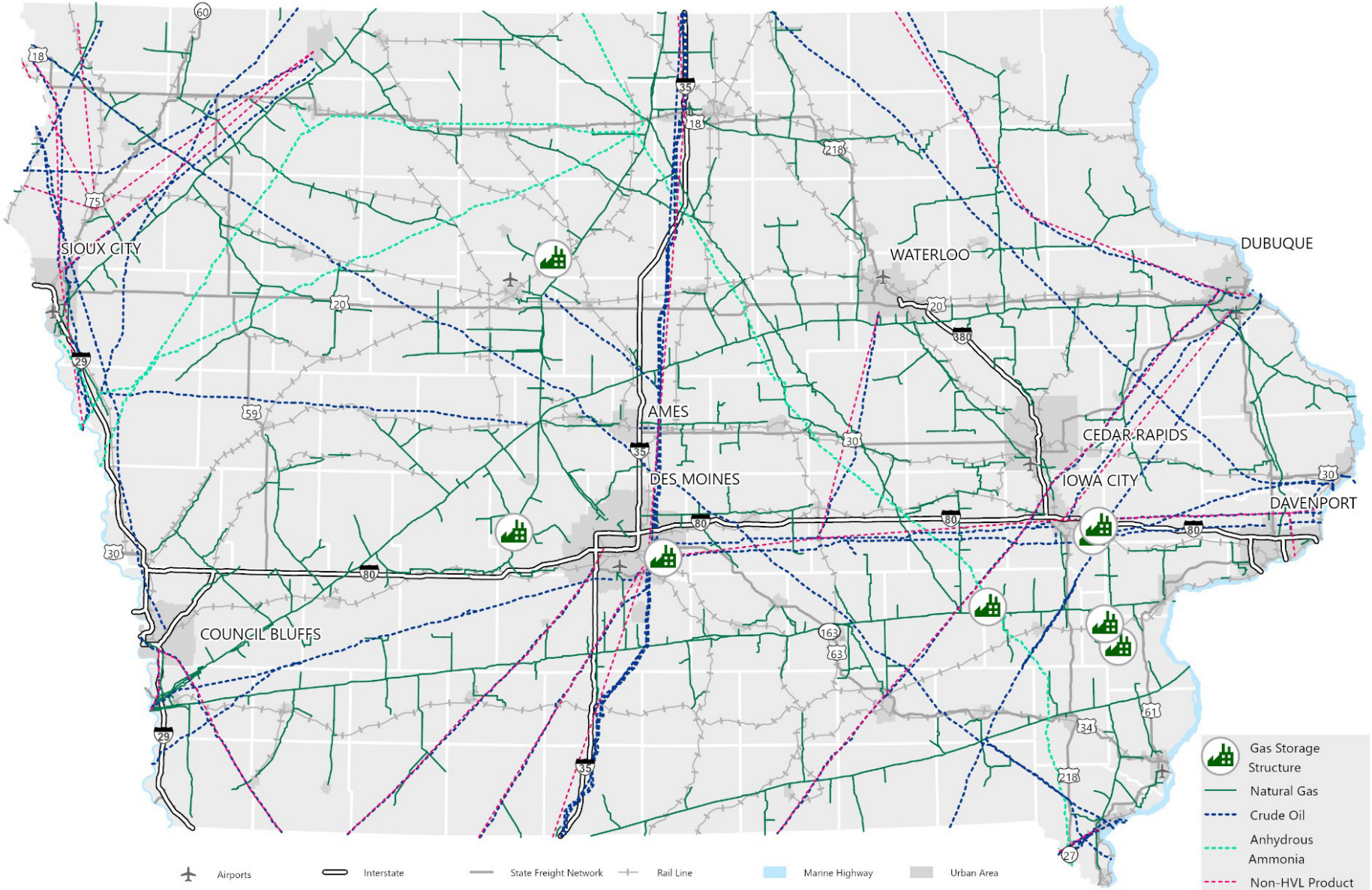
Table 2.12: Iowa pipeline mileage by commodity

System	Main miles	Service miles
Gas distribution	**18,936**	**15,088**
Natural gas	18,932	15,087
Propane	4	1
Gas transmission	**8,192**	-
Natural gas	8,192	
Liquid	**4,448**	-
Crude oil	672	
Highly Volatile Liquids*	1,901	
Refined petroleum products**	1,875	
Total	**31,576**	**15,088**

**Highly Volatile Liquids includes flammable and toxic liquids.*
***Refined petroleum products are obtained by distilling and processing crude oil.*

Source: Pipeline and Hazardous Materials Safety Administration

Figure 2.16: Iowa pipelines



Source: Pipeline and Hazardous Materials Safety Administration

Railroad

Iowa has an extensive rail transportation system with the ability to haul large volumes of freight in a safe, energy-efficient, and environmentally sound manner. Rail service in Iowa is dominated by five Class I carriers that operate most tracks and accrue most of the freight revenues in the state. Of the five Class I's, Union Pacific Railroad and BNSF Railway carry the largest volume of traffic in the state, operating on approximately 2,000 miles of track combined, including double tracks running east to west across the state.

Class II and III railroads often provide feeder service to the Class I carriers. The only Class II railway in the state, Iowa Interstate Railroad, maintains over 300 miles of track serving as another major east-to-west corridor from Omaha-Council Bluffs to the Chicago area. Class III railroads consist of two separate operating categories – line haul and switching. Switching railroads operate in urban areas and facilitate the interchange of rail shipments. These switch operators are typically associated with Class I railroads and are common practices within Class III operations.

IAIS train in Iowa (Source: Iowa DOT)

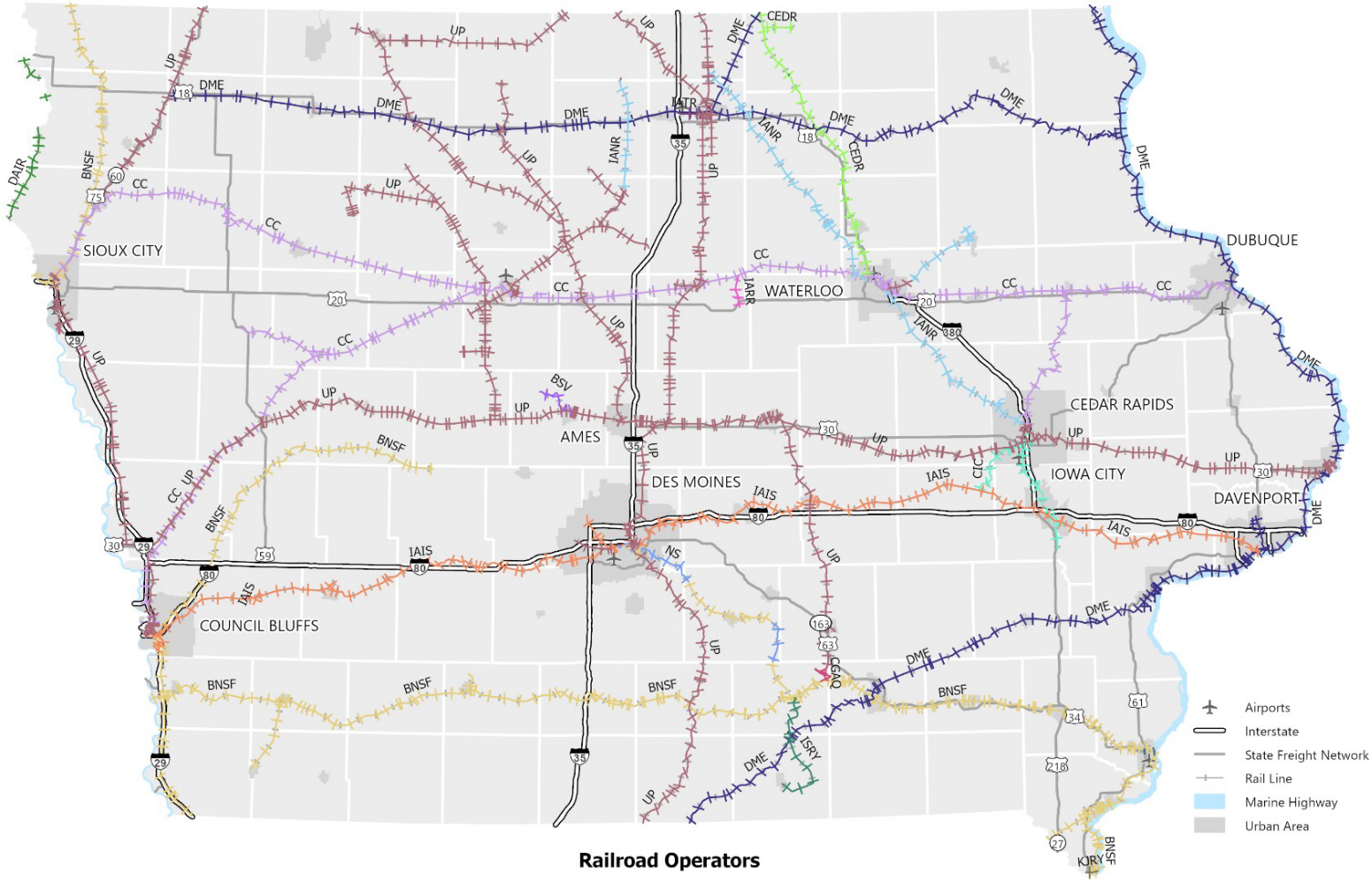
Table 2.13: Iowa railroad mileage by company

Class	Railroad	Owned/ Leased	Trackage Rights	Total Operated
I	BNSF Railway (BNSF)	624	35	659
	Canadian National Railway (CN) [1]	574	24	598
	Canadian Pacific Railway (CP) [2]	650	23	673
	Norfolk Southern Railway (NS)	6	37	43
	Union Pacific Railroad (UP)	1,281	152	1,433
II	Iowa Interstate Railroad (IAIS)	327	27	354
III	Boone & Scenic Valley Railroad (BSV)	2	0	2
	Burlington Junction Railway (BJRY)	6	0	6
	CBEC Railway (CBRX) [3]	5	0	5
	Cedar Rapids & Iowa City Railway (CIC)	60	23	82
	D&I Railroad (DAIR)	0	39	39
	Iowa Northern Railway (IANR)	174	43	217
	Iowa River Railroad (IARR)	35	0	35
	Iowa Southern Railway (ISRY)	11	0	11
	Iowa Traction Railroad (IATR)	10	0	10
	Keokuk Junction Railway (KJRY)	1	0	1
-	State of South Dakota (SD) [4]	39	0	39
	Total	**3,804**	**403**	**4,207**

[1] CN operates via subsidiaries Chicago Central & Pacific (CCP) and Cedar River Railroad (CEDR).
[2] CP operates via subsidiary Dakota, Minnesota & Eastern (DME).
[3] CBEC trackage is operated by IAIS.
[4] SD-owned trackage in Iowa is operated by DAIR.

Source: Railroad companies

Figure 2.17: Iowa railroads



Source: Railroad companies

Condition

Operating revenues and overall net ton-miles of the railroads are indicators of the condition and performance of the rail system, both of which have steadily increased over the last 35 years.

Railroads in Iowa have been steadily increasing the amount of funds spent on maintenance and improvements of rail infrastructure in the state. This includes $166.7 million in 2019 and over $1 billion in the last five years. Infrastructure maintenance and improvements are estimated to make up 11 percent of total operating expenses.

Utilization

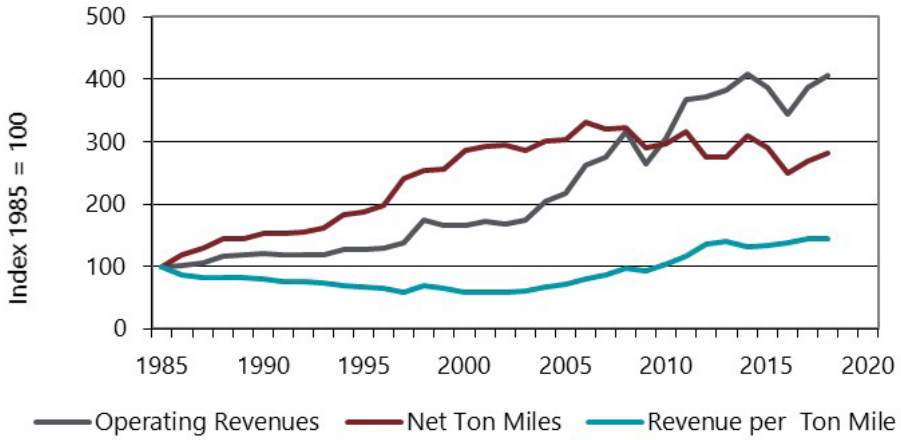
The activity on individual rail lines is measured in terms of density or gross ton-miles per mile. Gross ton-miles are defined as the total weight of all freight traveling on the rail line including the weight of freight-train cars and locomotives. While Iowa's rail miles have decreased slightly, the amount of gross tonnage moving over the network has been steadily increasing.

Class I carriers operate a majority of the rail mileage in the state and generate the most ton-miles. Iowa's two busiest rail lines are Union Pacific Railroad's Overland Route, an east-west double-track route passing through the center of Iowa (Clinton to Council Bluffs), and the BNSF Railway's line in southern Iowa, an east-west route that is partially double tracked (Burlington to west of Pacific Junction). The Class II and III railroads often provide feeder service to the Class I carriers, which results in smaller allocations of mileage and ton-miles.

Safety

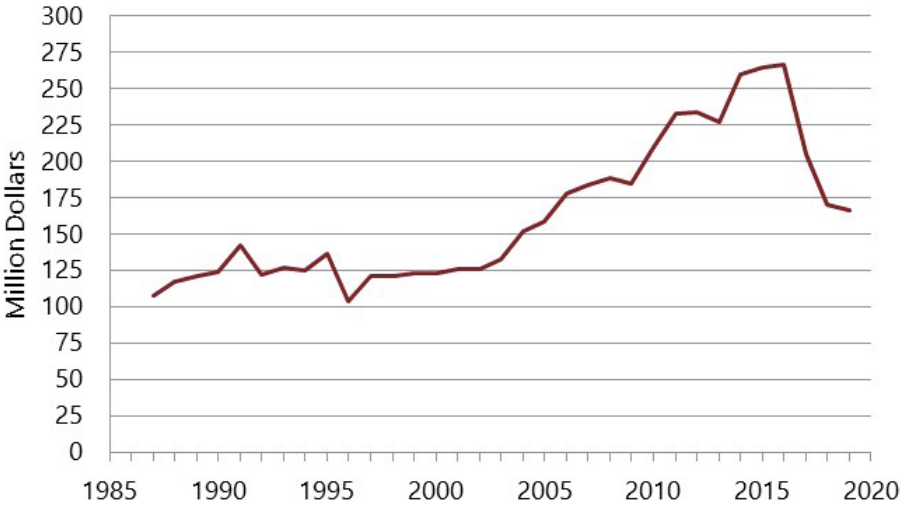
Over the last ten years, there were 378 crashes between highway and railroad traffic and 331 train derailments, with a relatively consistent number occurring each year. A total of 85 injuries and 98 fatalities resulting from those crashes and derailments, both with inconsistent trends by year.

Figure 2.18: Performance of Iowa rail operations, 1985-2018



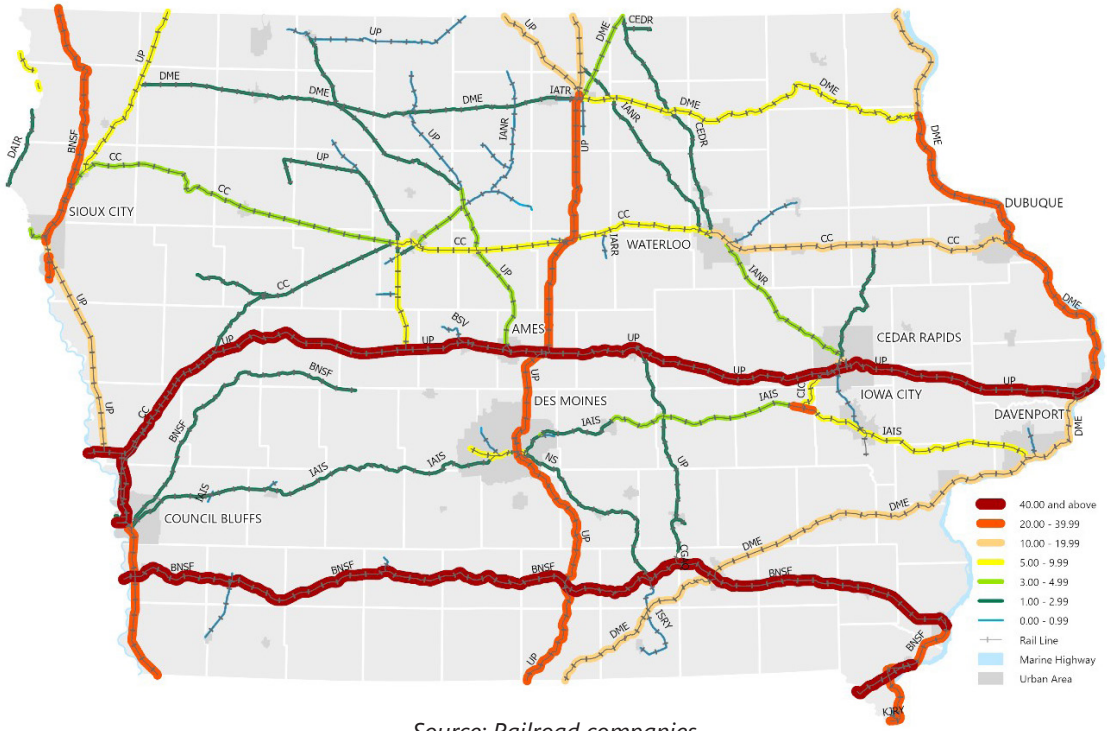
Source: Railroad companies

Figure 2.19: Iowa railroad maintenance investments, 1987-2019



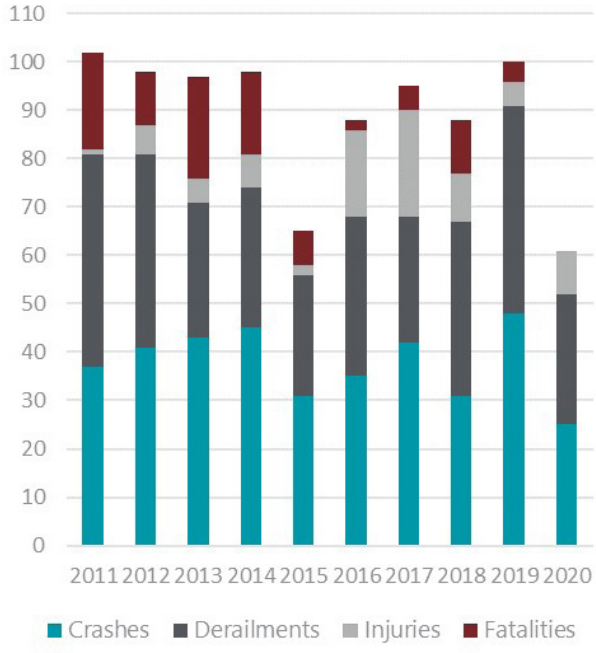
Source: Railroad companies

Figure 2.20: Freight railroad traffic density, 2020 (gross tons per mile)



Source: Railroad companies

Figure 2.21: Freight railroad-related safety statistics, 2011-2020



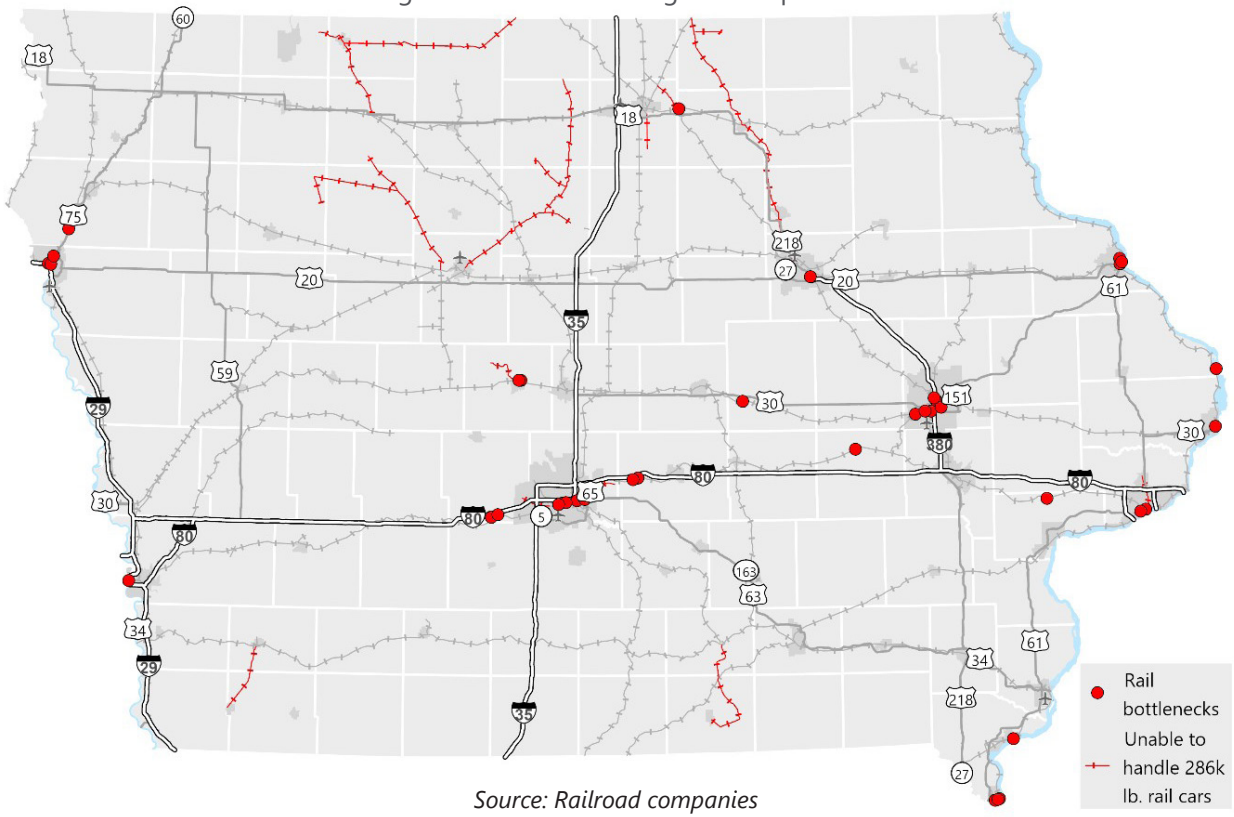
Source: Federal Railroad Administration

Reliability

Railroad bottleneck locations are usually referred to as "choke points" to avoid confusion with the more conventional railroad sector use of "bottleneck" to describe locations served by only one rail carrier (i.e., the "bottleneck carrier"). These choke points were identified by surveying each of the rail companies operating trackage in the state. Locations submitted primarily include structural choke points (e.g., low clearance areas and bridges with size restrictions), congested choke points (e.g., locations with operational issues or shared-use corridors), and low-lying areas at risk of flooding during heavy rains or high-water levels.

Additionally, railroads continue to focus their attention on heavier axle-load freight equipment and longer, heavier trains to lower costs. Using larger rail cars in 100-plus car unit trains allows the greatest savings and economic benefits, as well as keeping would-be truck traffic off the highways. The industry standard for rail car weight, which includes the weight of commodities and the rail car combined, is 286,000 pounds. Iowa has rail lines that are unable to carry the sizes and weights of railroad equipment that meet this threshold.

Figure 2.22: Railroad freight chokepoints



Source: Railroad companies

Table 2.14: Railroad freight chokepoints

	Railroad(s)	Location	Freight mobility issue
1	CN and UP	Mainline between Sioux City and Le Mars	**Track congestion** exists from multiple rail companies operating over the same line.
2	BNSF	31st Street Rail Crossing at Sioux City	This highway-railroad crossing is located on the edge of a rail yard resulting in the **roadway being regularly blocked** by trains and disrupting commercial and residential traffic. A coordinated crossings analysis and mitigation plan is needed.
3	BNSF, CN, DAIR, and UP	Terminal and Interchange Area at Sioux City	**Operational issues** exist where four railroads intersect at a major at-grade crossing of rail lines with trains operating at slow speeds with no designated interchange locations and many carriers operating on each other's yards to interchange cars.
4	BNSF	Gordon Drive viaduct at Sioux City	The Gordon Drive viaduct has a vertical clearance of 17' 6" above top of rail that **does not allow for the passage of double stack container trains.**
5	UP	West of Missouri Valley	**Flood prone area** is at risk of closure due to Missouri River flooding (e.g. 2011).
6	CN	UP rail bridge at Council Bluffs	CN uses a UP bridge over the Missouri River at Council Bluffs to reach a customer in Omaha, NE **causing delay** for some UP trains.
7	BSV and UP	Interchange at Boone	Interchange regularly serves more cars than originally designed resulting in significantly **increased time for sorting and coordination** between railroads to accommodate.
8	BSV	Industrial park at Boone	**Improved infrastructure** with additional siding, storage, and sorting capacity is needed.
9	IAIS	Bridge 380.4 near DeSoto	This **bridge restricts the movement of high-wide loads** (e.g. wind tower components) due to the truss construction.
10	IAIS	Bridge 378.1 near Van Meter	This **bridge restricts the movement of high-wide loads** (e.g. wind tower components) due to the truss construction.
11	IAIS	Des Moines	**Flood prone area** from MP359.04 to MP362.25 near Edwards Avenue is at risk of closure due to Raccoon River flooding anytime the Fleur Drive flood gates close.
12	IAIS	Track conditions at Des Moines	The **density of crossings** in downtown Des Moines limits speeds to 10 mph for westward bound trains. To alleviate, crossing consolidations or track upgrades need to be considered.
13	IAIS and UP	UP Short Line Yard at Des Moines	There is currently **no dedicated through route** for IAIS along the UP-owned trackage and yard. A dedicated separate track to allow IAIS through movements to pass without restriction is needed.
14	IAIS	Pleasant Hill	**Flood prone area** from MP352.25 to MP353 near Fairview Drive is at risk of closure due to Four Mile Creek flooding.
15	IAIS	Bridge 329.1 near Colfax	This **bridge restricts the ability to carry high-wide loads** (e.g. wind tower components). Need to replace structure with through plate girder bridge.

	Railroad(s)	Location	Freight mobility issue
16	IAIS	Colfax	**Flood prone area** from MP334.25 to MP336 near Walnut Street is at risk of closure due to Skunk River flooding.
17	CP and IANR	Interchange at Nora	Increased traffic volumes at the interchange results in **insufficient track capacity.**
18	IANR	Bryant Yard at Waterloo	Convergence of traffic from three subdivisions results in **insufficient classification space.**
19	UP	Montour	**Flood prone area** is at risk of closure due to large rain events (e.g. 2014).
20	IAIS	Bridge 268.6 near Marengo	This **bridge restricts the movement of high-wide loads** (e.g. wind tower components) due to the truss construction.
21	CIC and UP	Fairfax 3 at Cedar Rapids	UP can only deliver one train at a time at this location due to **insufficient interchange track.**
22	UP	Cedar Rapids	**Flood prone area** where main line and UP Beverly Yard are at risk of closure due to Prairie Creek and area drainage ditches flooding (e.g. 2014).
23	CIC	Cedar Rapids bypass at Cedar Rapids	**Rail traffic currently moves through the ADM plant** greatly affecting services. A new single line that bypasses ADM would allow trains to travel around the plant more efficiently and minimize potential operating conflicts between trains.
24	CIC	OR bypass at Cedar Rapids	**Insufficient capacity to accommodate the interchange space** for IANR and CN corn traffic while facilitating other yard switching activities. Bypass would provide additional capacity and efficiency of railroad operations.
25	CIC	Eighth Avenue curve at Cedar Rapids	The **current 13-degree 55 ft. curve limits train size and motive power options for train operations**, increasing the number of trains and causing vehicular and rail congestion downtown.
26	UP	Cedar Rapids	**Flood prone area** where the entire industrial lead is at risk of closure due to Cedar River flooding (e.g. 2008).
27	IAIS	Moscow	**Flood prone area** from MP211.75 to MP 212.75 near Noble Avenue at risk of closure due to Cedar River flooding.
28	CP	Garfield Avenue at Dubuque, Iowa	**Lack of rail yard capacity.**
29	CN*	CN rail bridge at Dubuque	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season.** The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays.

	Railroad(s)	Location	Freight mobility issue
30	CN	South Port at Dubuque	**Lack of rail yard capacity.**
31	CP*	CP rail bridge at Sabula	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season.** The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays.
32	UP*	UP rail bridge at Clinton	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season.** The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays.
33	BNSF and CP*	Crescent Bridge at Davenport	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season**, and the bridge is functionally obsolete. The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays.
34	BNSF, CP, and IAIS*	Government Bridge at Davenport	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season**, and capacity is marginal for rail cars with a maximum allowable gross weight of 286,000 lb. The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays.
35	BNSF*	BNSF rail bridge at Fort Madison	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season.** The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations causes delays to rail and highway traffic that share the bridge.
36	KJRY	Twin Rivers Yard at Keokuk	**Insufficient storage and switching capacity**, as well as the inability to block rail traffic properly, exists at this location. In order to alleviate, an increase in yard capacity is necessary.
37	KJRY	Keokuk	**Flood prone area** is at risk of closure due to Mississippi River flooding (e.g. 2008).
38	KJRY*	KJRY rail bridge at Keokuk	**Swing-span bridge over Mississippi River closes to rail traffic to accommodate barge passage on the river during navigation season.** The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause delays.

**Location also listed as a waterway bottleneck*

Source: Railroad companies

Waterway

Iowa is bordered by two navigable rivers that provide an economical option for moving bulk products to and from the state. The Missouri River (M-29 Marine Highway) on the west and the Mississippi River (M-35 Marine Highway) on the east connect to an extensive national inland waterway system and international deep-sea ocean port facilities at the Gulf Coast.

Both rivers are part of America's Marine Highway Program that is dedicated to expanding the use of the nation's navigable waterways in order to relieve landside congestion, reduce air emissions, and generate other public benefits by increasing the efficiency of the surface transportation system. The M-29 Marine Highway runs from Sioux City, Iowa, to Kansas City, Missouri. The M-35 Marine Highway runs from St. Paul, Minnesota, to Grafton, Illinois.

Located along these rivers are 63 barge terminals (57 on the Mississippi, six on the Missouri) in Iowa, owned and operated by private companies (see Appendix 1). These terminals transfer commodities between barge, rail, and truck. Freight moving via waterway in Iowa is primarily moving through facilities on the Mississippi River, within the boundaries of either the Upper Mississippi River Ports or Mid America Port Commission port statistical areas, or PSAs (see description on page 53).

A system of locks and dams (Table 2.15) on the upper Mississippi River, operated by the U.S. Army Corps of Engineers, helps to maintain adequate water levels for barge operations. The construction of these locks and dams was authorized in 1930 to achieve a 9-foot navigation channel in the upper Mississippi River. Dams are built on rivers to hold back water and form deeper navigation pools, allowing river vessels to use a series of locks to "step" up or down the river from one water level to another.

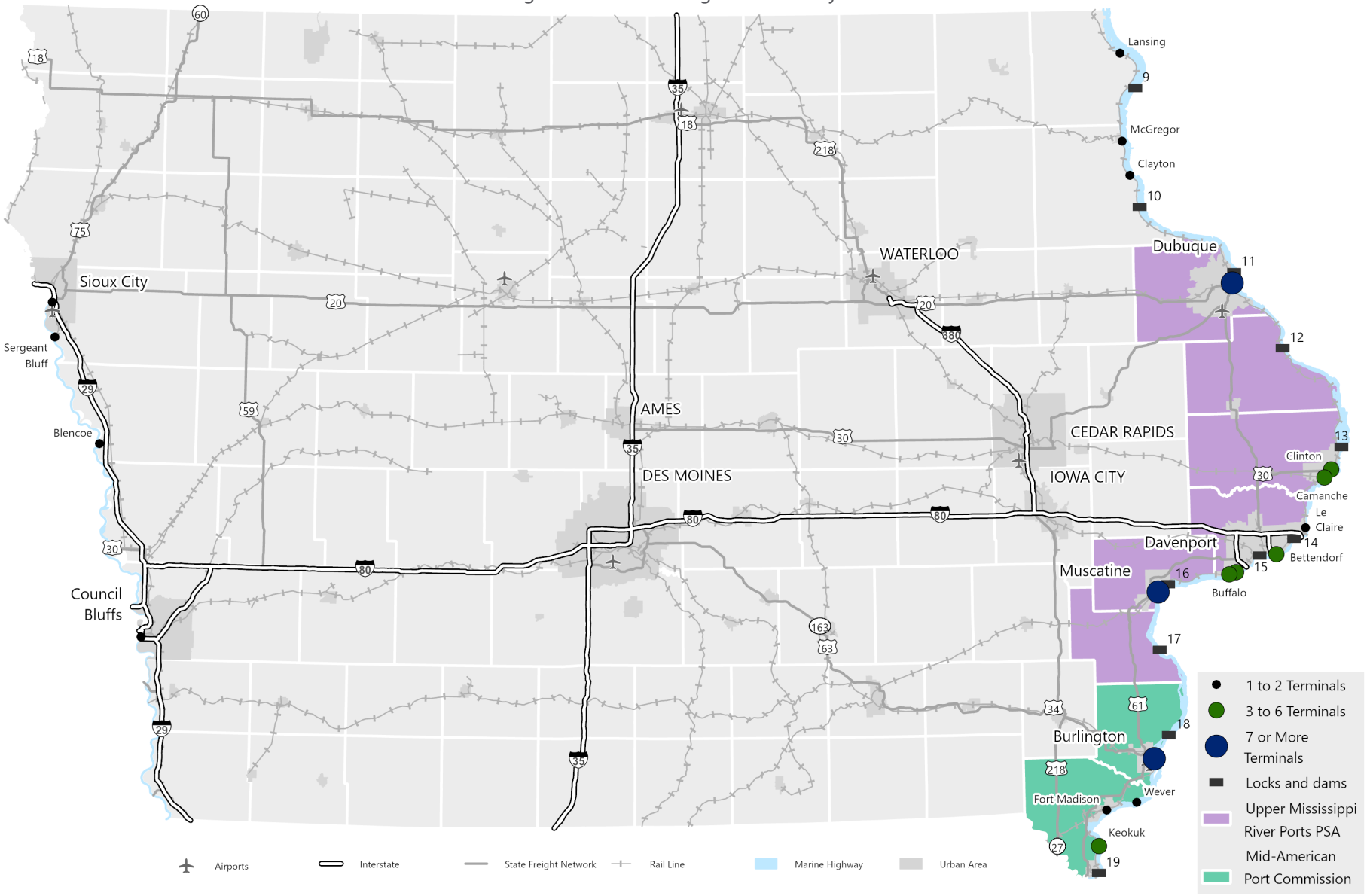
Table 2.15: Iowa Mississippi River locks summary

Lock	Location	Chamber type	River mile	Year open	Length (feet)	Width (feet)
9	Harpers Ferry	Main	647.9	1938	600ft	110ft
10	Guttenberg	Main	615.1	1936	600ft	110ft
11	Dubuque	Main	583	1937	600ft	110ft
12	Bellevue	Main	556.7	1939	600ft	110ft
13	Clinton	Main	522.5	1938	600ft	110ft
14	Le Claire	Main	493.0	1922	600ft	110ft
14	Le Claire	Auxiliary	493.0	1939	320ft	80ft
15	Rock Island (IL)	Auxiliary	482.9	1934	360ft	110ft
15	Rock Island (IL)	Main	482.9	1934	600ft	110ft
16	Muscatine	Main	457.2	1937	600ft	110ft
17	New Boston (IL)	Main	437.1	1939	600ft	110ft
18	Gladstone (IL)	Main	410.5	1937	600ft	110ft
19	Keokuk	Main	364.3	1957	1,200ft	110ft

Source: U.S. Army Corps of Engineers

Tug and barges at Lock 12 (Source: Iowa DOT)

Figure 2.23: Iowa navigable waterways



Source: U.S. Army Corps of Engineers

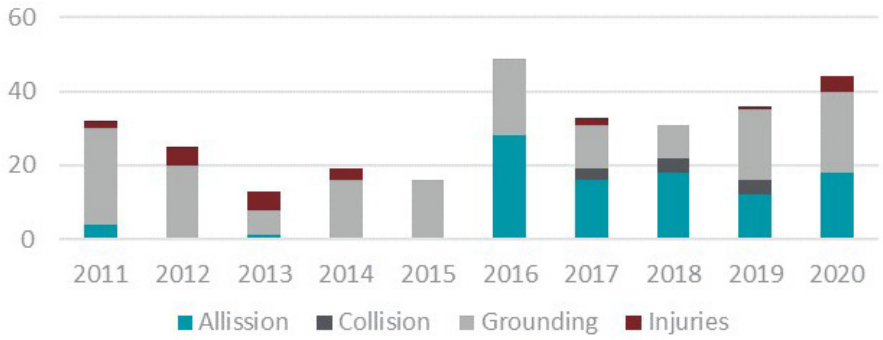
Condition

The American Society of Engineers Report Card for America's Infrastructure graded the inland waterway system as a D+, reflecting the age, condition, and reliability of the infrastructure. The system relies primarily on public investment and has suffered from chronic underfunding and many of the country's locks and dams have reached or even far exceeded design life, resulting in infrastructure deteriorating faster than it's being replaced.

The locks and dams bordering Iowa are undersized for modern Upper Mississippi tow lengths and are hindered by unscheduled repairs. The average age of these 11 locks and dams is over 80 years, 30 years past their design life. Only one lock bordering Iowa is long enough to accommodate a modern 1,200-foot barge tow. The remaining 10 are 600 feet long, which means barge operators must split the tow in half, lock through multiple times, and resecure the barges together before continuing. This creates major delays and congestion at each lock and dam, generating a ripple effect and longer delays throughout the rest of the system.

Also contributing to delay times is lock unavailability, both scheduled and unscheduled. Due to the age and condition of the infrastructure, locks and dams often must be closed for maintenance and repairs. On average, unscheduled repairs account for more than 50 percent of lock closures.

Figure 2.24: Freight waterway-related safety statistics, 2011-2020



Source: U.S. Coast Guard

Utilization

Barge traffic through Upper Midwest locks increases as the river flows from north to south. Iowa's navigable waterways are primarily utilized for moving bulk products such as grain, fertilizer, and coal, with most of the movements being agricultural exports out of the state and down the Mississippi River. These exports are shipped from Iowa barge terminals to the Gulf of Mexico where they are transloaded onto ocean vessels and shipped around the world.

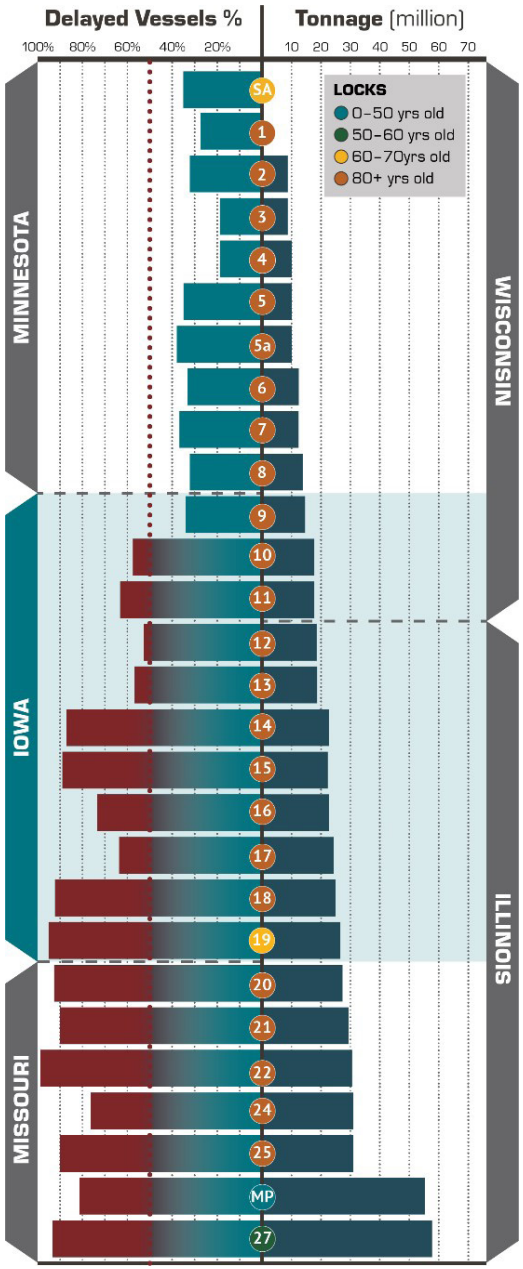
In the past, the Missouri River experienced a continual drop in freight tonnages, partly due to inconsistent water releases from upriver dams and controversy over water usage for all Upper Missouri River basin states. However, barge traffic is increasing on the Lower Missouri River and regular traffic is expected as far north as Blencoe, Iowa due to the opening of a new barge terminal in 2021 (see description on page 53).

Safety

There was a total of 276 freight-related allisions, collisions, and groundings on the Mississippi (270) and Missouri (6) rivers along Iowa's borders in the last ten years. There were no fatalities or missing crew members aboard towing vessels or barges along Iowa's border over that same period. However, there were 22 crew members injured – 21 on the Mississippi River and one on the Missouri River.

An **allision** is an event where a breakaway barge or navigating vessel makes contact with a stationary object (e.g., bridge, pier, dock, buoy, or moored vessel). A **collision** is an event where two objects underway or navigating vessels make contact. A **grounding** is an unintentional contact with the shore or bottom of the river, including unknown submerged objects.

Figure 2.25: Upper Mississippi River lock performance, 2020



Source: U.S. Army Corps of Engineers

Port statistical areas in Iowa

The Mississippi River Ports of Eastern Iowa and Western Illinois, doing business as Upper Mississippi River Ports PSA, consists of the existing ports and terminals in Dubuque, Jackson, Clinton, Scott, Muscatine, and Louisa counties, as well as others in Illinois. The Mid America Port Commission PSA consists of the existing ports and terminals in Des Moines and Lee Counties, as well as others in Illinois and Missouri.

The terminals in the region have been functioning for over 150 years, but were federally recognized as PSAs in 2020. These port statistical areas will leverage industry partnerships to promote economic opportunities, raise national awareness of their strategic importance for shipping commodities, and recognize the production and movement of freight as a vital economic driver for the region.

Port of Blencoe

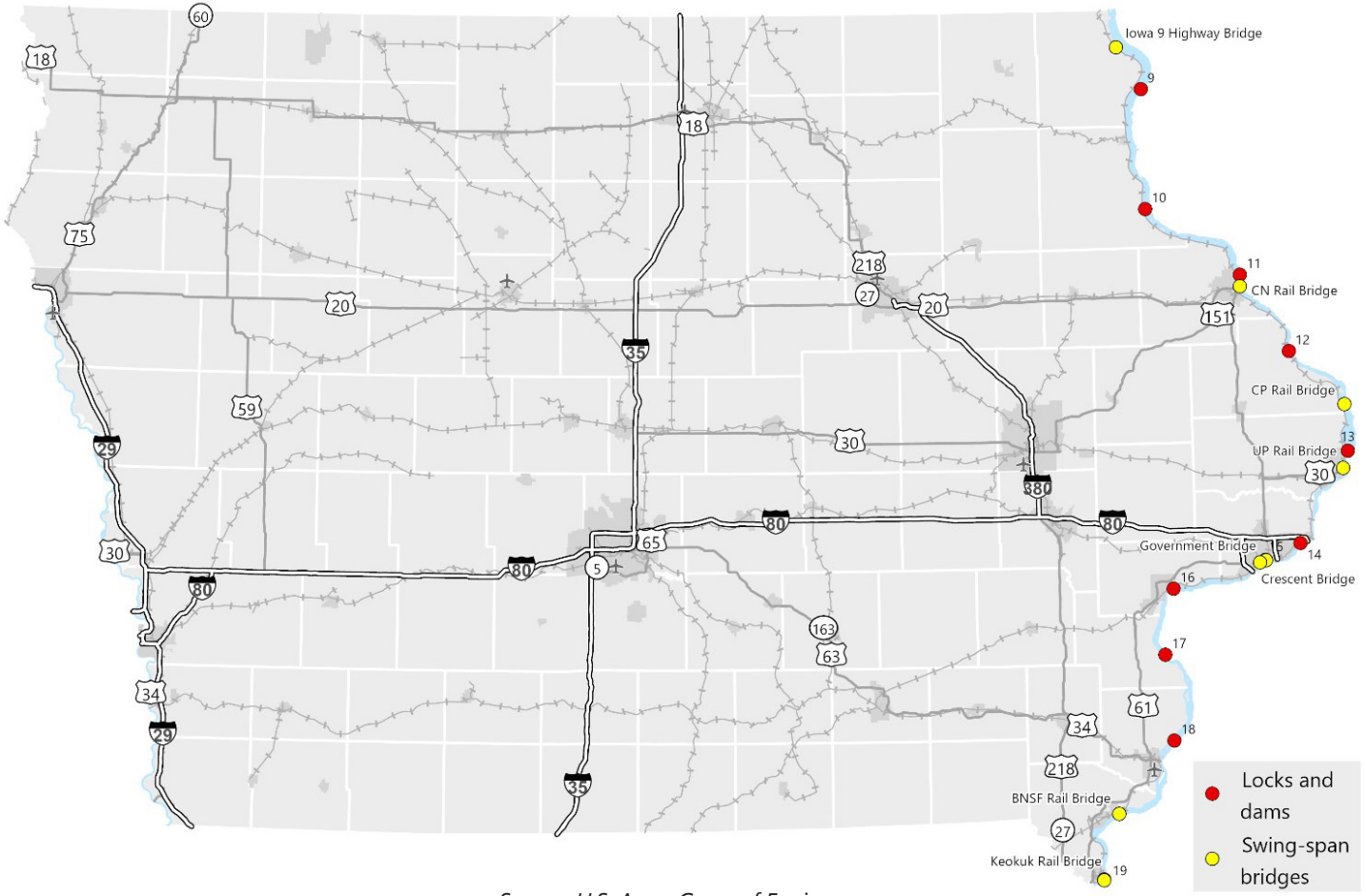
Located halfway between Council Bluffs and Sioux City, the NEW Cooperative Port of Blencoe serves as the northernmost gateway to the world market from the Missouri River. NEW Cooperative originally initiated the development of this terminal as a solution to growing transportation needs and a way to increase soybean basis for area farmers. The company was moving 36,000 tons of fertilizer via truck from the Mississippi River at Dubuque each year. Utilizing the Port of Blencoe now saves an estimated 248,000 truck miles and 58,000 gallons of fuel annually, significantly reducing carbon emissions.

The facility, which started moving traffic in early 2021, now handles corn, soybeans, dry fertilizers, soybean meal, dried distillers grains, and rock. There are multiple expansion projects planned (as of December 2021) to improve the performance and efficiency of the terminal, as well as a number of inquiries to move additional commodities such as wind turbine blades.

Reliability

Given the condition, size, and average delay of the 11 locks bordering Iowa, all are considered freight bottlenecks. It is clear that a lack of repairs, maintenance, and modernization will continue to have a negative impact on the efficiency and condition of the infrastructure. Failure or closure of a lock could be catastrophic for the region as there aren't any alternative routes. Seven swing-span bridges over the Mississippi River in Iowa are also considered bottlenecks. These bridges must "swing" open to allow for barge traffic to pass on the river before returning to the original placement for trains and vehicular traffic to cross. Although rail and highway traffic may not create an obstruction to marine traffic, delays can still occur due to rail operations. The Iowa 9 highway bridge over the Mississippi River was also identified due to the physical challenges it causes marine traffic.

Figure 2.26: Waterway freight bottlenecks



Source: U.S. Army Corps of Engineers

Table 2.16: Waterway freight bottlenecks

	Description	Location	Freight mobility issue
1	Iowa 9 highway bridge	Lansing	Curve of the river, dolphin protectors, and bridge piers cause barge delays.
2	Lock and Dam 9	Harpers Ferry	Age (1938), chamber size (600 ft.), delay (1.3 hours), annual closures (9)
3	Lock and Dam 10	Guttenberg	Age (1936), chamber size (600 ft.), delay (2.5 hours), annual closures (7)
4	Lock and Dam 11	Dubuque	Age (1937), chamber size (600 ft.), delay (2.5 hours), annual closures (19)
5	CN rail bridge*	Dubuque	Swing-span rail bridge must be opened to accommodate barge traffic.
6	Lock and Dam 12	Bellevue	Age (1939), chamber size (600 ft.), delay (2.1 hours), annual closures (3)
7	CP rail bridge*	Sabula	Swing-span rail bridge must be opened to accommodate barge traffic
8	Lock and Dam 13	Clinton	Age (1938), chamber size (600 ft.), delay (1 hour), annual closures (11)
9	UP rail bridge*	Clinton	Swing-span rail bridge must be opened to accommodate barge traffic.
10	Lock and Dam 14	Le Claire	Age (1922), chamber size (600 ft.), delay (1.7 hours), annual closures (15)
11	Government Bridge*	Davenport	Swing-span rail bridge must be opened to accommodate barge traffic.
12	Lock and Dam 15	Rock Island (IL)	Age (1934), chamber size (600 ft.), delay (2 hours), annual closures (29)
13	Crescent Bridge*	Davenport	Swing-span rail bridge must be opened to accommodate barge traffic.
14	Lock and Dam 16	Muscatine	Age (1937), chamber size (600 ft.), delay (2.6 hours), annual closures (11)
15	Lock and Dam 17	New Boston (IL)	Age (1939), chamber size (600 ft.), delay (1.8 hours), annual closures (17)
16	Lock and Dam 18	Gladstone (IL)	Age (1937), chamber size (600 ft.), delay (1.3 hours), annual closures (8)
17	BNSF rail bridge*	Fort Madison	Swing-span rail bridge must be opened to accommodate barge traffic.
18	Lock and Dam 19	Keokuk	Age (1957), delay (1.4 hours), annual closures (17)
19	KJRY rail bridge*	Keokuk	Swing-span rail bridge must be opened to accommodate barge traffic.

**location also listed as a railroad bottleneck*

Source: U.S. Army Corps of Engineers

Freight-generating facilities

Iowa's freight system includes a number of facilities that enable the smooth transfer of goods from one mode to another. These allow shippers to take advantage of the cost, speed, and capabilities of multiple modes.

The terms "intermodal" and "multimodal" are often used interchangeably, yet they can have entirely different meanings. Multimodal focuses on the different modal options that could be utilized to move goods from one place to another. Intermodal focuses on how two or more of these modes can connect at what typically amounts to a transfer point, such as an intermodal container facility or transload location. To put it another way, multimodal options provide the links in the transportation system, while intermodal connections are the nodes.

These intermodal transfer facilities are identified in the planning process as vital parts to the state's rail and water freight networks because they rely on trucking for pickup and delivery, which can produce significant freight traffic flowing to and from these locations.

Intermodal container facility

An **intermodal container facility** refers to the transfer of freight using an intermodal container or trailer through multiple modes of transportation (rail, barge, and/or truck) without the handling of the freight itself when changing modes. This method improves security and transportation speed while reducing the damage and loss of goods.

- **Container transfer facilities** handle rail-to-truck and truck-to-rail transfers in sealed units such as trailer-on-flatcar (TOFC) or container-on-flatcar (COFC).

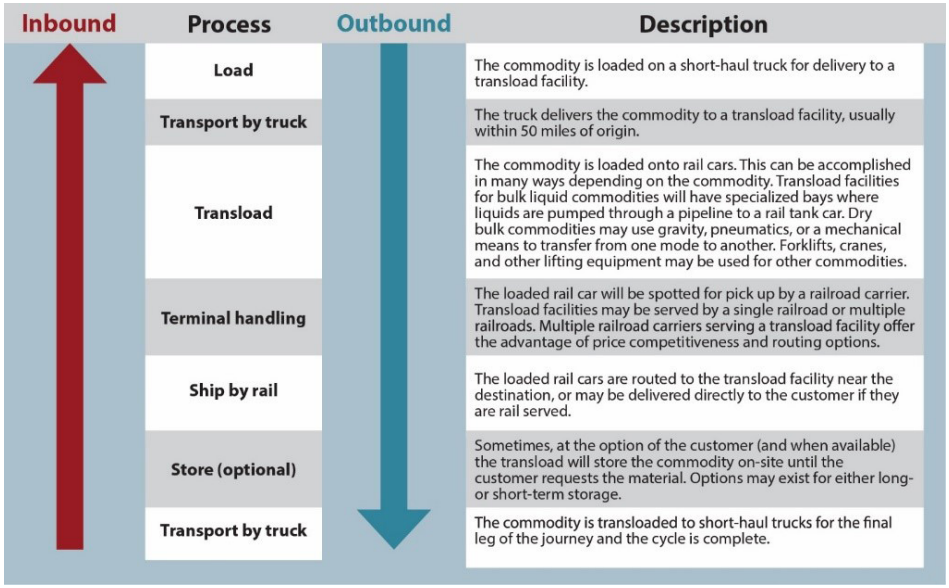
Transload facility

A transload facility refers to the transfer of freight shipments, typically bulk, from the vehicle/container of one mode to that of another at a terminal interchange point. Transloading works for a variety of commodities, including finished and unfinished goods, fresh food, lumber, bulk goods, etc.

- A **team track** is the most basic and common type of transload facility in Iowa. It is a simple siding or spur track where rail cars are placed and available for use to load and unload freight. Once the cars are loaded, the railroad is notified to pick them up. Team tracks can be owned by a railroad or a business served by the railroad.
- At a **cross-dock** transload facility, cargo is unloaded from an incoming truck or rail car and is reloaded directly into outbound trucks, trailers, containers, or rail cars. A cross-dock typically allows level loading between modes. This process improves the efficiency of commodity movement by utilizing as much of a container/vehicle as possible.
- **Barge terminals** are locations where commodities are transferred from barges to trucks and/or rail cars (or vice versa). These terminals are a staple of industries moving bulk products by river or inland waterway. Barges can be loaded and unloaded much more rapidly than packaging a bulk product and putting it in a truck and can handle a larger amount of freight and heavier freight than both truck and rail.

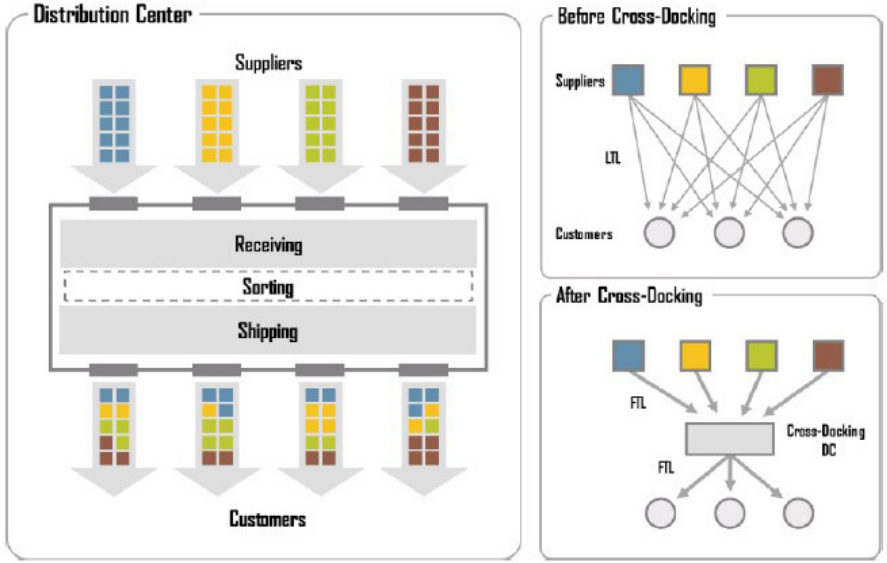
- **Biodiesel and ethanol plants** are production facilities for renewable fuels made with corn and the byproducts of corn production. These locations typically receive raw materials by truck and ship finished biodiesel/ethanol by truck and/or rail. The opportunity to shift from one mode to another qualifies these locations as transloads.
- **Grain elevators** are facilities that collect grain from farmers by tractor and trailer or truck. The grain is then stored and shipped to market via truck and/or rail. Iowa has a vast network of grain elevators to handle the large production of corn and soybeans each year before being transported elsewhere. As is the case with biodiesel and ethanol plants, the multiple transportation options qualify these locations as transloads.

Figure 2.27: Transload process example



Source: Iowa DOT

Figure 2.28: Cross-docking process example



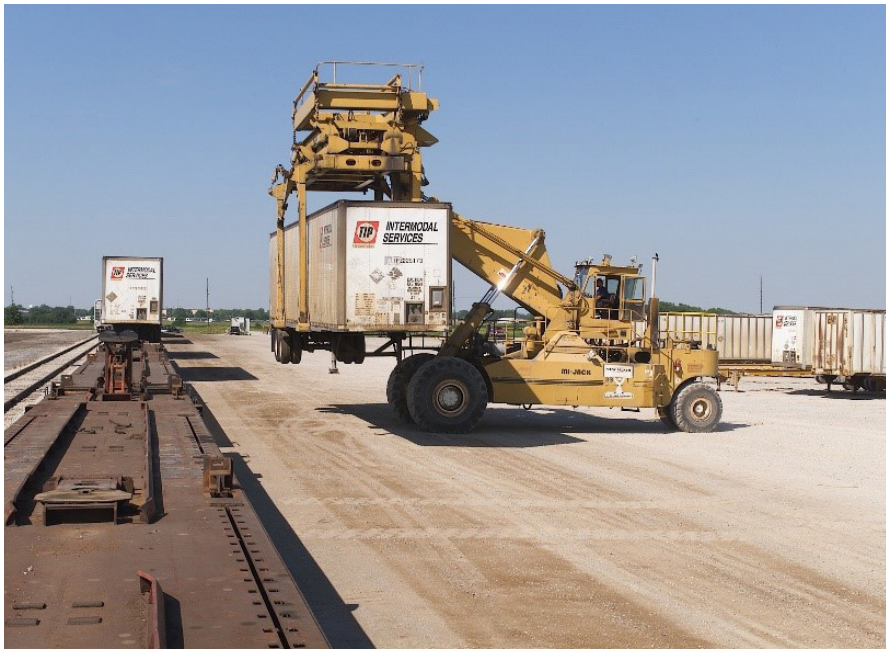
Source: Hofstra University

Other freight-generating facilities

The multimodal options within Iowa include a number of warehouses and distribution centers that collect and distribute freight. These locations can generate many truck trips from the shipping and receiving of products and commodities, which makes these facilities an important part of the planning process.

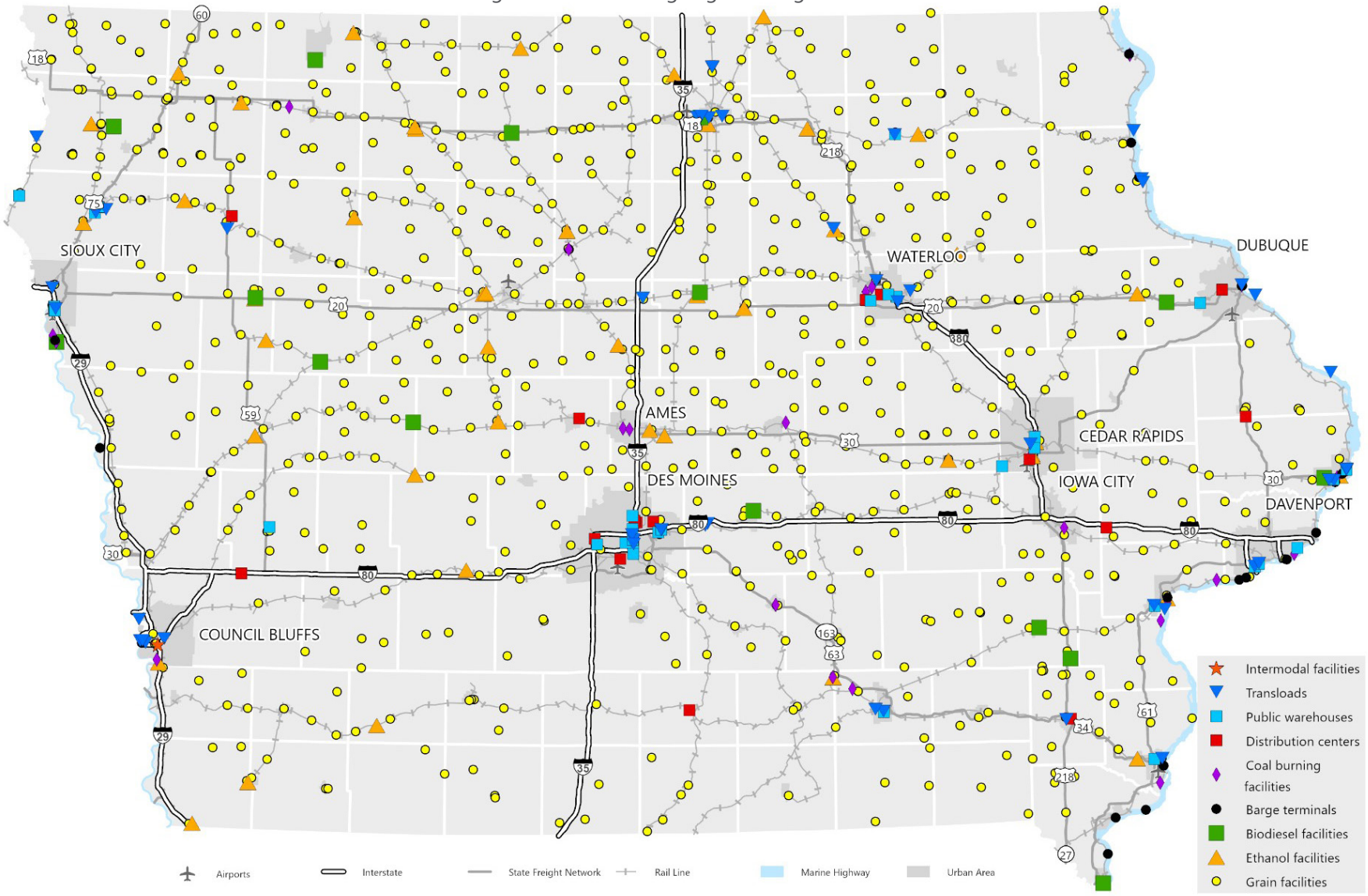
- **Warehouse** refers to a commercial building for storage of goods, which can include any raw materials, packing materials, spare parts, components, or finished goods associated with agriculture, manufacturing, and production. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses, etc., and some warehouses include transloading capabilities to offer short- and long-term storage and handling of goods.
- A **distribution center** is a warehouse or other specialized building often with refrigeration or air conditioning that is stocked with products to be redistributed to retailers, wholesalers, or directly to consumers. A distribution center can also be called a warehouse and serve as the foundation of a supply network as it equips a single location with a large variety of goods.

Appendix 1 includes an inventory of Iowa freight-generating facilities. These lists of freight-generating facilities included in Appendix 1 are not exhaustive. Some existing facilities may not be operational and new facilities may not be represented.



Intermodal container transfer facility in Iowa. (Source: Iowa DOT)

Figure 2.29: Iowa freight-generating facilities



This map is not a comprehensive representation of all of Iowa's freight-generating facilities Some existing facilities may not be operational and new facilities may not be represented.

Source: Iowa DOT, Leonard's Guide, Rail companies, U.S. Army Corps of Engineers

3. INDUSTRIES & COMMODITIES

3.1 Freight-dependent industries | 3.2 Commodity movement | 3.3 Primary supply chains

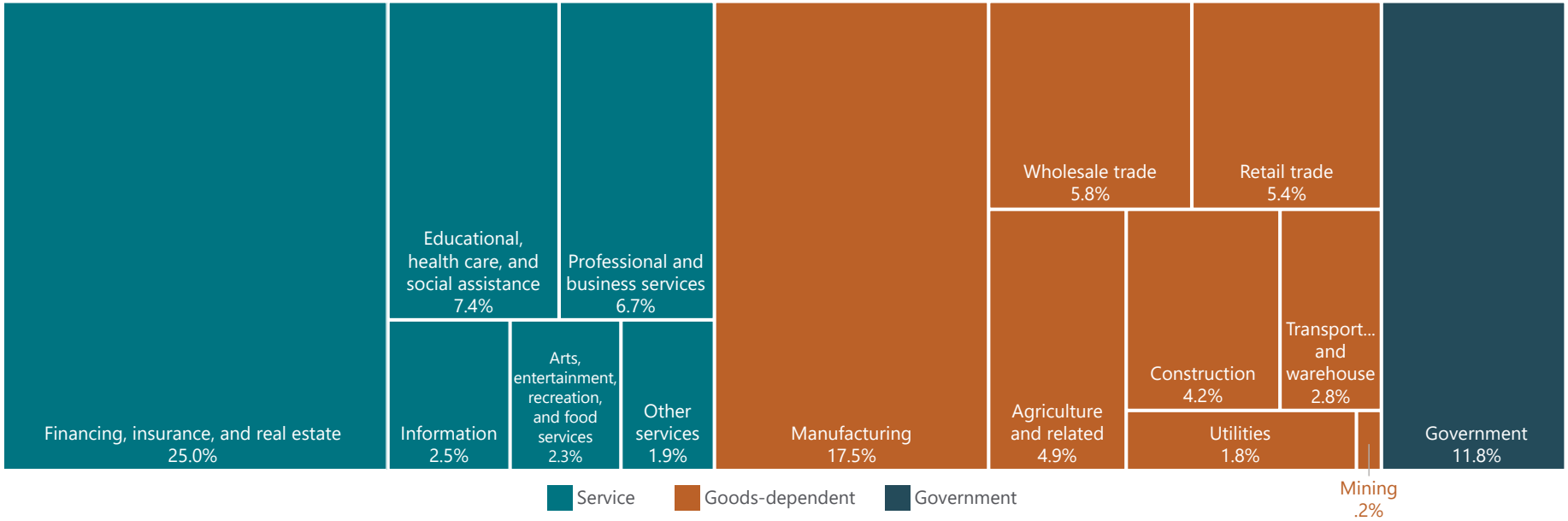
3.1 Freight-dependent industries

Goods-dependent (or freight-dependent) industries are those that rely on transportation to receive raw supplies or manufactured goods and to send their refined or finished products to market. Service industries are not as dependent on the movement of raw or manufactured materials, but do rely on smaller shipments of materials, office products, or other supplies.

Iowa's economy and transportation system are heavily influenced by goods-dependent industries, mostly related to grain production and the associated food and agricultural products and byproducts. The state continues to have a robust agricultural industry with the now added transportation demands of a greatly expanded value-added agricultural products sector, as well as a geographically dispersed industrial base that includes large industrial sectors of manufacturing, trade, construction, transportation, and warehousing that will continue to have significant transportation infrastructure needs.

Gross domestic product (GDP) is the total market value of all goods and services produced in the economy. In 2000, Iowa's GDP was $93 billion; by 2020, Iowa's current-dollar GDP had grown by 107% to $193 billion. Figure 3.1 details the proportion of GDP by each industry.

Figure 3.1: Iowa gross domestic product by industry, 2020



Source: U.S. Bureau of Economic Analysis

3.2 Commodity movement

According to the Federal Highway Administration's Freight Analysis Framework (FAF) tool, freight tonnage moving in the U.S. will double in the next 20 years, which would prove to be a sizable challenge for the overall freight transportation system. This growth will be reflected in Iowa and likely won't be uniform across all modes.

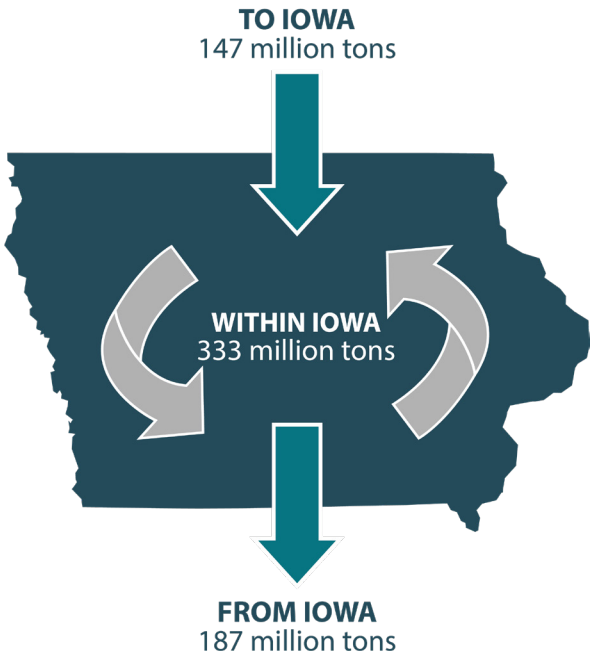
FAF integrates data from a variety of sources (including the Commodity Flow Survey) to create a comprehensive picture of freight movement among states and major metropolitan areas. The tool estimates tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for current and forecasted years. Understanding the flow of freight by weight provides insights into the infrastructure needs in Iowa, while understanding the flow of freight by value provides insights into the economic impact it has on the area.

Iowa's transportation system facilitated the movement of over 666 million tons of freight with an estimated value of $383 billion in 2017 (Figure 3.2). The total weight of goods imported into and exported out of the state is expected to grow (Figure 3.3).

Since the turn of the century, Iowa has remained an exporting state, meaning the state produces and exports more goods than it imports. This is true both in terms of tonnage and value. The gap between Iowa's imports and exports is projected to grow wider, from 40 million tons in 2017 to 115 million tons in 2050.

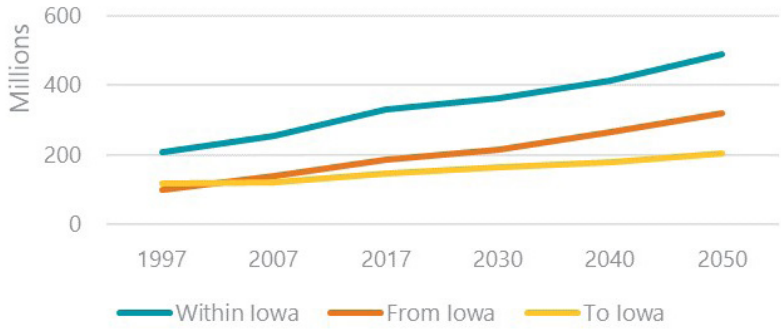
Figure 3.4 shows Iowa's freight tonnage and value by mode in 2017, and the projections for 2050. Truck, rail, and pipeline are the three top modes and collectively transport 93 percent of the tonnage to, from, and within Iowa. These three modes are expected to maintain their prominence through 2050. In addition, the share of each mode's tonnage is expected to remain consistent with small changes of less than one percent, as shown in Table 3.1. The continued prominence of trucks coupled with the projected 52 percent increase in tonnage will have a large impact on the state's highway system. It will result in increased congestion and more rapid deterioration of pavement and structures along the roadways.

Figure 3.2: Iowa freight movement, 2017



Source: Freight Analysis Framework

Figure 3.3: Projected Iowa freight movement by ton, 1997-2050



Source: Freight Analysis Framework

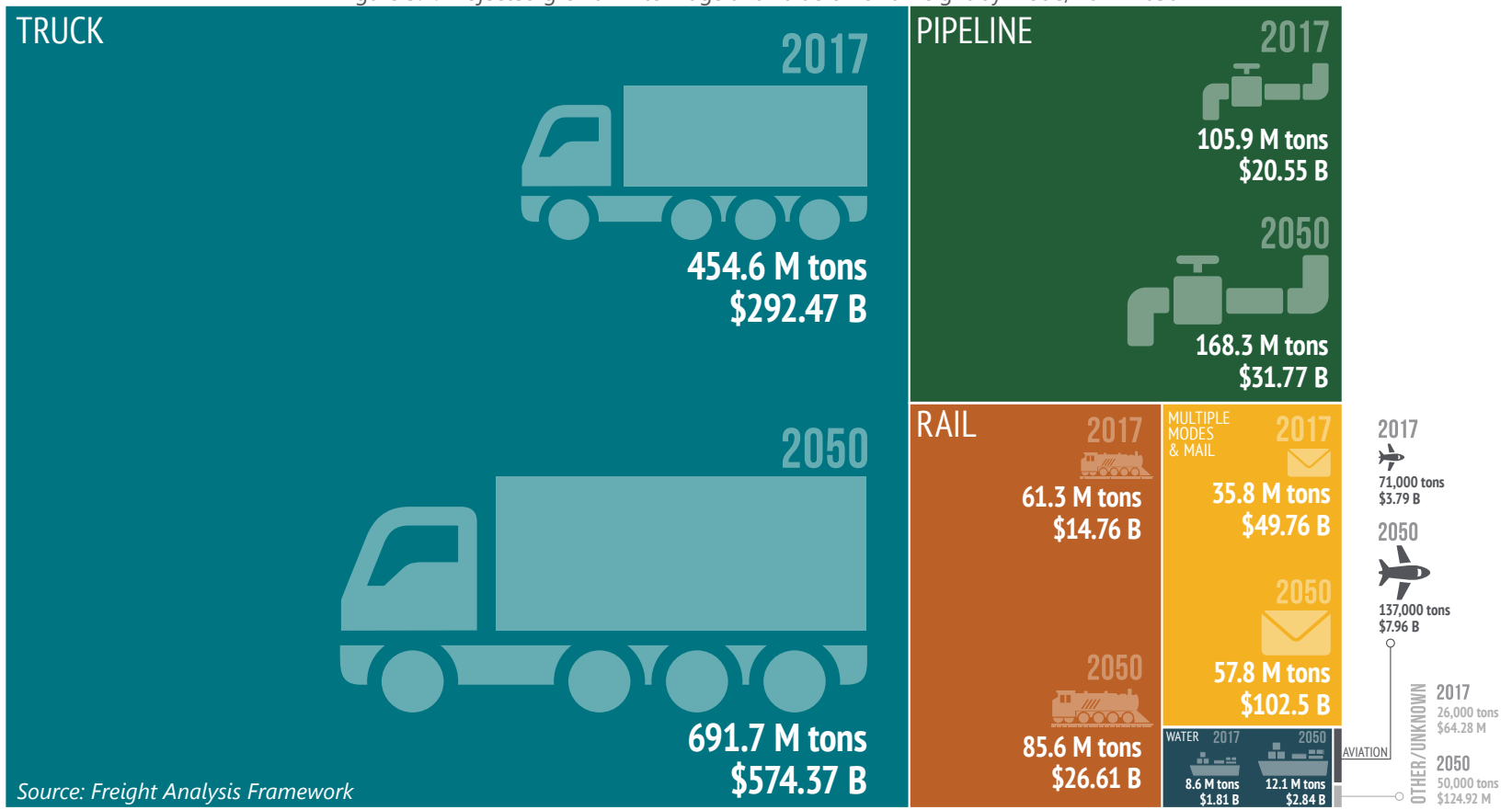
Table 3.1: Projected growth in share of tonnage of Iowa freight by mode, 2017-2050

Mode	Percent of total tonnage (2017)	Percent of total tonnage (2050)
Truck	68.23%	68.11%
Pipeline	15.89%	16.57%
Rail	9.21%	8.43%
Multiple modes & mail	5.37%	5.69%
Water	1.29%	1.19%

Aviation and Other Modes were excluded as they account for less than 1% of total tonnage.

Source: Freight Analysis Framework

Figure 3.4: Projected growth in tonnage and value of Iowa freight by mode, 2017-2050



Commodity flow by tonnage

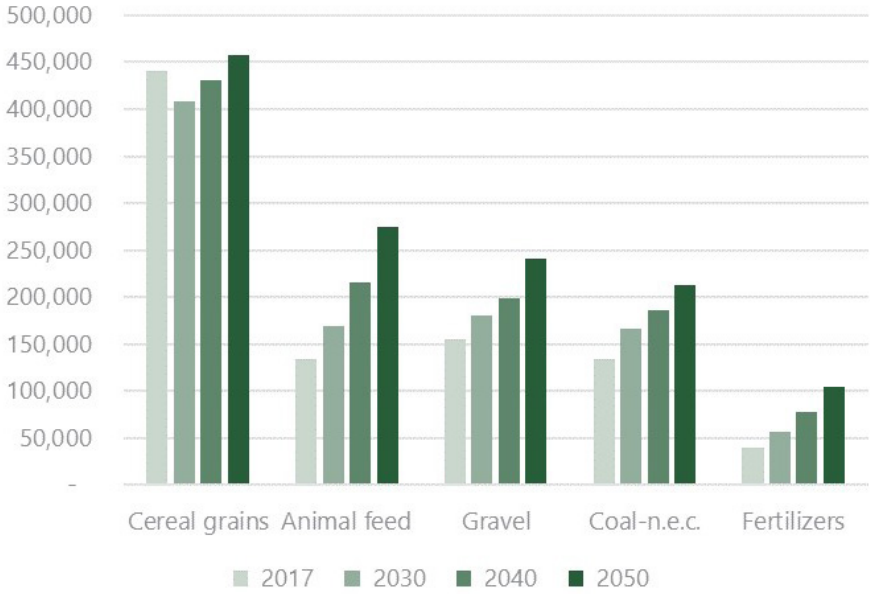
According to FAF, the total weight of Iowa freight (including freight moved within, exported from, and imported to the state) is expected to grow from roughly 666 million tons in 2017 to just over a billion tons in 2050.

In 2050, agricultural products will continue to be the top freight commodities, both as imports and exports. Figure 3.5 shows that cereal grains (such as corn) and animal products and feed (includes eggs) will be the top two commodities imported to and exported from Iowa by weight. These commodities are typically high-weight but low-value bulk shipments.

In terms of weight, cereal grains were the top commodity to move to, from, and within Iowa in 2017. Cereal grains are projected to continue to remain the top commodity through 2050.

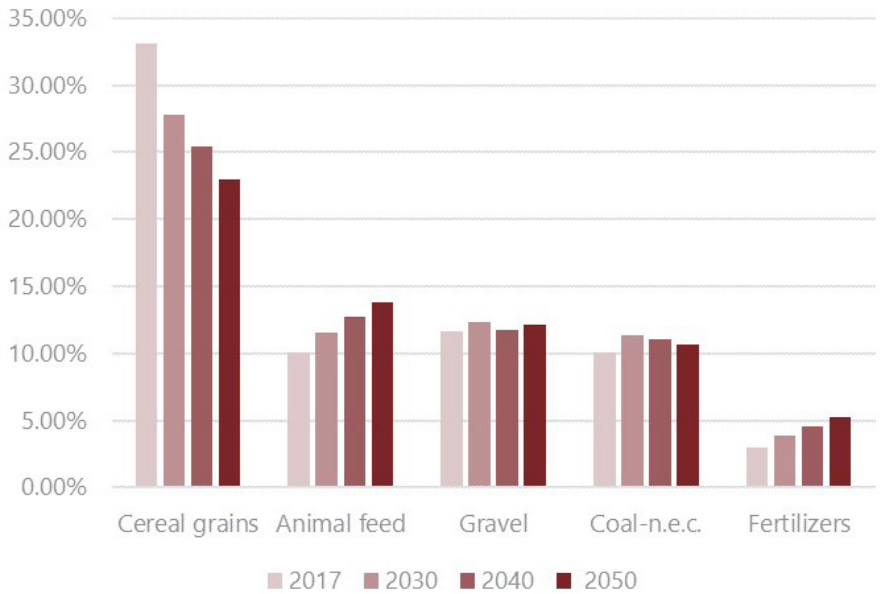
However, as shown in Figure 3.6, cereal grains are projected to become less prominent in part due to growth in other commodities such as animal feed, gravel, and fertilizers.

Figure 3.5: Forecast of Iowa domestic freight by tonnage, 2017-2050



Source: Freight Analysis Framework

Figure 3.6: Forecast of Iowa domestic freight tonnage by market share, 2017-2050



Source: Freight Analysis Framework

Commodity flow by value

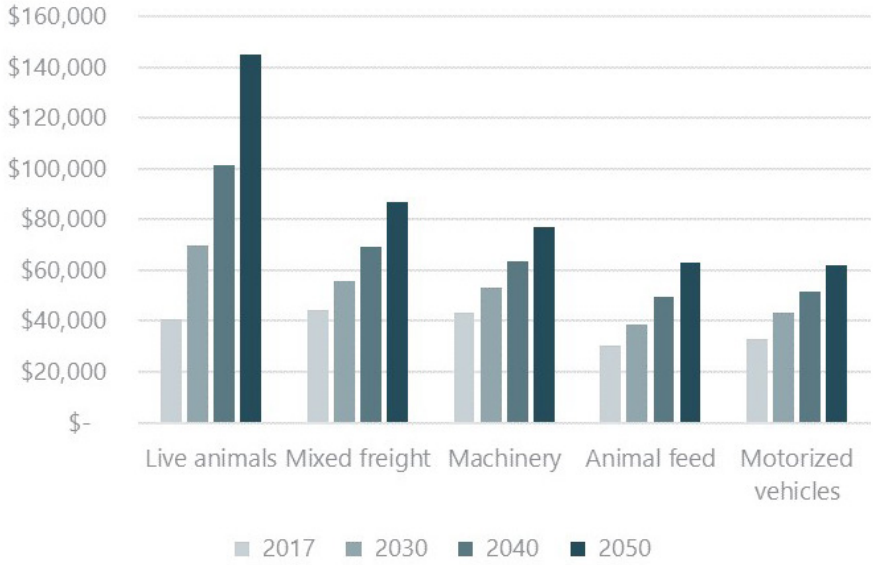
The total value of Iowa freight (including freight moved within, exported from, and imported to the state) is expected to grow from $383.2 billion in 2017 to $746.3 billion in 2050.

In 2050, live animals (such as pork) mixed freight (including items for grocery stores, restaurants, and hardware stores), and machinery (including turbines, boilers, internal combustion engines, and other non-electric motors and engines) will be the top commodities by value, as shown in Figure 3.7. According to FAF, the total value of live animals/fish freight is expected to increase by 255 percent by 2050.

It is interesting to note that while cereal grains (not shown) was the top commodity by value in 2017, it will drop to the 11th most valuable by 2050, according to FAF. This change is not due to a lack of growth. The value of cereal grain freight is expected to grow by 4 percent, but live animals is expected to grow even more.

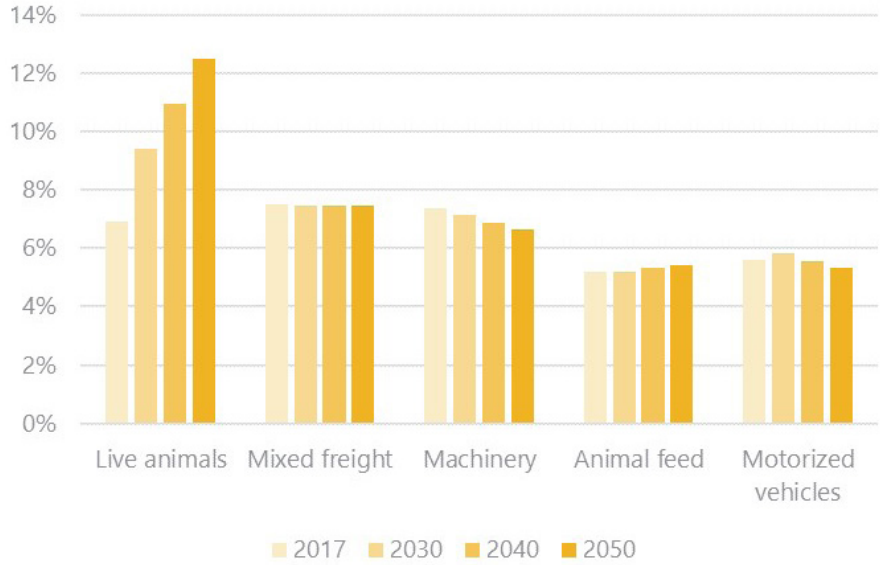
Live animals will continue to become a larger and larger portion of the state's freight by value, as shown in Figure 3.8. However, machinery and motorized vehicles will decline by 0.72 percent and 0.28 percent respectively.

Figure 3.7: Forecast of Iowa domestic freight by value (millions of dollars), 2017-2050.



Source: Freight Analysis Framework

Figure 3.8: Forecast of Iowa domestic freight value (millions of dollars) by market share, 2017-2050



Source: Freight Analysis Framework

Trading partners

In 2017, Iowa's top domestic trading partner by value was Illinois, as shown in Table 3.2. By tonnage, Minnesota was Iowa's top domestic trading partner in 2017, with 88 million tons imported from Minnesota or exported to Minnesota.

Iowa receives most domestic imports from the Great Plains and Midwest regions, as shown in Figure 3.9, with some exports from Louisiana, most likely shipments along the Mississippi and Missouri Rivers.

Iowa exports goods throughout the Midwest, but also to non-Midwest states like Texas (16.9 million tons), Louisiana (9.6 million tons), and California (3.9 million tons). These trading partners are shown in Figure 3.10.

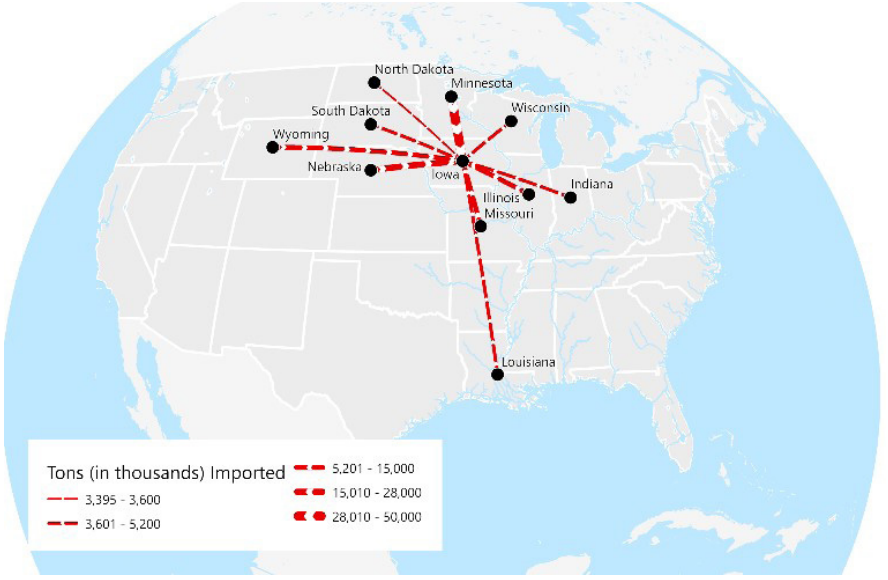
The Iowa DOT believes that with a large majority of Iowa's inbound and outbound freight involving states in the immediate vicinity, the coordination of network identification, regulation, infrastructure projects, and freight-related initiatives is crucial to economic growth and prosperity in the region.

Table 3.2: Iowa's top five domestic trading partners by value (millions of dollars), 2017

State	Imported from Iowa ($)	Exported to Iowa ($)	Total ($)
Illinois	$22,644.86	$18,987.94	$41,632.80
Minnesota	$16,851.56	$16,447.80	$33,299.36
Nebraska	$10,082.55	$11,119.62	$21,202.16
Texas	$11,310.54	$5,076.50	$16,387.04
Missouri	$7,613.68	$7,712.34	$15,326.02

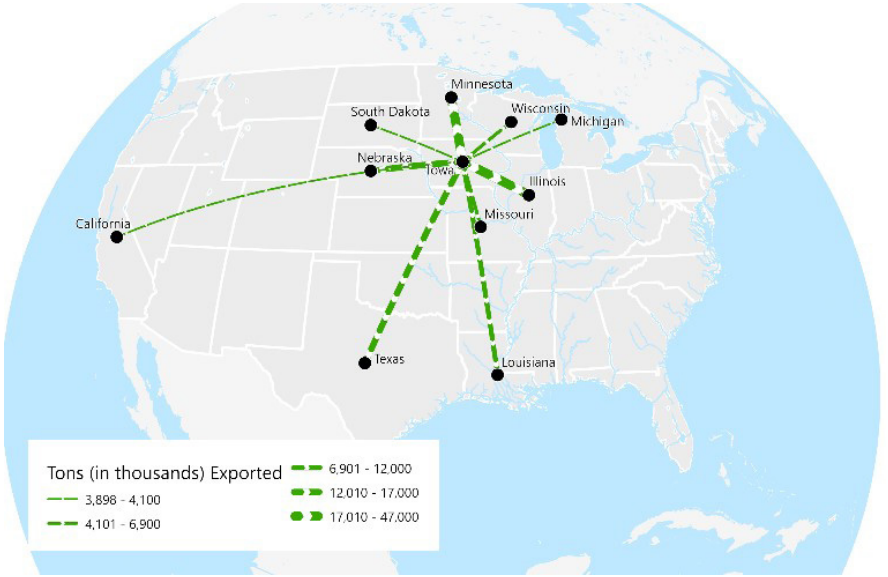
Source: Freight Analysis Framework

Figure 3.9: Top 10 domestic exporters to Iowa by tonnage, 2017



Source: Freight Analysis Framework

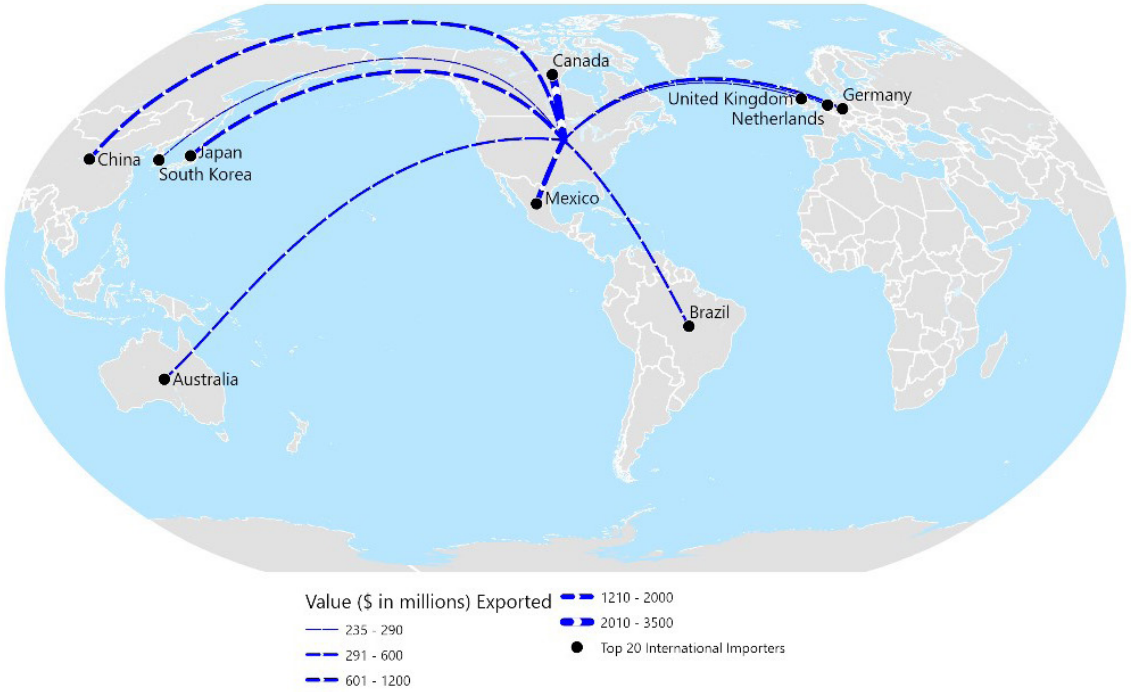
Figure 3.10: Top 10 domestic importers from Iowa by tonnage, 2017



Source: Freight Analysis Framework

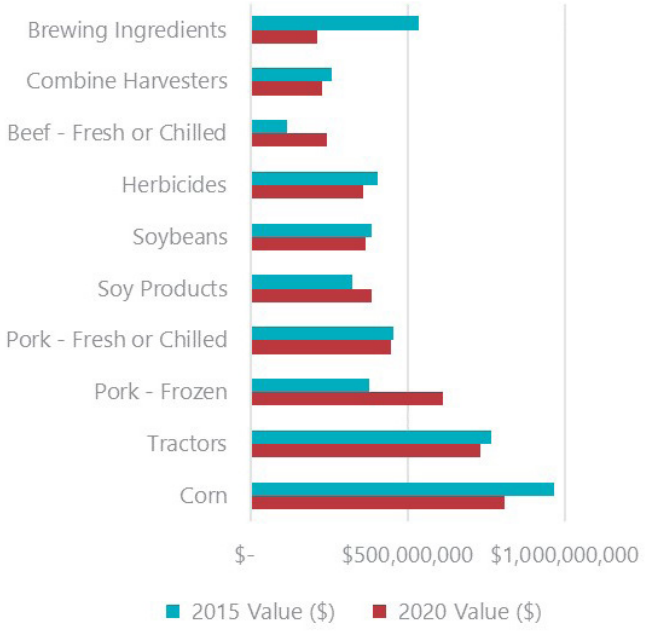
In 2020, Iowa's top trading partner was Canada at $3.5 billion of goods, followed by Mexico at almost $2 billion, and China at $1.2 billion. Figure 3.11 shows the locations of Iowa's top ten international trading partners, and the value of goods exported. The state of Iowa exported roughly $12.6 billion in goods in 2020. The top commodity in 2020 was corn, followed by tractors, and then pork. Figure 3.12 shows the top ten commodities exported internationally. Because international trade is an important factor affecting freight transportation in Iowa, the Iowa DOT pays special attention to international trading lanes (such as the Panama Canal) and trading regulations.

Figure 3.11: Iowa's top 10 international trading partners (exports only) by value, 2020



Source: U.S. Census Bureau and U.S. Trade Online

Figure 3.12: Iowa's top 10 exported commodities by value, 2020



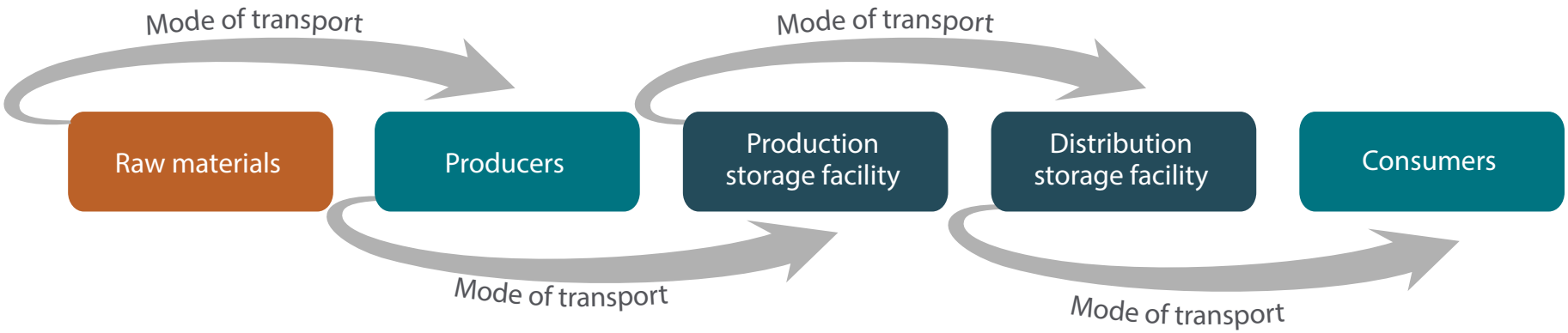
Source: U.S. Census Bureau and U.S. Trade Online

3.3 Primary supply chains

Although Iowa has a diverse economy made up of many service and goods-dependent industries, agriculture-related products dominate the state's imports and exports. Whether it is corn, products made from corn, farm machinery, meat, animal health products, or agricultural chemicals, many products moving on the freight transportation system are closely tied to the agricultural industry.

The movement of these commodities from origin to destination is reliant on efficient and profitable supply chains. Supply chains encompass the myriad of transportation legs and logistics functions associated with the complete process of bringing commodities from production to market. They incorporate a network of individuals, processes, and physical entities involved in producing, handling, and/or distributing a specific commodity, all of which are linked together by information and transportation infrastructure. Figure 3.13 shows a basic example of a supply chain that goes from the production of a commodity through various stops and using multiple modes of transportation before reaching the market and, ultimately, consumers.

Figure 3.13: Basic supply chain diagram



Source: Iowa DOT

Iowa is fortunate to have transportation infrastructure that has long provided Iowa producers and businesses with a strong comparative advantage, fostering the ability to efficiently and competitively serve domestic and global markets. As a producer-state, it is extremely valuable to have transportation flexibility that includes an advanced highway network, well-developed rail system, two navigable rivers, extensive pipeline grid, and several commercial airports that open the door to multiple options for producers and businesses to optimize their supply chains.

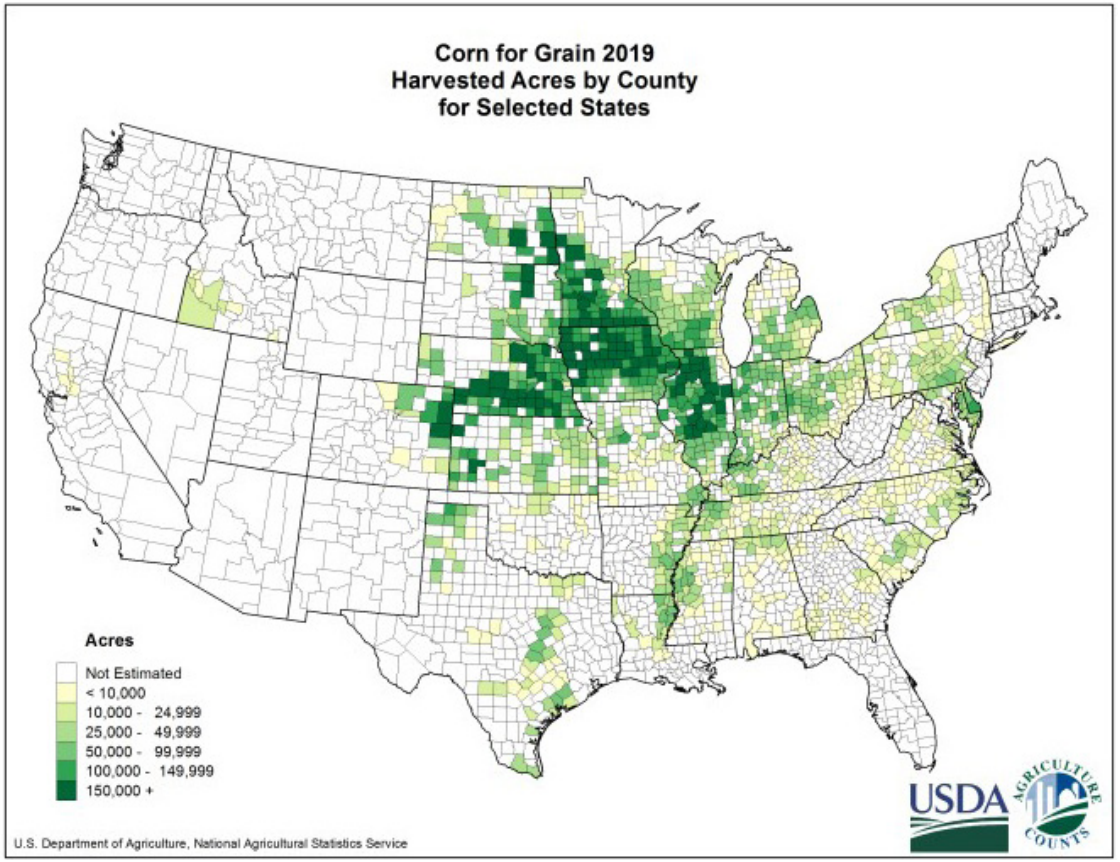
This section will provide an overview for a few of the major supply chains in Iowa. These commodities are not an exhaustive list of important commodities in the state but are major imports and exports by weight and value (see Section 3.2, Commodity movement) and have a large impact on the freight transportation system.

Corn

According to the U.S. Department of Agriculture (USDA), Iowa corn farmers produced 2.3 billion bushels of corn on 12.9 million acres of land in 2020, accounting for over 16 percent of total U.S. corn production. This is a consistent trend as the state has produced the largest corn crop of any state each year for two decades. Figure 3.14 shows the number of acres of corn harvested in each U.S. county in 2019 with the darkest green, representing the most acres, being concentrated in and around Iowa.

With the help of constant innovation, Iowa corn and corn byproducts are used to produce countless products in the state and around the world, such as food, fuel, pharmaceuticals, oils, sweeteners, starches, and plastics, with the majority being dedicated to food and fuel. Iowa is a national leader in the production of ethanol, dried distillers grains (DDGs), and other livestock feed. One-third of the corn that goes into producing ethanol comes out as DDGs – a byproduct of the process that is a high-value feed grain for livestock. Millions of bushels of corn (or corn byproducts) are consumed by Iowa livestock annually, mainly hogs, cattle, and poultry. The readily available livestock feed has helped Iowa consistently be a national leader in the production of eggs, pork, and beef, all of which are major Iowa and U.S. exports to top markets such as Japan, Mexico, and China. Another byproduct of corn production is corn stover, the above-ground part of the corn plant remaining after the grain is harvested, which can be used for ethanol production, cattle feed, livestock bedding, and building materials.

Figure 3.14: Corn acres harvested, 2019



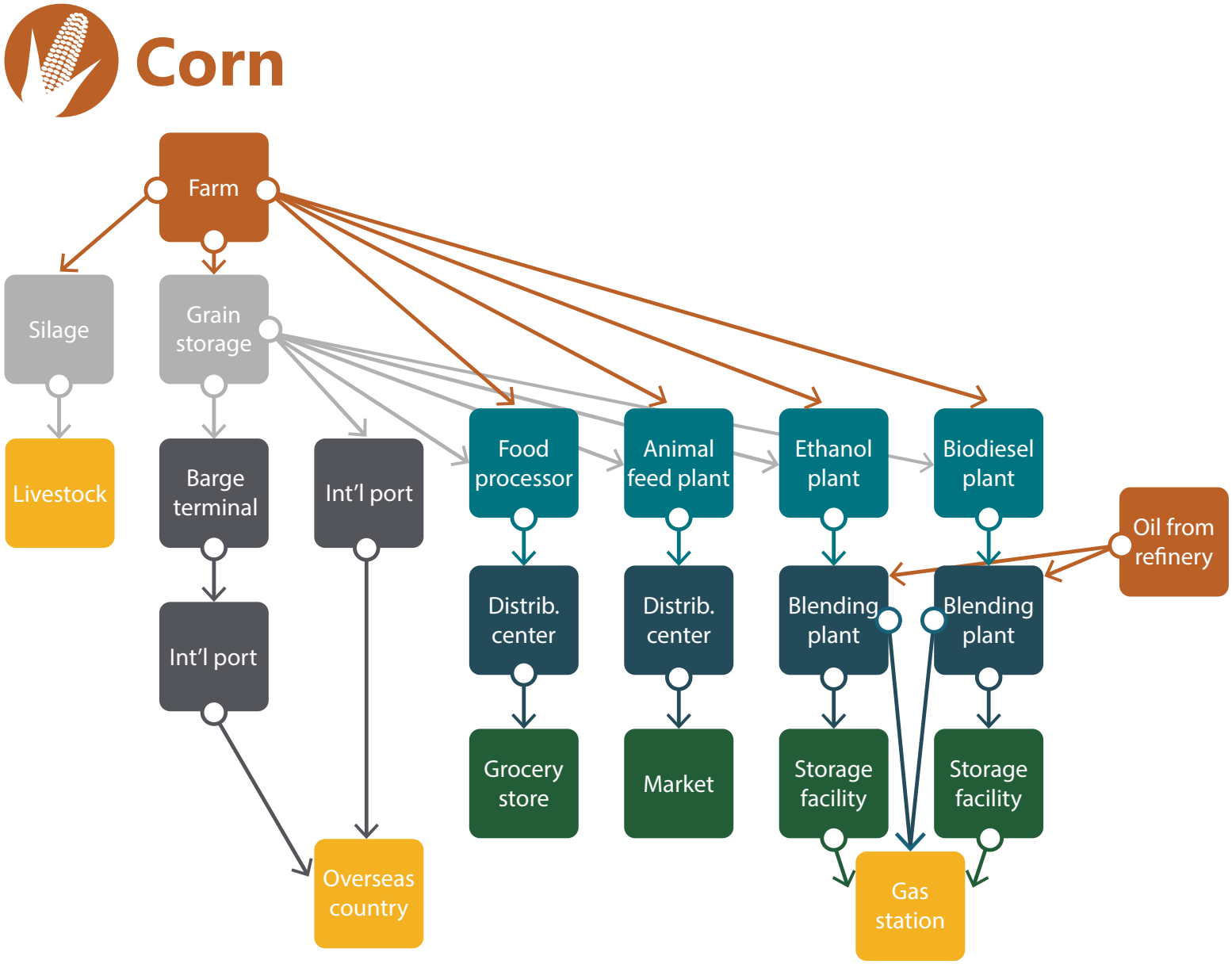
Source: U.S. Department of Agriculture

One bushel of corn is equivalent to:

- 2.9 gallons of ETHANOL
- 16 pounds DDGs
- 8 pounds BEEF
- 15.6 pounds of PORK
- 21.6 pounds of CHICKEN
- 30 pounds of TURKEY

Source: Iowa Corn Growers Association

Figure 3.15: Corn supply chain



Source: Iowa DOT

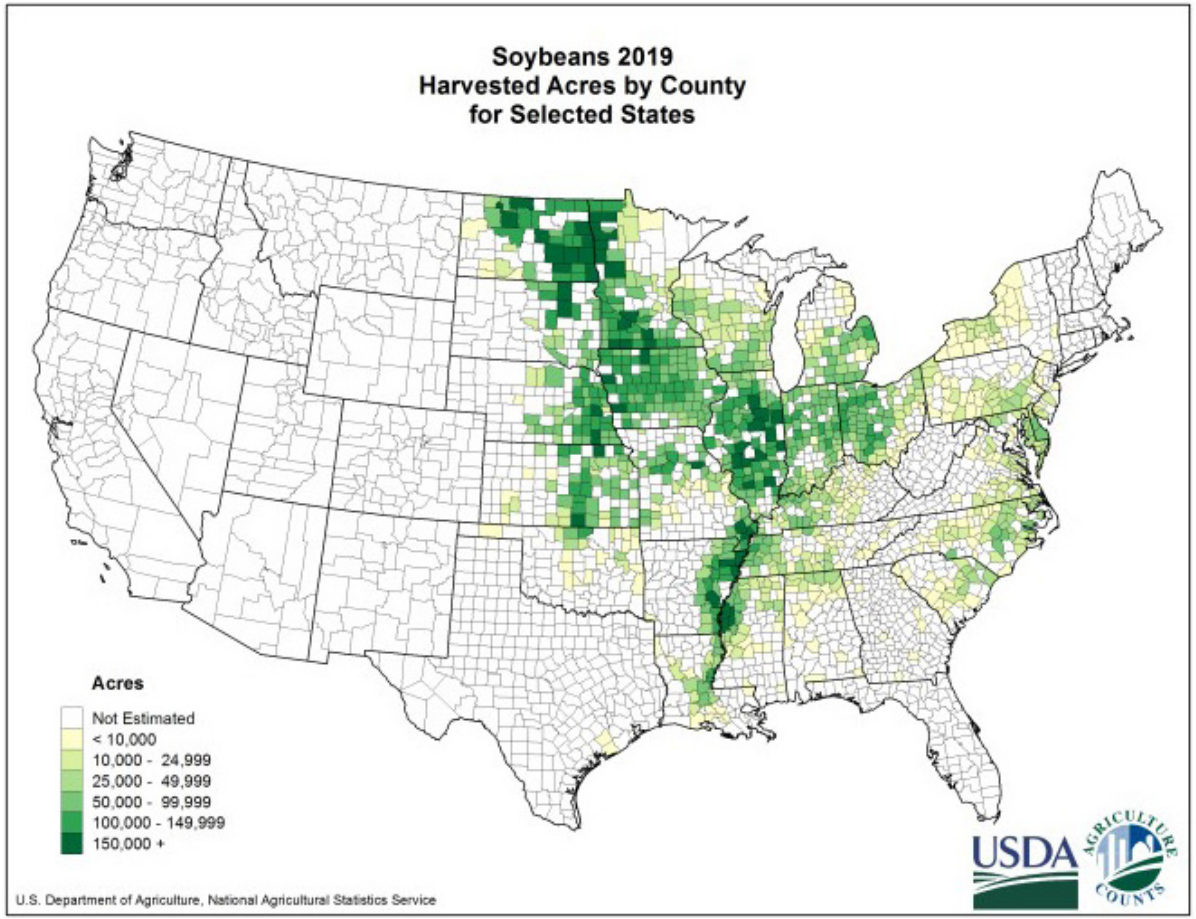
Soybeans

Iowa is also a leader in the production of soybeans, consistently ranking in the top three states in the nation each year. Iowa farmers produced 506 million bushels on 9.3 million acres in 2020. This translates to 12 percent of the nation's soybean production. Figure 3.16 shows the number of acres of soybeans harvested in each U.S. county in 2019 with the darkest green, representing the most acres, being concentrated in and around Iowa.

Soybeans are processed into numerous forms such as soy meal and soybean oil used to make valuable products consumed domestically and internationally. Soy meal is a major ingredient in animal feed for pork and poultry and makes up a majority of soybean production. Soybean oil, the second most consumed oil in the world, is used to produce food products such as margarine, salad dressings, and cooking oils, as well as industrial products like plastics and biodiesel fuel.

Like corn, soybeans are a major Iowa and U.S. export to countries around the world. Top buyers of soybeans include China, Mexico, and Japan; top markets of soy meal are Mexico, Philippines, and Canada; and the top destinations for soybean oil are China, Mexico, and India.

Figure 3.16: Soybean acres harvested, 2019



Source: U.S. Department of Agriculture

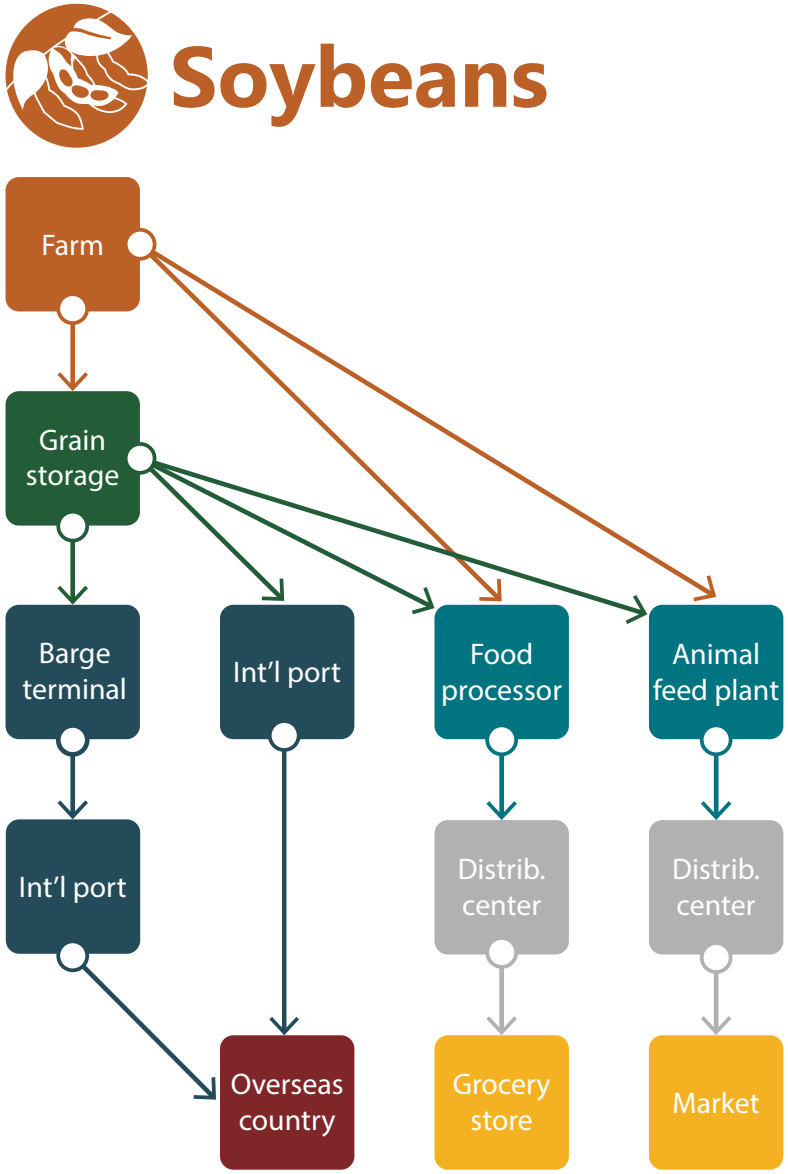
One bushel of soybeans is equivalent to:

48 pounds of SOY MEAL

11 pounds of SOYBEAN OIL

Source: Iowa Soybean Association

Figure 3.17: Soybean supply chain



Source: Iowa DOT

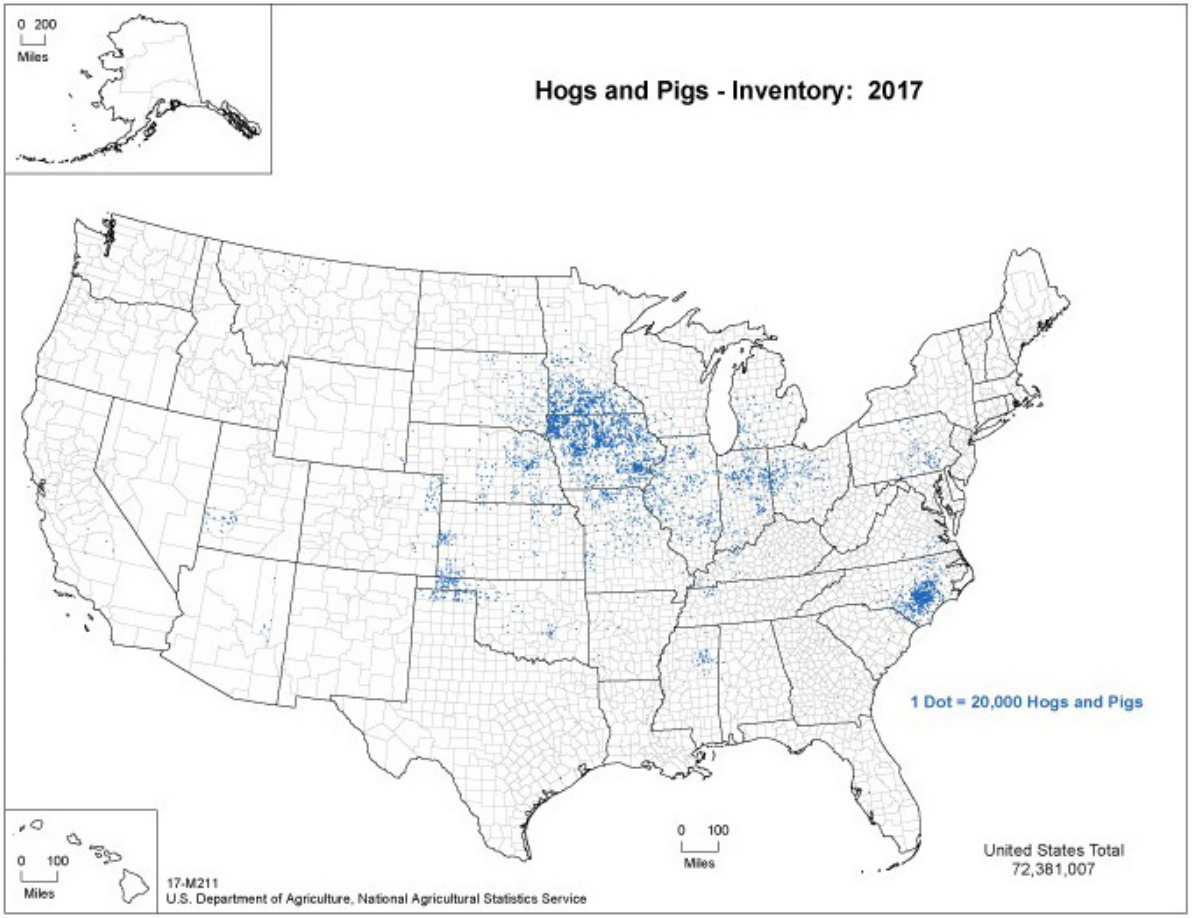
Pork

Iowa is the nation's leading pork producing state in numerous USDA categories, including all hogs and pigs inventory, all hogs and pigs value, pig crop, and pork export value. The state raises nearly one-third of the nation's hogs with over 5,400 operations and a total inventory of 24 million animals. Figure 3.18 shows the total inventory of hogs and pigs by U.S. county in 2017.

With a concentration of corn, soybeans, and packing plant capacity, Iowa is an ideal location for pork production. The abundance of materials and capacity within the state lowers the cost of transportation and feed for Iowa farmers.

Many hog byproducts are used in drugs and medical products such as insulin hormones and heart valves for transplants, as well as chemicals used in manufacturing to make glue, upholstery, pet food, lubricants, and cement. Additionally, a major byproduct from hogs is a necessity for Iowa's corn and soybean farmers: manure to be used as fertilizer for cropland. According to the Iowa Pork Producers Association, ten pigs from weaning to market provide the nutrient needs of an acre of cropland on a semiannual basis. This helps to enrich the soil for strong corn and soybean yields.

Figure 3.18: Inventory of hogs and pigs, 2017



Source: U.S. Department of Agriculture

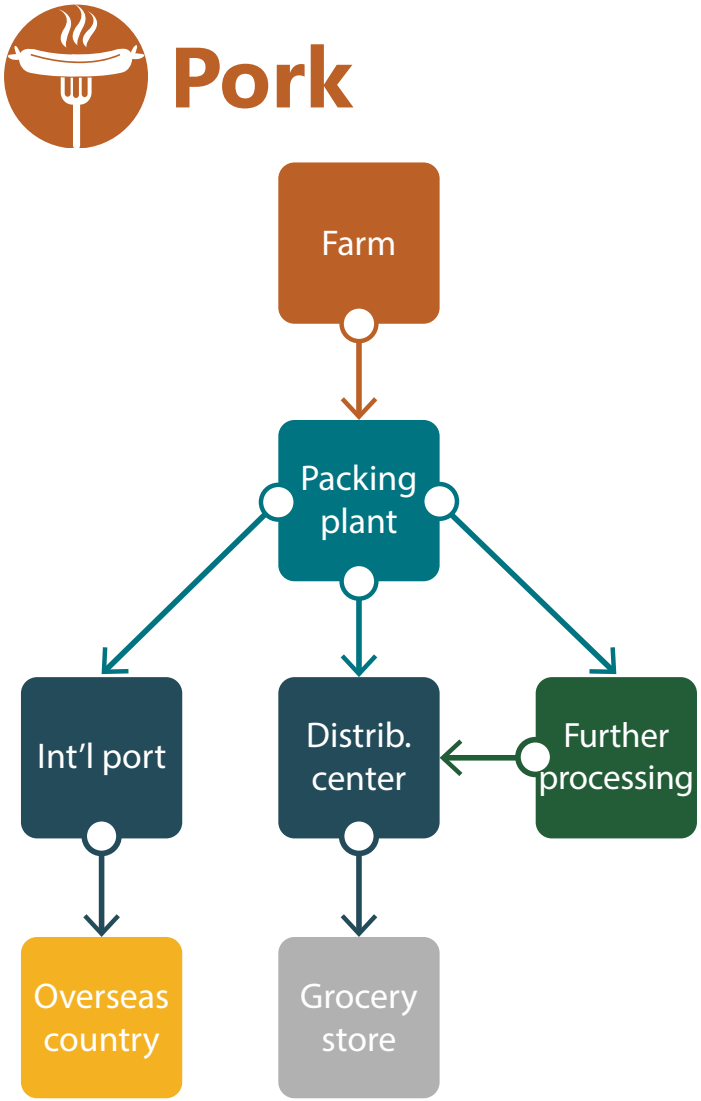
From wean to market weight of 270 pounds, one pig eats:

12 bushels of CORN

2.5 bushels of SOYBEANS

Source: Iowa Pork Producers Association

Figure 3.19: Pork supply chain



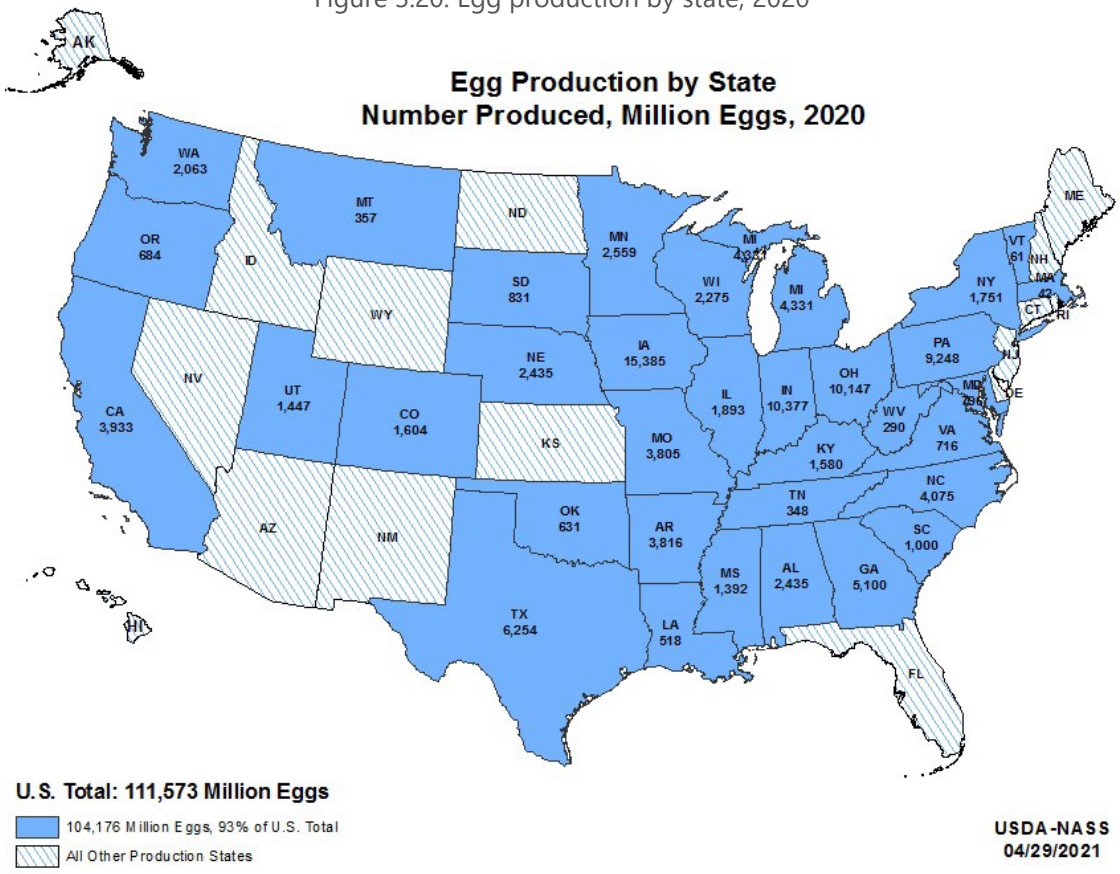
Source: Iowa DOT

Eggs

Iowa led the nation in egg production in 2020, continuing a trend that has lasted over a decade. The state increased egg output significantly between 1997 and 2006, taking advantage of a growing population and rising egg product consumption in the country. Production in Iowa has steadied since then, resulting in nearly 16 billion eggs being produced each year. Figure 3.20 shows U.S. egg production by state.

A significant reason for Iowa leading the nation in egg production is the competitive advantage the state has with affordable and abundant feed, which makes up a substantial percent of egg production costs. Laying hens alone consume more than 50 million bushels of corn and more than 450,000 tons of soybean meal each year. Iowa egg producers do not have the large additional cost of transporting feed like many other states. Iowa also has a feed price advantage due to its extensive feed-grain production and will likely maintain that advantage for the foreseeable future.

Figure 3.20: Egg production by state, 2020



Source: U.S. Department of Agriculture

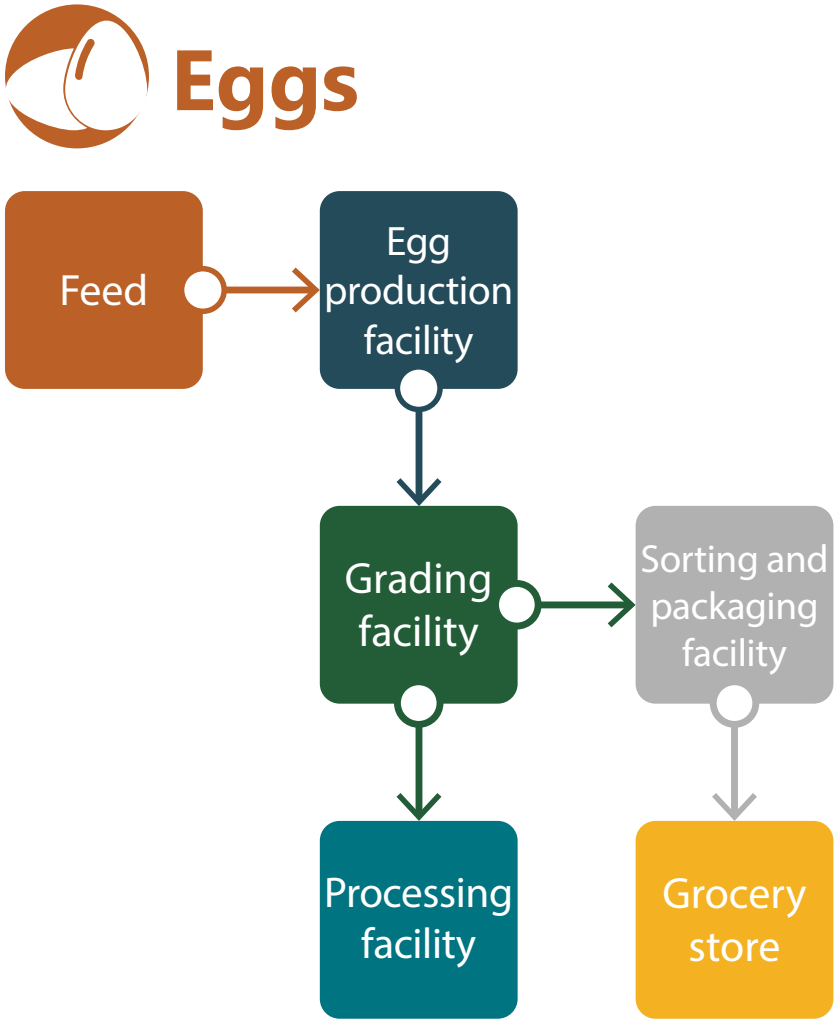
Iowa farmers are responsible for about

1 in 5 EGGS

consumed in the United States each year.

Source: Iowa Egg Council

Figure 3.21: Egg supply chain



Source: Iowa DOT

Tractors and machinery

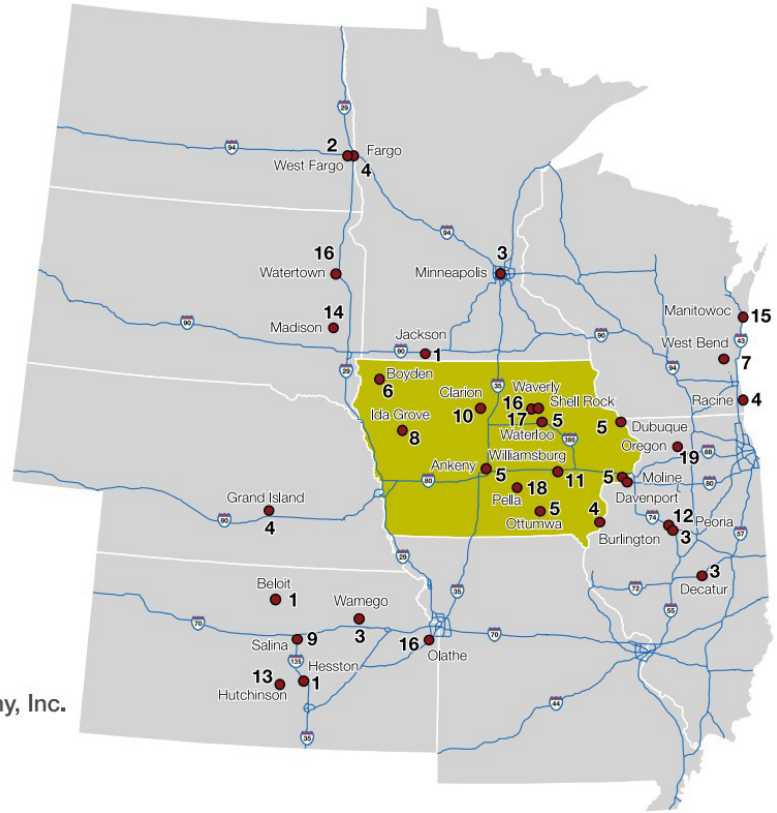
To produce record numbers of corn and soybeans, Iowa farmers need the appropriate equipment. The manufacturing of tractors and agricultural/construction machinery is a natural fit for a major agricultural production area like Iowa.

The state is a major manufacturing center for agricultural machinery giants John Deere, Caterpillar Inc., Kinze Manufacturing, Vermeer, Danfoss, CNH Industrial (CASE, New Holland), Bridgestone/Firestone Agricultural Tire, and Hagie Manufacturing. There are approximately 6,000 manufacturers with over 22,000 employees in Iowa with sales of over $91 billion per year. Figure 3.22 shows regional tractor and machinery manufacturing locations.

Agricultural and construction equipment manufacturing has continually developed over the years. These products are now the state's leading manufactured commodities in terms of value with tractors being Iowa's top manufactured export.

Figure 3.22: Regional agricultural and construction equipment manufacturers

1 AGCO Corporation
2 Bobcat Company
3 Caterpillar, Inc.
4 CNH Industrial
5 Deere & Company
6 DEMCO
7 Gehl Company
8 GOMACO Corporation
9 Great Plains Manufacturing, Inc.
10 Hagie Manufacturing Company
11 Kinze Manufacturing, Inc.
12 Komatsu America Corporation
13 Krause Corporation
14 Manitou Americas, Inc.
15 Manitowoc Company, Inc.
16 Terex Corporation
17 Unverferth Manufacturing Company, Inc.
18 Vermeer Manufacturing Company
19 Woods Equipment Company

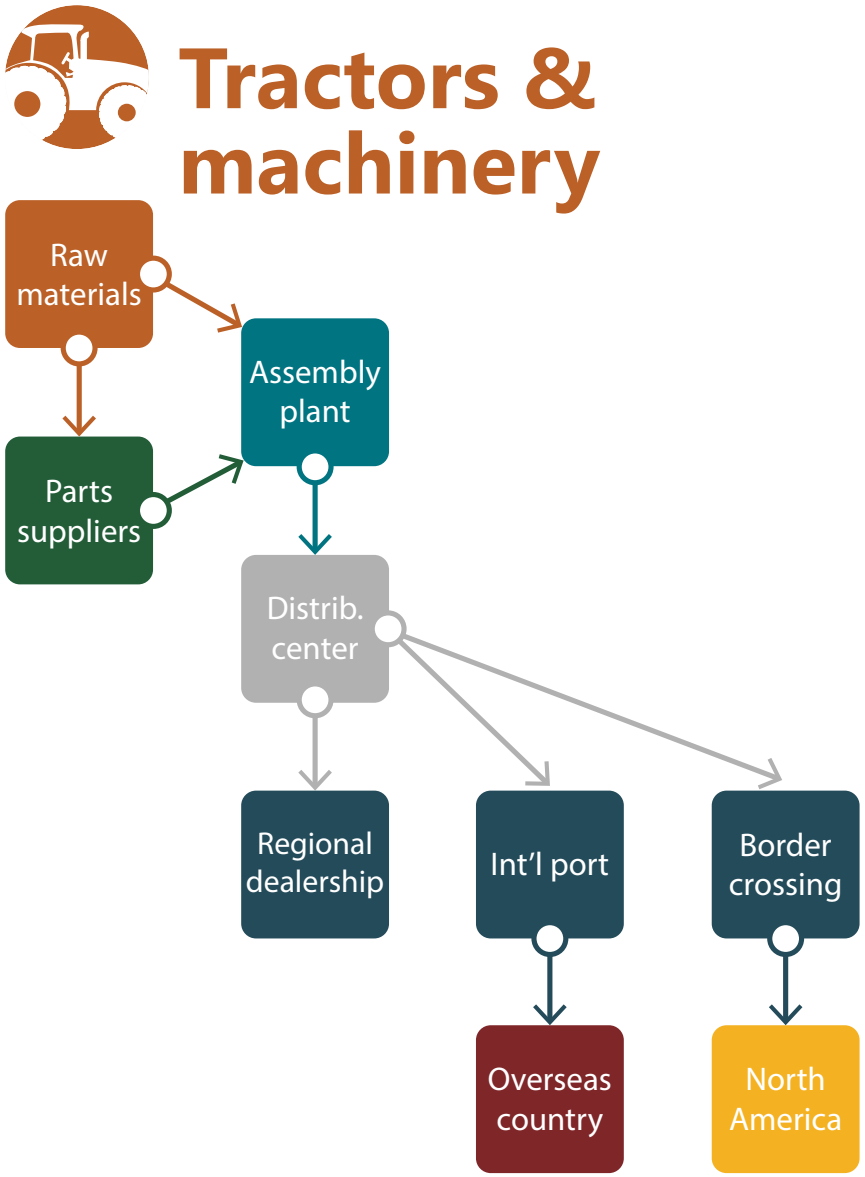


Source: Iowa Economic Development Authority

Iowa has 9x the concentration of
AGRICULTURAL AND CONSTRUCTION EQUIPMENT MANUFACTURING
compared to the rest of the nation.

Source: Iowa Economic Development Authority

Figure 3.23: Tractors and machinery supply chain



Source: Iowa DOT

4. PLANNING CONSIDERATIONS

4.1 Funding | 4.2 Supply chain and economics | 4.3 Network efficiency
4.4 Energy and environmental | 4.5 Considerations specific to modes

Proactively identifying and understanding key trends and issues impacting the freight transportation system is critical to implementing the most appropriate strategies and investments.

All trends and issues are subject to varying degrees of change and uncertainty. There are a number of things that have the potential to significantly disrupt current supply chains and freight corridors, including:

- Funding availability,
- Shifting reliance on global supply chains,
- Continuous growth of e-commerce,
- Acceleration of automation and emerging technologies,
- Increasing frequency and intensity of severe weather events,
- Global pandemics, and
- Sustained focus on infrastructure and supply chain resiliency.

Although uncertainty exists, it is necessary to attempt to forecast what should be considered and possibly addressed in the near- and long-term. Iowa Freight Advisory Council (FAC) members were asked to identify and prioritize trends and issues impacting the freight industry that should be considered when making planning and programming decisions. Those items identified are categorized and summarized in this chapter, with specific items identified by the FAC in bold text. As noted in Figure 4.1, items ranked 1-13 are considered high priority, 14-23 medium priority, and 24-34 low priority.

Figure 4.1: Iowa Freight Advisory Council priority considerations

High priority	1	Funding	Low priority	24	Land use
	2	Agriculture		25	Energy
	3	Lock and dams		26	Sourcing
	4	Trade		27	Automated trucking
	5	Multimodal		28	Economics
	6	Safety		29	Panama Canal
	7	Resiliency		30	Missouri River cargo
	8	Truck cargo		31	Fuel
	9	Highway design		32	Aviation trends
	10	Regulations		33	Air cargo
	11	Intermodal		34	Coal decline
	12	Trucking issues	Other considerations		Rural infrastructure
	13	Industry			Interstate Highways
Medium priority	14	Human trafficking			Rail crossing safety
	15	Mississippi River cargo			Sustainable investment
	16	Manufacturing			Container availability
	17	Rail network			Pipelines
	18	E-commerce			Labor shortages
	19	Rail cargo			
	20	First mile/last mile			
	21	Automation			
	22	Oversize/overweight			
	23	Biorenewables			

Source: Iowa Freight Advisory Council

4.1 Funding

Key issues: infrastructure funding

The state of Iowa is fortunate to have a strong multimodal freight transportation system that facilitates the safe and efficient movement of goods. This system allows our industries to move commodities more quickly and efficiently than those in most other nations, lowering the costs to domestic consumers and improving the economic competitiveness of freight industries.

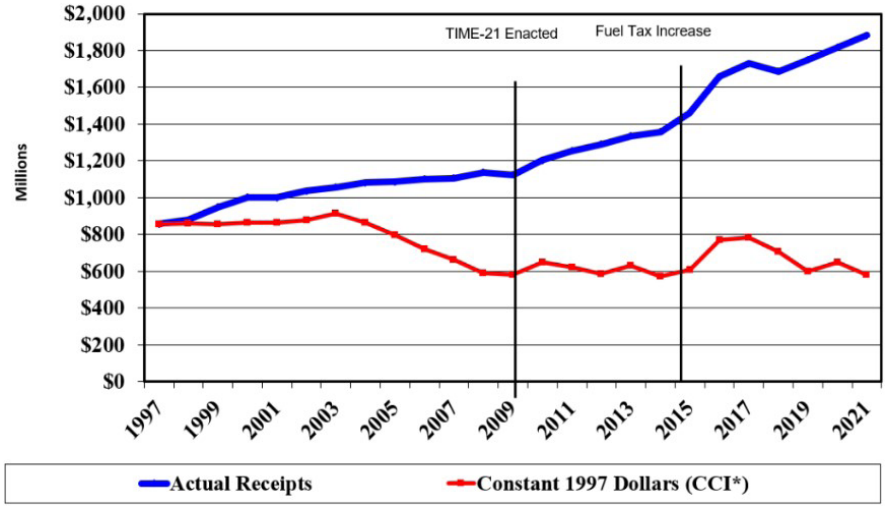
With this success comes the challenge to maintain and improve the multimodal system in the face of deteriorating conditions, diminishing buying power (see Figure 4.2), and growing demands. A well-maintained freight system reduces transportation costs and provides consistent and reliable services, all of which are factors critical in the evaluation companies undertake when deciding where to expand or how to disperse their goods and products. Without maintaining and improving our state's freight infrastructure, Iowa's economy will be weakened, and maintaining a competitive edge is critical to the Iowa and U.S. economies.

Infrastructure funding for all modes of transportation will continue to be a challenge in the future, requiring exploration of other sources. Public infrastructure funding at the federal, state, and local levels has decreased by eight percent since 2003 (National Freight Strategic Plan).

It is necessary to explore and/or create other funding sources to increase **sustainable investment** in the freight system. Difficult decisions must be made in dealing with Iowa's funding shortfall. Prioritizing projects, emphasizing stewardship, and achieving the right blend of modification, optimization, and transformation of the multimodal system will be critical to ensure limited dollars are spent in the most beneficial way. Asset management and rightsizing practices are necessary to help the system operate as efficiently as possible and to maximize the benefits of each dollar spent.

Targeted investments in bottlenecks and the Iowa Multimodal Freight Network (IMFN) should be prioritized.

Figure 4.2: Historic trend in Road Use Tax Fund buying power



Iowa Construction Cost Index, which reflects the inflation of roadway costs in Iowa and corresponding loss in buying power

Source: Iowa DOT

4.2 Supply chain and economics

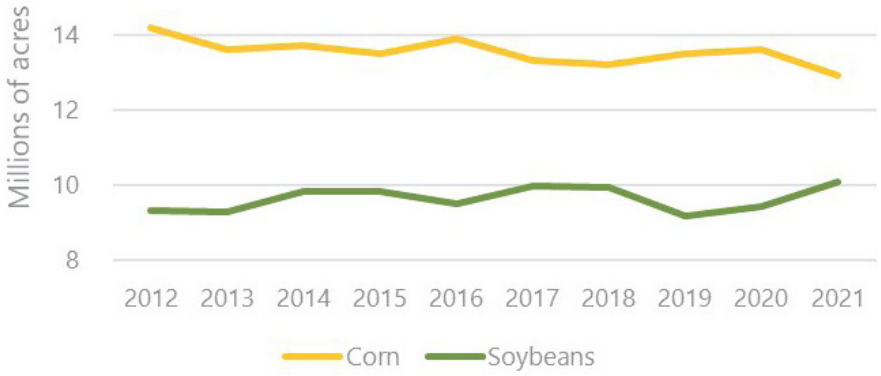
Key issues: agriculture, trade, resiliency, industry, manufacturing, and e-commerce

Iowa's exports are dominated by agriculture products. In recent decades, the landscape of Iowa agriculture has shifted as small farms continue to be consolidated into fewer larger farms that are more corporate in nature and produce more products that need to be shipped. With consistent acreage planted, the state has been fortunate to experience record corn and soybean harvests in recent years (see Figures 4.3 and 4.4), as well as a boom in ethanol and biodiesel production. The latter is significant as the majority of Iowa corn now stays in the state to be used for products such as biofuels and livestock feed rather than being exported outside of the state.

For the agricultural products that are exported, Iowa producers rely on the highway system to transport goods to major consolidation points like elevators and barge terminals, the inland waterways to ship to gulf coast ports via barges, and railroads to ship to west coast ports via unit trains. This trend is shifting, however. Producers (i.e., farmers and/or farming corporations) can achieve transportation economies of scale by transporting their own products using their own or for-hire truck equipment. Iowa farmers are now starting to ship more outputs directly via truck with less focus on moves to local consolidation points and rail terminals.

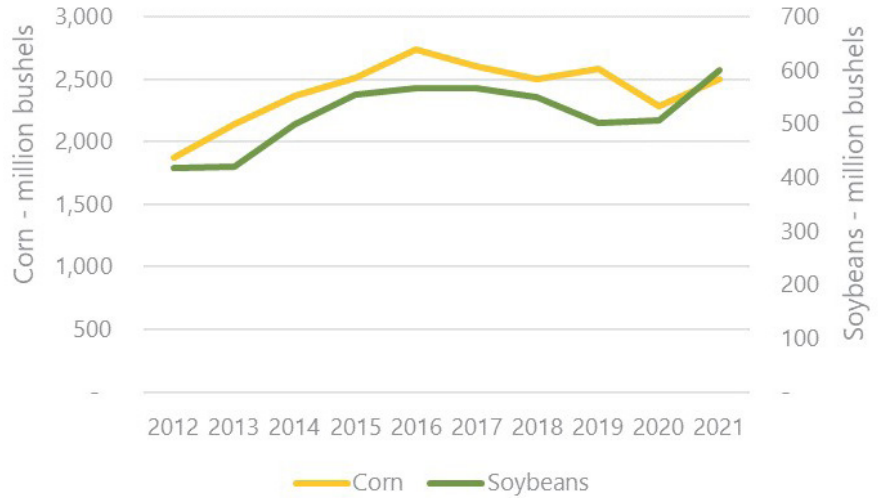
Producers and shippers continue to look for ways to achieve transportation economies of scale by adjusting shipping practices. This could lead to reanalyzing the freight transportation network as it relates to farm products, including the Farm-to-Market System and other rural infrastructure that serve as first mile/last mile connections for the agricultural industry. Overall optimization of the freight network will minimize costs and travel time and improve supply chain efficiency.

Figure 4.3: Iowa planted acres, 2012-2021



Source: U.S. Department of Agriculture

Figure 4.4: Iowa agricultural production, 2012-2021



Source: U.S. Department of Agriculture

Iowa industries, such as agriculture (although a growing share of goods are staying in state for value-added production) and manufacturing, rely on exports. Forecasted growth in **trade** and future trade negotiations will have impacts on these and other industries, as well as the associated supply chains.

Imports and exports are forecasted to be a greater share of freight moving in the country as international trade continues to grow with supply chains becoming increasingly global, resulting in increased freight movement and demand for containerized intermodal cargo. It will be important to monitor international trade deals and negotiations to better understand implications to freight transportation in Iowa. For example, the United States-Mexico-Canada Agreement (USMCA) was signed in 2019 as a modernized version of its predecessor, the North American Free Trade Agreement. USMCA will support mutually beneficial trade leading to increased efficiencies and robust economic growth for the U.S. and its two largest trading partners.

Potential challenges to growing international trade include existing bottlenecks on the freight system, growing congestion at U.S. trade gateways and border crossings, and infrastructure limitations at ocean ports. Multimodal bottlenecks exist throughout the transportation system and are exasperated by increased freight movement, there is consistent congestion at trade gateways due to inspections and security, and some U.S. ports lack the capacity to dock, unload, and load larger megaships that are now able to transit the Panama Canal to access gulf and east coast ports. Those ports that can handle these larger ships have experienced significant growth but the surge of cargo coming off megaships can strain connecting landside infrastructure and operations.

See Chapter 3, Industries and commodities (Section 3.2, Commodity movement), for Iowa domestic and international trade trends.

Infrastructure and supply chain **resiliency** are critical topics for both public and private stakeholders. A resilient freight transportation system is responsive and able to provide reliable services when it encounters small disruptions and returns to service quickly after large disruptions.

Increasing freight traffic is having a large impact on already aging infrastructure with limited capacity, reducing the overall resiliency of those corridors. Aging and deteriorating infrastructure is being further stressed by increases in extreme weather events such as flooding. Major events, such as the Missouri River floods of 2011 and 2019 in western Iowa, can disrupt or shut down critical infrastructure for days, weeks, or even months costing billions of dollars.

Infrastructure and supply chains must be resilient to smaller disruptions such as traffic crashes and larger events such as cyberattacks and global pandemics. The COVID-19 pandemic exposed vulnerable links in global supply chains that perhaps haven't been considered before, such as the implications of rapidly changing supply and demand situations in global supply chains and the importance of maintaining the health and safety of the freight labor force.

It is critical for infrastructure owners and operators to employ strategies and make necessary improvements to reduce the vulnerability of the infrastructure to extreme weather and other major disruptions. Without improvements, shippers will reassess their reliance on vulnerable freight gateways and corridors.

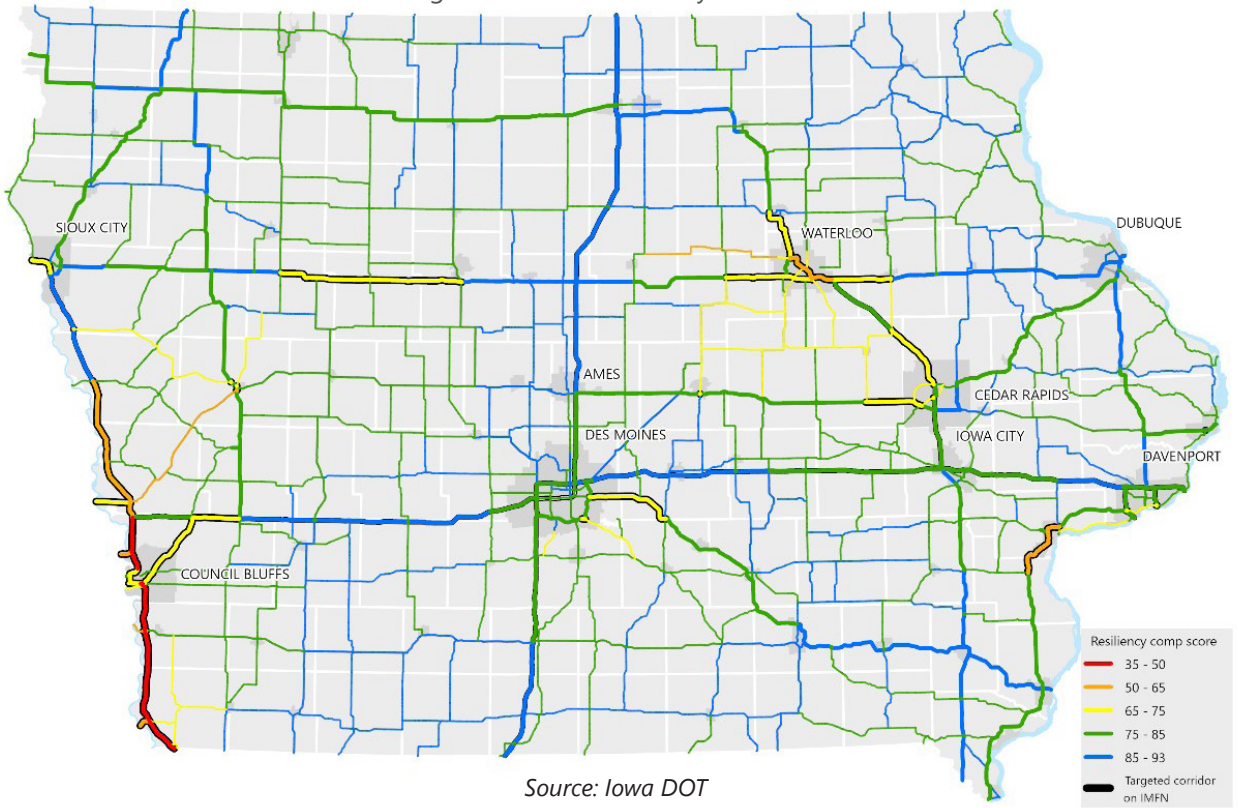
Consideration of resiliency in traffic operations and the overall project planning and programming process is critical for states to be prepared to address major disruptions and mitigate the impacts to freight industries. A resilient and reliable freight transportation system could ultimately lead to additional industries locating in the area.

Iowa Infrastructure Resiliency Efforts

Over the last couple of decades, Iowa has been increasingly impacted by natural disasters, including historic flooding, snowstorms, and tornadoes. This trend is likely to increase as climate data shows strong trends towards increasing temperatures, precipitation, stream flows and flooding. Awareness of human-induced disruptions has amplified as vigilance of potential terrorism and cyberattacks has increased.

The Resiliency Working Group was formed to provide guidance, support, and coordination of resiliency efforts within Iowa DOT, with the primary goal of developing and maintaining a transportation system that is resilient to disruptions that are caused by either natural or man-made disasters, and to reduce the vulnerability or risk to the general public and Iowa's transportation system. This group recently completed a statewide network screening to identify locations vulnerable to a 100-year flood event by analyzing highway segments by robustness, redundancy, and criticality. Results of this analysis are shown in Figure 4.5.

Figure 4.5: Iowa resiliency corridors



Source: Iowa DOT

Iowa's primary freight-dependent industries, such as agriculture, trade, transportation, and **manufacturing** rely on the freight transportation system for moving materials and goods. See Chapter 3, Industries and commodities (Section 3.1, Freight-dependent industries). The network will need to adapt for the current and future needs of these industries to support continued economic growth in the state.

National trends could impact Iowa's industries. Changes in location, **sourcing**, and density of economic activity will likely change supply chains and business models. Supply chains increasingly rely on materials, technology, labor, production facilities, and consumers located abroad, but issues brought to light by the COVID-19 pandemic may change overall reliance on global supply chains. Domestic sourcing could drastically impact demand for port utilization. U.S. industries may explore bringing manufacturing or production sites back to the U.S. (reshoring) or moving to nearby countries (nearshoring) to avoid longer transportation routes and congested ocean ports.

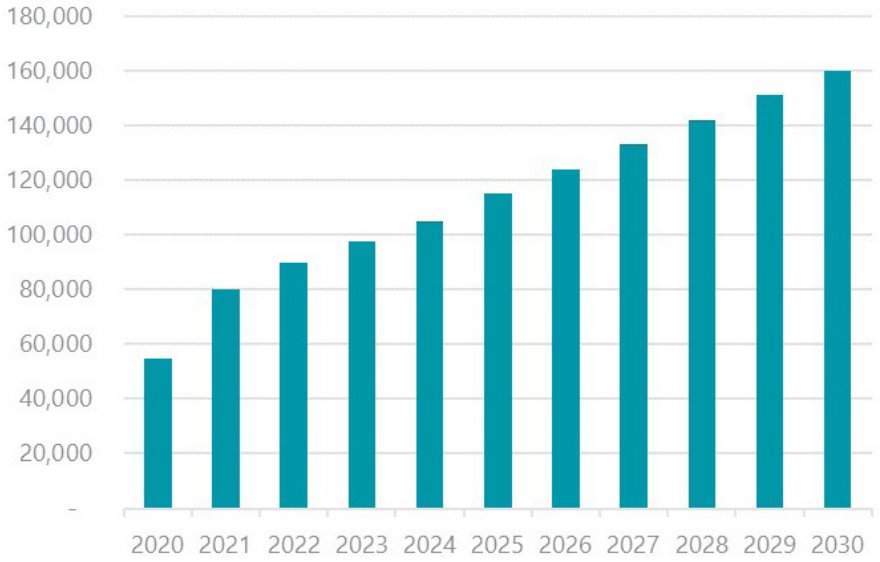
Industries may also revisit reliance on the just-in-time delivery model where companies minimize inventory costs by ordering products when they're ordered by consumers and then rely on quicker delivery schedules.

Labor shortages across supply chains continue to plague freight and transportation industries for a variety of reasons, many of which were compounded by the COVID-19 pandemic. Retaining and recruiting qualified workers (e.g., commercial drivers) has always been a challenge for certain industries but the issue of filling existing and future vacancies to address overall growth and an aging workforce is crucial. Challenges include barriers to entry into the professions (e.g., license and/or certification requirements), commercial drivers license age requirements, rapidly evolving technologies changing the nature of the jobs, and changing expectations among the workforce (such as the desire to be home every night).

U.S. industries may explore bringing manufacturing or production sites back to the U.S. (reshoring) or moving to nearby countries (nearshoring) to avoid longer transportation routes and congested ocean ports. Benefits of reshoring and nearshoring are:

- Shorter lead times,
- Increased production control,
- Improved time to consumers,
- Streamlined distribution of products, and
- Avoidance of taxes and tariffs.

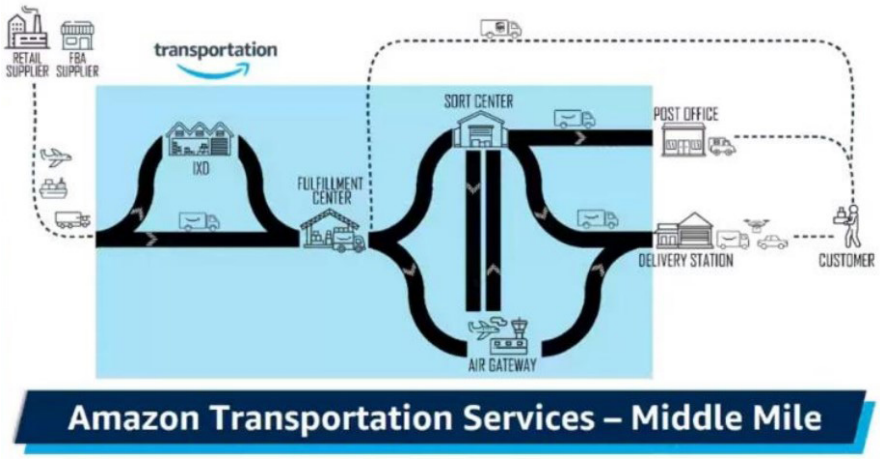
Figure 4.6: Commercial driver shortage projections, 2020-2030



Graph shows the number of needed drivers, in addition to the current workforce.

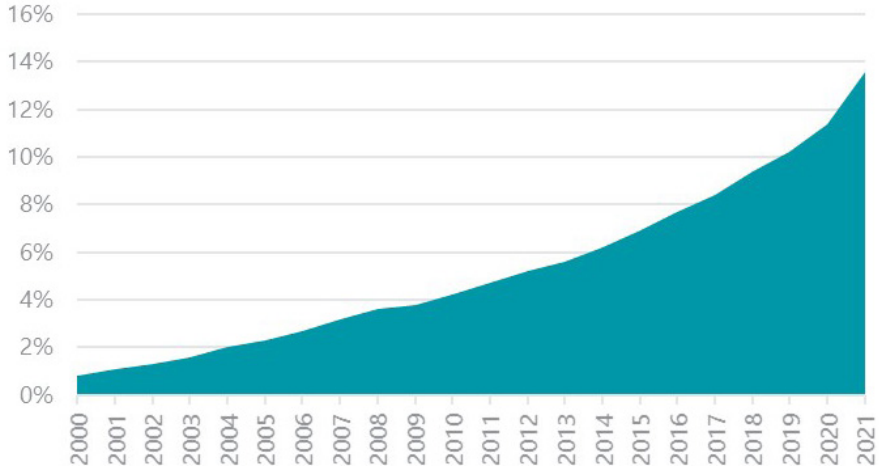
Source: American Trucking Associations

Figure 4.7: Amazon supply chain model



Source: Amazon DSM5

Figure 4.8: E-commerce percent of total retail, 2000-2021



Source: U.S. Department of Commerce

E-commerce is growing significantly and impacting market trends and freight movement, with even more rapid growth experienced over the last two years resulting from the COVID-19 pandemic. This trend is projected to continue in years to come.

This new model of buying and selling has changed the way retailers and consumers interact with each other as purchasing goods online typically means bypassing traditional brick-and-mortar stores and traveling directly from a warehouse or distribution center to consumers' homes, or vice versa when product returns are necessary. Some of this shift represents the last mile trip for consumer goods now being made by a delivery truck rather than store-to-home trips by consumers.

Online sales of most products, from clothing to perishable items like groceries, are experiencing growth. This means an increased emphasis on the reliability and timeliness of truck transportation, changing truck delivery patterns, an increase in shorter trips, and a greater strain on local infrastructure. Other related impacts include an increased demand for air cargo and efficient terminals and changing land use and development patterns such as locating inventory and distribution closer to population centers.

Population and **economic** growth are contributing to increased freight movement. The population is also becoming more concentrated in urban areas while most freight corridors and production areas are in rural areas. These trends will impact **land use** considerations.

The completed expansion of the **Panama Canal** allows larger ships to move through which has been beneficial to Iowa. More opportunities exist, but taking advantage depends heavily on the reliability of the inland waterway system.

4.3 Network efficiency

Key issues: multimodal, intermodal, safety, regulations, and automation

There is a continuous need for **multimodal** coordination and **intermodal** connections to address freight demand. The terms "multimodal" and "intermodal" are often used interchangeably, yet they can have entirely different meanings. Multimodal focuses on the different modal options that could be utilized to move goods from one place to another. Intermodal focuses on how two or more of these modes can connect at what typically amounts to a transfer point, such as an intermodal container facility or transload location. To put it another way, multimodal options provide the links in the transportation system, while intermodal connections are the nodes.

These connections or facilities are an integral part of the freight transportation network. Each provides the opportunity for seamless transitions from one mode to another, allowing shippers to take advantage of the cost, speed, and capabilities of more than one mode. Limiting these connections increases the costs of Iowa export goods, inhibits economic development, and impairs the state's position in both foreign and domestic markets.

There continues to be an increase in international trade resulting in more containerization and containerized freight, creating opportunities for Iowa industries. Containerization specifically uses intermodal containers that fit on the axles or decks of multiple modes and can be transferred from one to another relatively quickly. Transport using intermodal containers works for many different commodities and minimizes the handling of the freight itself, which improves security and reduces loss.

However, **container imbalance** and container shortages create challenges. Iowa produces more products shipped via container than it receives causing a large imbalance of containers. This creates added transportation costs due to the need to haul empty containers into Iowa, that is, when they can be obtained. Demand for containers has increased significantly making it more economical for international shipping companies to transport empty containers back overseas and to other production areas rather than waiting for the containers to be refilled in the U.S.


Intermodal container transfer facility in Iowa. (Source: Iowa DOT)

Safety is always a top priority for freight industries across all modes of transportation, but with increased freight movement comes increased safety risks. As freight traffic has increased, the number of related crashes and fatalities has also increased. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for Iowa freight-related safety statistics.

Highway safety is important as truck traffic increases, creating more opportunities for freight vs. passenger incidents. Additionally, truck parking is insufficient throughout most of the country leading to trucks parking at locations that are unsafe to both the driver and the traveling public. Driver performance has been a greater focus as companies try address driver fatigue. New hours of service regulations have also been implemented in an attempt to mitigate this issue. See Section 4.5, Considerations specific to modes, for more on related trucking issues.

Rail crossing safety at grade crossings is also a major focus. Collisions at highway-railroad grade crossings have decreased but remain a priority in states like Iowa. The Iowa DOT regularly updates the Highway-Railroad Grade Crossing Safety Action Plan, which focuses on crossings with multiple crashes or those that are "at risk" and identifies specific solutions, including closure and consolidation of at-grade crossings. It also focuses attention on trespasser hotspots.

Another aspect of safety relates to the transport of hazardous materials, or hazmat, which has increased in the U.S. Without proper classification, packaging, and transport, these materials pose a threat to the labor force, public, and environment. Human performance errors and operational issues remain concerns, but related incidents have decreased overall thanks to advances in technology and more stringent safety standards.

Iowa Highway Helper vehicle and Motor Vehicle Enforcement vehicle. (Source: Iowa DOT)

Regulatory Barriers Commonly Cited by Industry

Truck size and weight standards are a blend of federal and state regulations controlling the maximum gross vehicle weights and axle loads on the highway system. Federal law controls loads on the Interstate Highway System and state law controls loads on non-Interstate highways, leading to inconsistent regulations by state.

Hours of service (HOS) requirements refer to the maximum amount of time commercial drivers are permitted to be on duty, including driving time, and specifies number and length of rest periods to help ensure that drivers stay awake and alert.

An **Electronic logging device (ELD)** is technology that automatically records a driver's driving time and other HOS data. The ELD mandate applies to most motor carriers and drivers required to keep records of duty status.

Positive Train Control (PTC) is a system that uses global positioning systems and radio communication to prevent collisions or derailments caused by human error. Congress mandated in 2008 that PTC be adopted and implemented on Class I railroad main lines over which certain hazmat are transported and lines with regularly scheduled passenger rail.

The **Jones Act** is a federal law that regulates maritime commerce, requiring that goods shipped between U.S. ports must be transported on ships that are built, owned, and operated by Americans or permanent residents.

To ensure the safe movement of freight, a wide array of **regulations** at all levels (federal, state, and local) has been put into place. These regulations affect, firsthand, those doing business in Iowa. A better understanding of these regulations and their impacts will assist the state in recognizing ways to better coordinate with those agencies responsible for the various elements that make up freight regulations.

Better coordination, education, and streamlining of freight-related regulations is needed. Although regulations (e.g., safety, environmental, economic, etc.) are developed with good intentions, some can be impediments to freight efficiency. Barriers commonly cited by the industry include truck size and weight limitations, routing restrictions, HOS rules, fuel and emissions standards, and customs and border security rules.

One of the primary obstacles is the fragmented nature of federal and state authorities. Regulations and policies are developed across modes, sectors, and jurisdictions typically leading to misalignment. Insufficient coordination between these authorities contributes to inefficiencies and bottlenecks, and efforts should be made to streamline and align freight-related regulations and minimize unintended consequences to shippers, industries, etc.

Many shippers in Iowa are currently encountering regulatory obstacles that hinder the movement of freight among all modes of transportation. If not addressed, these issues may lead to delayed freight movement, increased congestion, a decrease in safe travel operations, and an unwanted drag on the economy.

Advances in **automation** and automated technologies relating to information and communications (e.g., blockchain and internet of things), robotics, artificial intelligence, sensors, batteries, and alternative delivery methods (e.g., crowdsourcing, personal delivery devices, drones, 3D printing, and teleoperation) are allowing for the development of autonomous vehicles and automated rail yards, marine terminals, and warehouses. These developments have the potential to transform freight-related industries by increasing safety and efficiency and altering supply chains. Industries are integrating automated technologies as a response to consumer expectations, increased competition, and rising labor costs.

Example of Amazon autonomous delivery vehicle.
(Source: Waterloo-Cedar Falls Courier)

Blockchain is a series of nodes where all involved parties have identical copies of every transaction ever made, updated in real time. This can help overcome existing issues in intra-business information sharing, assist with supply chain finance, and improve operations management.

Internet of Things refers to the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices via the internet. Freight stakeholders can utilize the real-time information produced by this technology to improve efficiencies, pricing, and inventory strategies.

Artificial intelligence is technology that allows for machines or programs to learn from experience, adjust to new inputs, and perform tasks. Firms are looking to apply advances in artificial intelligence and machine learning to improve the performance of freight movement and delivery networks.

3D printing, also known as additive manufacturing, uses Computer Aided Drafting to create 3D models that are ultimately sent to a 3D printer to be created. Material categories include plastics, metal (powder bed, powder feed, or wire extrusion), ceramics, food, stem cells, and others. Industrial-scale 3D printing could alter supply chains as businesses wouldn't need to ship inventory but rather the raw materials to be used to print inventory.

Teleoperation, also known as remote operation, uses computer and telecommunication systems to allow for the operation of freight modes. For trucking, this could support automation activities for primary operation or a fallback measure without a person in the vehicle.

4.4 Energy and environmental

Key issues: biorenewables

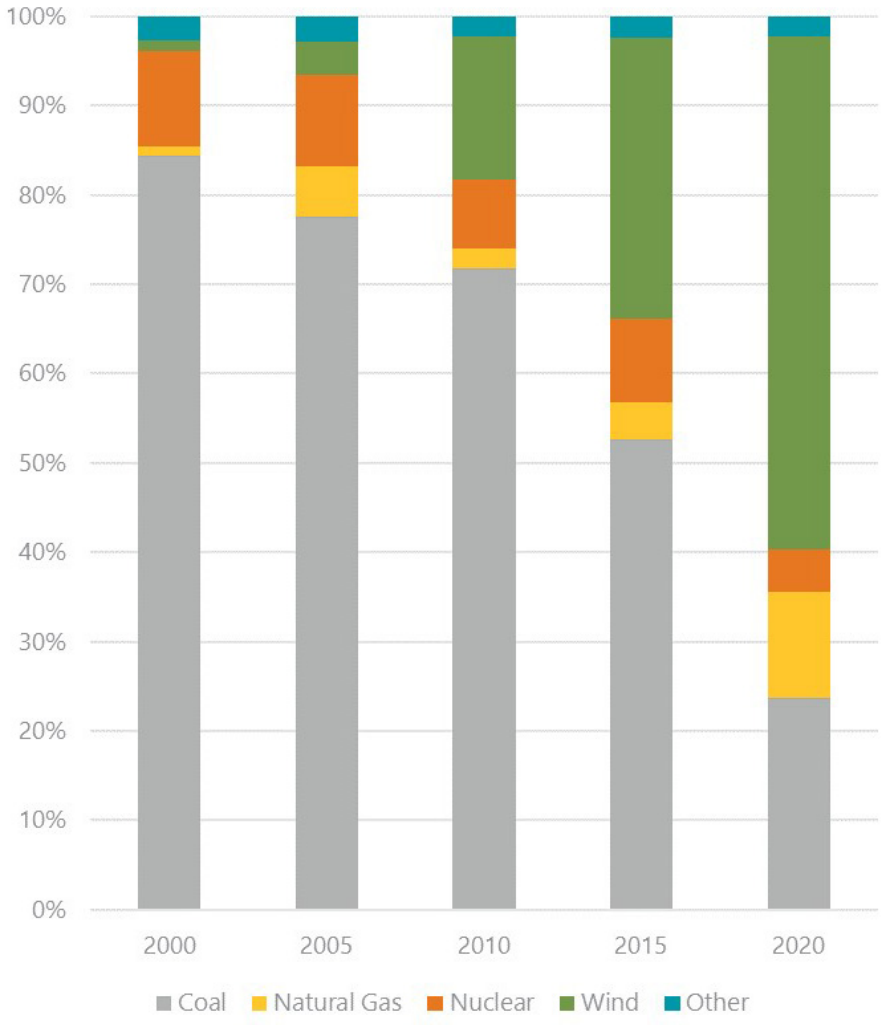
The **biorenewable** chemical industry is undergoing rapid transformation and growth. Due to Iowa's abundance of feedstock, technical workforce, and biorenewable and plant genetic research, the state has an opportunity to be a major player in this growth industry.

Energy production in the United States has grown significantly with one of the largest growing sectors being hydraulic fracturing of rock or "fracking." This process allows for the recovery of deep sources of gas and petroleum products and has resulted in large amounts of gas and oil being extracted and transported elsewhere in the U.S. and abroad. The development of wind farms has also changed energy production and consumption in the U.S. Most of Iowa's electricity is now generated by wind power, and the construction and maintenance of the wind farms means wind turbine components are regularly being moved on the freight network.

Alternative transportation **fuels** are being widely utilized, mainly ethanol and biodiesel in Iowa. Natural gas comes in the form of either compressed natural gas (CNG) or liquefied natural gas (LNG), both of which are being explored and adopted by transportation industries. Other fuel sources such as propane and renewable diesel are also being explored. Each of these alternative fuel sources produce lower emissions than gas/diesel traditionally used by freight vehicles. Adopting these would contribute to reduced air pollution.

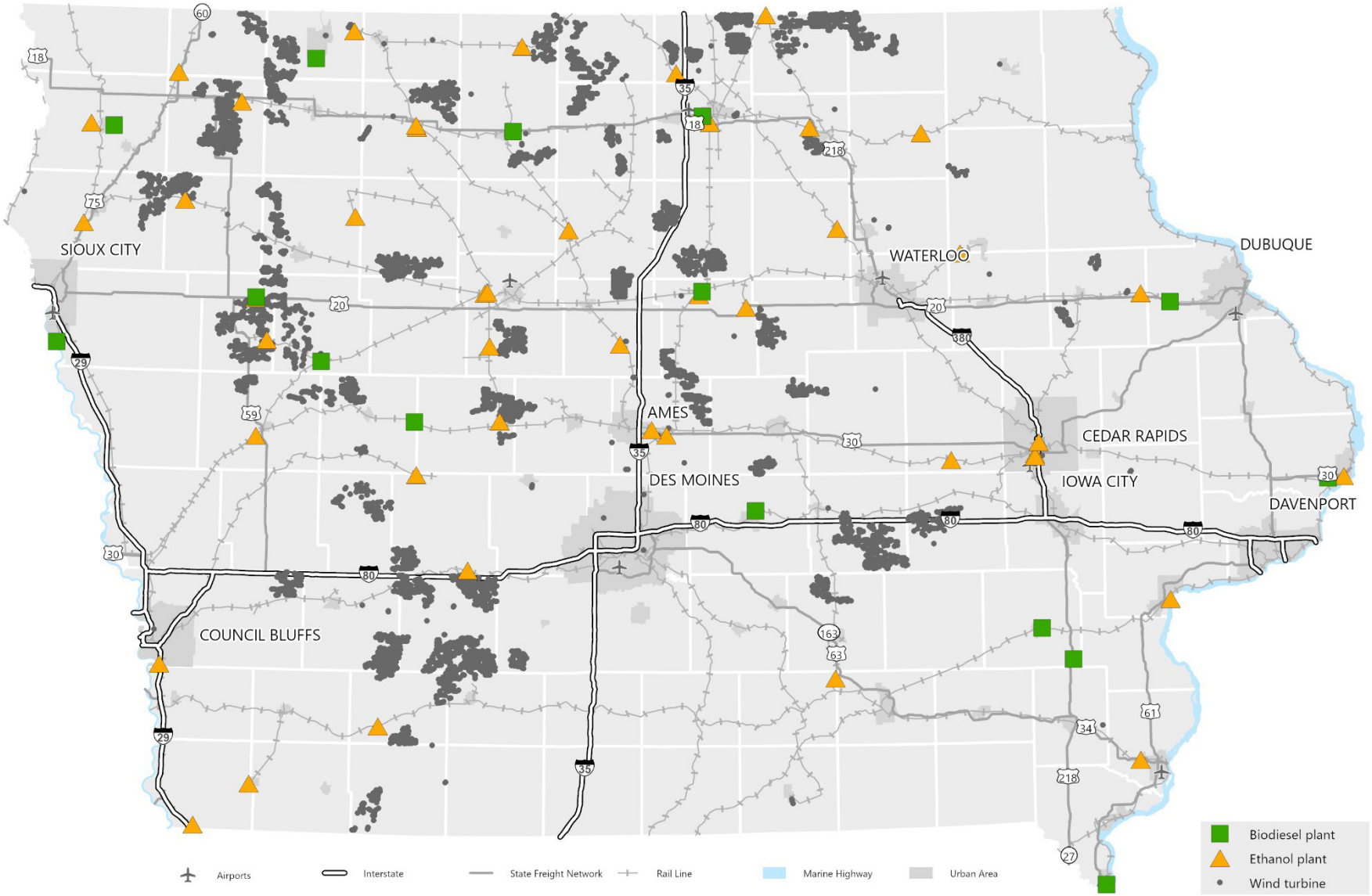
Coal use is declining significantly with the increased use of renewable energy (e.g., wind). This has impacted rail and barge tonnages as coal once represented a significant portion of tonnages being moved by each mode.

Figure 4.9: Iowa utility generation by source, 2000-2020



Source: U.S. Energy Information Administration

Figure 4.10: Iowa energy production



Source: Iowa Renewable Fuels Association and U.S. Wind Turbine Database

4.5 Considerations specific to modes

Aviation

Developing **aviation trends** related to the economy, new technologies, and security may impact the industry. Most notable is the emergence of unmanned aircraft systems, or drones, for different applications.

Air cargo has been variable over the last decade, but future cargo totals could be significantly impacted by increases in e-commerce. UPS recently expanded a facility at the Eastern Iowa Airport and FedEx recently built a new facility at the Des Moines International Airport (DSM). Additionally, Amazon Cargo established a new air gateway at DSM which is expected to change the air freight landscape in Iowa and nationally.

Inaugural Amazon Air aircraft being unloaded and reloaded at Des Moines International Airport on Tuesday, November 9, 2021. (Sources: Des Moines Register and Des Moines International Airport)

Highway

Key issues: truck cargo, oversize/overweight (OSOW), first mile/last mile, highway design, trucking issues, and human trafficking

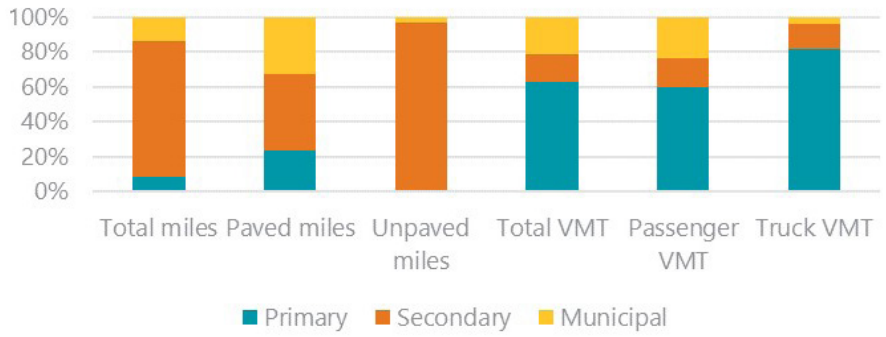
Trucks are the dominant mode for freight movement in the state as **truck cargo** and truck traffic continue to steadily increase at a rate faster than other modes. Increased truck traffic leads to more congestion, which leads to lost economic productivity and wasted fuel. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for tonnage figures.

Iowa's highway network also handles increasing numbers and evolving types of **OSOW** loads due primarily to geography and affordable permits. Some of the major OSOW loads are products of the expanded wind energy sector in the state. Wind turbine components are transported throughout Iowa for wind farm construction and maintenance.

Commodity movement by truck (including OSOW) is heavily concentrated on the Primary Highway System, more specifically the IMFN, which includes much of the **Interstate Highway System**. The IMFN represents the most critical freight corridors in the state based on overall utilization and the safety, efficiency, reliability, and resilience of these routes is critical to the freight industry. Targeted investment in operational and physical improvements on this network should be prioritized.

First mile/last mile connections from the IMFN to freight generating facilities and final customers should also be considered. Distribution centers and other intermodal/multimodal facilities are even more important with the continuous growth of e-commerce, manufacturing, and agricultural production.

Figure 4.11: Mileage and Vehicle Miles Traveled, 2019



Source: Iowa DOT

Rural infrastructure serves as the first mile/last mile connections for the agricultural industry. Rural highways and bridges are in poor condition, and these routes are critical for getting inputs to the field and outputs to market. Farmers are now using larger, heavier field equipment and shipping more commodities via truck directly to processors or export terminals increasing the importance of rural routes. As changing urban-rural dynamics continue, more population and resources are in urban areas while more production areas and actual freight corridors are in rural areas, further exasperating rural infrastructure funding issues.

Developing freight-specific **highway design** considerations will help protect and enhance the IMFN and related first mile/last mile connections. Investments targeted for facilities that handle significant freight traffic, including OSOW vehicles, should incorporate designs compatible with these types of freight movements, and avoid improvements that unintentionally create new obstructions to freight movement in urban and rural areas. See Chapter 5, Action plan (Section 5.1, Implementation strategies), for Iowa DOT freight design considerations.

In addition to rising truck traffic levels, **trucking Issues** such as commercial vehicle driver shortages and retention (see Section 4.2, Supply chain and economics), truck parking, and HOS (see Section 4.3, Network efficiency) continue to challenge the industry.

A freight truck parking study was conducted as part of the Iowa Rest Area Management Plan to assess the current system's needs for truck parking. Iowa's central geographic location and abundance of transportation options result in significant movement of freight throughout the state. Recent studies conducted by Iowa DOT document truck parking and OSOW parking availability as one of the top freight mobility issues in the state, particularly along cross-state Interstate routes (I-29, I-35 and I-80). See Chapter 5, Action plan (Section 5.1, Implementation strategies), for Iowa's latest commercial motor vehicle parking facilities assessment.

Another significant issue related to the trucking industry is **human trafficking.** Traffickers typically target professions deemed "transient in nature" as consumers and regularly travel across multiple states to places such as oil and gas fields, truck stops, hotels along highways, etc. The trucking industry is critical in helping to spot these types of activities. Law enforcement continues to reach out to the trucking industry and others for partnering opportunities in the fight against human trafficking.

Automated trucking concepts continue to be developed and tested, including truck platooning or automated following platooning (where the lead truck operates normally with driver assistance technology and the second truck operates at a higher level of automation. These emerging technologies have the potential to increase safety and efficiencies as well as hours of service (e.g., labor) and parking challenges by allowing drivers to rest in the truck while it's in operation and be on roadways for longer operations.

Pipeline

Iowa's **pipeline network** supplies commodities such as anhydrous ammonia, crude oil, liquefied petroleum gas, and natural gas for residential and industrial consumption. The importance of this network to the state's economy should continue to be considered moving forward.

Iowa ranks fourth in the nation in consumption of liquefied gas in the form of propane, due primarily to the use in drying corn after harvest and heating one in eight households. Iowa is also the only non-crude oil-producing state among the top five energy-consuming states on a per capita basis, mainly due to the state's relatively small population and its energy-intensive industrial sector (U.S. Energy Information Administration). Limitations in Iowa are typically related to propane terminals and storage areas during high-demand seasons.

The construction of carbon capture pipelines has been proposed in Iowa to move carbon dioxide to be sequestered underground, potentially cutting greenhouse gas emissions from ethanol, fertilizer, and other industrial ag plants.

Wind turbine components on a train in Iowa. (Source: Iowa DOT)

Railroad

Key issues: rail network, rail cargo

Over the past 30 years, Iowa's **rail network** has steadily decreased in miles but is being operated by roughly the same number of railroad companies. Railroad service continues to evolve as these companies seek to lower transportation costs and improve efficiencies. Growing demand and changes to the industry have led to larger rail cars and longer trains. Additional improvements are necessary to meet capacity needs as nearly 20 percent of Iowa's rail miles are not able to carry the industry-standard 286,000-pound cars.

Although today's rail network consists of less mileage, **rail cargo** handled annually has slowly increased with the exception of a few variable years. Railroads typically move bulk commodities and containerized freight to, from, and through the state. Top commodities originating and terminating in Iowa include farm, food, and chemical products with other cargo steadily becoming a larger portion of overall tonnage, such as intermodal containers. Coal is the primary commodity being shipped to Iowa, but tonnages continue to decrease annually as utility generation has transitioned to other energy sources. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for tonnage figures.

A proposed merger between Canadian Pacific and Kansas City Southern has the potential to significantly impact both Iowa's rail network and overall rail cargo.

Waterway

Key issues: lock and dams, river cargo

The inland waterway system is critical to the U.S. continuing its competitive advantage over the rest of the world. Overall barge traffic in the U.S. and the Upper Midwest has increased over time, as have delays and inefficiencies primarily attributable to lagging infrastructure maintenance and improvements. **Lock and dam** infrastructure throughout the country has significantly surpassed the originally intended design life, resulting in infrastructure deterioration and poor performance of the system.

Contributing to the continual deterioration is the chronic underfunding of the inland waterway system. Operations and maintenance needs are significantly underfunded, rehabilitation projects are overdue, and small- and large-scale improvements to the system are behind due to lack of construction funds.

Aging infrastructure has led to significant delays for barge traffic and more unplanned closures to make necessary repairs. Lack of capacity at most Upper Mississippi River locks intensifies the negative impact to efficiency and reliability. Additional delays can also occur on river segments, with or without lock and dam infrastructure, during flooding or low water periods. Time lost due to delays and closures are costly to shippers and reliability is an important consideration in modal choice. The continued deterioration of this infrastructure inhibits the ability to fully realize reliability and environmental benefits (i.e., lower emissions compared to other surface transportation modes) of moving more cargo via barges on the inland waterways.

Failure of a single lock could be catastrophic for the region and have a crippling effect on the movement of bulk products.

Sufficient investment and completion of already authorized projects on the inland waterways will potentially open additional markets and commodity types to utilize the inland waterways.

Thanks to the efforts of the U.S. Army Corps of Engineers to keep the Upper Midwest locks functioning, **Mississippi River cargo** remains steady, primarily consisting of bulk materials. This includes grain going down the river to be exported and fertilizer, sand, and salt being brought up the river.

Missouri River cargo has declined but demand and momentum has picked up, especially on the lower river. A new terminal at Blencoe has increased accessibility to the river, and projections indicate increased barge traffic originating and terminating between Sioux City and Council Bluffs.

Table 4.1: Age of Upper Mississippi River locks bordering Iowa

Lock	Location	Year open	Age (years)
9	Harpers Ferry	1938	83
10	Guttenberg	1936	85
11	Dubuque	1937	84
12	Bellevue	1939	82
13	Clinton	1938	83
14	Le Claire	1922	99
14 (Aux)	Le Claire	1939	82
15 (Aux)	Rock Island (IL)	1934	87
15	Rock Island (IL)	1934	87
16	Muscatine	1937	84
17	New Boston (IL)	1939	82
18	Gladstone (IL)	1937	84
19	Keokuk	1957	64

Source: U.S. Army Corps of Engineers

5. ACTION PLAN

5.1 Implementation strategies | 5.2 Improvements | 5.3 Performance measures
5.4 Stakeholders and partners | 5.5 Funding mechanisms | 5.6 Freight Investment Plan

5.1 Implementation strategies

Iowa's overall freight improvement strategy includes a listing of prioritized implementation strategies that were developed in consultation with freight stakeholders.

Chapter 4, Planning considerations, introduced critical issues that were identified through a series of discussions and exercises between the Iowa Department of Transportation and the Iowa Freight Advisory Council (FAC) over the last decade. The high and medium priority items represent those that are considered to be most urgent by freight industry representatives.

Building from the FAC-identified priorities and the original strategies from the 2017 State Freight Plan, the following strategies represent the primary elements of Iowa DOT's overall freight improvement strategy going forward. Some of the activities associated with these strategies are already underway, while others will be initiated in the near future as new tools and technologies are implemented.

Each element of the department's strategy aims to address freight specific needs and aligns with both the priorities of the FAC and the national freight goals.

Additionally, these strategies relate to the Iowa DOT system objectives of safety, sustainability, flow, and accessibility (Figure 5.1). These are described in Chapter 1, Introduction (Section 1.1, Plan purpose). The icon preceding each strategy shows which of the four objectives it supports.

Figure 5.1: Iowa DOT system objectives

Source: Iowa DOT

Prioritized implementation strategies

1. **Explore additional sustainable funding sources to increase investment in the freight transportation system.** Growing demands, deteriorating conditions, and diminishing buying power are impacting the efficiency and reliability of freight movement. Exploring other funding mechanisms, or even creating new ones, would be advantageous to the state of Iowa. Options include, but are not limited to, strategically targeting funding to freight projects, using public-private partnerships to expedite investment, or allowing more flexibility in current funding mechanisms to make multimodal freight improvements.

2. **Support the development and adoption of emerging freight technologies to increase safety and efficiency.** Emerging technologies such as automation, autonomous vehicles, unmanned aircraft systems (e.g., drones), blockchain, and others have the potential to be transformative for freight industries by increasing safety and efficiencies, enhancing supply chains, and disrupting business models. These types of opportunities should be explored and supported so industries can address various challenges such as consumer acceptance and expectations, increased competition, rising labor costs, and labor availability. As opportunities arise, work to align and coordinate the activities of the Iowa Advisory Council on Automated Transportation and the FAC.

3. **Partner with freight stakeholders to find innovative ways to address labor shortages across industry sectors.** Commercial vehicle driver shortages and labor shortages across supply chains continue to plague freight and transportation industries for a variety of reasons. Public and private stakeholders should partner to find innovative solutions designed to aid in reducing shortages and improve recruiting, training, and retention.

4. **Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces.** Per Iowa Code, the "Farm-to-Market System" means intra- and intercounty roadways under county jurisdiction that serve principal traffic generating areas and connect them to other farm-to-market routes, city streets, and primary roads. Given the rapidly changing agricultural landscape and the diminishing buying power of existing transportation resources, the size and operation of the Farm-to-Market System should be re-examined. All potential alternatives to improve efficiency should be examined with stakeholders, including road abandonments, vacations, service conversions, and links to other transportation modes.

5. **Streamline and align freight-related regulations and minimize unintended consequences.** The regulatory environment can encourage or deter business in a state, and not all state and federal regulations have a positive impact on freight mobility. State departments should partner to analyze negative impacts, coordinate with stakeholders, and attempt to minimize any unintended consequences of regulations that may hinder freight movement and/or discourage businesses from investing in the state. Additionally, since freight movements are often multistate in nature, there is a need for improved reciprocity between states regarding issues not standardized at the federal level.

6. **Explore opportunities for increasing value-added production within the state.** Iowa is a major producer of agricultural commodities. Efforts should be made to identify economic development opportunities related to value-added production goods utilizing agricultural products. This would provide an opportunity for the state to consider investments that would allow for such value-added processes to occur in-state, prior to these products being exported.

7. **Improve freight transportation system resiliency.** A resilient freight transportation system is responsive. It is able to provide reliable service when small disruptions occur and return to service quickly after large disruptions. Reducing the vulnerability of highway infrastructure by investing in improvements such as roadway grade raises and foreslope erosion countermeasures, and working with partners to do the same for other modes and supply chains should be a priority. Operational improvements to address small disruptions can also be made by leveraging real-time information from users of the system to support advanced decision-making, incidence avoidance, and faster response times, as well as by providing real-time information on system conditions to support the movement of freight.

8. **Collaborate with railroad operators to provide Iowa companies with increased access and capacity to accommodate additional Iowa freight shipments.** Iowa's railroad network provides significant opportunities for reducing transportation costs for shippers. Implementation of strategies and initiatives from the State Freight Plan and the Iowa State Rail Plan (ISRP) will help to further enhance railroad capacity and access points, which are essential for Iowa shippers to leverage rail freight movements.

9. **Support opportunities to develop new intermodal freight facilities in the state.** Intermodal facilities are critical connections between freight modes that allow shippers to take advantage of the cost, speed, and capabilities of more than one mode. Development of these facilities, including air cargo facilities, truck cross-docking operations, rail intermodal facilities, transload facilities, barge terminals, and logistics parks, will improve the efficiency of the overall freight transportation system.

10. **Target investment to address mobility issues that impact freight movements.** Investments that target the elimination or reduction of freight mobility issues are a key element to Iowa's freight improvement strategy. This includes addressing operational and capacity needs, as well as increasing connectivity of modes through intermodal facilities. These improvements will increase efficiency and flow, while also helping to reduce freight emissions and associated air pollution. Additionally, congestion in surrounding areas outside of the state's borders may have an impact on Iowa freight movement. Collaboration with other states and exploration of regional solutions is needed to maximize the effectiveness of investments made within the state.

11. **Continually monitor international trade deals and negotiations.** New and ongoing trade negotiations will have impacts on Iowa's commodity markets and associated supply chains. These should be monitored to better understand the implications to all modes of freight transportation in Iowa, and strategies should be developed to mitigate negative consequences and take advantage of economic opportunities.

12. **Advocate for the funding and improvement of the inland waterway system and explore ways to expand Iowa's role.** The M-35 (Mississippi River) and M-29 (Missouri River) marine highways support the economic competitiveness of the nation, relieve landside congestion on highways and railroads, reduce air emissions, and increase the efficiency of other transportation modes. The state of Iowa continues to work with other regional states to promote the value of these rivers, advocate for infrastructure investments, facilitate regional dialogue, market current services, and seek out new tools. Opportunities to invest in and improve the system should continue to be explored, such as the recent partnership between the Iowa DOT and the U.S. Army Corps of Engineers (USACE) to build a mooring cell on the Upper Mississippi River, the construction of the Port of Blencoe on the Missouri River, and the establishment of the Mississippi River Ports of Eastern Iowa and Western Illinois (doing business as Upper Mississippi River Ports).

13. **Optimize the availability and use of freight shipping containers, including exploring other options for repositioning empty containers.** A significant imbalance exists in the use of in- and outbound shipping containers. This is a problem that is inherent to many intermodal facilities in major metropolitan areas. Cost effective opportunities may exist to utilize different transportation modes to relocate some of these empty containers to locations in Iowa for reloading. With significant volumes of production, Iowa is well-positioned to provide potential loads for outbound movements of these containers, which could prevent them from being shipped back to international markets such as Asia without back-loads.

14. **Partner with law enforcement and the trucking industry to combat human trafficking.** Human trafficking has been reported in all 50 states, and the number of victims in the United States is estimated to be in the hundreds of thousands. Traffickers typically target professions deemed "transient in nature" as consumers and they regularly travel across multiple states to places such as oil and gas fields, truck stops, hotels along highways, etc. The trucking industry is critical in helping to spot these types of activities. Law enforcement, government agencies, and the trucking industry should continue to work together to facilitate the investigation of human trafficking and combat this crime.

15. **Mitigate the impacts of freight transportation on communities, wildlife, and the environment.** Potential negative impacts of freight transportation include emissions, noise pollution, congestion, and accelerated deterioration of local infrastructure. State and local partnerships should continue to work to mitigate negative impacts to citizens, wildlife (including habitat), and the natural environment as freight volumes increase.

16. **Target investment in the Iowa Multimodal Freight Network (IMFN) at a level that reflects the importance of this system for moving freight.** The IMFN consists of priority airports, highways (including Interstate, U.S., and Iowa routes), railroads, and waterways representing the most critical freight corridors in the state. Operational and physical improvements that increase the safety, efficiency, reliability, and resilience of this network, as well as associated first/last mile connections, should be prioritized.

17. **Rightsize the highway system and apply cost-effective solutions to locations with existing and anticipated issues.** Rightsizing of the system is the application of cost-effective solutions (e.g., Super-2 improvements) to address existing and anticipated issues. This will require significant investment in stewardship, some focused capacity expansion as resources allow, and perhaps even some contraction of the highway system. Applied correctly, such solutions will balance mobility needs with revenue limitations and the need to rightsize the system, produce more favorable long-term asset management outcomes, and limit the amount of agricultural land and wildlife habitat that is converted to highway right-of-way.

18. **Enhance planning and asset management practices for the IMFN by utilizing designs and treatments that are compatible with significant freight movements.** Investments targeted for facilities that handle significant freight traffic, including oversize/overweight vehicles, should incorporate designs compatible with these types of freight movements, and avoid improvements that unintentionally create new obstructions to freight movement such as restrictive roundabouts, overhead structures, and turn radii. Particular emphasis should be placed on the highway portion of the IMFN. In addition, future routing and access control decisions and processes should consider those facilities that are most compatible with freight movement. See pages 104-105 for freight design considerations.

19. **Work with partners to address increasing truck parking demand.** Continued implementation of initiatives to address truck parking needs to remain an emphasis, including for oversize/overweight trucks. These initiatives include the Iowa Rest Area Management Plan, which provides a strategy to reallocate existing truck parking spaces and strategically add new spaces along high-demand corridors, and the Truck Parking Information and Management System (TPIMS), which is a region-wide system that helps commercial vehicle drivers find available truck parking spaces. See pages 106-107 for the most recent commercial motor vehicle parking facilities assessment conducted by Iowa DOT.

Freight design considerations

Critical infrastructure (e.g., IMFN) should be protected and enhanced for improved freight mobility. This can be done by implementing department policies for these corridors relating to design and use while also considering adjacent communities and land uses.

Although the following recommendations[1] are focused on freight traffic, other modes such as bicycles, pedestrians, and public transit should be considered by investigating things like visibility, sight distance for truck drivers, and traffic speeds.

Diverging diamond interchange at I-35 and 1st Ave. in Ankeny. (Source: Iowa DOT)

Corridors

Considerations for roadway segments depend on the type, location, operating conditions, and adjacent land uses (urban or rural). Table 5.1 includes physical recommendations for roadways that allow for improved truck accessibility and maneuverability.

Table 5.1: Roadway corridor design recommendations

Item	Recommendation(s)
Lane width	12 ft. (urban and rural)
	11 ft. minimum (urban)
Shoulder width	10 ft. effective width
	6 ft. paved width
Vertical clearance	16.5 ft. (secondary over primary and interchanges)
	15 ft. (primary over secondary)
Horizontal clearance	3 ft. from curb face (two lane)
	2 ft. from curb face (multi-lane)

Refer to the Iowa DOT Road Design Manual for the latest on design guidance.

Source: Iowa DOT

[1] These recommendations were informed by the Iowa DOT Road Design Manual (Chapter 1C-1), Kentuckiana Regional Planning & Development Agency Freight Design Guide, and NCHRP 943: Design and Access Management Guidelines for Truck Routes: Planning and Design Guide (2020).

Intersections and interchanges

Without proper designs and considerations, urban and rural intersections and interchanges can be a challenge for trucks to navigate. Things like turning radii, lane widths, interactions with other traffic, access management, lane striping, and signage need to be considered.

The volume and size of the trucks that are estimated to use a facility under design development shall be considered to appropriately accommodate the needed **turning paths** of these larger vehicles. The design should typically eliminate off-tracking of the rear trailer axles onto unpaved shoulders and eliminate off-tracking onto **pedestrian facilities**. Low raise curbs, lane encroachment and shoulder encroachment can be considered as part of the design to facilitate truck movements when appropriate.

Left turn lanes with appropriate length lane tapers or storage bays should be considered to decrease delays for through vehicles. Long tapers accommodate multiple trucks, while signal phasing, when appropriate, allows drivers to turn without yielding to pedestrians. In non-urban areas, exclusive **right turn lanes** for accommodating trucks should be considered.

Additionally, adjacent intersections and interchanges should be spaced appropriately from ramps to avoid long queues of trucks blocking other traffic movements.

Innovative design considerations

Innovative intersection and interchange designs are implemented to improve the safety and capacity of high traffic areas but require special considerations to sufficiently accommodate trucks.

Roundabouts are utilized throughout Iowa, on and off the primary system. Truck traffic needs should be considered prior to the construction of a roundabout on the IMFN and the remainder of the Primary Highway System.

If roundabouts are constructed on the IMFN, full size truck turning radii and mountable aprons should be included for increased maneuverability. Multi-lane roundabouts should consider signage, lane markings, and sight distance for truck drivers when being designed. If oversize/overweight (OSOW) trucks are expected, additional clearances should be implemented.

Diverging Diamond Interchanges shift traffic to the left side of the road through the middle of the interchange to reduce left turn conflicts and improve traffic flow. These interchanges are being utilized in certain parts of Iowa. The design of lane widths, lane markings, and signage should consider truck needs.

Other types of innovative designs such as intersections utilizing U-turns (e.g., restricted crossing U-turn and median U-turn intersections) are generally challenging for trucks and should be avoided on major truck routes. If these designs are constructed, considerations should include similar things like turning radii, median width, and number of lanes.

Truck parking and loading/unloading zones

Access to adequate truck parking for single unit, combination, and OSOW trucks is a top industry need. This includes not only parking along major highway corridors but also in urban areas to serve as short-term loading/unloading zones.

Efforts to reallocate existing truck parking spaces and strategically add new spaces along high-demand corridors are underway at Iowa DOT. Considerations of accommodating typical OSOW loads (e.g., wind turbine blades) should be included when designing additional truck parking areas.

In urban areas, the creation or designation of loading/unloading zones should be considered. Options include reserving designated spaces for delivery drivers and/or assigning spaces with time restrictions during peak periods.

Commercial motor vehicle parking facilities assessment

From 2012 to 2020, the Iowa DOT undertook an in-depth, multi-phase analysis of the rest area system throughout the state to assess current conditions of rest area facilities, user needs, freight truck parking, and overall public sentiment towards the Department's plan for future investment of state funds. As part of this analysis, the Iowa DOT examined the parking needs for commercial vehicles (truck parking). Figure 5.2 shows the state's current rest area system.

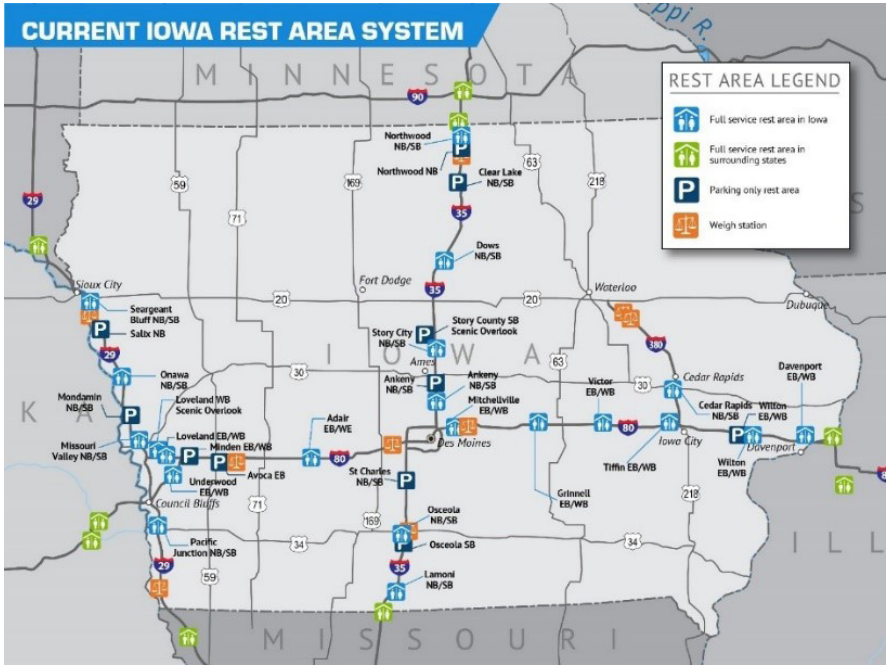
During the study, observers recorded the usage of commercial vehicle parking spaces to help estimate parking demand across the system. The study found that many of Iowa's rest areas lack commercial vehicle parking spaces and drivers must park along rest area entry ramps, in car parking spaces, and in other unauthorized parking areas.

Recommended Closures

To reduce the financial and maintenance burden of underutilized or redundant rest areas, the DOT plans to close eight full-service rest areas and ten parking only rest areas. This will dramatically reduce commercial vehicle parking.

To account for this, the Iowa DOT will increase available parking at the remaining rest areas. This reallocation process will add commercial vehicle parking to some corridors and remove parking from others. Figure 5.3 shows the net changes in truck parking on each interstate corridor.

Figure 5.2: Iowa rest area system, 2020



Source: Iowa DOT

Figure 5.3: Proposed additional truck parking

Source: Iowa DOT

Impact on Truck Parking

When closing rest areas, reductions in truck parking are the single largest impact to the traveling public. In consideration of these impacts, the Iowa DOT is evaluating and implementing mitigation efforts that will offset inconveniences that may be experienced by commercial drivers. Mitigation efforts include parking cameras and real time parking availability updates, and augmenting truck parking at adjacent rest areas and weigh stations.

Parking Cameras and Real-time Updates

The Iowa DOT placed real time truck parking availability cameras in operation at the rest areas along I-35 that provide real time truck parking availability to those in need. While it has been useful, it is time consuming for those looking for a spot to quickly assess multiple locations along a particular route.

With this in mind, a Transportation Investment Generating Economic Recovery grant funded implementation of a Mid America Association of State Transportation Officials (MAASTO) regional TPIMS program that collects and broadcasts real-time parking availability to drivers through a variety of media outlets including smart phone applications and traveler information websites. This helps drivers proactively plan their routes and make safer, smarter parking decisions at rest areas as well as private parking areas. TPIMS became operational in January 2019 and provides real time availability information along I-80, I-29, I-35, I-235, and I-380.

Augmenting Truck Parking at Adjacent Rest Areas & Weigh Stations

Strategies to address truck parking issues and needs in Iowa were developed and refined to include the following recommendations:

- Expand TPIMS solutions with additional sites, educational outreach to drivers and carriers, and integration with other parking apps and Electronic Logging Devices.
- Invest in vehicle-to-infrastructure technology to provide real-time parking information.
- Add a truck parking reservation system, particularly for oversize trucks.
- Use TPIMS historical data and predictive analytics to predict parking availability.
- Expand truck parking at remaining rest areas and parking only sites to offset parking loss from rest area closures and expand total truck parking by an estimated 247 spaces on the state system.
- Explore partnerships with public agencies and private companies to supplement truck parking, optimize the locations of truck parking capacity, and maximize the benefits of Iowa DOT investment.
- Update design standards and templates to increase the number of required truck parking spaces and incorporate oversize truck parking.

5.2 Improvements

Specific improvements are necessary to address the freight mobility issues experienced in Iowa. These will support the state's freight implementation strategies, the national freight goals, and the Iowa DOT system objectives.

Aviation

Most commercial airports in Iowa have the capacity, acreage, and necessary services to accommodate freight movement. However, the Des Moines International Airport (DSM) and Eastern Iowa Airport (CID) in Cedar Rapids handle more than 99 percent of reported air freight; therefore, current and future improvements at both locations are highlighted here. No air cargo bottlenecks were identified in Iowa as there is capacity to accommodate freight growth in the future. However, the existing air cargo facilities at DSM and CID are getting closer to full utilization.

DSM

The airport handled roughly 55 percent of Iowa's air cargo in 2020 and has about 50 acres reserved for cargo operations between two quadrants.

The south cargo area has approximately 43 acres that includes facilities for all-cargo carriers Amazon Air, FedEx, and UPS Inc. This area handles the majority of air cargo operations and was recently renovated, including roadways, new pavement, and a new FedEx facility. The east cargo area has approximately eight acres that includes some cargo facilities for United Airlines and the Federal Inspection facility (primary function is to perform inspections on cargo merchandise).

The current facilities are not fully utilized. However, DSM has a development plan that includes areas that may be developed into cargo operations as demand increases. With the addition of Amazon Air service in 2021, continued air cargo growth is expected.

CID

The airport handled roughly 44 percent of Iowa's air cargo in 2020. The majority moves through the airport via the integrated express carriers FedEx, UPS Inc., and DHL Express, with FedEx being the market leader.

There are four cargo-handling buildings and three cargo ramps currently at 90 percent utilization. Cargo carriers do not have exclusive use of these facilities so coordination is necessary at times depending on cargo carrier schedules.

There are an additional 76 acres, of an original 106 acres, identified in the airport's master plan for future cargo development and additional cargo apron space is programmed for construction in 2023. An update to the master plan started in 2021, with air cargo movement and capacity at CID being a primary focus during the planning process as e-commerce and other industry drivers continue to impact cargo needs.

Highway

There were 27 locations identified as highway freight bottlenecks in Iowa. Highway segments with capacity needs that impact freight mobility were also identified. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for information on the identification process for bottlenecks and capacity needs.

Since this bottleneck analysis is a very granular segment-level analysis, most bottlenecks occur at intersections, which is to be expected. However, to diagnose the specific issue and most effective treatment, a broader look at the surrounding network will likely be needed. Bottlenecks may have solutions as simple as retiming stoplights or as complex as access changes or new construction.

It should also be noted that identifying capacity needs at a corridor level involves professional judgment, as the existing or forecasted volume-to-capacity ratio throughout a corridor may vary substantially. Being identified as a capacity need does not necessarily mean additional lanes will need to be constructed. There are many other strategies and project types that may be appropriate for corridors other than capacity expansion, such as operational strategies, demand management, and intersection/interchange improvements.

The bottleneck locations were prioritized using the Value, Condition, and Performance (VCAP) matrix. After each candidate location was assigned a Value, Condition, and Performance value, each was ranked for the three categories. The average of these three rankings was calculated and the locations were assigned an overall priority rank. If multiple locations had the same average ranking, total truck traffic at the location was used as a tiebreaker.

Figure 5.4 and Table 5.2 show Iowa's freight highway priority locations.

VCAP Matrix

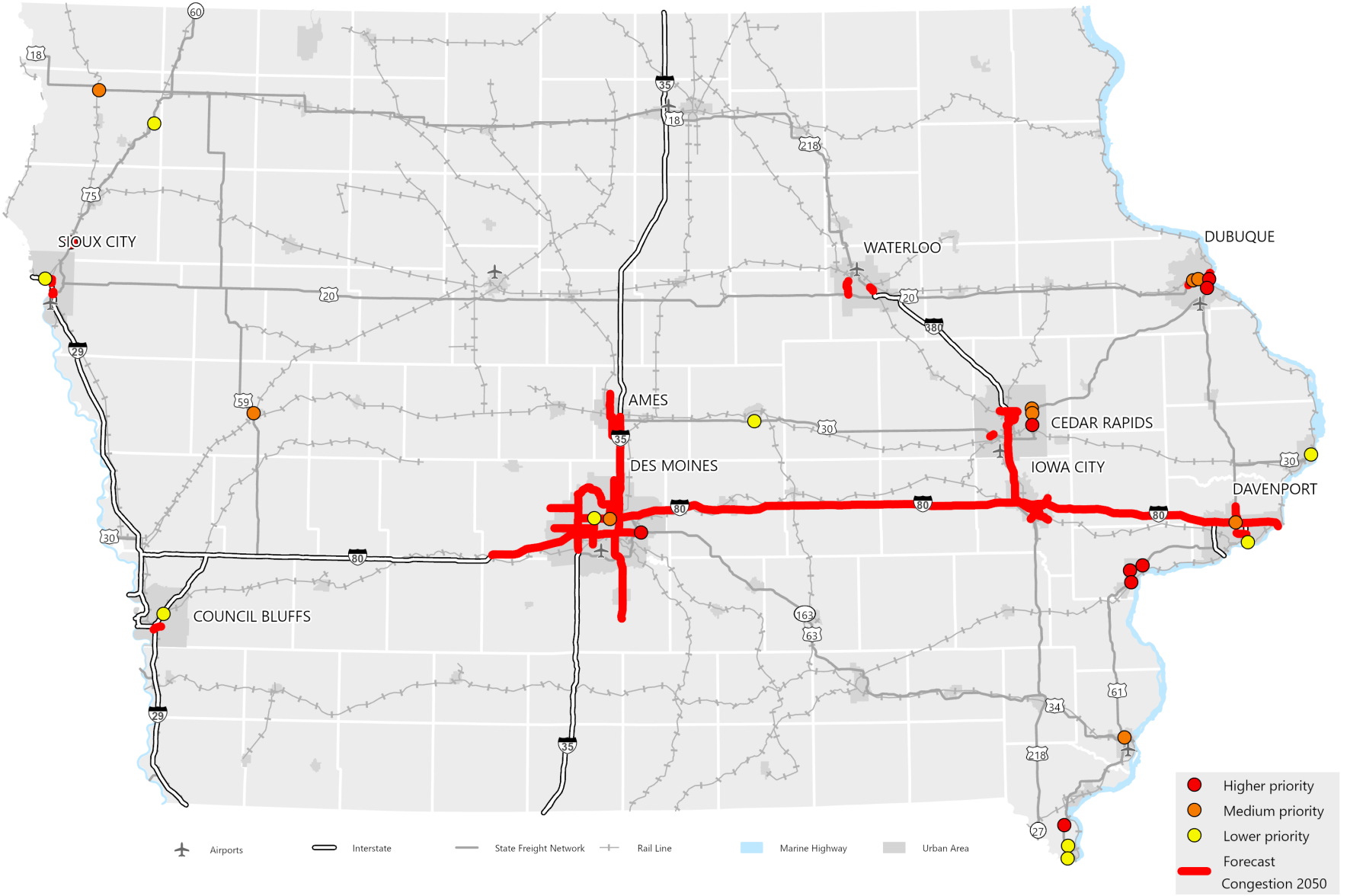
In order to identify and prioritize candidates for highway freight improvements, the Iowa DOT utilized the VCAP matrix. This approach takes advantage of multiple tools available at the Iowa DOT, including the Iowa Travel Analysis Model (iTRAM), Infrastructure Condition Evaluation (ICE), INRIX travel speed data, and Iowa's annual traffic counts.

Value: iTRAM was used to assess the value of each candidate location to the overall freight transportation network. An initial run of the model was completed first to show a base case scenario. A second run was then completed that excluded each one of the candidate locations individually. Once complete, the truck vehicle-hours traveled (VHT) was compared from the before-and-after scenarios and the difference was assigned as the value of the location. This process was completed for each individual candidate location, with higher priority being assigned to locations with larger VHT increases when excluded from the network. In other words, higher priority was assigned to locations that make the truck network more efficient from a VHT perspective.

Condition: ICE is a tool used for evaluating the primary highway system based on seven criteria: Pavement Condition Index (PCI), International Roughness Index, Bridge Condition Index, passenger traffic, single-unit truck traffic, combination truck traffic, and congestion. A normalization and weighting process is applied to each criterion and used to analyze highway segments before ultimately ranking them against each other based upon a final composite rating.

Performance: The total bottleneck minutes per mile for each location was determined during the bottleneck identification process using INRIX travel speed data. Those values were assigned to each location as the overall performance rating.

Figure 5.4: Highway freight priority locations and capacity needs



Source: Iowa Travel Analysis Model, Infrastructure Condition Evaluation, and INRIX

Table 5.2: Highway freight priority locations

	City	Location	Length	Value[2]		Condition[3]		Performance[4]		Average
1	Dubuque	U.S. 52 at U.S. 61/U.S. 151	0.01	131.4	2	55.5	2	14,357,435	2	2.0
2	Altoona	NE 70th Street at Iowa 163	0.03	114.5	3	63.0	6	8,354,943	4	4.3
3	Muscatine	U.S. 61 at Grandview Ave and Dick Drake Way	0.09	68.0	5	65.5	8	6,061,731	6	6.3
4	Cedar Rapids	U.S. 151/Iowa 13 at Mt Vernon Road	0.66	14.8	13	59.5	4	13,541,271	3	6.7
5	Dubuque	U.S. 20 at U.S. 61/U.S. 151	0.01	54.5	7	38.1	1	1,268,577	16	8.0
6	Keokuk	U.S. 218 at U.S. 61	0.11	34.1	8	64.0	7	1,917,954	13	9.3
7	Muscatine	Iowa 22 at U.S. 61	0.02	17.3	12	71.5	16	19,002,289	1	9.7
8	Muscatine	U.S. 61 at Iowa 38	0.10	19.8	11	67.4	11	2,648,475	8	10.0
9	Hinton	U.S. 75 at C60	0.45	141.8	1	62.7	5	298	27	11.0
10	Denison	U.S. 59 at Iowa 39	0.01	58.1	6	68.9	13	1,318,122	15	11.3
11	Burlington	Mt Pleasant Street at U.S. 61	0.13	6.6	18	65.5	9	2,286,496	9	12.0
12	Marion	U.S. 151 at Iowa 13	0.06	83.5	4	76.6	21	1,741,501	14	13.0
13	Hull	U.S. 18 at U.S. 75	0.39	10.2	15	57.0	3	576,743	21	13.0
14	Marion	U.S. 151/Iowa 13 at Iowa 100	0.14	9.1	17	78.3	22	8,145,963	5	14.7
15	Dubuque	U.S. 20 at NW Arterial	0.03	21.6	10	75.7	19	1,165,967	17	15.3
16	Dubuque	U.S. 20 at John F Kennedy Road	0.02	3.4	21	70.5	14	1,965,023	12	15.7
17	Davenport	U.S. 61 at I-80	0.13	25.0	9	70.8	15	2,382	26	16.7
18	Des Moines	Iowa 415/NW 2nd Avenue at I-80/35	0.17	1.3	23	66.0	10	1,087,158	18	17.0
19	Davenport	U.S. 67 at I-74	0.16	12.8	14	68.1	12	296,664	25	17.0
20	Des Moines	Iowa 28/Merle Hay Road at I-80/35	0.11	5.9	20	79.0	23	2,074,782	11	18.0
21	Keokuk	U.S. 61 at U.S. 136	0.01	3.0	22	84.0	26	4,269,800	7	18.3
22	Marshalltown	Iowa 14 at U.S. 30	0.04	9.6	16	81.0	24	748,215	19	19.7
23	Hospers	400th Street at Iowa 60	1.37	-1.8	27	83.0	25	2,212,836	10	20.7
24	Keokuk	U.S. 61 at U.S. 218 and Wirtz Lane	0.02	1.2	24	76.5	20	556,611	22	22.0
25	Clinton	U.S. 30 at U.S. 67	0.12	-0.6	26	72.0	17	512,472	23	22.0
26	Council Bluffs	U.S. 6/Kanesville Boulevard at I-80	0.32	5.9	19	89.0	27	681,358	20	22.0
27	Sioux City	U.S. 77 at I-29	0.01	0.2	25	72.5	18	322,172	24	22.3

Source: Iowa Travel Analysis Model, Infrastructure Condition Evaluation, and INRIX

2 Value score is determined by the change in truck vehicle hours traveled when each location is unavailable as part of the transportation system.

3 Condition is determined by the composite Infrastructure Condition Evaluation score for the segments at each location.

4 Performance is determined by calculating the total bottleneck minutes per mile for each location.

Railroad

The ISRP outlines potential projects and initiatives Iowa might consider proposing to improve existing services in the state. This includes possible future railroad improvements and investments that could address passenger rail, freight rail, and rail safety needs of Iowa, as identified through railroad company and stakeholder outreach and internal Iowa DOT coordination during development of the ISRP.

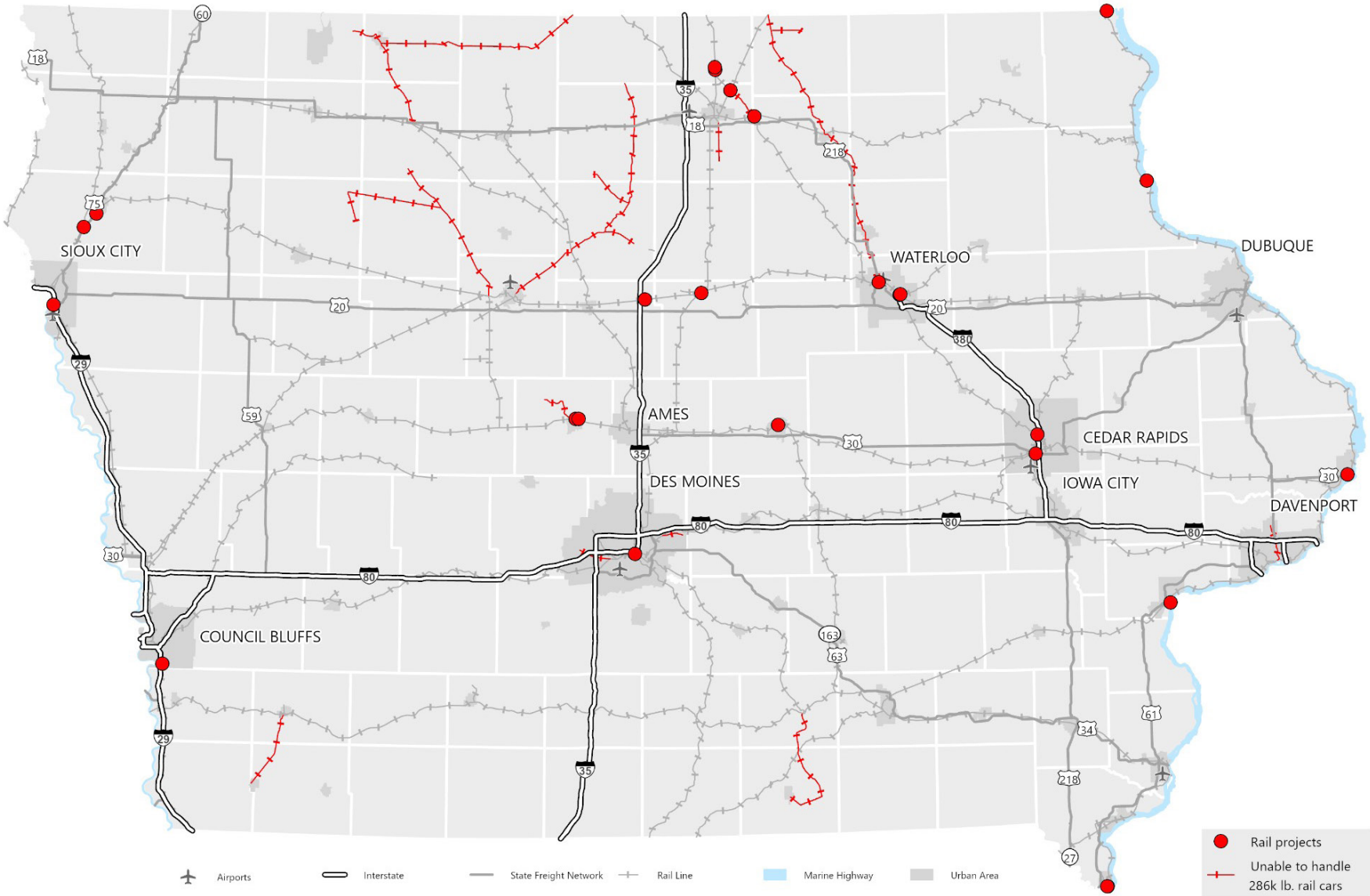
The full list of short-range (1-4 years) and long-range (5 or more years) projects is available in the ISRP. The railroad improvement list included in Figure 5.5 and Table 5.3 includes only the short-range freight rail projects on the railroad portion of the IMFN. The list is not prioritized but is listed from West to East through the state. Types of freight rail projects identified include the following.

- Enhancement of existing or construction of new transload or intermodal facilities
- Enhancement of existing rail access or development of new rail access for shippers/receivers
- Improvements to track infrastructure
- Enhancements to the capacity of the state's rail network
- Improvements to bridge infrastructure
- Address operating bottlenecks
- Mitigation measures in flood prone areas
- Grade separation of highway/rail grade crossings

In addition to these specific projects, there are multiple projects that utilize funds from the following programs annually.

- **Federal Highway-Railroad Crossing Safety Program:** Statewide grade crossing improvement and upgrade projects, including upgrading crossings with passive warning devices including crossbucks to active warning devices including flashing light signals and gate arms; upgrading existing signals; improve crossing surfaces; and to provide low-cost improvements such as increased sight distance, medians, widened crossings, or to close crossings.
- **State Highway-Railroad Surface Repair Program:** Includes statewide grade crossing improvement and upgrade projects to promote safety through surface replacement programs at public highway-railroad grade crossings.
- **Statewide Grade Crossing Safety Fund:** Includes funding for a portion of the maintenance costs for traffic control devices activated by the approach or presence of a train installed under the Highway-Railroad Crossing Safety Program.

Figure 5.5: Short-range freight rail projects



Source: Iowa railroad companies

Table 5.3: Short-range freight rail projects

	Railroad(s)	Project	Description
1	BJRY	Le Mars Transload expansion	Construct improvements and expand capacity of the transload facility in the Le Mars Industrial Park to handle additional commodities.
2	BNSF	Grade separation conceptual design at Merrill	Develop a concept for grade separation of US 75 and the BNSF Marshall Subdivision.
3	UP	Big Soo Terminal rail expansion at Sioux City	Construct a new industrial spur to supplement the existing rail capacity.
4	BNSF	Siding track construction at Council Bluffs	Develop a siding track for use in serving a transload facility under development on the BNSF Council Bluffs Subdivision.
5	UP	Add yard/working track support at Boone	Support switching operations at location to handle increased local business.
6	BSV	Boone Industrial Park upgrade Phase I	Install a 1700-foot siding track (including grading, ties, and ballasting) and on a spur into the existing industrial park allowing for the accommodation of 286K rail cars.
7	BSV	Boone Industrial Park upgrade Phase II	Upgrade 4200 feet of rail to 286K standard to increase track availability to stage rail cars, increase operational capacity at UP interchange, and install new 900-foot spur to allow for improved sorting of customer rail cars.
8	UP	Add yard/working track support at Marshalltown	Support switching operations to handle increased local business.
9	BNSF, IAIS, NS, and UP	Des Moines Transload Facility expansion	Future expansion of the private transload facility constructed in 2021.
10	IANR	Expanded capacity at Manly	Expand track capacity, develop land, and build access road entrance and exit to the Manly Logistics Park.
11	IANR	Intermodal facility construction at Manly	Develop a new intermodal facility on the IANR Manly Subdivision.
12	CP AND IANR	Remote control switches at Plymouth Junction	Install remote control switch machines to expedite train movements between IANR and CP at Plymouth Junction.
13	CP AND IANR	Remote control switches at Nora Springs	Install remote control switch machines to expedite train movements between IANR and CP at Nora Springs Junction.
14	CP and IANR	Interchange track capacity at Nora Springs	Increase track capacity at interchange to accommodate increasing traffic growth between CP and IANR.
15	CN	Transload services expansion at Williams	Convert the existing Alliant Energy coal transloading facility on the CN Waterloo Subdivision to a standard transload facility that could handle additional commodity and product types.

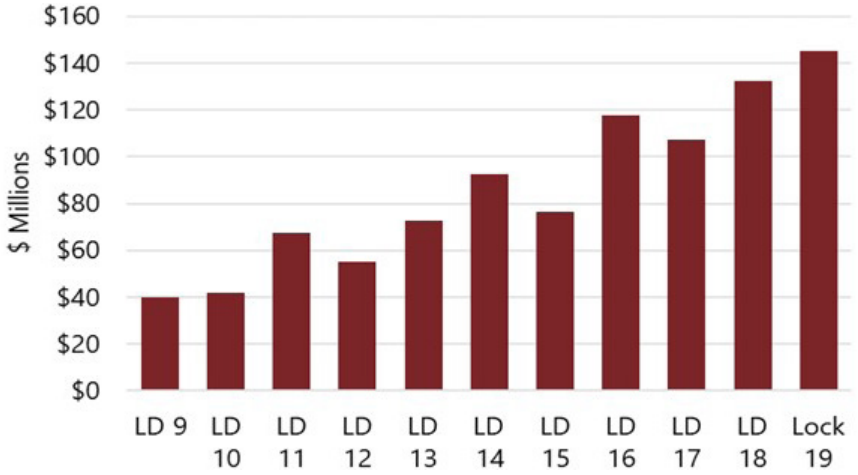
	Railroad(s)	Project	Description
16	CN and UP	Dual-rail connection in Hardin County and transload facility construction at Iowa Falls	Construct a dual-rail connection track to the CN Waterloo Subdivision and the UP Mason City Subdivision, four yard tracks and a siding each near CN and UP interchanges, and a transload/terminal facility.
17	CN	Standard Distribution Company Rail Transload Facility expansion at Cedar Falls	Increase facility size and track capacity at the transload facility on the CN Osage Subdivision.
18	CN and IANR	Bypass track construction at Waterloo	Construct a bypass track to connect the CN Industrial lead to the IANR Oelwein Subdivision which would eliminate reverse moves and blocked crossings.
19	CN AND IANR	Remote control switches at Waterloo	Install remote control switch machines to expedite train movements between IANR and CN.
20	CIC	Bypass track construction at Cedar Rapids	Construct a track to bypass ADM allowing trains to travel around rather than through the plant, promoting efficiency and minimizing potential operating conflicts for trains.
21	IANR	Flood mitigation measures at Cedar Rapids	Address flood prone area along the Cedar River by performing bank stabilization measures on the Cedar Rapids Subdivision from MP 101.2 to MP 200.9 at Linn Junction.
22	CP	Fauser Rail Terminal rail access at New Albin	Construct a rail spur to serve industries located on the CP Marquette Subdivision.
23	CP	Pattison Sand unit train capacity expansion at Garnavillo	Phases 1 and 2 of a six-phase project to expand the unit train capacity for Pattison Sand on the CP Marquette Subdivision.
24	CP and UP	ADM "S" curve improvement at Clinton	Reconfigure rail spur at the Clinton ADM Plant straightening the current "S" curve to allow for multiple cars transiting the spur.
25	CP	Transload/intermodal/port facility construction at Muscatine	Construct a multimodal transload/intermodal/port facility on the CP Ottumwa Subdivision and the Mississippi River.
26	KJRY	Yard and main track enhancements at Keokuk	Expand the Twin Rivers Yard by adding new yard tracks and undertaking other major yard rehabilitation, including replacing damaged infrastructure from derailments and flooding. Improvements will also be made to the main track between US 136 and the Mississippi River.
27	KJRY	Yard enhancements II at Keokuk	Two phase project to expand the KJRY Twin Rivers Yard by adding track capacity through track and switch improvements.
28	Multiple	Infrastructure upgrades to accommodate 286K rail cars	Upgrade segments, including track and bridges, of the rail network that were identified as being incapable of handling 286K rail cars.

Source: Iowa railroad companies

Waterway

With growing barge traffic on the Missouri River, it will be important for USACE to continue focusing on the Bank Stabilization and Navigation Project with the authorized purpose of providing a reliable, self-scouring navigation channel from St. Louis, Missouri to Sioux City, Iowa that is 9 feet deep and not less than 300 feet wide. However, most water-related needs for Iowa are associated with the infrastructure in and along the Mississippi River. Given the condition, size, and average delay of the 11 locks bordering Iowa, all are considered freight bottlenecks. It is clear that a lack of repairs, maintenance, and modernization will continue to have a negative impact on the efficiency and condition of the infrastructure. Failure or closure of a lock could be catastrophic for the region. The USACE has identified over $948 million in deferred/backlog maintenance and major rehabilitation and repair costs for the 11 locks and dams bordering Iowa, shown in Figure 5.6 and Table 5.4. Addressing these needs is essential to ensure continued viability of the Mississippi River for transporting freight to and from Iowa.

Figure 5.6: Deferred/backlog maintenance and major rehabilitation and repair costs for Iowa locks and dams



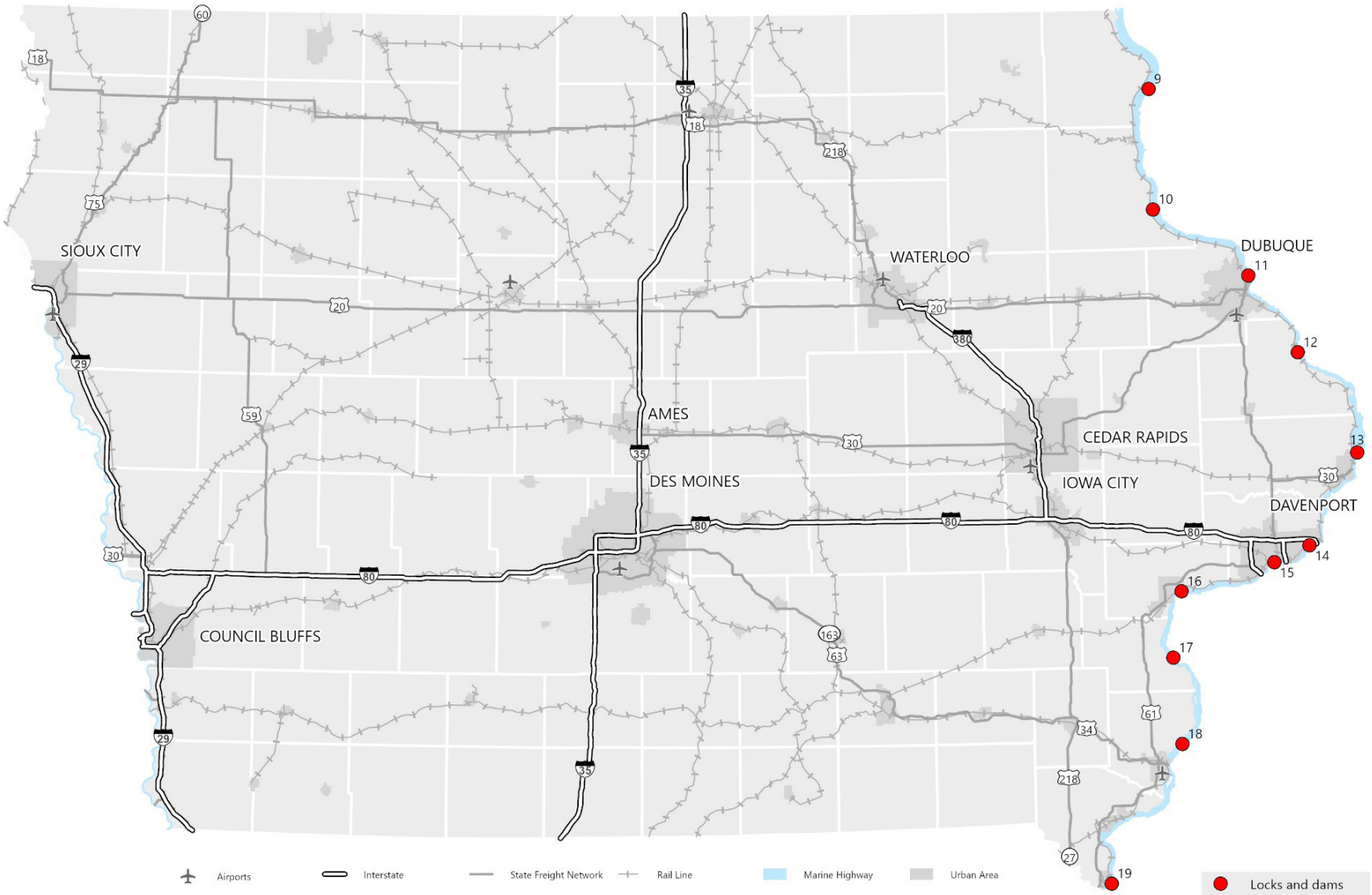
Source: U.S. Army Corps of Engineers

Table 5.4: Prioritized maintenance projects for Iowa locks and dams

1	Lock 18 Miter Gate Anchorage Replacement
2	Lock 17 Miter Gate Anchorage Replacement
3	Lock 19 PLC System Replacement
4	Lock 17 Upstream Guidewall Sheetpile Transition Wall Repair
5	Lock 13 Filling and Emptying System Replacement
6	Lock 19 Hydraulic Cylinder Rod Replacement
7	Dam 13 Spillway Seepage Cutoff Wall Repairs
8	Lock 14 - Auxiliary Lock/MRPO Guidewall
9	Lock 18 Access Road Repairs
10	6 Sites Dam Gate Trunnion Repairs
11	Lock 16 Filling and Emptying System (Drums and Wire Ropes)
12	Lock & Dam 14 Replace Bridge Crane & Bulkhead Lifter (Prototype)
13	Replace Bridge Crane & Bulkhead Lifter 10 Sites
14	Lock 11 & 12 Replace Miter Gate Anchorages Including A-Frame
15	Lock 13 & 14 Replace Miter Gate Anchorages Including A-Frame
16	Lock 15 & 16 Replace Miter Gate Anchorages Including A-Frame
17	12 Sites Lock & Dam Safety Hand Rail Replacement
18	12 Sites Lock & Dam Safety Signage - Restricted, etc.
19	Lock 13 Pressure Relief Wells
20	Lock 16 Floor Stability "Relief Wells"
21	Lock & Dam 11 - 19 Gates (Various maintenance/replacement)
22	Lock & Dam 12 - 10 Gates (Various maintenance/replacement)
23	Lock & Dam 13 - 13 Gates (Various maintenance/replacement)
24	Lock & Dam 14 - 17 Gates (Various maintenance/replacement)
25	Lock & Dam 15 - 11 Gates (Various maintenance/replacement)
26	Lock & Dam 16 - 19 Gates (Various maintenance/replacement)
27	Lock & Dam 17 - 11 Gates (Various maintenance/replacement)
28	Lock & Dam 18 - 17 Gates (Various maintenance/replacement)
29	Wingdam Repairs Pool 11-22
30	Fairlead Replacement at 6 Lock Sites
31	Lock & Dam 15 Checkposts

Source: U.S. Army Corps of Engineers

Figure 5.7: Waterway freight priority locations



Source: U.S. Army Corps of Engineers

5.3 Performance measures

Performance monitoring allows for the demonstration of how well the freight transportation system is performing relative to defined system objectives.

Iowa's freight performance measures reflect the most critical metrics for tracking the condition, utilization, safety, reliability, and sustainability of the overall freight system. These performance measures will be used to assess how the freight transportation system is currently performing and whether it is meeting the initiatives of the national freight goals. Reviewing performance of the network is an important piece of implementation. As the gap between transportation maintenance needs and available funding continues to grow, it is increasingly important to spend resources in the most strategic and efficient way possible.

Most of these freight performance measures are being tracked regularly, as shown in Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode), Chapter 3, Industries and commodities (Section 3.2, Commodity movement), and/or the Annual Implementation and Performance Report available on the State Freight Plan webpage. The emissions-related measures for each mode are to be developed.

All measures are categorized by mode and the relationship of each to the Iowa DOT system objectives (safety, sustainability, accessibility, and flow), as defined in Chapter 1, Introduction. These measures will be revisited and reevaluated during each future update of the State Freight Plan.

Aviation

- Number of freight-related aviation accidents
- Number of freight-related aviation fatalities

- State investments in IMFN airports
- Total estimated aviation emissions

- Total tons of air cargo at commercial airports
- Total value of air cargo at commercial airports

- Percent of IMFN airports with excess cargo-handling capacity

Highway

- Number of freight-related highway crashes
- Number of freight-related highway fatalities

- State investments in IMFN highways
- Infrastructure Condition Evaluation rating of the IMFN
- Total estimated truck emissions

- Change in public truck parking spaces

- Total truck vehicles miles traveled on the IMFN
- Total tons of truck cargo on the highway system
- Total value of truck cargo on the highway system
- Bottleneck minutes per mile on the IMFN
- Truck Travel Time Reliability Index for the IMFN

- Improvements made at highway bottleneck locations

- Total oversize/overweight loads permitted on the IMFN
- Percentage of the IMFN without capacity needs

Pipeline

- Number of freight-related pipeline fatalities
- State investments in pipelines
- Total tons of commodities on the pipeline system
- Total value of commodities on the pipeline system
- Number of freight-related pipeline incidents (including leaks)

Railroad

- Number of freight-related railroad crashes and/or derailments
- Number of freight-related railroad fatalities
- State investments in IMFN railroads
- Private maintenance and improvement spending on the railroad system
- Total estimated locomotive emissions
- Total gross ton-miles per mile on the railroad system
- Total tons of cargo on the railroad system
- Total value of cargo on the railroad system
- Number of choke points identified on the railroad system
- Improvements made at rail chokepoints
- Percentage of track-miles able to handle 286,000-pound cars

Waterway

- Number of freight-related inland waterway allisions, collisions, and/or groundings
- Number of freight-related inland waterway fatalities
- State investments in IMFN inland waterways
- Age of Mississippi River locks
- Total estimated vessel emissions
- Length of navigation season on the Mississippi and Missouri Rivers
- Total tons of cargo on the waterway system
- Total value of cargo on the waterway system
- Total delay at Mississippi River locks
- Improvements made at inland waterway bottlenecks
- Total unscheduled closures at Mississippi River locks
- Percentage of Mississippi River locks bordering Iowa that are 1200 ft. long

5.4 Stakeholders and partners

Utilizing input from freight stakeholders is crucial for the development of strong plans and implementation of successful strategies. The Iowa DOT engaged a number of state, regional, and national public and private sector stakeholders throughout the process to gather input on plan development and will continue to consider any findings or recommendations from these groups when carrying out freight activities.

Coordinating freight planning activities with stakeholders provides benefits and opportunities that include identifying and prioritizing investment opportunities, sharing design standards, and harmonizing regulations on specific corridors. It also assists in the sharing of resources and minimizing the duplication of efforts by multiple agencies. Although not an exhaustive list, this section provides an overview of the freight-related groups with which the Iowa DOT is most actively involved.

FAC

The FAC is a group of Iowa-based public and private stakeholders serving as an advisory body to the Iowa DOT on freight mobility policies, programs, and investments. This group was created in 2012 as a forum to assist with understanding the complexities associated with freight movements through education, discussion, and review.

Members representing the agriculture, energy, distribution, logistics, and multimodal transportation industries, as well as local and state government agencies (see FAC webpage for the most up-to-date membership list), meet on a quarterly basis to address critical topics cooperatively identified by the FAC Chair and Iowa DOT staff. This guidance allows the Iowa DOT to more effectively guide public investment in the freight transportation system with the ultimate goal of enhancing the competitiveness of Iowa's business and industry.

The FAC was engaged and consulted regularly throughout the development of the State Freight Plan. The group provided input on goals, trends, issues, networks, bottlenecks, implementation strategies, improvements/projects, and performance measures.

Rail Advisory Committee (RAC)

The mission of the RAC is to guide the Iowa DOT in fostering a safe and efficient rail transportation system. Through education, discussion, and sharing of concerns and opportunities, the RAC assists and advises the Iowa DOT on rail policies, programs, and investments. Responsibilities may include but are not limited to:

- Serving as an advisory body to Iowa DOT staff,
- Assisting in the development of the Iowa State Rail Plan,
- Reviewing proposals for policies, programs, and investments,
- Proactively identifying emerging trends that may impact the rail transportation system, and
- Advising on legislative issues impacting rail transportation.

The group, which includes representatives from each of the railroads operating in Iowa, meets a minimum of twice per year or as issues require. The Iowa DOT also communicates and consults with the RAC, as needed, outside of regular biannual meetings

The RAC was consulted on rail-specific portions of the State Freight Plan, including rail choke points and improvements.

MAASTO

MAASTO is one of four geographical regions of the American Association of State Highway and Transportation Officials, which is an association representing highway and transportation departments in the 50 states. MAASTO consists of 10 states primarily in the Midwest, including Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The goal of MAASTO is to foster the development, operation, and maintenance of an integrated and balanced transportation system that adequately serves the transportation needs of the states.

Mid-America Freight Coalition (MAFC)

Serving as the freight planning and research arm of MAASTO, the MAFC is a regional organization that cooperates in the planning, research, operation, preservation, and improvement of transportation infrastructure in the ten member states. These states meet regularly to collaborate on freight trends and initiatives.

Upper Mississippi River Basin Association (UMRBA)

UMRBA is a regional interstate organization coordinating Illinois, Iowa, Minnesota, Missouri, and Wisconsin river-related programs and policies, as well as work with federal agencies. UMRBA is involved primarily with programs related to commercial navigation, ecosystem restoration, water quality, aquatic nuisance species, hazardous spills, flood risk management, and water supply. The UMRBA Navigation Group, consisting of the five state transportation departments, has primary responsibility for implementing activities on the M-35 Marine Highway Corridor.

North American Strategy for Competitiveness (NASCO)

The goal of NASCO is to increase economic development activity while supporting multimodal infrastructure improvements, technology and security innovations, and environmental initiatives along the NASCO Corridor. This includes cities, counties, states, provinces, and private sector representatives along the corridor in Canada, Mexico, and the United States. The corridor also shadows U.S. Interstates 29, 35, and 94, and the connecting transportation system in Canada and Mexico critical to national and international trade.

Intelligent Transportation Systems (ITS) Heartland Corridor Coalition

The ITS Heartland Chapter of ITS America is intended to facilitate information sharing for ITS projects and activities and to showcase ITS applications in five heartland states: Missouri, Iowa, Kansas, Nebraska, and Oklahoma. To date, all five state transportation departments, along with major universities in each state and the FHWA, have been involved in developing the organization.

5.5 Funding mechanisms

Most highway projects in Iowa are paid for using revenue from the Road Use Tax Fund (RUTF). However, the State of Iowa also has several different grant and loan programs that aid freight-related projects. Each has specific eligibility requirements, but all support projects intending to improve the movement of goods.

This section provides a brief overview of the following funding programs. For a more detailed guide on the grant and loan programs, see the Iowa DOT's website.

- RUTF
- Linking Iowa's Freight Transportation System (LIFTS) Program
- State Airport Improvement Program
- Revitalize Iowa's Sound Economy (RISE)
- Railroad Revolving Loan and Grant (RRLG) Program
- Highway-Railroad Crossing Surface Repair Program
- Iowa Clean Air Attainment Program (ICAAP)
- County and City Bridge Construction Fund
- County-State Traffic Engineering Program (C-STEP)
- Iowa Traffic Engineering Assistance Program (TEAP)
- Traffic Safety Improvement Program
- Urban-State Traffic Engineering Program (U-STEP)

Federal funding programs not specific to Iowa are not included. A summary of the National Highway Freight Program (NHFP) funds allocated to Iowa is included in Section 5.6, Freight Investment Plan.

RUTF

Dedicated highway use revenue, collected through a state excise tax on fuels, is deposited into the RUTF. No state General Fund (i.e., general tax) revenue is used for highway projects in Iowa. Established in 1949, the RUTF has provided a stable and reliable source for investing in the state's primary, secondary, and municipal roadway systems. After some off-the-top diversions, receipts into the RUTF are distributed according to a formula of 47.5 percent for the primary road system, 24.5 percent for secondary county roads, 8 percent for farm-to-market county roads, and 20 percent for city streets.

LIFTS Program

The LIFTS program was created in fall 2015 as a one-time, flexible funding source of $2.6 million for multimodal freight-related projects utilizing State Infrastructure Bank funds. This was used for an initial round of project solicitation and awards that helped demonstrate the demand and value of a freight funding program.

The Iowa Transportation Commission and Iowa DOT now allocate NHFP flexible funds to a competitive grant program and updated version of the original LIFTS pilot program. The updated version of LIFTS allows stakeholders outside of the Iowa DOT to apply for the flexible funding for use on freight projects. Project evaluation criteria are used to determine which projects are funded as part of each funding cycle. Specific projects funded through the LIFTS program are identified in Section 5.6, Freight Investment Plan.

RISE

The RISE program was established to promote economic development in Iowa through construction or improvement of roads and streets. Iowa cities and counties are eligible for these funds, which may be in the form of a grant, loan, or a combination thereof. Projects must involve construction or improvement of a public roadway.

State Airport Improvement Program

This program provides funding for airport improvements, navigational aids, communications equipment, marketing, safety, security, outreach, education, and planning. Airport Development and Immediate Safety Enhancement are specific funding programs under the Airport Improvement Program. Publicly owned airports in Iowa are eligible.

RRLG Program

RRLG is a state loan and grant program established to build or improve rail infrastructure or facilities that will spur economic development and job growth and provide assistance to railroads for the preservation and improvement of the rail transportation system. Those eligible include businesses, industries, railroads, local governments, and economic development agencies. Justification for projects focuses on improving the rail network, job creation, wage quality, and project investment.

Highway-Railroad Crossing Surface Repair Program

This program assists railroad companies and public road jurisdictions with rebuilding public highway-railroad grade crossing surfaces in Iowa. Those eligible include railroad companies, private entities that own a railroad track, and public road jurisdictions.

ICAAP

ICAAP funds highway/street, transit, bicycle/pedestrian, and freight projects, as well as programs that help maintain Iowa's clean air quality by reducing transportation-related emissions. Eligible highway/street projects must be on the federal-aid system, which includes all federal functional class routes except rural minor collectors. The state, a county, or a city may sponsor an application or may co-sponsor for private, nonprofit organizations or individuals. Eligible projects reduce emissions via traffic flow improvements, reduce vehicle-miles of travel, reduce single-occupant vehicle trips, or other transportation improvement projects that improve air quality or reduce congestion.

County and City Bridge Construction Fund

This program provides funding for construction or replacement of public roadway bridges. Iowa counties and cities are eligible. Candidate bridges must be classified as structurally deficient or functionally obsolete according to federal guidelines.

C-STEP

The intent of C-STEP is to solve traffic operations and safety problems on primary roads outside incorporated cities. Any Iowa county is eligible to use these funds on spot and/or linear improvements.

U-STEP

The intent of U-STEP is to solve traffic operation and safety problems on primary roads in Iowa cities. Spot and/or linear improvements must involve a municipal extension of a primary road.

TEAP

TEAP provides traffic engineering expertise to local units of government. The purpose is to identify effective traffic safety and operational improvements, as well as potential funding sources to implement the recommendations. Typical studies address high-crash locations, unique lane configurations, obsolete traffic control devices, school pedestrian traffic, truck routes, parking issues, etc.

Traffic Safety Improvement Program

This program provides funding for traffic safety improvements or studies on any public road under county, city, or state jurisdiction. Eligible projects will fall into one of three categories: construction or improvement of traffic safety and operations at a specific site with crash history; purchase of materials for installation of new traffic control devices; or transportation safety research, studies, or public information initiatives.

5.6 Freight Investment Plan

The NHFP was developed to improve the condition and performance of the National Highway Freight Network (NHFN). The NHFP includes a formula program providing funding to be used for freight-related projects on the NHFN across the country. Each state receives funds in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs (see Table 5.5).

A state may not obligate these funds unless the state has developed an approved freight plan which includes a freight investment plan listing of priority projects and describes how NHFP funds made available would be invested and matched. Table 5.7 documents the use of NHFP funds, National Highway Performance Program (NHPP) funds, and Primary Road Fund match.

Each federal fiscal year (FY), a state may obligate up to 30 percent of the total apportionment to the state for freight intermodal or freight rail projects. The Iowa Transportation Commission allocated NHFP flexible funds to the LIFTS competitive grant program for use on freight projects.

NHFP funds from FY 2016 to FY 2021 were awarded and/or authorized to the following projects:

- Council Bluffs Interstate Highway System (I-29/I-80)
- Davenport I-74 bridge replacement
- Iowa City I-80/I-380 interchange
- Multiple LIFTS projects (see Table 5.6)

Table 5.5: Iowa NHFP apportionment, 2016-2026

	Apportionment total	Apportionment (98%)*	Freight projects (90%)	Flexible funding (10%)
FY 2016	$14,085,949	$13,804,230	$12,423,807	$1,380,423
FY 2017	$13,386,574	$13,118,843	$11,806,958	$1,311,884
FY 2018	$14,627,929	$14,335,370	$12,901,833	$1,433,537
FY 2019	$16,511,333	$16,181,106	$14,562,996	$1,618,111
FY 2020	$18,276,135	$17,910,612	$16,119,551	$1,791,061
FY 2021	$18,161,883	$17,798,645	$16,018,781	$1,779,865
FY 2022	$17,043,984	$16,703,104	$15,032,794	$1,670,310
FY 2023	$17,384,864	$17,037,167	$15,333,450	$1,703,717
FY 2024	$17,732,561	$17,377,910	$15,640,119	$1,737,791
FY 2025	$18,087,213	$17,725,469	$15,952,922	$1,772,547
FY 2026	$18,448,957	$18,079,978	$16,271,980	$1,807,998
Total	**$183,747,382**	**$180,072,434**	**$162,065,191**	**$18,007,243**

**Apportionment (98%) includes a 2% reduction to account for SPR*

Source: Iowa DOT and Federal Highway Administration

Table 5.6: LIFTS projects awarded

Grant recipient(s)	Project description
Burlington Junction Railway and City of Mt. Pleasant	Construction of a transload facility to be operated by Burlington Junction Railway. Facility will be used for rail-to-truck and truck-to-rail cross dock transloading.
TSL Company	Redevelopment and expansion of the existing container terminal in Council Bluffs, IA in three phases, including upgrading the lot to concrete and constructing a temporary transload facility.
U.S. Army Corps of Engineers, Rock Island District	Construction of a mooring cell near Lock & Dam 14 on the Mississippi River.
Iowa Southern Railway	Replacement and anchoring of up to 5,000 new cross ties, 10,000 new rail anchors, and 20,000 new track spikes between Centerville and Moravia.

Source: Iowa DOT

Table 5.7: Iowa Freight Investment Plan, 2022-2026

Iowa NHFP funds	Apportionment (98%)	$16,703,104	$17,037,167	$17,377,910	$17,725,469	$18,079,978	$86,923,627
Location, project	**Funding**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Total**
Freight projects							
I-80 in Johnson County *1.5 miles East of Iowa 1 to 0.5 miles East of County Road X30*	NHPP	$20,095,357		$2,262,681	$2,613,178	$0	$24,971,216
	NHFP	$13,115,543		$15,640,119	$15,952,922	$10,881,000	$55,589,584
	Primary Road Fund match	$3,690,100		$1,989,200	$2,062,900	$1,209,000	$8,951,200
	Total project cost	$36,901,000		$19,892,000	$20,629,000	$12,090,000	$89,512,000
I-80 in Cedar County *East of Cedar River to west of County Road Y26*	NHPP		$2,088,750				$2,088,750
	NHFP		$15,333,450				$15,333,450
	Primary Road Fund match		$1,935,800				$1,935,800
	Total project cost		$19,358,000				$19,358,000
Flexible funding (LIFTS program)							
Burlington Junction Railway and City of Mt. Pleasant	NHFP	$451,561					$451,561
	Match	$134,000					$134,000
	Total Project Cost	$670,000					$670,000
TSL Company	NHFP	$1,536,000					$1,536,000
	Match	$384,000					$384,000
	Total Project Cost	$1,920,000					$1,920,000
U.S. Army Corps of Engineers, Rock Island District	NHFP	$1,600,000					$1,600,000
	Match	$400,000					$400,000
	Total Project Cost	$2,000,000					$2,000,000
Iowa Southern Railway	NHFP		$330,935				$330,935
	Match		$330,934				$330,934
	Total Project Cost		$661,869				$661,869
Future LIFTS projects	NHFP		$1,372,782	$1,737,791	$1,772,547	$1,807,998	$7,022,052
Totals							
Freight projects subtotal		$13,115,543	$15,333,450	$15,640,119	$15,952,922	$10,881,000	$70,923,034
Flexible funding projects subtotal	*(22% in FY22, 10% FY23-FY26)*	$3,587,561	$1,703,717	$1,737,791	$1,772,547	$1,807,998	$10,609,613
Total funds spent		$16,703,104	$17,037,167	$17,377,910	$17,725,469	$12,688,998	$81,532,647
Total funds remaining		$0	$0	$0	$0	$5,390,980	$5,390,980

Source: Iowa DOT

APPENDICES

Appendix 1: Freight-generating facilities

Appendix 1 includes an inventory of Iowa freight-generating facilities. These lists are not exhaustive. Some facilities listed may no longer be operational and new facilities may not be represented. Descriptions of freight-generating facility types are included in Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode). Intermodal facilities, transload facilities, barge terminals, distribution centers, public/contract warehouses, ethanol plants, and biodiesel plants are listed. Due to the large number of facilities and locations throughout the state, grain elevators are not listed.

Table A.1: Intermodal and transload facilities

City	Facility	Intermodal	Transload	Cross-dock	Team track	Warehouse	Truck/ Rail	Truck/ Barge	Rail/ Barge
Altoona	Merchants Distribution Service		■	■		■			
Altoona	Iowa Cold Storage			■					
Burlington	BJRY		■	■	■	■			
Camanche	ADM Terminal Services		■	■		■			
Camanche	UP Distribution Services			■	■				
Cedar Falls	Standard Distribution		■	■		■			
Cedar Rapids	CRANDIC Wilson Ave Team Track		■	■	■				
Cedar Rapids	Logistics Park Cedar Rapids		■			■			
Cherokee	Cloverleaf Cold Storage					■			
Clayton	Consolidated Grain and Barge		■						
Clinton	ADM Terminal Services		■			■			
Clinton	Clausen Companies Warehousing		■	■		■			
Council Bluffs	IAIS Intermodal Facility	■							
Council Bluffs	BAT Logistics		■						
Council Bluffs	Cox Contracting Company Inc.		■						
Council Bluffs	Union Pacific Distribution Services			■	■				
Davenport	Catch-Up Logistics		■	■		■			
Davenport	Murrays Warehousing		■	■		■			
Des Moines	Merchants Distribution Service		■	■		■			
Des Moines	Des Moines Cold Storage			■		■			
Des Moines	Luckey Logistics		■						

City	Facility	Intermodal	Transload	Cross-dock	Team track	Warehouse	Truck/ Rail	Truck/ Barge	Rail/ Barge
Des Moines	Des Moines Transload		■			■			
Dubuque	Gavilon		■			■			
Le Mars	BJRY Transload		■	■	■				
Le Mars	Le Mars Public Storage, Inc.			■		■			
Manly	Manly Terminal		■						
Manly	Manly Yard		■			■			
Mason City	Iowa Dry Warehouse		■	■	■	■			
Mason City	IATR/Progressive Rail		■	■	■				
Mason City	Cartersville Elevator Inc.		■						
Mt. Pleasant	BJRY		■						
Muscatine	Kinder Morgan		■			■			
Muscatine	CAM II Warehouse					■			
New Hampton	New Hampton Transfer & Storage		■	■		■			
Newton	Luckey Logistics		■						
Newton	IAIS				■				
Ottumwa	BJRY		■	■	■				
Ottumwa	Quest Liner/Foodliner		■						
Shell Rock	Butler Logistics Park	■	■			■			
Sioux City	Big Soo Terminal		■						
Sioux City	L.G. Everist		■						
Waterloo	Kinder Morgan		■			■			
Waterloo	Bryant Yard		■	■		■			
Williams	Williams Bulk Transfer		■	■	■	■			

Source: Survey of Iowa companies

Table A.2: Barge terminals

City	Facility	River
Bettendorf	Noble Petro Inc.	Mississippi
Bettendorf	Bettendorf Terminal	Mississippi
Bettendorf	Continental Cement Co.	Mississippi
Bettendorf	Flint Hills Resources, LP	Mississippi
Blencoe	NEW Cooperative Port of Blencoe	Missouri
Buffalo	Upper Mississippi River Fleeting Inc.	Mississippi
Buffalo	Blackhawk Fleet, Inc	Mississippi
Buffalo	LaFarge Corporation - Davenport	Mississippi
Buffalo	Cargill AgHorizons	Mississippi
Buffalo	Cargill Buffalo Terminal	Mississippi
Burlington	Matteson Marine Service, Inc	Mississippi
Burlington	ADM/Growmark	Mississippi
Burlington	ADM/Growmark	Mississippi
Burlington	ADM/Growmark	Mississippi
Burlington	AGRI Grain Marketing	Mississippi
Burlington	Alliant Energy-Burlington Generating Station	Mississippi
Burlington	Burlington River Terminal, Inc. North	Mississippi
Burlington	Matteson River Terminal	Mississippi
Burlington	Burlington River Terminal, Inc. South	Mississippi
Camanche	American River Transportation Company	Mississippi
Camanche	Vertex Chemical Corporation	Mississippi
Clayton	Pattison Brothers - North	Mississippi
Clayton	Pattison Brothers - South	Mississippi
Clinton	ADM Corn Processing	Mississippi
Clinton	ADM/Growmark	Mississippi
Clinton	M.L. Kapp Station	Mississippi
Clinton	ARTCO Fleeting Services	Mississippi
Clinton	Clinton Municipal Dock	Mississippi
Council Bluffs	Cargill	Missouri
Davenport	Linwood Mining & Minerals	Mississippi
Davenport	River/Gulf Grain Company	Mississippi
Davenport	Texpar Energy LLC	Mississippi
Davenport	W.G. Block	Mississippi
Davenport	CHS Inc.	Mississippi
Davenport	CHS Inc.	Mississippi
Dubuque	Peavey Company	Mississippi
Dubuque	Dubuque Power Plant	Mississippi
Dubuque	ARTCO Fleeting Services	Mississippi
Dubuque	Flint Hills Resources	Mississippi
Dubuque	Cargill AgHorizons	Mississippi
Dubuque	Dubuque Barge & Fleeting Service Co	Mississippi
Dubuque	Dubuque River Terminal	Mississippi
Fort Madison	Hall Towing, Inc.	Mississippi
Keokuk	Hendricks River Logistics, LLC	Mississippi
Keokuk	Roquette America Services	Mississippi
Keokuk	Roquette America, Inc.	Mississippi
Lansing	Lansing Power Station	Mississippi
Le Claire	Riverstone Group Inc.	Mississippi
McGregor	Agri-Bunge, LLC	Mississippi
McGregor	ARTCO Fleeting Services	Mississippi
Muscatine	Grain Processing Corporation	Mississippi
Muscatine	K.A. Steel	Mississippi
Muscatine	Muscatine Power & Water Generation	Mississippi
Muscatine	River Terminal Corp.	Mississippi
Muscatine	Cargill AgHorizons	Mississippi
Muscatine	W.G. Block Company	Mississippi
Muscatine	Central Iowa Power Cooperative Fair Station	Mississippi
Muscatine	CHS Inc.	Mississippi
Sergeant Bluff	Koch Nitrogen Co. LLC	Missouri
Sergeant Bluff	Ag Processing, Inc.	Missouri
Sioux City	Jebro, Inc.	Missouri
Sioux City	Big Soo Terminal	Missouri
Wever	Colusa Elevator Company	Mississippi

Source: U.S. Army Corps of Engineers

Table A.3: Distribution centers

City	Facility
Altoona	Amazon
Ankeny	Casey's General Store
Ankeny	Perishable Distributors of Iowa
Ankeny	Firestone
Ankeny	Toro
Ankeny	Advance Auto Parts
Boone	Fareway Stores
Cedar Falls	Target
Cedar Falls	Wesco Aircraft
Cedar Rapids	Nordstrom Direct Contact and Fulfillment Center
Chariton	Hy-Vee
Cherokee	Hy-Vee
Clear Lake	McKesson
Council Bluffs	AP Moller
Davenport	Von Maur
Des Moines	Florist Distributing Inc.
Des Moines	Lomar Distributing Inc.
Des Moines	Watsco
Des Moines	Lennox
Dubuque	Nordstrom
Dyerville	Farmtek
Forest City	Winnebago
Forest City	3M
LeMars	Wells Enterprises
Manly	Sukup Manufacturing
Maquoketa	Family Dollar
Maquoketa	Generac
Mt. Pleasant	Walmart
Shelby	Menards
Sioux City	AGCO
Urbandale	United States Postal Service Des Moines NDC
Waterloo	Ferguson Enterprises
West Branch	Proctor & Gamble

Source: Survey of Iowa companies

Table A.4: Public/contract warehouses

City	Facility
Akron	Heyl Truck Lines
Altoona	Iowa Cold Storage, LLC
Altoona	Merchants Distribution Service
Ankeny	Ankeny Cold Storage
Bettendorf	AmeriCold Logistics
Burlington	Diversified Distribution Service Center
Camanche	Economy Coating Systems, Inc.
Cedar Falls	Standard Distribution Co.
Cedar Rapids	Worley Warehousing, Inc
Cedar Rapids	Midwestern Third Party Logistics
Clinton	Clausen Warehousing & Trucking
Davenport	Catch-Up Logistics Warehousing and Distribution
Davenport	Murray's Warehouse, Inc.
Des Moines	Action Warehouse Co., Ltd.
Des Moines	Des Moines Cold Storage Co., Inc.
Des Moines	Jacobson Companies
Des Moines	Kitt's Transfer & Storage
Des Moines	Diverse Solutions MBE
Des Moines	Centennial Warehouse Corp.
Harlan	Variety Distributors, Inc.
Le Mars	Jacobson Companies
Le Mars	Nor-Am Cold Storage
Muscatine	C A M II Warehouse
New Hampton	New Hampton Transfer & Storage, Inc.
Ottumwa	Hardsocg Pneumatic Tool Co./HPT Stores-All
Peosta	Peosta Warehousing
Sioux City	Big Soo Warehouse
Sioux City	Jacobson Companies
Sioux City	Jacobson Companies
Walford	GSTC Logistics, Inc.
Waterloo	Crystal Distribution Services, Inc.
Waterloo	Waterloo Warehousing and Service Co., Inc

Source: Leonard's Guide National Warehouse and Distribution Directory

Table A. 5: Ethanol plants

City	Facility
Albert City	Valero Renewables
Arthur	POET - Arthur
Ashton	POET - Ashton
Atlantic	Elite Octane
Cedar Rapids	Archer Daniels Midland
Cedar Rapids	Archer Daniels Midland
Charles City	Valero Renewables
Clinton	Archer Daniels Midland
Coon Rapids	POET - Coon Rapids
Corning	POET - Corning
Council Bluffs	Southwest Iowa Renewable Energy
Denison	The Andersons Denison Ethanol, LLC
Dyersville	Big River United Energy, LLC
Eddyville	Cargill, Inc
Emmetsburg	POET - Emmetsburg
Emmetsburg	POET - DSM Advanced Biofuel, LLC
Fairbank	POET - Fairbank
Fort Dodge	Cargill, Inc
Fort Dodge	Valero Renewables
Galva	Quad County Corn Processors
Goldfield	Corn, LP
Gowrie	POET - Gowrie
Grand Junction	Louis Dreyfus Commodities, LLC
Hanlontown	POET - Hanlontown
Hartley	Valero Renewables
Iowa Falls	POET – Iowa Falls
Jewell	POET - Jewell
Lakota	Valero Renewbles
Marcus	Little Sioux Corn Processors
Mason City	Golden Grain Energy
Menlo	POET - Menlo
Merrill	Lakeview Plymouth Energy

Table A. 5: Ethanol plants (continued)

City	Facility
Muscatine	Grain Processing Corporation
Nevada	Lincolnway Energy
Nevada	Verbio Nevada
New Hampton	Homeland Energy Solutions
St. Ansgar	Absolute Energy (MN)
Shell Rock	POET – Shell Rock
Shenandoah	Green Plains, Inc.
Sioux Center	Siouxland Energy Cooperative
Steamboat Rock	Pine Lake Corn Processors, LLC
Superior	Green Plains, Inc
West Burlington	Big River Resources

Source: Iowa Renewable Fuels Association

Table A.6: Biodiesel plants

City	Facility
Algona	Ag Processing Inc (AGP)
Clinton	HERO BX - Clinton
Crawfordsville	W2 Fuel
Farley	Western Dubuque Biodiesel
Iowa Falls	Cargill, Inc
Mason City	Renewable Energy Group (REG)
Newton	Renewable Energy Group (REG)
Ralston	Renewable Energy Group (REG)
Sergeant Bluff	Ag Processing Inc (AGP)
Wall Lake	Western Iowa Energy
Washington	Iowa Renewable Energy
Wall Lake	Western Iowa Energy
Washington	Iowa Renewable Energy

Source: Iowa Renewable Fuels Association

Appendix 2: Plan revisions

Freight Investment Plan amendment – December 2022

Added Linking Iowa's Freight Transportation System (LIFTS) program project (awarded December 2022) to Table 5.6: LIFTS projects awarded on page 124 and Table 5.7: Iowa Freight Investment Plan, 2022-2026 on page 125

- Iowa Southern Railway
  - Total project cost: $661,869 ($330,935 NHFP, $330,934 match)
  - Project description: replacement and anchoring of up to 5,000 new cross ties, 10,000 new rail anchors, and 20,000 new track spikes between Centerville and Moravia.

Performance measures – January 2023

Added measures, pages 118-119

- Number of freight-related aviation fatalities
- State investments in IMFN airports
- Percent of IMFN airports with excess cargo-handling capacity
- State investments in IMFN highways
- Change in public truck parking spaces
- Improvements made at highway bottleneck locations
- State investments in pipelines
- State investments in IMFN railroads
- Improvements made at rail chokepoints
- State investments in IMFN inland waterways
- Improvements made at inland waterway bottlenecks

Removed measures, pages 118-119

- Commercial airport runway PCI
- Accessibility to commercial airports in Iowa or surrounding states
- Number of freight carriers at each commercial airport
- Regularity of pipeline and infrastructure inspection
- Average train length and/or number of trains per day
- Maintenance and rehabilitation spending at Mississippi River locks
- Number of barges on the waterway system

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