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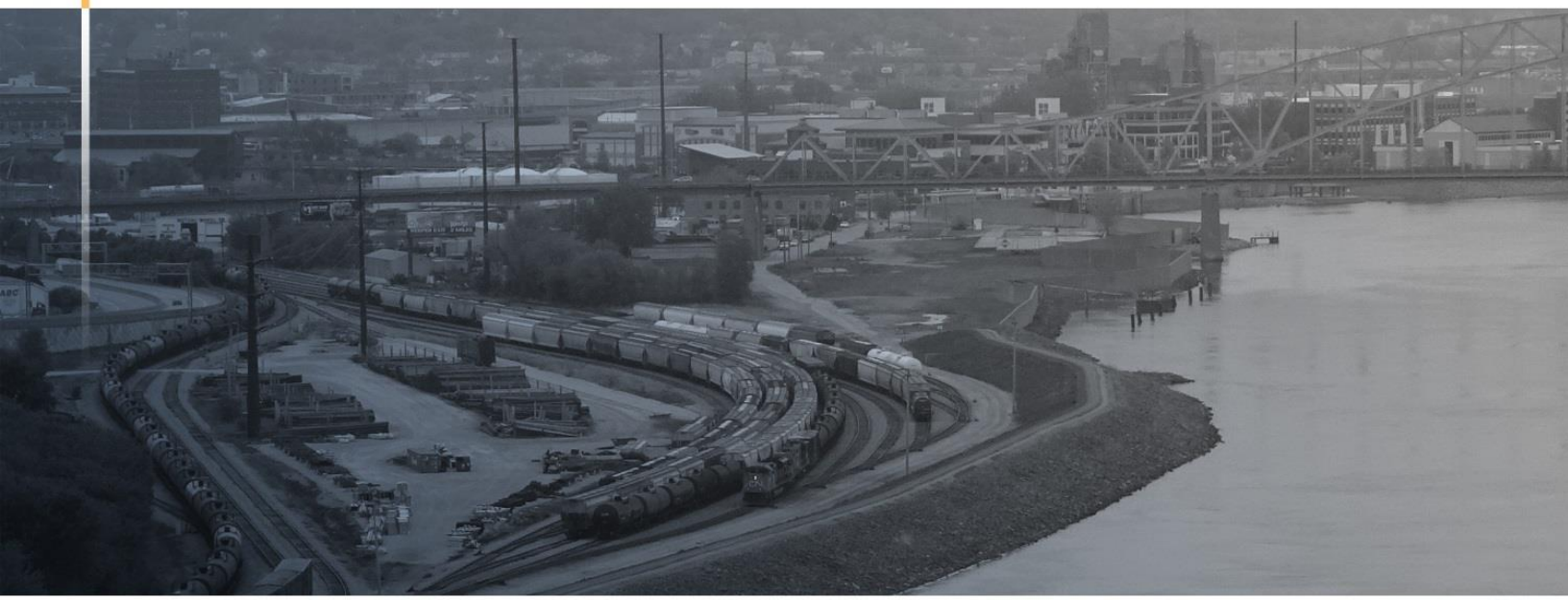

Eight County Freight Plan

Working Paper 1: Freight System Inventory and Use

Prepared for:

East Central Intergovernmental Association

Blackhawk Hills Regional Council

Prepared by:

CPCS

In association with:

WSP | Parsons Brinckerhoff

American Transportation Research Institute

Solutions for growing economies

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September 18, 2017

Eight County Freight Plan

The objective of the Eight County Freight Plan (Plan) is to develop a better understanding of the multimodal freight system in the bi-state region and to use that information to better inform policy and programming decisions.

Working Paper

This Working Paper is the first in a series of four that together inform the Plan. This first Working Paper provides an overview of the Eight County's economy and key industries, freight system assets, and how they are used.

Acknowledgments

The CPCS Team acknowledges and is thankful for the input of those consulted in the development of this Working Paper, as well as the guidance and input of representatives from ECIA, BHRC and their study partners.

Opinions

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of ECIA or BHRC.

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Cover image source: CPCS

Table of Contents

Acronyms / Abbreviations ..... **vi**
Executive Summary ..... **viii**
1 Introduction **1**
1.1 Background 1
1.2 Objectives 2
1.3 Project Structure 2
1.4 Purpose of this Working Paper 3
1.5 Methodology 3
1.6 Limitations 3
2 Eight County Regional Economy **4**
2.1 Regional Economy 4
2.1.1 Population 4
2.1.2 Income and Education 5
2.2 Employment and Industries 8
2.3 Freight-Related Industries 9
2.3.1 Manufacturing 14
2.3.2 Agriculture 17
2.4 Freight-Related Industry Transportation Requirements 22
3 Eight County Freight System **24**
3.1 Eight County Freight System Use 24
3.2 Highway System 25
3.2.1 Key Roadway Corridors 27
3.2.2 Supporting Corridors 35
3.2.3 Bridge Connections 36
3.2.4 Access and Connectivity 36
3.3 Railroad System 39
3.3.1 Rail Bridges 42
3.3.2 At-Grade Rail Crossings 43
3.3.3 Key Facilities 43

3.3.4 Access and Connectivity 44
3.4 Inland Waterway System 45
3.4.1 Locks and Dams 48
3.4.2 Key Facilities 48
3.4.3 Access and Connectivity 51
3.5 Regional, National and Global Connectivity 52
3.5.1 Air Cargo 52
3.5.2 Intermodal Facilities 54
4 Future Outlook 57
4.1 External Factors that Influence the Freight System 57
4.1.1 Social Factors and Trends 59
4.1.2 Technological Factors and Trends 61
4.1.3 Environmental Factors and Trends 64
4.1.4 Economic Factors and Trends 66
4.1.5 Political Factors and Trends 69
4.1.6 Questions for an Unknown Future 70
4.2 Strengths, Weaknesses, Threats and Opportunities 71
4.2.1 Population and Workforce 71
4.2.2 Key Industries 72
4.2.3 Transportation Infrastructure 73
5 Conclusions and Next Steps 75
5.1 Conclusions 75
5.2 Next Steps 75

Table of Figures

Figure ES-1: Eight County Region ix
Figure ES-2: Relative Employment by Industry x
Figure ES-3: Freight System Tonnage (left) and Value (right) by Mode (2014) xi
Figure ES-4: Freight System Tonnage (left) and Value (right) by Commodity (2014) xi
Figure ES-5: Eight County Region Strengths, Weaknesses, Threats and Opportunities xiii
Figure 1-1: Eight County Region 1
Figure 1-2: Project Approach 2
Figure 2-1: Population Trends 5
Figure 2-2: Population Comparison 5
Figure 2-3: Median Income 6
Figure 2-4: Educational Attainment in the Eight County Region 7
Figure 2-5: Regional Workforce Development Efforts 8
Figure 2-6: Unemployment Rate Comparison 9
Figure 2-7: Regional Employment by Industry 9
Figure 2-8: Relative Employment by Industry 10
Figure 2-9: Freight-Related Employment 10
Figure 2-10: Freight-Relevant Firms 11
Figure 2-11: Freight-Related Industries in the Region (with 20+ employees) 12
Figure 2-12: Location Quotients of Freight-Related Businesses 13
Figure 2-13: Manufacturing's Share of Gross Domestic Product, State and National Trends 14
Figure 2-14: Regional Manufacturing Share of Employment* (left) and Payroll (right), 2005 - 2015 . 14
Figure 2-15: Top 5 Manufacturing Firms by Employment 15
Figure 2-16: Regional Manufacturing Employment Concentrations 16
Figure 2-17: Important Manufacturing Industries 17
Figure 2-18: Agriculture's Share of GDP for Illinois, Iowa, and the US 18
Figure 2-19: Combined Corn and Soybean Acreage by County 18
Figure 2-20: Regional Corn and Soybean Crop Cover, 2016 19
Figure 2-21: Regional Farms and Employment by County 20
Figure 2-22: Grain Corn and Soybean Production (left) and Yield (right) 20

Figure 2-23: Manufacturing Firms Supporting the Agricultural Industry (20+ employees) 21
Figure 2-24: Freight Transportation Spectrum 22
Figure 2-25: Cargo Carrying Capacity of Freight Modes 23
Figure 3-1: Freight System Tonnage (left) and Value (right) by Mode (2014) 24
Figure 3-2: Freight System Tonnage (left) and Value (right) by Commodity (2014) 25
Figure 3-3: Regional Road Mileages by Network or Classification 26
Figure 3-4: Eight County Highway System 26
Figure 3-5: Regional Truck Volumes 28
Figure 3-6: Regional Truck Percentages 29
Figure 3-7: Regional Truck Routes 30
Figure 3-8: US-20 Corridor 31
Figure 3-9: US-30 Corridor 32
Figure 3-10: US-61 Corridor 33
Figure 3-11: US-52 Corridor 34
Figure 3-12: US-151 Corridor 34
Figure 3-13: I-88 Corridor 35
Figure 3-14: Regional Highway Bridges over the Mississippi River 36
Figure 3-15: Components of the National Highway Freight Network 37
Figure 3-16: Regional Intermodal Connectors 38
Figure 3-17: Travel Time to Regional Transportation Facilities 38
Figure 3-18: Railroad System Miles by Operator 39
Figure 3-19: Eight County Railroad System 40
Figure 3-20: Regional Rail Traffic Volumes (Trains per Day) 41
Figure 3-21: Mississippi River Railroad Bridges 42
Figure 3-22: Clinton Rail Bridge 42
Figure 3-23: Eight County Rail At-Grade Crossings 43
Figure 3-24: Regional Railroad Facilities 44
Figure 3-25: Travel Time (hours) and Mileage to Nearby Rail Intermodal Facilities from Select Locations 44
Figure 3-26: Eight County Inland Waterway System 46
Figure 3-27: Regional Locks and Dams 47
Figure 3-28: Regional Annual Commercial Lock Traffic, 2016 47
Figure 3-29: Regional Waterborne Tonnages 48

Figure 3-30: Eight County Barge Terminals 49
Figure 3-31: Regional Barge Terminals (North to South) 50
Figure 3-32: Key Mississippi River Facilities 51
Figure 3-33: Eight County Proximity to Other Key Regional Freight Facilities 53
Figure 3-34: Eight County Intermodal Facilities 54
Figure 3-35: Eight County Intermodal Facilities 56
Figure 4-1: External Factors and Potential Impact to the Freight System 58
Figure 4-2: External Factors Influencing Freight Transport 59
Figure 4-3: US Coal Production and Consumption (2010-2016) 64
Figure 4-4: Wind Farms and Production Facilities in Iowa and Illinois 65
Figure 4-5: Eight County Region SWOT – Population and Workforce 72
Figure 4-6: Eight County Region SWOT – Key Industries 73
Figure 4-7: Eight County Region SWOT – Transportation Infrastructure 74
Figure 5-1: Project Approach 75

Acronyms / Abbreviations

BHRC	Blackhawk Hills Regional Council
BNSF	Burlington Northern and Santa Fe Railway
CN	Canadian National
CNG	Compressed Natural Gas
CP	Canadian Pacific
CRANDIC	Cedar Rapids and Iowa City Railway
CRFC	Critical Rural Freight Corridors
CUFC	Critical Urban Freight Corridors
DOT	Department of Transportation
ECIA	East Central Intergovernmental Association
EIA	Energy Information Administration
FAST Act	Fixing America's Surface Transportation Act
FASTLANE	Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
IA	Iowa
IADOT	Iowa Department of Transportation
IL	Illinois
ILDOT	Illinois Department of Transportation
JIT	Just in Time
LNG	Liquefied Natural Gas
MN	Minnesota
NAFTA	North America Free Trade Agreement
NC	Not calculated
ND	Not disclosable
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHS	National Highway System
NS	Norfolk Southern
PHFS	Primary Highway Freight System
Plan	Eight County Freight Plan
Region	Eight County Region
RVPR	Riverport Railroad
STEEP	Social, technological, environmental, economic, political
SWOT	Strengths, weaknesses, threats and opportunities

TEU	Twenty foot equivalent unit
UMMIC	Upper Mississippi Manufacturing Innovation Center
UP	Union Pacific Railroad
UPS	United Parcel Service
US	United States
USACE	United Stated Army Corps of Engineers
WI	Wisconsin

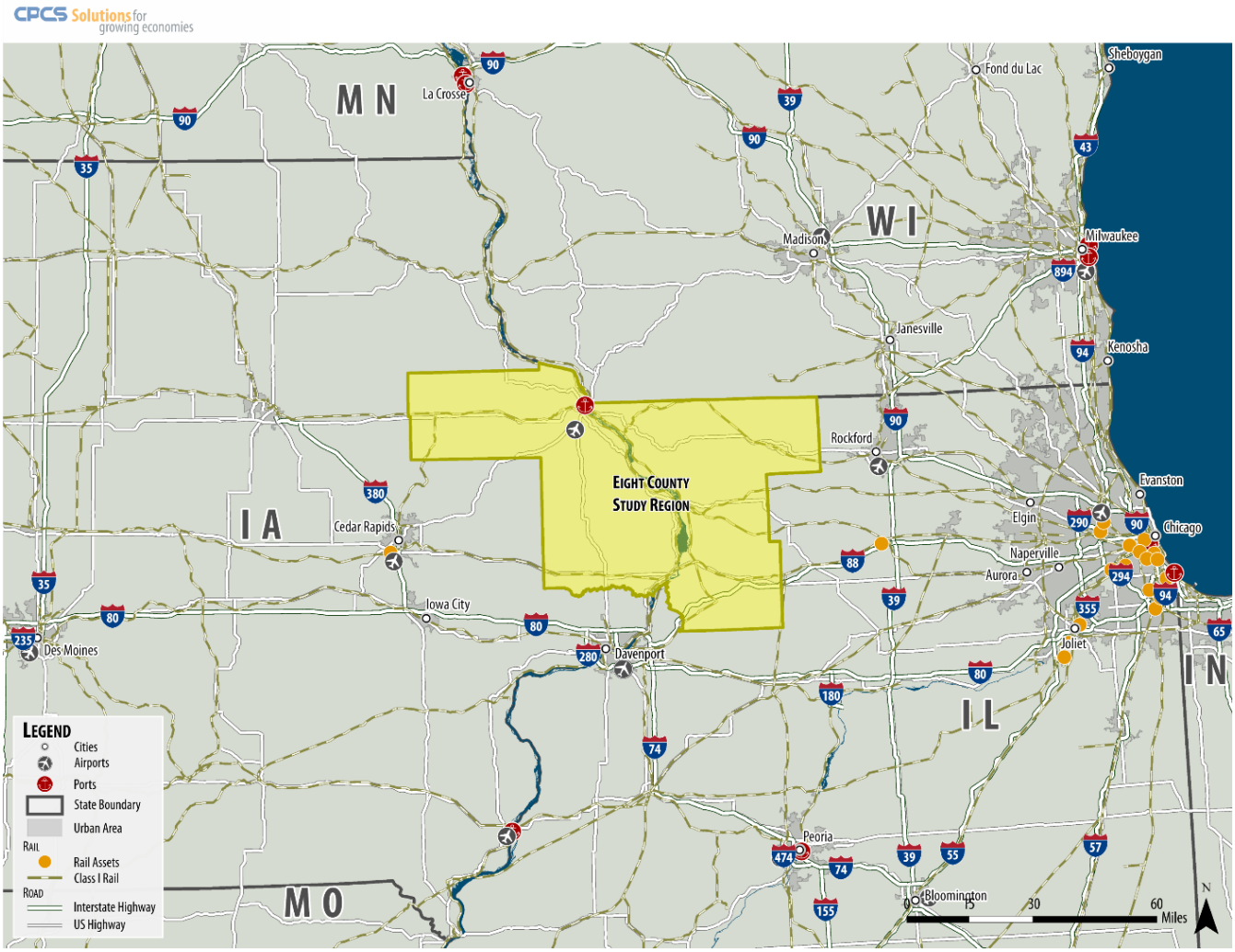
Project Sponsors

Executive Summary

The Eight County Region is at the heart of major US manufacturing and agricultural activity, and is made up of the Counties of Carroll, Jo Daviess, Stephenson, and Whiteside counties in Illinois, as well as Clinton, Delaware, Dubuque, and Jackson counties in Iowa. This region, shown in Figure ES-1, relies on the multimodal transportation system of roads, rails, air and water ports to both supply the inputs needed for production and to transport goods to consumers inside and outside of the Region – driving their local economies.

The efficiency of the transportation system affects the competitiveness and growth potential of the Region. In order to enable the competitiveness of existing, as well as attract new business, the Region must understand how the freight transportation system is linked to the local economy, identify needs on the transportation system and define opportunities to improve freight transportation in local planning and policy decisions.

Figure ES-1: Eight County Region

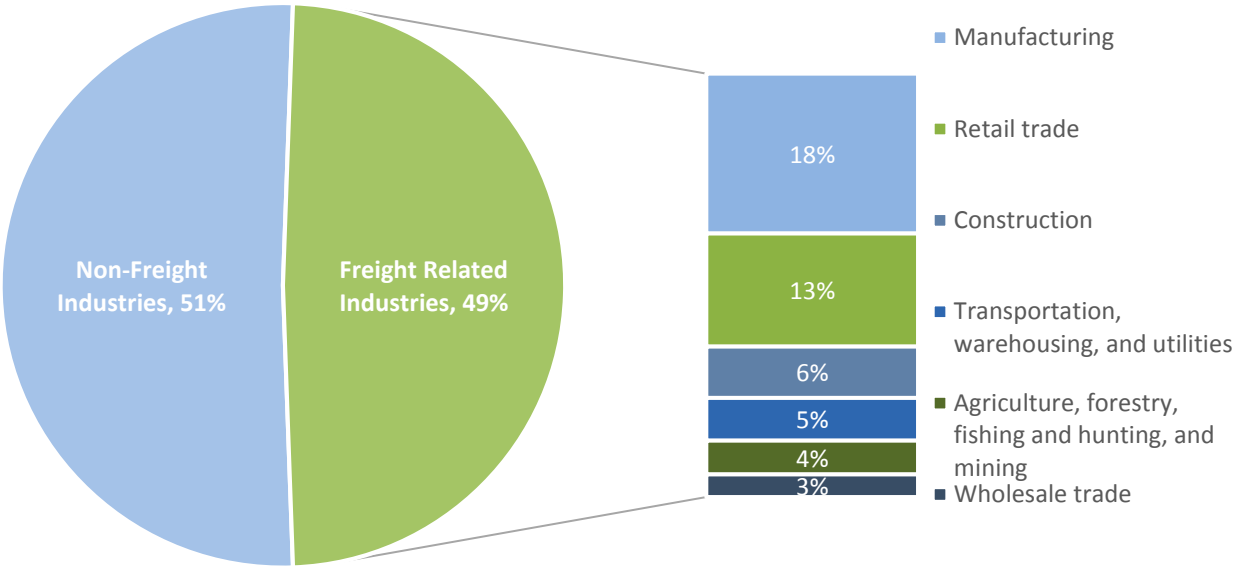


Source: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

Key Industries and Output

This Region has a diverse population and economy in which freight transportation is extremely important. As shown in Figure ES-2 almost 50 percent of the Region's workers are employed by firms that rely on the movement of freight to support their operations. Key freight-related industries for the region are agriculture, which generates large tonnages of freight (over 31.8 million tons in 2014), and manufacturing, which employs 18 percent of the Region's workforce.

Figure ES-2: Relative Employment by Industry



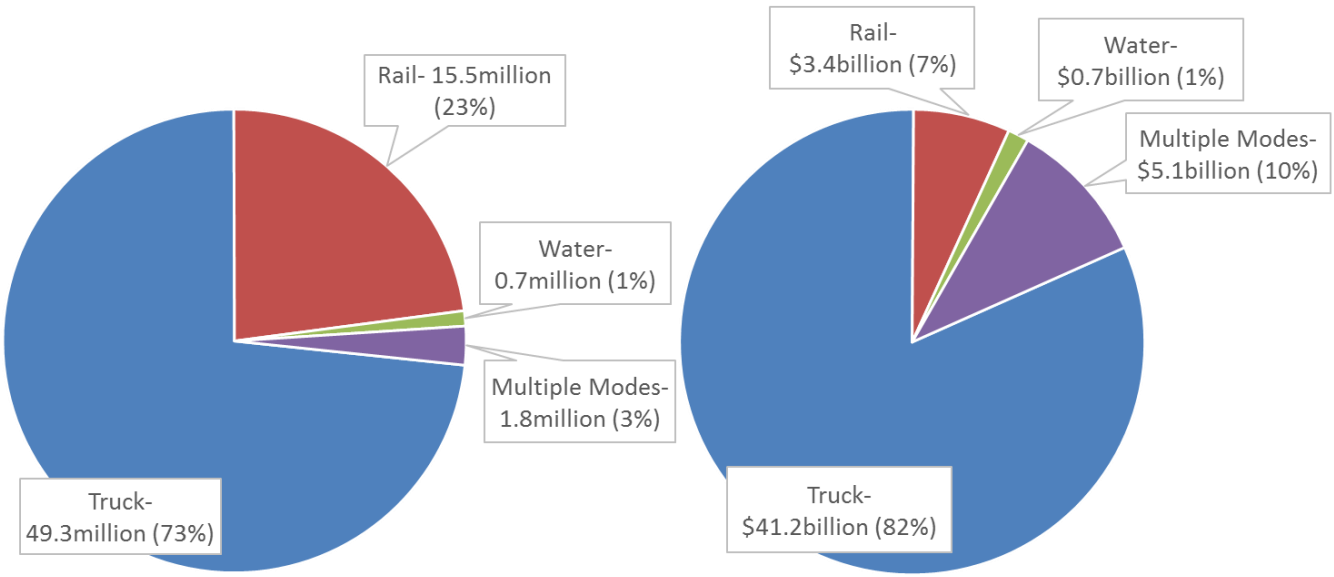
Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau

As a result of these local industries, in 2014, the Region's freight system carried 67.3 million tons of freight worth $50.4 billion. As shown in Figure ES-3, trucking was the most commonly-used mode, carrying 73 percent of the region's freight by tonnage, and 82 percent of its freight by value. While trucks carry the majority of the freight in the Eight County Region in terms of both value and tonnage, the Region also has extensive rail lines and major barge facilities. Rail carried the second largest tonnage (23 percent), and multiple-mode shipments (such as truck to barge or truck to rail, or containerized shipments), carried the second largest share of value (10 percent).

Generally, the Region's transportation assets are aligned for the efficient movement of bulk goods.

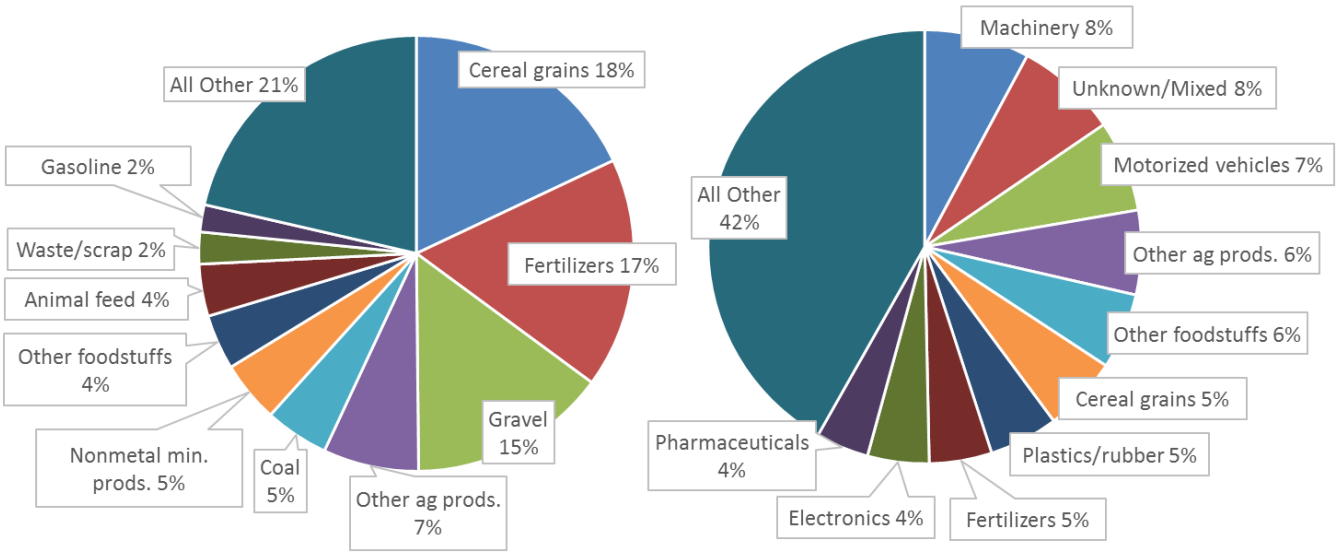
In terms of specific commodities, bulk cereal grains (such as corn) are the number one commodity by tonnage (18 percent), and machinery is the number one commodity by value (eight percent). Figure ES-4 provides a visual of the top ten commodities by tonnage and value.

Figure ES-3: Freight System Tonnage (left) and Value (right) by Mode (2014)



Source: WSP | PB Analysis of FHWA Freight Analysis Framework version 4 (FAF4) data. Preliminary.

Figure ES-4: Freight System Tonnage (left) and Value (right) by Commodity (2014)



Source: WSP | PB Analysis of FHWA Freight Analysis Framework version 4 (FAF4) data. Preliminary.

Infrastructure

In terms of freight system infrastructure, the Region's road network is made up of different sub-networks including Interstate highways, national highways, state highways, and county roads. However, of note is the small number of Interstate miles in the Region (~46 miles), as compared to national highway system miles (~640 miles). This means trucks must rely on US and State Routes for connections to the broader national freight system.

A similar picture is true for rail infrastructure. The Region is served by five railroads and nine railyards, yet local firms have relatively limited rail access, as rail sidings are required for direct access, and most of the Region's rail terminals are built for the transfer of bulk materials, such as grain or fertilizer. Because of this orientation towards bulk shipments, few rail connections are available for producers of non-bulk commodities such as manufactured goods. Firms looking to move their goods by rail may have to ship their products by truck to rail intermodal facilities.

The Mississippi River flows for 93 miles through the center of the Region, making it an ideal transportation corridor to the Gulf of Mexico and international markets. The Region is home to 21 groups of barge terminals in seven cities, with the majority clustered around Dubuque, IA and Clinton, IA. All terminals have a truck connection, and ten have rail connections.

The Region may lack its own access points for many mode/commodity combinations, but it benefits from the Midwest's wealth of transportation assets, in particular the Mississippi River, and the intermodal yards and airports nearby in Rockford, Rochelle and greater Chicago.

Future Outlook

The freight system (including the transportation network, shippers, carriers, etc.) operates within a dynamic environment that is continually changing and adapting to best meet current market demands. While it is difficult to pinpoint how this environment will change in the future, we do know that there are a number of external factors that will influence it and, in turn, how goods are moved in the Region.

This study does not focus on predicting how the system will change, as much as it considers how to make the Region's freight transportation system resilient and adaptable to an unknown future.

Based on the information presented in this Working Paper, initial observations have been made related to the Region's strengths weaknesses, threats, and opportunities (SWOT). Figure ES-5 presents a summary of the SWOT as conducted related to the Region's population, key industries, and transportation infrastructure. This preliminary assessment will continue to be built upon during the development of the Eight County Freight Plan.

Figure ES-5: Eight County Region Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
• Relatively stable population • Steady increases in income • Diverse industrial base, including manufacturing and agriculture • Diverse manufacturing sector • Multimodal freight assets • Freight system designed to transport bulk goods	• Lack of skilled and semi-skilled employees • Bridges, river crossings • Distance to major intermodal and transfer facilities
Threats	**Opportunities**
• Lower population growth compared to peer regions • Shrinking workforce • The importance of manufacturing for the Region appears to be decreasing • Automation (manufacturing-related) • Competitive global market for crops • Infrastructure failure – locks and dams • Unknown social, economic, and policy changes from the adoption of connected and autonomous vehicles • Sea level rise	• Postsecondary workforce programs • On- and Near-shoring • Value-added agriculture • Embrace technology

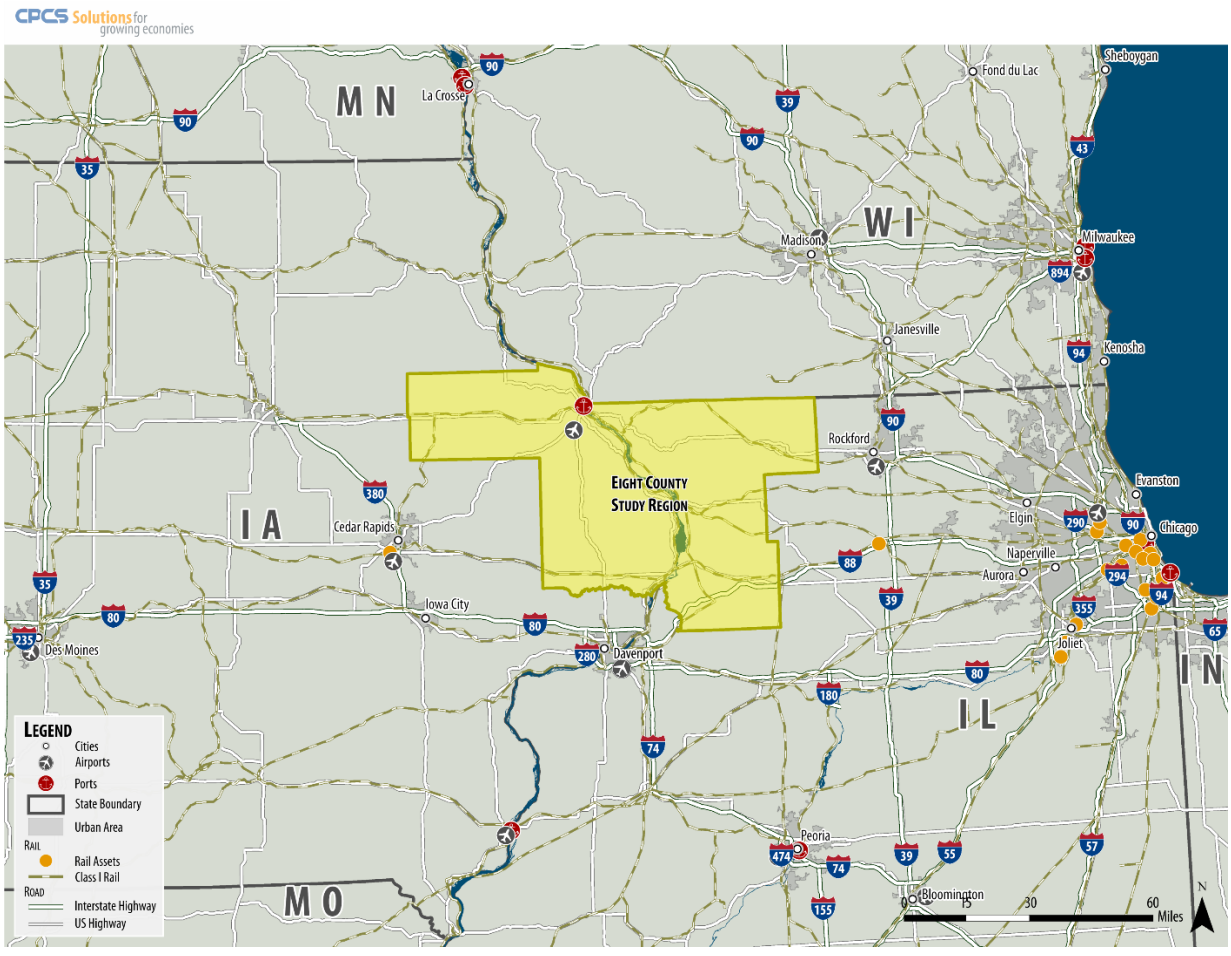
1 Introduction

1.1 Background

The Eight County Region, shown in Figure 1-1, is at the heart of major US manufacturing and agricultural activity. The Counties of Carroll, Clinton, Delaware, Dubuque, Jackson, Jo Daviess, Stephenson, and Whiteside rely on the multimodal transportation system of roads, rails, air and water ports to both supply the inputs needed for production and to transport goods to consumers inside and outside of the Region – driving their local economies.

The efficiency of the transportation system affects the competitiveness and growth potential of the Region. In order to enable the competitiveness of existing, as well as attract new business, the Region must understand how the freight transportation system is linked to the local economy, identify needs on the transportation system and define opportunities to improve freight transportation in local planning and policy decisions.

Figure 1-1: Eight County Region



Source: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

1.2 Objectives

The primary objective of the Eight County Freight Plan is

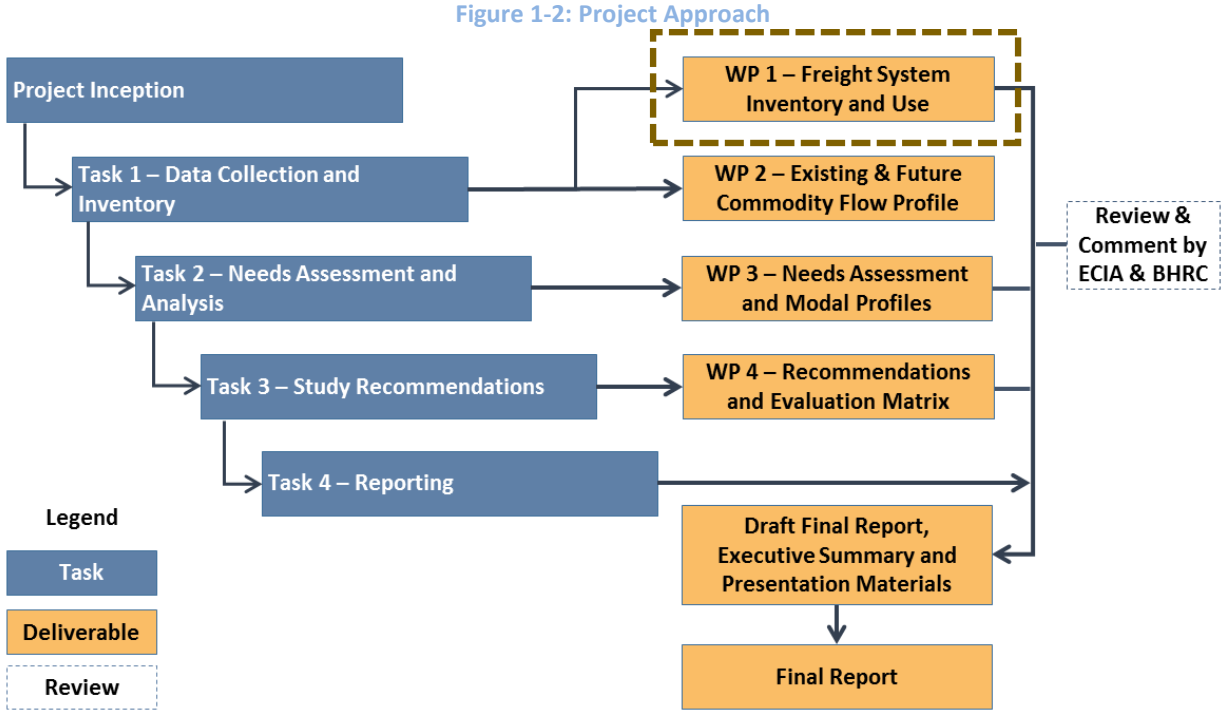
to develop a better understanding of the multimodal freight system in the Eight County Region and to use this information to better inform policy and programming decisions.

Thus, the central output of the study will be the identification of baseline freight movements across modes, the identification of the major freight transportation challenges including truck bottlenecks and how they may impact the performance of key economic sectors, as well as the formulation of recommendations on freight policy and projects that will provide the greatest benefit to the Region. This study will also provide the Region with a means of leveraging freight transportation data to help leaders make better, more informed investment decisions.

1.3 Project Structure

The project is to be developed through four broad tasks, as set out in Figure 1-2. The present Working Paper is the output of Task 1 – Data Collection and Inventory.

Figure 1-2: Project Approach



1.4 Purpose of this Working Paper

The purpose of this Working Paper is to inventory the Study Area's existing freight transportation system components and articulate how they are used. Specifically, it addresses the following key questions:

- What are the Study Area's key freight assets and corridors?
- How are these assets used today?
- What are the Study Area's major freight generators/businesses?
- What are the Study Area's strengths, weaknesses, threats, and opportunities?

This Working Paper is also intended to provide an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the Final Report. Revisions to this Working Paper will be reflected in the Draft Final Report.

1.5 Methodology

This Working Paper was prepared using a combination of empirical data and stakeholder inputs. At the onset of this plan CPCS developed a data request for ECIA and BHRC to assist in collecting local data related to 1) multimodal transportation system infrastructure assets and use, 2) regional economic and workforce data, and 3) land use data. These agencies consulted with the Illinois Department of Transportation (ILDOT), Iowa Department of Transportation (IADOT) and local agencies to assist in providing a robust repository of data for use in this, and future, Working Papers. CPCS worked to secure other publicly available data not provided by ECIA or BHRC.

The CPCS team and local economic development agencies are also in the process of conducting 200+ freight stakeholder consultations. While the detailed findings of this effort will be more fully documented in Working Paper 3 – Needs Assessment, as appropriate, findings were used to provide select insights in this document.

1.6 Limitations

Some of the findings in this report are based on the analysis of third party data. While CPCS makes efforts to validate data, CPCS cannot warrant the accuracy of third party data.

2 Eight County Regional Economy

Key Chapter Takeaway

The Eight County bi-state region has a diverse population and economy, but faces economic challenges related to a shrinking population and a potential shortage of medium- and high-skill workers. Freight transportation is extremely important to the Region; almost 50% of the Region's workers are employed by firms that rely on the movement of freight to support their operations. Key freight-related industries for the Region are agriculture, which generated over 31 million tons of freight in 2014, and manufacturing, which employs 18 percent of the Region's workforce.

2.1 Regional Economy

The Region is made up of eight counties, Carroll, Jo Daviess, Stephenson, and Whiteside counties in Illinois, and Clinton, Delaware, Dubuque, and Jackson counties in Iowa. The communities in these counties make up two intergovernmental associations: The East Central Intergovernmental Association (ECIA) in Iowa, and the Blackhawk Hills Regional Council (BHRC) in Illinois.

The ECIA is a council of governments that assists its members with planning and policymaking in six areas: Community Development, Economic Development, Transportation Planning, Housing Assistance, Employment and Training, and Rural Transit Services.[1] The BHRC is similar; it is a regional planning council that provides services in community planning, development assistance, natural resource conservation, and grant writing and administration.[2]

Both the ECIA and BHRC serve additional counties that are not considered in this study. Cedar County in Iowa, and Ogle and Lee counties in Illinois are members of the ECIA or BHRC, but are not participating in this freight study.

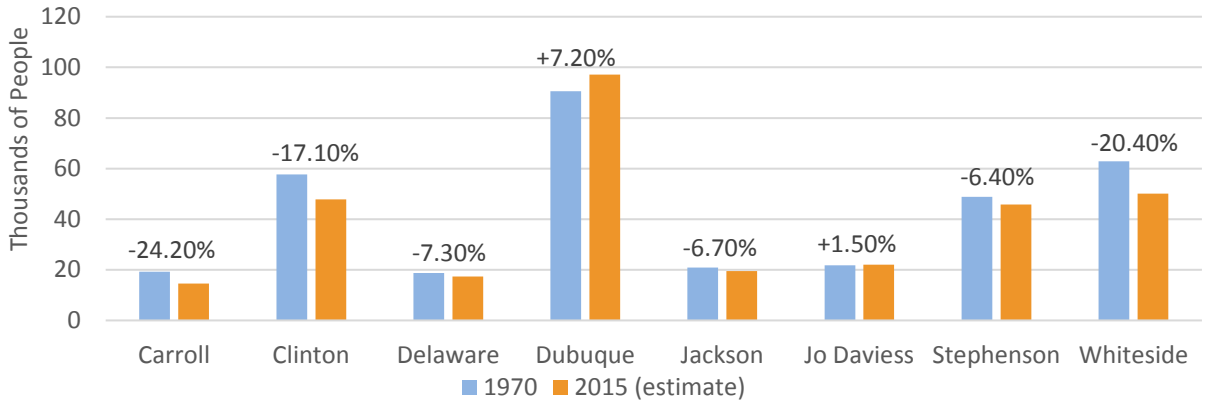
2.1.1 Population

Population trends will influence how the Region's economy and workforce develops, and how the Region's transportation system may be used in the future. In 2015, the Region has a population of 314,270 people in 132,349 households. The least populous county was Carroll County, with 14,616 residents, and the most populous was Dubuque County, with 97,125

[1] East Central Intergovernmental Association, 2017. http://www.ecia.org/programs/index.cfm
[2] Blackhawk Hills Regional Council, 2017. http://www.blackhawkhills.com/about-us/

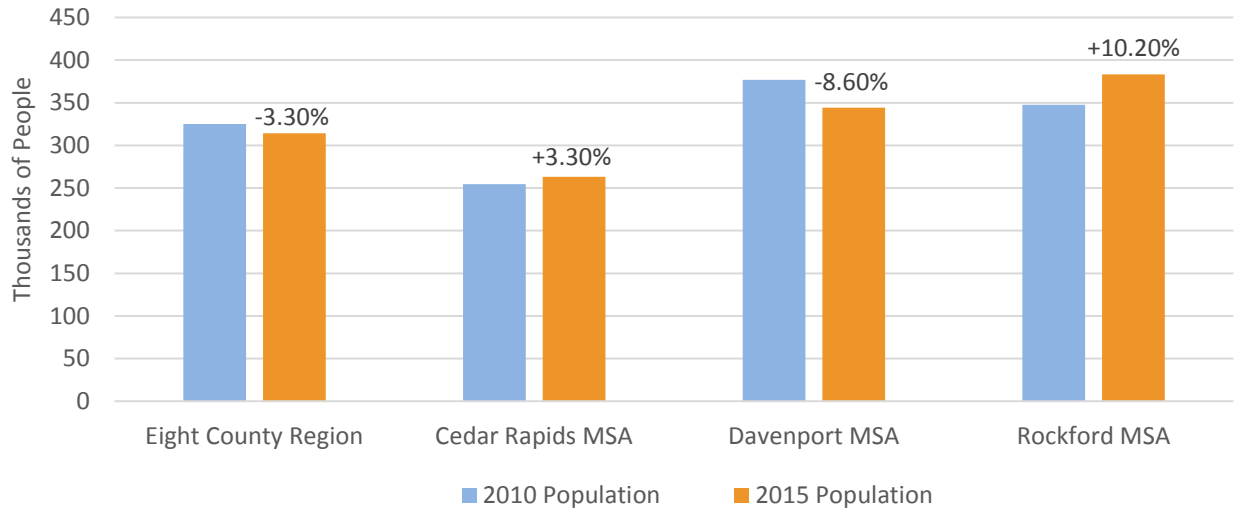
residents. The Region's population peaked at 350,108 in 1980, and the populations of most counties have declined or remained flat since the 1980s. Figure 2-1 shows the population trends for each county, and Figure 2-2 shows the population trends of the Region compared against nearby regions.

Figure 2-1: Population Trends



Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

Figure 2-2: Population Comparison



Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

The Region's population has generally trended downward since 1980. However, in recent years the population has been relatively stable, with Dubuque and Jo Daviess Counties posting overall population increases. Compared to peer regions in Iowa and Illinois, the Region has lower population growth, which could pose challenges for businesses that require a large, skilled workforce.

2.1.2 Income and Education

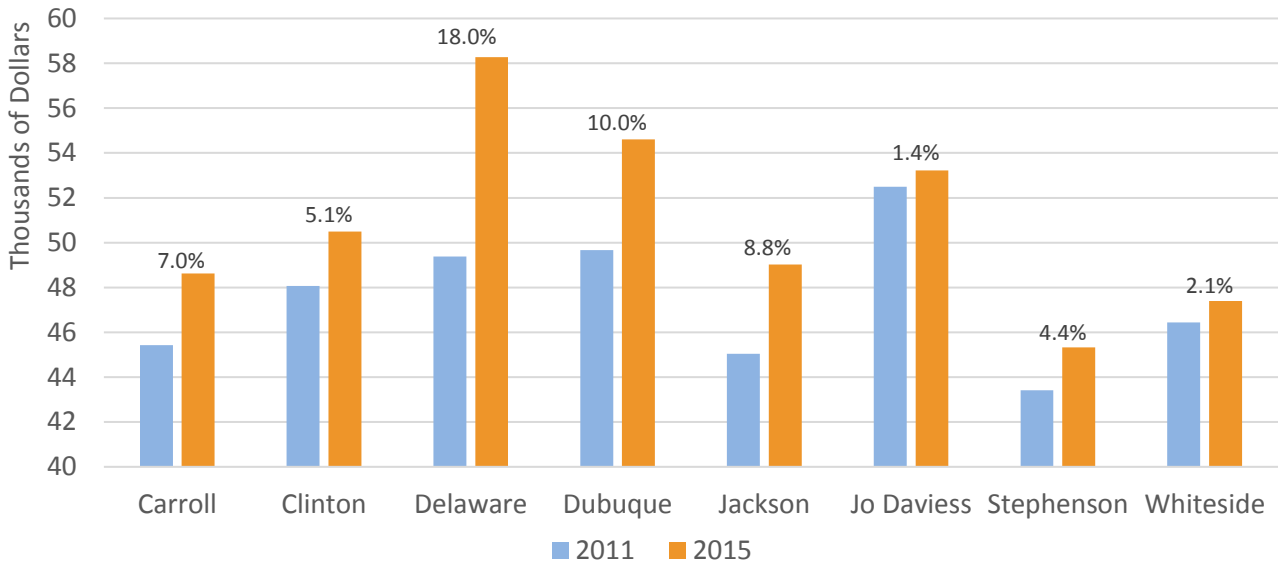
Income and education are often closely connected, as an individual's level of education influences their career opportunities and earning potential. The education level of the Region's population as a whole will also determine what industries can be supported by its workforce. By examining both income and education, we can develop a better understanding of the

economic well-being of the Region, as well as the ability of the Region's workforce to support relatively higher-paid medium- and high-skill jobs. A workforce with both medium and high-skilled labor may be necessary to support some freight-relevant industries like manufacturing. This relationship between industries and freight is discussed in Section 2.3.

The Region's household income and level of educational attainment is increasing.

Since 2010, household income in the Region has slowly increased. The greatest increases in median incomes occurred in Delaware and Dubuque Counties. Delaware saw the largest increase: almost $9,000 between 2011 and 2015. Average household income for the Region was $60,129, which was lower than average household income for the US ($75,558), Illinois ($79,556), or Iowa ($68,446). However, median incomes were closer to the national median ($53,889), and Iowa's median ($5,183), but lower than Illinois' ($57,574).[3] Figure 2-3 shows the estimated median household income trends for each county.

Figure 2-3: Median Income



Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau. All amounts in inflation-adjusted 2015 dollars.

Between 2010 and 2015, the percentage of residents without a high school degree dropped by from 11.9 percent to 9.7 percent. In that same period, the percentage of residents with a bachelors' degree increased from 18 percent to 19.7 percent. Figure 2-4 lists the highest level of education attained by the Region's residents in 2010 and 2015, and shows how educational attainment is improving.

[3] CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

Figure 2-4: Educational Attainment in the Eight County Region

Highest Level of Education Attained	2010	2015
No high school diploma	11.9%	9.7%
High school graduate (includes equivalency)	38.8%	36.3%
Some college, or an Associate's degree	31.3%	34.3%
Bachelor's degree or higher	18.0%	19.7%

Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

Workforce Development

Workforce development is important because it helps the Region tailor its workforce's skills to changing economic conditions. However, the Region has a lack of skilled and semi-skilled employees required for industries like manufacturing, agriculture, and transportation. The ECIA identified a lack of skilled workers as the number one concern for employers in the Region: 62 percent of manufacturers and 64 percent of transport and logistics firms in ECIA counties indicated challenges with hiring for vacant positions.[4]

A shortage of medium- and high-skill labor is a Regional economic weakness as it means well-paying jobs go unfilled.

Given the challenge of finding skilled workers, the ECIA's economic development plan established a goal to "improve the quantity and quality of the Region's workforce to address employers' demands in advanced manufacturing; healthcare; and professional, scientific, and technical services."[5] The BHRC economic development plan reached a similar conclusion, it identified "need for a technologically skilled labor force" as a regional weakness.[6] Workforce development would be supported by regional training programs, which are noted in Figure 2-5.

Many postsecondary schools in the Region offer training that supports target industries with courses in manufacturing, agriculture, and transportation skills. One unique Regional asset for workforce development is the Upper Mississippi Manufacturing Innovation Center (UMMIC), a new cooperative effort between three colleges in Iowa, Illinois, and Wisconsin to meet manufacturers' needs. One element of the UMMIC's work is providing curricula for workforce education and training.

The Region is served by four community colleges: Highland and Sauk Valley Community Colleges cover most of the Illinois portion of the Region, with small portions served by Black Hawk and Rock Valley Colleges. The Iowa portion of the Region is served by Northeast Iowa and East Iowa Community Colleges. These institutions are critical sources of medium-skills training, which usually requires a 2-year degree. Some institutions with freight-related programming are listed in Figure 2-5.

[4] Comprehensive Economic Development Strategy. East Central Intergovernmental Association. 2015.
[5] Ibid.
[6] Comprehensive Economic Development Strategy. Blackhawk Hills Regional Council. 2015.

Figure 2-5: Regional Workforce Development Efforts

Institution	Location	Skill Areas
Highland Community College	Freeport, IL	Agriculture, industrial manufacturing, mechatronics
Sauk Valley Community College	Dixon, IL	Manufacturing technology
Morrison Institute of Technology	Morrison, IL	Construction and manufacturing
Whiteside Area Career Center	Sterling, IL	Manufacturing and skilled trades
North Central Illinois Works	Oglesby, IL	Workforce investment board
Northern Illinois Workforce Alliance	Rockford, IL	Workforce investment board
East Iowa Community College	Clinton, IA	Manufacturing, processing, assembly, warehousing
Northeast Iowa Community College	Peosta, IA	Manufacturing

Sources: CEDS Five Year Report January 2015 to December 2019. East Central Intergovernmental Association; 2014-2019 Comprehensive Economic Development Strategy. Blackhawk Hills Regional Council.

The Region has a lack of semi-skilled and skilled workers required to meet the needs of potential employers. However, the Region's post-secondary educational institutions are responding to the demand for skilled labor, and have the potential to meet this labor demand. One challenge for the future will be linking training programs with Regional employment, which will help keep graduates with skills in the Region.

A shortage of skilled employees in the transportation and logistics industries is especially relevant to the Region's freight system, since these industries directly facilitate freight movements. A lack of employees in transportation and logistics could reduce the supply of services like trucking, which may result in higher transportation costs, and less competitive conditions for Regional firms.

2.2 Employment and Industries

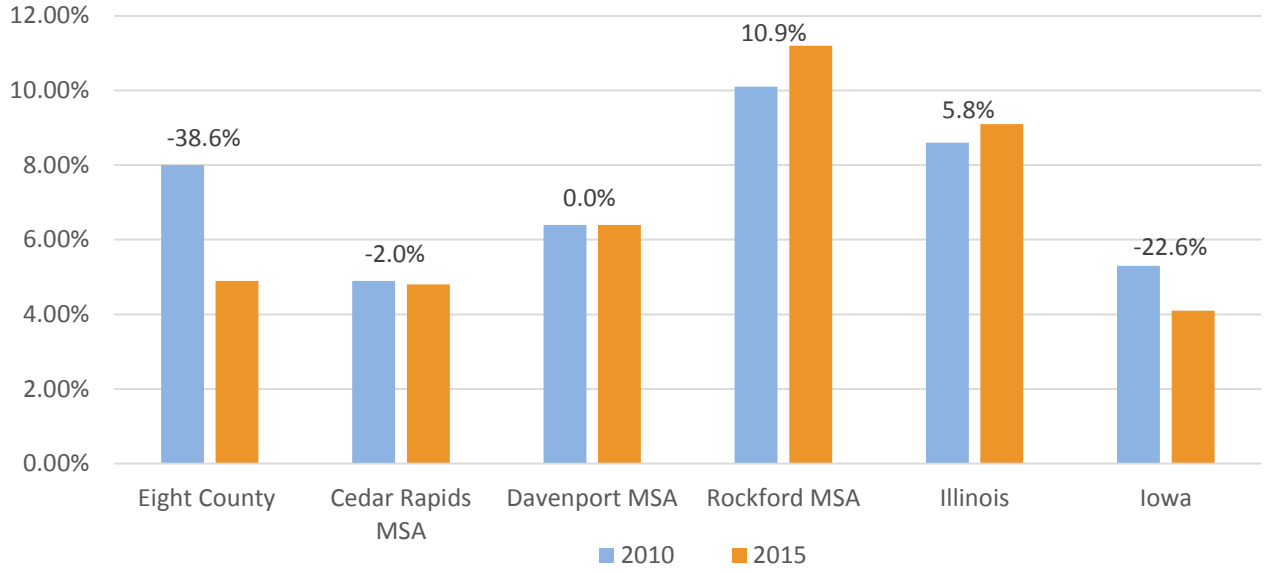
Employment is another measure of the Region's economic well-being. Additionally, employment indicates which industries are especially important to the Region's workforce. The Region's unemployment rate was eight percent in 2010 and 4.7 percent in 2016. According to the Federal Reserve, between 4.7 percent and 5.8 percent represents the natural rate of unemployment as a certain number of workers are continually seeking better employment. The main threat to this region is a shrinking workforce due to people moving out of the Region, retiring, leaving the workforce, among other reasons.

Declining Regional unemployment rates are driven by a shrinking workforce, not job growth.

Breaking down the change in the unemployment rate in the Eight County Region between 2010 and 2016, reveals the number of employed Regional residents decreased by 1,254 and the number of people considered unemployed decreased by 6,203. These numbers suggest that the decline in the Region's unemployment rate was a result of a decrease in the Region's labor force and not an increase in employment.

In 2016, Stephenson County had the highest unemployment rate in the Region at 5.85 percent, while Delaware County had the lowest, at 3.5 percent. Figure 2-6 compares the Region's unemployment rate against nearby cities and states.

Figure 2-6: Unemployment Rate Comparison



Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

The largest industry in the Region by employment is educational services, health care, and social assistance, which employs about 35,700 people, or 22.5 percent of the Region's workforce. The next largest industry is manufacturing, which employs about 29,300 people, or 18.5 percent of the workforce. Figure 2-7 lists the Region's employment numbers and percentages by industry.

Figure 2-7: Regional Employment by Industry

Industry	Employment	Percentage of Total Employment
Educational services, and health care and social assistance	35,739	22.5%
Manufacturing	29,308	18.5%
Retail trade	20,726	13.0%
Arts, entertainment, and recreation, and accommodation and food services	11,941	7.5%
Professional, scientific, and management, and administrative services	10,230	6.4%
Construction	9,410	5.9%
Finance and insurance, and real estate and rental and leasing	8,699	5.5%
Transportation and warehousing, and utilities	7,831	4.9%
Other services, except public administration	7,522	4.7%
Agriculture, forestry, fishing and hunting, and mining	6,196	3.9%
Public administration	4,427	2.8%
Wholesale trade	4,143	2.6%
Information	2,669	1.7%
Total	158,841	100.0%

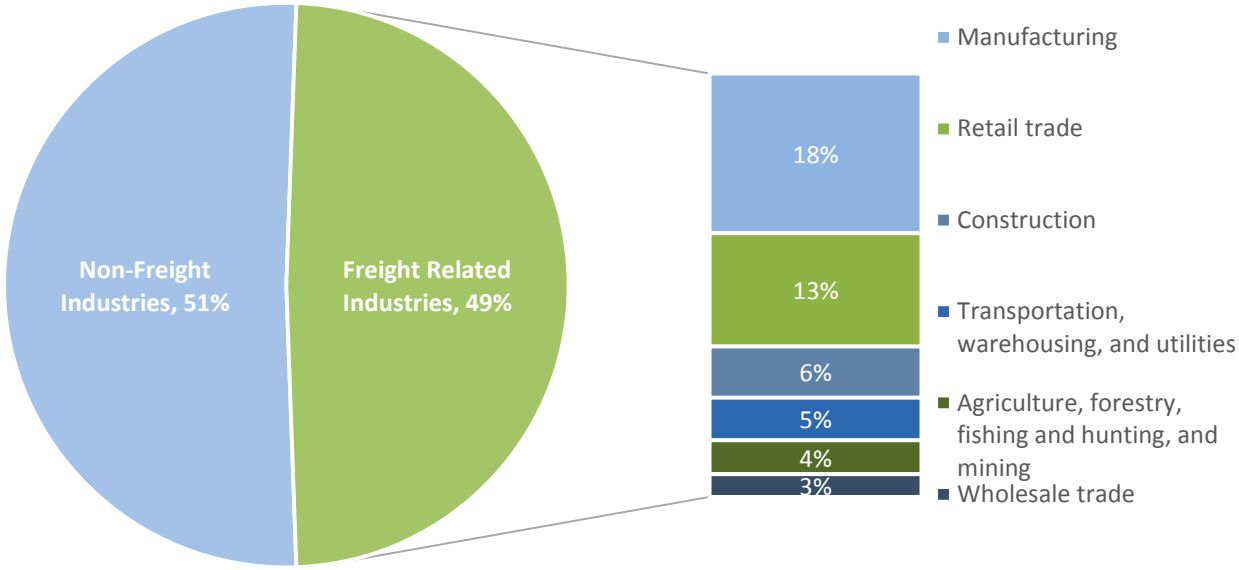
Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

2.3 Freight-Related Industries

Freight-related industries are industries that rely heavily on the shipment of physical goods to support their operations. These industries include natural resources (agriculture and mineral extraction), manufacturing, retail, construction, transportation, and warehousing. Many of

these industries, particularly, natural resources, agriculture, and transportation are often location-dependent (agricultural fields, mines, railroads, and rivers cannot be moved like factories), and thus they are reliant on the performance of the freight system to remain competitive. Freight-related industries as a whole are especially relevant to the Region because they employ about 77,600 people, or almost 50 percent of the Region's workforce. Figure 2-8 shows the how these different freight-related industries make up the Region's total employment.

Figure 2-8: Relative Employment by Industry



Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau

About 50 percent of the Region's labor force is employed by firms that are reliant on the freight transportation system.

Figure 2-9 shows the US Census Bureau's estimates for numbers of residents employed in freight-related industries.

Figure 2-9: Freight-Related Employment

Industry	Workers	Percentage of Total Workforce
Agriculture, forestry, fishing and hunting, and mining	6,196	3.9%
Construction	9,410	5.9%
Manufacturing	29,308	18.5%
Wholesale trade	4,143	2.6%
Retail trade	20,726	13.0%
Transportation and warehousing, and utilities	7,831	4.9%
Total	**77,614**	**49%**

Source: CPCS Analysis of 2015 American Community Survey Data, US Census Bureau.

Figure 2-10 lists the number of firms, by employee size, in each industry area. The figure only lists firms with more than 20 employees, which means that the agricultural sector's firms (which usually have less than 20 employees) are underrepresented. Agriculture's employment and its relevance to the Region is discussed in Section 2.3.2.

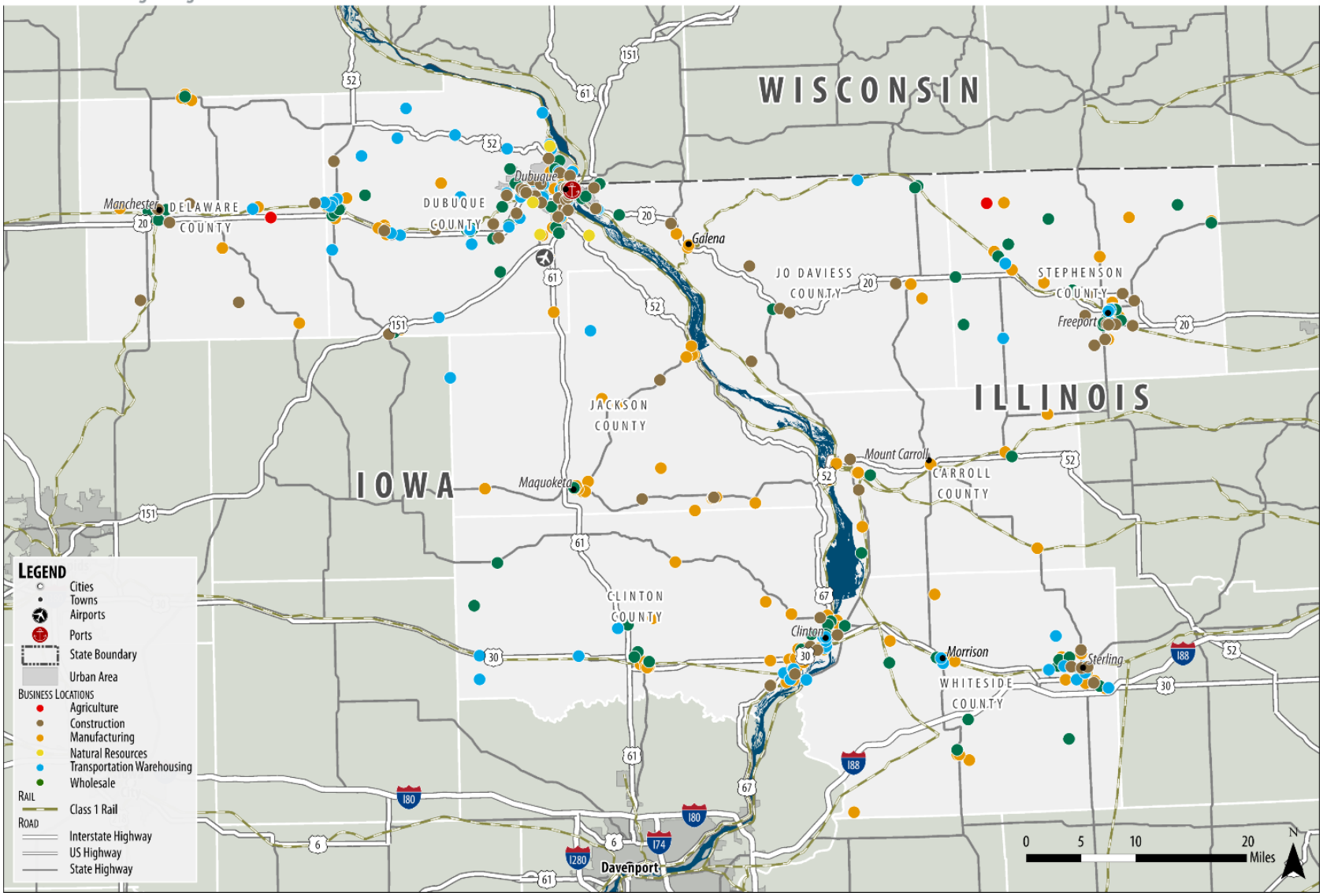
Figure 2-10: Freight-Relevant Firms

	Firms with 20-49 Employees	Firms with 50-99 Employees	Firms with 100+ Employees
Agriculture, Forestry, Fishing, and Hunting	3	2	1
Mining, Quarrying, Oil and Gas Extraction	5	2	2
Utilities	5	0	5
Construction	87	12	24
Manufacturing	144	49	92
Wholesale Trade	69	24	117
Retail Trade	191	44	52
Transportation and Warehousing	81	16	10

Source: CPCS Analysis of Reference USA, 2016.

The Region's freight-related industries are clustered around Dubuque, IA, Clinton, IA, Freeport, IL, and Sterling, IL. Manchester, IA, Dyersville, IA, Maquoketa, IA, DeWitt, IA, and Morrison, IL have smaller, but noticeable concentrations of firms. Figure 2-11 shows where these industries are most dense. As mentioned before, the map only shows firms with greater than 20 employees, which means that agriculture and smaller retail establishments are underrepresented.

Figure 2-11: Freight-Related Industries in the Region (with 20+ employees)



Sources: CPCS Analysis of Reference USA, 2016; National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

The Region is home to relatively high concentrations of employment for nearly all freight-related industries, and manufacturing stands out as especially important for all counties. Figure 2-12 shows the location quotient of each freight-related industry for each county. Location quotients are calculated by the Bureau of Labor Statistics, and measure the proportion of workforce employed in a certain industry relative to other areas or industries. In the figure below, values greater than 1.0 indicate an employment proportion in a specific industry higher than the national average. For example, each county's manufacturing quotient is greater than 1.0, which means each county has a greater proportion of people employed in manufacturing than the national average. ND indicates that a quotient is not disclosable (as disclosing quotient information could violate a firm's confidentiality), and NC indicates quotients that could not be calculated (usually due to insufficient employment data).

Figure 2-12: Location Quotients of Freight-Related Businesses

Industry	Carroll	Clinton	Delaware	Dubuque	Jackson	Jo Daviess	Stephenson	Whiteside
Agriculture	ND	ND	**1.58**	ND	**1.97**	ND	**2.66**	ND
Mining, Quarrying, Oil and Gas Extraction	ND	ND	NC	ND	NC	ND	NC	ND
Utilities	ND	**1.11**	ND	0.66	ND	ND	ND	0.33
Construction	0.9	0.9	**1.25**	0.86	0.97	**1.3**	**1.36**	0.6
Manufacturing	**2.13**	**2.28**	**3.18**	**1.68**	**1.65**	**1.6**	**2.3**	**2.02**
Wholesale trade	**2.15**	0.5	**1.9**	**1.16**	**1.33**	ND	0.67	0.96
Retail trade	**1.24**	0.98	0.95	0.98	**1.35**	**1.14**	0.89	**1.16**
Transportation, Warehousing	ND	ND	ND	**2.07**	**1.17**	ND	**1.06**	ND

Source: CPCS Analysis of Bureau of Labor Statistics, 2015.

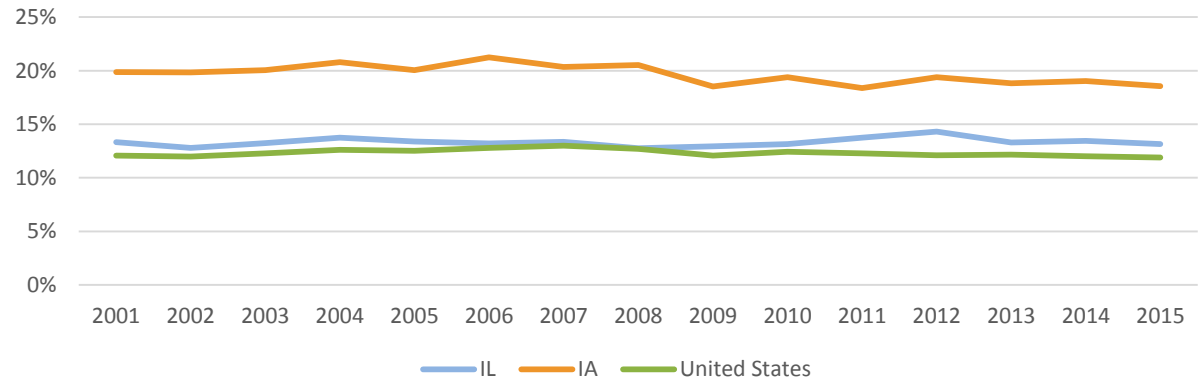
Based on the location quotients, a number of industries stand out as particularly important to the Eight County Region in terms of employment and economic impact. These industries include manufacturing and agriculture, which are described in the following sections.

Because the Region has high concentrations of employment in freight-related industries, the condition and performance of the freight transportation system will be influential for future economic development of the Region. Careful stewardship of freight system assets like roads, barge terminals, and intermodal facilities will be necessary if the Region wishes to support further growth in areas like agriculture, logistics, or manufacturing.

2.3.1 Manufacturing

Manufacturing firms and jobs are distributed across the Region and include a variety of specialties including metalwork, machinery, food processing, and wood products. Figure 2-13 shows how since 2000, manufacturing's share of Illinois' and Iowa's Gross Domestic Product (GDP) has remained relatively steady.

Figure 2-13: Manufacturing's Share of Gross Domestic Product, State and National Trends

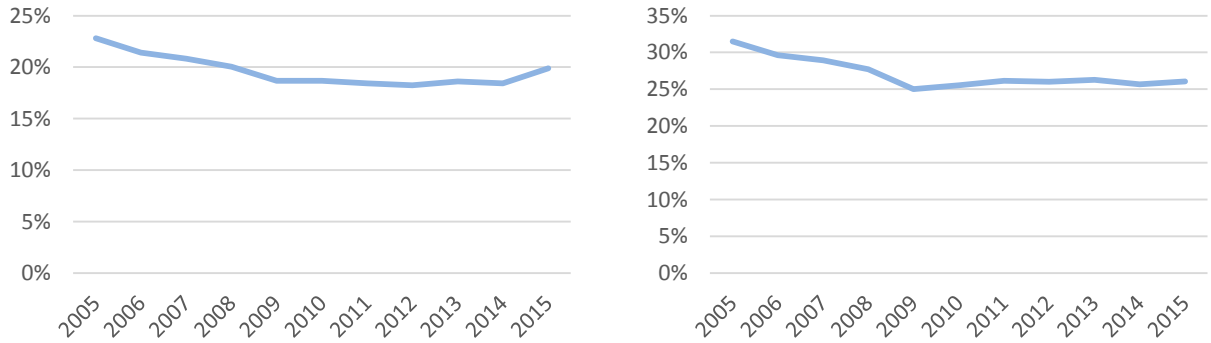


Source: CPCS analysis of Regional Economic Accounts. Bureau of Economic Analysis. 2016.

Manufacturing's importance to the Regional economy may be decreasing, as the sector shrank in the last decade, and growth has been low.

Gross Domestic Product information is not available at the county level, but other measures like employment and payroll expenditures can provide an estimate of a particular industry's importance to a region. The importance of manufacturing for the Region appears to be decreasing: Figure 2-14 show's how manufacturing's share of total Regional employment and payroll expenditures declined between 2005 and 2009, and has remained relatively flat.

Figure 2-14: Regional Manufacturing Share of Employment* (left) and Payroll (right), 2005 - 2015



Source: 2005-2015 County Business Pattern (CBP) Data, US Census Bureau.
Note: Manufacturing employment estimates from County Business Patterns vary slightly from the American Community Statistics estimates due to methodological differences.

In the past ten years, the number of manufacturing establishments dropped by seven percent, the number of manufacturing employees declined by 12 percent, and inflation-adjusted

manufacturing payroll amounts decreased by 7.7 percent.[7] However, inflation-adjusted annual pay per manufacturing employee has increased by five percent.[8] This higher pay rate may reflect the skilled labor shortage discussed in Section 2.1.2, as manufacturers may be willing to pay more for skilled labor.

Figure 2-15 lists some of the largest manufacturing employers and Figure 2-16 displays the concentration of manufacturing jobs across the Region. Dubuque, IA, Clinton, IA, Sterling, IL, and Freeport, IL stand out as particularly important centers for manufacturing employment, with towns such as Manchester, IA, DeWitt, IA, and Savanna, IL hosting moderate concentrations of manufacturing jobs.

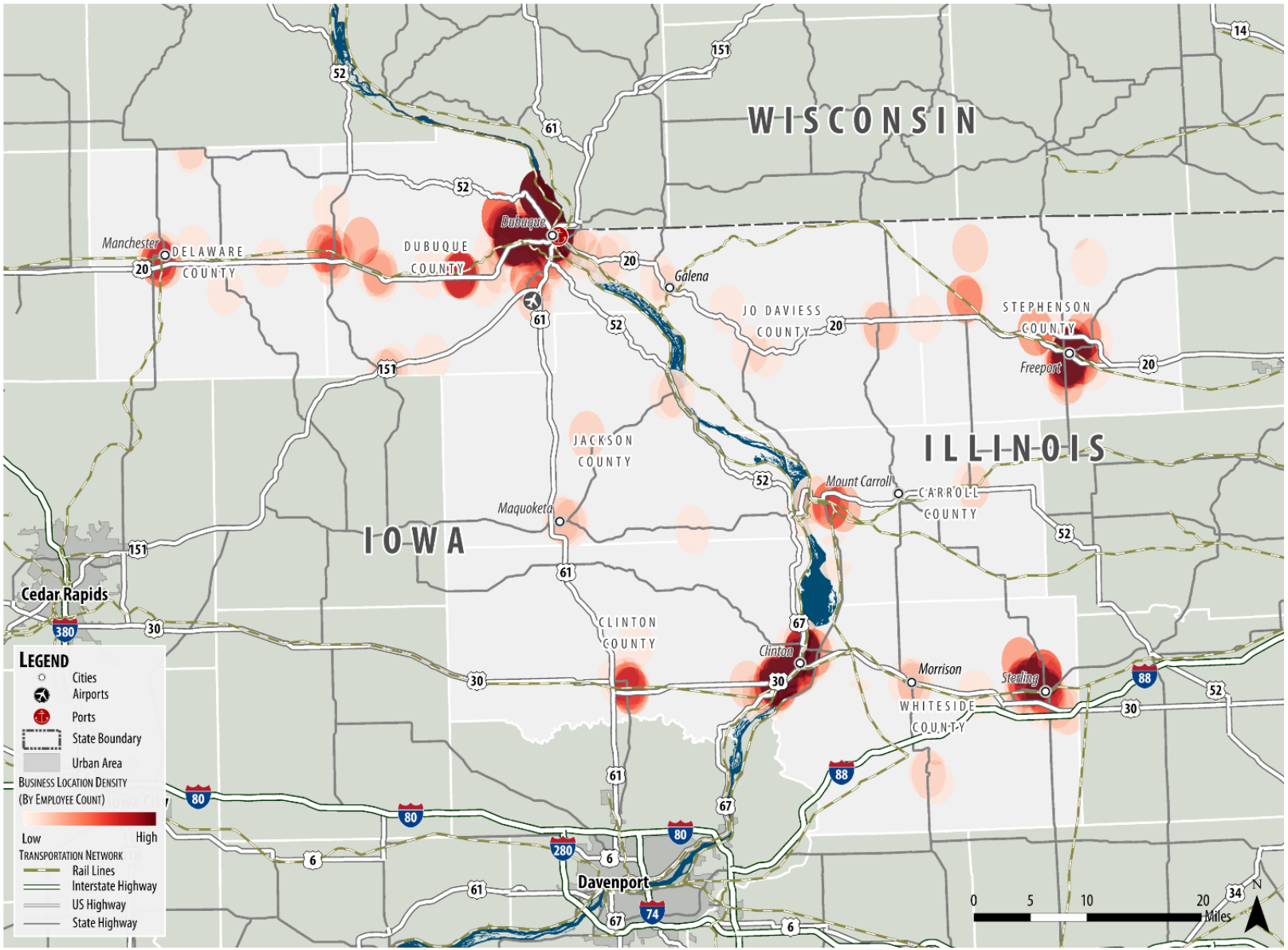
Figure 2-15: Top 5 Manufacturing Firms by Employment

Name	Location	Commodities / Services
John Deere	Dubuque	Construction and Agricultural Machinery
Wahl Clipper	Sterling	Consumer Appliances
Custom-Pak	Clinton	Plastics Manufacturing Equipment
Eagle Window and Door	Dubuque	Building Supplies
Titan Tire	Freeport	Vehicle Tires

Source: CPCS analysis of Reference USA data. 2017.

[7] 2005-2015 County Business Pattern (CBP) Data, US Census Bureau.
[8] Ibid.

Figure 2-16: Regional Manufacturing Employment Concentrations



Sources: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015; CPCS analysis of Reference USA data. 2017.

Figure 2-17 uses location quotients to show particularly important manufacturing industries in the Region. Fabricated metal products and machinery top the list as industries with relatively high shares of employment. Food and wood product manufacturing also have relatively high shares of employment in each county. Whiteside County has an exceptional concentration of electrical equipment and appliance manufacturing jobs, with a location quotient of 23.71, higher than any other manufacturing quotient in the Region. Clinton County is also home to unique concentrations of employment in the plastics, paper, and chemical industries.

Figure 2-17: Important Manufacturing Industries

Industry	Carroll County, IL	Clinton County, IA	Delaware County, IA	Dubuque County, IA	Jackson County, IA	Jo Daviess County, IL	Stephenson County, IL	Whiteside County, IL
Fabricated metal product manufacturing	ND	**1.91**	**1.57**	**2.47**	**1.9**	0.25	**1.52**	**5.09**
Machinery manufacturing	**10.25**	ND	**6.13**	**6.15**	ND	ND	**2.82**	**2.97**
Food manufacturing	ND	**5.13**	ND	**1.36**	0.94	**1.13**	**5.2**	0.24
Wood product manufacturing	ND	0.92	**5.19**	**8.1**	0.95	NC	ND	**1.29**
Electrical equipment and appliance mfg.	NC	ND	ND	ND	ND	ND	ND	**23.71**
Plastics and rubber products manufacturing	ND	**9.97**	ND	0.61	ND	0.7	ND	NC
Paper manufacturing	NC	**5.64**	NC	ND	NC	NC	NC	ND
Chemical manufacturing	ND	**4.32**	ND	ND	NC	ND	ND	ND

Source: CPCS Analysis of Bureau of Labor Statistics Data, 2015.

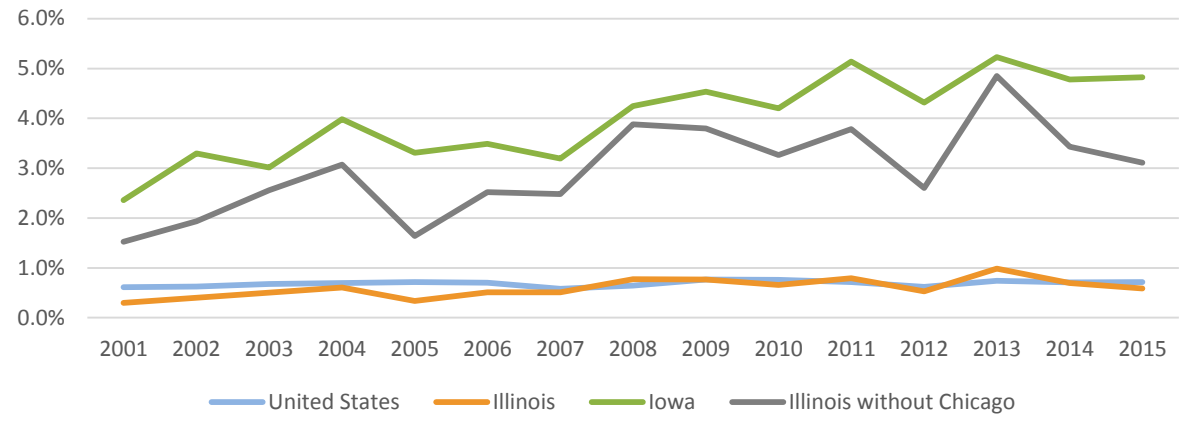
Manufacturing is most heavily concentrated in the Region's most populous towns, such as Dubuque, IA, Clinton, IA, Sterling, IL, and Freeport, IL. Manufacturing employment, and manufacturing's share of total employment (about 18%) has remained relatively steady in the Region since 2010. Since they work with physical goods, manufacturers are major users of the freight system, but their specific freight needs vary based on the weight and value of their inputs and finished goods.

2.3.2 Agriculture

Agriculture is another key industry for Illinois, Iowa, and the Region. Figure 2-18 shows how agriculture makes up a relatively high share of the GDP of each state. This high share of GDP shows that agriculture is an important industry for both states. This figure presents Illinois with

and without Chicago included, as the urban activity skews the importance of agriculture to the state.

Figure 2-18: Agriculture's Share of GDP for Illinois, Iowa, and the US

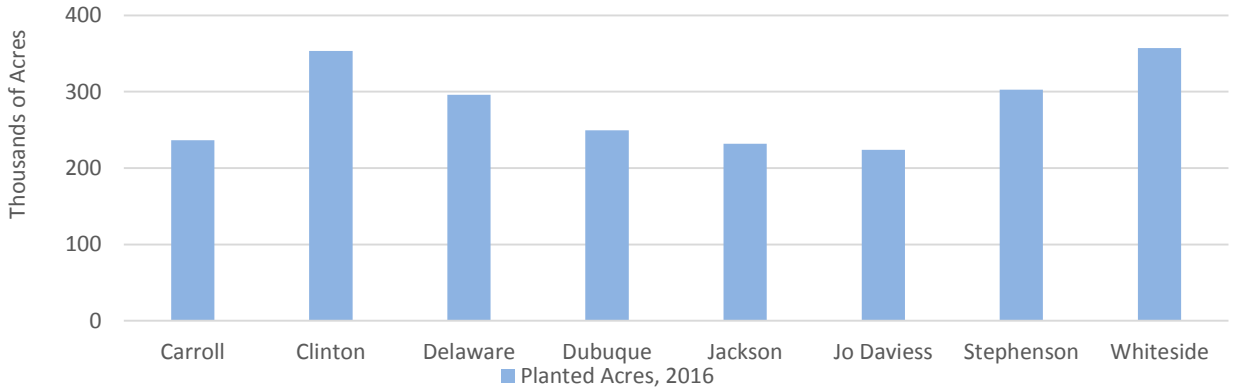


Source: Regional Data. Bureau of Economic Analysis. 2016.

Agriculture is an essential industry for the Region as well. In 2016, the Region was home to 1.2 million acres of cornfields, 500,000 acres of grass or pasture, and 470,000 acres of soybeans.[9] Combined, these three agricultural uses covered 10,000 square miles, or 69 percent of the Region's land area. This agricultural acreage in the Eight County Region is slightly larger than the entire state of Maryland.

Figure 2-19 shows the comparative corn and soybean acreages across the Region's counties, and Figure 2-20 illustrates how corn and soybean crops are distributed over the Region.

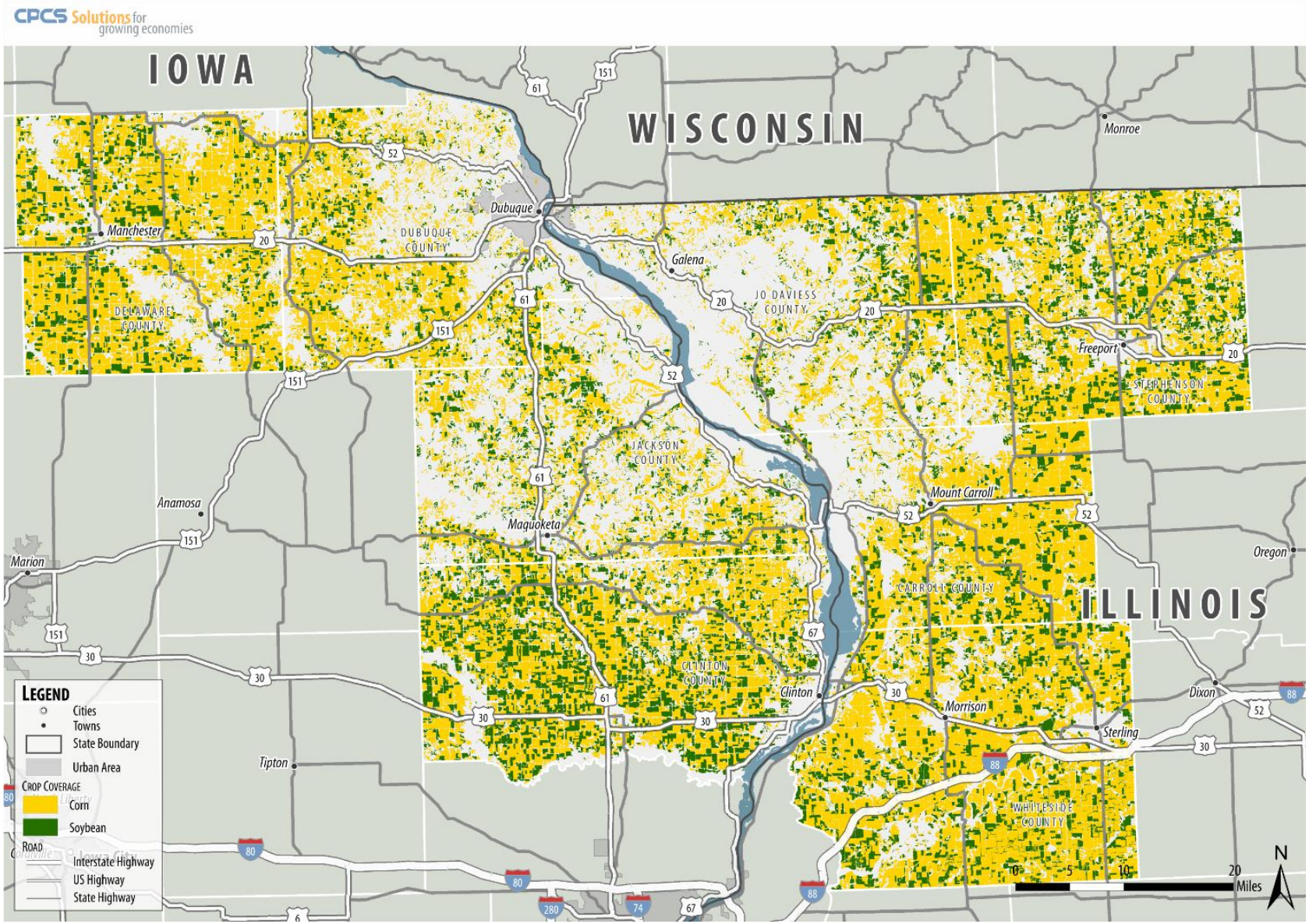
Figure 2-19: Combined Corn and Soybean Acreage by County



Source: National Agricultural Statistics Service. 2016.

[9] CPCS Analysis of Cropland Data Layer, National Agricultural Statistics Service. 2017.

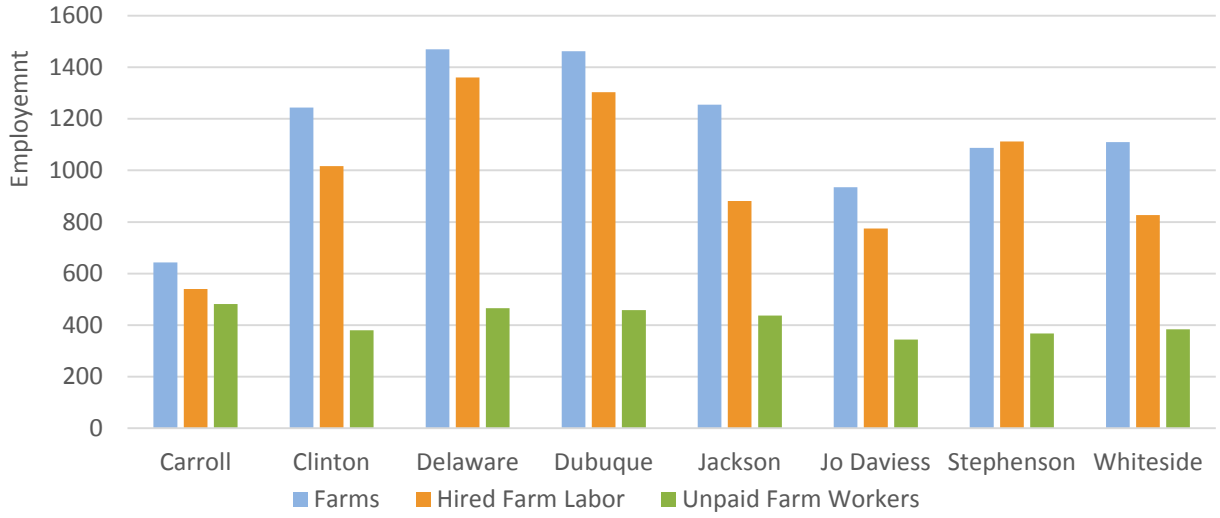
Figure 2-20: Regional Corn and Soybean Crop Cover, 2016



Source: CropScape. National Agricultural Statistics Service. 2016.

Agriculture's employment is spread out across the Region, and agricultural firms are very small, usually consisting of less than five people. For example, in 2012, the Region had about 9,200 farms, which employed 7,800 people as hired farm labor, and an additional 3,300 people as unpaid farm labor.[10] Figure 2-21 provides information from the 2012 Census of Agriculture on farm operations and employment by county. All sizes of firms are included in this figure.

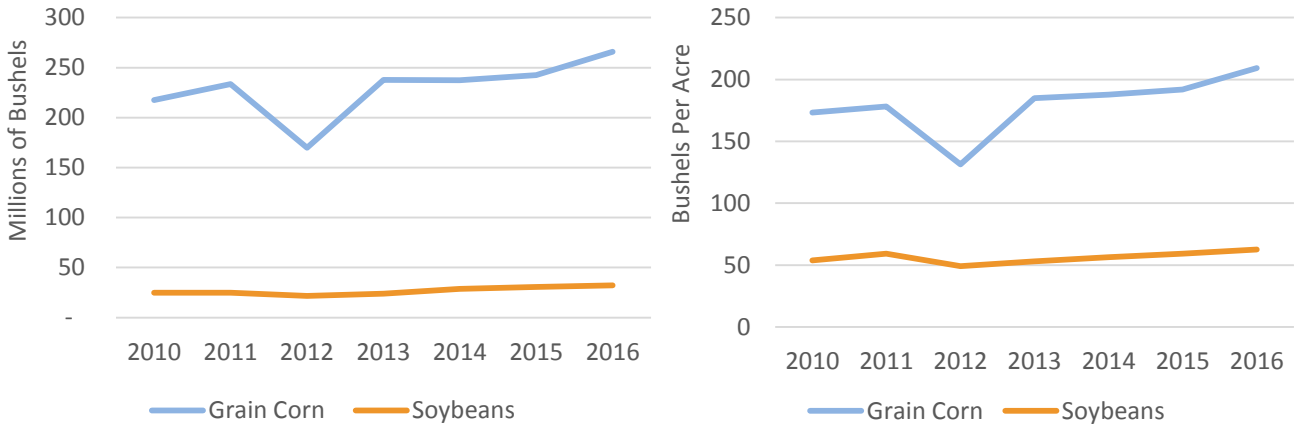
Figure 2-21: Regional Farms and Employment by County



Source: United States Census of Agriculture. US Department of Agriculture 2012.

The Region's agricultural production reflects its high crop cover and substantial employment. In 2016, the Region's farms produced 265 million bushels of grain corn, and 32 million bushels of soybeans. Figure 2-22 shows the Region's grain corn and soybean production and yield between 2010 and 2016. The dip in production and yield in 2012 was caused by a severe drought.[11]

Figure 2-22: Grain Corn and Soybean Production (left) and Yield (right)



Source: National Agricultural Statistics Service, US Department of Agriculture

[10] United States Census of Agriculture. US Department of Agriculture. 2012.
[11] "The US Drought of 2012." Bradley Rippey. USDA Research and Programs on Extreme Events. 2015.

In addition to its own employment, agriculture has spillover effects in other industries. For example, the Region is home to nine manufacturers who support the agricultural industry, listed in Figure 2-23.

Figure 2-23: Manufacturing Firms Supporting the Agricultural Industry (20+ employees)

Firm	Specialty	Location
ADM	Flour Mill	Clinton, IA
APC Inc.	Animal Feed	Dubuque, IA
Dekalb Feeds	Animal Feed	Rock Falls, IL
Edgewood Locker	Animal Slaughtering	Edgewood, IA
Furst-McNess	Animal Feed	Freeport, IL
Nestle Purina	Animal Feed	Clinton, IA
Nu World Amaranth	Flour Mill	Dyersville, IA
Progressive Processing (Hormel)	Animal Slaughtering	Dubuque, IA
Rock River Provision	Animal Slaughtering	Rock Falls, IL

Source: CPCS analysis of Reference USA. 2017.

Crop production and yield have increased over time: since 2010, corn production has increased 22 percent and soybean production has increased 30 percent. Corn yield has increased 17 percent and soybean yield has increased 13 percent. These productivity and yield increases place additional demand on Region's freight system, and the tonnages shipped by the Region's trucks, trains, and barges are discussed in Section 3.1.

The Region is a major producer of agricultural products, particularly corn and soybeans. Agricultural production is spread out across the Region, and a robust multimodal freight system is needed to accommodate the transport of almost 300 million bushels of corn and soybeans each year. Corn and soybean production is increasing, and this increased agricultural tonnage will create additional demand for freight services in the future. A further discussion of the destinations of, and freight modes used for agricultural shipments will be provided in Working Paper 2 – Existing and Future Commodity Flow Profile.

2.4 Freight-Related Industry Transportation Requirements

The freight-related industries profiled in the previous section all rely on the Region's multimodal transportation system to ship goods from production to market. And each part of the system (road, rail, water and air) serves an important and distinct role.

The transportation mode used to transport freight depends on a number of factors, but usually the most important factors are price and mode availability.

Figure 2-24 provides a "spectrum" of freight transportation modes based on service characteristics and cargo characteristics (further illustrated in Figure 2-25). A freight shipper must weigh both of these considerations when determining how to transport cargo.

Figure 2-24: Freight Transportation Spectrum

<---- Higher					Lower--->
Air Cargo	**Truck**	**Rail Intermodal**	**Rail Unit**	**Rail Carload**	**Water**
<---- Faster					Slower--->
<---- More Reliable		**Service Characteristics**			Less Reliable--->
<---- More Visible					Less Visible--->
<---- More Expensive					Less Expensive--->
<---- Low Weight		**Cargo Characteristics**			High Weight--->
<---- Higher Value					Lower Value--->
<---- More Time-Sensitive					Less Time-Sensitive--->

Source: CPCS adapted from Freight Transportation Service Spectrum, Hofstra University

On one side of the spectrum is water. Generally, water (via barges) is a slower mode of transportation compared to the others, but is also less expensive and well-suited to carry higher volumes of bulk commodities that are not time-sensitive. Common commodities that are transported using the inland waterway include agricultural products (grain and fertilizer), construction materials, road salt and others. These commodities, in particular grain, also have a low sale price per ton (or bushel) and it is important to keep transportation costs low so profit can be maximized.

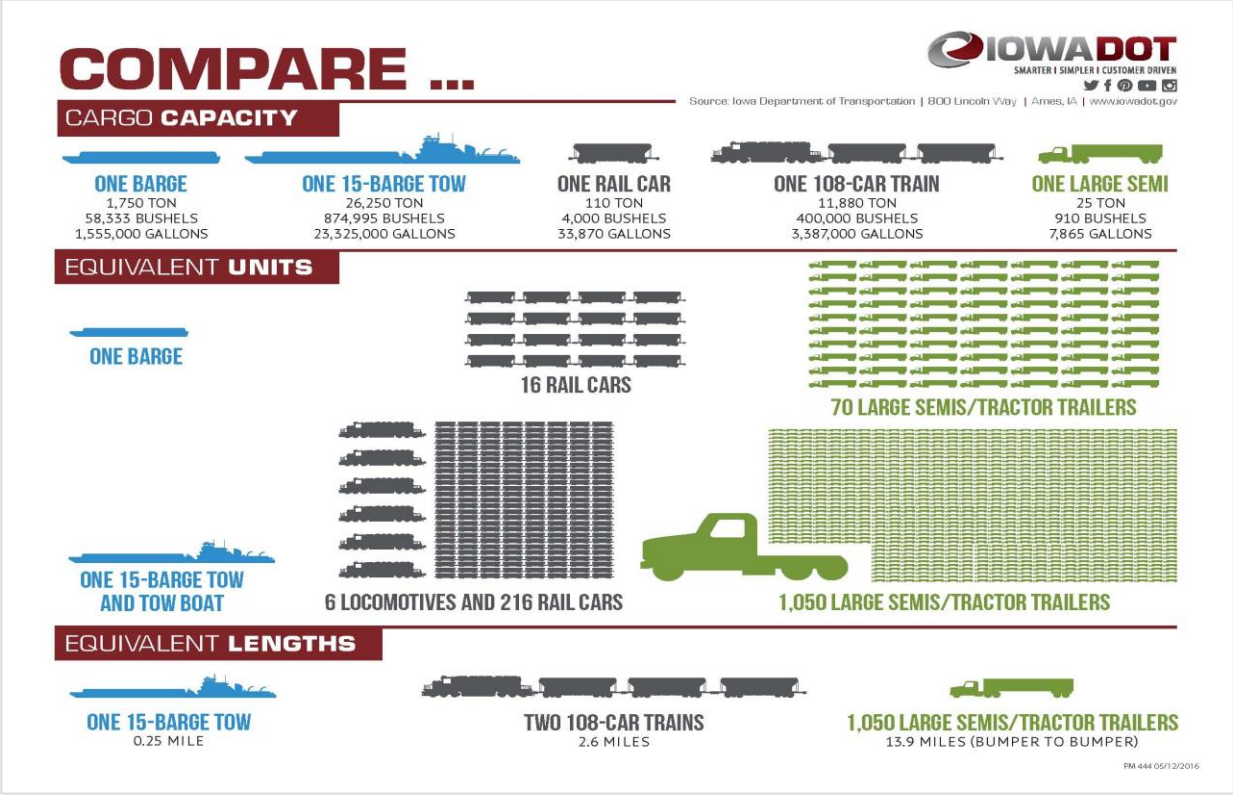
On the other side of the spectrum, air transportation is the fastest and most expensive option typically reserved for the freight with the lowest weight and strict delivery requirements. Common commodities that are transported using air freight include perishable items or higher

value, lightweight manufactured products like medical equipment and electronics. Air is the least used freight mode in the Eight County Region.

The transportation modes that lay between these two sides of the spectrum – truck and rail – are the most used modes in the Region in terms of both tonnage and value carried (as described in Section 3.1). These modes may sometimes compete with water and air services, but in the Region are often favored due to their availability and, in the case of trucks, their ability to provide last-mile (doorstep) delivery. Both trucks and rail are well-suited for transporting a variety of freight including manufactured goods, bulk goods, and a variety of consumer products.

As shown in Figure 2-25, cargo carrying capacity of the key freight modes utilized in the Region vary, with one barge equaling the carrying capacity of 16 rail cars or 70 semi trucks. The amount of cargo requiring transport is often a consideration in determining which mode to use, and certainly this decision influences the amount of freight (i.e., number of barges, rail cars or trucks) on various parts of the system. In an ideal situation, a business could choose between all modes for their shipping needs. However, as previously noted, a mode's availability varies by location, making mode availability a constraining factor in decision-making.

Figure 2-25: Cargo Carrying Capacity of Freight Modes



Source: Iowa DOT

3 Eight County Freight System

Key Chapter Takeaway

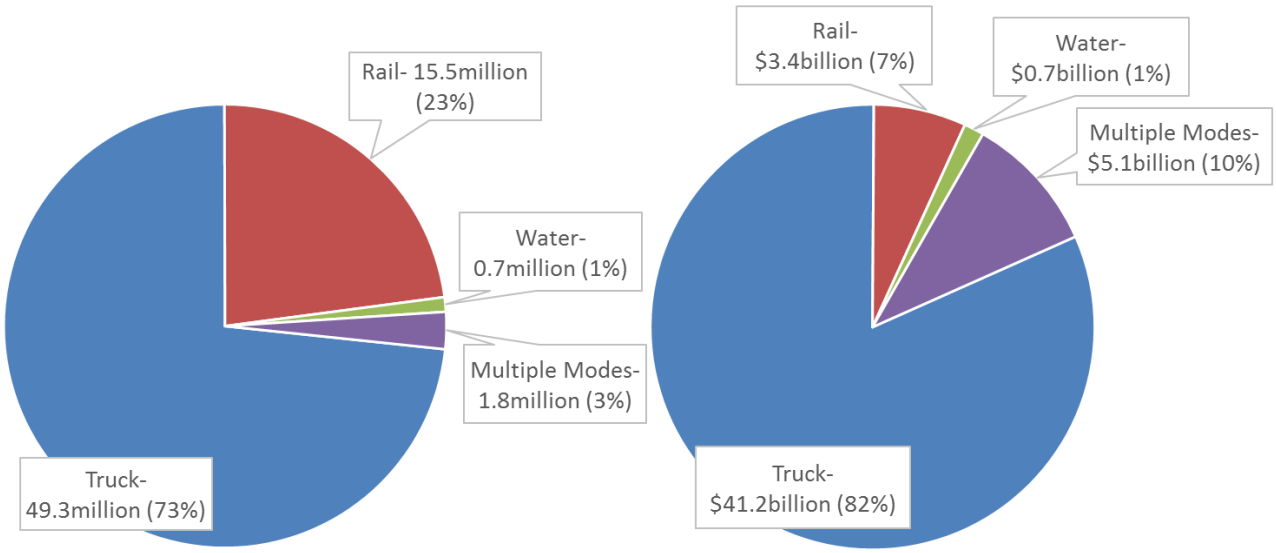
The Eight County Region has a multimodal freight transportation system, with each mode serving a distinct role in transporting goods produced by the Region's manufacturers and consumed by the Region's residents.

Trucks carry the majority of the freight in the Eight County Region in terms of both value and tonnage, but the Region also has extensive rail lines, and major barge facilities. Generally, the Region's transportation assets are aligned for the movement of bulk goods. Locals that produce/consume other types of goods (non-bulk) must truck their products to neighboring areas like Quad Cities or Chicago for rail and air freight access and options.

3.1 Eight County Freight System Use

In 2014, the Region's freight system carried 67.3 million tons of freight worth $50.4 billion. Trucking was the most commonly-used mode, carrying 73 percent of the region's freight by tonnage, and 82 percent of its freight by value. Rail carried the second largest tonnage (23 percent), and multiple-mode shipments (such as truck to barge or truck to rail, or containerized shipments), carried the second largest share of value (10 percent). A comparison of each mode's share of tonnage and value is provided in Figure 3-1.

Figure 3-1: Freight System Tonnage (left) and Value (right) by Mode (2014)



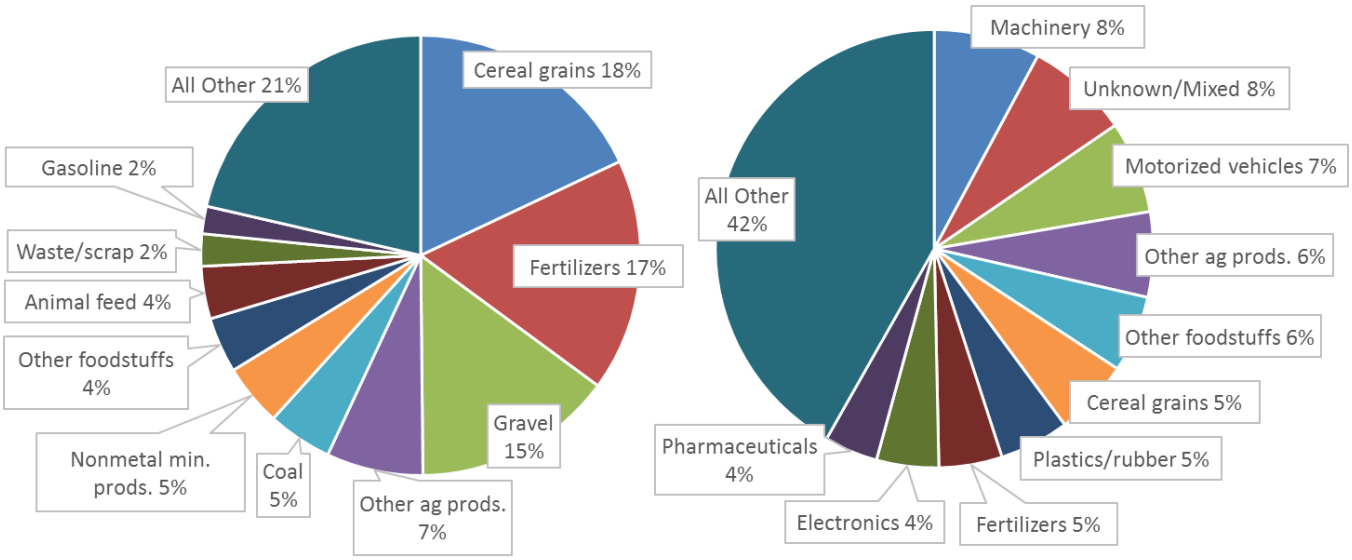
Source: WSP | PB Analysis of FHWA Freight Analysis Framework version 4 (FAF4) data. Preliminary.

Trucks carry the greatest share of the Region's freight by both tonnage and value.

The share of freight value carried by truck (82 percent) is greater than the share of freight tonnage (73 percent), suggesting that trucks are being used to carry the Region's higher-value, lower weight manufactured goods. Rail serves a different purpose, carrying 23 percent of the Region's tonnage, but only seven percent of its value, which suggests rail shipments are being used for relatively high-weight, low-value commodities like agricultural products. An interesting category is multiple-mode shipments, which carried only three percent of tonnage, but accounted for 10 percent of value. This category includes intermodal container shipments, which are often used to carry higher-value goods with low to medium weights

In terms of specific commodities, cereal grains (such as corn) are the number one commodity by tonnage (18 percent percent), and machinery is the number one commodity by value (eight percent). Figure 3-2 provides a visual of the top ten commodities by tonnage and value. Modal and commodity tonnage and value information will be further detailed in Working Paper 2 – Existing and Future Commodity Flow Profile.

Figure 3-2: Freight System Tonnage (left) and Value (right) by Commodity (2014)



Source: WSP | PB Analysis of FHWA Freight Analysis Framework version 4 (FAF4) data. Preliminary.

3.2 Highway System

The Region's road network is made up of different sub-networks including Interstate highways, national highways, state highways, and county roads. Figure 3-3 lists the mileages of some elements of the Region's roads, and Source: National Highway Planning Network. Federal Highway Administration. 2014.

Figure 3-4 provides a visual overview of the routes within the system. Of note is the small number of interstate miles in the Region, and the reliance on US and State Routes.

Figure 3-3: Regional Road Mileages by Network or Classification

	Illinois	Iowa	Total
Interstate	46.3	0	46.3
US Highway	103.4	278.0	381.4
State Highway	117.8	98.7	216.5

Source: National Highway Planning Network. Federal Highway Administration. 2014.

Figure 3-4: Eight County Highway System

Source: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

The Eight County road network carries over 73 percent of the Region's freight tonnage, and 82 percent of its value.

Truck transport serves a range of industries and commodities, but is generally preferred for moderate to high value items that are low to moderate weight. This trend towards a higher

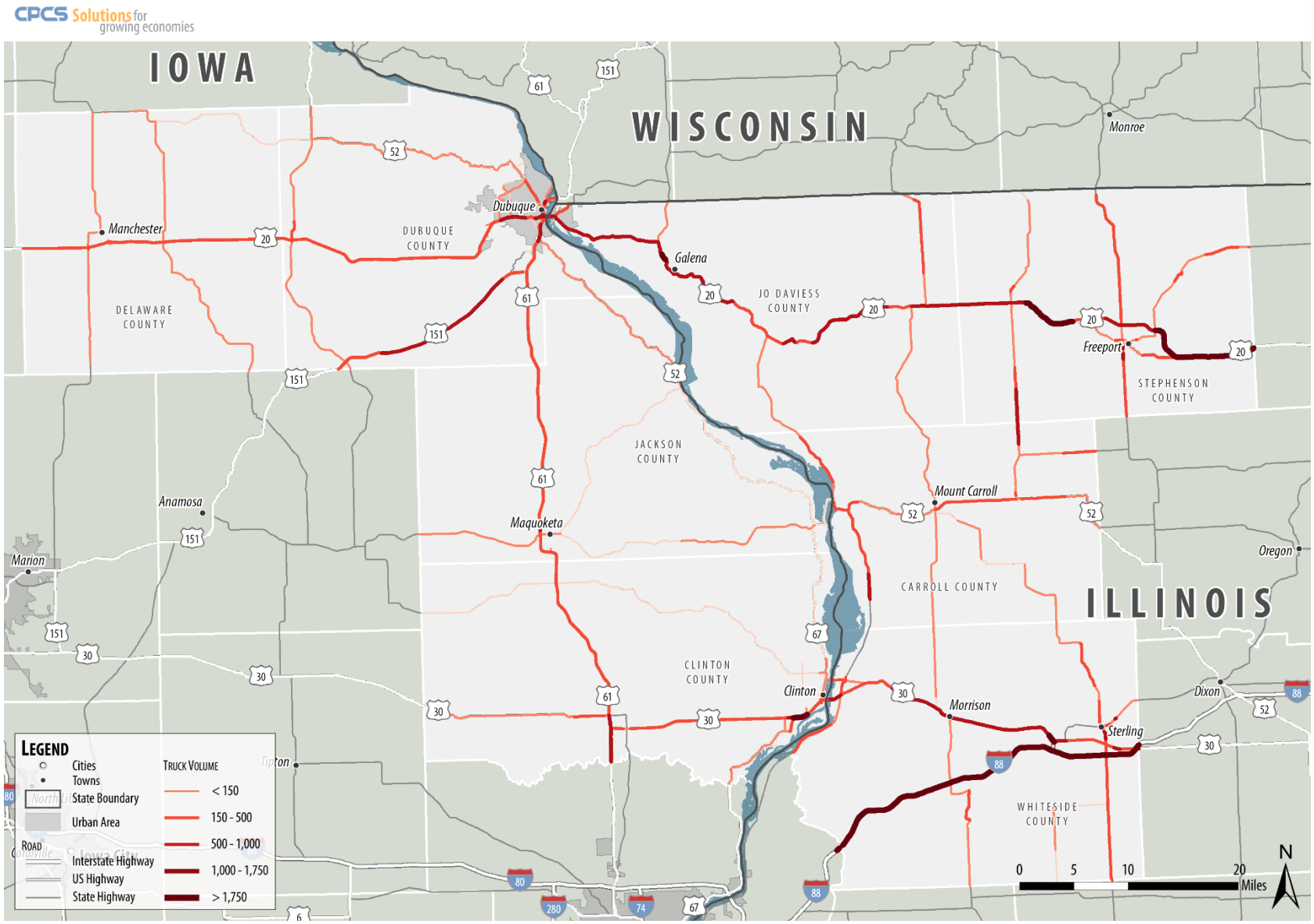
value-to-weight ratio for truck shipments helps explain why the Region's truck freight value share (82 percent) is higher than its tonnage share (73 percent). Specific commodities using road transportation will be discussed in Working Paper 2.

3.2.1 Key Roadway Corridors

The Region has relatively limited direct access to the Interstate Highway System: the only direct interstate connections in the Region are on I-88 in Whiteside County. Therefore, national highways such as US-20, US-30, US-52, US-151, and US-61 serve as important road corridors for freight movement in the Region. Figure 3-5 shows which corridors are heavily used by trucks, Figure 3-6 shows where trucks make up relatively high percentages of traffic, and Figure 3-7 shows the Region's designated truck routes.

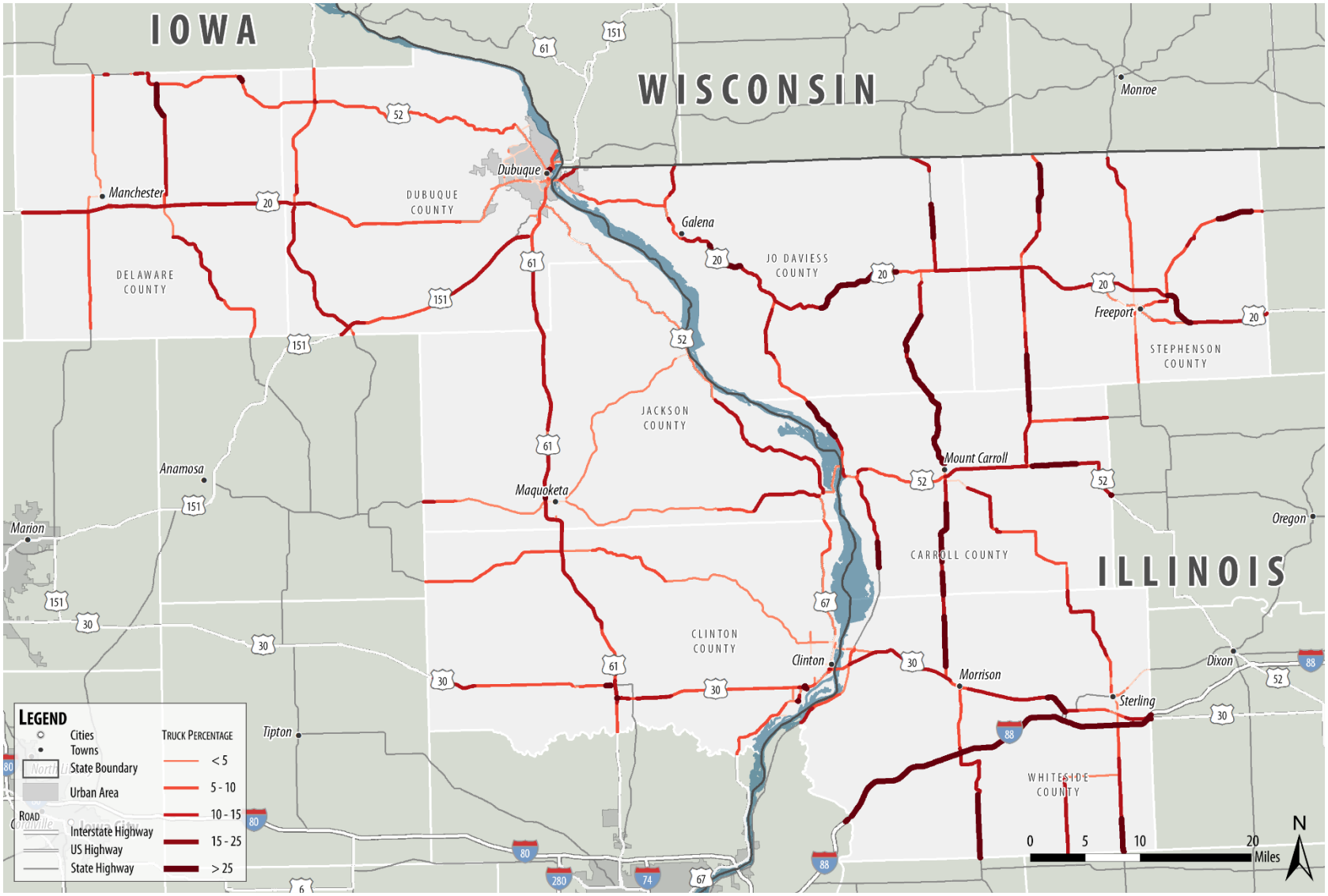
The following subsections profile each of the key highway corridors in the region. Each description includes a figure, provides location, indicates other modes in the area (rail lines), if the road crosses the Mississippi River via a bridge, and freight-related business locations that are adjacent to the road.

Figure 3-5: Regional Truck Volumes per Day



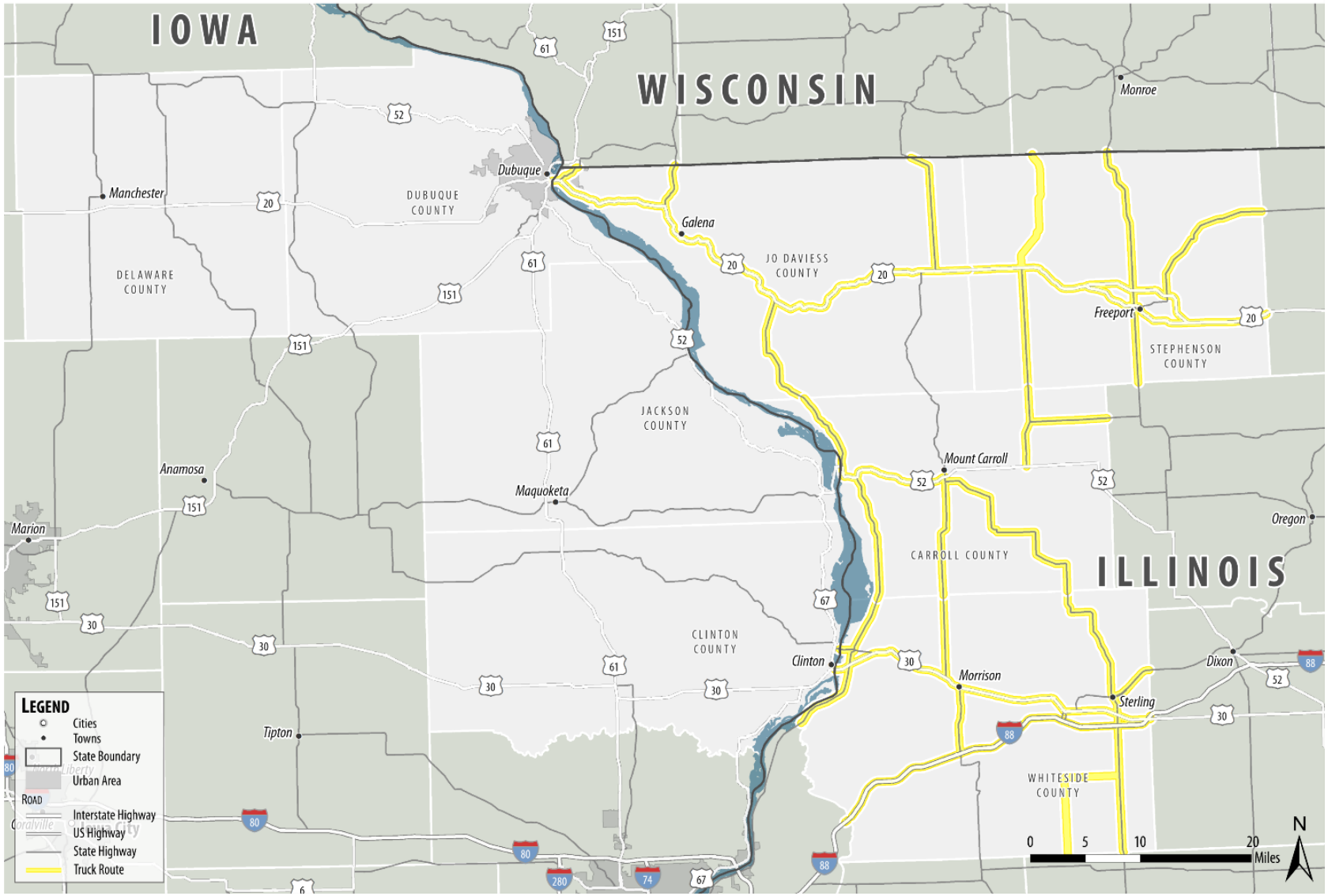
Sources: National Transportation Atlas Database. Bureau of Transportation Statistics, 2015; 2016 Highway System File. Illinois DOT; Iowa DOT

Figure 3-6: Regional Truck Percentages



Sources: National Transportation Atlas Database. Bureau of Transportation Statistics, 2015; 2016 Highway System File. Illinois DOT; Iowa DOT

Figure 3-7: Regional Truck Routes



Sources: National Transportation Atlas Database. Bureau of Transportation Statistics, 2015; 2016 Highway System File. Illinois DOT; Iowa DOT. Note: Truck route data only available for Illinois.

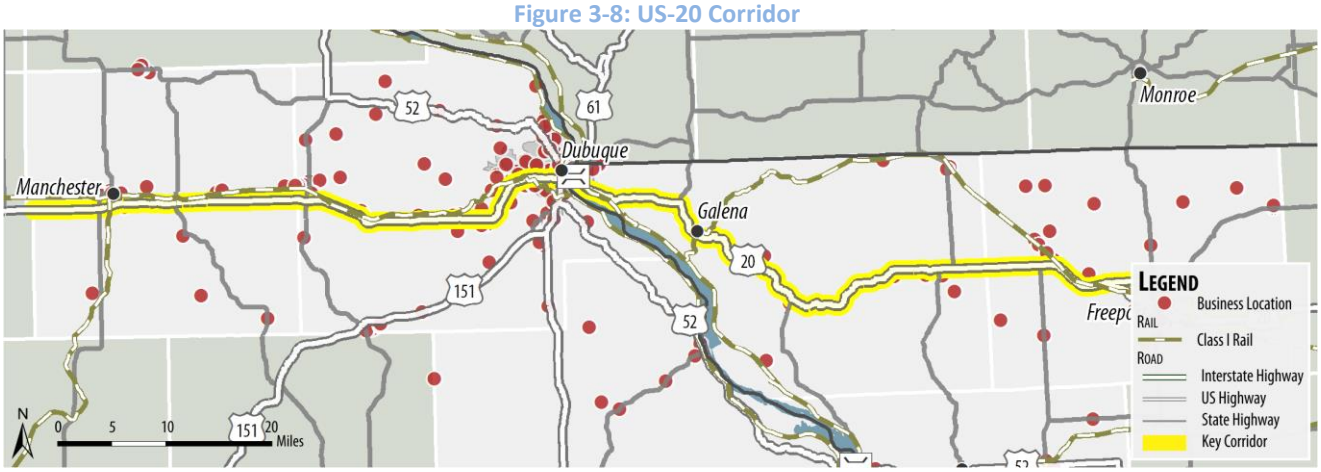
US-20

US Highway 20 runs east-west through Freeport, IL, Dubuque, IA, and Manchester, IA. It connects the Region to I-39 and I-90 in Rockford, IL, and I-380 near Waterloo, IA. The majority of the route (92 percent) is considered rural and is four lanes. However, 47 miles (or 37 percent of the route) between Galena, IL and Freeport, IL is two lanes. Eighteen manufacturing, agricultural, and shipping stakeholders mentioned the need for expansion of US-20, for a variety of reasons including congestion, a lack of shoulders, and improved safety.

Since the road is a major corridor for the Region, Illinois DOT has studied converting the remainder of the route to four lanes, and improving alignment and visibility. Studies and environmental impact statements for the corridor were completed in the mid-2000s, but progress on the corridor has been slow. Preliminary planning for the first portion of the corridor, a 6.5 mile section of four-lane freeway called the Galena Bypass, was completed in 2013, but additional funding is needed to advance work on the Bypass.[12] Another bottleneck for US-20 is the Julien Dubuque Bridge, which crosses the Mississippi River and is only two lanes wide. Three stakeholders specifically mentioned the bridge as a US-20 bottleneck due to its narrow lanes.

Truck traffic on US-20 is heaviest around Dubuque, IA and Freeport, IL, but truck percentages are relatively high throughout the entire corridor. This high percentage across the Region confirms stakeholder feedback that US-20 is a key east-west route for freight in the Region.

Figure 3-8: US-20 Corridor



Source: CPCS analysis of Reference USA data.

US-30

US Highway 30 runs east-west and serves the communities of DeWitt, IA, Clinton, IA, Morrison, IL and Sterling, IL. It provides direct access to I-88 near Sterling, and I-380 near Cedar Rapids. The route is mostly two-lane, with the exception of a 20 mile, four-lane expressway between DeWitt, IA and Clinton, IA. Illinois DOT has studied the possibility of expanding US-30 to four lanes between Fulton, IL and Rock Falls, IL. However, expansion plans were shelved in 2017 due

[12] US-20 Galena Bypass. Illinois DOT. http://www.idot.illinois.gov/projects/us-20-galena-bypass

to a decline in traffic, and local opposition.[13] A key asset for the US-30 corridor is the Gateway Bridge, which only has two lanes and crosses the Mississippi River.

Truck traffic on US-30 is highest in Camanche, IA, and from Fulton, IL to I-88. Truck percentage is higher in the same areas, as well as around DeWitt, IA. Six stakeholders such as manufacturers, warehouses, and shippers noted problems with US-30. Three specifically mentioned the need for four lanes in Illinois, and three mentioned safety issues with the corridor.

Figure 3-9: US-30 Corridor

Source: CPCS analysis of Reference USA data.

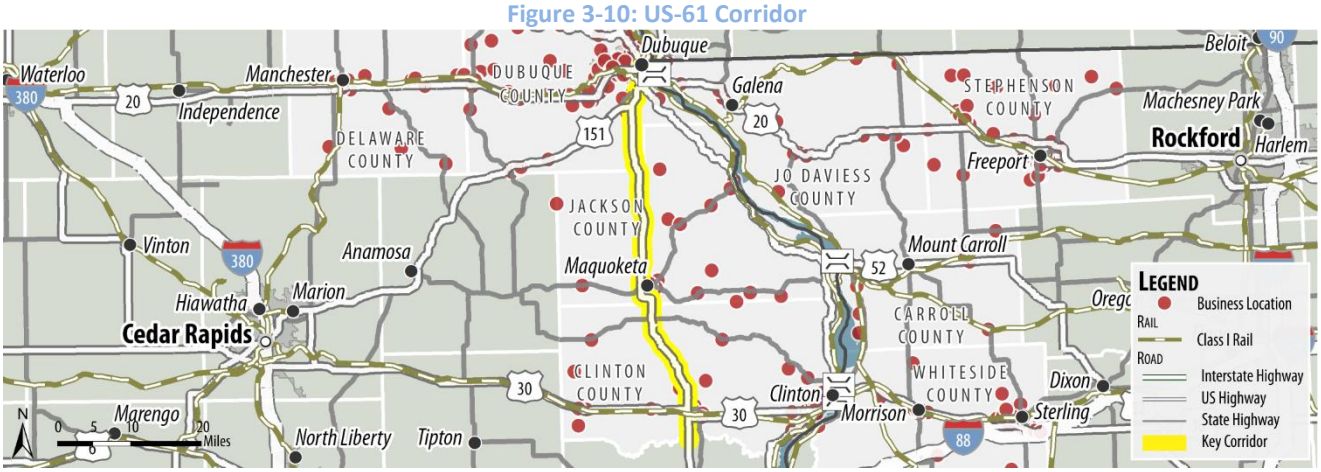
US-61

US Highway 61 provides a four-lane, north-south corridor through the Iowa portions of the Region. US-61 enters the Region in Dubuque, IA, and runs south through Maquoketa, IA and DeWitt, IA before entering the Quad Cities. This route provides direct access to I-80 in the south, but does not provide access to any notable transportation facilities north of Dubuque, IA.

Truck traffic and truck percentages on the US-61 corridor are moderately high, and fairly consistent between Dubuque, IA and DeWitt, IA. This consistency, combined with the fact that the highway serves relatively few industries outside of Dubuque, IA, DeWitt, IA, and Maquoketa, IA suggests that US-61's primary importance for the Region is providing north-south through service, rather than local access. US-61 and US-151 share the Region's only four-lane Mississippi River bridge, the Dubuque-Wisconsin Bridge.

[13] David, John. "IDOT to Discuss Decision to Scrap Major Renovation on US Route 30." WQAD 8 News. http://wqad.com/2017/03/15/idot-to-discuss-decision-to-scrap-major-renovation-on-u-s-route-30/

Figure 3-10: US-61 Corridor



Source: CPCS analysis of Reference USA data.

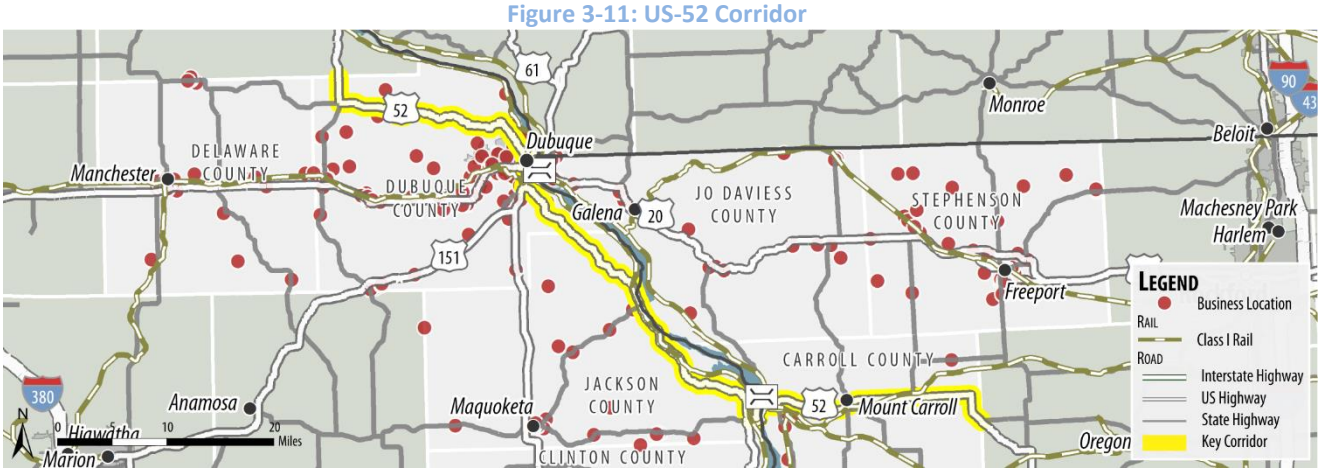
US-52

US Highway 52 runs diagonally through the Region, passing through Dubuque, IA, Sabula, IL, Savanna, IL, Lanark, IL and Polo, IL before crossing over I-88. This route provides one of the most direct paths to Minneapolis and St. Paul, MN from the Region, as well as access to I-88 and I-39 outside of the Region. The route is two lanes through most of the Region, with the exception of some segments near Dubuque, IA. The route also has one the Region's key Mississippi River crossings: the Savanna-Sabula Bridge. A new, wider replacement for this bridge is due to open in fall 2017.[14]

Truck traffic on US-52 is relatively low compared to other US highways in the Region, which suggests that US-52 is less important for freight relative to US-30, US-20, or US-61. Volumes are highest between Dubuque, IA and Bellevue, IA, and Savanna, IL and the Carroll-Ogle County line. Truck percentages are highest between Bellevue, IA and Sabula, IA, and from Mount Carroll, IL to the Carroll-Ogle County line. Relatively few industries are directly served by US-52, and some manufacturers in Bellevue, IA, Savanna, IL, and Mount Carroll, IL are the biggest clusters of industry.

[14] Miller, Michael. "Savanna/Sabula Bridge Project on Schedule, Within Budget. Prairie Advocate." March 28, 2017.

Figure 3-11: US-52 Corridor

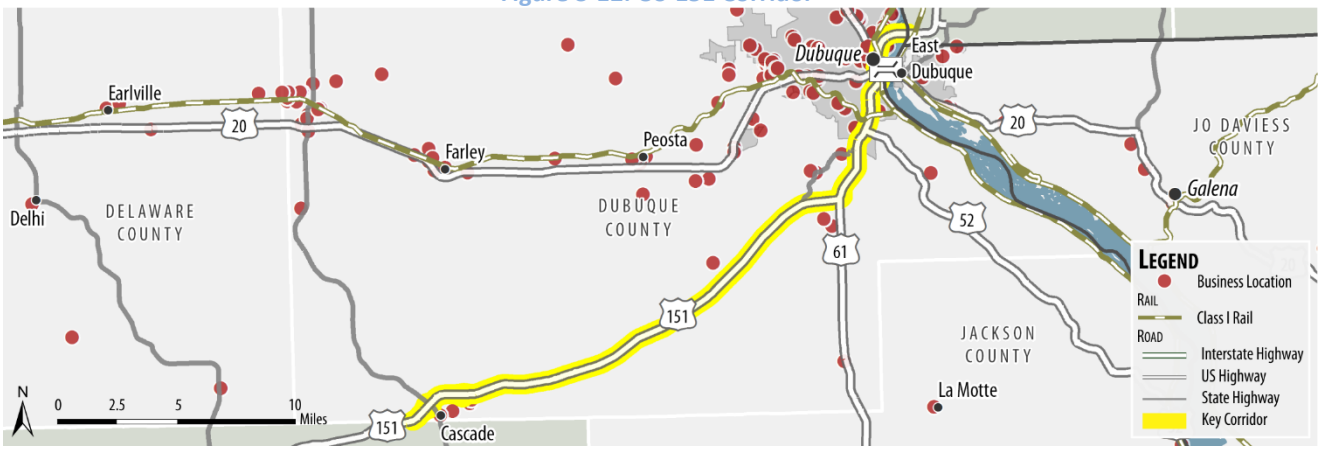


Source: CPCS analysis of Reference USA data.

US-151

US Highway 151 serves a relatively small portion of the Region, as it only passes through Dubuque County. However, the four-lane route provides access to Cedar Rapids, IA and Madison, WI. Truck volumes and percentages are relatively high across the whole corridor, with higher volumes and percentages near Cascade, IA and the US-151 and US-61 merge near Dubuque, IA. US-151 passes over the Mississippi River on the Dubuque-Wisconsin Bridge.

Figure 3-12: US-151 Corridor

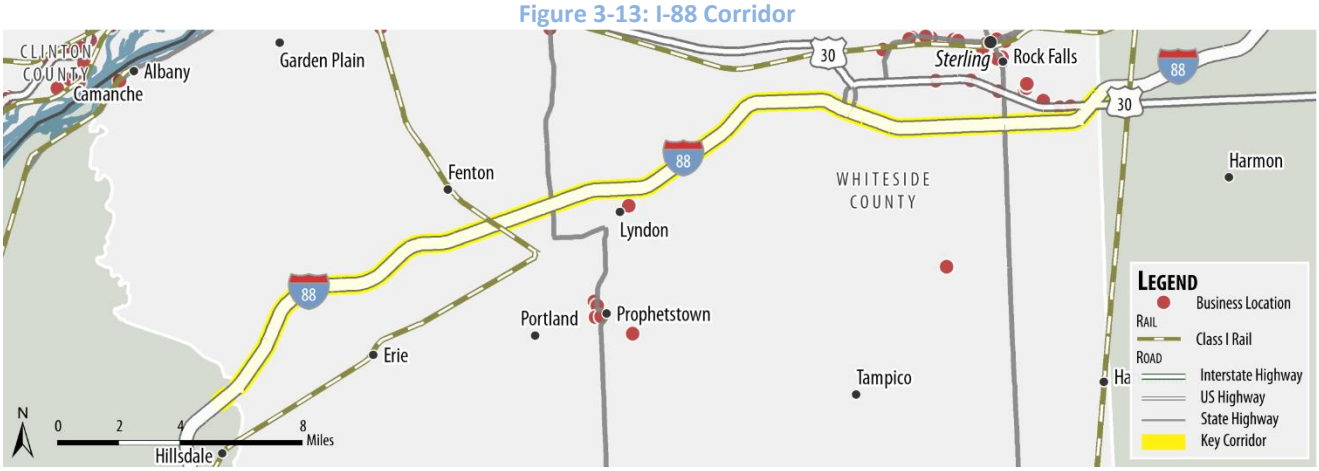


Source: CPCS analysis of Reference USA data.

I-88

Like US-151, I-88 only serves a small portion of the Region. I-88 cuts through Whiteside County, and connects to the Quad Cities and Chicago. Since I-88 is an interstate, truck volumes and percentages are high across the brief length of the corridor. I-88 becomes a tollway immediately east of the Region. Therefore, firms looking to ship goods to Chicago may alternately use Illinois Route 40 to connect with I-80, which is not tolled.

Figure 3-13: I-88 Corridor



Source: CPCS analysis of Reference USA data.

3.2.2 Supporting Corridors

In addition to the key corridors described above, there are 5 other routes that support freight movements through multiple counties in the Region.

- IL-84 runs north to south, from US-20, through Savanna, IL and Fulton, IL and on to the Quad Cities. While the route only has moderate truck volumes, its truck share is high, particularly around Savanna, IL.
- IL-78 provides another north-south corridor, and runs from the Wisconsin state line down through Warren, IL, Stockton, IL, Mount Carroll, IL, and Morrison, IL before crossing I-80. IL-78 has relatively low truck volumes, (most sections carry less than 150 trucks per day) but trucks make up more than 25 percent of the route's traffic, making it a noteworthy supporting corridor. IL-78 is not a designated truck route, so trucks that use this route may be in violation state or local regulations.
- IL-73 starts in Lanark, IL, and runs north to the Wisconsin border. The route has relatively low levels of truck traffic, but a high truck share, particularly around Pearl City, IL. Five BHRC stakeholders noted problems with IL-73, including poor pavement conditions, and low weight limits.
- IL-40 connects Mount Carroll, IL with Sterling, IL and points south. Like the routes above, it has low levels of truck traffic, but a relatively high truck share, particularly south of Sterling, IL. IL-40 connects with I-80, which provides toll-free access to the Chicago area, making IL-40 an attractive route for firms looking to avoid I-88's tolls.
- Stagecoach Trail in Stephenson and Jo Daviess Counties serves as an alternate route for US-20, and passes through the towns of Apple River, IL, Warren, IL, Nora, IL, and Lena, IL. Three stakeholders from the BHRC specifically mentioned that they would like to see Stagecoach Trail become a designated truck route.

3.2.3 Bridge Connections

In addition to the corridors listed above, the Region's five road bridges over the Mississippi River are important transportation assets. Two bridges are located in Dubuque, IA and two are located in Clinton, IA and Fulton, IL. The remaining bridge links Savanna, IL and Sabula, IA in the center of the Region. These bridges are the only road links between the two halves of the Region, and all but one (the Dubuque-Wisconsin Bridge) are two- lanes. Because of their limited traffic capacity, and long distance between towns, these bridges could be regional chokepoints for road freight movement. For example, if the Savanna-Sabula Bridge was impassable, traffic crossing the river would have to detour about 50 miles north to Dubuque, IA, or about 20 miles south to Clinton, IA. Figure 3-14 provides reference information for each of the Region's bridge connections.

Figure 3-14: Regional Highway Bridges over the Mississippi River

Bridge	Routes Carried	City	Lanes	Year Opened
Dubuque-Wisconsin Bridge	US 61, US 151	Dubuque, IA	4	1982
Julien Dubuque Bridge	US 20	Dubuque, IA & East Dubuque, IL	2	1943
Savanna-Sabula Bridge	US 52, IL 64, IA 64	Savanna, IL & Sabula, IA	2	1932*
Mark Morris Memorial Bridge	IL 136, IA 136	Fulton, IL & Clinton, IA	2	1975
Gateway Bridge	US 30	Fulton, IL & Clinton, IA	2	1956

Source: National Bridge Inventory. Federal Highway Administration. 2016.
*A replacement for the Savanna-Sabula Bridge is under construction.

3.2.4 Access and Connectivity

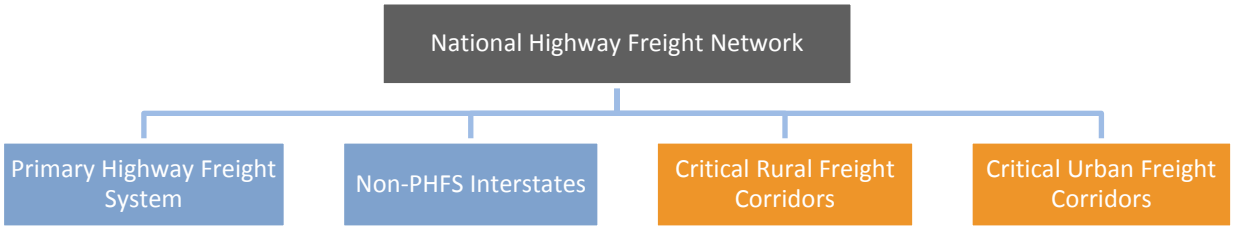
As shown in Source: National Highway Planning Network. Federal Highway Administration. 2014.

Figure 3-4, the Region has numerous national and state highways. However, connectivity, or links to the broader national freight system are more limited: the Region has very little direct interstate highway access. This section describes the highway connections available for the Region's firms. Particularly important are National Highway System Intermodal Freight Connectors ("intermodal connectors"), critical rural and urban freight corridors, and links to nearby interstates, rail intermodal terminals, and cargo airports.

Nationally Recognized Freight Corridors

The Fixing America's Surface Transportation (FAST) Act established a National Highway Freight Network (NHFN) to strategically direct Federal resources and policies toward improving the performance of the NHFN. The NHFN is a primary recipient of National Highway Freight Program (NHFP) funding allocated to states for freight projects and is one of the roadway types eligible for the Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE) Grants Program. Figure 3-15 displays the components of the NHFN.

Figure 3-15: Components of the National Highway Freight Network



Source: CPCS

- **Primary Highway Freight System (PHFS) –** 41,518 centerlines miles designated by USDOT. Illinois and Iowa have 1,685.40 miles and 549.62 miles respectively.
    - No PHFS mileage is in the Eight County Region.
- **Non-PHFS Interstates –** 9,511 centerline miles of interstates not included on the PHFS. Illinois and Iowa have 586.89 and 257.59 miles respectively.
    - About 31 miles of I-88 in the study area is part of the NHFN.
- **Critical Rural Freight Corridors (CRFC) –** the greater part of 20 percent of a states PHFS mileage or 150 miles. CRFC roads are outside of urbanized areas and are designated by state DOTs.
    - Illinois and Iowa have 337.08 and 150 miles respectively
- **Critical Urban Freight Corridors (CUFC) –** the greater part of 10 percent of the PHFS mileage in the state or 75 miles. CUFCs designation is led by state DOTs (urban populations of 50,000 up to 500,000) or MPOs (urban populations of 500,000 and above) in consultation with the other organization.
    - Illinois and Iowa have 168.54 and 75 miles CUFC miles respectively

Illinois and Iowa DOTs have not yet officially identified their CRFC and CUFC mileage. Illinois DOT is in the development stage and Iowa DOT is finalizing their designation. Currently the Eight County Region does not have access to NHFP funds (I-88 is not eligible because Illinois and other states with over two percent of PHFS mileage must spend NHFP funds on the PHFS, CUFCs, and CRFCs). Future CUFC and CRFC designations could make roadways eligible for NHFP funding.

Intermodal Connectors

The Region has two areas designated as intermodal connectors (Figure 3-16). Intermodal connector designations are submitted to the USDOT by state DOTs, and are used to mark particularly important connections to intermodal freight facilities. Routes that are designated as intermodal connectors and therefore included on the National Highway System are eligible for additional types of funding, such as FASTLANE grants. Iowa DOT considers these connectors to be critical freight links. Illinois DOT has not designated intermodal connectors in the Region.

Figure 3-16: Regional Intermodal Connectors

Connector Name	Type	Description	Length
Continental Grain Co., Dubuque	Port Terminal	Kerper Blvd, E 16th St, E 11th St, E 9th St, 9th-11th W Conn, between the Terminal and US 61/151	1.91
Harvest States Peavey, Dubuque	Port Terminal	E 7th St, Central Ave and White St between the Terminal and Commercial St	0.51

Source: Federal Highway Administration

Access to Regional Transportation Facilities

Companies shipping their goods outside of the Region, particularly by rail or air may need to send their products to other major freight facilities in Illinois and Iowa. Figure 3-17 provides a list of mileages and travel times from major Regional cities to nearby freight facilities such as airports, intermodal terminals, and interstate connections. The range of mileages and times below suggests that while the Region lacks certain types of freight facilities (e.g., intermodal container facilities, air cargo facilities, and extensive interstate highway connections), there are a variety of nearby transportation options.

Figure 3-17: Travel Time to Regional Transportation Facilities

Key Regional Transportation Facilities	Dubuque		Clinton		Freeport	
	Distance (miles)	Time (hours)	Distance (miles)	Time (hours)	Distance (miles)	Time (hours)
Davenport (I-80 link, air cargo)	71	1.25	41	0.75	100	2.00
Cedar Rapids (air cargo, intermodal terminal)	73	1.25	84	1.50	137	2.50
Rochelle (intermodal terminal)	123	2.25	67	1.25	60	1.00
Rockford (air cargo)	95	1.75	75	1.50	30	0.50
Chicago Area	175	3.25	144	2.50	144	2.00

Source: Google Maps. 2017 Preliminary data. Subsequent performance analysis will use truck-specific data.

For Figure 3-17, Davenport, IA was selected because it provides a link to the major I-80 east-west corridor, a southbound link to I-74, and air cargo service at the Quad City Airport. Cedar Rapids, IA was selected because it will soon be home to Iowa's second intermodal rail terminal, and has air cargo service. Rochelle, IL was selected for a similar reason, it is home to Union Pacific's Global III intermodal yard, which can provide rail connections to Chicago, the western US, and foreign markets. Rockford, IL was selected because it provides air cargo service, and provides access to I-90 and I-39. Time and distance to the Chicago area was also calculated due to Chicago's role as an international freight hub.

The highway system is the workhorse of the Region's freight system. Area roadways provides doorstep connections to firms, and connections to nearby centers where freight can be loaded on to rail or air. The Region is hindered by few suitable Mississippi River bridge crossings and lack of designated intermodal connectors and routes of Regional and National significance, which could pose challenges when freight funding is requested for future infrastructure improvements.

3.3 Railroad System

The Region is served by five railroads, which operate over 580 miles of mainline track in the Region. In 2014, these railroad carried 15.5 million tons of goods (15 percent of the Region's total tonnage) worth $3.4 billion (7 percent of the Region's total value).[15] These disparate values reflect the fact that rail is often used to haul bulky, low value commodities, such as corn, crude oil, and minerals such as sand. Since these types of goods are low value, but heavy, the value-to-weight ratio of rail freight movements in the Region is low.

Four Class I railroads serve the Region, providing access to a wide range of locations throughout the western and southern US. The Burlington Northern and Santa Fe Railway (BNSF) provides access to the Twin Cities, Chicago, and St. Louis. The Union Pacific Railroad (UP) connects to Chicago and Des Moines, the Canadian National (CN) connects to Chicago, and Omaha, and the Canadian Pacific (doing business as the Dakota, Minnesota, and Eastern) connects to the Twin Cities, Chicago, and Kansas City. The Region is also home to a short line, the Riverport Railroad, which provides switching service, transloading, car maintenance, and railcar storage near Savanna, IL. Figure 3-18 provides information on each railroad's miles of track and trackage rights. Figure 3-19 shows the Class I railroads in the Region, Figure 3-20 provides a map of the Region's rail traffic.

Figure 3-18: Railroad System Miles by Operator

Railroad	System Miles (Owned)	Trackage Rights (Miles)	Number of Mainline Tracks	Road Crossings
BNSF	125	UP – 1.7, CN – 15.2, CP – 23.5	2 from East Dubuque to Savannah, 1 for rest of Region	130
UP	129	0	2	105
CN	168	0	1	258
CP (Dakota, Minnesota, and Eastern)	162	CN – 1.3, UP – 1.7, BNSF – 15.4	1	177

Source: National Transportation Atlas Database. Bureau of Transportation Statistics, 2015; Public Crossing Inventory Detail Report. Office of Safety Analysis, Federal Railroad Administration.

[15] WSP Analysis of Freight Analysis Framework Data. Preliminary.

Figure 3-19: Eight County Railroad System

Source: National Transportation Atlas Database. USDOT. 2015.

Figure 3-20: Regional Rail Traffic Volumes (Trains per Day)

Sources: Public Crossing Inventory Detail Report. Office of Safety Analysis, Federal Railroad Administration. 2016; National Transportation Atlas Database. Bureau of Transportation Statistics. 2015.

3.3.1 Rail Bridges

In addition to hundreds of miles of track, the Region is home to three rail bridges across the Mississippi River. A list of basic facts about each bridge is provided in Figure 3-21. These bridges are important not only to the Region, and the nation's freight network as a whole. The double-track Clinton Rail Bridge is especially important: it carries 40+ trains per day on the UP mainline between Chicago and the West.

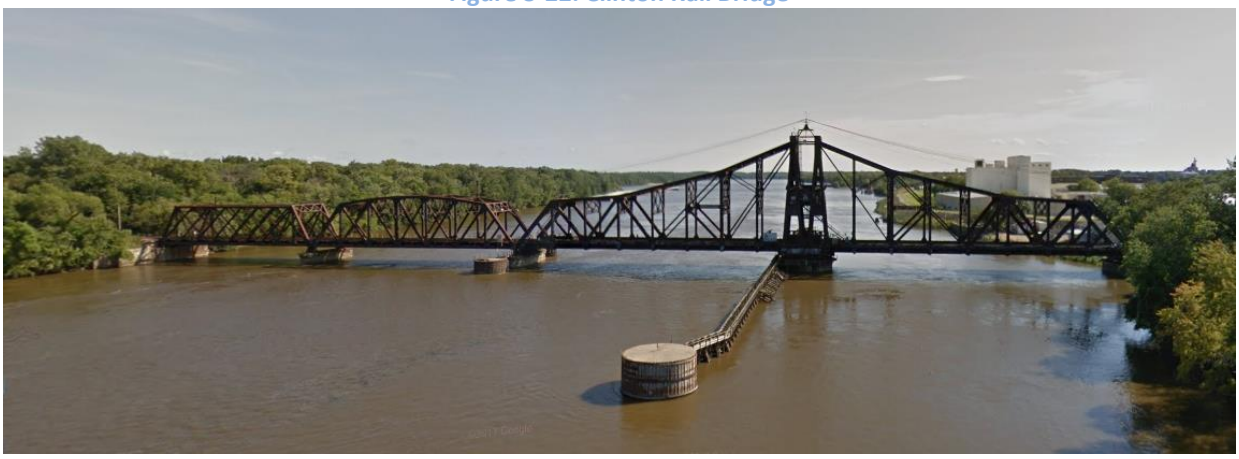
Figure 3-21: Mississippi River Railroad Bridges

	Tracks	Owner	Trains per Day	Year Opened
Dubuque Rail Bridge	1	CN	8	1899
Sabula Rail Bridge	1	CP	7	1906
Clinton Rail Bridge	2	UP	40	1909

Sources: "Iowa's Railroad Profiles." Iowa Department of Transportation. https://iowadot.gov/iowarail/iowa-freight-rail/profiles; Google Maps; "Dunleith and Dubuque Bridge". Encyclopedia Dubuque; Weeks, John A. "Sabula Rail Bridge."

The Region's railroad bridges are potential chokepoints for both rail and water traffic. Each of the three bridges are too low for barges to pass underneath, and each bridge was constructed with a rotating span that can move to allow barges to pass. Therefore only one mode can pass through a bridge site at one time, which can create delays and congestion for both barges and trains. Furthermore, the central "island" that supports the swinging motion of the bridge creates a very narrow navigable channel, and is a hazard to barge navigation. Figure 3-22 provides an example with the Clinton Rail Bridge, which must rotate to allow barges to pass through the narrow central channel.

Figure 3-22: Clinton Rail Bridge



Source: Google Streetview. 2017.

In the event of a barge-bridge collision, rail and river navigation can be shut down for hours or days as accidents are cleaned up, and bridge structures are inspected and repaired. In addition to their potential hazards and inefficient operations, the Region's swing bridges are over 100 years old, and require staff on hand at all times to operate the bridge. Given these inefficiencies and problems, and the extremely high volume of rail traffic on its mainline, the UP is studying

options for the construction of a new, higher bridge with a fixed span as a replacement for its aging Clinton Rail Bridge.[16]

3.3.2 At-Grade Rail Crossings

Railroad-road grade crossings may serve as another type of potential chokepoint relevant to the Region's freight system. The Region has 331 publicly-owned crossings, and 477 private crossings. 63 percent of the 331 public crossings had some form of protection such as gates, or lights, while the remaining 37 percent only had stop signs or cross bucks. Information on controls and protection at private crossings was not available. Figure 3-23 provides a breakdown of the types and number of crossings by county. Controlled crossing are equipped with active warning devices like gates, flashing lights, or bells, while uncontrolled crossings are only protected by a static sign such as a stop sign or cross bucks.

Figure 3-23: Eight County Rail At-Grade Crossings

County	Public			Private
	Controlled	Uncontrolled	Total	Total
Carroll	44	9	53	53
Clinton	43	36	79	69
Delaware	17	27	44	37
Dubuque	25	15	40	46
Jackson	3	17	20	34
Jo Daviess	25	1	28	40
Stephenson	19	5	24	69
Whiteside	33	10	43	129
TOTAL	209	120	331	477

Source: Highway-Rail Crossing Inventory Data. Federal Railroad Administration. 2017.

3.3.3 Key Facilities

In addition to mainline track, the Region has nine switching yards, located in the cities of Dubuque, IA, Clinton, IA, East Dubuque, IL, Freeport, IL, Fulton, IL, and Savanna, IL. These yards, and other railroad facilities such as interchanges, transload areas, and maintenance depots are listed in Figure 3-24.

[16] Source: Dahlstrom, Katie. "UP Eyes South Clinton Land." Clinton Herald. April 4, 2013.

Figure 3-24: Regional Railroad Facilities

Railroad	Yard Location	Facilities
CP	Clinton	Transloading, Interchange with UP
UP	Clinton	Switching yard, Maintenance, Transloading, Interchange with CP
CN	Dubuque	Switching yard, Interchange with CP
CP	Dubuque	Switching yard, Interchange with CN
BNSF	East Dubuque	Switching yard, Interchange with CN
CN	Freeport	Switching yard
UP	Fulton	Switching yard
RVPR	Savanna	Interchange with BNSF, Transloading, Maintenance
CP	Savanna	Switching yard
BNSF	Savanna	Switching yard

Sources: "Iowa's Railroad Profiles" Iowa DOT Office of Rail Transportation. https://iowadot.gov/iowarail/iowa-freight-rail/profiles; Blackhawk Hills Regional Council; Google Maps

3.3.4 Access and Connectivity

Despite the presence of five railroads and nine railyards, the Region's firms have relatively limited rail access, as rail sidings are required for direct access, and most of the Region's rail terminals are built for the transfer of bulk materials, such as grain or fertilizer. Because of this orientation towards bulk shipments, few rail connections are available for producers of non-bulk commodities such as manufactured goods. Firms looking to move their goods by rail may have to ship their products by truck to the rail intermodal facilities listed in Figure 3-25. The closest rail intermodal container facilities for the Region are UP's Global III terminal in Rochelle, IL, and an intermodal yard in Cedar Rapids, IA, which is under construction. Firms looking for more choice in rail shippers, or connections to the eastern US must send their products to the Chicago area.

Figure 3-25: Travel Time (hours) and Mileage to Nearby Rail Intermodal Facilities from Select Locations

Intermodal Facility - Railroad	Dubuque		Clinton		Freeport	
	Miles	Time	Miles	Time	Miles	Time
Global III (Rochelle) - UP	123	2.25	67	1.25	60	1.00
Cedar Rapids - CRANDIC	73	1.25	84	1.50	137	2.50
Bedford Park (Chicago) - CSX	188	3.50	142	2.50	125	2.25
Joliet - UP, CN, BNSF	202	3.50	150	2.25	140	2.25

Source: Google Maps

For Figure 3-25, Rochelle, IL was selected because it is the nearest currently operating intermodal facility, and is located directly on the UP mainline that passes through Fulton, IL and Clinton, IA. Cedar Rapids, IA was selected because it will provide an additional intermodal facility near to the Region. Bedford Park, IL was selected because regional firms looking to ship goods to eastern markets, or Europe may need to access Eastern Class I railroads like CSX or NS in Chicago. CSX' Bedford Park, IL yard is the nearest terminal operated by a Class I railroad that serves the eastern US and travel distance and time to Bedford Park, IL will be similar to time and distance for other intermodal facilities in the Chicago area. Joliet, IL was selected because it has some of Illinois' newest and most advanced intermodal facilities, such as the BNSF logistics

park, and UP's Global IV yard. Using intermodal facilities in Joliet, IL can also help firms avoid traffic congestion closer to Chicago.

The need to move goods by truck to intermodal rail facilities increases the cost of transportation for a firm, as they must pay to have freight transferred between truck and rail. A new intermodal terminal in Cedar Rapids, IA and an existing terminal in Rochelle, IL means that the Region's firms will have relatively quick and low-cost access to intermodal services, and national and international markets.

While many rail lines pass through the Region, the Region's firms do not have many options for rail access, as there are relatively few rail facilities, and current facilities often focus on the movement of bulk goods. This lack of loading facilities means that other intermodal terminals in Cedar Rapids, IA, Rochelle, IL, and Chicago are important transportation assets for Regional firms.

3.4 Inland Waterway System

The Mississippi River flows for 93 miles through the center of the Region, making it an ideal transportation corridor to the Gulf of Mexico and international markets. Figure 3-26 provides a visual overview of the river's path through the Region and the location of locks and dams. Figure 3-27 provides basic information on the size and age of the Region's locks and dams, which maintain a nine foot river channel depth needed to accommodate barge traffic.

Figure 3-26: Eight County Inland Waterway System

Source: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

Figure 3-27: Regional Locks and Dams

	Nearest City	Lock Size	Year Opened*	Average Lift
Lock and Dam 11	Dubuque	110' x 600'	1937	9.4'
Lock and Dam 12	Bellevue	110' x 600'	1935	9.0'
Lock and Dam 13	Fulton	110' x 600'	1936	8.6'

Source: Upper Mississippi River Locks & Dams. US Army Corps of Engineers. 2017.
*Year opened refers to the year the lock was completed. Dams were often completed after locks.

In 2016, between 17,000 and 19,000 individual barges made up of 3,000 to 3,300 barge tows passed through the Region. Combined, these movements carried about 20 million tons of goods. Figure 3-28 provides information on how many barges passed through each lock in the Region in 2016. Commercial lockages refers to the number of times the locks were operated for commercial vessels. Commercial flotillas indicates the number of barge tows that passed through the locks, and barges is the number of individual barges that passed through the locks.

Figure 3-28: Regional Annual Commercial Lock Traffic, 2016

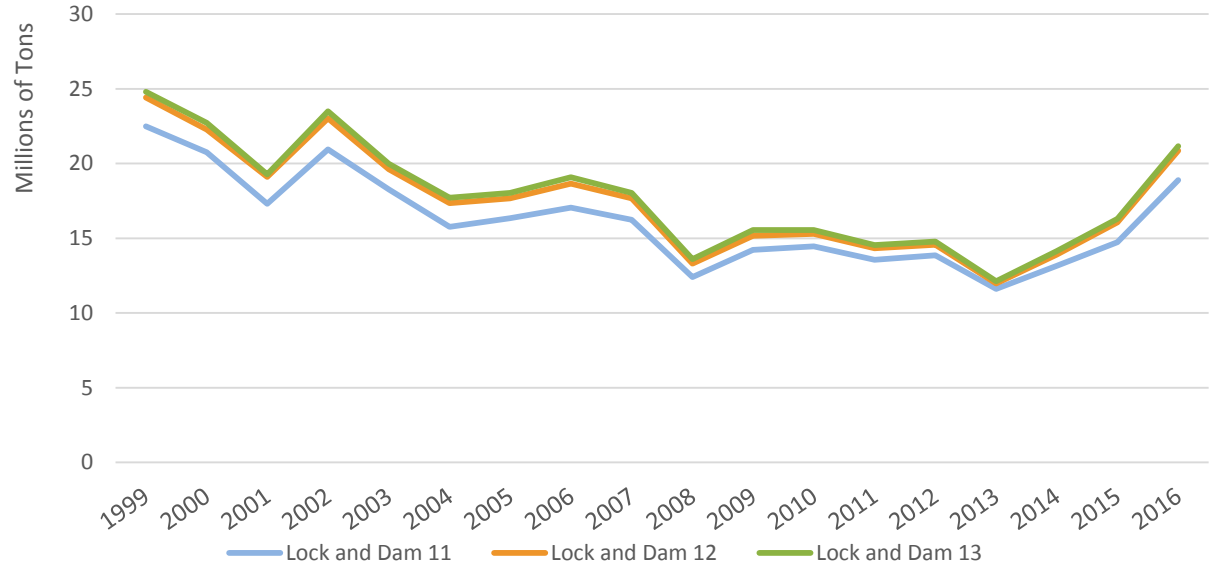
	Commercial Lockages	Commercial Flotillas	Barges (Empty and Loaded)
Lock and Dam 11	2,995	1,193	16,989
Lock and Dam 12	3,299	2,169	18,746
Lock and Dam 13	3,393	2,222	19,179

Source: Lock Performance Management System, US Army Corps of Engineers. 2017.

The river carries one percent of the Region's freight volume and value, and its slow-moving, but fuel-efficient barges are well-suited for extremely bulky lower-value commodities like grain, oil, fertilizer, and minerals. In fact, one barge can carry the equivalent dry cargo tonnage of 16 railcars, or 70 semi-trucks.[17] Barge tonnages in the Region reached a low point in 2013, and have increased by about 70 percent in the last three years. This growth may be attributed to recovery in agricultural production after a severe drought in 2013, and high agricultural production in following years. Further discussion of the type and value of commodities shipped by barge will be provided in Working Paper 2. Figure 3-29 shows barge shipment trends over time.

[17] A Modal Comparison of Domestic Freight Transportation Effects on the General Public. Texas A&M Transportation Institute. 2017.

Figure 3-29: Regional Waterborne Tonnages



Source: Lock Performance Management System, US Army Corps of Engineers. 2017.

3.4.1 Locks and Dams

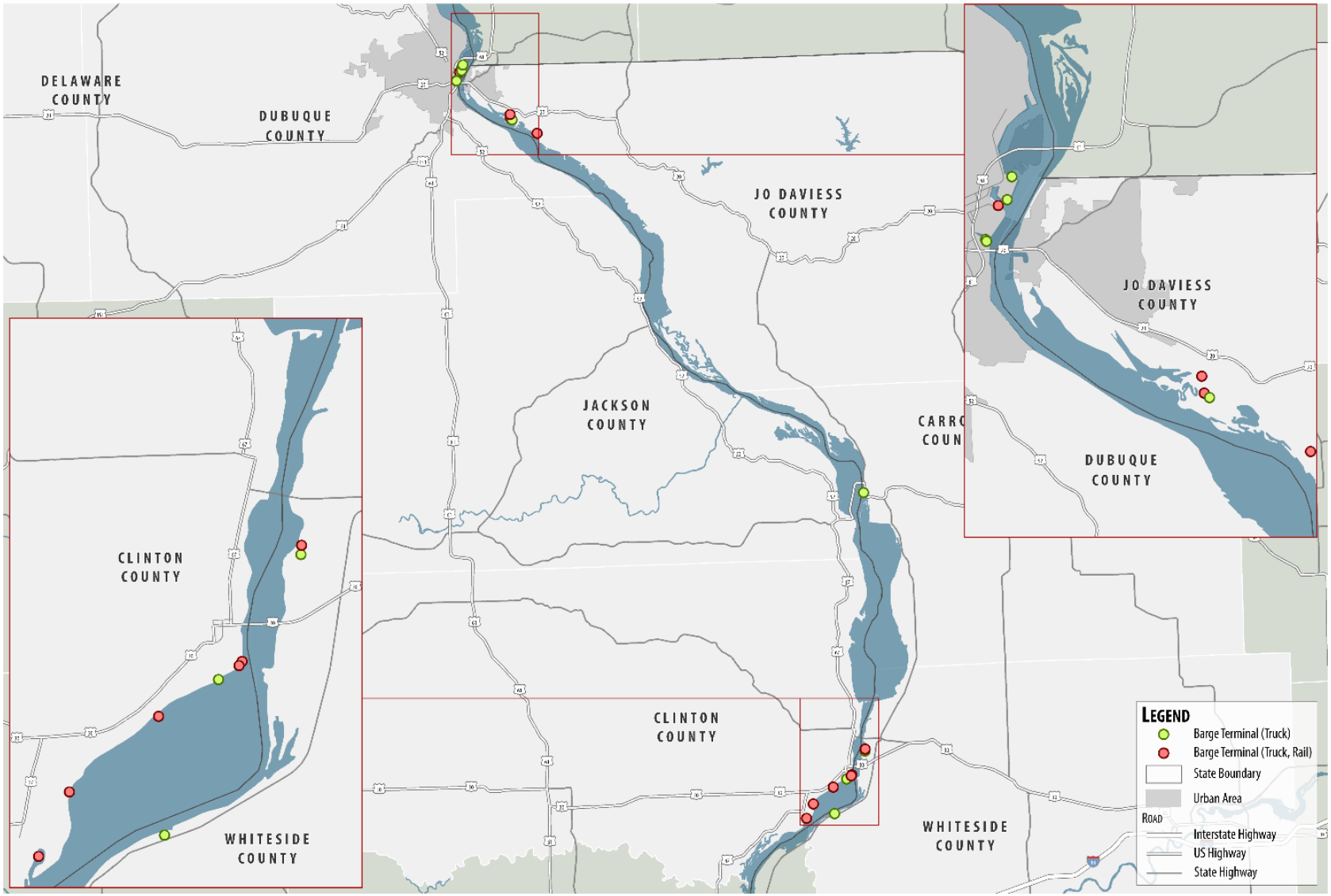
The river's flow is controlled by three locks and dams, which maintain a nine foot river channel depth needed to support barge traffic. Each of these locks has a 110 by 600 foot lock chamber, which means that barge tows often must be divided up into smaller groups to pass through the lock.

The Region's barge system is affected by the seasons: for about three months during the winter, the river freezes and barges cannot operate. The system's operation is also affected by the state of repair of lock facilities, which are over 75 years old. These facilities may experience shutdowns when lock equipment fails, and these shutdowns can halt river traffic for days or weeks. As the locks and dams continue to age, breakdowns, and disruptions to barge traffic may become more common. The potential for delays or shutdowns is a threat to the economic competitiveness of Regional firms that rely on the waterway for shipping.

3.4.2 Key Facilities

The Region is home to 21 groups of barge terminals in seven cities, with the majority clustered around Dubuque, IA and Clinton, IA. All terminals have a truck connection, and ten have rail connections. Figure 3-30 provides a map of the Region's terminals, Figure 3-31 and provides more detail about each facility.

Figure 3-30: Eight County Barge Terminals



Sources: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015; Blackhawk Hills Regional Council; Freight Map Files. Iowa DOT. https://gis.iowadot.gov/public/rest/services/Systems_Planning/Freight/MapServer; US Army Corps of Engineers

Figure 3-31: Regional Barge Terminals (North to South)

Name	City	Commodity Handled	Modes Connected
Cargill AgHorizons	Dubuque	Grain	Truck
Flint Hills Resources (Koch)	Dubuque	Liquid Petroleum	Truck
Peavey Co	Dubuque	Mixed	Truck, Rail
Dubuque River Terminal	Dubuque	Mixed	Truck
Newt Marine Service Dock	Dubuque	Mixed	Truck
IEI Barge Services	East Dubuque	Mixed	Truck, Rail
Aggregate Materials Co	East Dubuque	Mixed	Truck, Rail
Consolidated Grain and Barge	East Dubuque	Grain	Truck
East Dubuque Nitrogen Fertilizers	East Dubuque	Chemicals	Truck, Rail
Consolidated Grain and Barge	Savanna	Grain	Truck
Fulton River Terminal	Fulton	Mixed	Truck
Bunge Grain	Fulton	Grain	Truck, Rail
ARTCO Fleeting	Clinton	Mixed	Truck, Rail
Clinton Municipal dock	Clinton	Mixed	Truck, Rail
ADM Growmark	Clinton	Grain	Truck
ADM Corn Processing	Clinton	Grain	Truck, Rail
Vertex Chemical	Camanche	Chemicals	Truck, Rail
Bunge Grain	Albany	Grain	Truck
ARTCO Camanche	Camanche	Mixed	Truck, Rail

Sources: Blackhawk Hills Regional Council; Freight Map Files. Iowa DOT. https://gis.iowadot.gov/public/rest/services/Systems_Planning/Freight/MapServer; US Army Corps of Engineers

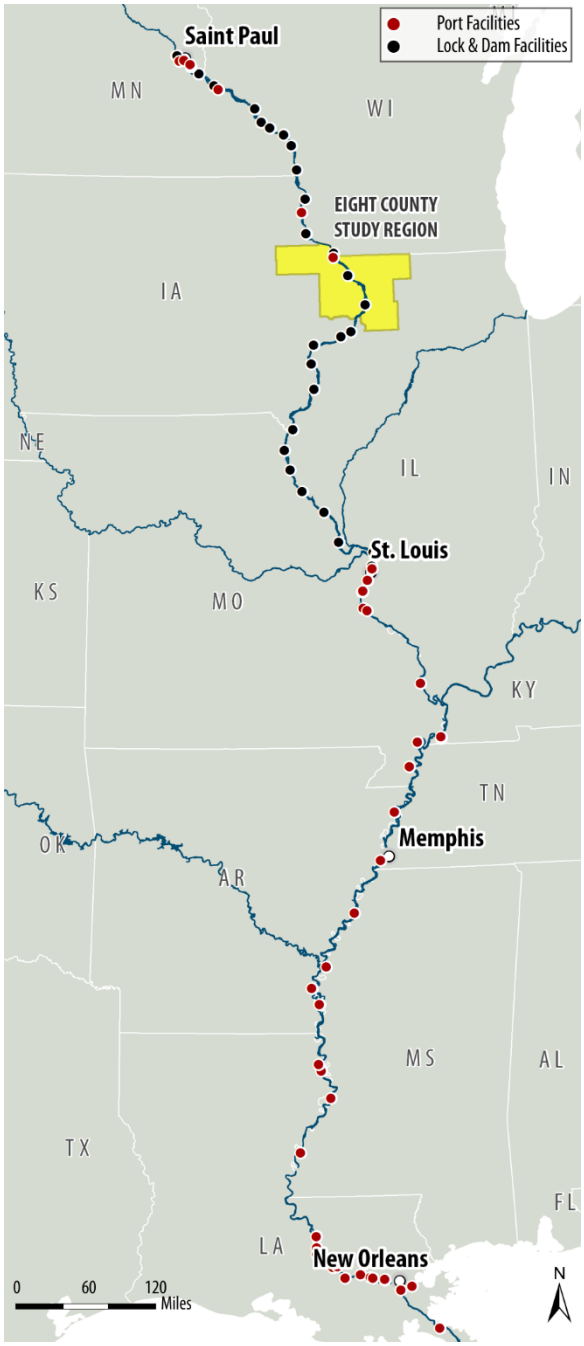
3.4.3 Access and Connectivity

The Region's firms have access to the river through the many of the barge terminals listed in Figure 3-31. The Mississippi River and the inland waterway network provides connections to a range of cities including St. Paul, St. Louis, Memphis, New Orleans, Chicago, Louisville, Cincinnati, and Pittsburgh. Additionally, New Orleans and the Gulf of Mexico provide access to ocean shipping and international markets for the Region's agricultural products.

While the range of potential barge destinations is great, the disadvantage of barge shipments is their low speed. As shown in Figure 3-32, the Gulf of Mexico is between 1,460 and 1,553 miles from the Region (depending on starting city), and it takes barges about 15 days on average to reach the Gulf, as barge tows must be broken down and re-configured as loads and picked up and dropped off in major cities like Memphis and St. Louis.[18] This slow movement makes barges only suitable for low-value, bulk cargo that is not time sensitive.

The Region's position along the Mississippi River, and ample barge terminals is an advantage for Regional firms looking to move large volumes of goods at a low cost. However, the lock and dam infrastructure that supports commercial navigation is outdated, and potential failure of this infrastructure is a threat to the Region's economy.

Figure 3-32: Key Mississippi River Facilities



[18] Perry, Ernest et al. Leveraging our Comparative Advantage. Phase II: Identification and Development of Wisconsin Port Market Scenarios. CFIRE. 2016.

3.5 Regional, National and Global Connectivity

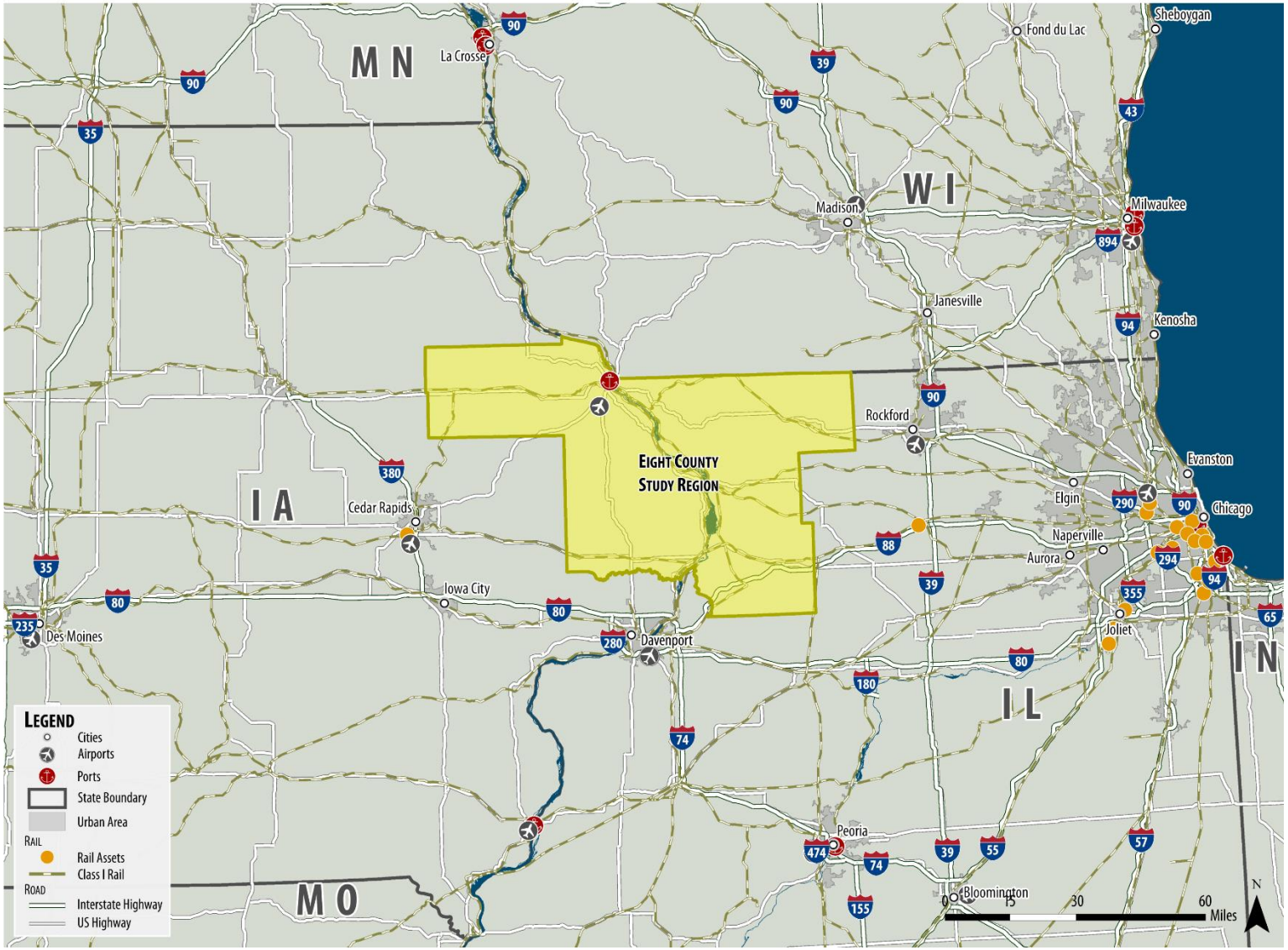
Access refers to the ability to ship goods via a certain mode, while connectivity is the ability to reach a variety of destinations or markets. For example, farms have water access via the Region's many grain elevators, but the Mississippi River system does not provide direct connectivity to inland areas like Colorado. Another example: the UP railroad that passes through Clinton and Whiteside Counties has connectivity to Chicago, Omaha, and eventually the West coast, but firms in the Eight Counties wishing to access this rail network may have to truck their goods to an intermodal terminal outside of the Region.

The Region may lack its own access points for many mode/commodity combinations, but it benefits from the Midwest's wealth of transportation assets, in particular the Mississippi River, and the intermodal yards and airports of the Chicago area. This section provides a high-level qualitative overview of the location and proximity of the eight counties to freight hubs and infrastructure in the Midwest and connection to the rest of the US. Figure 3-33 provides an overview of the Region's proximity to some of the Upper Midwest's key freight facilities.

3.5.1 Air Cargo

Air cargo shipments are expensive, and thus are used for high-value, low weight, or highly time-sensitive goods. Dubuque Regional Airport does not provide cargo service, so Regional firms looking to move goods by air must use other airports. Three nearby options are The Eastern Iowa Airport in Cedar Rapids, IA the Quad City International Airport in Moline, IL and Chicago-Rockford International Airport. Firms seeking further choice in air cargo shippers and connectivity may choose to send their goods to Chicago O'Hare International Airport.

Figure 3-33: Eight County Proximity to Other Key Regional Freight Facilities



Source: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015

3.5.2 Intermodal Facilities

The Region is home to 31 specific facilities that can transfer goods between modes, and these facilities are listed in Figure 3-34. These facilities are mapped in Figure 3-35, which shows barge terminals and land terminals, such as rail transload facilities, grain elevators, and rail-served warehouses. Most of the Region's intermodal facilities are designed to move bulk materials, such as agricultural products, chemicals, and minerals like gravel.

Figure 3-34: Eight County Intermodal Facilities

Facility Name	Facility Type	Commodities Handled	City	Nearest Road
ADM Corn Processing	Barge Terminal	Agricultural	Clinton	Beaver Channel Pkwy.
ADM Growmark	Barge Terminal	Agricultural	Clinton	South 4th St.
Aggregate Materials Co	Barge Terminal	Mixed Bulk	East Dubuque	US-20
ARTCO Camanche	Barge Terminal	Mixed Bulk	Camanche	North Washington Blvd.
ARTCO Fleeting	Barge Terminal	Mixed Bulk	Clinton	15th Ave. S.
Bunge Grain	Barge Terminal	Agricultural	Fulton	3rd St.
Bunge Grain	Barge Terminal	Agricultural	Albany	East Main St.
Cargill AgHorizons	Barge Terminal	Agricultural	Dubuque	Kerper Blvd.
Carroll Service	Rail Transload	Mixed Bulk	Milledgeville	Dutchtown Road
Clasen Warehousing	Warehouse	Mixed Bulk	Clinton	South 2nd St.
Clinton Municipal dock	Barge Terminal	Mixed Bulk	Clinton	15th Ave. South
Consolidated Grain and Barge	Barge Terminal	Agricultural	East Dubuque	US-20
Consolidated Grain and Barge	Barge Terminal	Agricultural	Savanna	Broderick Dr.
Consolidated Grain and Barge	Grain Elevator	Agricultural	Freeport	Hancock Ave.
Dubuque River Terminal	Barge Terminal	Mixed Bulk	Dubuque	Jones St.
Economy Coating Systems	Warehouse	Mixed Bulk	Camanche	21st St.
Farmer's Shipping Association	Grain Elevator	Agricultural	Dyersville	Beltline Rd.
Flint Hills Resources	Barge Terminal	Petroleum	Dubuque	Koch Ct.
Frary Lumber	Rail Transload	Mixed Bulk	Sterling	Lincoln Hwy.
Fulton River Terminal	Barge Terminal	Mixed Bulk	Fulton	11th Ave.
Gavilon Grain Warren	Grain Elevator	Agricultural	Warren	IL-78
IEI Barge Services	Barge Terminal	Mixed Bulk	East Dubuque	US-20
Innovative Ag Services	Grain Elevator	Agricultural	Farley	Jamesmeier Rd.
Midwest 3PL	Rail Transload	Mixed Bulk	Blackhawk	Shinske Rd.
Milledgeville Farmers Elevator	Grain Elevator	Mixed Bulk	Milledgeville	Railroad Ave.
Newt Marine Service Dock	Barge Terminal	Mixed Bulk	Dubuque	Jones St.
Pearl City Elevator	Grain Elevator	Agricultural	Lena	US-20
Peavey Co	Barge Terminal	Mixed Bulk	Dubuque	East 7th St.
Rentech Nitrogen	Barge Terminal	Agricultural	East Dubuque	US-20
Ryan Cooperative	Grain Elevator	Agricultural	Ryan	Union St.
Sterling Logistix	Rail Transload	Mixed Bulk	Sterling	Ave. G
Vertex Chemical	Barge Terminal	Chemicals	Camanche	Industrial Park Dr.

Sources: Iowa DOT, US Army Corps of Engineers, Blackhawk Hills Regional Council.

The Region may lack its own access points for many mode/commodity combinations, but it benefits from the Midwest's wealth of transportation assets, in particular the Mississippi River, and the intermodal yards and airports of the Chicago area.

Figure 3-35: Eight County Intermodal Facilities

CPCS Solutions for growing economies

Sources: National Transportation Atlas Database. Bureau of Transportation Statistics. 2015; Blackhawk Hills Regional Council; Freight Map Files. Iowa DOT. https://gis.iowadot.gov/public/rest/services/Systems_Planning/Freight/MapServer; US Army Corps of Engineers

4 Future Outlook

Key Chapter Takeaway

The freight system (including the transportation network, shippers, carriers, etc.) operates within a dynamic environment that is continually changing and adapting to best meet current market demands. While it is difficult to pinpoint how that environment will change in the future, we do know that there are a number of external factors that will influence it and, in turn, how goods are moved. The key is not so much in trying to predict how the system will change, as much as to considering how to make the Region's freight transportation system resilient and adaptable to an unknown future.

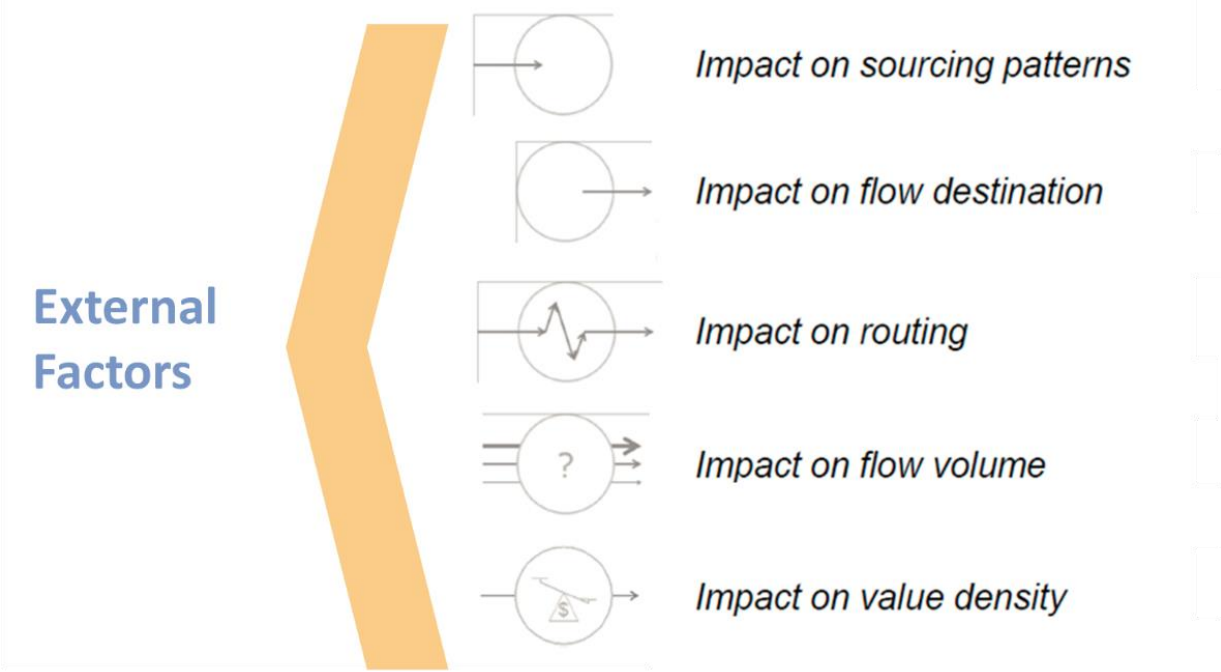
4.1 External Factors that Influence the Freight System

The freight system (including the transportation network, shippers, carriers, etc.) operates within a dynamic environment that is continually changing and adapting to best meet current market demands. While it is difficult to pinpoint how that environment will change in the future, we do know that there are a number of external factors that will influence it and, in turn, how goods are moved. As shown in Figure 4-1 external factors can influence the system in several ways, including:[19]

- **Sourcing patterns.** These factors may impact what raw materials and other inputs are sourced and where they are sourced from (i.e. origination).
- **Flow destination.** These factors may impact where materials and other goods are destined for manufacturing, consumption or other uses (i.e. termination).
- **Routing.** These factors may impact how goods are moved within a region, and if the routing is direct, via a single mode and if there are intermediate transfer points on the route.
- **Flow volume.** These factors may impact the total volume of freight shipped within and through a region.
- **Value density.** These factors may impact product characteristics and the value of goods shipped.

[19] Chris Caplice, Massachusetts Institute of Technology

Figure 4-1: External Factors and Potential Impact to the Freight System

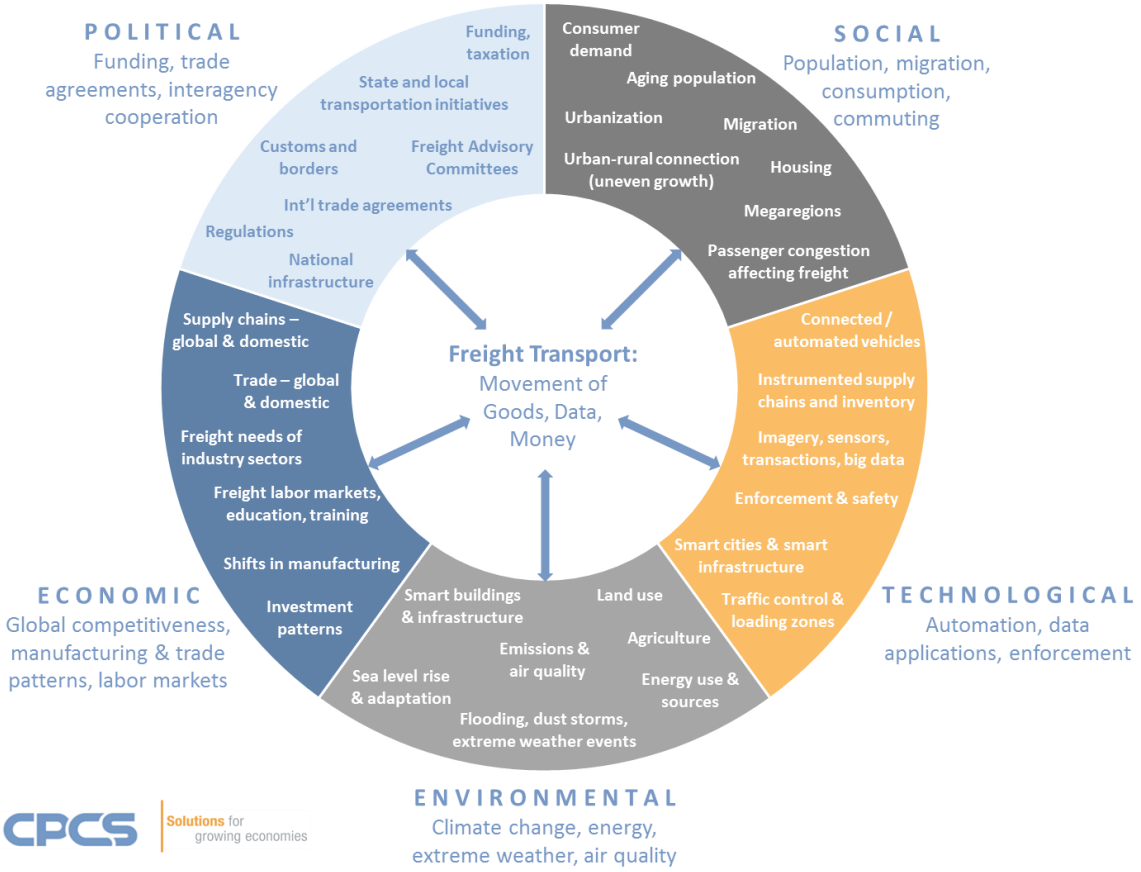


Source: Chris Caplice, Massachusetts Institute of Technology

External factors are often generally categorized using the "STEEP" terminology which reflects Social, Technological, Environmental, Economic, and Political considerations, as shown in Figure 4-2. While on the surface these factors may not all appear to be directly linked to freight, they do each have a role in influencing freight system sourcing, destinations, routing, volume and density in some way and provide insight to future freight system needs, issues and opportunities.

The following subsections provide examples of how historic trends and current developments may impact the Eight County freight system in the future. Note that these examples are provided for context and are not intended to be exhaustive.

Figure 4-2: External Factors Influencing Freight Transport



4.1.1 Social Factors and Trends

Social factors are broad and include demographics, income, consumption patterns, population location and density, as well as other considerations. Several of these social factors, and their related trends have already been noted in Section 2 - Eight County Regional Economy.

Several social trends previously presented provide insight into future freight system demand that is linked to consumer activity/needs:

- **Population.** (see Figure 2-1 and Figure 2-2) The population of the Eight County Region as a whole has increased. However, this increase is due to population growth in both Dubuque and Jo Daviess Counties, while populations in other counties have declined. The increase in both these counties could indicate residents' desire to be close to the major urban area in the Region.

- **Income.** (see Figure 2-3) Income increased steadily across the Eight County Region between 2011 and 2015, with Delaware County showing the largest increase of 18 percent, followed by Dubuque County at 10 percent. Delaware County also has the highest median income in the Region at over $58,000.

- **Education.** (see Figure 2-4) Directly related to the increase in income is a similar trend that shows an increase in education between 2010 and 2015. The percent of residents that

have “Some college, or an Associate’s degree” and “Bachelor's degree or higher” has increased while the number with “No high school diploma” has decreased.

At the same time the Region does lack semi-skilled and skilled workers required to meet the needs of potential employers. However, the Region’s post-secondary educational institutions are responding to the demand for skilled labor, and have the potential to meet this labor demand as they continue and are enhanced to meet industry needs.

Potential Impact of Social Factors and Trends

The trends described (complemented by consultant insights) may impact the Eight County freight system in a few ways:

- **Flow destination.** The increasing population and consumer wealth in the Region will mean that consumers will be in a position to buy more goods. These goods may be purchased at brick-and-motor stores, but more likely will be ordered online and delivered directly to their doorstep (see Technological Factors and Trends). This means that in the future there will likely be more goods traveling in residential areas to make deliveries.
- **Routing.** As the Eight County freight system is designed today, most of these “last-mile” deliveries to brick-and-motor stores and consumer doorsteps will be made via truck. Many consumer goods will have be shipped internationally via container and dropped at intermodal hubs such as those in Chicago or Rochelle as is the case today. This is not expected to change in the future. If containers are dropped in Cedar Rapids in the future, trucks will still be used for “last-mile” delivery but they may take a shorter route to their final destination.
- **Flow volume.** Again, increasing population and consumer wealth in the Region will mean that consumers will be in a position to buy more goods. This means there will likely be more goods traveling on the Eight County freight system in the future.
- **Value density.** It is expected that consumers will increasingly buy higher value goods and the value density of the Region’s freight system will increase. This will be a function of increasing consumer wealth, but also due to the fact that more and more consumer goods are higher value by nature (e.g., electronics and high-tech related).

While each of the points above relate to increasing freight volume on the Eight County freight system transported by trucks, there is currently a shortage of skilled employees in the transportation and logistics industries. A lack of employees in transportation and logistics could reduce the supply of services like trucking, which may result in higher transportation costs, and less competitive conditions for firms in the Region.

4.1.2 Technological Factors and Trends

Technological factors include those that may generate new (alternative) products or services, increase the availability/lower the cost of current products or services, or change the nature of production processes, transportation and distribution activities, information flows, as well as other considerations.

Technology has been a game changer in how we move and make transportation decisions. The clearest example of this is related to real time trip routing, travel time and incident reporting information. Applications such as Google maps and Waze provide real time information to drivers on routing, journey times, traffic conditions, and alternative routes among other relevant information. In fact, the Iowa DOT has partnered with Waze to leverage this technology as a cost-effective means of providing travelers information without having to invest in instrumenting their roadways.

Technology advancements related to "smart technology," generally, and to manufacturing and freight transportation and delivery, specifically, are changing rapidly and will be critically important to how the freight system is used, invested in and governed in the future.

Smart Technology

The proliferation of smart technology – smartphones, wearable devices, as well as the rise of the "Internet of Things" – sensors and actuators embedded in physical objects that are linked through wired and wireless networks – will continue, providing increasing information connectivity. Around 99.4 percent of objects that will one day be part of the Internet of Things are, today, unconnected, and 50 billion things are expected to be connected to the Internet by 2020, including 20 percent of all vehicles.[20]

Additive Manufacturing

Additive manufacturing (or 3D printing) has emerged as an alternative to the physical flow of certain products. 3D printing is best used for custom, small batch products, and is increasingly common in specialized applications or as an alternative to maintaining inventories of specialized product components. Today, the aerospace and medical industries are using the technology to produce custom devices (such as hearing aids and heart values) on demand for just-in-time delivery, significantly reducing inventory costs. Companies like UPS are further enabling this by providing MakerBot machines at many of their locations.[21]

Delivery of Goods

Some of the largest companies in the US that provide consumer goods, such as Amazon, Walmart and others, are testing ways to use technology to more effectively manage/control their operations in response to consumer demands – both in terms of streamlining their supply chains, but also to move away from the model of dropping of packages at individual doorstops which has high cost in terms of physical assets and labor requirements.

[20] Intelligent Connectivity for Seamless Urban Mobility, Arup with Qualcomm (2015)
[21] "UPS To Launch On-Demand 3D Printing Manufacturing Network," UPS.com, May 18, 2016

With more packages being delivered every day, Amazon is placing itself in control of its entire supply chain. The company is using supply chain insights from years of data collection to move away from its dependence on traditional carriers, such as UPS and FedEx, to deliver its products – and to bring its entire supply chain in-house. This year Amazon announced that it will establish a dedicated air cargo hub in Covington, KY that includes several facilities on nearly 920 acres of land, including a 3 million-square-foot sorting facility and a 350,000 square-foot loading dock, and enough ramp space to house 100 cargo jets.[22] In terms of last-mile delivery, in cities across North America Amazon has introduced "delivery lockers" that provide safe and convenient self-service package drop-off/pick-up locations. These locations not only are aimed at reducing package theft, but also have the potential to minimize the number of doorstops/truck trips drivers must make.

Both Amazon and UPS have also tested delivery drones for light package delivery in select markets.

Connected and Autonomous Vehicles

Autonomous and driverless vehicles are here and will without a doubt become integrated components of transportation systems for both freight and passenger users in the not too distant future. Nearly a dozen companies are currently testing driverless cars, and for freight, (semi-)autonomous trucking is being spearheaded by a handful of companies including Volvo, Daimler, Peloton and others, with fully autonomous trucking on the near-term horizon. This concept, as applied to freight, uses wireless vehicle-to-vehicle technology to enable the driver of a lead truck to control the speed (and braking) of the truck behind. It is expected that truck "platooning" will provide trucking industry benefits in terms of fuel savings (reduced wind resistance). The adoption of connected and autonomous vehicles could have an impact on the Region's workforce needs, the demand for skilled drivers in the region could decrease, or drivers may be required to learn new skills to operate connected and autonomous systems.

[22] "Amazon will add 2,700 jobs at new $1.5B Kentucky hub," USA Today, February 1, 2017

Potential Impact of Technological Factors and Trends

The trends described (complemented by consultant insights) may impact the Eight County freight system in a few ways:

- **Sourcing patterns.** Technological innovations that change how goods are produced/manufactured will influence where goods are sourced. As 3D printing advances, no longer will finished or semi-finished parts need to be shipped to be fed into assembly processes; these goods could instead be produced on demand, on-site. This could mean that more raw and bulk materials are shipped in the Eight Counties (used as inputs) as compared to semi-finished components today. Already manufacuring supply chains are shortening through the introduction of 3D printed products. In some sectors, 3D printing is replacing Just in Time (JIT) with "Real Time" (RT) inventory.
- **Flow destination.** As noted in Social Factors and Trends, consumers are demanding doorstep delivery for goods, but the model is unsustainable for shippers/carriers from an overall cost and labor perspective. Technology could be used in the future in the Eight County Region to focus deliveries in select areas of the community that have high traffic and could reach a large number of residents with a minimal number of deliveries.
- **Routing.** Smart technology will continue to ensure that trucks (delivery and through vehicles) take the least congested and most direct routing in the Region.
- **Flow volume.** As noted, if technological innovations are embraced (such as 3D printing) by manufacturers in the Eight County Region the flows in terms of commodities and volumes on the system will change. While manufactured goods will still be produced (shipped out) the input to these processes may be lower value and bulk materials – goods that can make effective use of rail and the inland waterway, depending on their origins and destinations.
- **Value density.** As noted above, the value density of the system may change if more lower cost raw and bulk materials are shipped on it. Consumer purchased products transported on the system will continue to be of high value.

Some of the technological changes being made by Amazon, for example, related to the delivery of goods will ultimately be felt along the retailers entire supply chain, but today are concentrated in large urban areas such as Chicago. It remains unclear when they may touch the Eight County Region, but new approaches to goods delivery are bound to emerge if some of these leading-edge innovations can demonstrably reduce supply chain costs and costs to end users.

4.1.3 Environmental Factors and Trends

Environmental factors may influence the demand for or the production of goods and services, either positively or negatively, and may also impact the how and when goods are shipped.

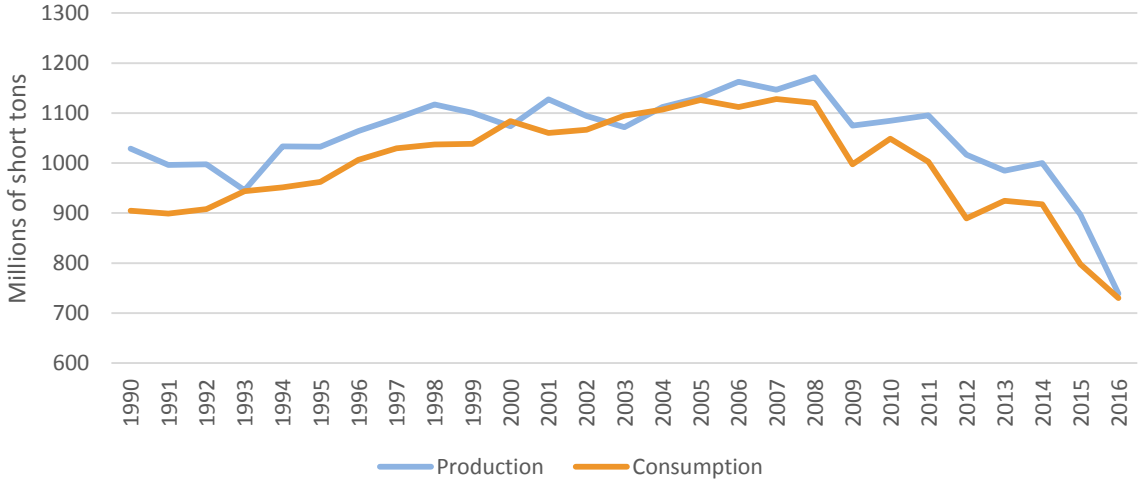
Climate Change

The Earth's average temperature has risen by 1.5°F over the last hundred years, and is projected to rise another 0.5 to 8.6°F over the next century. These small changes in average temperature translate to dramatic changes in weather that include more floods, droughts, and more frequent and severe storms and other weather events.[23] These changes in the environment are likely to become more noticeable in the coming years and the Eight County Region is likely to be impacted in several ways. These impacts could range from increasingly fluctuating water levels on the Mississippi River (as is already occurring) to changes to the agricultural industry – an important freight sector that depends on both a consistent and favorable climate and the inland waterway system to compete in the Global marketplace.

Changing Energy Future

As shown in the Figure 4-3, coal production and consumption is declining. This is important as, shown in Figure 3-2, coal is one of the top five commodities by tonnage in the Eight County Region. According to the US Energy Information Administration (EIA), US coal production is estimated to have fallen by 158 million short tons in 2016, or 18 percent of 2015 production, representing the lowest production levels since 1978. The implementation of the EPA's Clean Power Plan is a major factor in this decline, and its continued projected decline into the future.

Figure 4-3: US Coal Production and Consumption (2010-2016)



Source: CPCS analysis of Annual Energy Review Data, US Energy Information Administration.

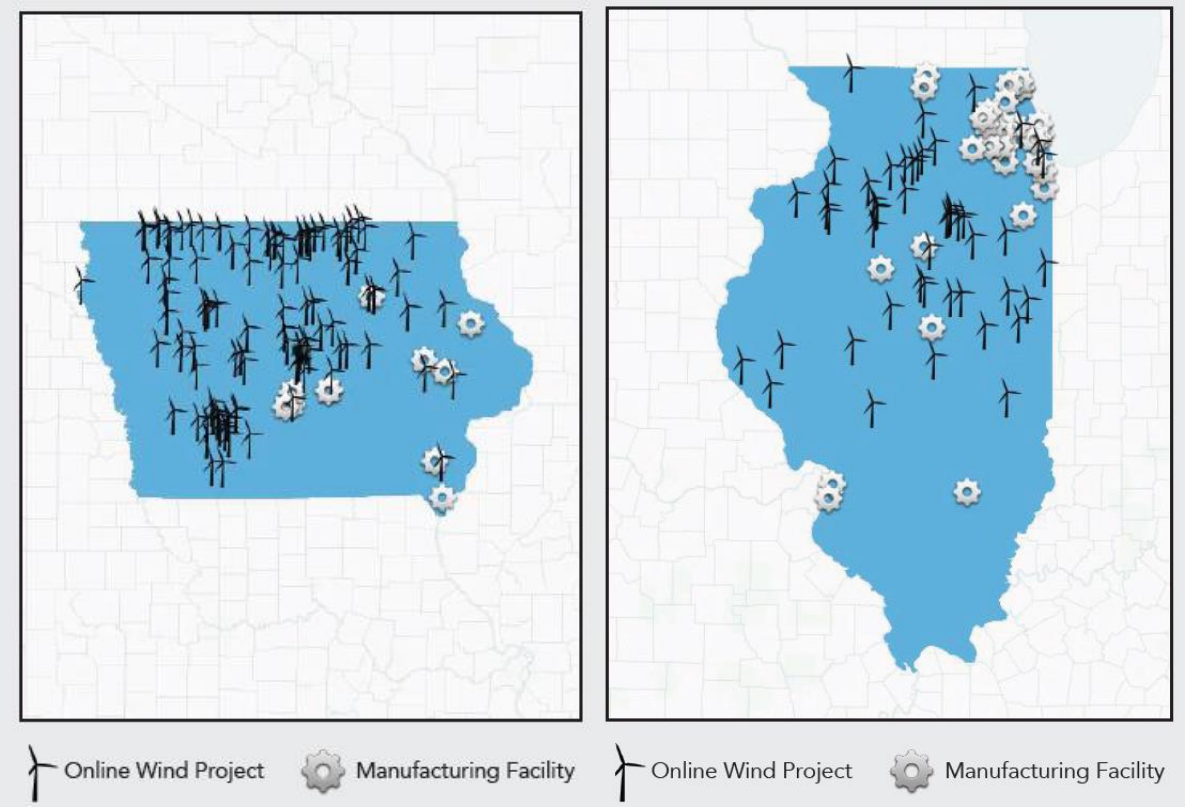
Already in the Eight County Region a changing energy future is evolving. Of two coal-fired plants in the study area located on the Mississippi River, one plant has been idled and another has been converted to natural gas. The conversion and idling have resulted in a significant drop in

[23] US Environmental Protection Agency

coal being transported on the Mississippi River to serve these facilities. Coal, natural gas, and nuclear power are the only energy sources that can provide energy on the scale required for energy-intensive industries, and today the price of natural gas is very low making it attractive to users (in addition to its environmental benefits over coal).

In both Iowa and Illinois wind is being explored as a power source as shown by the types of wind related facilities depicted in Figure 4-4. While wind power does have an impact on the Region's energy future, its greater impact is felt in the over dimensional loads on the transportation system as turbines, nacelles and towers are moved from production to installation.

Figure 4-4: Wind Farms and Production Facilities in Iowa and Illinois



Source: American Wind Energy Association

And last, transportation generates approximately one quarter of all greenhouse gas emissions (GHG) which are understood by many to be a leading cause of climate change.[24] While lower emitting fuels (such as those containing corn-based ethanol) are promoted by the government, there is also a movement by auto manufacturers to develop lower emitting/no-emitting vehicles, such as the Tesla and Chevy Volt. These all electric and hybrid electric are generally designed for passenger travel, but the technology is being adapted for light-duty delivery vehicles in urban areas. Additionally, semi trucks and rail locomotives are experimenting with alternate fuels such as liquefied and compressed natural gas (LNG and CNG). As new fuels are

[24] US Environmental Protection Agency

introduced the transportation system will need to adapt to provide opportunities for these vehicles to refuel/recharge.

Potential Impact of Environmental Factors and Trends

The trends described (complemented by consultant insights) may impact the Eight County freight system in a few ways:

- **Sourcing patterns.** As the energy produced in the Region begins to come from different sources (likely not coal), new sources will have to be provided from different origins via different modes (e.g., natural gas via pipeline as compared to coal via rail or barge).
- **Flow destination.** Similar to sourcing, destinations of goods may also change over time. In the event our motor fuel requirements change, the fueling/charging infrastructure will need to evolve as well. For example, the existing brick and mortar gas stations of today may be obsolete in the future.
- **Routing.** Routing is already changing in the Region as barges are no longer required to deliver coal to power plants. Routing will also become important related to sea (river) level rise. Some of the Region's major population centers and key freight infrastructure (water ports, roads and rails) directly abut the water and could be vulnerable in the future – alternate routes/options should be considered today.
- **Flow volume.** Similar to sourcing and destinations, the volume of goods transported may change over time. In the case of wind farm development, the volume of over dimensional flows may increase in the future. In the case of agricultural production, weather conditions will directly influence how much product is harvested and transported.

4.1.4 Economic Factors and Trends

Economic factors may influence overall economic growth (global, regional) or the distribution of that growth and the ability of individuals' or businesses' to invest or purchase goods or services, as well as other considerations.

Key Industrial Sectors

Several economic factors related to the key industrial sectors in the Eight County Regional have already been noted in Section 2 - Eight County Regional Economy, most importantly the historic growth of the Region's two key industries – manufacturing and agriculture.

Manufacturing

Manufacturing employment represents a significant share of employment in the Region (about 18 percent). And reviewing location quotient information, the Region appears to be particularly

well suited for fabricated metal product manufacturing, machinery manufacturing, food manufacturing and others. Since manufacturers handle goods in terms of raw materials in and finished product out, they are major users of the freight system.

However, manufacturing's importance to the Regional economy may be decreasing, as the sector shrank in the last decade, and growth has been low. GDP information is not available at the county level, but other measures like employment and payroll expenditures can provide an estimate of a particular industry's importance to a region. These indicate that the importance of manufacturing for the Region appears to be decreasing:

Agriculture

As previously stated, crop production and yield have increased over time in the Eight County Region. Since 2010, corn production has increased 22 percent and soybean production has increased 30 percent. Corn yield has increased 17 percent and soybean yield has increased 13 percent. While it is expected that this trend will continue, there are some that speculate the record year-over-year yields may not continue for the long term. The high-level of productivity is in part due to genetically modified seeds, but it is also related to government aid.

Nevertheless, with high levels of productivity and a saturated domestic consumption market, increasing export activity will be key to the agricultural industry. A challenge is that the already low price of corn is forecast to decrease further, driven by abundant global supplies and intense competition from harvests in South America.[25] And, like corn, there is some concern about production competition in the export market for soybeans. Brazil is a bigger producer of soybeans than the US and is beginning to refine their agricultural supply chain to more effectively compete internationally.

Changing Pacific Trade

Enabled in part by the low cost of container transportation, and driven primarily by the low cost of labor in Southeast Asia, over recent decades a share of US manufacturing has shifted production to Asia. The freight transportation system in the US responded by strengthening West-East linkages between coastal ports (particularly on the West Coast) and inland markets, including in the Midwest (greater Chicago).

But there are at least three factors that are likely to influence the pattern of trade with Asia. First, steadily increasing wage rates in China are pushing production westward to lower cost jurisdictions such as Vietnam and Bangladesh. This is resulting in a greater share of Asian trade with North American routing though the Suez Canal to North America's East Coast, rather than over the Pacific to North American West Coast ports. As an inland market, the Midwest (Eight County Region) has not been particularly challenged in adapting to this shift. Second, with the increasing prominence of automation in manufacturing, the advantage of low cost labor is for many sectors not what it has been in the past, resulting in a diminished need to shift manufacturing to lower cost Asian countries. Third, the US, under President Trump, has signaled

[25] Outlook for U.S. Agricultural Trade, USDA, February 2017

a shift away from trade with Asia, as exemplified by withdrawal from Trans Pacific Partnership negotiations. This could lead to a decrease in US trade flows from the Eight County Region to the coasts (including agricultural flows).

Impact of Nearshoring and Automation

Some have suggested that "near-" and "on-shoring," that is, shifting production from Asia to locations closer to home markets will result in a resurgence of manufacturing jobs in the US. Though production may in some cases be shifting back from Asia to North American, this is unlikely to mean that jobs lost to Asian manufacturers will return in their same numbers to the Region. Two factors in particular are worth noting. First, many of the jobs initially lost, are returning in the form of automated manufacturing processes, requiring a fraction of the jobs used to make the same products. This trend will no doubt continue, but the true long term impact to the Eight County Region remains unclear. Second, an important share of production has been "nearshored" to Mexico.

Potential Impact of Economic Factors and Trends

The trends described (complemented by consultant insights) may impact the Eight County freight system in a few ways:

- **Sourcing patterns.** As manufacturing shifts, so too will the inputs to Regional manufacturing and the origination of products destined to consumers in the Region.
- **Flow destination.** Specifically related to agriculture, as it becomes more and more difficult to compete in the international marketplace, raw agricultural products may not be direct exported. These products may be shipped to an interim US facility to be slightly processed or refined prior to export to "add value" and ensure that US products remain competitive.
- **Routing.** As trade shifts, in particular international import and export activity, the US - which is oriented to the East and West Coast ports – may shift to include trade to the south (Mexico and Latin America). In some cases, this may shorten supply chains. The Eight County Region should be able to easily adapt, as north/south rail and the river are both integrated parts of the transportation system.
- **Flow volume.** The volume of goods transported may change over time.
- **Value density.** The value of goods transported may increase over time, as the Region (and the US, generally) works to add value to US products so they may more effectively compete internationally.

4.1.5 Political Factors and Trends

Political factors may influence the production, sourcing, flow or trade of goods, or investments in public infrastructure, such as highways, among other factors. Some political factors have been briefly noted already, including changing US energy policy and US agricultural policy.

Evolving US and Global Trade Policies

Evolving US trade policies could have important implications for the future of trade between the US and its trading partners, especially the closest and largest of these – Canada and Mexico. As we are just a few months into a new Presidential Administration it remains unclear how trade policies will play out. Already President Trump has vowed to put America first in trade dealings with other countries and announced plans to renegotiate the North American Free Trade Agreement (NAFTA). He has also encouraged the automotive industry to produce cars for the US market in the US, threatening increased tariffs and punitive measures to curb the import of vehicles made outside the US. These and similar announced protectionist plans and policies are likely to have important implications for the north-south trades and significantly alter existing cross-border supply chains.

Infrastructure Investment – Panama and Suez Canal Expansions

A number key investments are influencing global trade patterns, but watched are the canal expansions that could result in a shift in key trade lanes to the US. The Panama Canal Authority, as well as the Suez Canal Authority, have both invested massively to improve access for larger ships. The Panama Canal is critical for Asia-North American East Coast trade. The major expansion in 2016 means the canal can now handle 13,000 TEU vessels (up from 5,000 TEU). The Suez Canal is critical for Asia-Europe trade, and the most recent expansion (new channel) has doubled capacity (there is no container ship size restriction as there are no locks[26]). The implication of the Panama and Suez Canal expansions for the Region is expected to be limited. Most impacts will be felt at coastal North American container ports. Nevertheless, the Ports of Mobile and New Orleans, which have barge connections may facilitate increased maritime traffic that is connected to the Region. This benefit may extend to the agriculture sector which uses Gulf ports to reach markets, including in Asia. The new Panama Canal locks, for example can accommodate vessels that transport from 2.1 to 2.2 million bushels of grain or soybeans or an additional 500,000 bushels, reducing the unit cost per bushel.[27]

[26] The only limitation is a maximum draft of 20 meters. This does not affect mega container ships, though would affect fully laden super tankers.

[27] "Panama Canal expansion boosting opportunity for U.S. ag." Ohio's Country Journal. February 8, 2016.

Potential Impact of Political Factors and Trends

The trends described (complemented by consultant insights) may impact the Eight County freight system in a few ways:

- **Flow destination.** To the extent products produced in the Eight County Region (manufactured or grown) are exported destinations may be reduced, or higher costs incurred to get to market.
- **Routing.** As the US east coast ports of call attract more, bigger ships, rail services oriented to the east coast may be desired.
- **Flow volume.** The volume of goods transported may increase as the US may produce more goods for US consumption.
- **Value density.** The value of goods transported may increase as the US may produce more goods for US consumption.

4.1.6 Questions for an Unknown Future

As shown, the Eight County region is facing pressures both internal and external to the Region. Some of these pressures public and private stakeholders and partners in this Plan are positioned to address, but most they are not. Regardless, as history has shown, the Eight County Region should prepare itself for game changers and disruptors that will inevitably influence the freight system in the future. While the future is unknown, decisions will still need to be made.

For the purpose of considering how the freight system and its use may be different in the future, a set of questions have been developed for consideration. These are general and not comprehensive, but frame some of the reflections in the preceding section that should inform this Plan – Its vision, goals and, ultimately, recommendations.

What will be the demand for freight in the Eight County Region?

- Will freight-related industries continue to represent nearly ½ of the Region's employment?
- Will consumers be able to manufacture their own goods (3D printing) to fulfill their own needs?

How will freight move in the Eight County Region?

- Will automated trucks mark the end of the ever present truck driver shortage?
- Will major local developments (investments) forever change how the freight system is used in the Region?

How will the Eight County Region trade?

- How (what mode) and with whom will the Region trade?
- What will the Region's most important transportation gateways, corridors, and hubs look like?

How will transportation infrastructure and services in the Eight County Region interact with the natural and built up landscape?

- Will climate change necessitate the relocation of transportation assets and built up areas?
- How will freight and the community interact?

How will freight transportation and mobility in the Eight County Region be governed?

- How will we pay for transportation infrastructure and services?
- How will regional cooperation work across institutions, agencies and stakeholders?

The key is not so much in searching for answers to these questions as much as to consider how to make the Region's freight transportation system resilient and adaptable to an unknown future.

4.2 Strengths, Weaknesses, Threats and Opportunities

Based on the information presented in this Working Paper, initial observations have been made related to the Region's strengths weaknesses, threats and opportunities. This preliminary assessment will continue to be built upon during the development of the Eight County Freight Plan.

4.2.1 Population and Workforce

In terms of the Region's population and available workforce, the findings are highlighted in Figure 4-5 and include:

- **Strengths.** The Region's population has been relatively stable in recent years, with Dubuque and Jo Daviess Counties posting overall population increases. At the same time, income in the Region is steadily rising.
- **Weaknesses.** In the short term, there is a shortage of skilled employees in the transportation and logistics industries. A lack of employees in transportation and logistics could reduce the supply of services like trucking, which may result in higher transportation costs, and less competitive conditions for Regional firms.

- **Threats.** Compared to peer regions in Iowa and Illinois, the Region has lower population growth, which could pose long-term challenges for businesses that require a large, skilled workforce. At the same time, while unemployment is relatively low, it is driven by a shrinking workforce, not job growth.

- **Opportunities.** The largest opportunity, that is already occurring in part, is the role postsecondary schools provide in training directly related to local industry needs such as manufacturing, agriculture, and transportation skills. These programs have the potential to improve freight-relevant workforce capacity in the longer-term.

Figure 4-5: Eight County Region SWOT – Population and Workforce

Strengths	Weaknesses
• Relatively stable population • Steady increases in income	• Short term lack of skilled and semi-skilled employees
Threats	**Opportunities**
• Lower population growth compared to peer regions • Shrinking workforce	• Strengthen relationships with community colleges, universities and private schools to enhance workforce efforts. • Postsecondary workforce programs

4.2.2 Key Industries

In terms of the Region's key industries, the findings are highlighted in Figure 4-6 and include:

- **Strengths.** The Region has a diverse industrial base and a diverse base of freight-related industries that provide economic value to the Counties. Freight-related industries employ about 77,600 people, or almost 50 percent of the region's workforce. The Region has a particular strength in terms of manufacturing employment (18 percent).

- **Weaknesses.** As noted above, the shortage of skilled employees in the transportation and logistics industries will pose a challenge for manufacturers in the long term.

- **Threats.** There are a number of threats the Region's industries face. First, while manufacturing has provided a solid employment base, historic trends show that manufacturing is decreasing in importance. In the past ten years, the number of manufacturing establishments decreased, the number of manufacturing employees decreased, and inflation-adjusted manufacturing payroll amounts also decreased. At the same time another threat, automation, could further reduce employment in this sector. And last, the Region's agricultural production reflects its high crop cover and substantial employment, with crop productivity continually increasing over time. Competition is fierce on the global market and the Region will need to be able to continue to export grain to these markets as the US is unable to use all that is produced within its borders.

- **Opportunities.** The large manufacturing presence in the Region poses opportunities; if goods used in the US will be required to be produced in the US, the Region is in a good position to capture additional manufacturing opportunities. Also, with the large agricultural base, combined with food manufacturing resources, the Region could become

a value-added agriculture center; semi-processing grain to add value and ensure it is differentiated from other raw global agricultural products.

Figure 4-6: Eight County Region SWOT – Key Industries

Strengths	Weaknesses
• Diverse industrial base, including manufacturing and agriculture • Diverse manufacturing sector	• Lack of skilled and semi-skilled employees (see Population and Workforce)
Threats	**Opportunities**
• The importance of manufacturing for the Region appears to be decreasing • Automation • Competitive global market for crops	• On- and Near-shoring • Value-added agriculture

4.2.3 Transportation Infrastructure

In terms of the Region's transportation infrastructure, the findings are highlighted in Figure 4-7 and include:

- **Strengths.** The Region benefits from a truly multimodal freight system that is oriented to handle the types of goods the Region has historically produced – bulk goods.

- **Weaknesses.** The Mississippi River divides Iowa and Illinois, and limits cross Regional connectivity. Only five road bridges (four of which are two lane) and three rail bridges (only one of which is double tracked) cross the river. Connectivity is also limited in the Region due to the fact that there are no intermodal terminals present. If shippers in Dubuque need to ship something this way, the nearest existing yard is 2.25 hours away in Rochelle, IL.

- **Threats.** There are a number of threats to the Region's future transportation system. First, the lock and dame infrastructure is aging and is in need of repair, but the USACE approach of "fix on failure" has the potential to disrupt goods movement in the region if a lock breaks down. Second, connected and autonomous cars and trucks will likely change supply chains and change how public agencies invest in the system – the threat relates to the fact that how and what will change is unknown. And last, the Region is bisected by the Mississippi River and road and rail infrastructure is vulnerable if water levels rise. Also, if water levels rise the navigability of the river itself may be threatened.

- **Opportunities.** While technology is expected to change "everything" in the future, if implemented correctly, it has the ability to enable better information sharing, better planning, and lower costs, among other benefits. The Region should explore and embrace transportation-related technology in the future, as appropriate.

Figure 4-7: Eight County Region SWOT – Transportation Infrastructure

Strengths	Weaknesses
• Multimodal freight assets • Freight system designed to transport bulk goods	• Bridges, river crossings • Distance to major intermodal and transfer facilities
Threats	**Opportunities**
• Infrastructure failure – locks and dams • Unknown social, economic, and policy changes from the adoption of connected and autonomous vehicles • Sea level rise	• Embrace technology

5 Conclusions and Next Steps

5.1 Conclusions

The Eight County Region has a robust, multimodal freight system that is oriented to the historical strengths of the Region – the transport of bulk goods. Looking to the future, industries in the Region are evolving and consumer demands are changing; in turn, supply chains and use of the transportation system will shift. While the future is difficult to predict, this Working Paper presents a summary of some of the strengths and weaknesses of the Region, and suggests ways in which it may consider positioning and preparing itself. This initial assessment will continue to be built upon during the course of developing the Eight County Freight Plan.

5.2 Next Steps

The present Working Paper is the output of Tasks 1.1 to 1.2 and is provided for review and comment by ECIA and BHRC. A revised Working Paper will be provided in due time, based on comments and updates based on future consultations and research. The next Working Paper (Working Paper 2 – Existing and Future Commodity Flow Analysis) will reflect Task 2.2 activities, and will build on the preliminary commodity flow picture provided in Section 3.1. The in-depth commodity flow analysis will include a detailed breakdown of commodities using the system, their quantity and value, the modes used and the major trade lanes traveled. The results of Working Paper 2 will complement the content herein and enable the conduct of a thorough needs assessment of the multimodal freight transportation system in the Eight Counties.

Figure 5-1: Project Approach