

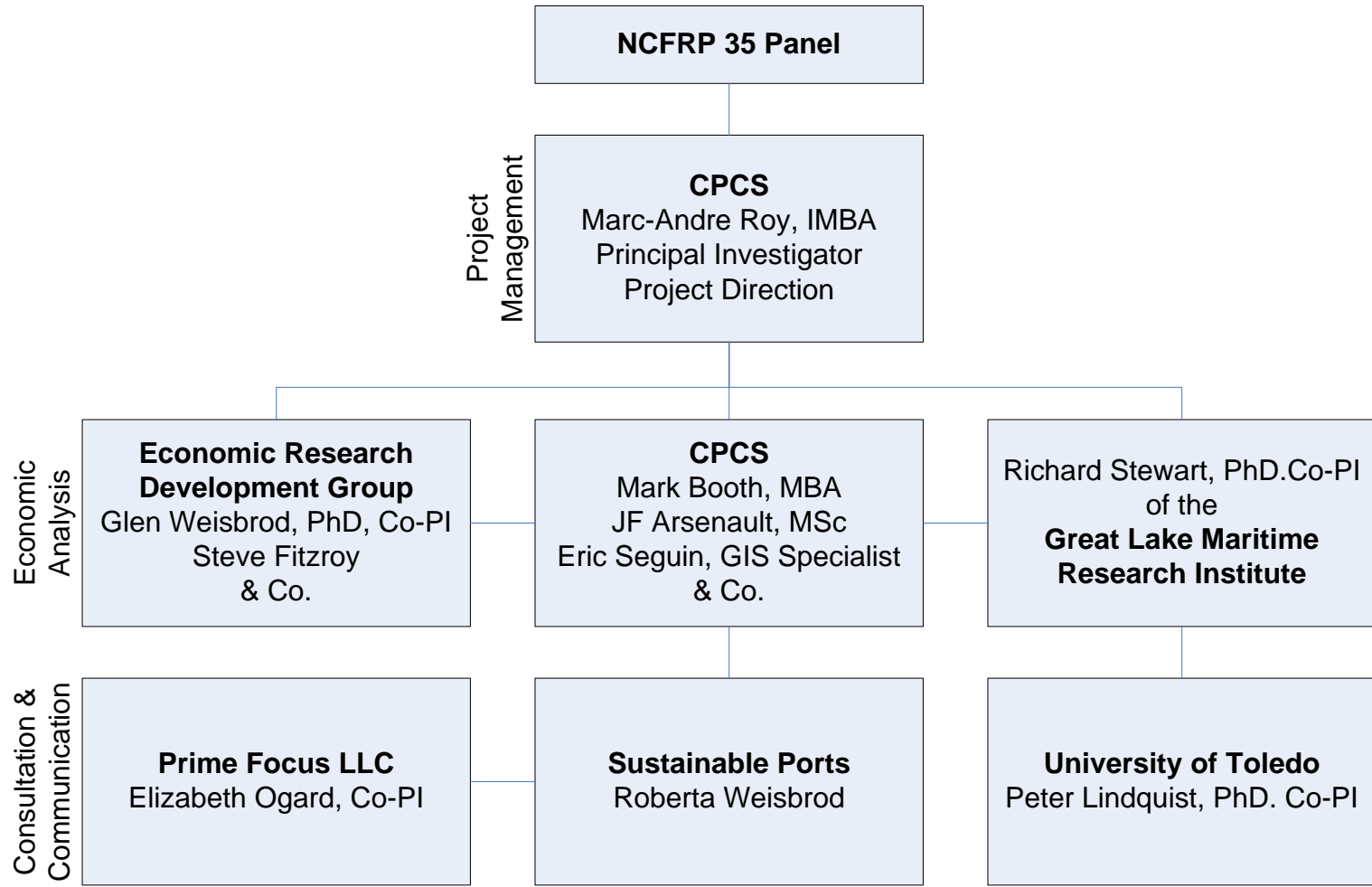
## NCFRP 35: Multimodal Freight Transportation within the Great Lakes-Saint Lawrence Basin

Mid-America Freight Coalition Annual Meeting

Marc-André Roy  
Principal Investigator  
April 19, 2012



# Bi-National Team



- What is the multimodal freight transportation system in the Great Lakes St. Lawrence Basin (GLSLB)?
- What is the economic impact of this freight transportation system, by mode and major industry?
- What is the multimodal freight system's performance?
- What can be done to improve its performance, from a policy and planning standpoint?

Challenge: How to distill complex multimodal, multi-jurisdictional and multi-commodity freight system into practical insights for policy and planning?



## ➔ Overview of GLSLB Multimodal Freight Transportation System

Economic Importance

Major Commodities Handled

System Performance

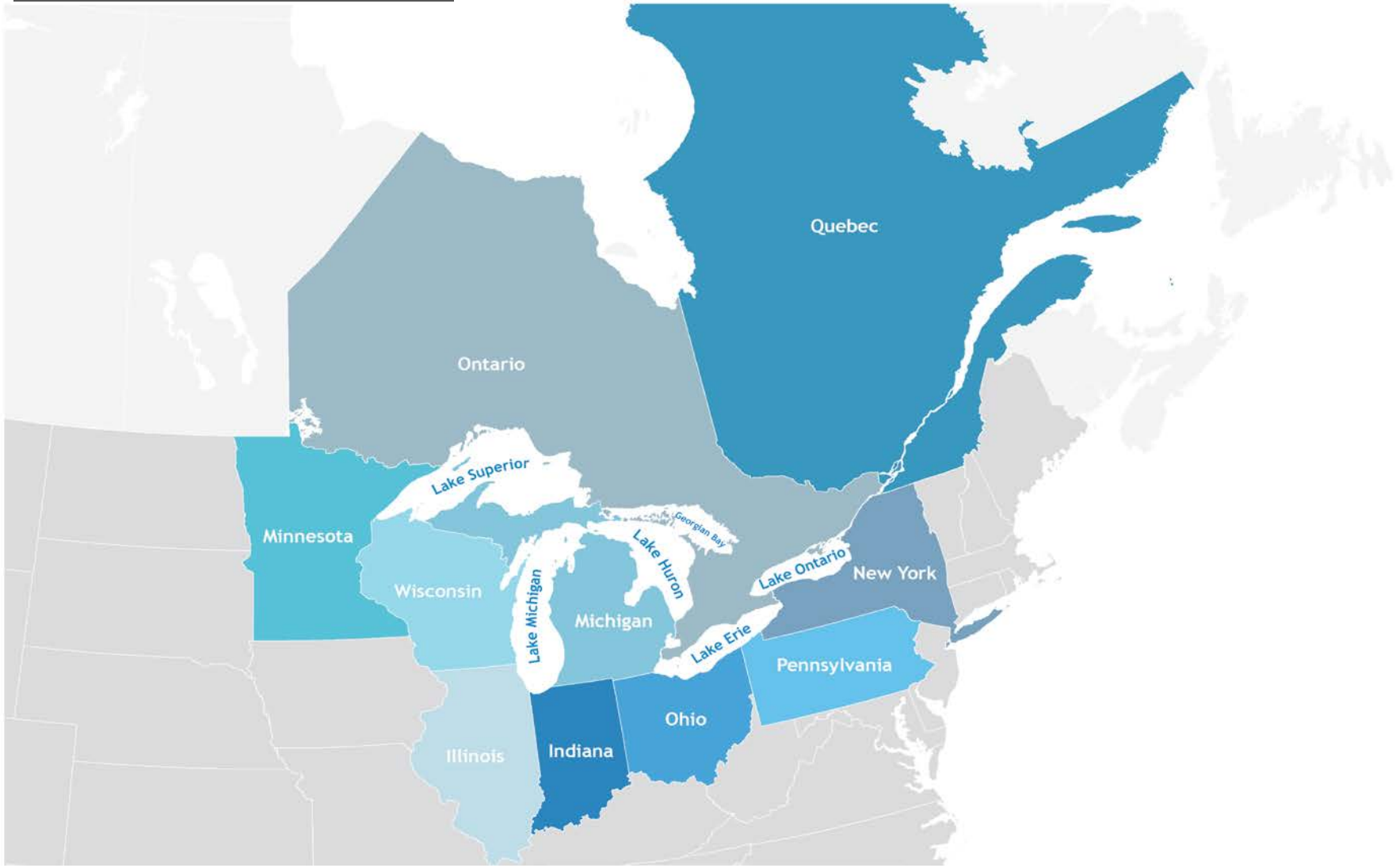
Barriers to System Performance

Opportunities to Improve System Performance

Areas for Future Research



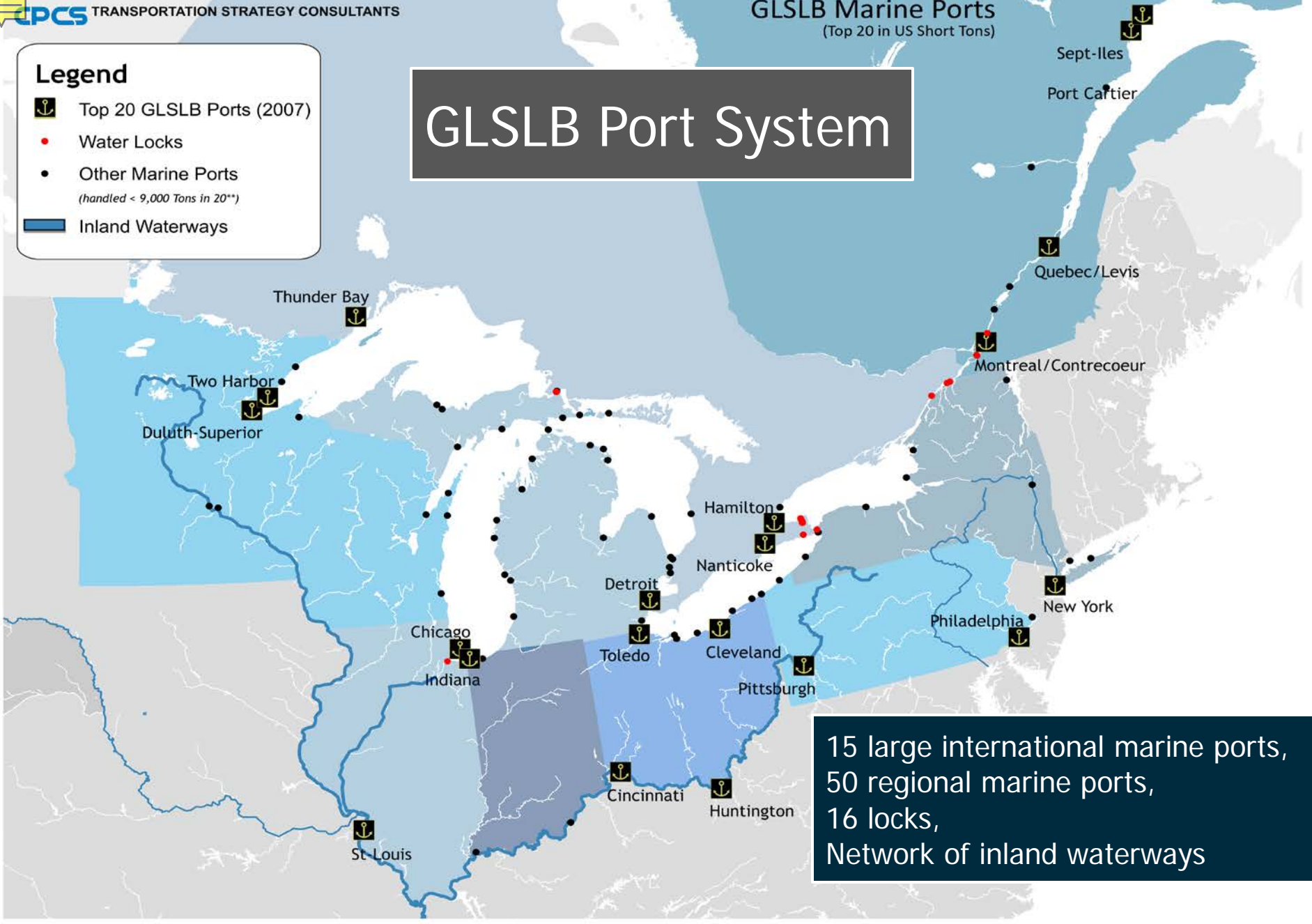
# The Study Area



**Legend**

-  Top 20 GLSLB Ports (2007)
-  Water Locks
-  Other Marine Ports  
*(handled < 9,000 Tons in 20\*\*)*
-  Inland Waterways

# GLSLB Port System



15 large international marine ports,  
50 regional marine ports,  
16 locks,  
Network of inland waterways








# Port Throughput


**Legend**

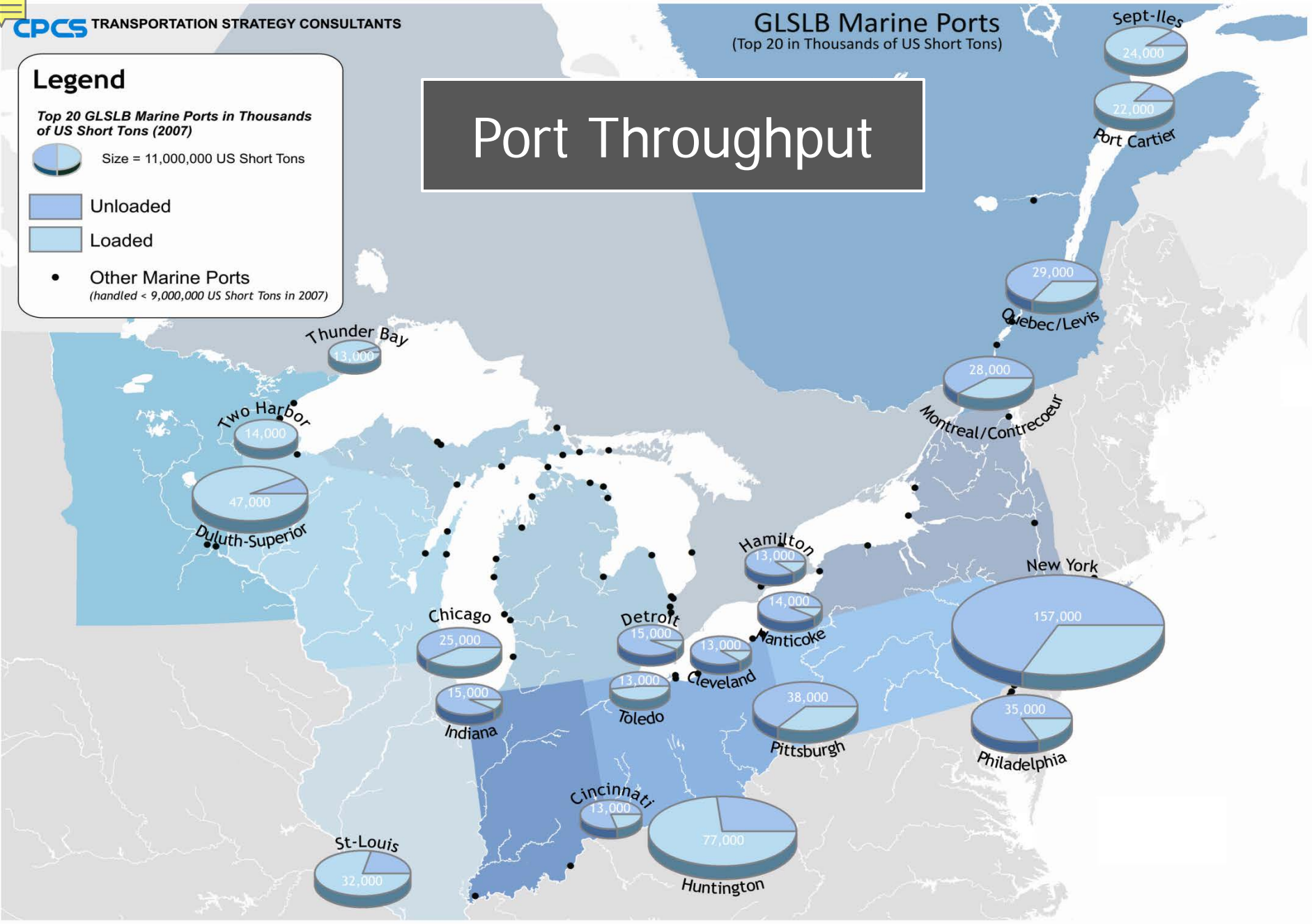
Top 20 GLSLB Marine Ports in Thousands of US Short Tons (2007)

 Size = 11,000,000 US Short Tons

 Unloaded

 Loaded

 Other Marine Ports  
(handled < 9,000,000 US Short Tons in 2007)

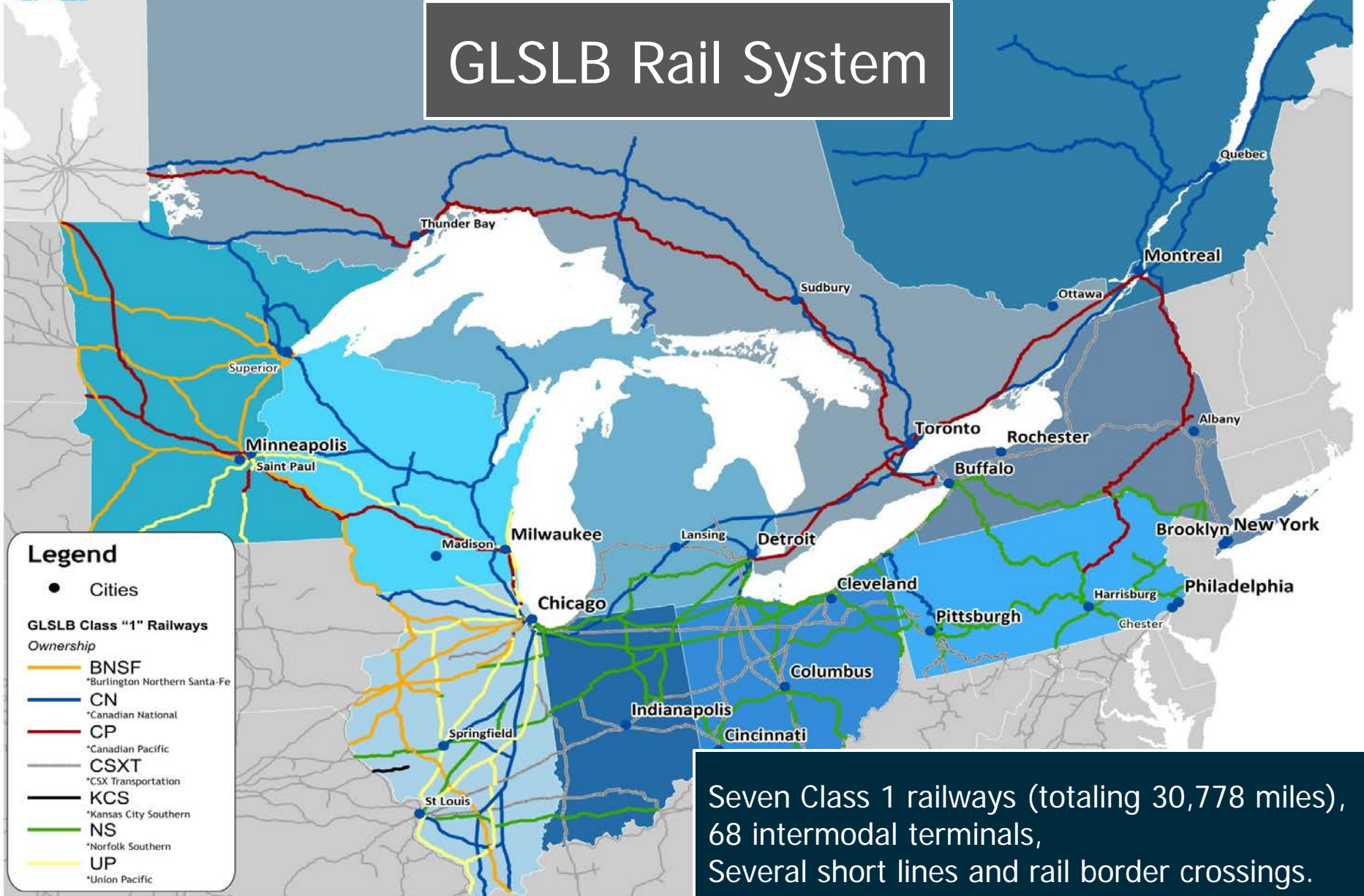


# Inland Waterway Traffic





# GLSLB Rail System



Seven Class 1 railways (totaling 30,778 miles),  
68 intermodal terminals,  
Several short lines and rail border crossings.



# Rail Traffic

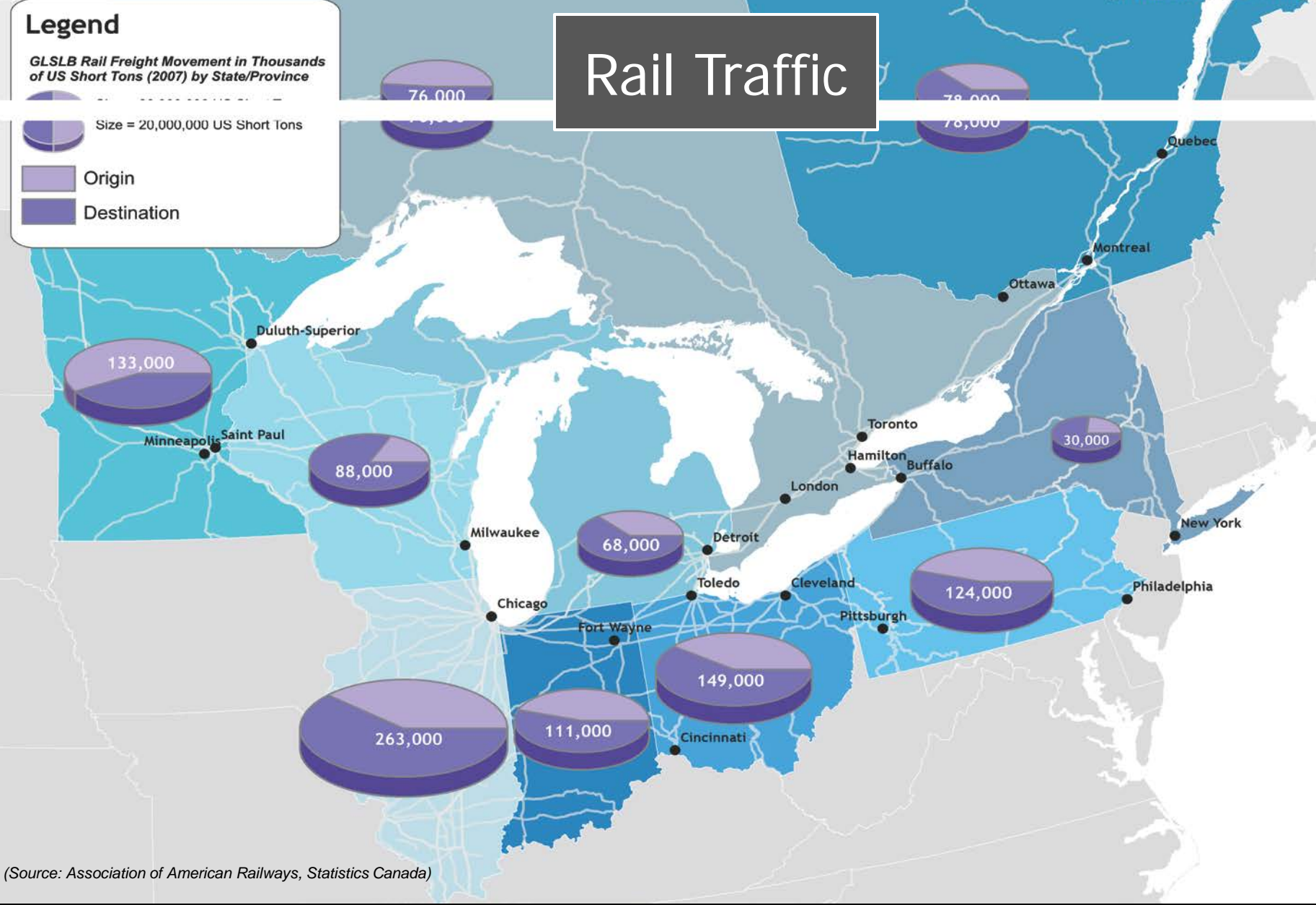
**Legend**

GLSLB Rail Freight Movement in Thousands of US Short Tons (2007) by State/Province

Size = 20,000,000 US Short Tons

Origin

Destination



(Source: Association of American Railways, Statistics Canada)





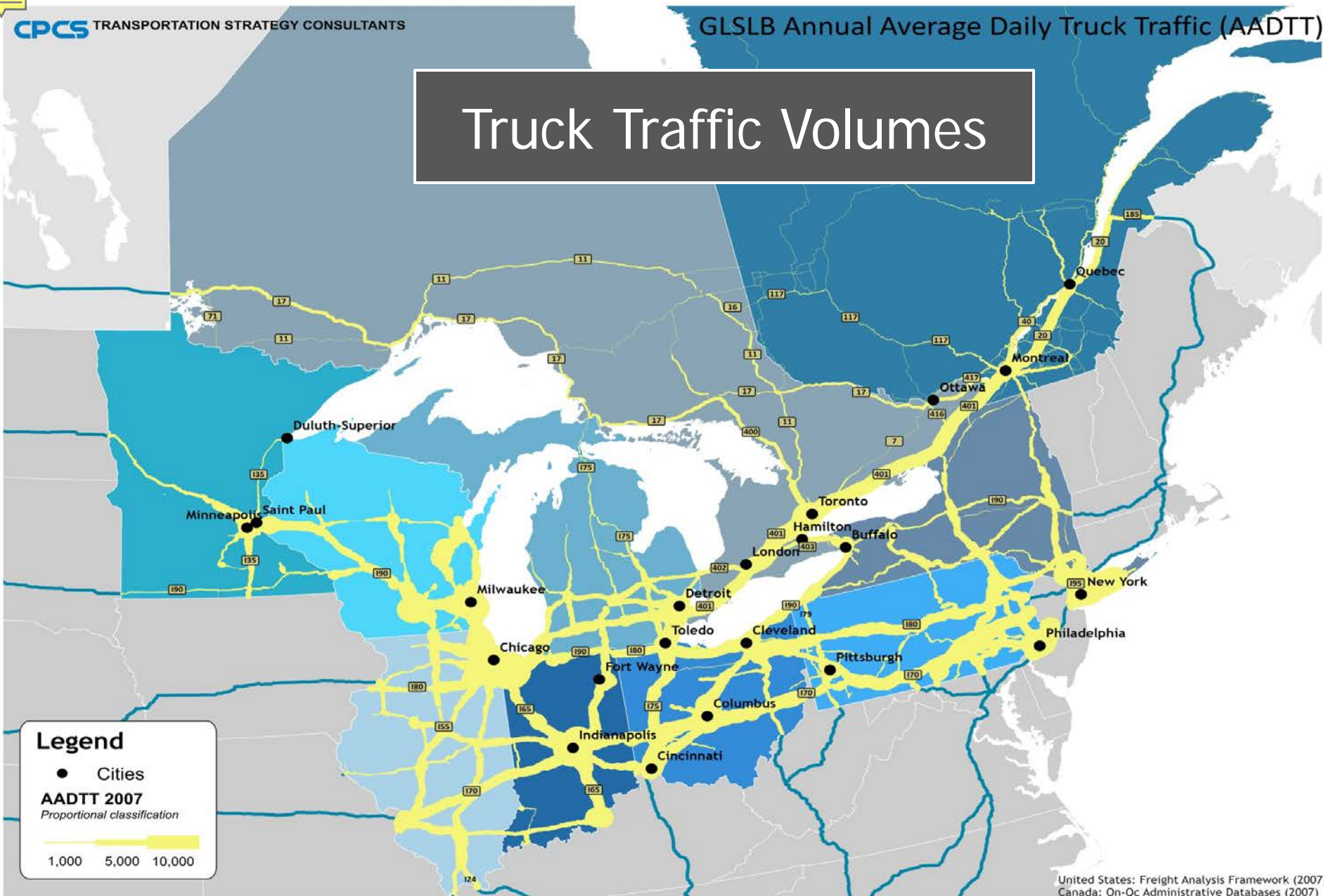
# GLSLB Highway System

**Legend**

- Cities
- Major Highways
- Secondary Highways
- Other Roads



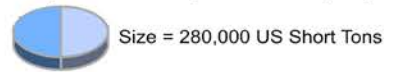
# Truck Traffic Volumes





### Legend

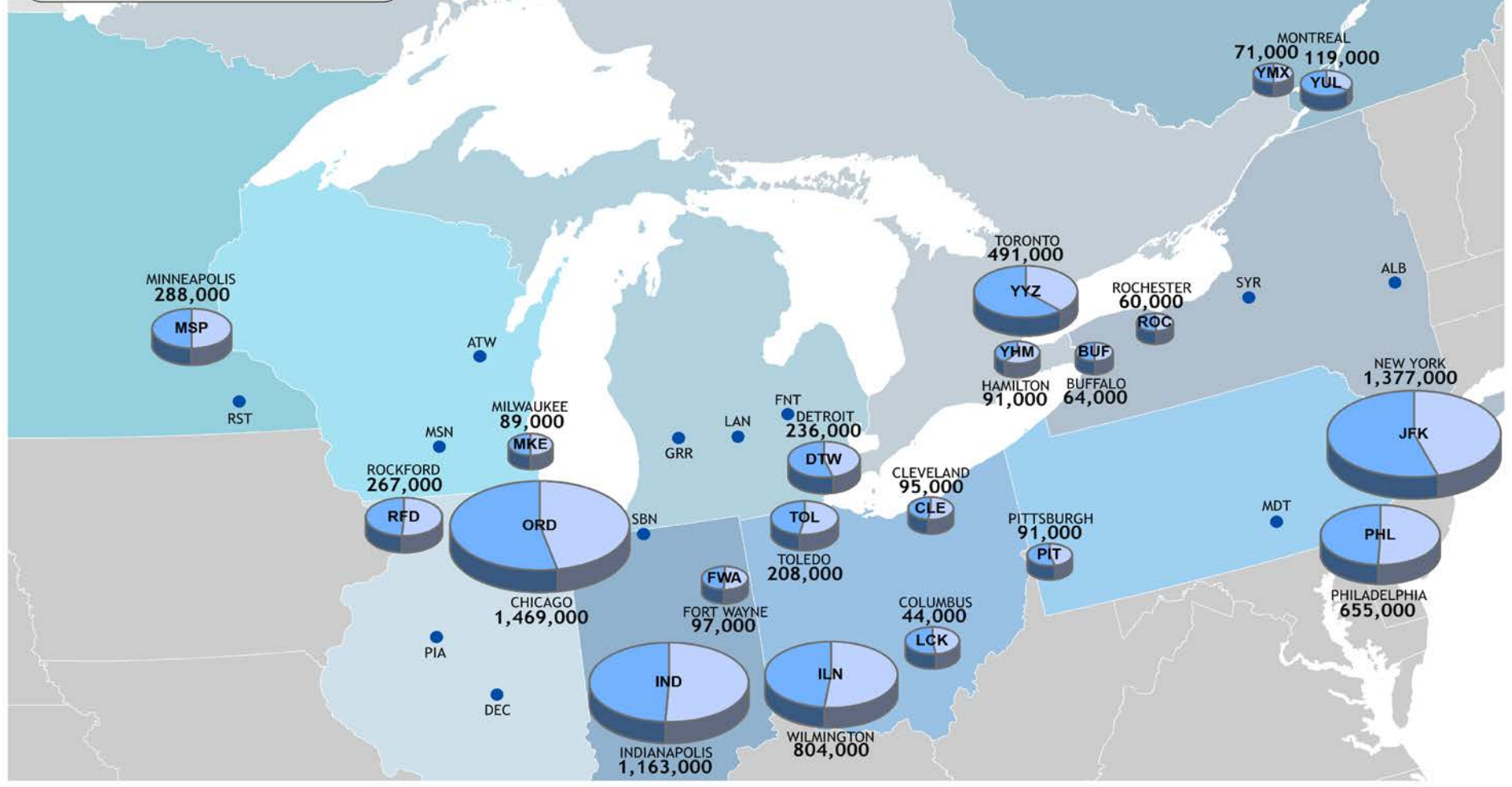
Top 20 GLSLB Airports in Tons (2007)



Loaded  
Unloaded

Other Airports (handled ≥ 10,000 Tons in 2007)

# GLSLB Airports

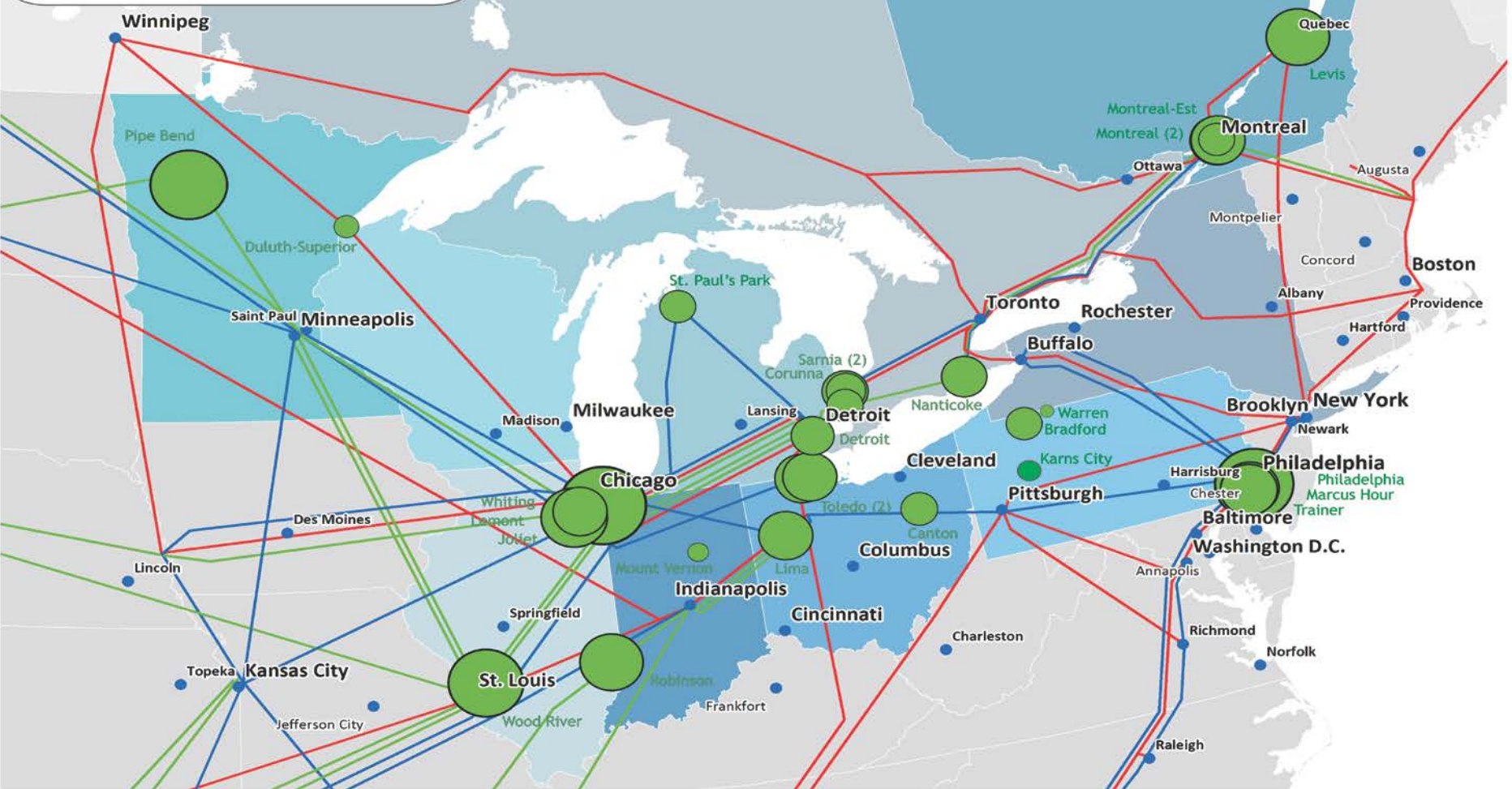





**Legend**

- Cities
- GLSLB Major Oil Refineries Capacity 2007 (bbl/d)
  - 10,000
  - 50,000
  - 100,000
- GLSLB Pipelines Type
  - Petroleum Products
  - Crude Oil
  - Natural Gas

# GLSLB Pipeline Network



## Overview of GLSLB Multimodal Freight Transportation System



### Economic Importance

Major Commodities Handled

System Performance

Barriers to System Performance

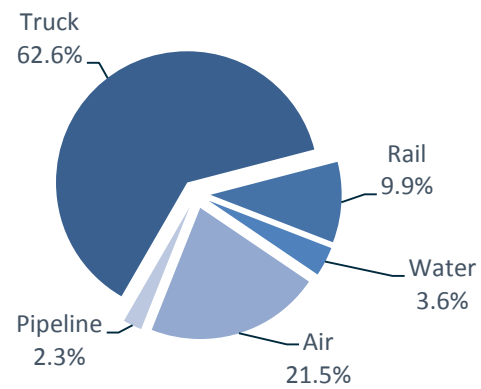
Opportunities to Improve System Performance

Areas for Future Research

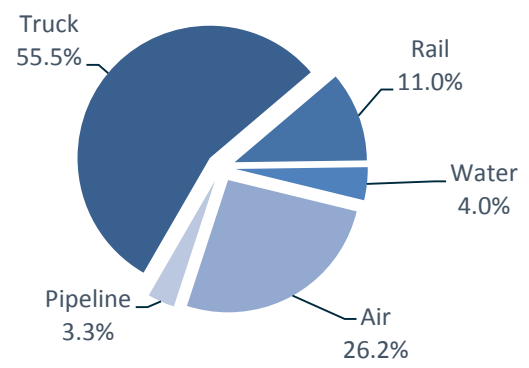


# Economic Impact

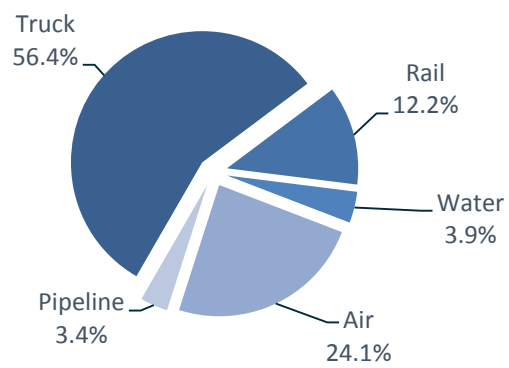
## Employment – 3.8 million jobs



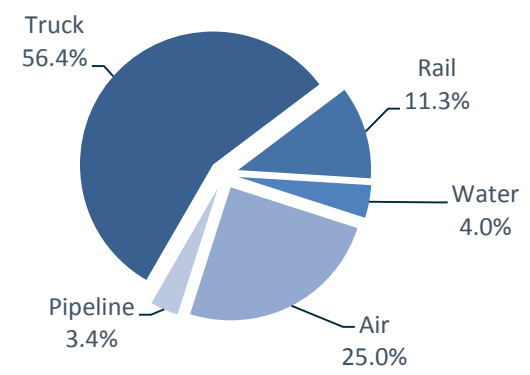
## Output – Total U.S. \$627 billion



## Value-Added – Total U.S. \$311 billion



## Taxes – Total U.S. \$87 billion



# Summary of Interim Report Research Results

Overview of GLSLB Multimodal Freight Transportation System

Economic Importance

➔ Major Commodities Handled

System Performance

Barriers to System Performance

Opportunities to Improve System Performance

Areas for Future Research

The major commodities moving to, from or within the GLSLB include:

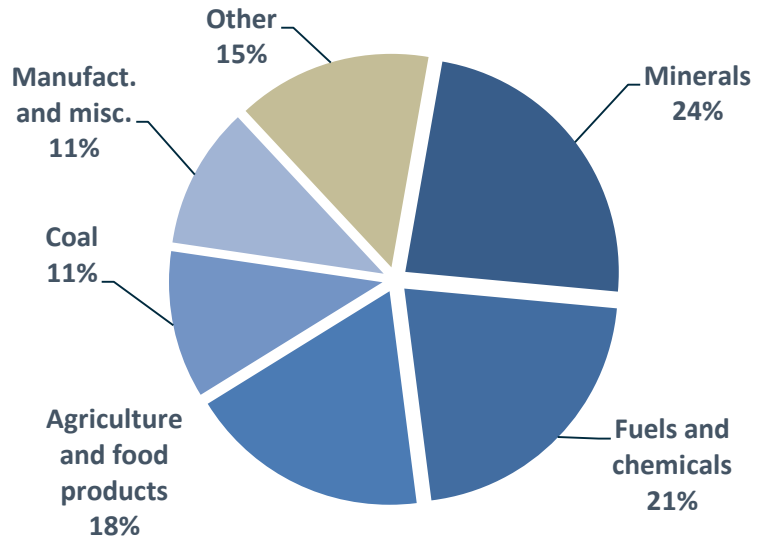
- **Coal** (largely for regional power production),
- **Iron ore** (for regional steel production and export),
- **Grain and other agricultural products** (local consumption and export),
- **Automotive and machinery** (supporting local manufacturing base), and
- **Other manufactured goods** (including containerized imports for regional distribution and consumption and exports)



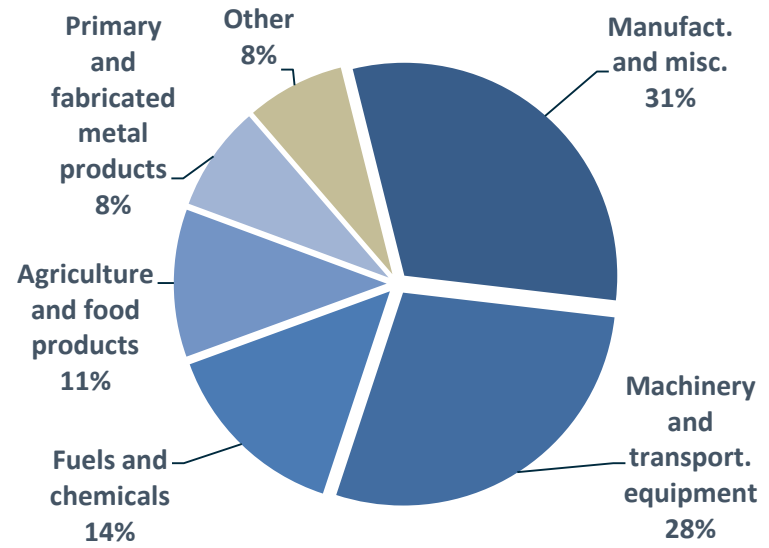


## Top 5 commodities handled:

### Weight



### Value



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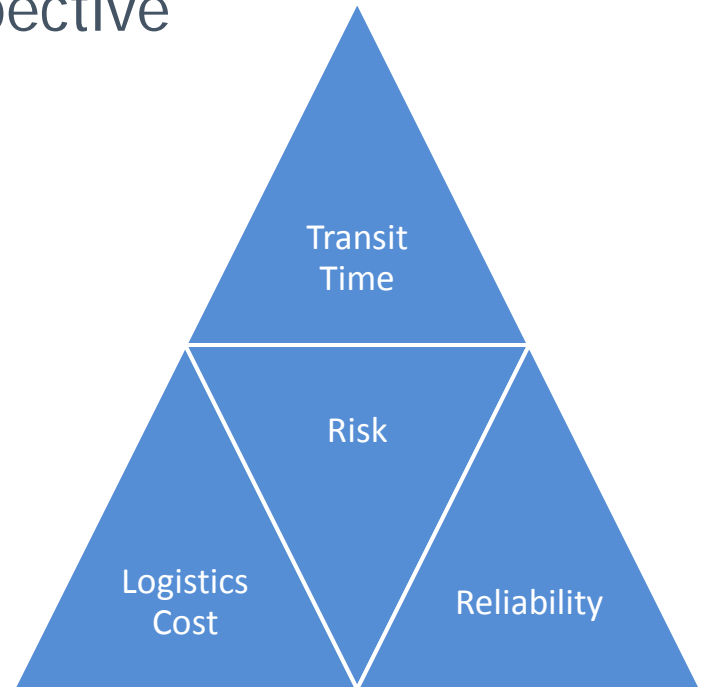




## Performance measurement:

- Highly complex
- Different measurement by different stakeholders
- Most salient is the shipper perspective
- Performance tradeoff:

Performance is  
Supply Chain  
Specific



# Coal Supply Chains

## Legend

Major ports involved in coal supply chain (more than 2.5m tons)

- Inbound ports
- Outbound ports
- Coal mines with 400 employees or more
- Coal fired power plants producing 1,500 MW or more

## Total Coal Flow Movement

- 2,500,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 20,000,000

## (in US Short Tons)

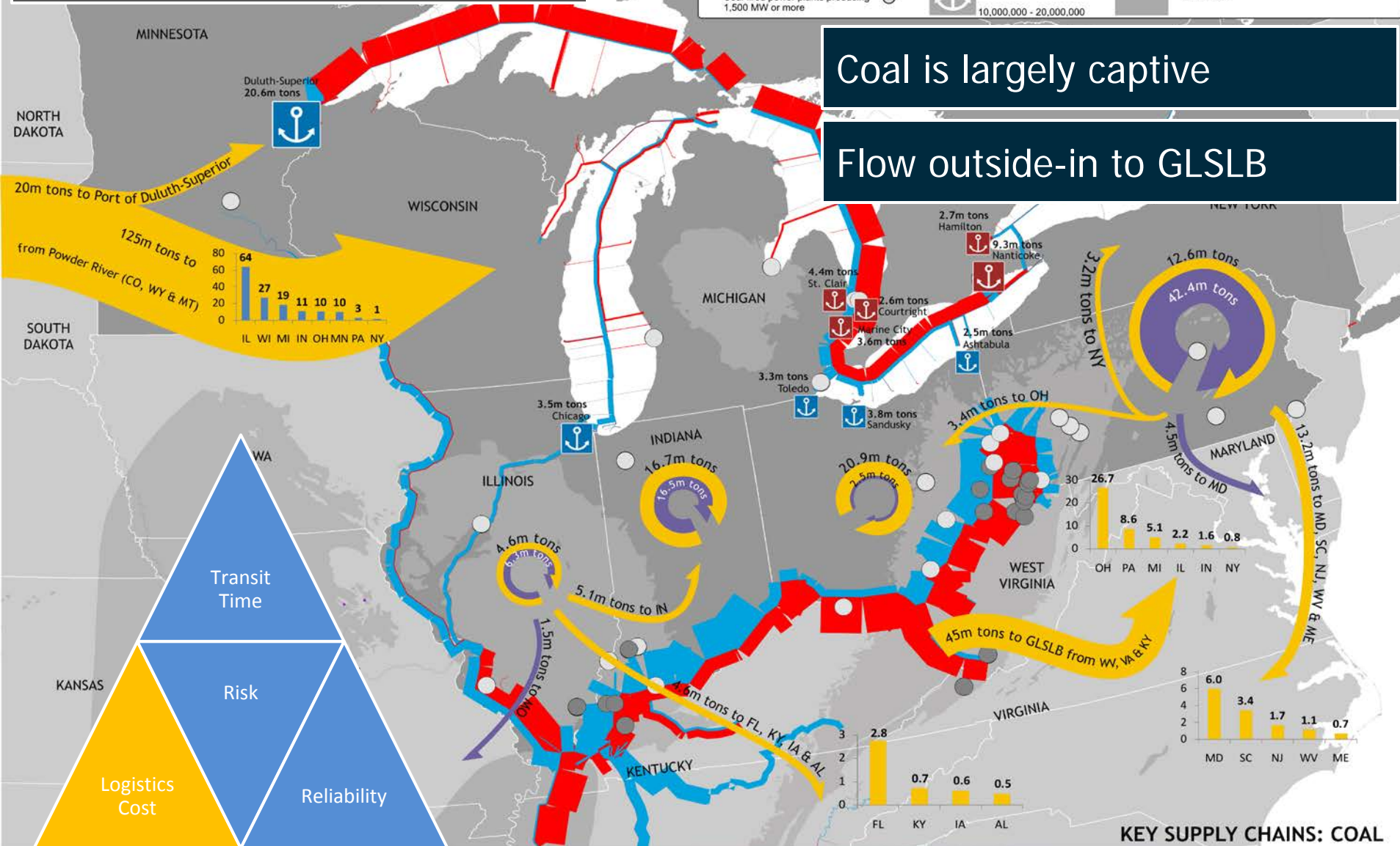
- 100,000
- 1,000,000
- 10,000,000
- 50,000,000

## Types of Flows

- Upstream waterway flow
- Downstream waterway flow
- Train flow
- Truck flow

Coal is largely captive

Flow outside-in to GLSLB



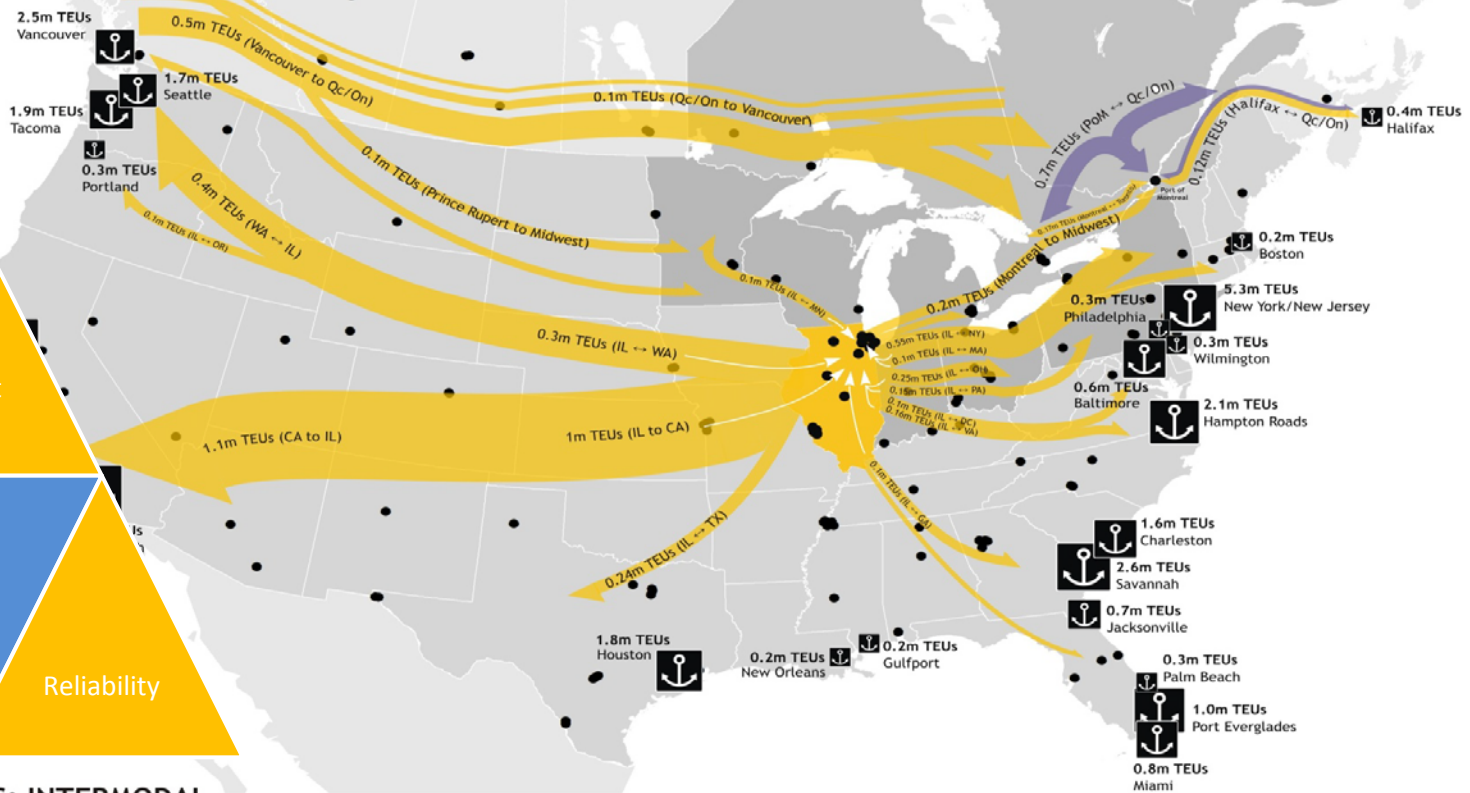
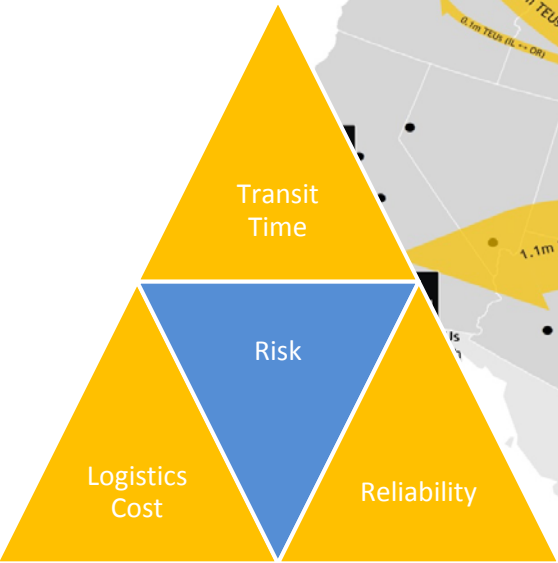
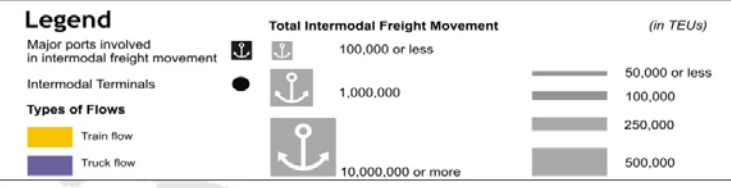
KEY SUPPLY CHAINS: COAL



# Marine Containers

Intermodal traffic moves by rail between coasts and GLSLB

Chicago is undisputed hub, thus extremely congested



KEY SUPPLY CHAINS: INTERMODAL





**Legend**

Major ports involved in automotive supply chain

- Inbound ports
- Outbound ports

**Automotive & Machinery Manufacturing Types**

- Car Dealership
- Car Manufacturer
- Machinery Manufacturer

**Total automotive & machinery manufacturing flow movement (in US Short Tons)**

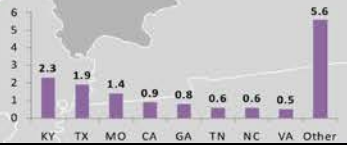
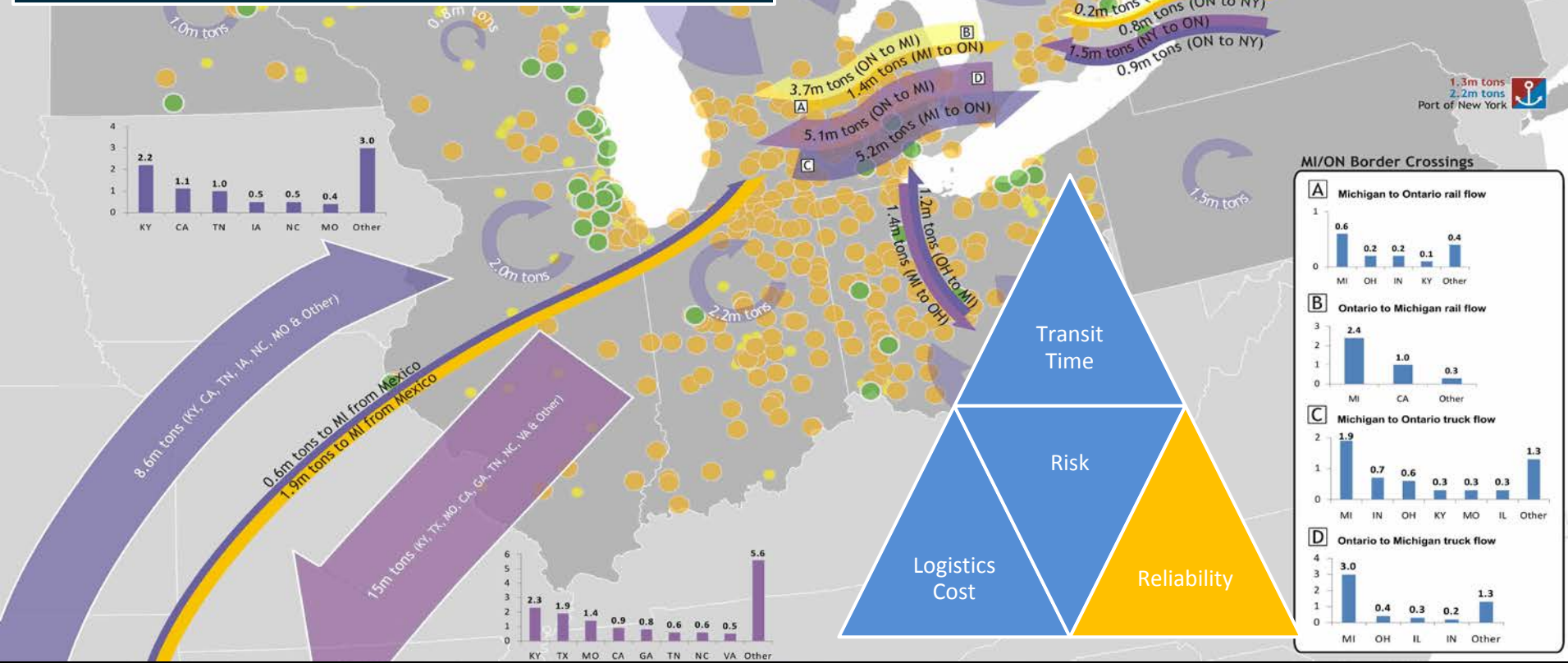
- 100,000 - 1,000,000
- 1,000,000 and more

**Types of Flows**

- 50,000 or less
- 100,000
- 250,000
- 500,000
- Train flow
- Truck flow

# Automotive Supply Chains

Most significant commodity by value



**Legend**

Major ports involved in coal supply chain (more than 2.5m tons)

Inbound ports Outbound ports

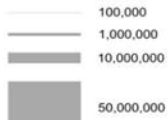
Harvested acreage of grain

1 Dot = 7,000 harvested acres

**Total Coal Flow Movement**



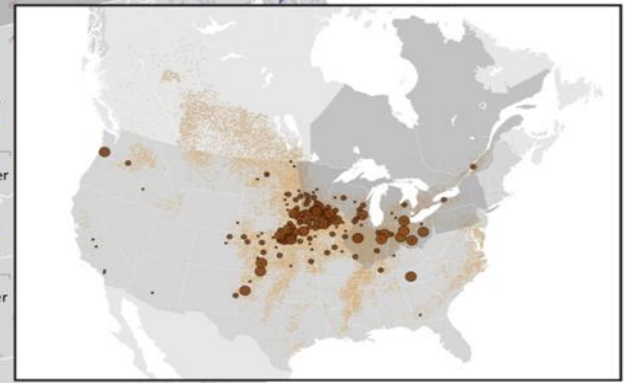
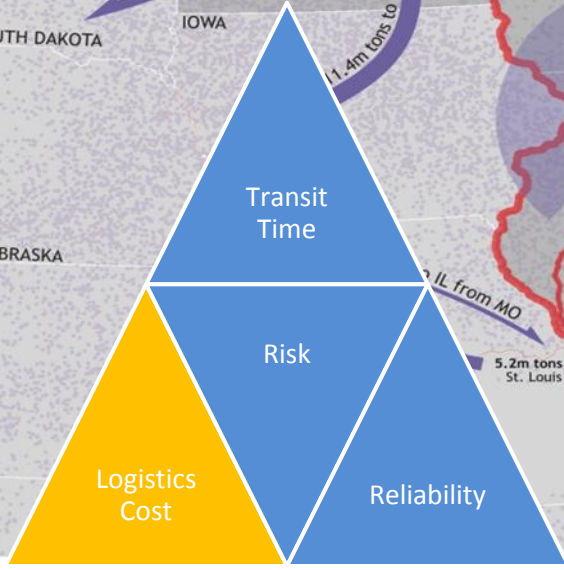
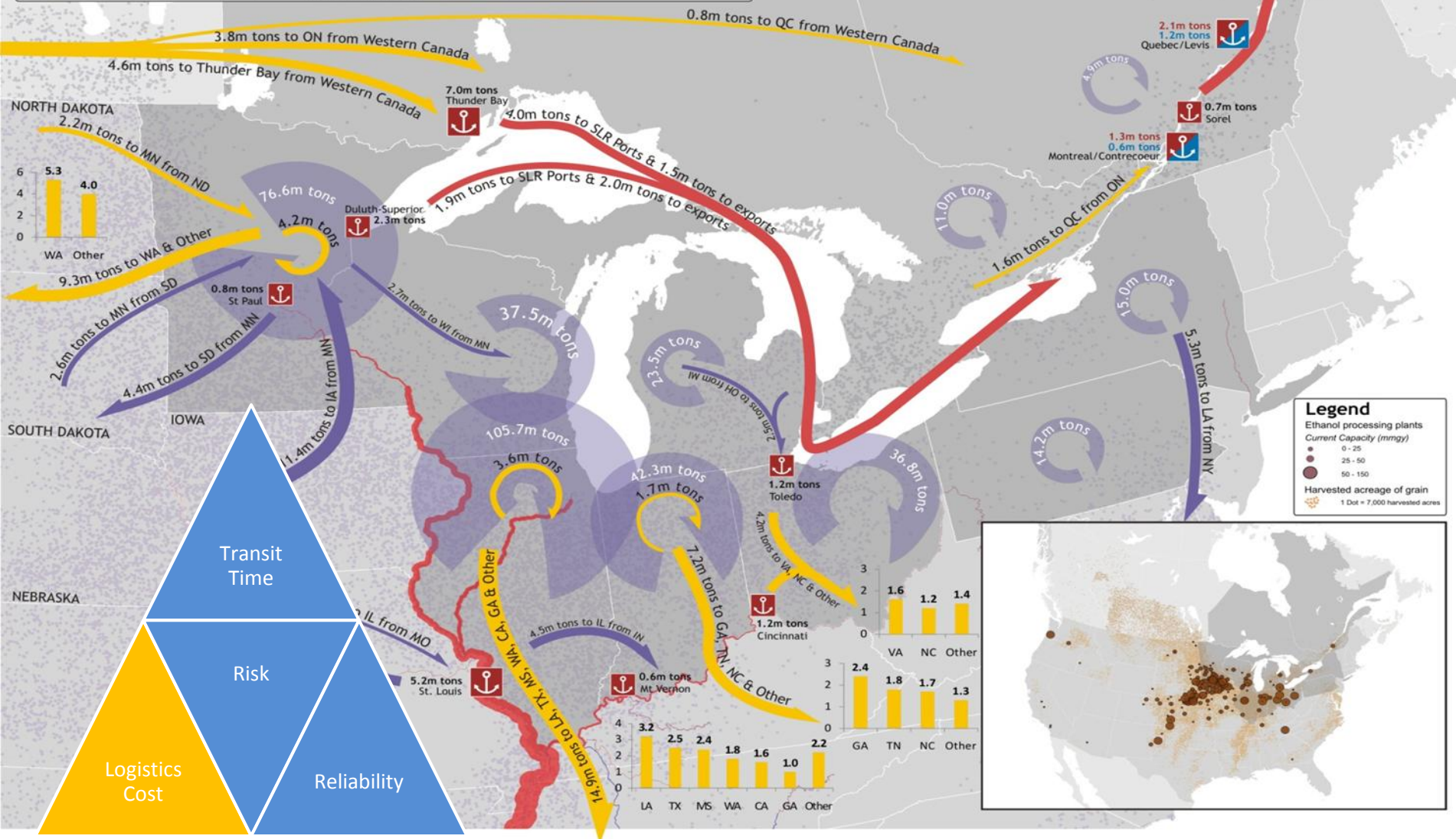
(in US Short Tons)



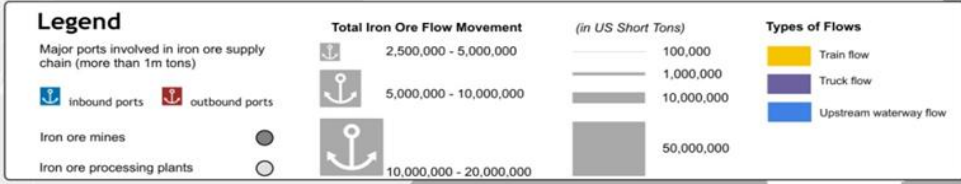
**Types of Flows**



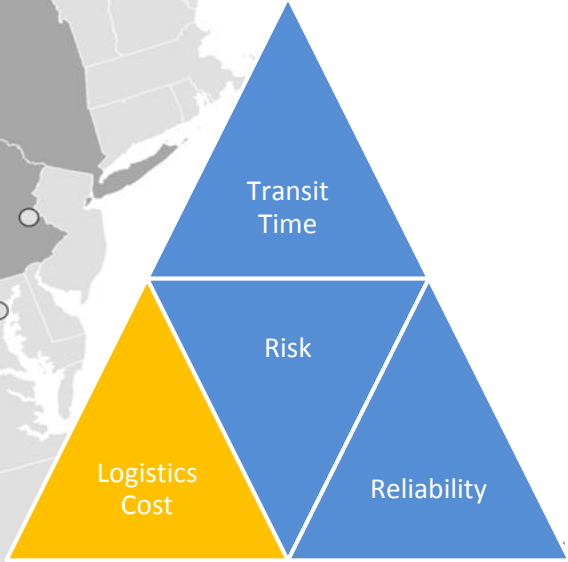
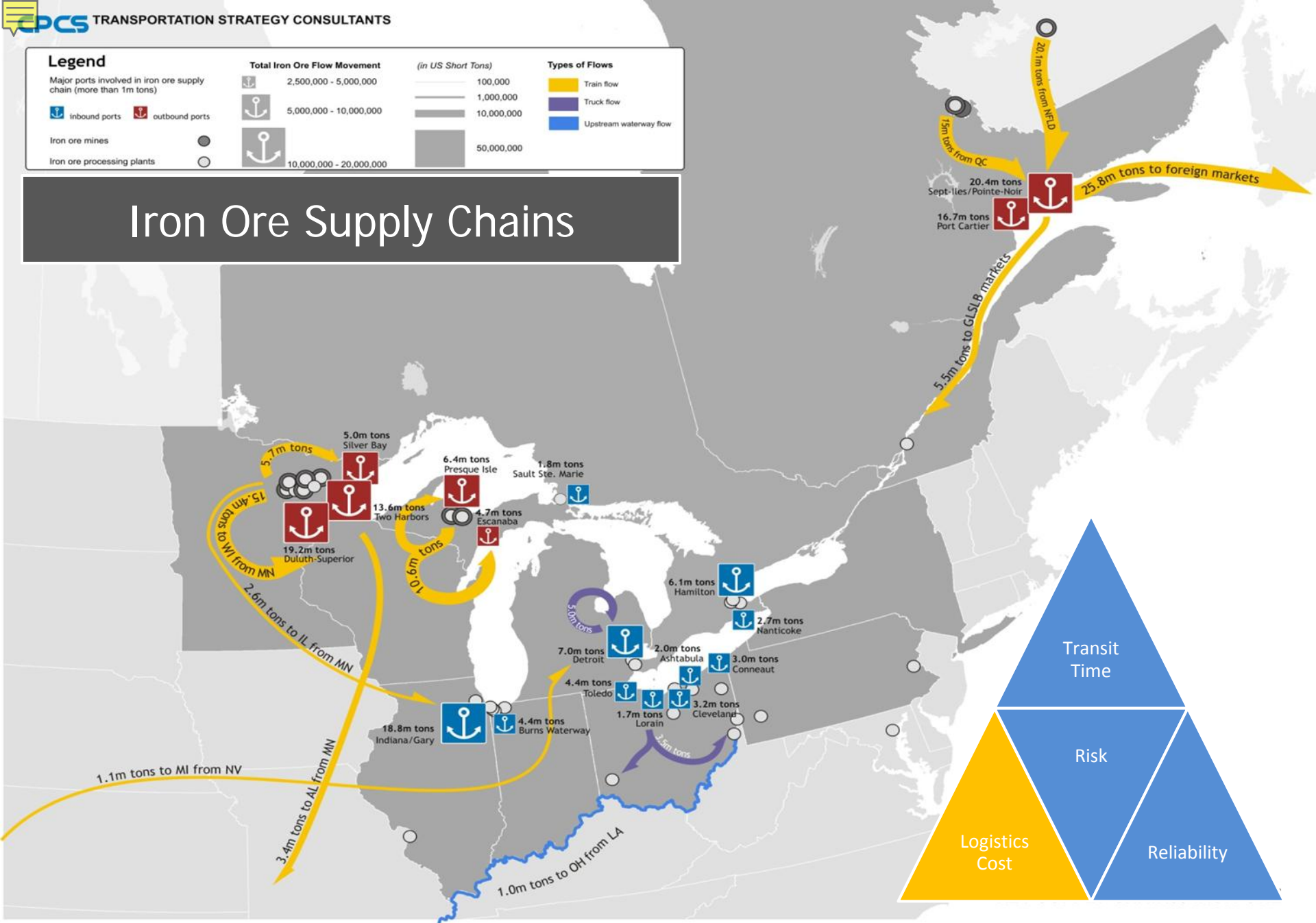
# Grain Supply Chains







# Iron Ore Supply Chains





Overview of GLSLB Multimodal Freight Transportation System

Economic Importance

Major Commodities Handled

System Performance



Barriers to System Performance

Opportunities to Improve System Performance

Areas for Future Research





Modal constraints are fairly well understood...

What is relatively less well understood are commodity or supply chain specific barriers and their potential solutions.

Some of the most significant barriers and constraints to multimodal freight transportation performance in the GLSLB, as identified by those consulted:

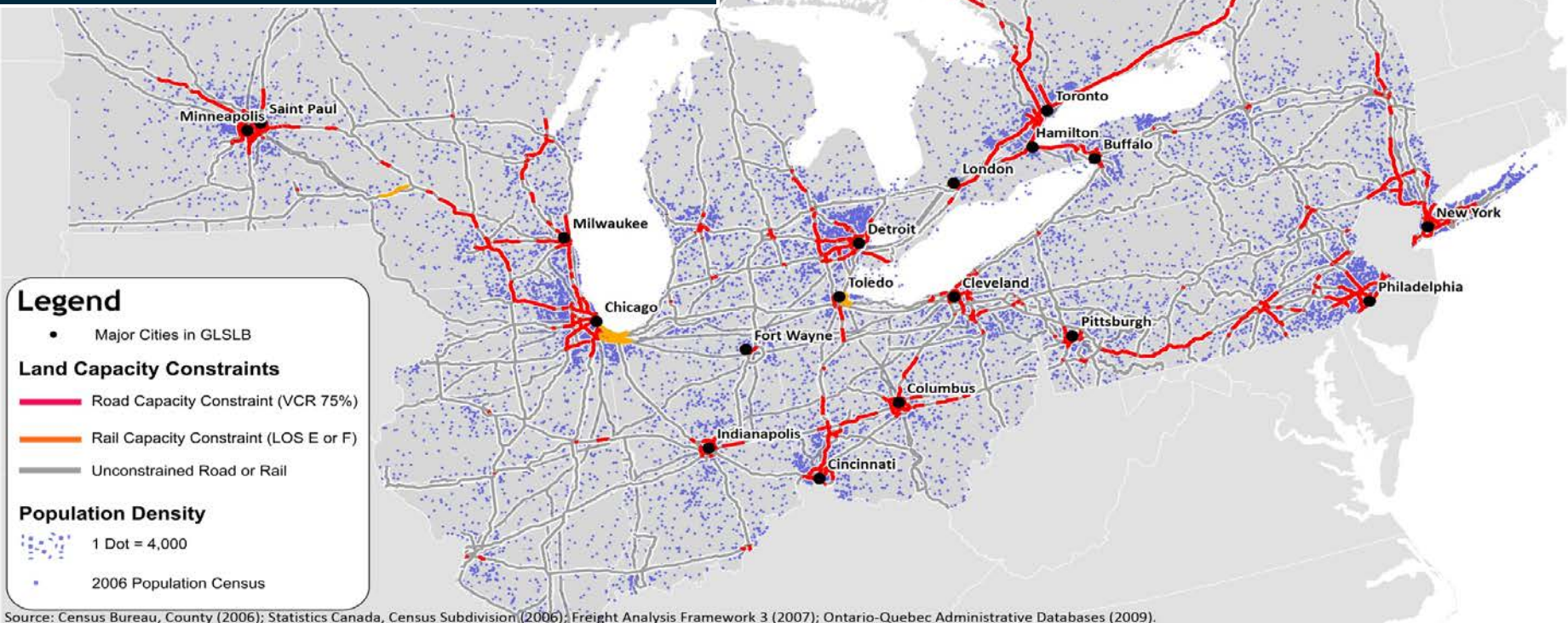




# System Capacity Constraints

Capacity constraints and congestion are most significant around Chicago

Airports and waterways have excess capacity, however, modal shift not a given



**Legend**

- Major Cities in GLSLB

**Land Capacity Constraints**

- Road Capacity Constraint (VCR 75%)
- Rail Capacity Constraint (LOS E or F)
- Unconstrained Road or Rail

**Population Density**

- 1 Dot = 4,000
- 2006 Population Census

Source: Census Bureau, County (2006); Statistics Canada, Census Subdivision (2006); Freight Analysis Framework 3 (2007); Ontario-Quebec Administrative Databases (2009).





## Others Include:

- Modal integration challenges
- Lack of jurisdictional coordination
- Lack of multimodal funding mechanisms
- Modal inequality
- Lack of awareness of importance and role of freight transportation system
- Labor constraints
- Insufficiency of data and performance metrics



# Summary of Interim Report Research Results

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➔ Opportunities to Improve System Performance

Areas for Future Research

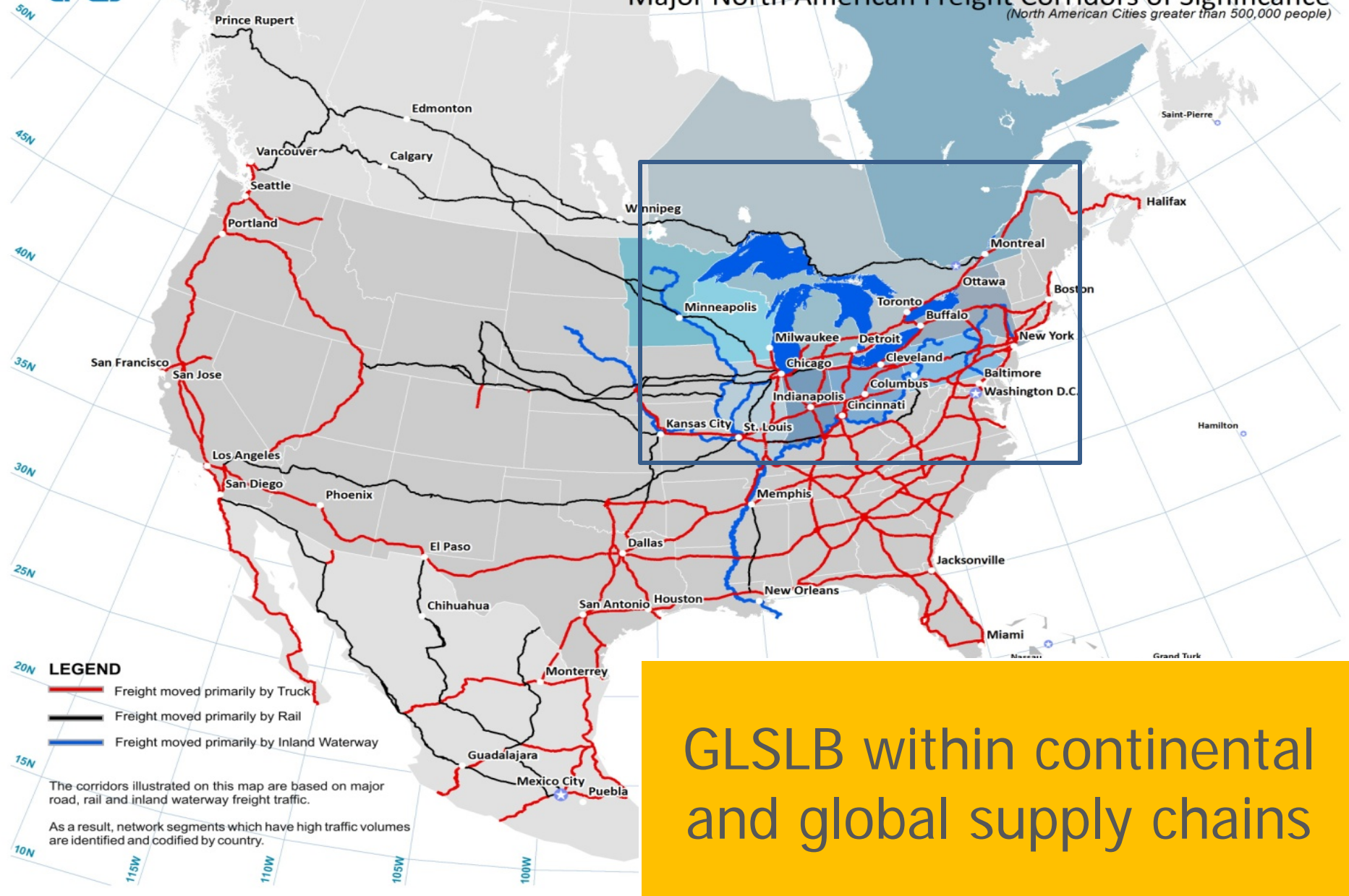


# Performance Improvement Opportunities

- Improved freight transportation performance data and performance measures
- Better modal and jurisdictional coordination
- Multimodal funding and funding mechanisms
- Regional strategic framework to identify multimodal freight transportation priorities
- Gateway and corridor or supply chain specific performance analysis







**LEGEND**

- Freight moved primarily by Truck
- Freight moved primarily by Rail
- Freight moved primarily by Inland Waterway

The corridors illustrated on this map are based on major road, rail and inland waterway freight traffic.

As a result, network segments which have high traffic volumes are identified and codified by country.

GLSLB within continental and global supply chains



# Summary of Interim Report Research Results

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Opportunities to Improve System Performance

➔ Areas for Future Research





## Opportunities for Future Research

- Greater clarity is needed on specific regional/national/continental transportation policy goals
- More research is needed on individual supply chains, their performance needs, and related issues/opportunities
- Need for more data and key performance indicators on freight performance
- Opportunity to leverage research from NCFRP 35 to advance future research:

Data and analysis from NCFRP 35 publicly available  
(<http://ncfrp35.utoledo.edu/Data.aspx>)



# NCFRP 43 Guidebook (for validation)

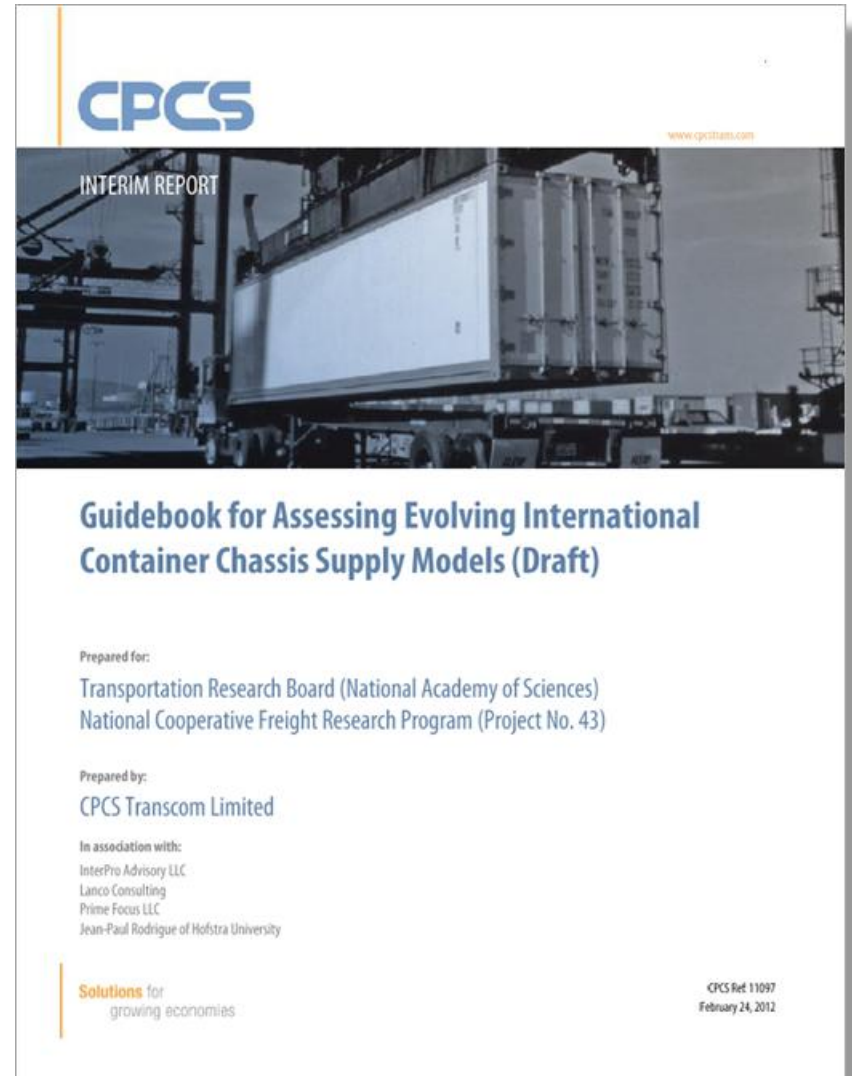


To obtain a copy, Google:  
“Chassis and CPCS”.

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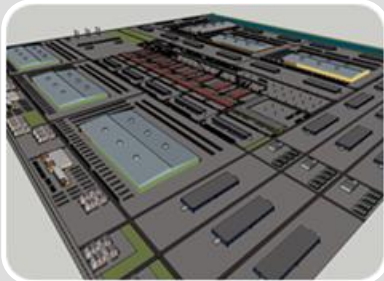
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# Summary of CPCS Qualifications

Management consulting & transaction advisory, specific to transportation sector (est. 1969 as consulting arm of CP, independent since 1986)

## Summary of activity over last 7 years



### Freight Rail

100+ Strategy mandates  
8 Transactions  
\$3+ billion in deals

### Port & Terminals

35+ Strategy mandates  
30+ Transactions  
\$5+ billion in deals

### Multi-modal Transport

30+ Strategy mandates

### Passenger & Transit

10+ Strategy mandates  
3 transactions  
\$3 billion in deals

