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Analyzing Long-Distance Truck Travel for Statewide Freight Planning in Ohio

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ANALYZING LONG-DISTANCE TRUCK TRAVEL FOR STATEWIDE FREIGHT PLANNING IN OHIO

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PARSONS BRINCKERHOFF

OHIO DEPARTMENT OF TRANSPORTATION

morpc
Mid-Ohio Regional Planning Commission

FREIGHT MODELING

- 2 percent of all trips, but 1/3 of all VMT
- Most freight flows travel long-distance
- Ohio deals with a lot of through trips (I-80/I-90)
- Employment is only a poor substitute for truck trip generation
- Goods shipments explain most truck traffic, but some trucks travel empty
- Mode share is based on long-term contracts
- Highly limited data availability

OUTLINE

Part 1: Methods and Data

- Statewide model
- Freight Analysis Framework 3 (FAF3)
- Empty truck modeling
- Combining statewide model and FAF3

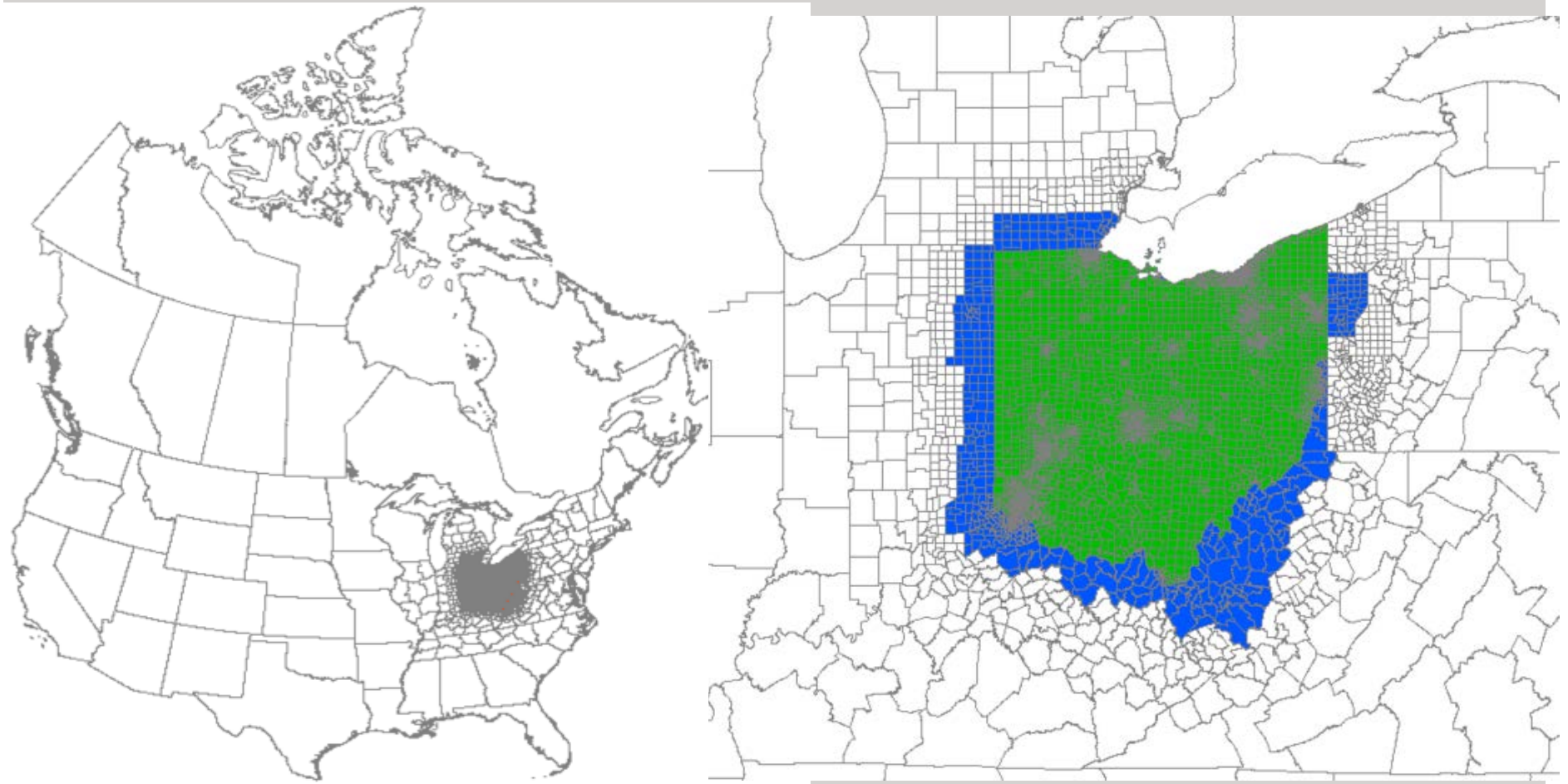
Part 2: Planning Questions

- How do we define a truck network?
- Which bottlenecks most affect freight movements in Ohio?
- What if we build new intermodal terminals?
- What if we increase truck weight limits?

METHODS

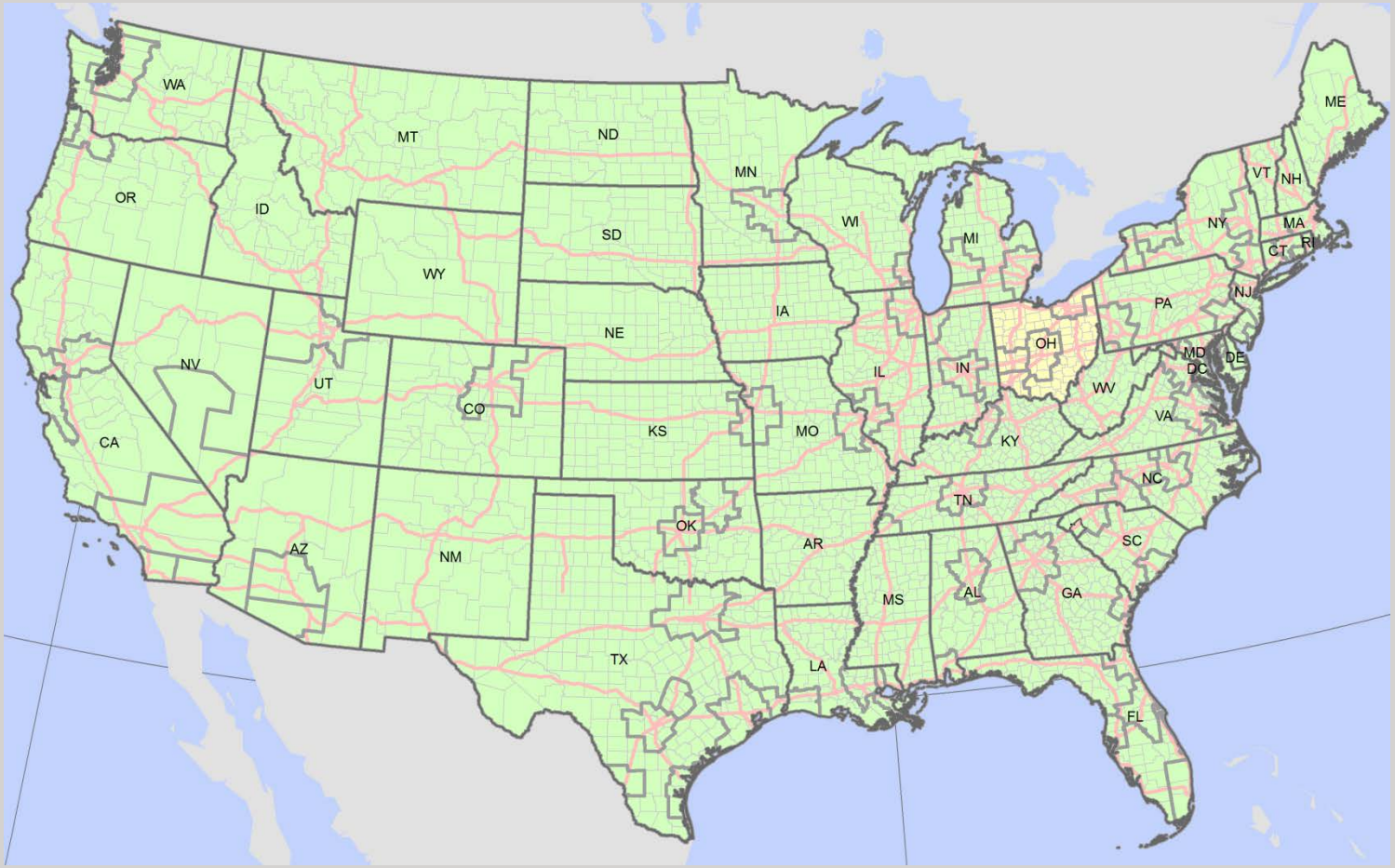
Let's model freight!

STATEWIDE MODEL

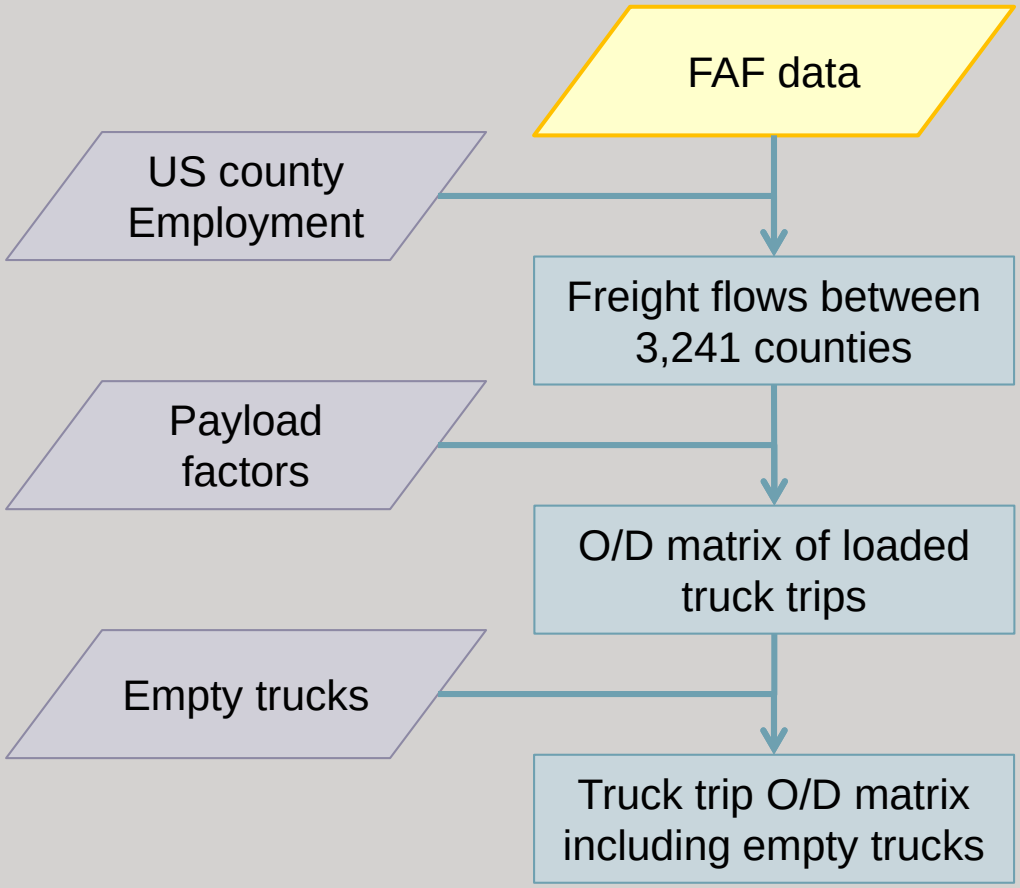


Maps show TAZs:
Green=Ohio; Blue=Halo

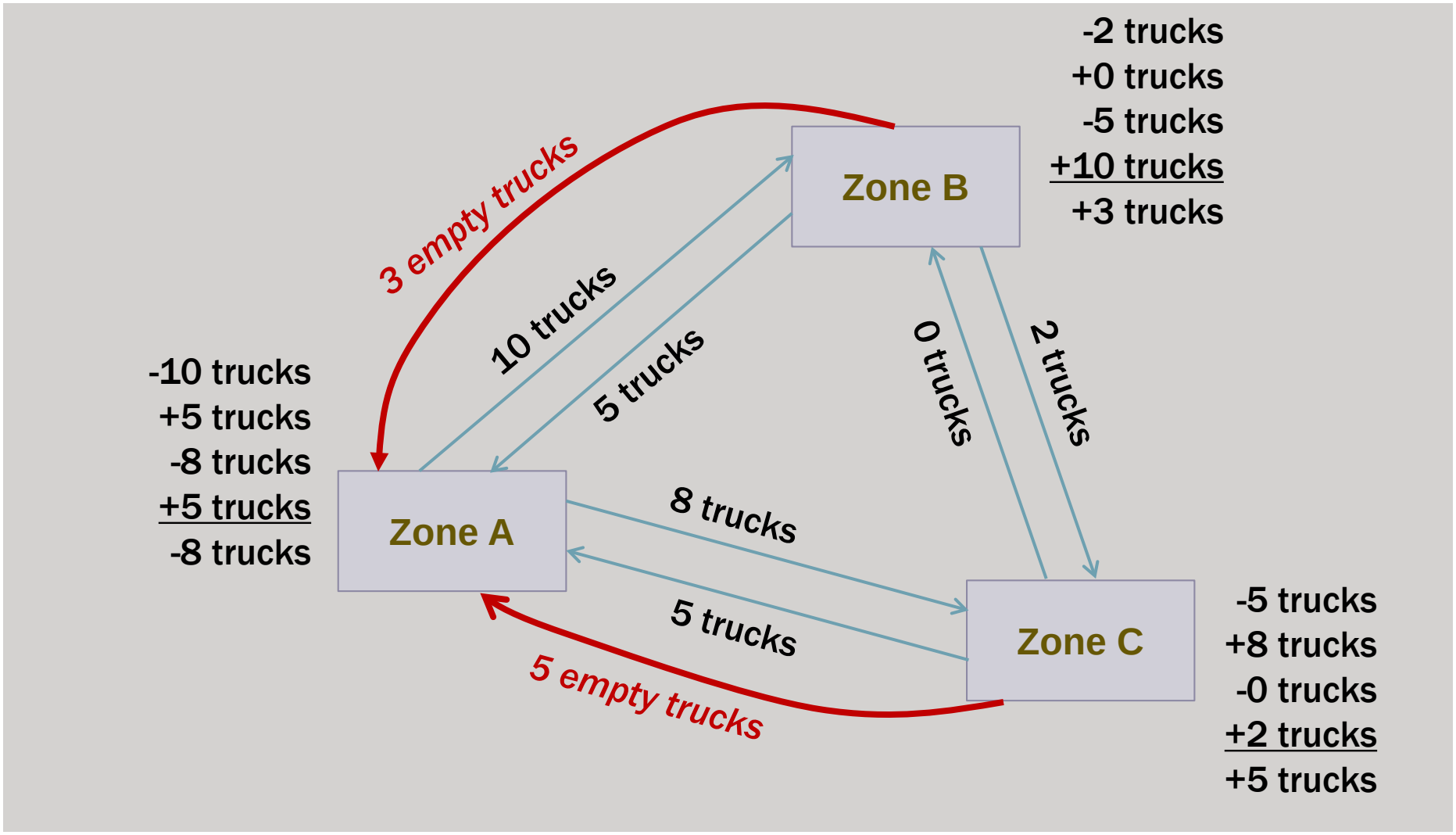
FREIGHT ANALYSIS FRAMEWORK 3 (FAF3)



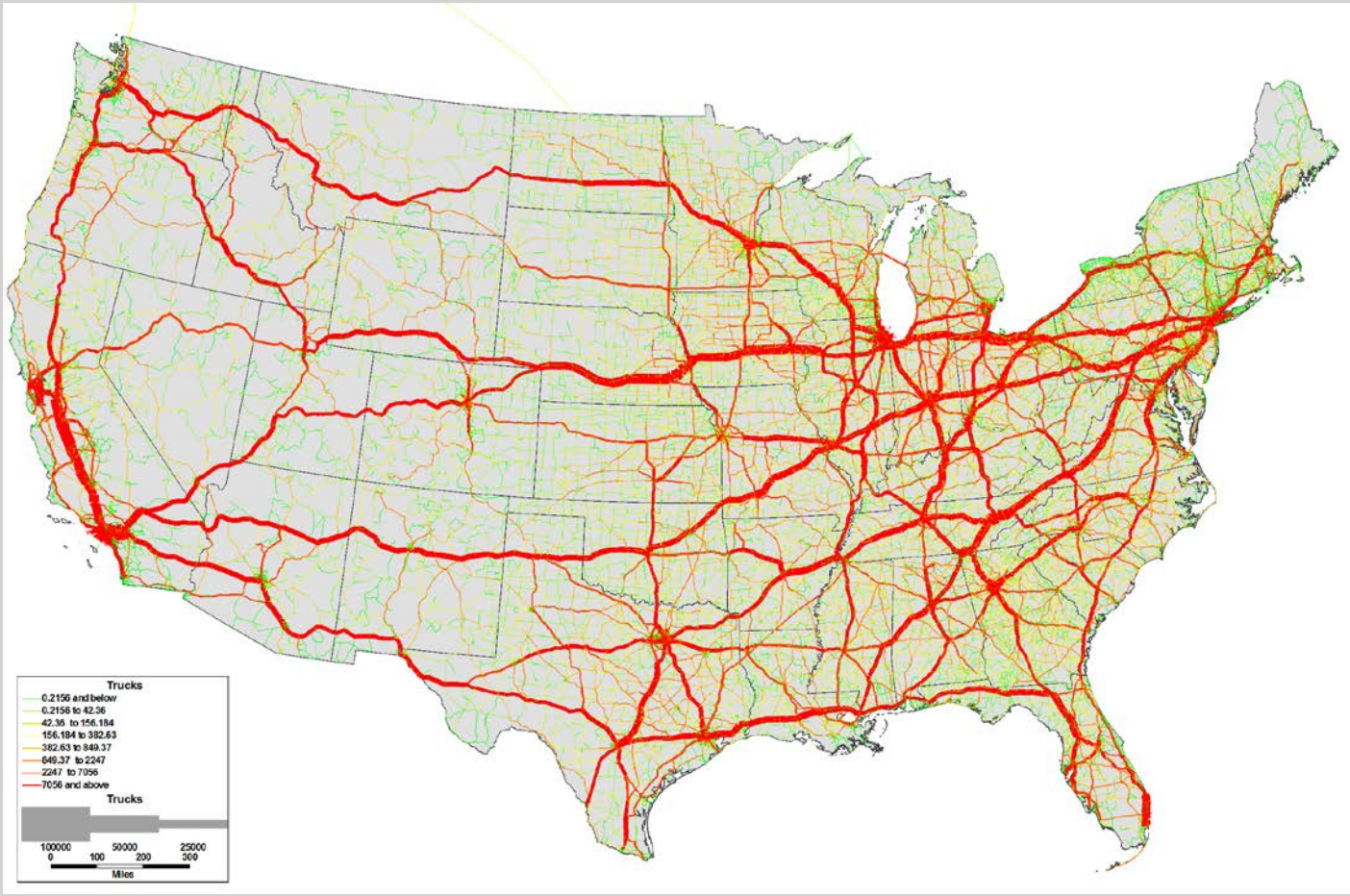
FREIGHT FLOW DISAGGREGATION



EMPTY TRUCK TRIPS

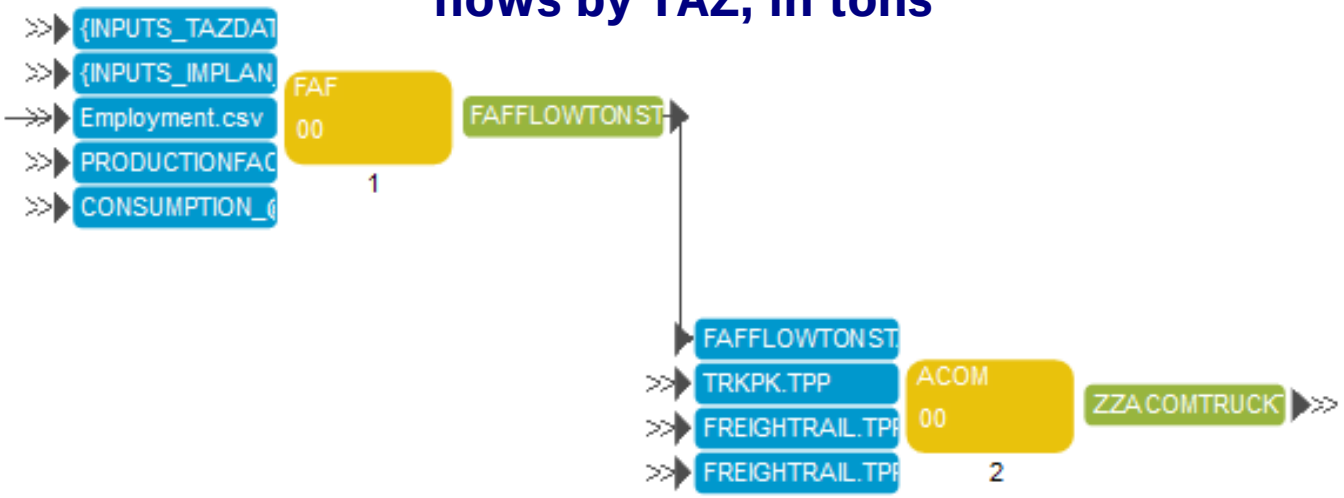


NATIONWIDE ASSIGNMENT OF TRUCKS



COMBINING STATEWIDE MODEL & FAF3

1. FAF – Determine commodity flows by TAZ, in tons



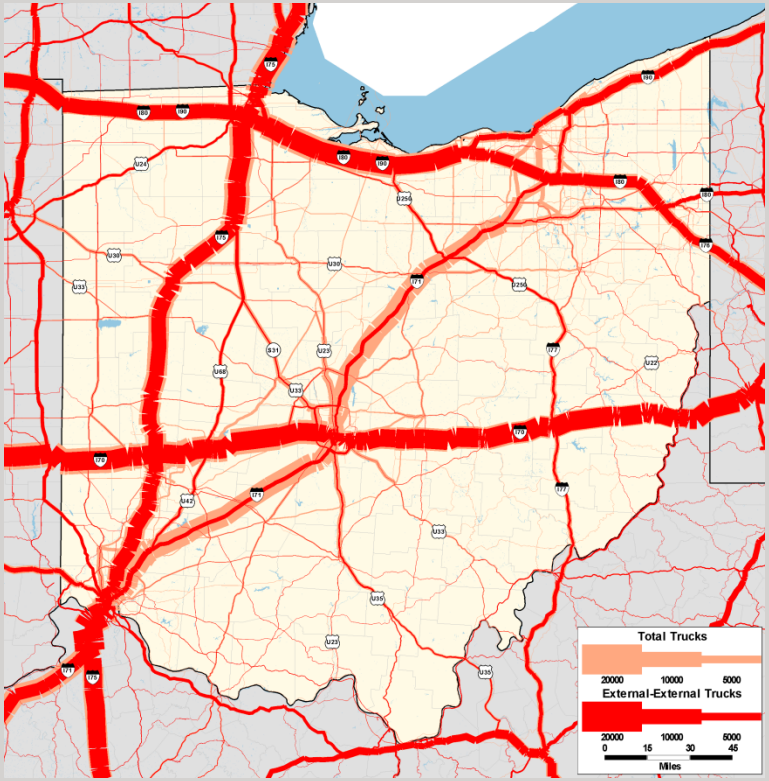
2. ACOM – convert to truck trips

HOW DO WE DEFINE A TRUCK NETWORK?

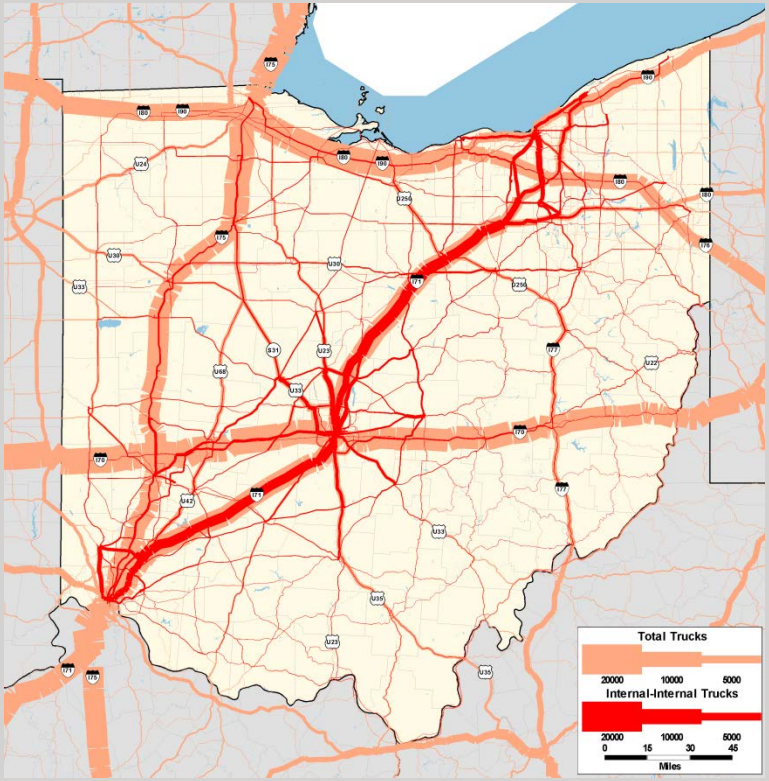
Which trucks matter?

TRUCKS BY FLOW DIRECTION

External-to-External

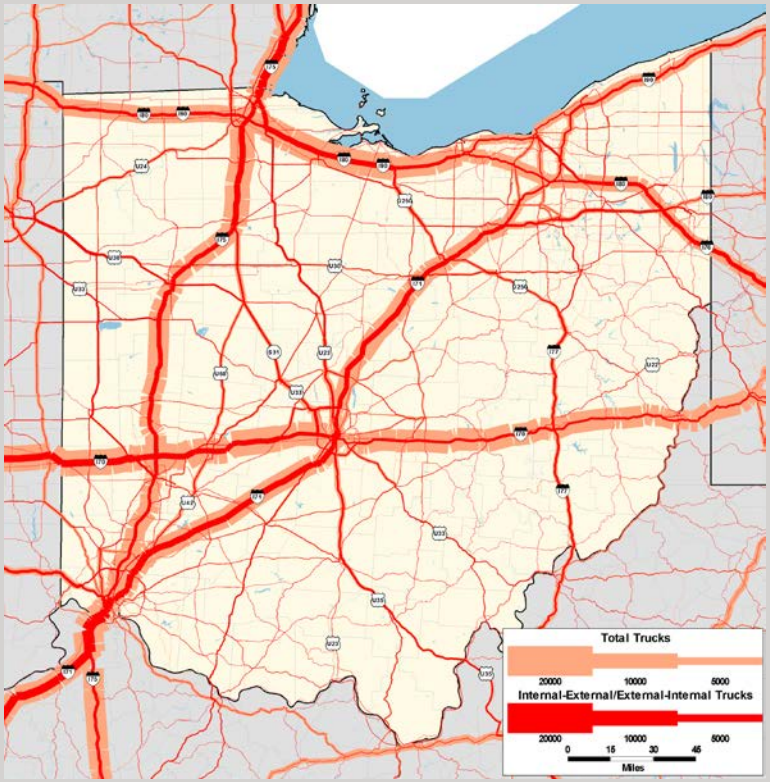


Internal to Internal

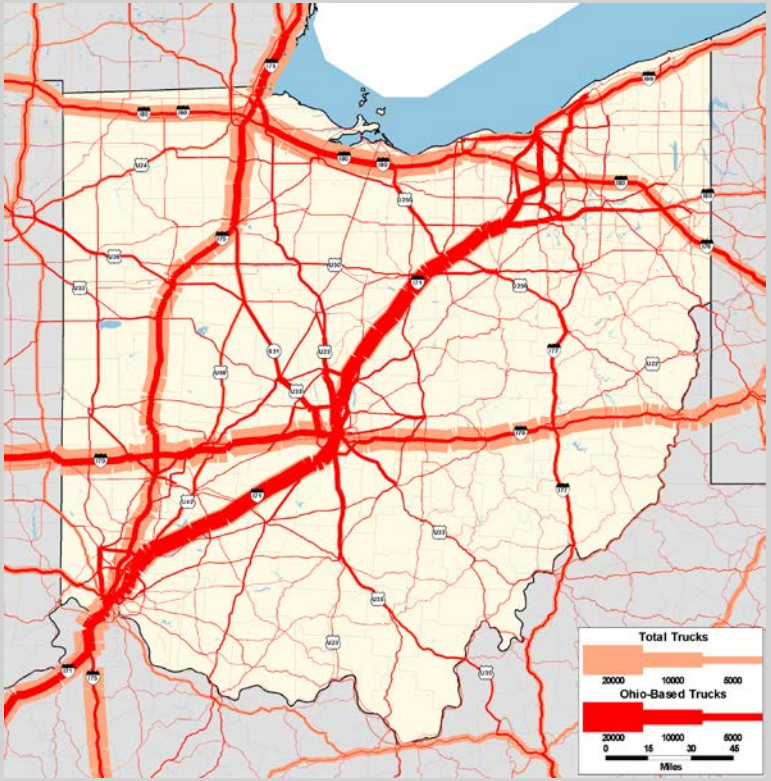


TRUCKS BY FLOW DIRECTION

Internal-to-External
External-to-Internal

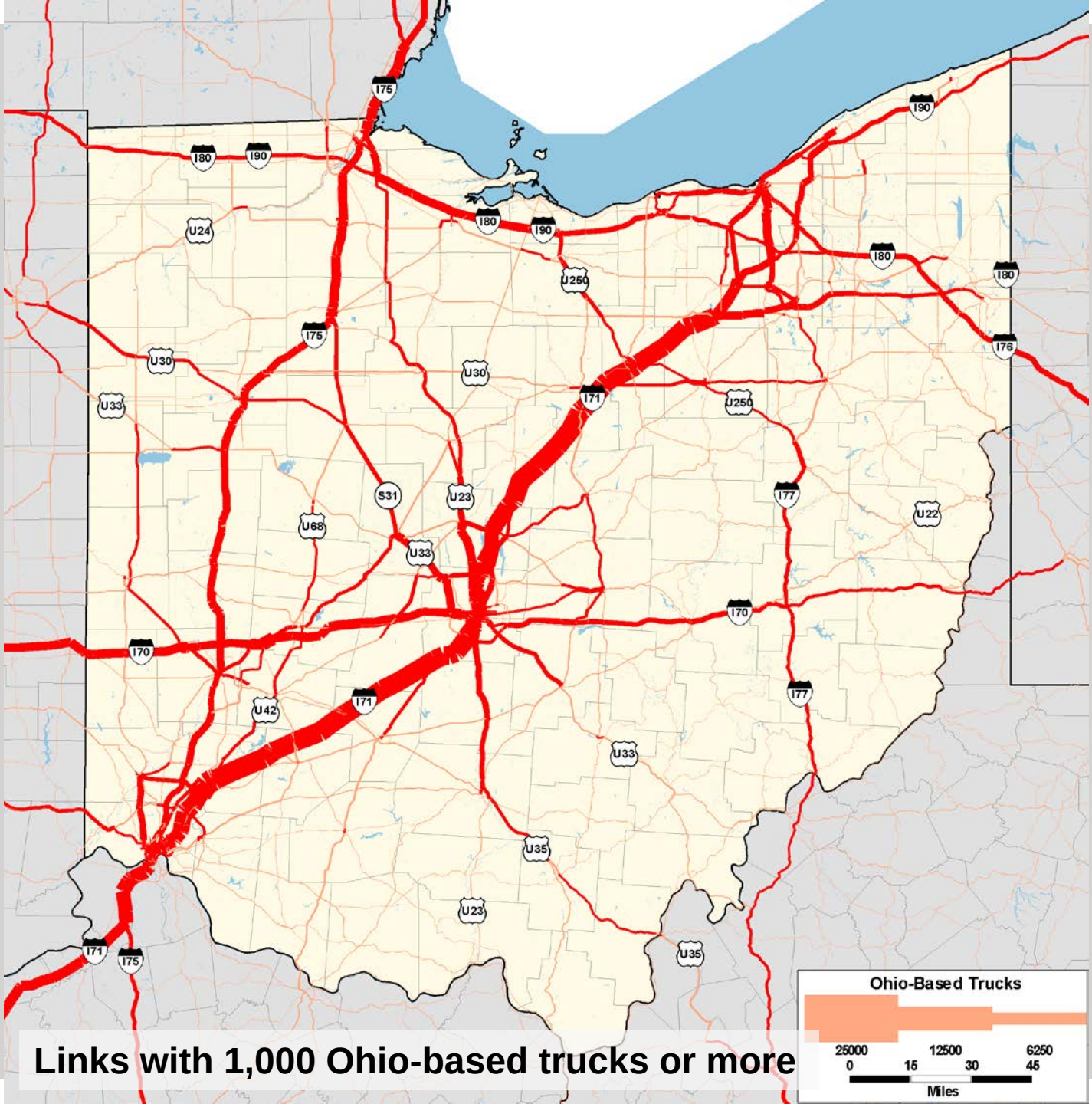


Internal-to-Internal
Internal-to-External
External-to-Internal



HOW DO WE DEFINE A TRUCK NETWORK?

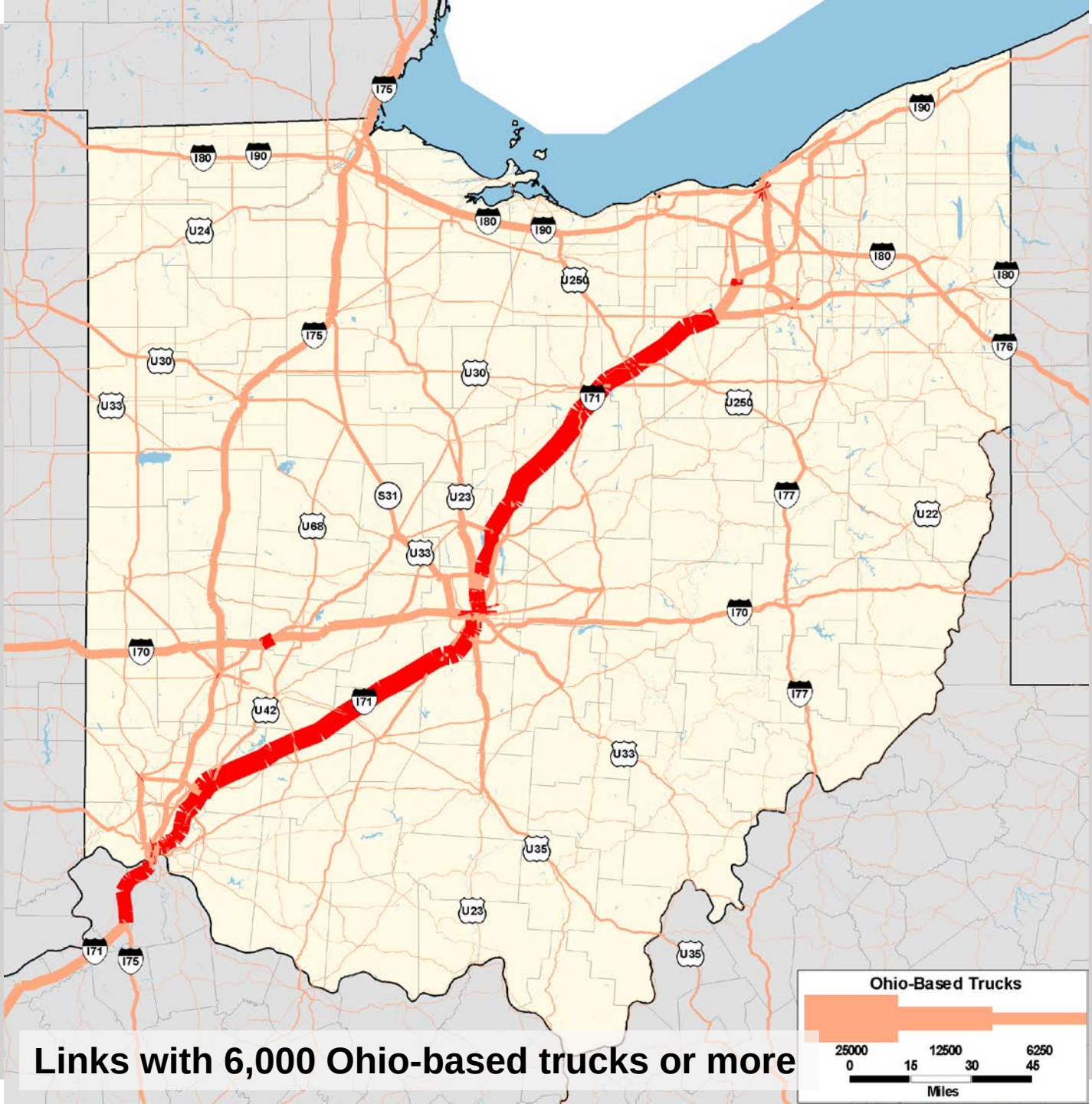
How many trucks are there?



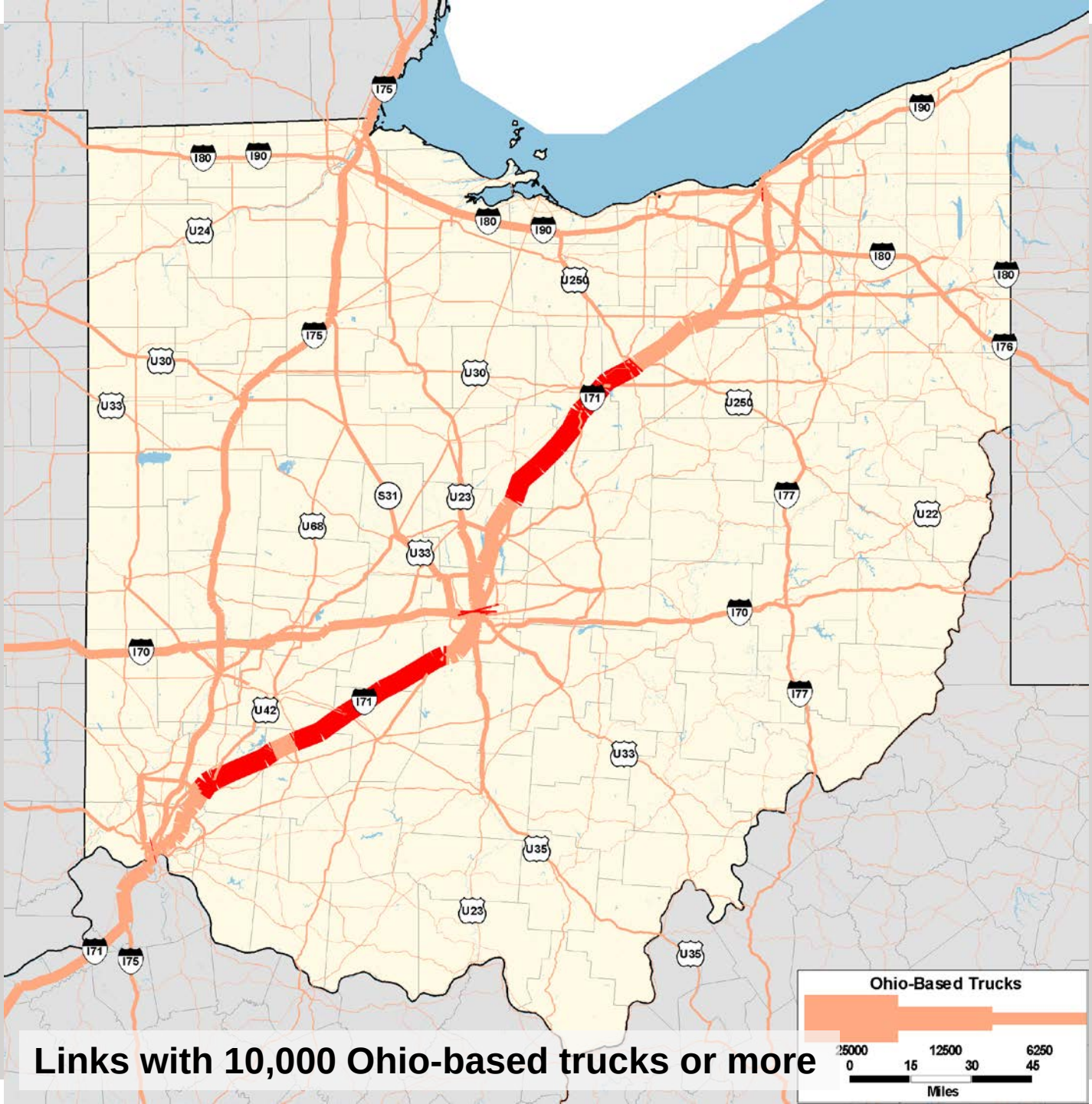
Links with 1,000 Ohio-based trucks or more

Links with 2,000 Ohio-based trucks or more

Links with 4,000 Ohio-based trucks or more



Links with 6,000 Ohio-based trucks or more



Links with 10,000 Ohio-based trucks or more

WHICH BOTTLENECKS MATTER?

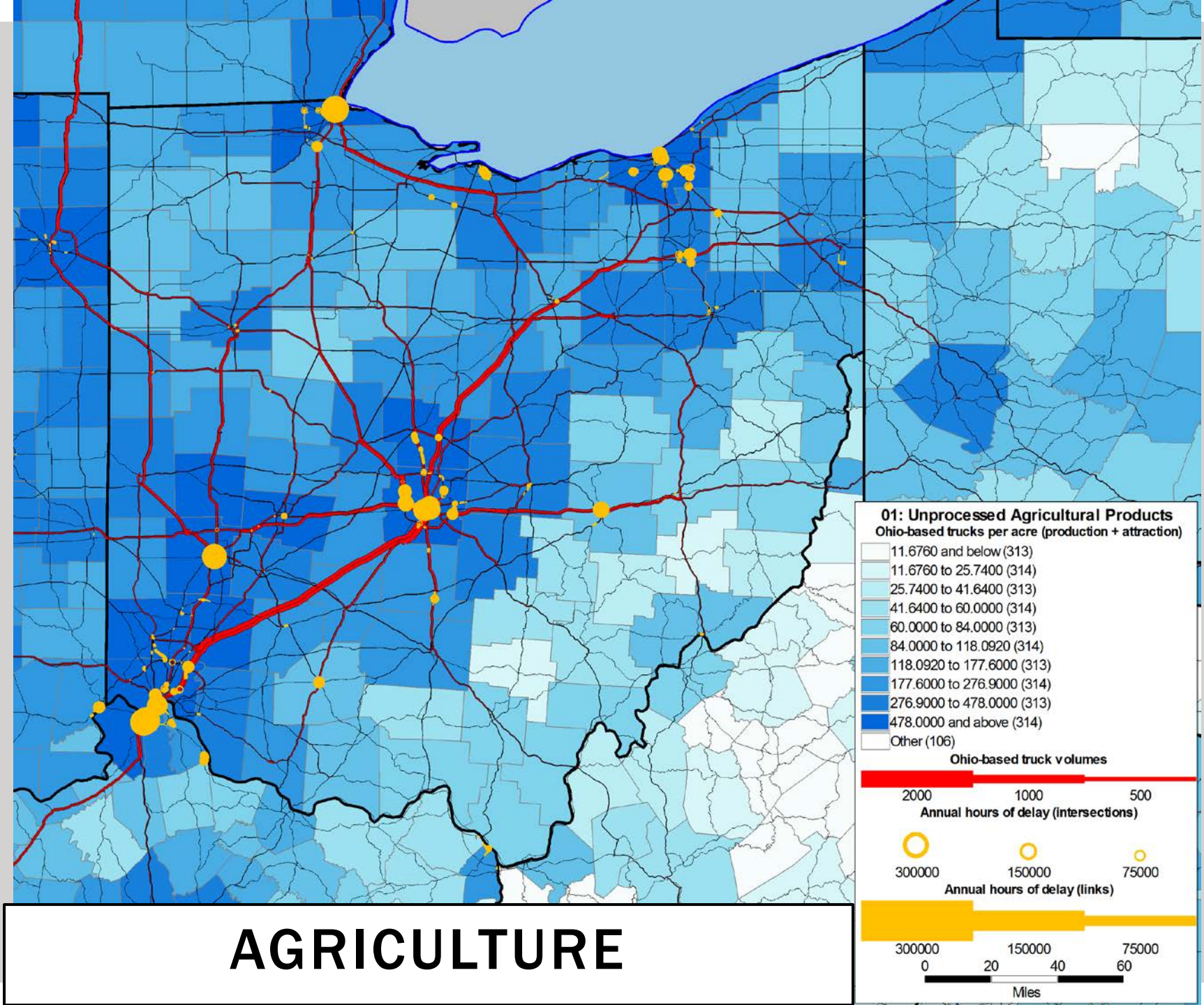
Where are the bottlenecks and what commodities move through them?

FOLLOWING SLIDES SHOW OHIO-BASED TRUCK FLOWS BY COMMODITY GROUP

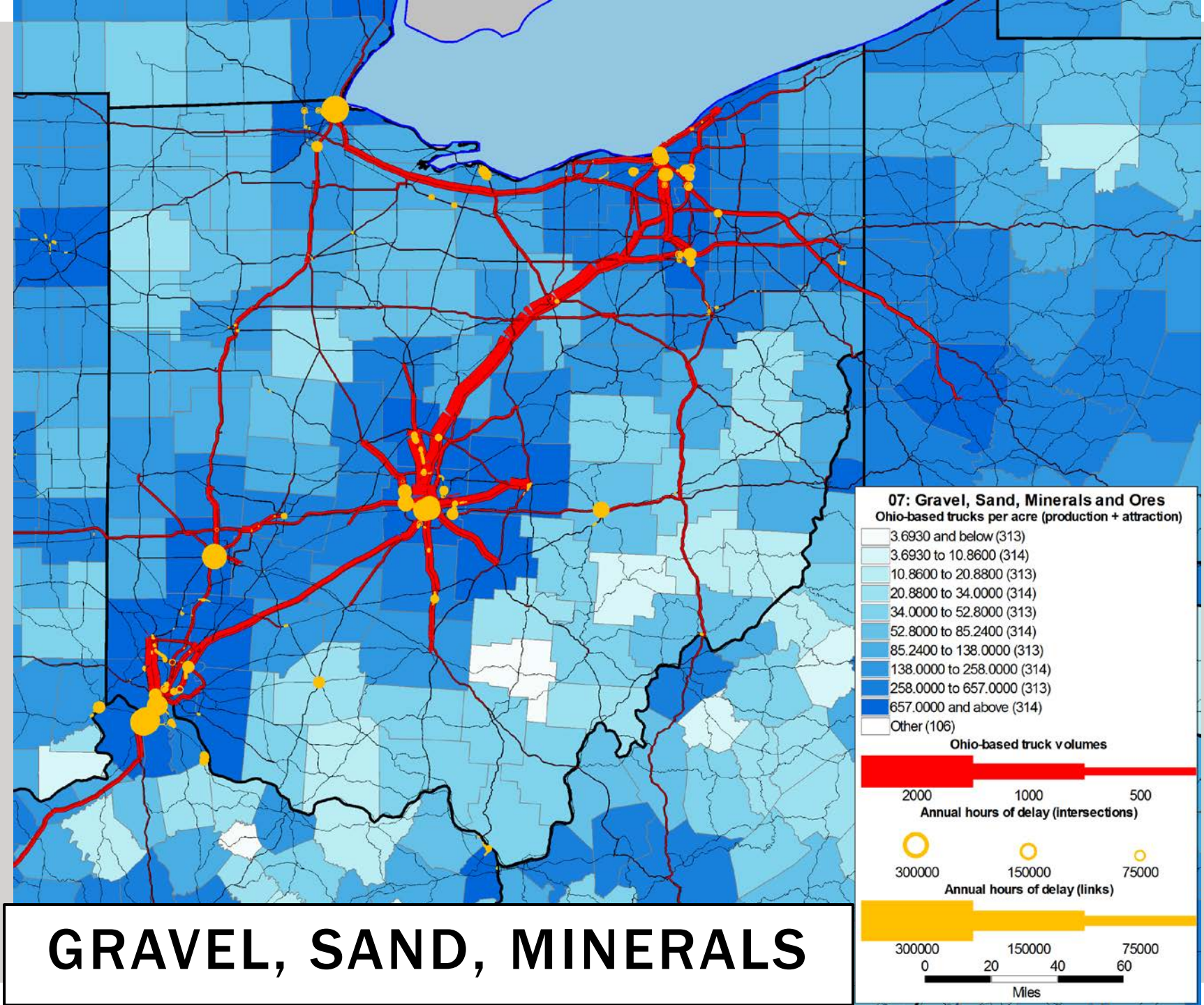
- Only trips with at least one trip end within Ohio are included
- The background color shows number of trucks generated and attracted per acre by county, i.e. truck trips are counted twice (at their origin and destination)
- Bottlenecks are shown in yellow (identical for every slide, not commodity-specific)
- Scale on every slide changes. The relative distribution of truck flows can be compared across different commodities, but not the absolute bandwidth/color

DISTINGUISHED COMMODITY GROUPS

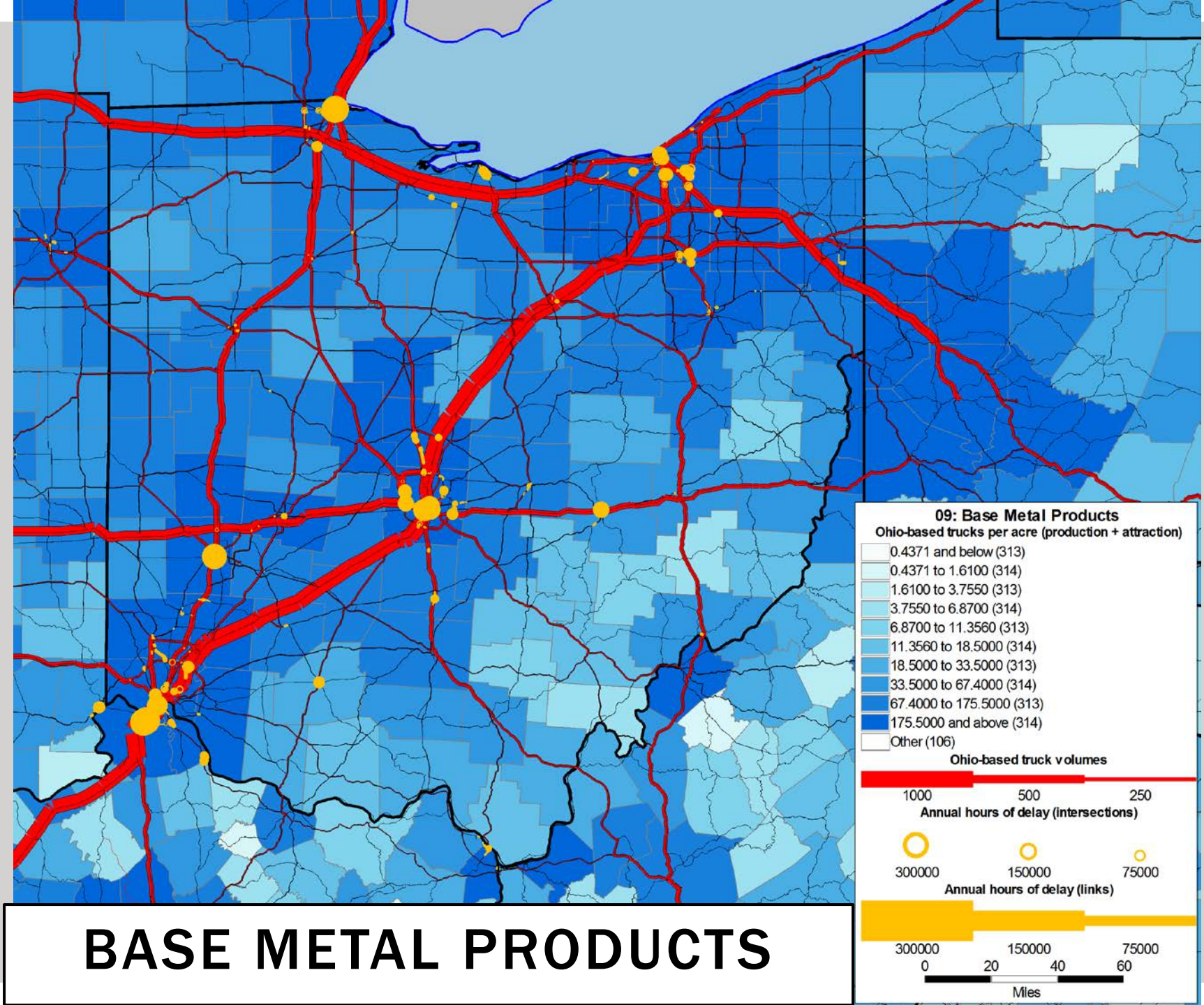
Group	Commodity
1	Unprocessed agricultural products
2	Live animals and live fish
3	Food products
4	Petroleum
5	Automobiles
6	Coal
7	Gravel, Sand, Minerals and ores
8	Waste and scrap
9	Base metal products
10	Instruments and electronics
11	Logs
12	Wood products
13	Basic chemicals
14	Chemical products
15	Machinery and building stone
16	Nonmetallic mineral products
17	Miscellaneous freight



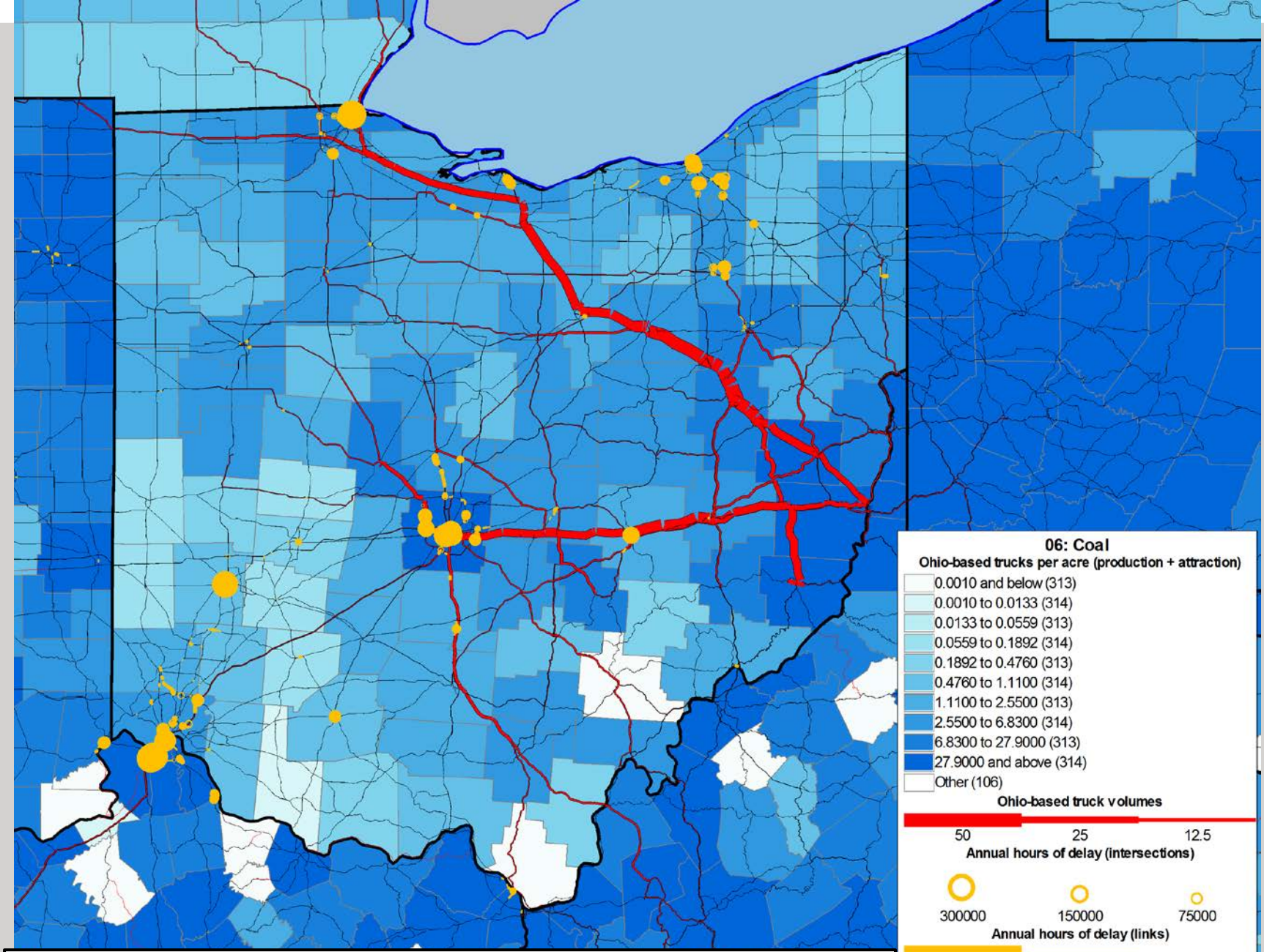
AGRICULTURE



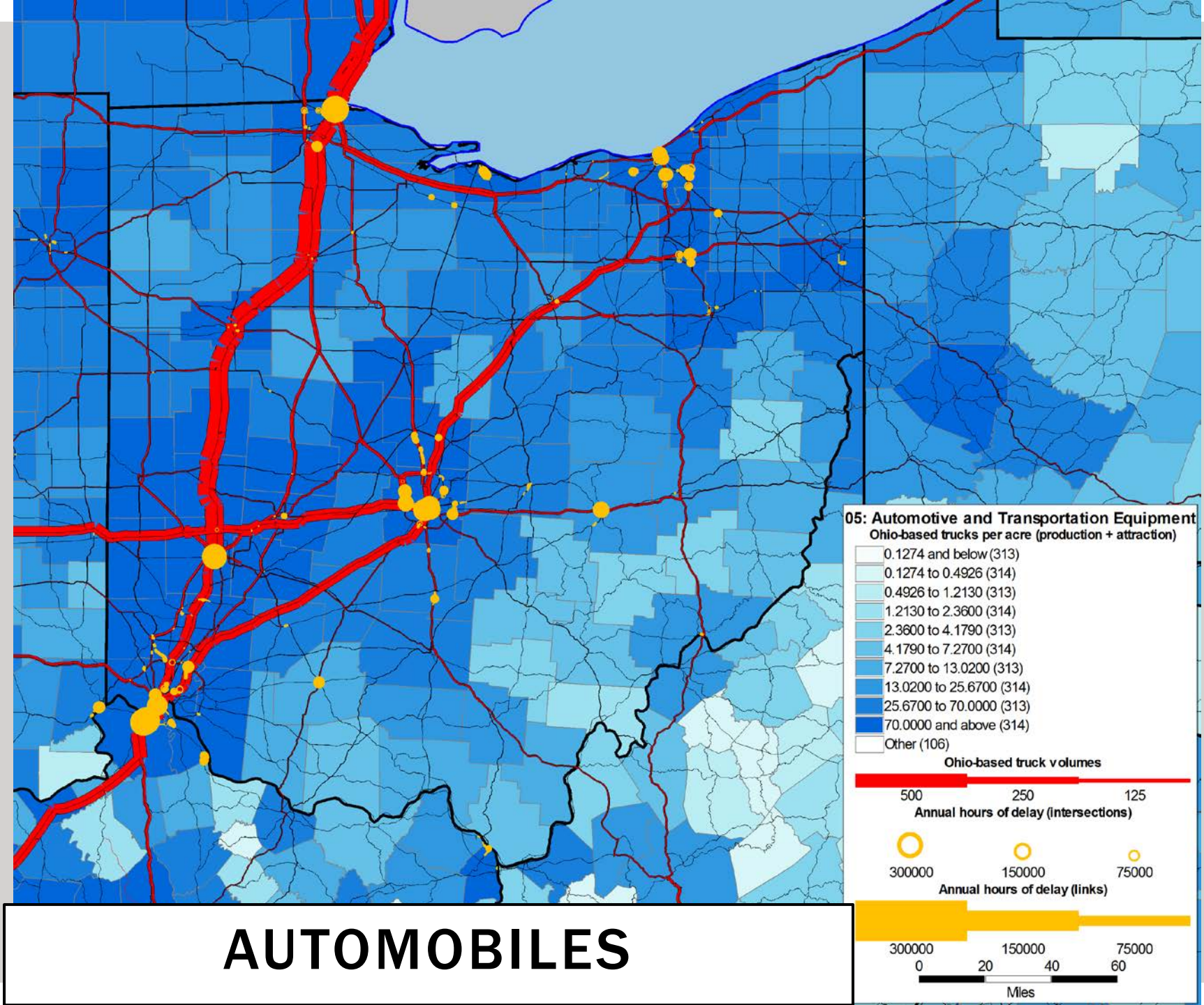
GRAVEL, SAND, MINERALS



BASE METAL PRODUCTS


06: Coal
Ohio-based trucks per acre (production + attraction)
0.0010 and below (313)
0.0010 to 0.0133 (314)
0.0133 to 0.0559 (313)
0.0559 to 0.1892 (314)
0.1892 to 0.4760 (313)
0.4760 to 1.1100 (314)
1.1100 to 2.5500 (313)
2.5500 to 6.8300 (314)
6.8300 to 27.9000 (313)
27.9000 and above (314)
Other (106)
Ohio-based truck volumes
50
25
12.5
Annual hours of delay (intersections)
300000
150000
75000
Annual hours of delay (links)
300000
150000
75000
0
20
40
60
Miles

COAL



AUTOMOBILES

WHAT IF WE BUILD NEW INTERMODAL TERMINALS?

How much traffic would divert from trucks to intermodal?

INTERMODAL FACILITIES IN COLUMBUS AREA

	Tons				
Year	MULTIMODAL	TRUCK	RAIL	OTHER	Total
2000	-	-	-	-	-
2005	38,462	(38,462)	-	-	0
2010	41,398	(41,398)	-	-	0
	Mode Share%				
Year	MULTIMODAL	TRUCK	RAIL	OTHER	Total
2000	0.0%	0.0%	0.0%	0.0%	0.0%
2005	0.1%	-0.1%	0.0%	0.0%	0.0%
2010	0.1%	-0.1%	0.0%	0.0%	0.0%

WHAT IF WE INCREASE TRUCK WEIGHT LIMITS?

How many fewer trucks would be on the road?

INCREASE PAYLOAD FACTORS IN MI & OH

Truck Vehicle Miles Traveled			
Payload factor	I-I	I-E/E-I/E-E	Total in OH
Original	63,491,368	33,746,501	97,237,869
Increased	62,272,117	33,655,403	95,927,519
Difference	(1,219,251)	(91,099)	(1,310,349)
% Difference	-1.9%	-0.3%	-1.3%

CONCLUSIONS

What did we learn?

CONCLUSIONS

Part 1: Methods and Data

- Freight needs to be modeled on a large (national) scale
- Data matters
- Statewide model needed for auto flows
- Questions about how much sensitivity to allow

Part 2: Planning Questions

- Freight forecasting is not “plug-and-chug”
- Creativity needed in framing the questions and searching for insights

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Questions?

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