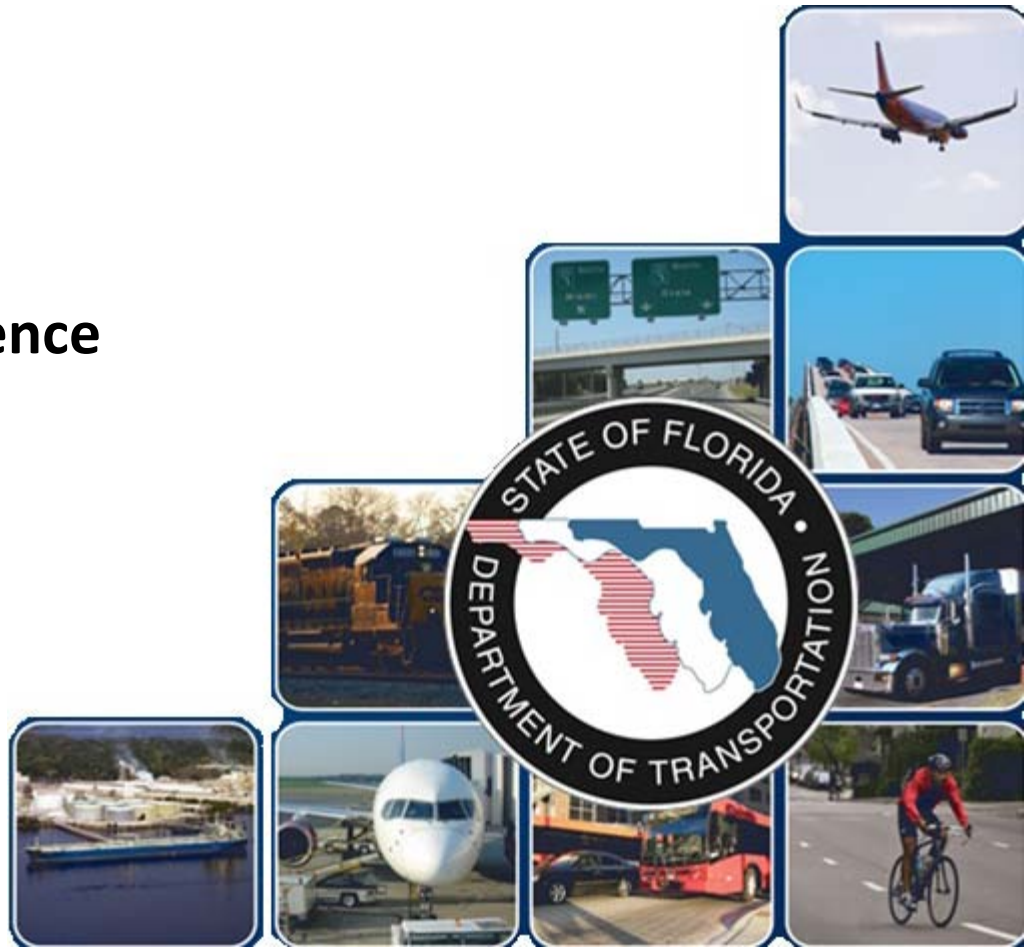
Florida Statewide Multi-Modal Freight Model

presented to

14th TRB Application Conference

Statewide Model Workshop



presented by

Vidya Mysore

May 05, 2013

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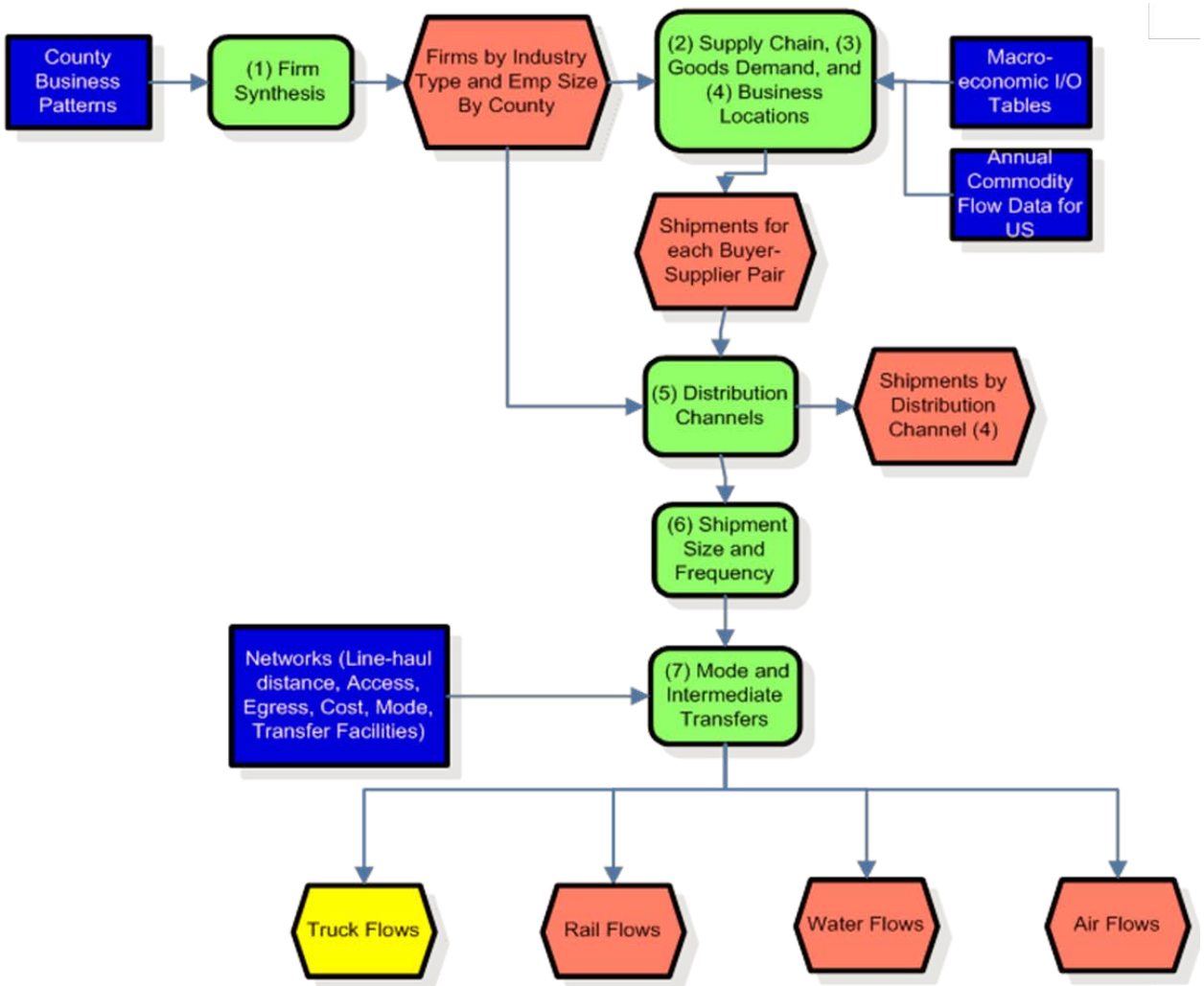
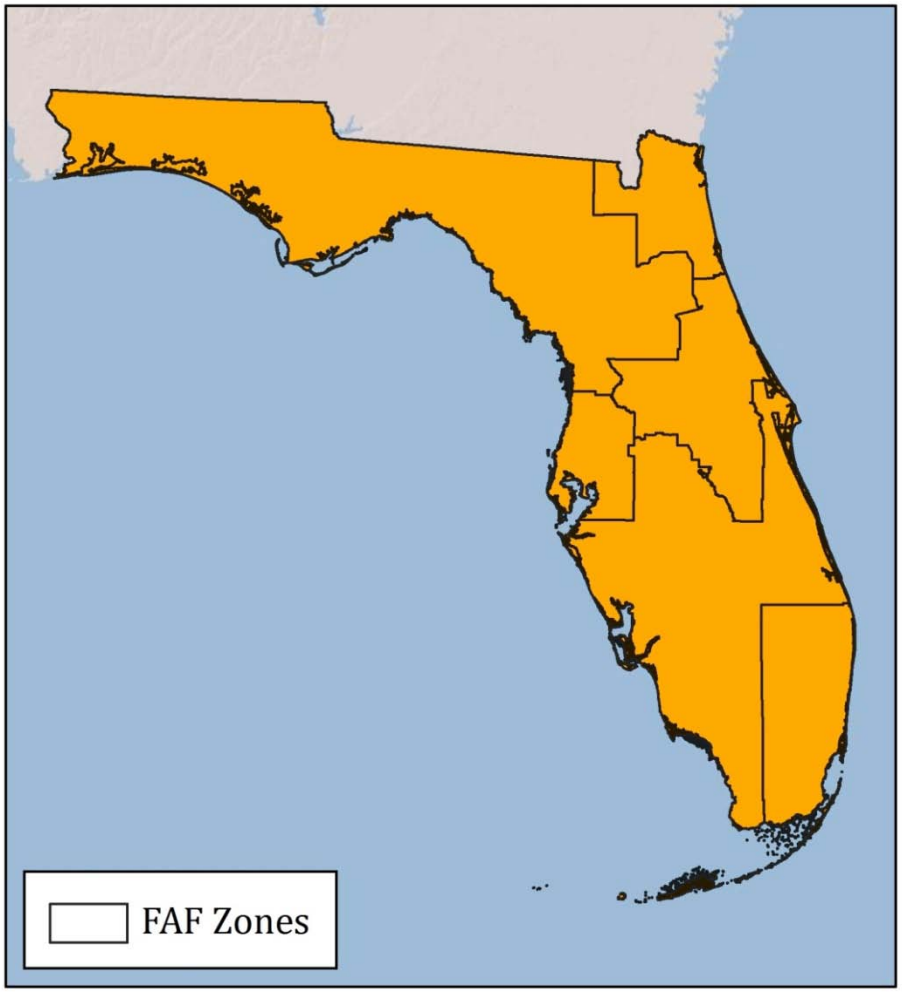
Statewide Model Framework

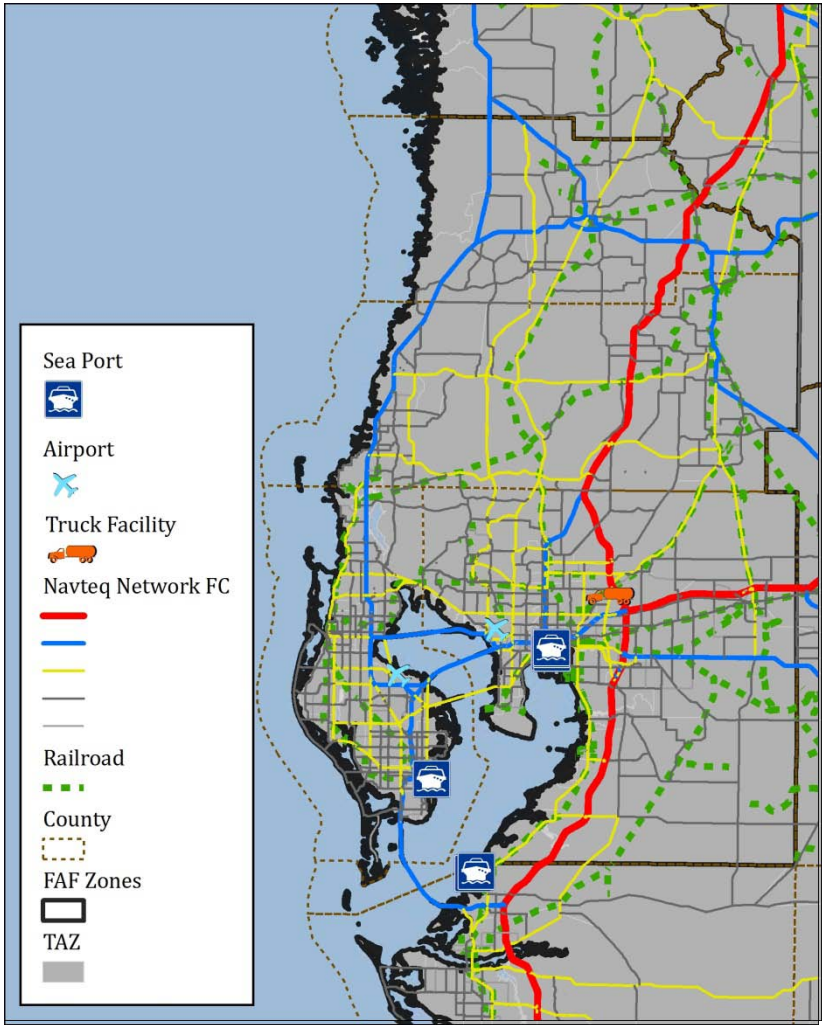


Firms and Commodity Flow Data



- Individual firms are synthesized in each traffic analysis zone (TAZ) based on employment data for each industry (County Business Patterns, InfoUSA, QCEW, and other local data)
- TAZs provide detailed spatial resolution, particularly in metropolitan areas, for firm locations and shipment origins and destinations
- Across the whole of Florida, the TAZs provide a significant level of detail
- FAF commodity flow data, a model input, uses large FAF zones. This is disaggregated down to TAZs based on the firm allocations and economic (input/output) data

Transportation Networks



- Model covers all of Florida and includes transportation networks across the USA and internationally
- Uses newest multi-modal transportation networks: highway, rail, seaports and waterways, airports, and intermodal connections
- Uses network information to understand transportation costs (including storage costs during transshipment), capacities, and resulting travel times
- Model outputs vehicle and commodity flows on networks and through intermodal/distribution centers

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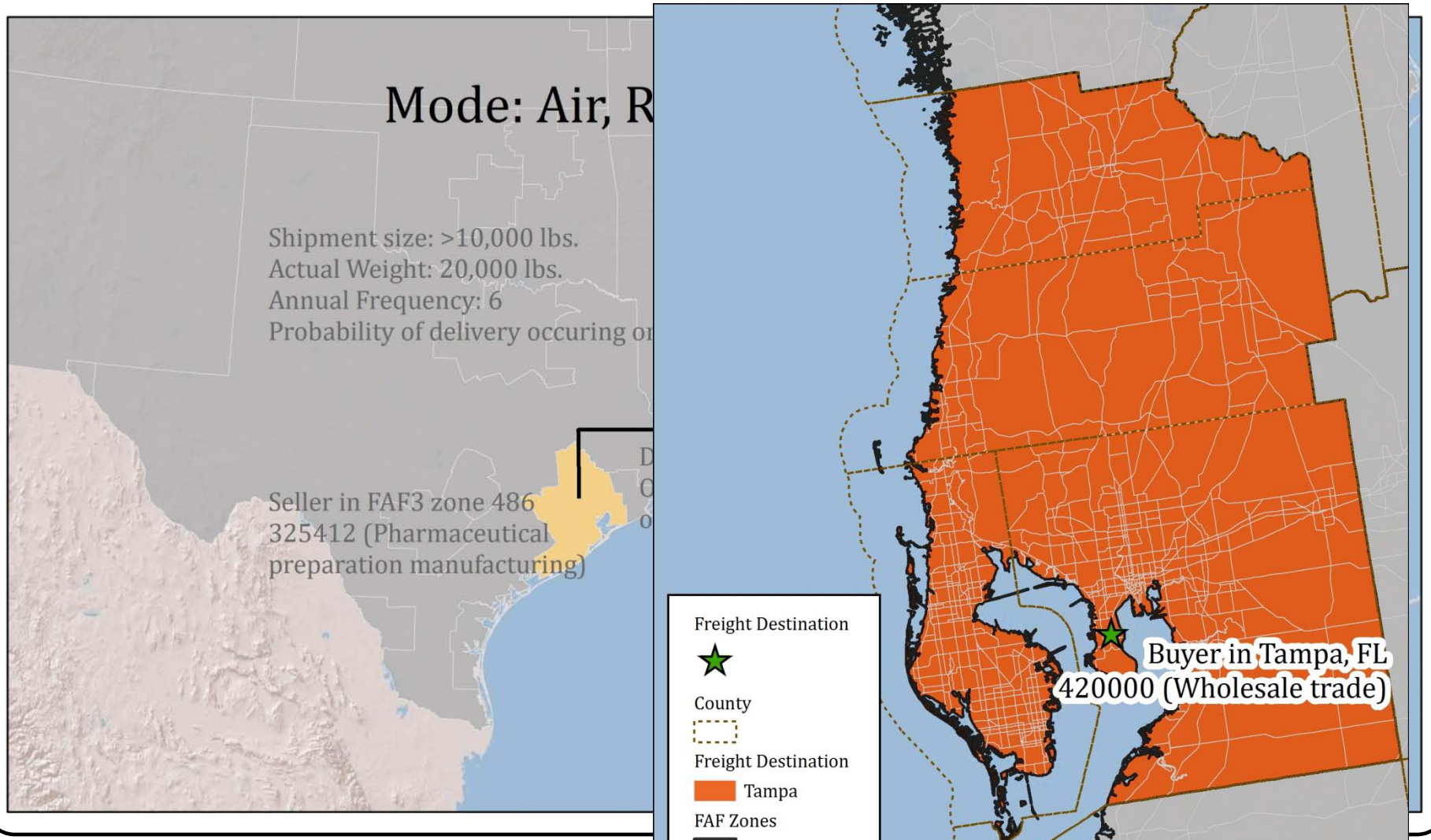
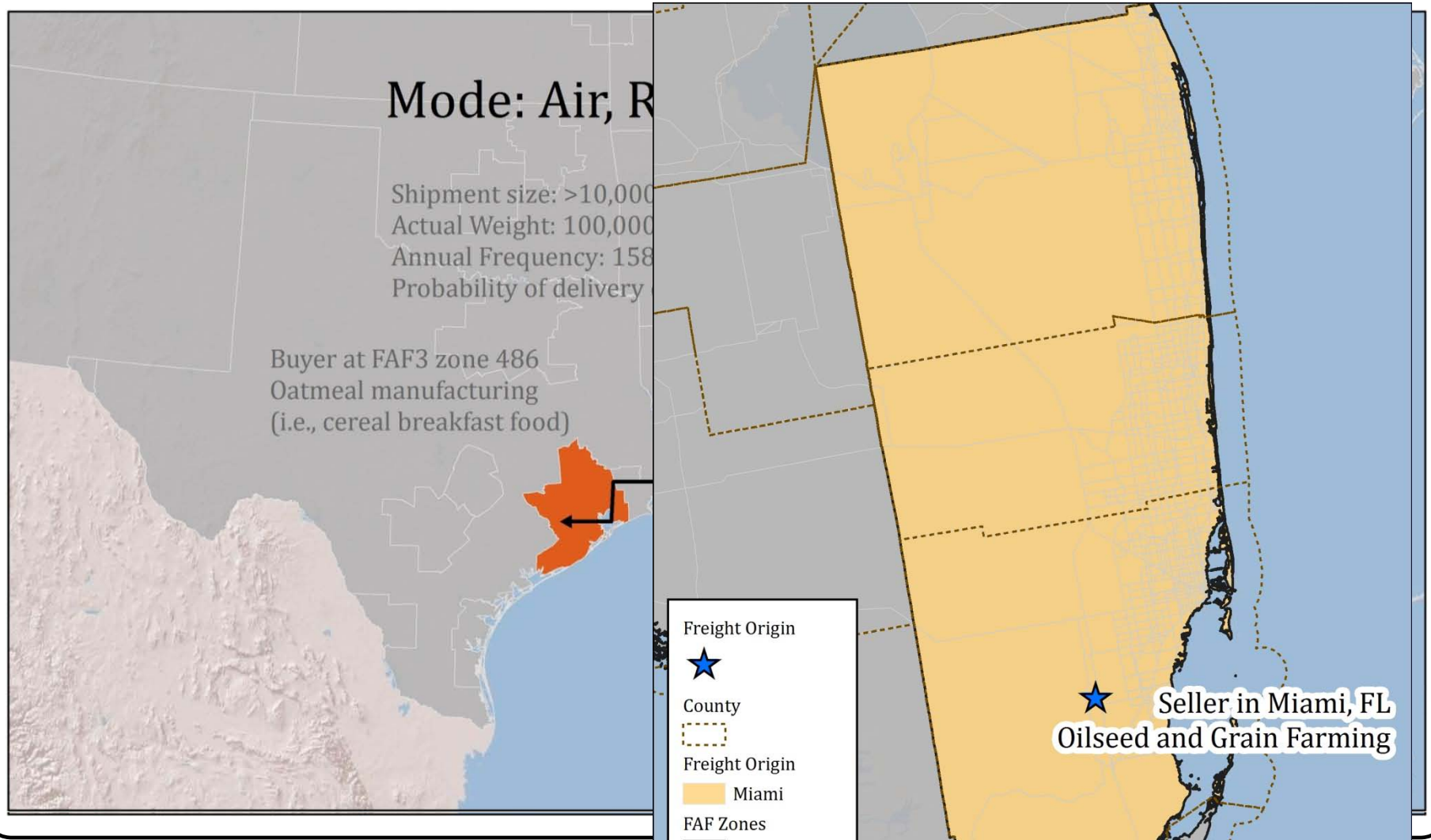
Sample Model Sequence #1



Sample Model Sequence #2



Mode Choice-Total Costs

Inventory Costs

=

ordering

+

carrying

+

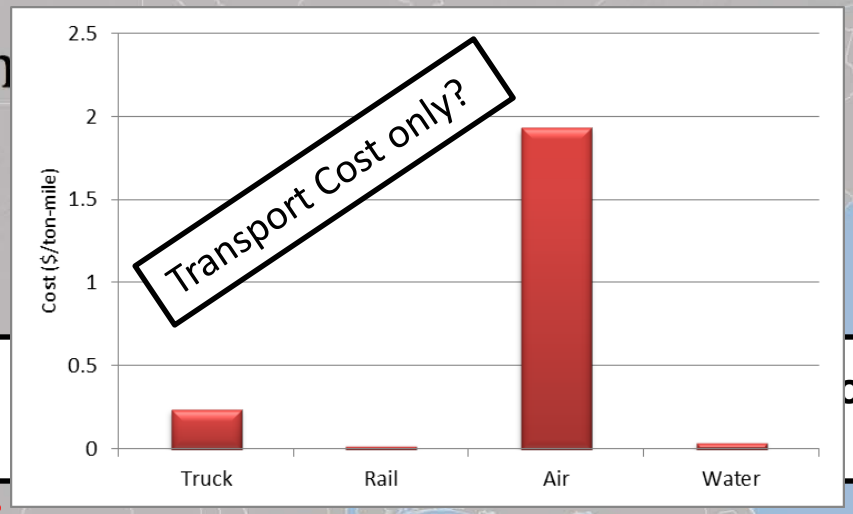
damage

+

Inventory in-Transit

+

Safety Inventory



Total

osts

FAF Zones
Freight Origin
Miami
Freight Destination
Houston

Seller in Miami, FL
Oilseed and Grain Farming

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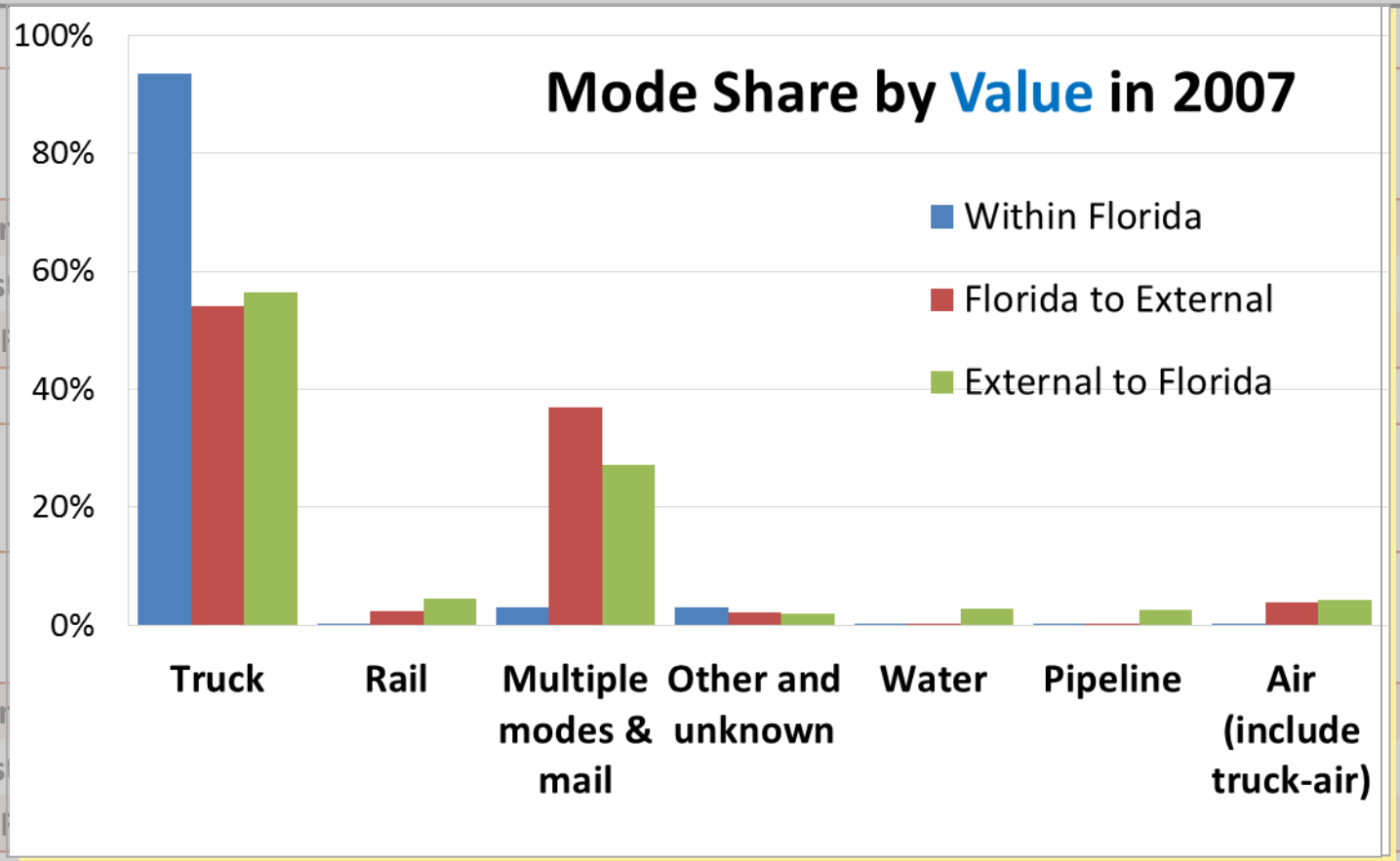
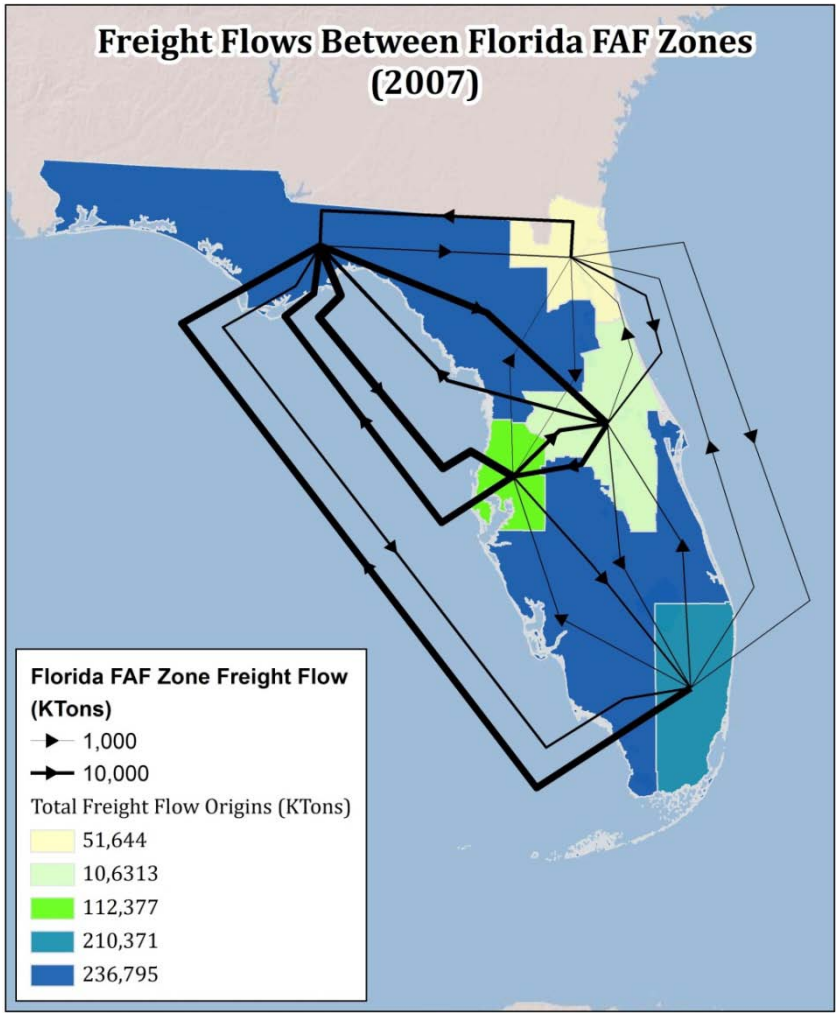
Mode Shares by Weight and Value



By Weight (KTons)								Total
Florida-Flor								717,501
Florida-Res								80,711
Rest of US-F								166,573
Total								964,784
By Value (M$)								**Total**
Florida-Flor								526,979
Florida-Res								156,221
Rest of US-F								303,928
Total	748,563	19,691	156,627	24,855	9,450	8,442	19,500	987,128

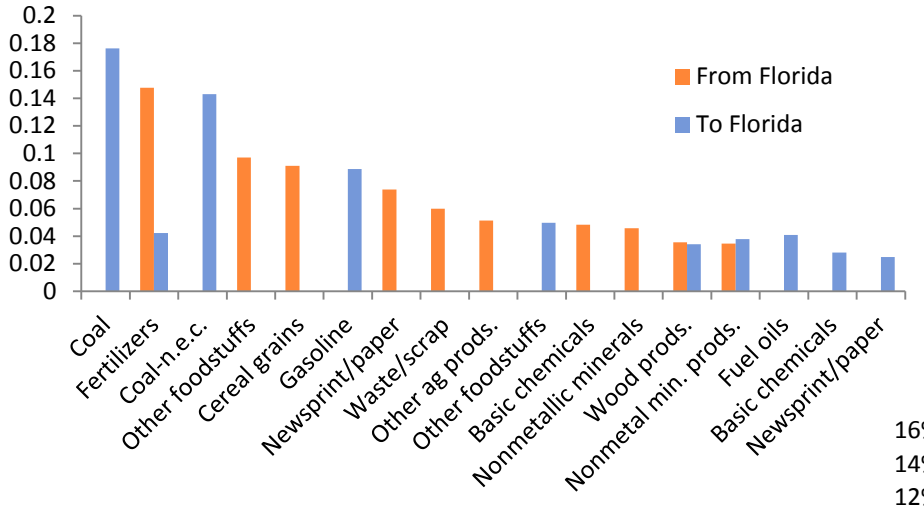
Largest Freight Flows within Florida



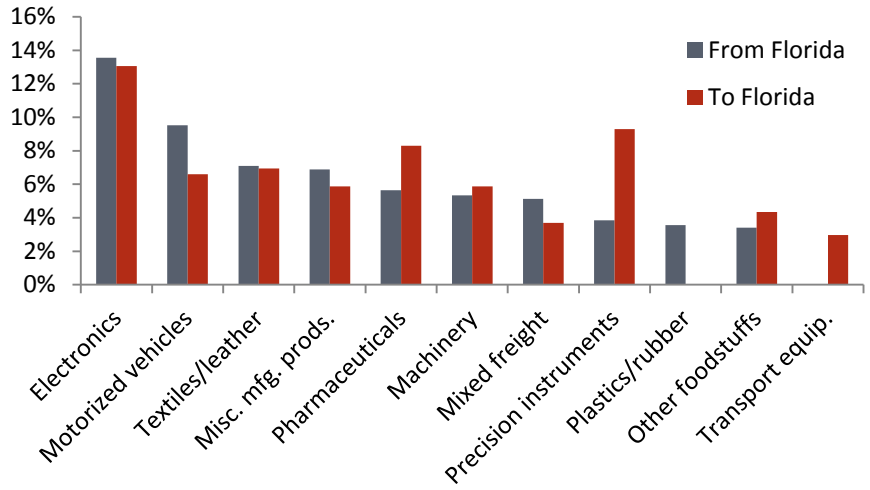
Top Commodities (by Weight)		Top Commodities (by Value)	
Gravel	21%	Machinery	17%
Nonmetal min. prods.	20%	Electronics	9%
Waste/scrap	9%	Mixed freight	8%
Gasoline	7%	Motorized vehicles	6%
Natural sands	6%	Gasoline	6%
Nonmetallic minerals	3%	Pharmaceuticals	6%
Logs	3%	Articles-base metal	4%
Other ag prods.	3%	Misc. mfg. prods.	4%
Other foodstuffs	3%	Other foodstuffs	3%
Cereal grains	3%	Precision instruments	3%

Largest Commodity Flows to and from Florida

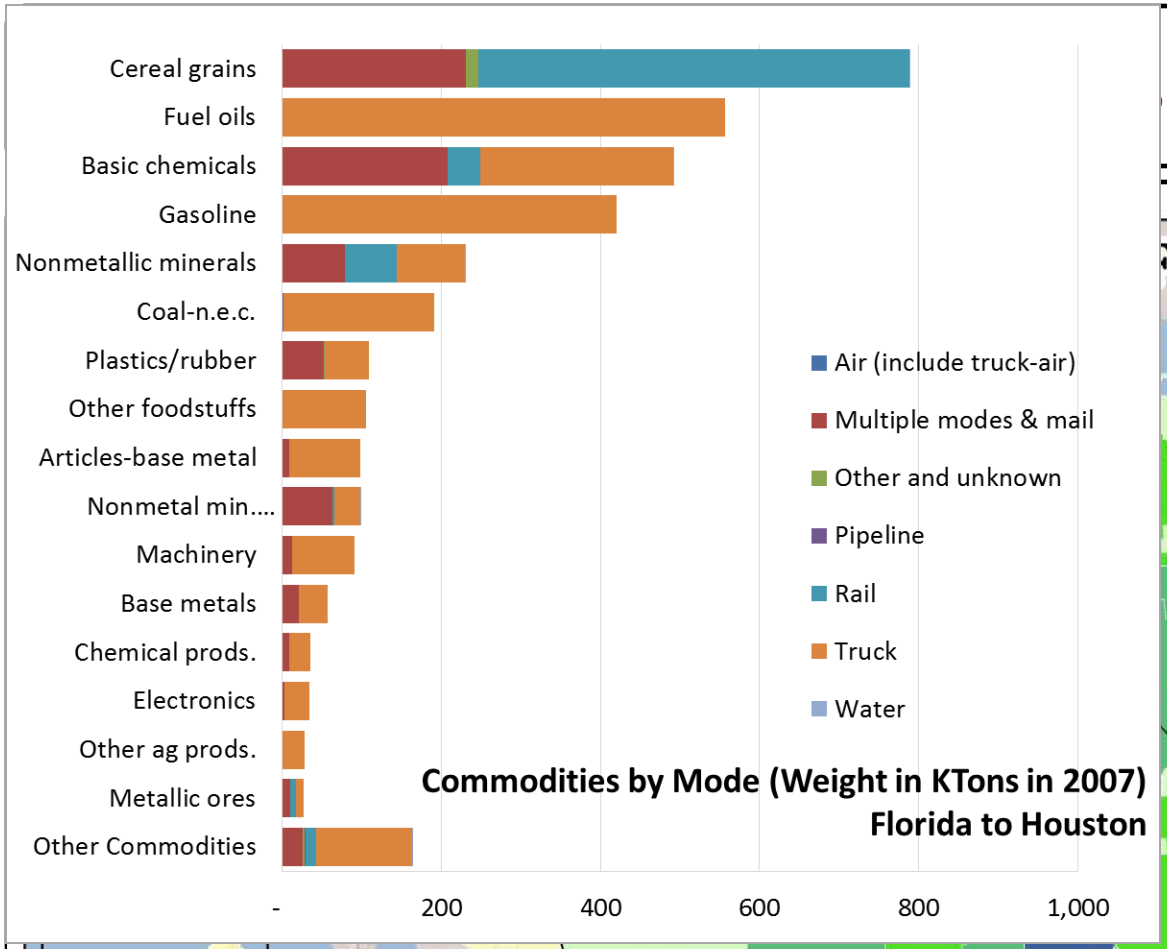
Top Commodities (by Weight)

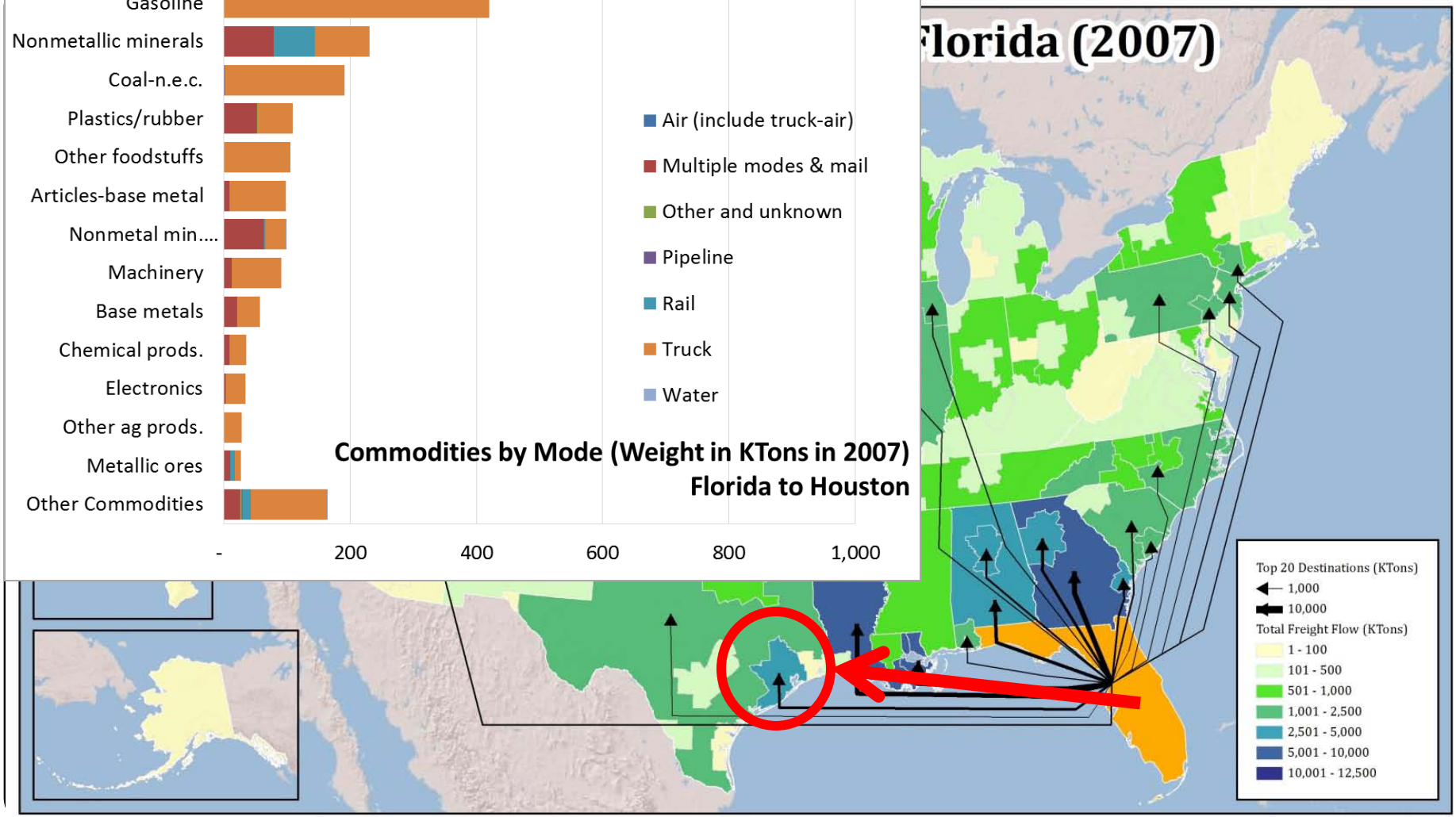


Top Commodities (by Value)



to and from Florida





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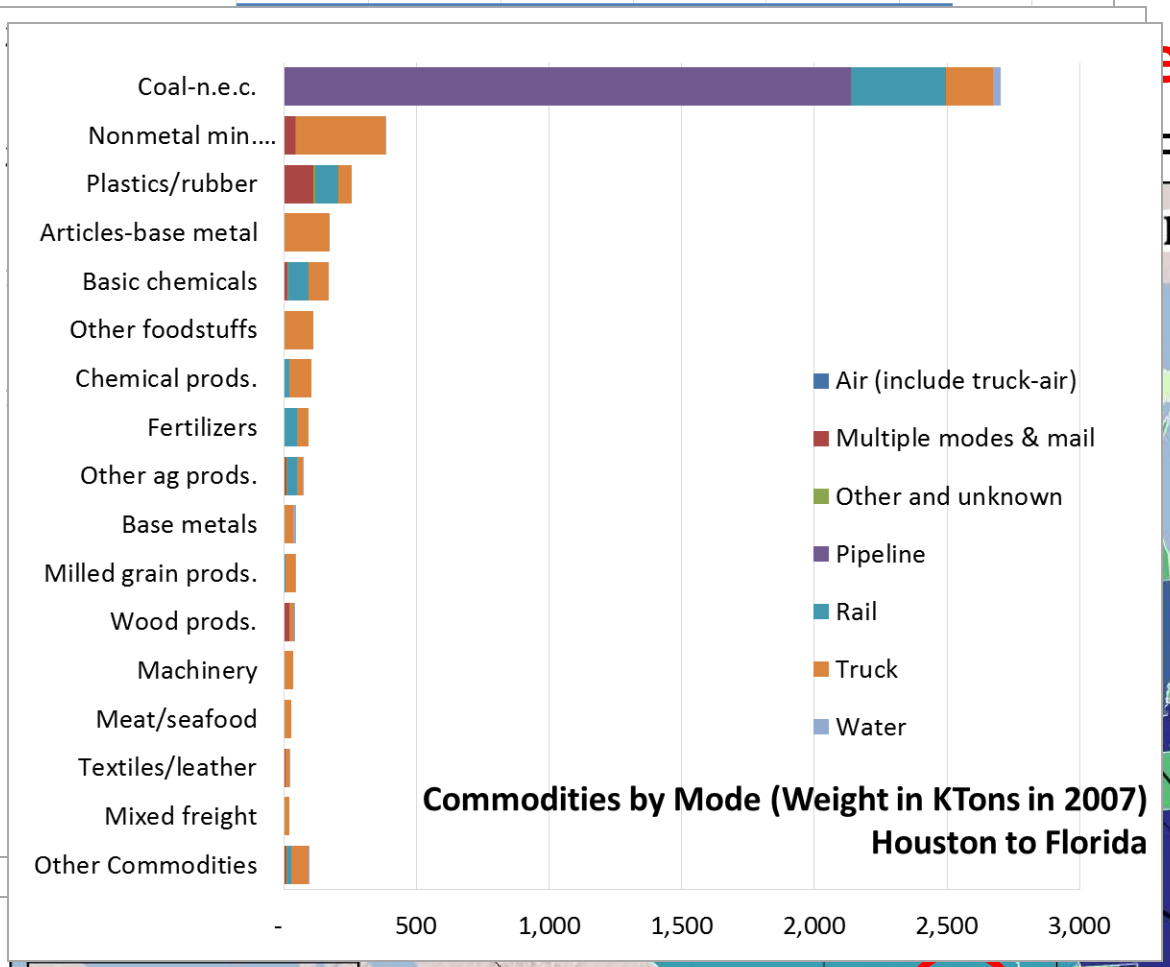
e state



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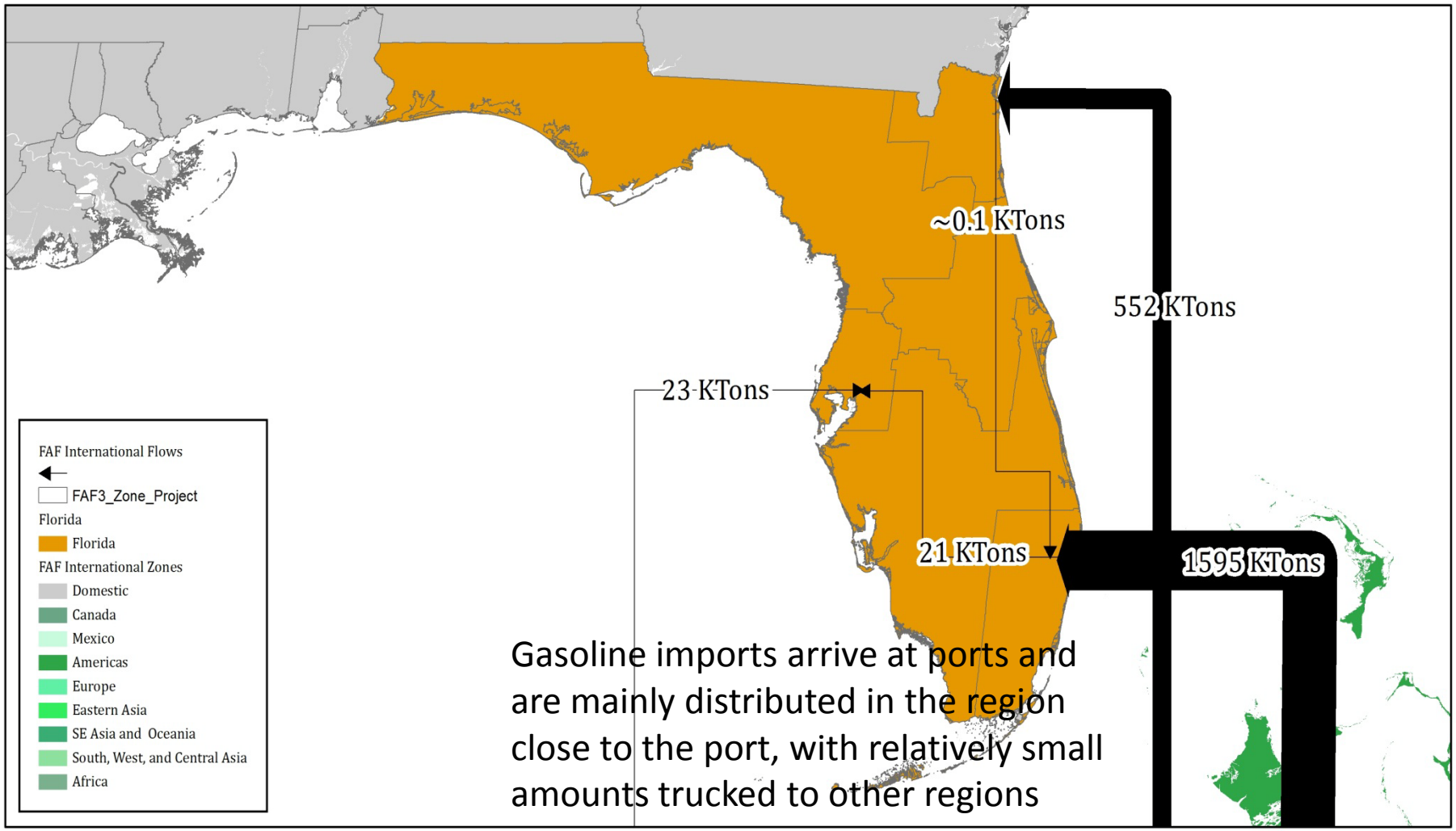
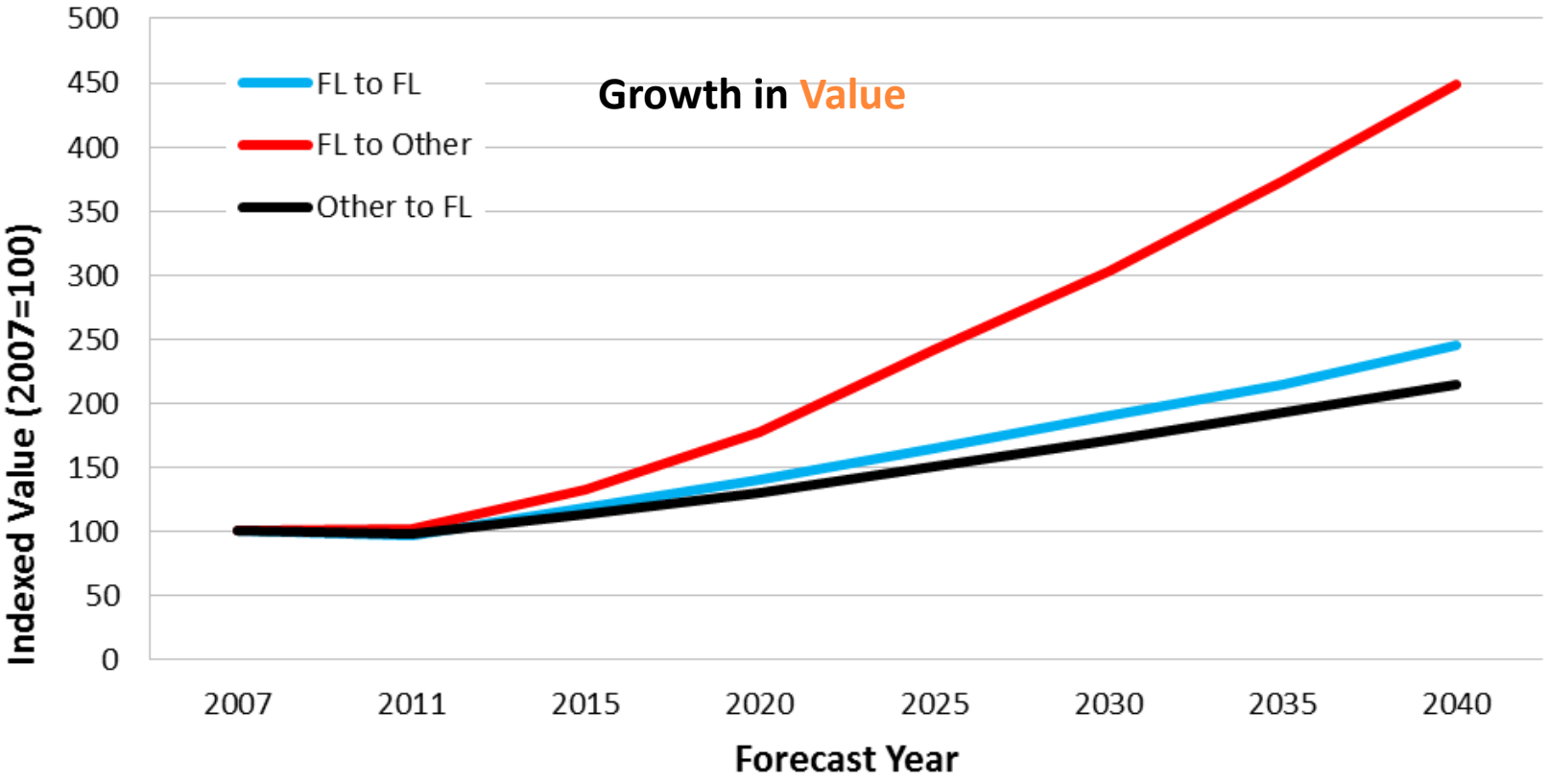
International Freight Flows to and from Florida



Gasoline imports arrive at ports and are mainly distributed in the region close to the port, with relatively small amounts trucked to other regions

Growth in Freight Flows to 2040

- FHWA's FAF includes forecasts out to 2040
- High growth forecast in outbound flow from Florida



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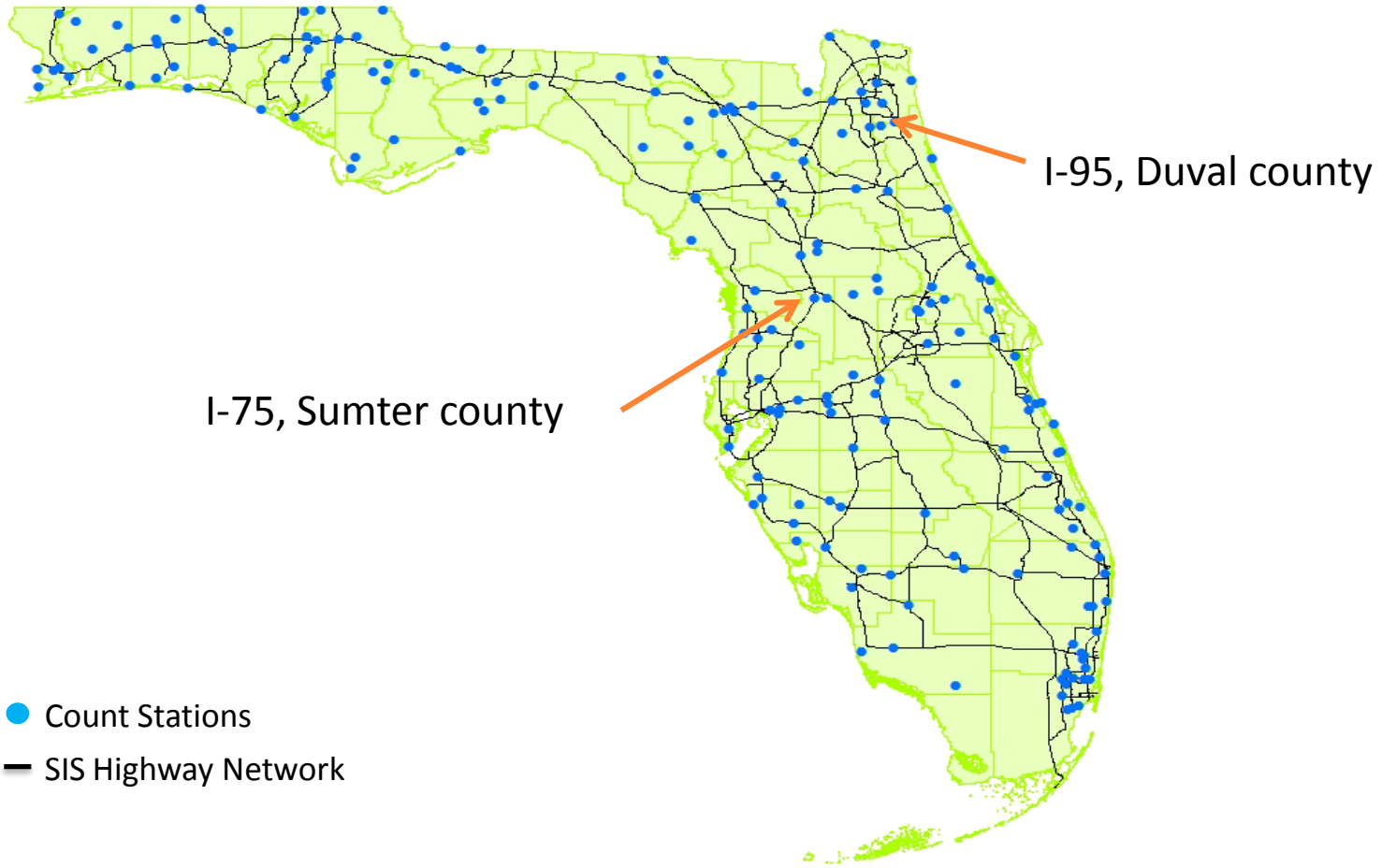
MODEL DATA AND ANALYSIS

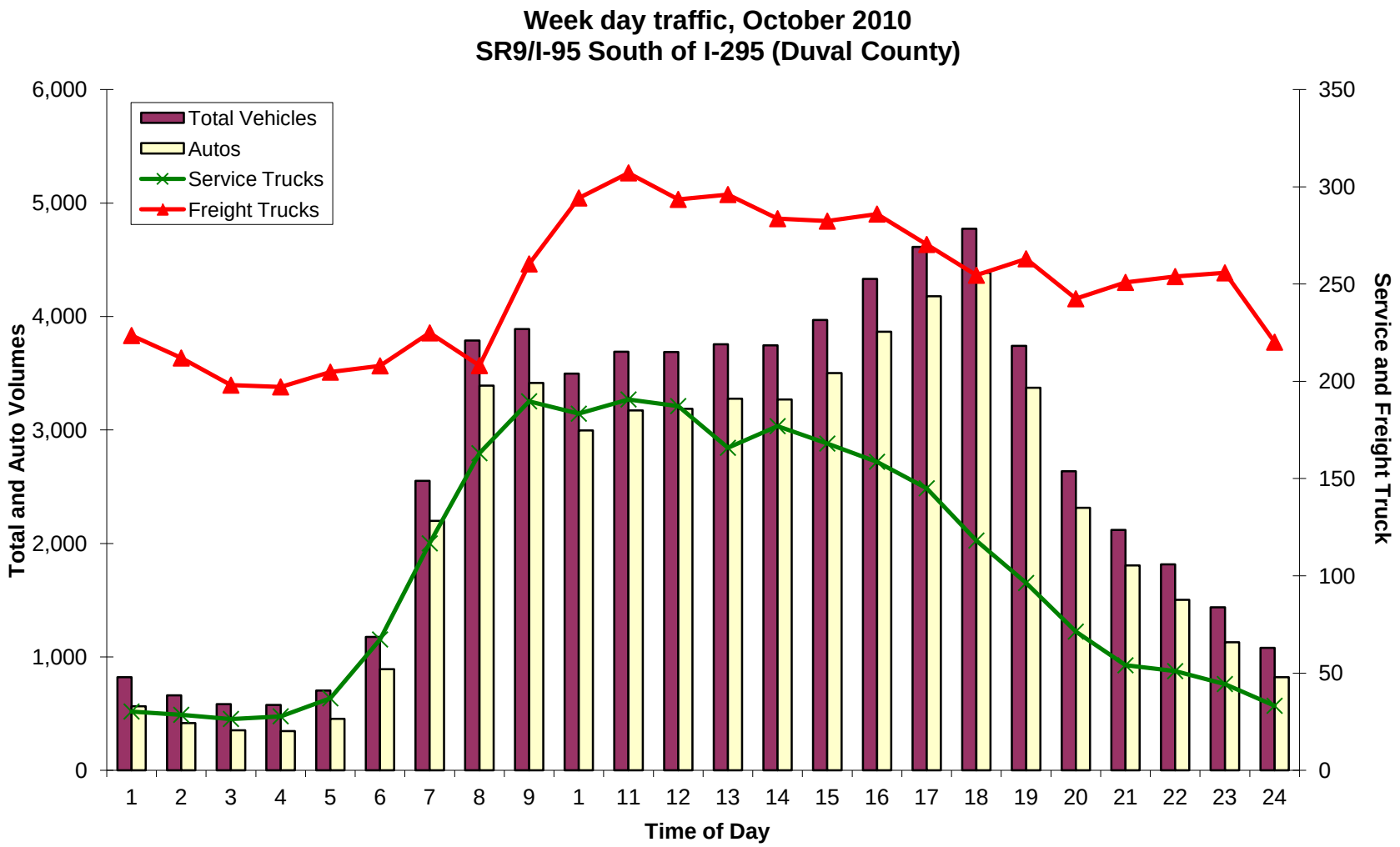
Data Needs

- **Freight Flows**
  - By commodity group
  - By weight and value
  - By mode
  - By origin and destination
- **Employment**
  - By firm size
  - By industry
- **Distribution Centers**
  - By size
  - By type
- **Economic Data**
  - By producer/consumer industry
- **Networks and Counts**
  - By mode
  - By time period
  - By facility type
- **Costs**
  - By mode
  - By time period
  - By facility type

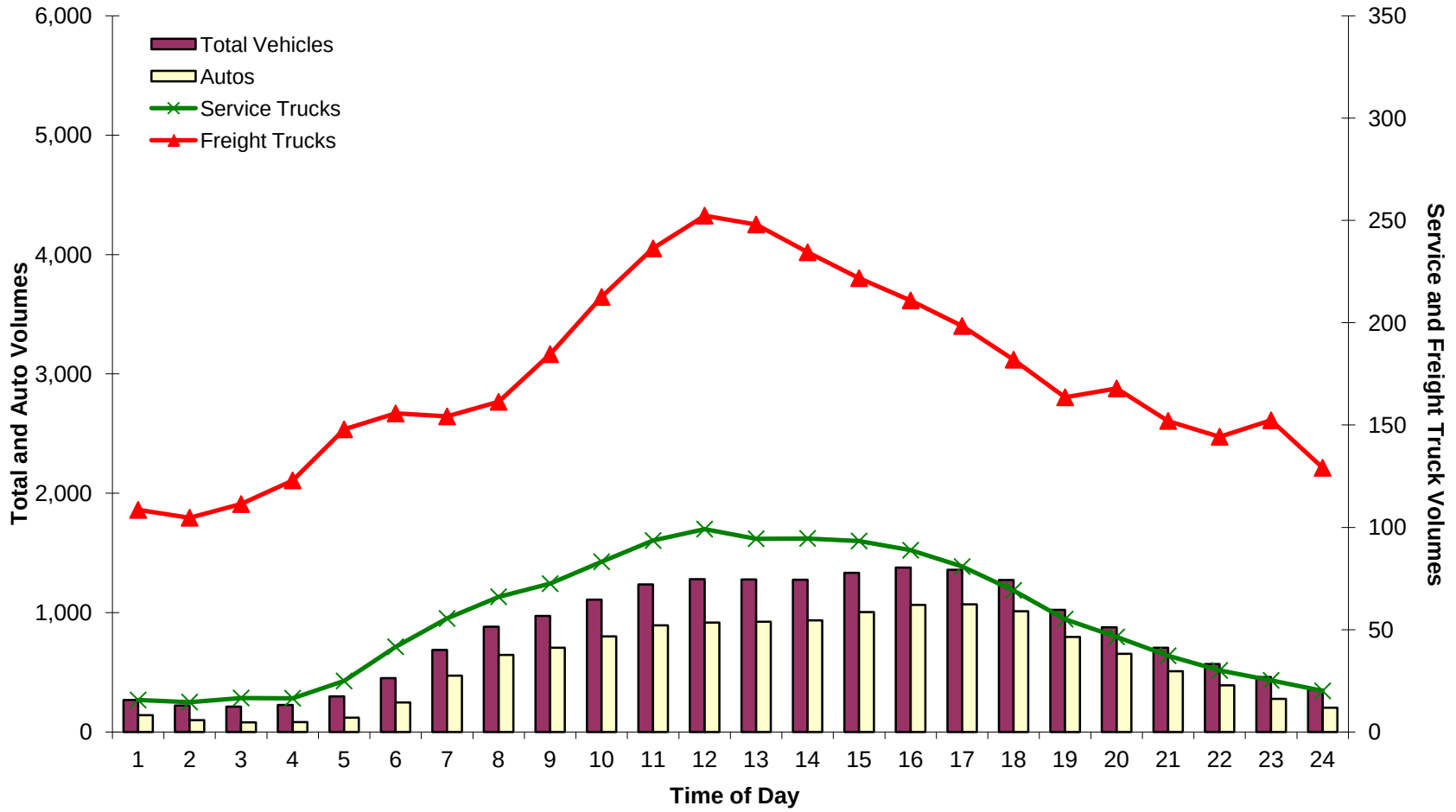
Traffic Count - Vehicular Classification



Traffic Count - Vehicular Classification



Traffic Count - Vehicular Classification



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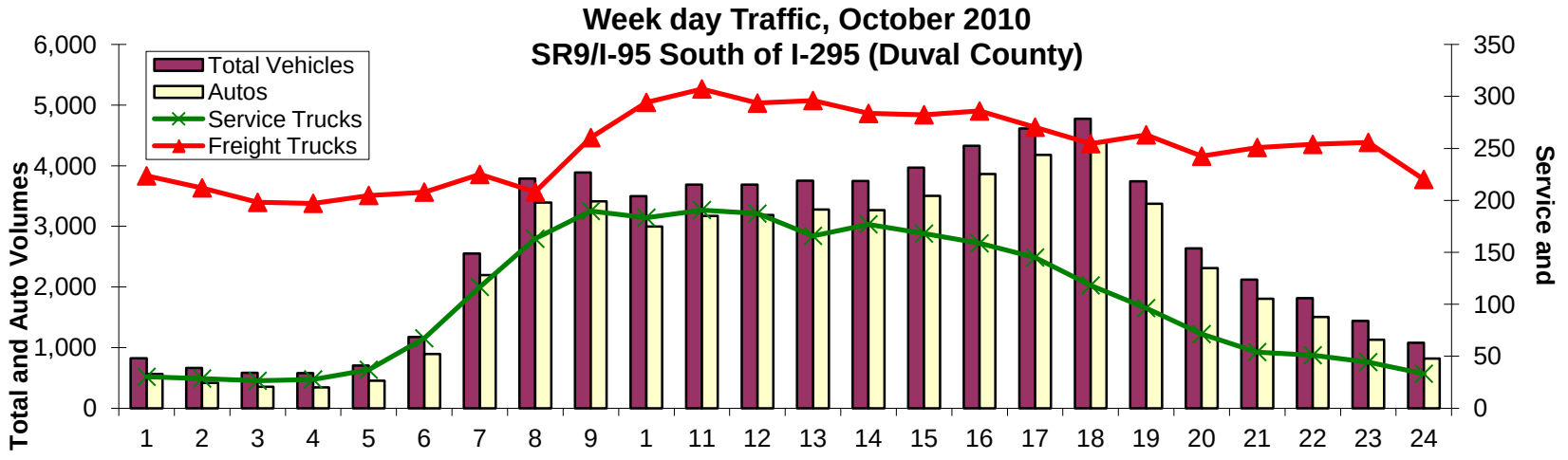
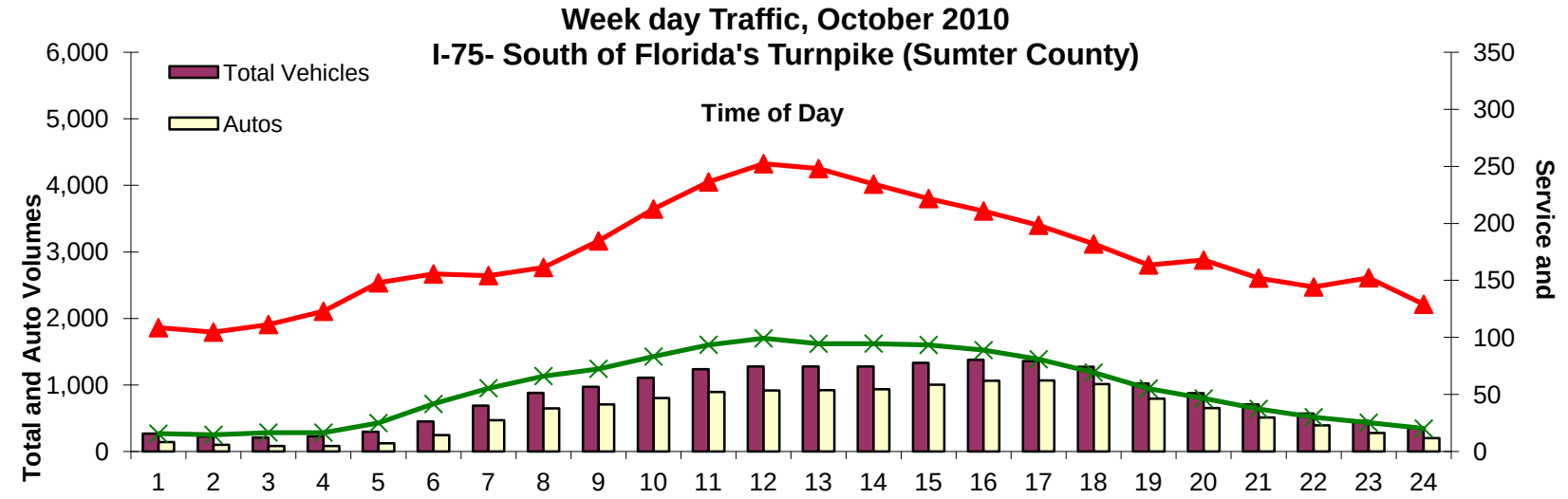
Two Sites

- Site 729905 - SR9/I-95, 2 Mi South of I-295 S interchange (Duval County)
  - Facility Type – Urban Interstate
  - Number of Lanes – 6
  - Area Type - Urban
- Site 189920 – SR93/I-75, 3.5 Mi South of Florida's Turnpike (Sumter County)
  - Facility Type – Rural Interstate
  - Number of Lanes – 4
  - Area Type - Rural

Traffic Count - Vehicular Classification





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Truck Probe Data

- American Transportation Research Institute (ATRI)
  - Unique Access to Trucking Industry Data
    - Massive Truck GPS Database
- Customized Processing System/Methods for Producing Freight Performance Measures
  - Multiple Industry Data Sources
  - 7+ Years of Continuous Data
  - Billions of Unique Truck Positions Received & Processed Annually
  - Several Hundred Thousand Individual Trucks in the Population

ATRI's Data Within Florida

- The ATRI database contains continuous data in the State of Florida from 2005 through the most recent month of 2012.
- At a minimum each record within the database contains the following information:
  - Unit Information: A unique identifier for the transponder/truck.
  - Geographic Information: The latitude and longitude data that identify where a truck position record was recorded.
  - Temporal Information: The time at which a truck position record was recorded, in the following format - MM-DD-YYYY HH:MM:SS.

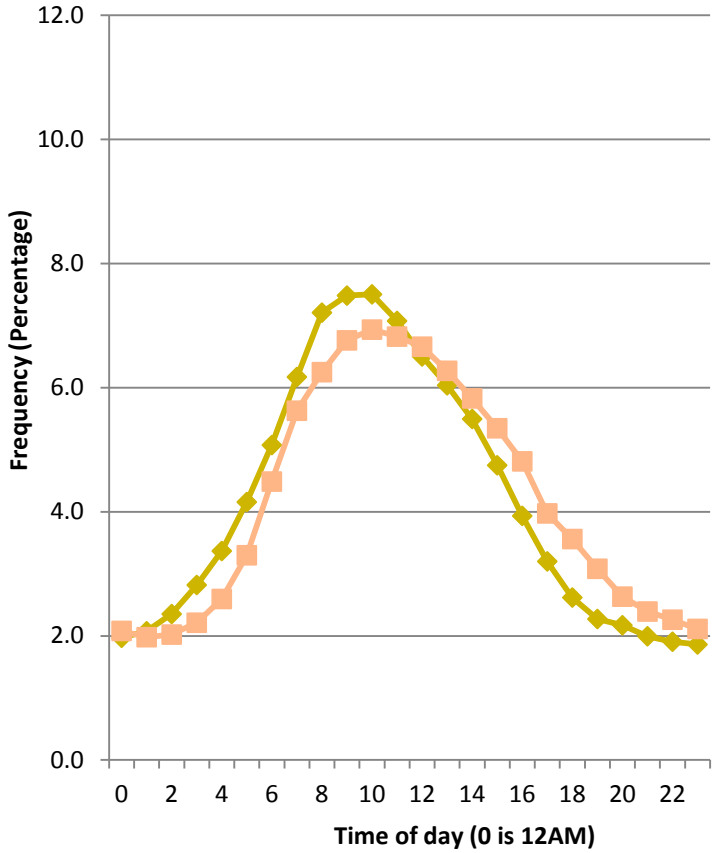
* Additionally, approximately half of the records currently contain information such as spot speed and heading.

Applications of ATRI's Data

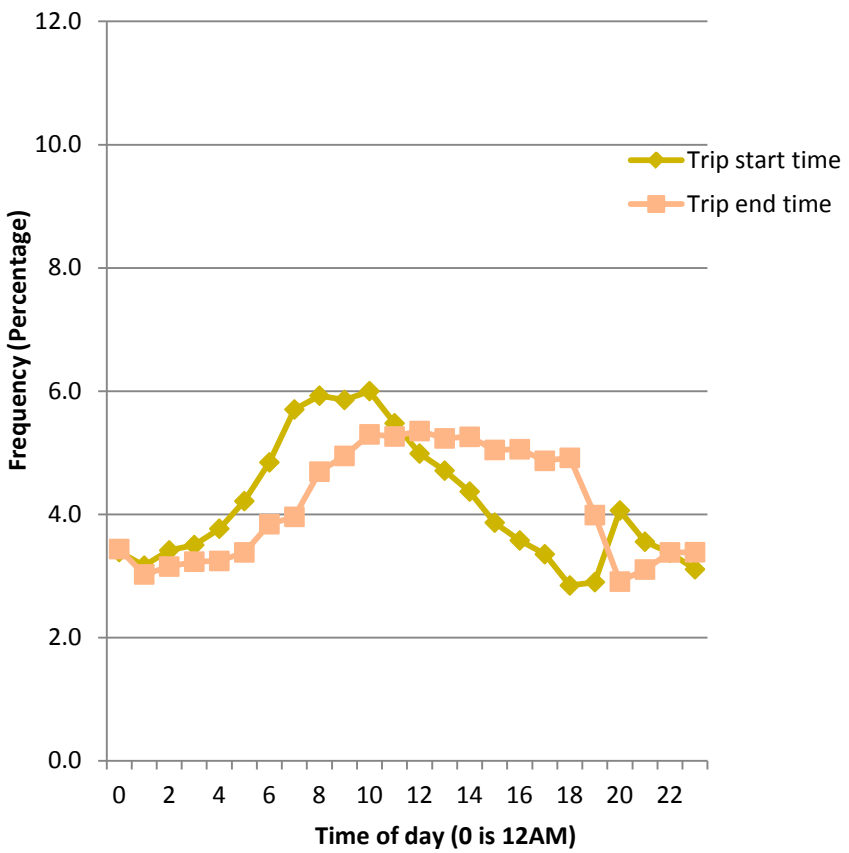
- **Performance Measurement**
  - Average Highway Speeds and Travel Times
  - Reliability Measurements
  - Analysis of Chokepoints/Bottlenecks
- **Travel Time/Route Planning**
  - Addresses short term congestion issues
  - Real time and historic data
    - Allows for quick fixes
- **Truck Flow Analysis**
- **Origin and Destination – Trip (length, duration), TOD & TOW**

Time-of-day Profile of Trips Derived from 4 weeks of ATRI Data

Weekdays (all data, all trips)



Weekend (all data, all trips)



(one week in each of the following months: April, May, June, July 2010)

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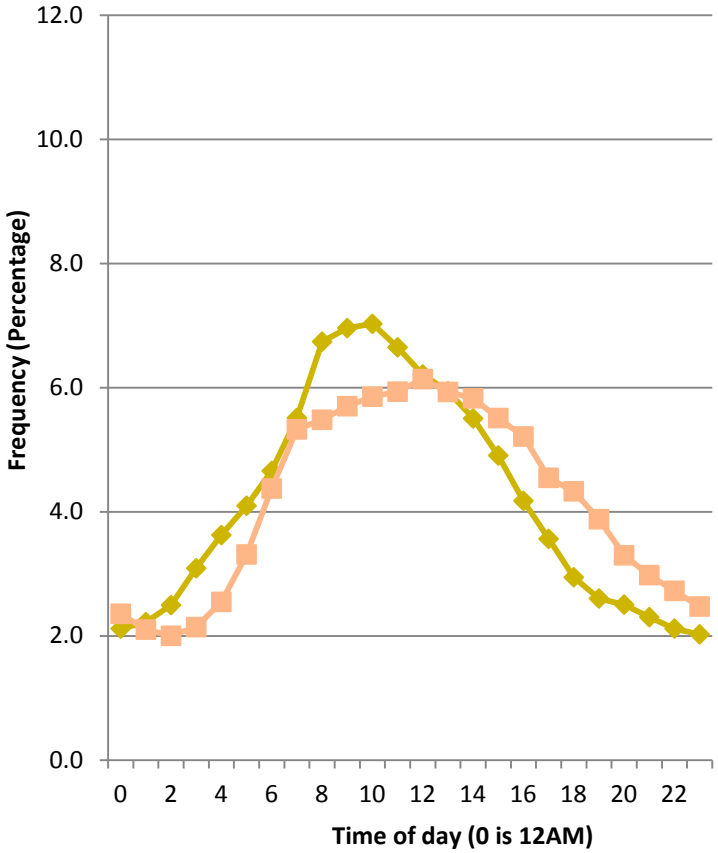
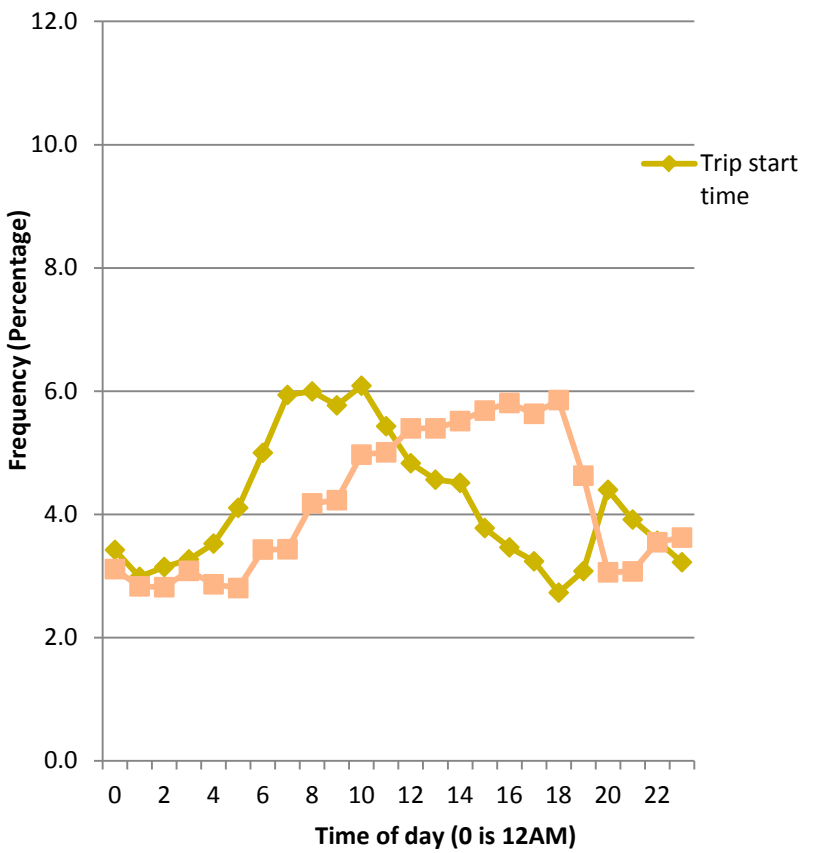
Time-of-day Profile of Trips Derived from 4 weeks of ATRI Data

Weekdays (all data, trips > 50 miles)

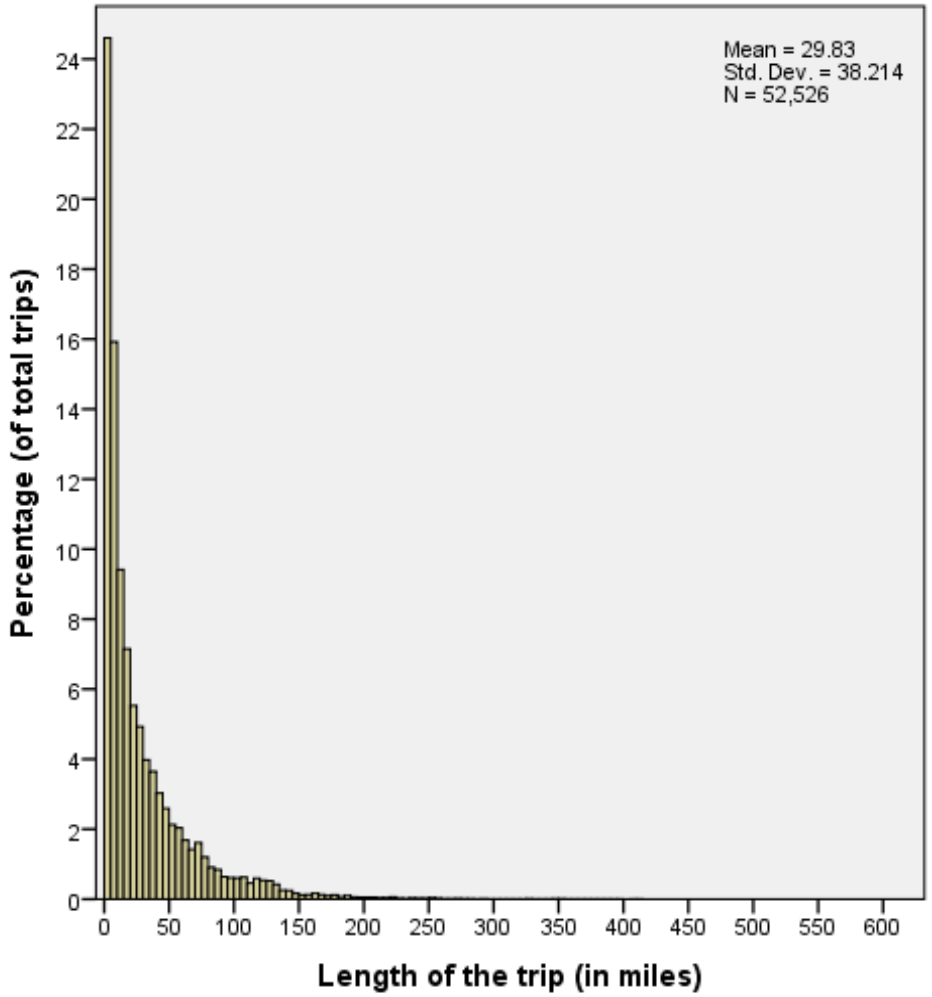


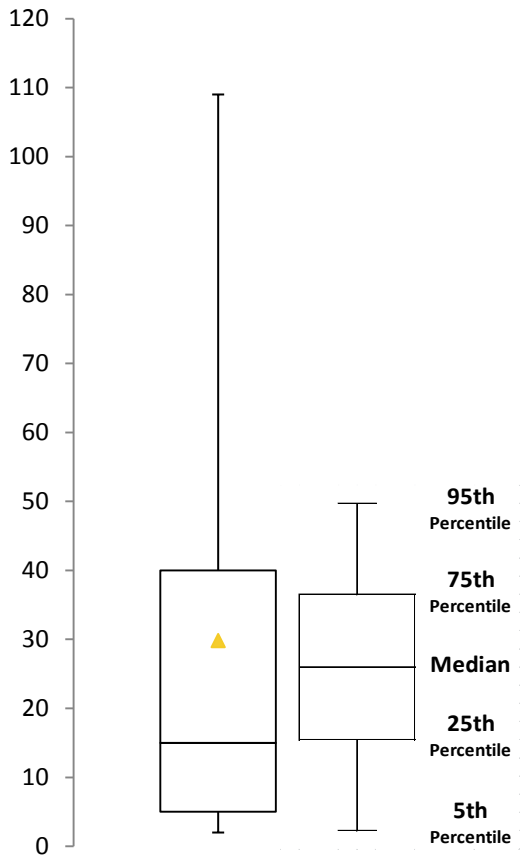
Weekend (all data, trips > 50 miles)



Note: The weekend data shows a hike (dip) after

Trips Extracted from ATRI data within Florida: Trip Length Distribution





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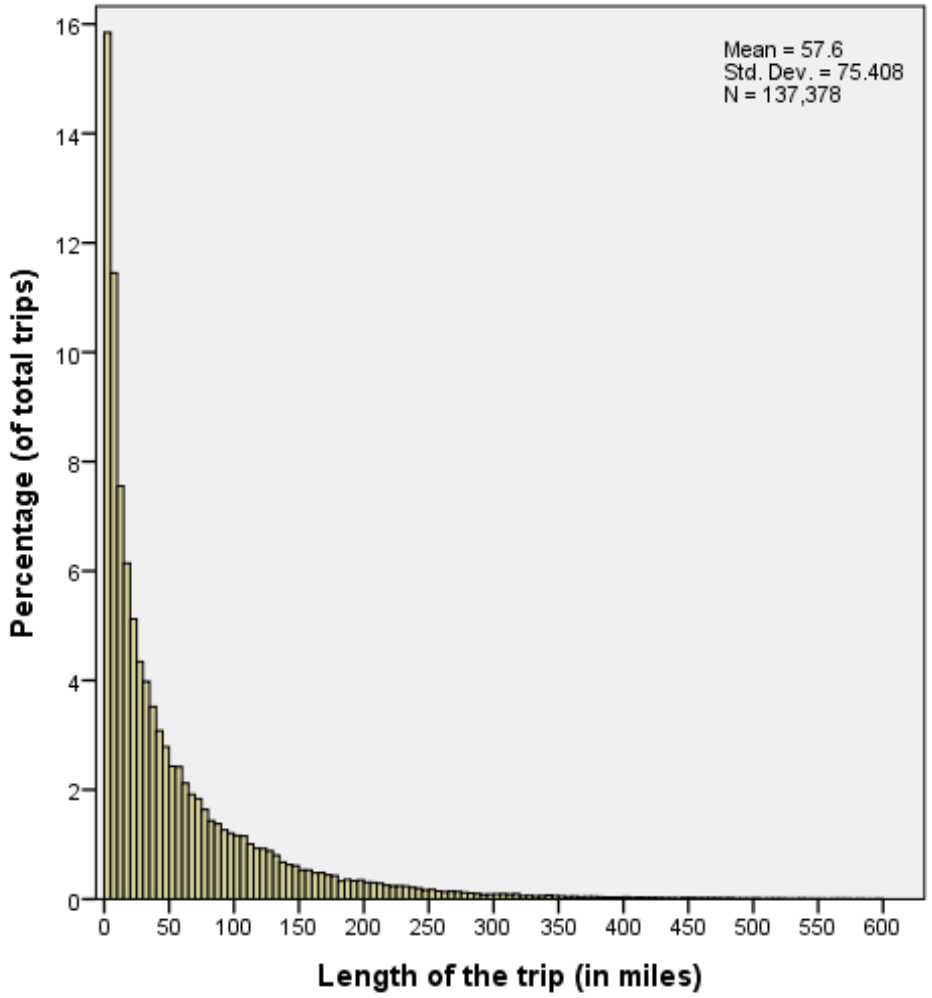
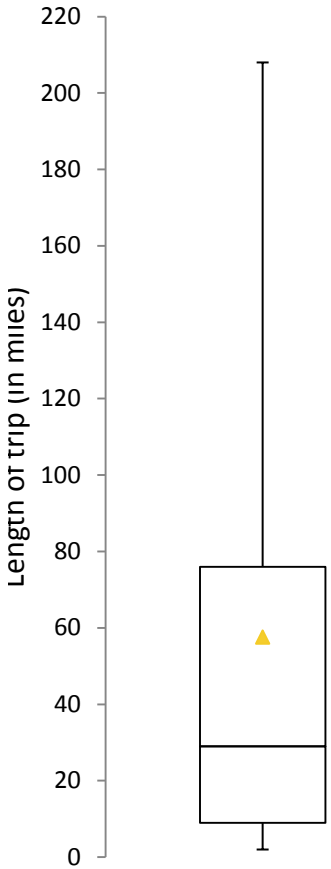
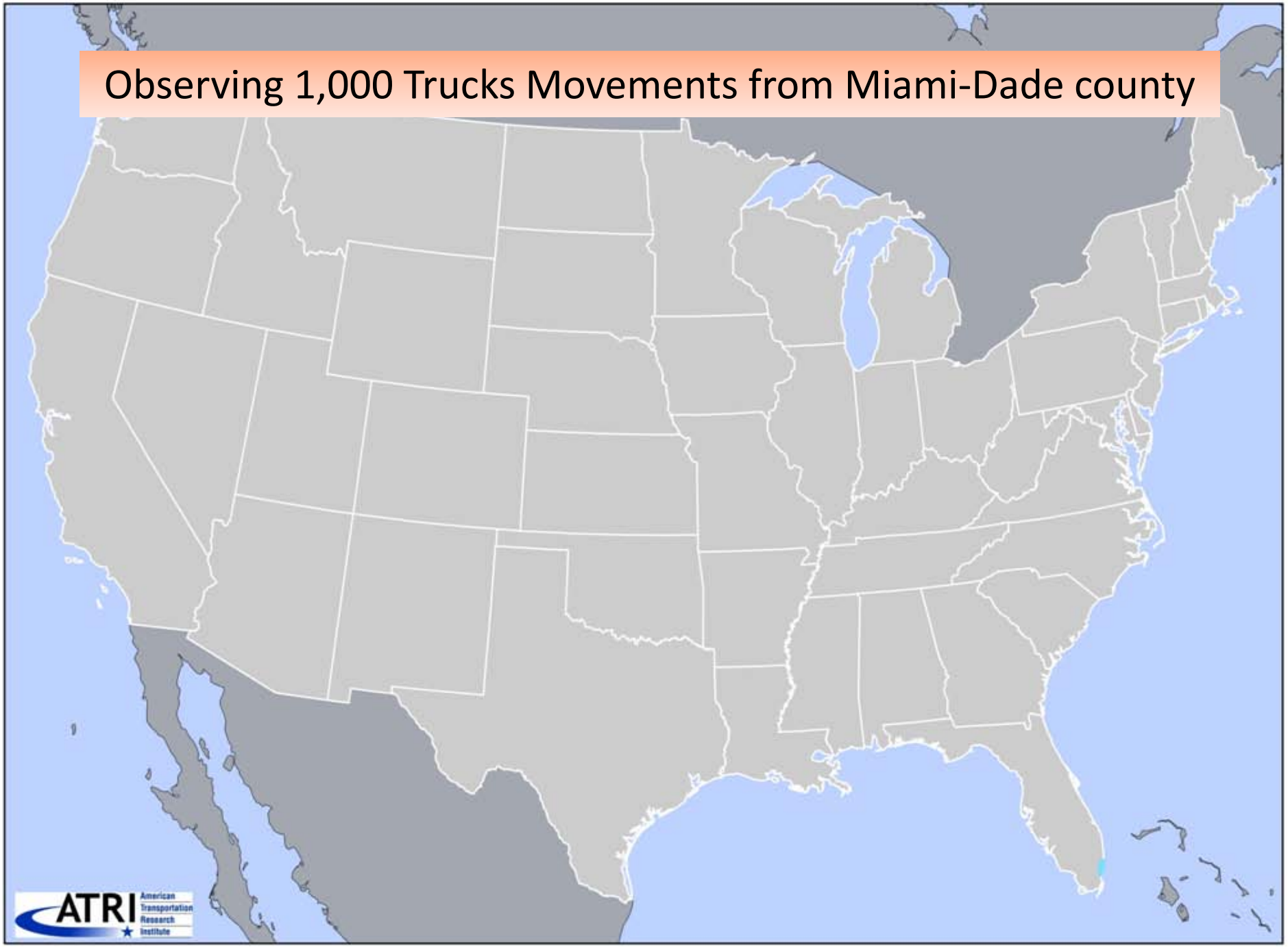
Trips Extracted from ATRI data within & outside Florida: Trip Length Distribution

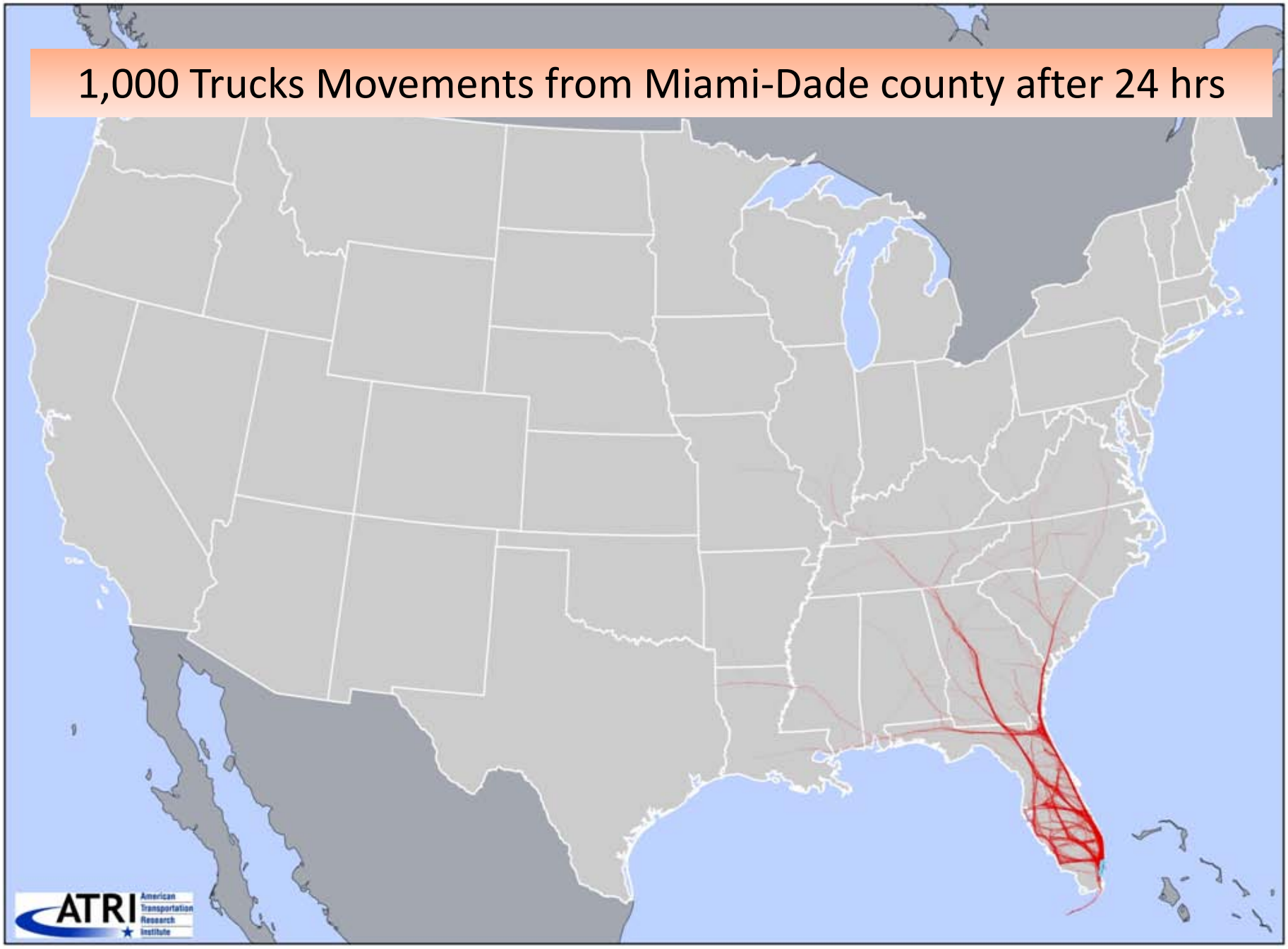




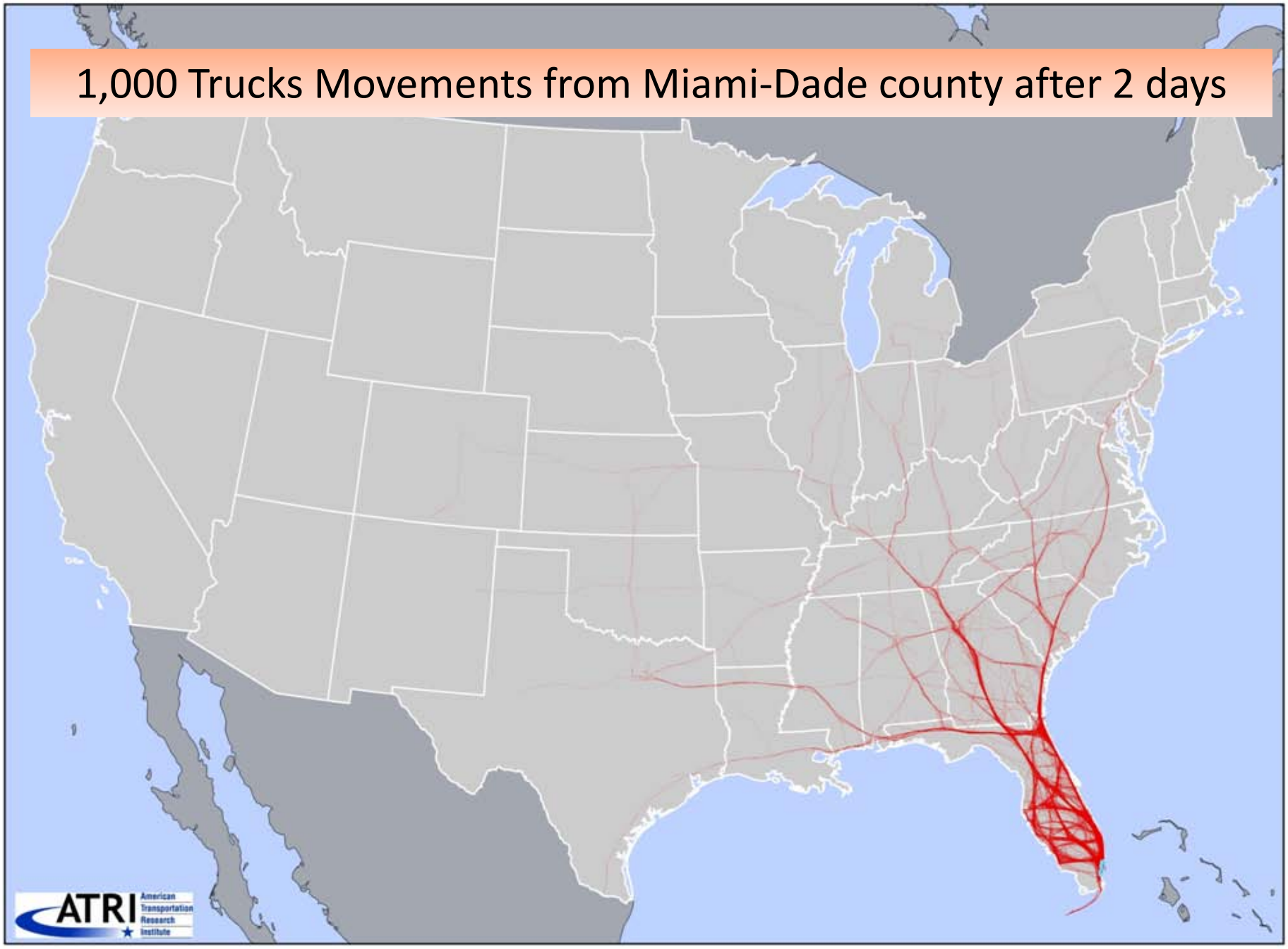
Observing 1,000 Trucks Movements from Miami-Dade county



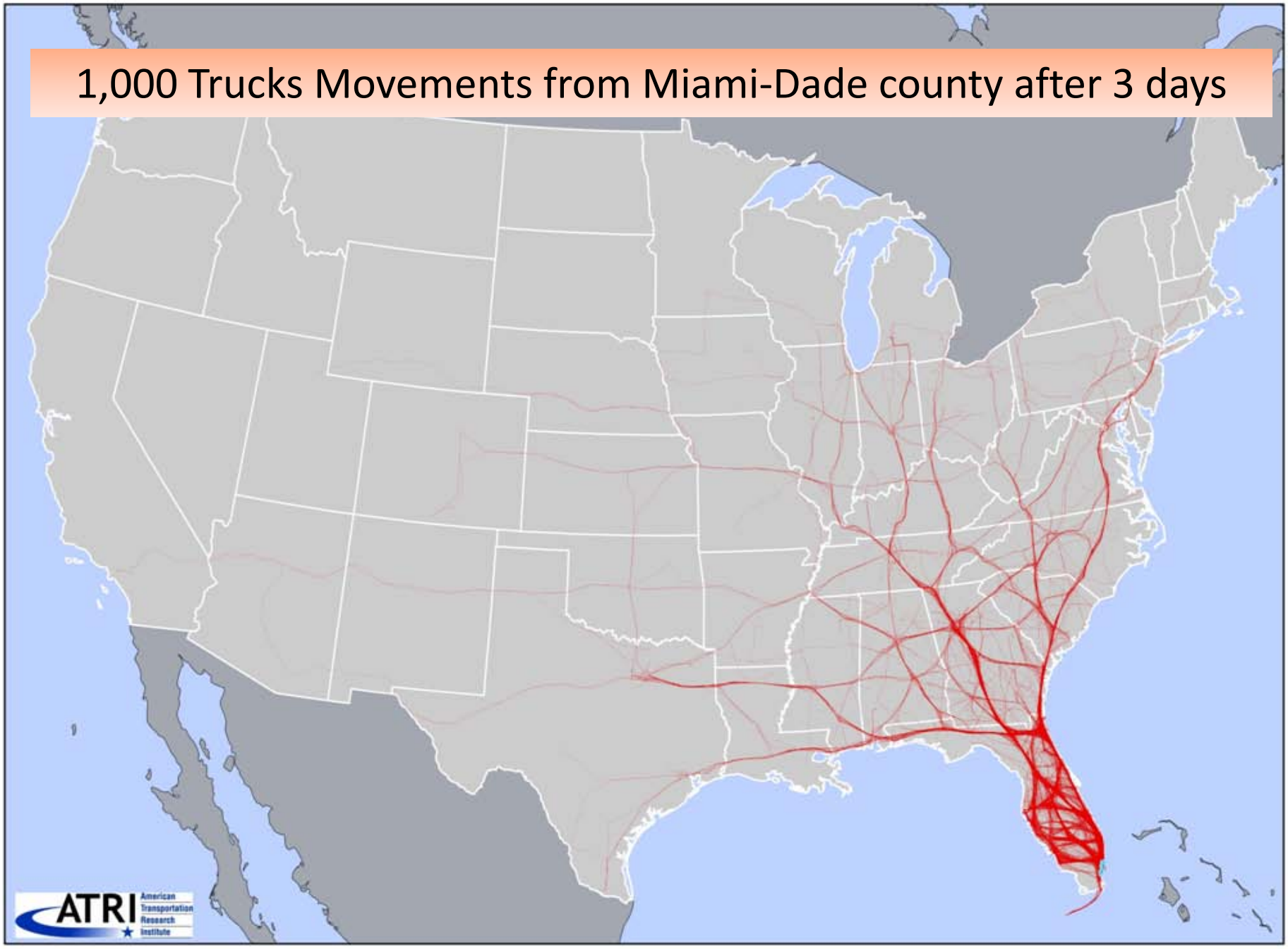
1,000 Trucks Movements from Miami-Dade county after 24 hrs



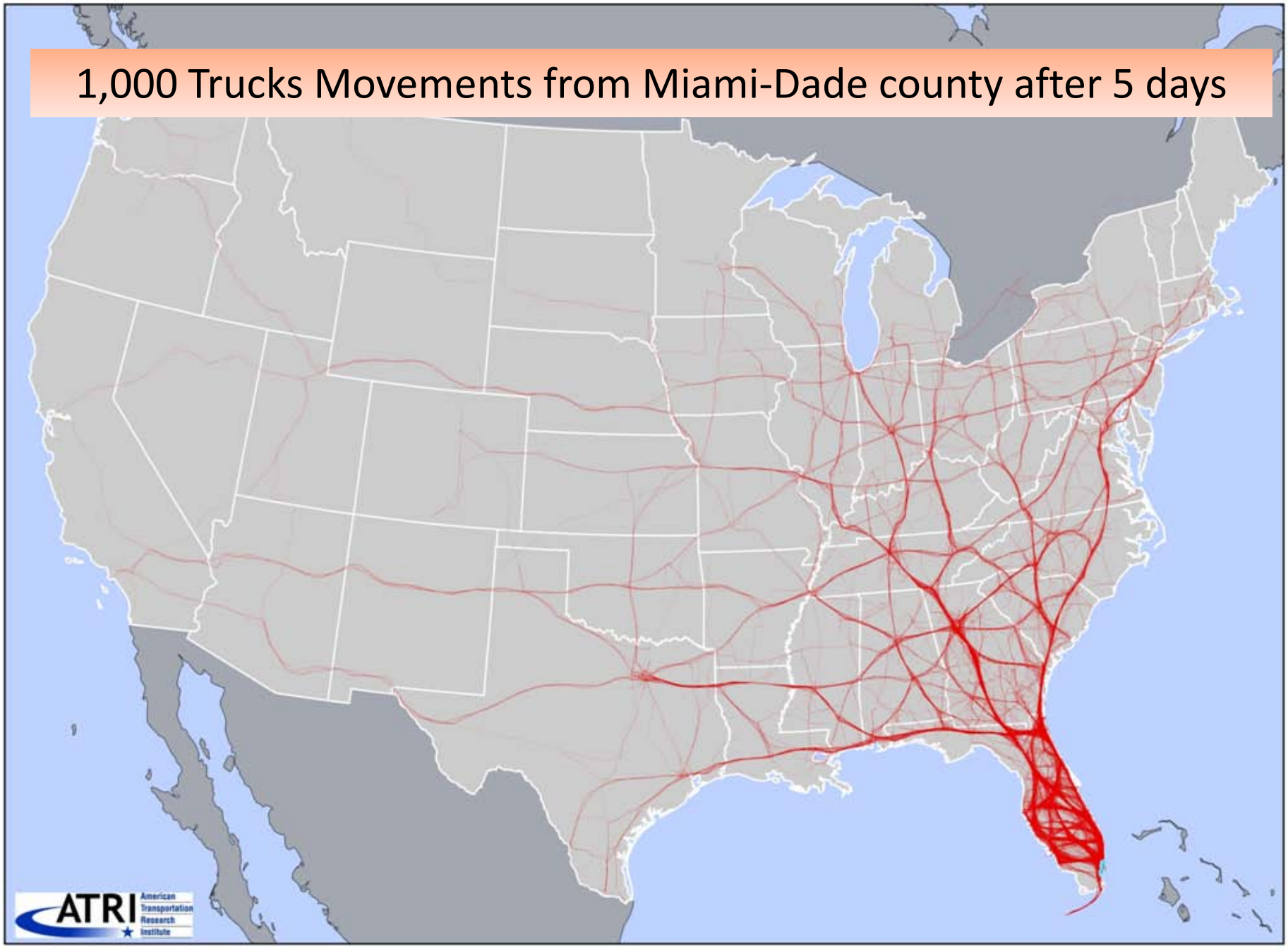
1,000 Trucks Movements from Miami-Dade county after 2 days



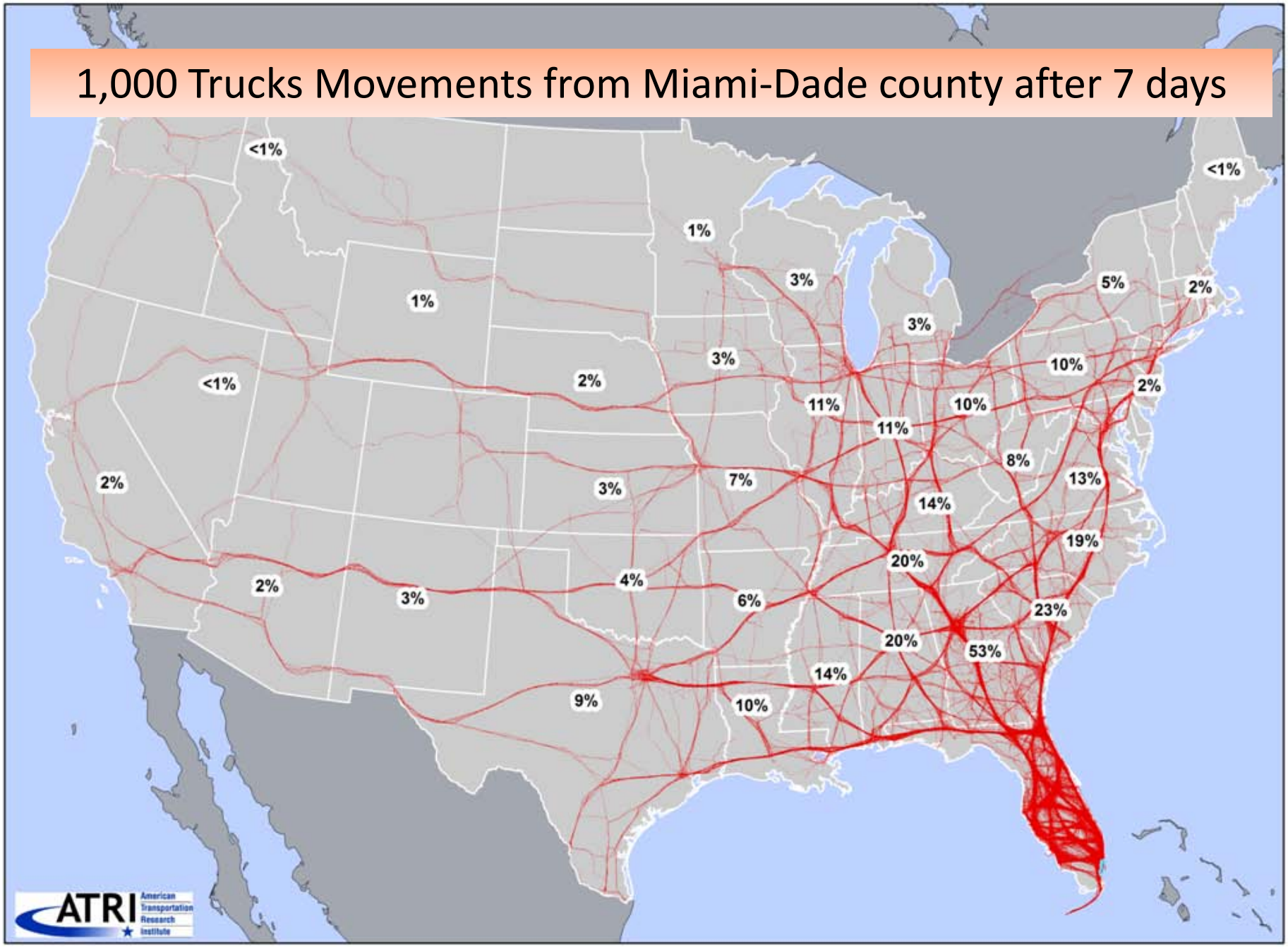
1,000 Trucks Movements from Miami-Dade county after 3 days

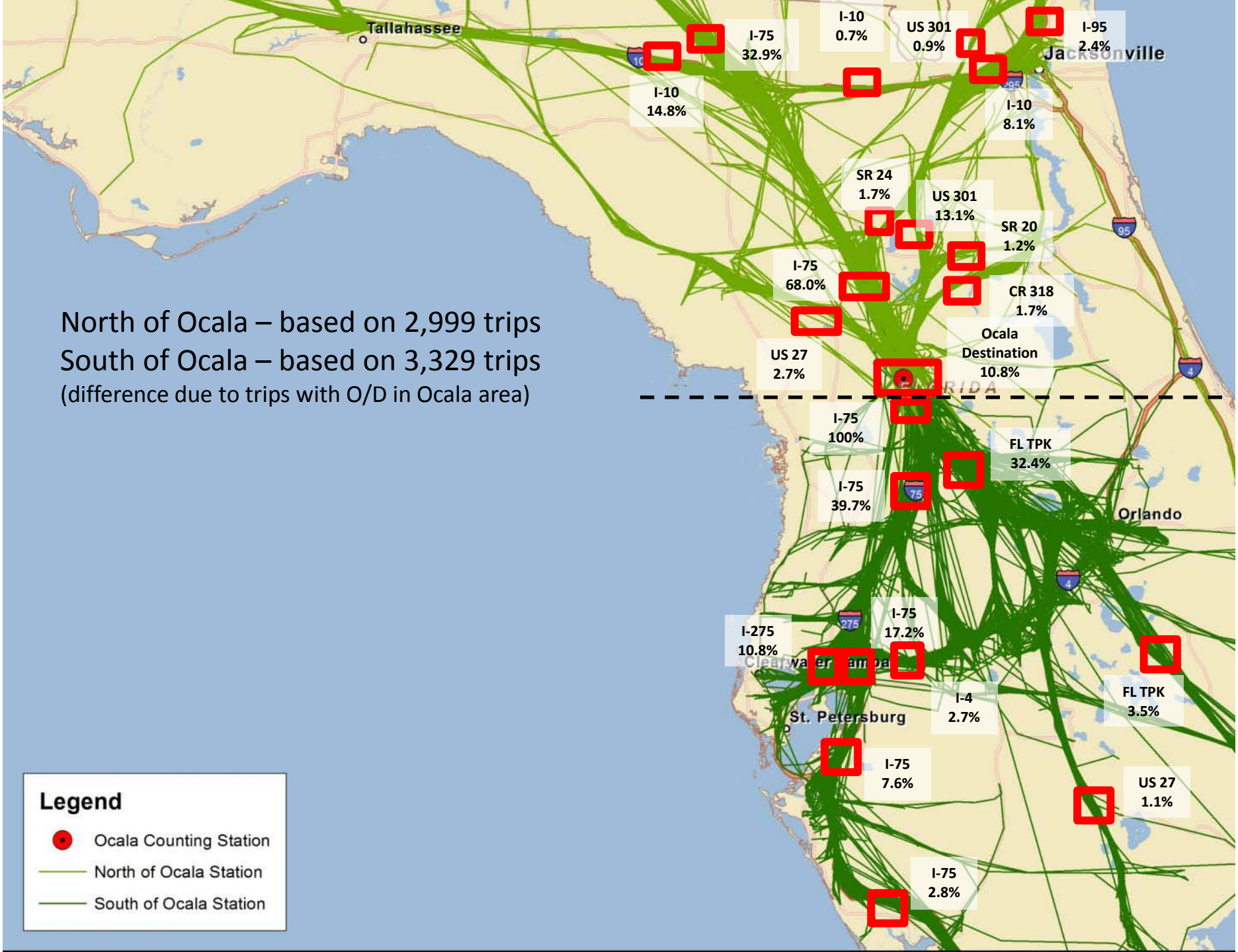


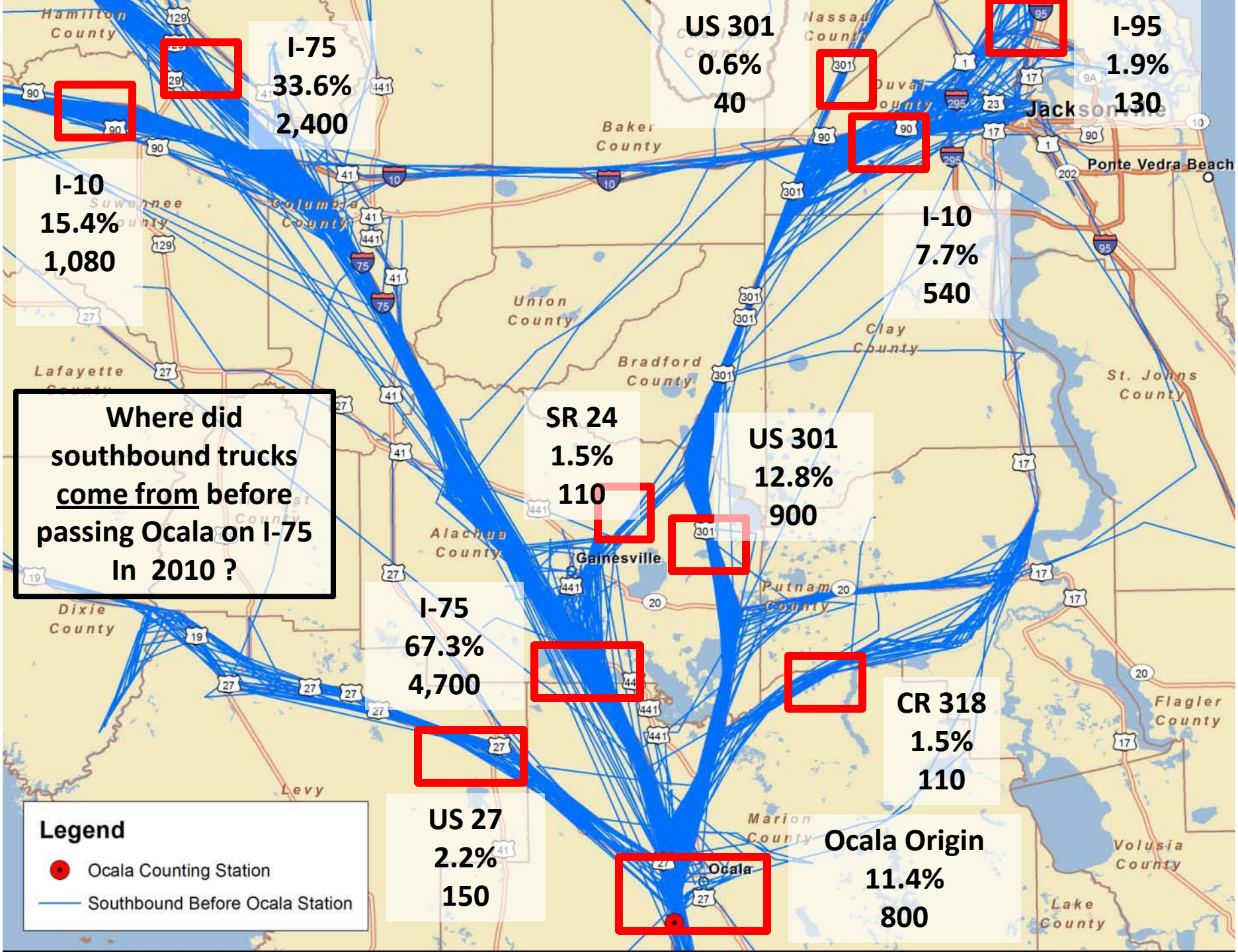
1,000 Trucks Movements from Miami-Dade county after 5 days

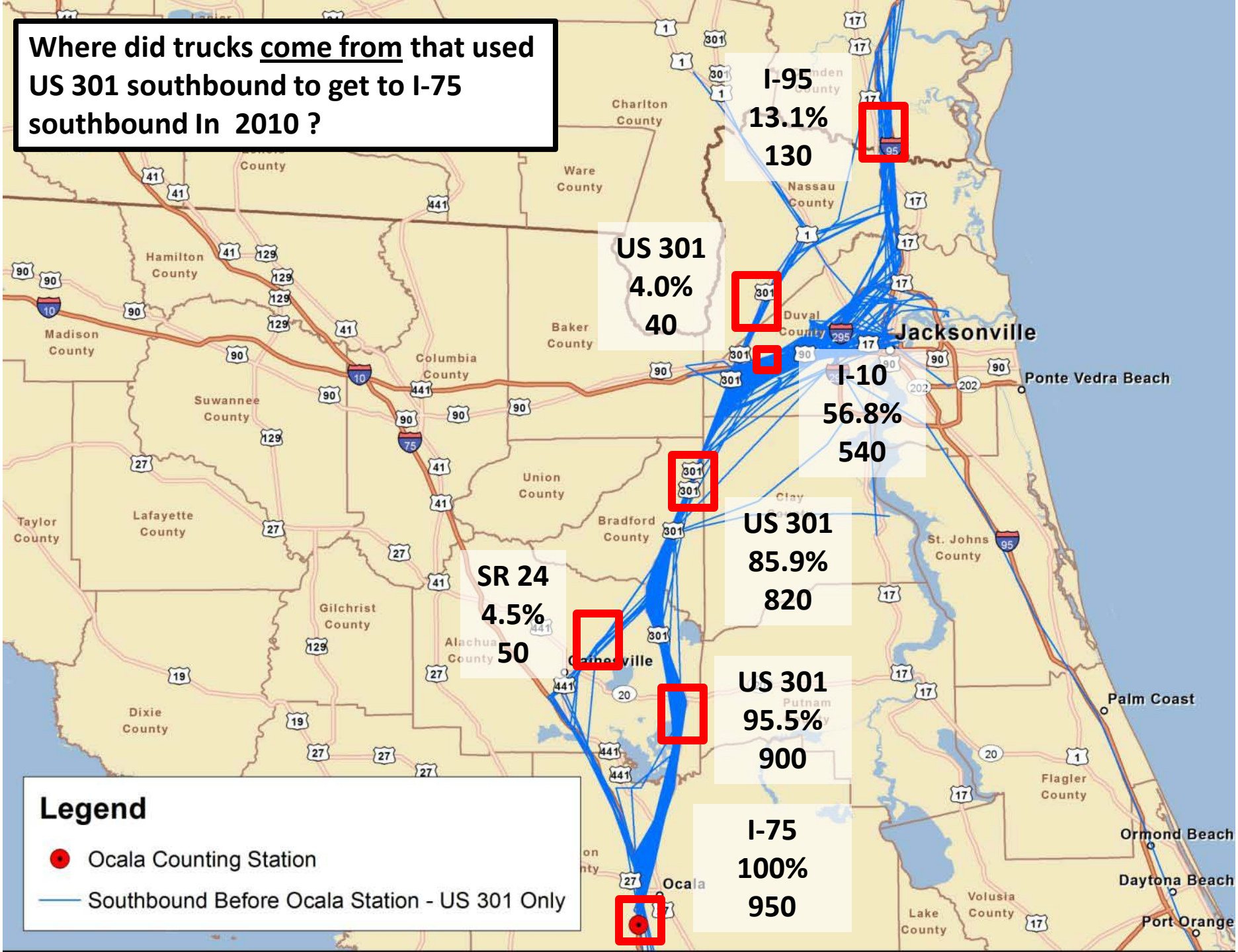


1,000 Trucks Movements from Miami-Dade county after 7 days




Tallahassee
Jacksonville
Orlando
St. Petersburg
I-10
14.8%
I-75
32.9%
I-10
0.7%
US 301
0.9%
I-95
2.4%
I-10
8.1%
SR 24
1.7%
US 301
13.1%
SR 20
1.2%
I-75
68.0%
CR 318
1.7%
Ocala
Destination
10.8%
US 27
2.7%
I-75
100%
FL TPK
32.4%
I-75
39.7%
I-275
10.8%
I-75
17.2%
I-4
2.7%
FL TPK
3.5%
I-75
7.6%
US 27
1.1%
I-75
2.8%
North of Ocala – based on 2,999 trips
South of Ocala – based on 3,329 trips
(difference due to trips with O/D in Ocala area)
Legend
Ocala Counting Station
North of Ocala Station
South of Ocala Station


Where did southbound trucks come from before passing Ocala on I-75 In 2010 ?
I-10
15.4%
1,080
I-75
33.6%
2,400
US 301
0.6%
40
I-95
1.9%
130
I-10
7.7%
540
SR 24
1.5%
110
US 301
12.8%
900
I-75
67.3%
4,700
CR 318
1.5%
110
US 27
2.2%
150
Ocala Origin
11.4%
800
Legend
Ocala Counting Station
Southbound Before Ocala Station
Gainesville
Ocala
Jacksonville
Ponte Vedra Beach
Hamilton County
Columbia County
Baker County
Union County
Bradford County
Clay County
Alachua County
Putnam County
St. Johns County
Flagler County
Volusia County
Lake County
Marion County
Levy
Dixie County
Lafayette


Where did trucks come from that used US 301 southbound to get to I-75 southbound In 2010 ?
I-95
13.1%
130
US 301
4.0%
40
I-10
56.8%
540
US 301
85.9%
820
SR 24
4.5%
50
US 301
95.5%
900
I-75
100%
950
Jacksonville
Ponte Vedra Beach
Palm Coast
Ormond Beach
Daytona Beach
Port Orange
Ocala
Charlton County
Ware County
Nassau County
Hamilton County
Madison County
Baker County
Duval County
Columbia County
Suwannee County
Union County
Bradford County
Clay
St. Johns County
Taylor County
Lafayette County
Gilchrist County
Dixie County
Flagler County
Volusia County
Lake County
Legend
Ocala Counting Station
Southbound Before Ocala Station - US 301 Only

Commodity Flow Data

- Transearch
  - Most up to date commodity flow data available
  - Available at county and sub county geographies
  - FDOT procuring Transearch data
  - Will be used in the model
    - Disaggregated down to TAZ level
  - Commodities classified as STCC
- PIERS (seaport) & Waybill (rail) data
- Shared with FDOT offices and Florida MPOs

FDOT Freight Model Use

- Support freight plan development
- Evaluate potential large scale infrastructure investments
- Provide inputs to more detailed project level evaluations
- Provide inputs to regional transportation planning

Thank you

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