

# Logistics Challenges to Support Increased Biofuels Usage

Presentation To The

## Center for Strategic and International Studies Alternative Fuels Briefing Series

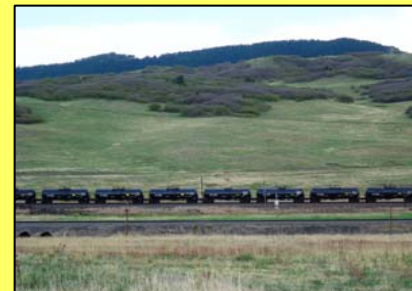


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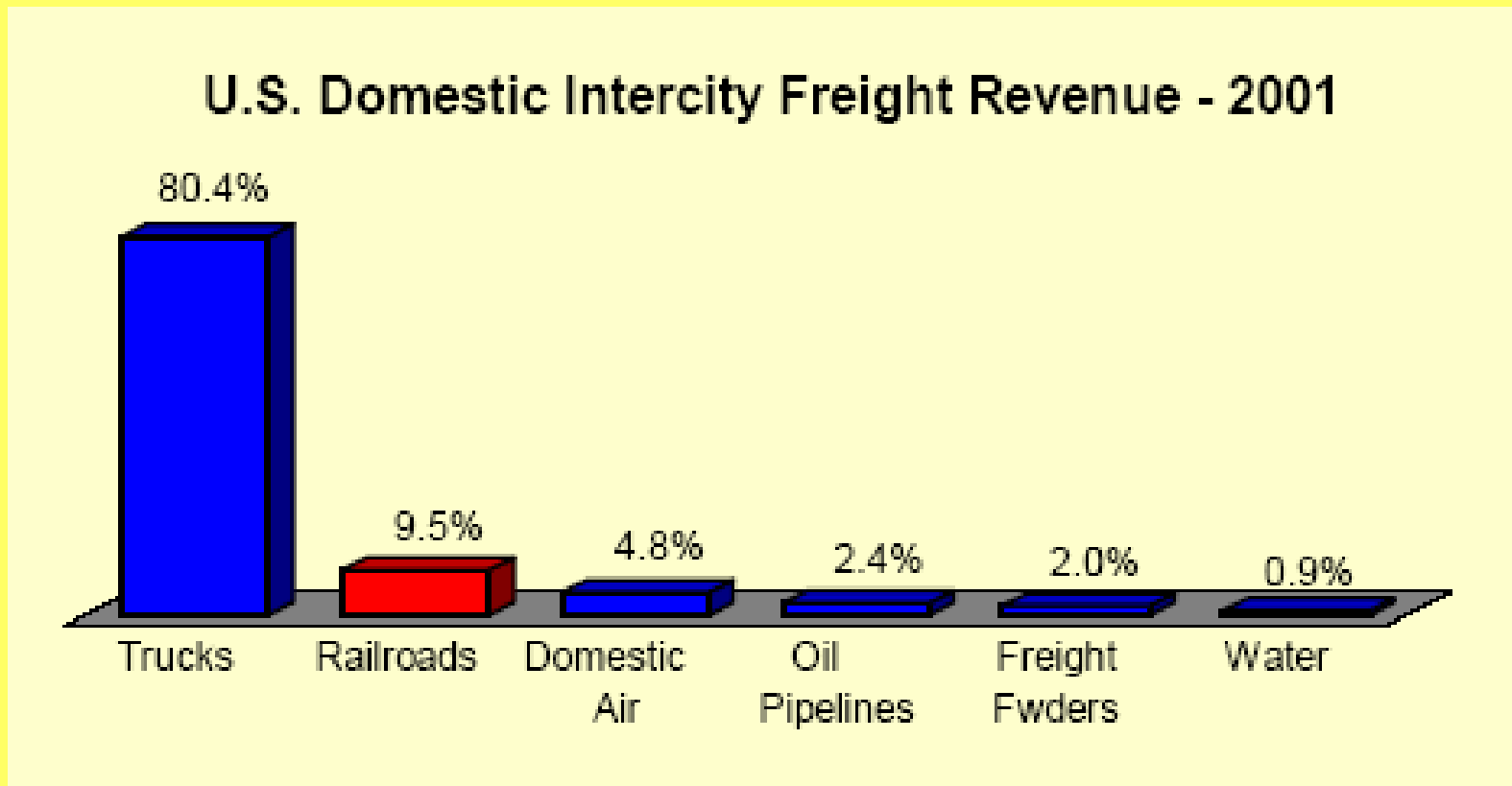


May 17, 2007

# **Key Messages:**

- **The Capacity of All Freight Transportation Options Is Becoming Severely Constrained and Will Only Get Worse**
- **Dramatic Increases in Domestically Produced Biofuels Will Increase Demands on Already “Constrained” Transportation Infrastructure**
- **New Solutions/Approaches Should Be Evaluated**

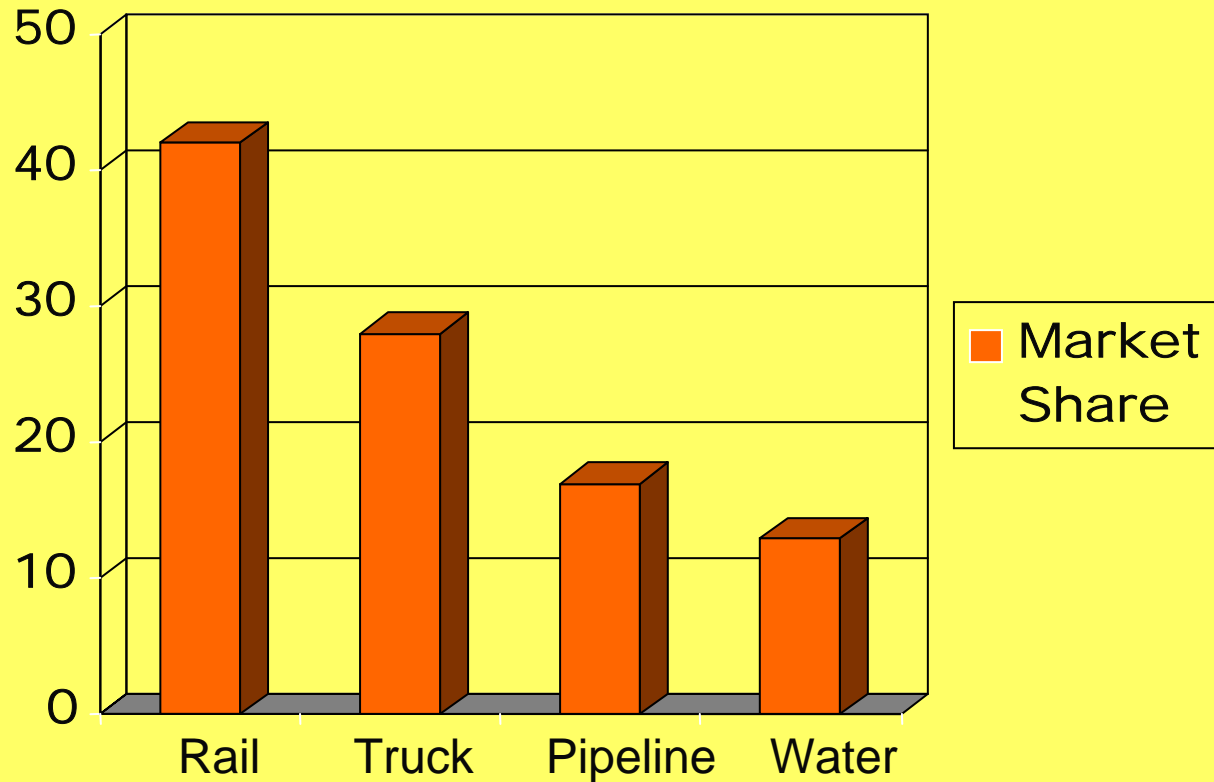
# Modal Market Shares of Intercity Freight Revenue (%)



Source: Class I Railroad Statistics, Association of American Railroads, 2006.

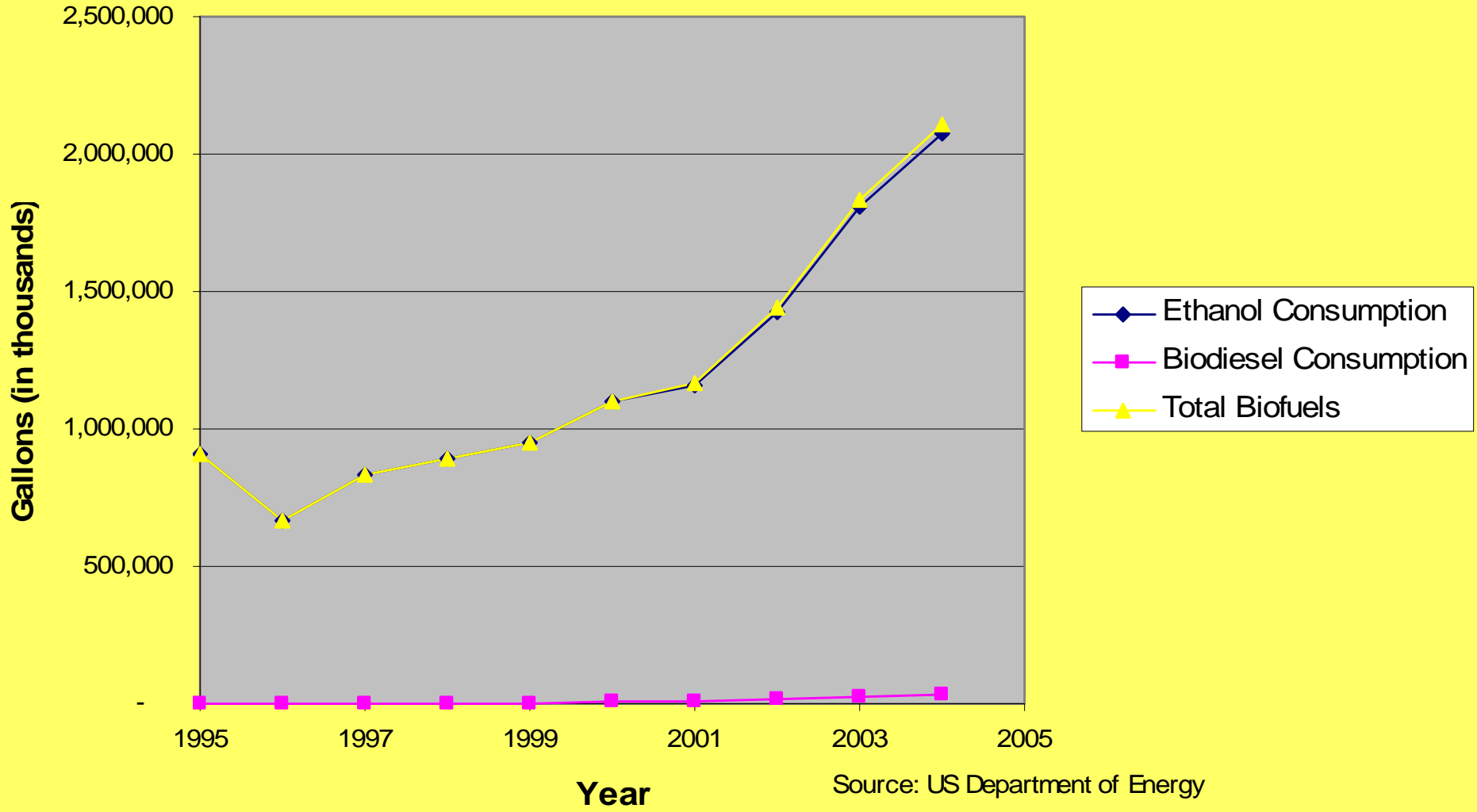
# Modal Market Shares of Intercity Ton-Miles (%)

2001



Source: AAR overview of U.S. Freight Railroads.

# US Total Biofuels Consumption

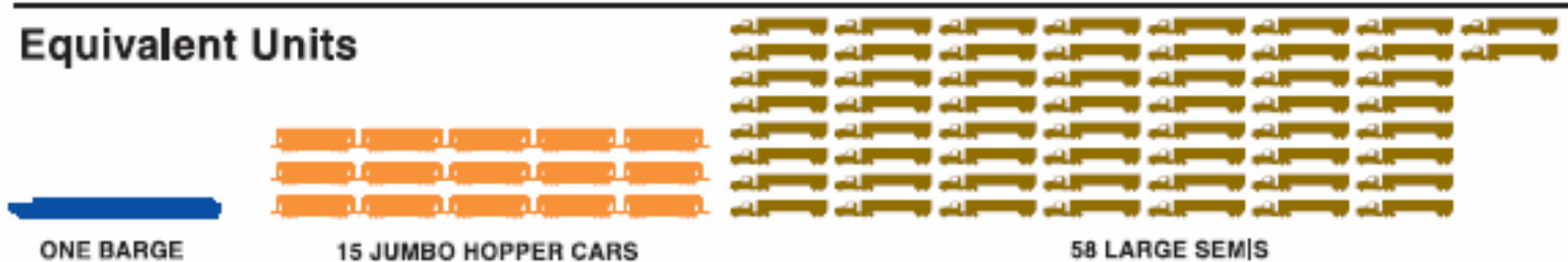


# Mode Choice Matters...

## Cargo Capacity



## Equivalent Units



## Equivalent Lengths



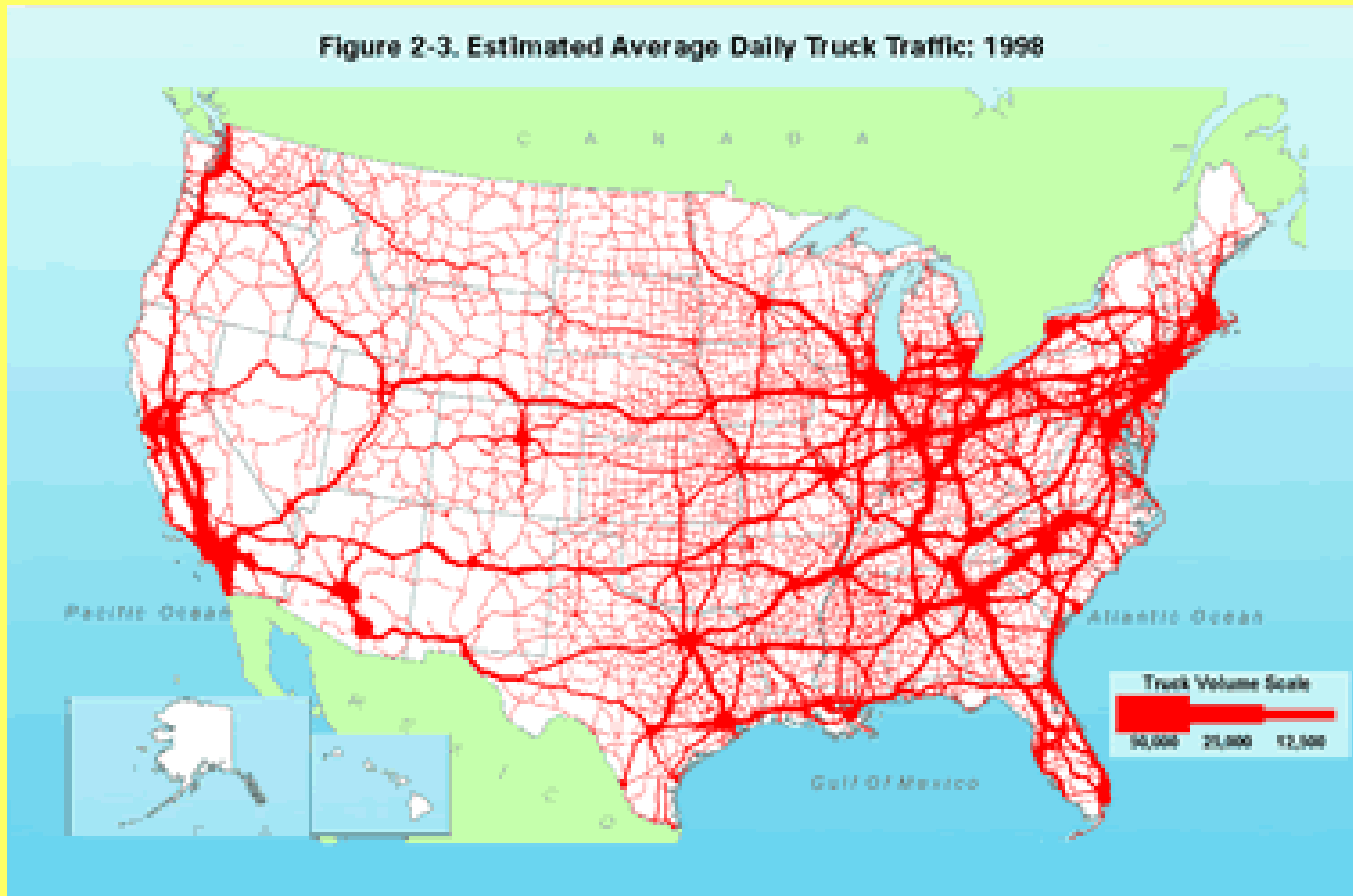
# Transportation Options Metrics

Mode	Rates	Lead Time	Reliability	Accessibility
<b><u>Truck</u></b>	High	<b>Lowest</b>	High	<b>High</b>
<b><u>Rail</u></b>	Medium	Medium	Medium	Medium
<b><u>Barge</u></b>	<b>Low</b>	High	High	Low
<b><u>Pipeline</u></b>	Medium	Low	<b>Highest</b>	Lowest

# Motor Carrier Challenges

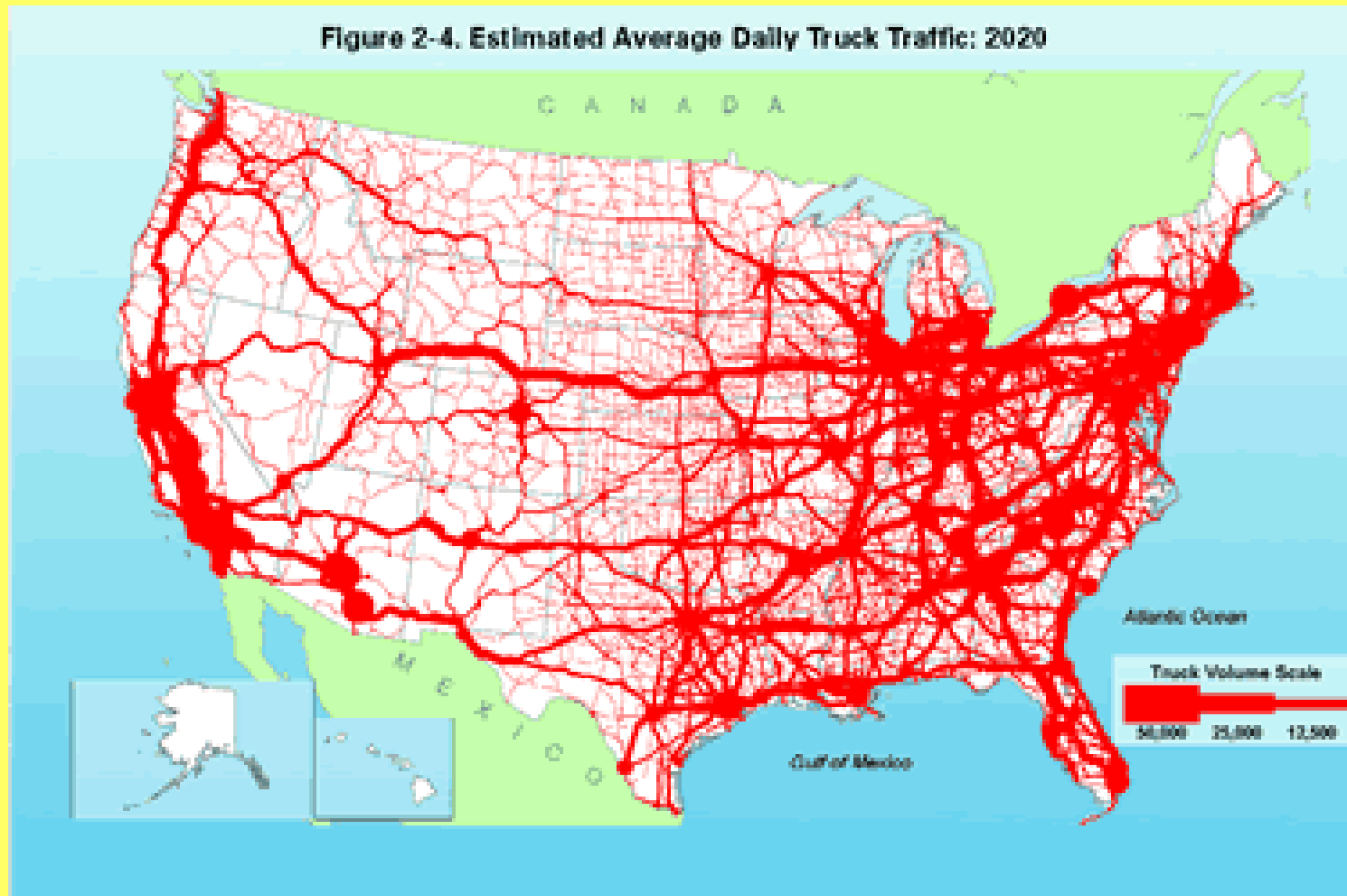
- **Fuel Prices**
- **Driver Shortage/Recruitment**
- **Hours of Service**
  - **11 Hours Over in any 14 Hour Window with 10 Consecutive Hours Off (Before and After)**
- **Road Congestion**

# Truck Movements – 1998...

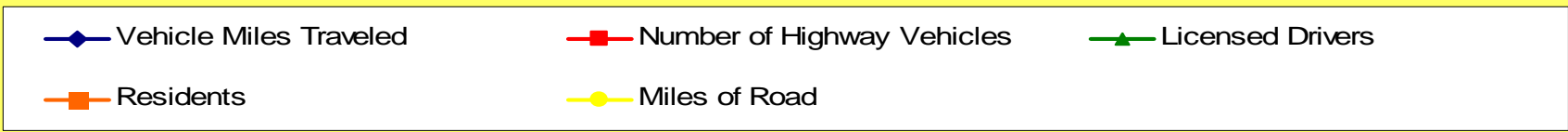
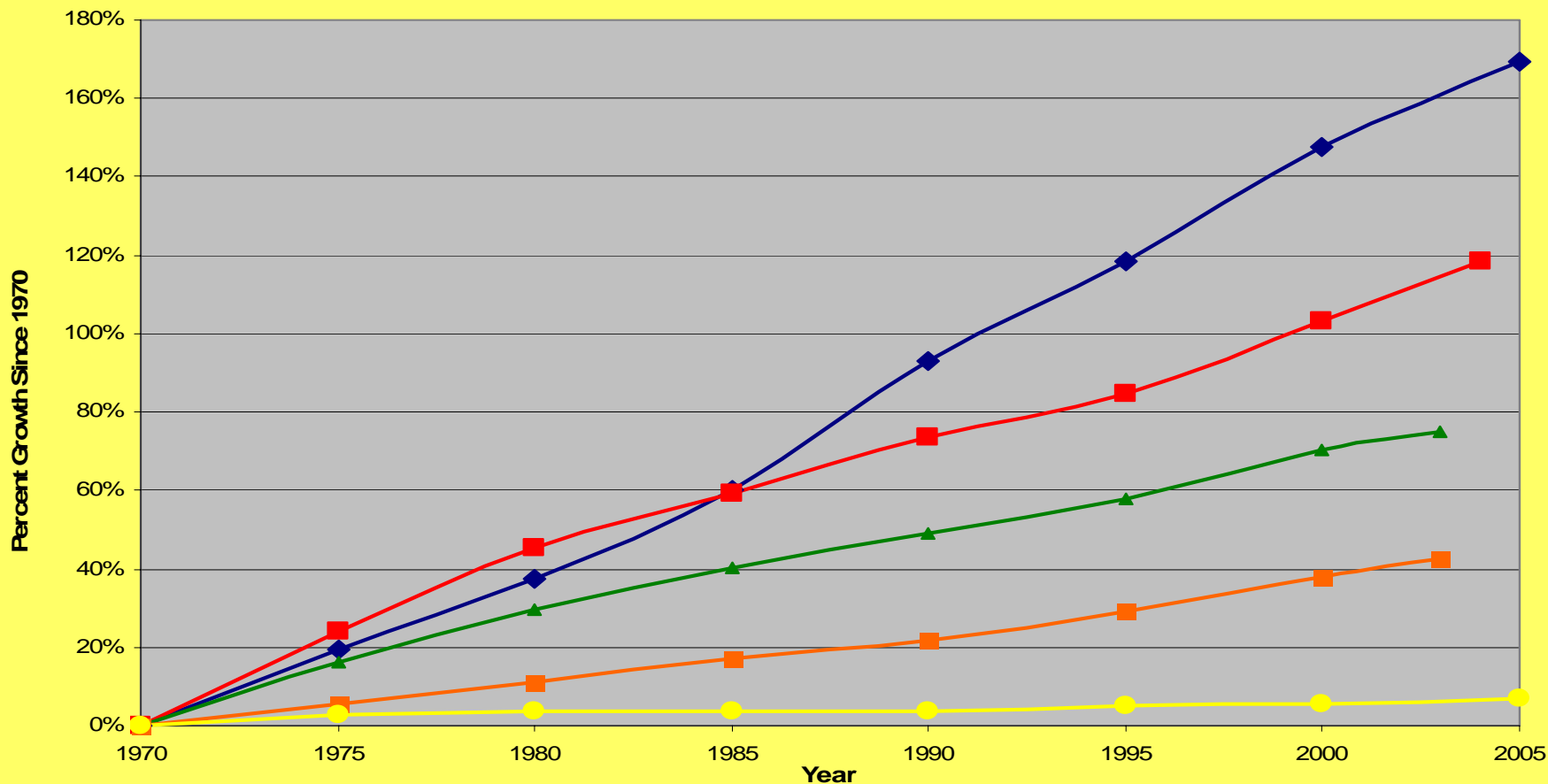


Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework.

# Truck Movements - 2020



# National Gridlock Ahead...



Sources: U.S. Department of Transportation FHWA & Bureau of Transportation Statistics.

*...12,000 miles of waterways linking  
America's heartland to the world....*



Source: <http://www.enginesys.com/ir/financial.cfm>

# Barge Transportation

## Inland Waterways

- **Not Many Miles and No Supply Side Growth**
  - **Navigable Channels**
    - 11,000 Miles since 1980
  - **Great Lakes-St. Lawrence Seaway**
    - 2,342 Miles since 1980
- **Supply Negatively Impacted by Katrina**
  - 400 Barges Destroyed or Damaged

Navigable channels: U.S. Army Corps of Engineers.

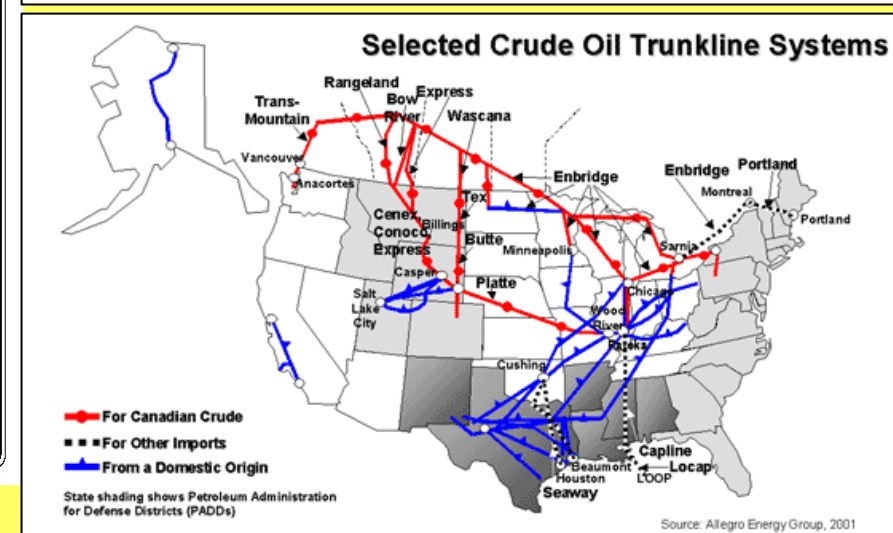
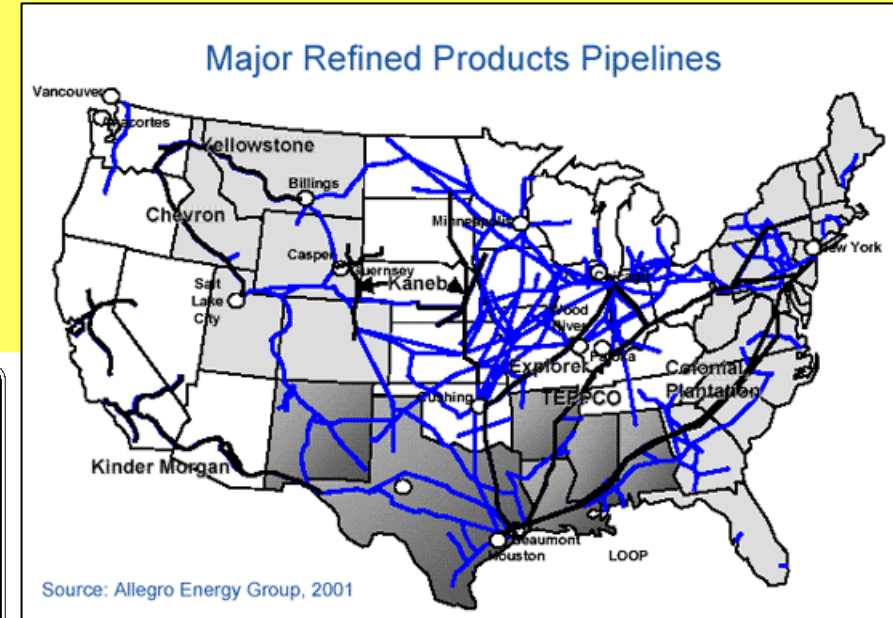
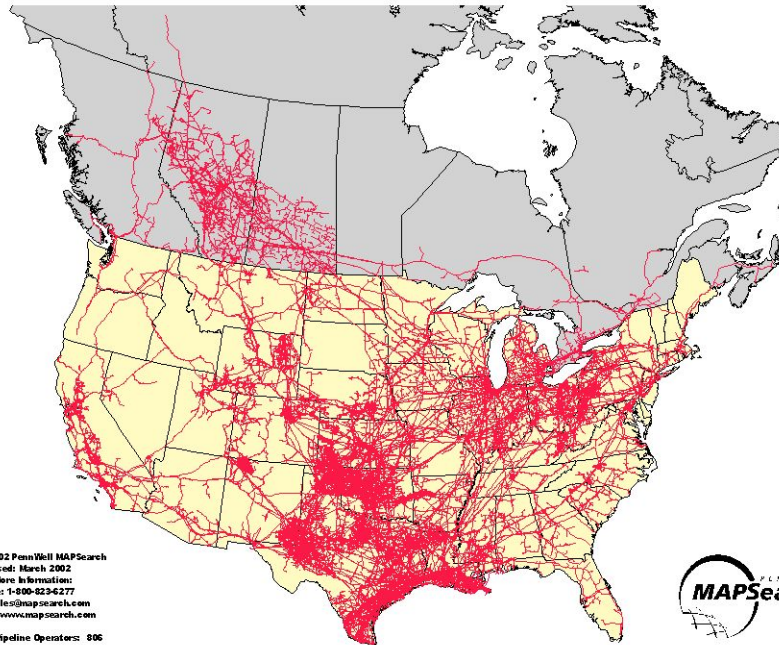
Great Lakes-St. Lawrence Seaway: Great Lakes-St. Lawrence Seaway System, "Seaway Facts," available at <http://www.greatlakes-seaway.com/en/aboutus/seawayfacts.html> as of May 11, 2004.

CRS Report for Congress, U.S. Agriculture After Hurricanes Katrina and Rita: Status and Issues, October 5, 2005.

# Oil, Gas and Refined Product Pipelines

**Networks Are Extensive ...But**

**PennWell MAPSearch Pipeline Coverage - All Commodities**



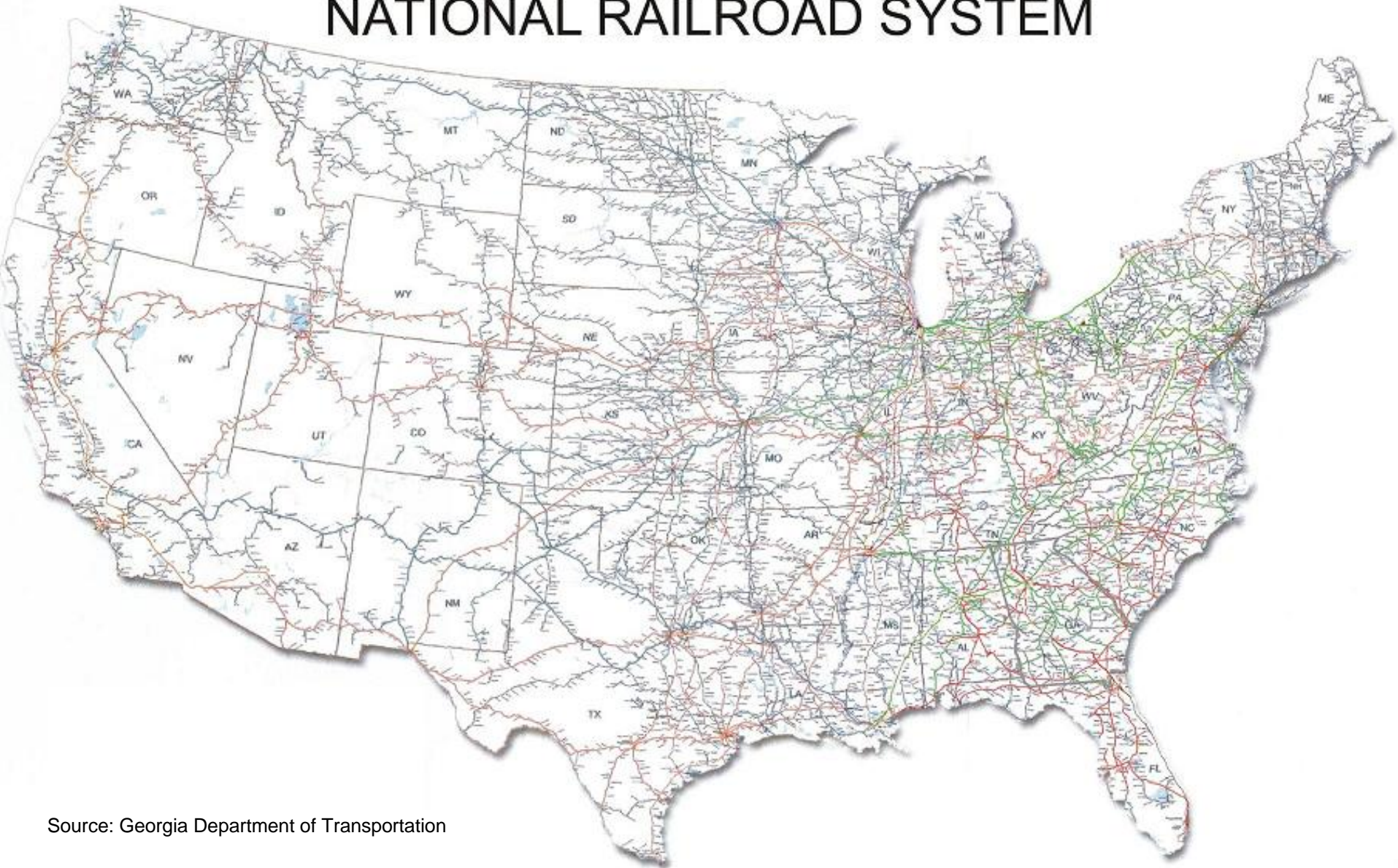
# Pipeline Infrastructure: Not Consistently Growing

- **Miles of Gas Pipelines:**
  - 1,051,774 Miles (1980)
  - 1,424,200 Miles (2003)
  - Percent Change = 35.4% Increase
- **Miles of Oil Pipelines:**
  - 218,393 (1980)
  - 160,868 (2003)
  - Percent Change = 26.3% Decrease
- **\$1.05 Billion to Build Cedar Rapids – Houston**  
(1,050 miles at \$1 million per mile)

Pipelines: Bureau of Transportation Statistics, [bts.gov](http://bts.gov)

Cost: American Gas Association, Gas Facts (Arlington, VA: Annual issues).

# NATIONAL RAILROAD SYSTEM



Source: Georgia Department of Transportation

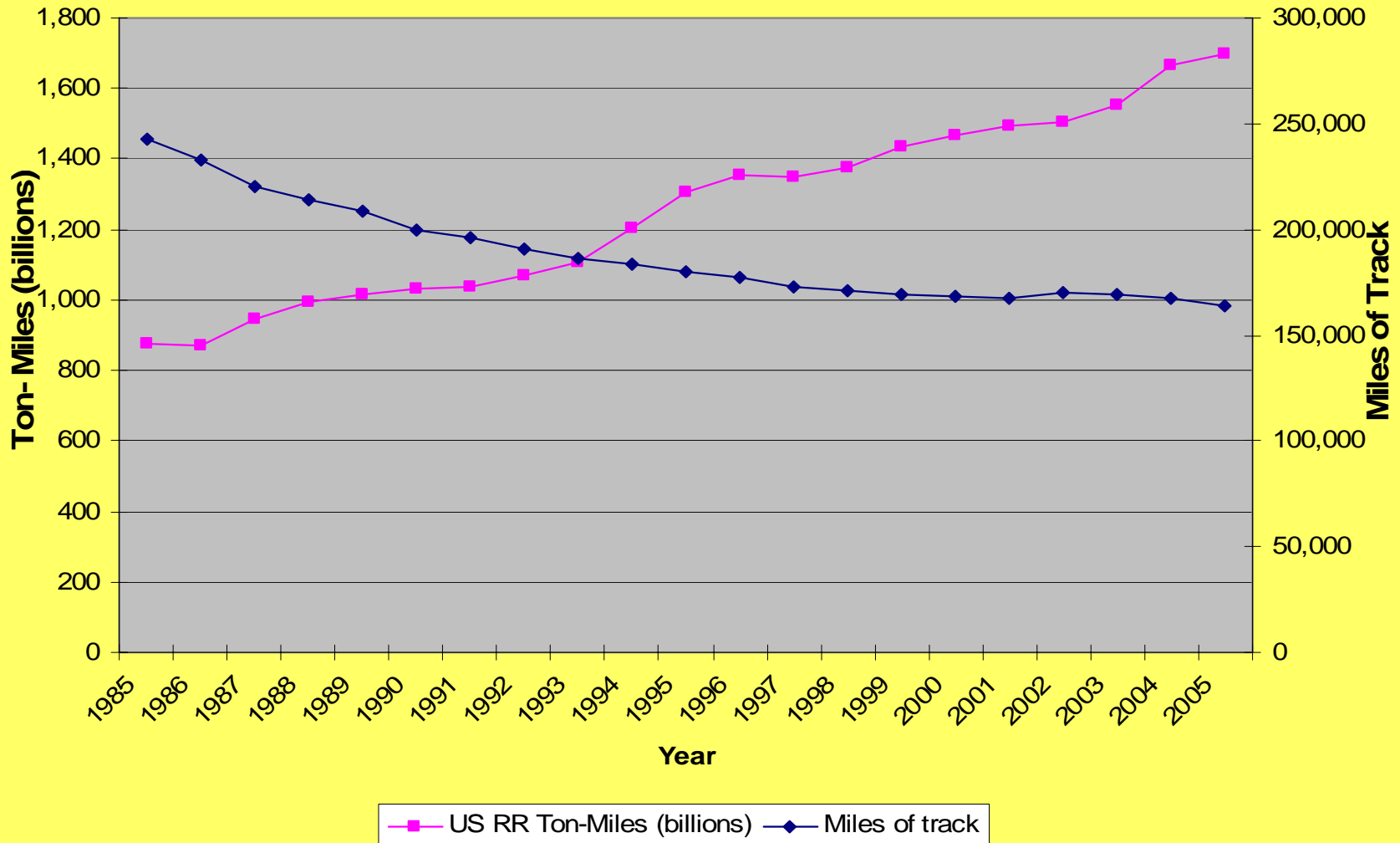
# Railroads



- **562 Common Carrier Railroads (2006)**
- **\$48 Billion in Industry Revenues (2006)**
- **Over 90% Privately Owned**
- **Class I's = 1% of Freight Railroads but:**
  - **68% of Railroad Mileage**
  - **89% of its Employees and**
  - **93% of Freight Revenue**

# Railroads...Are They Still Around?

## ■ Diminished Supply vs. Burgeoning Demand

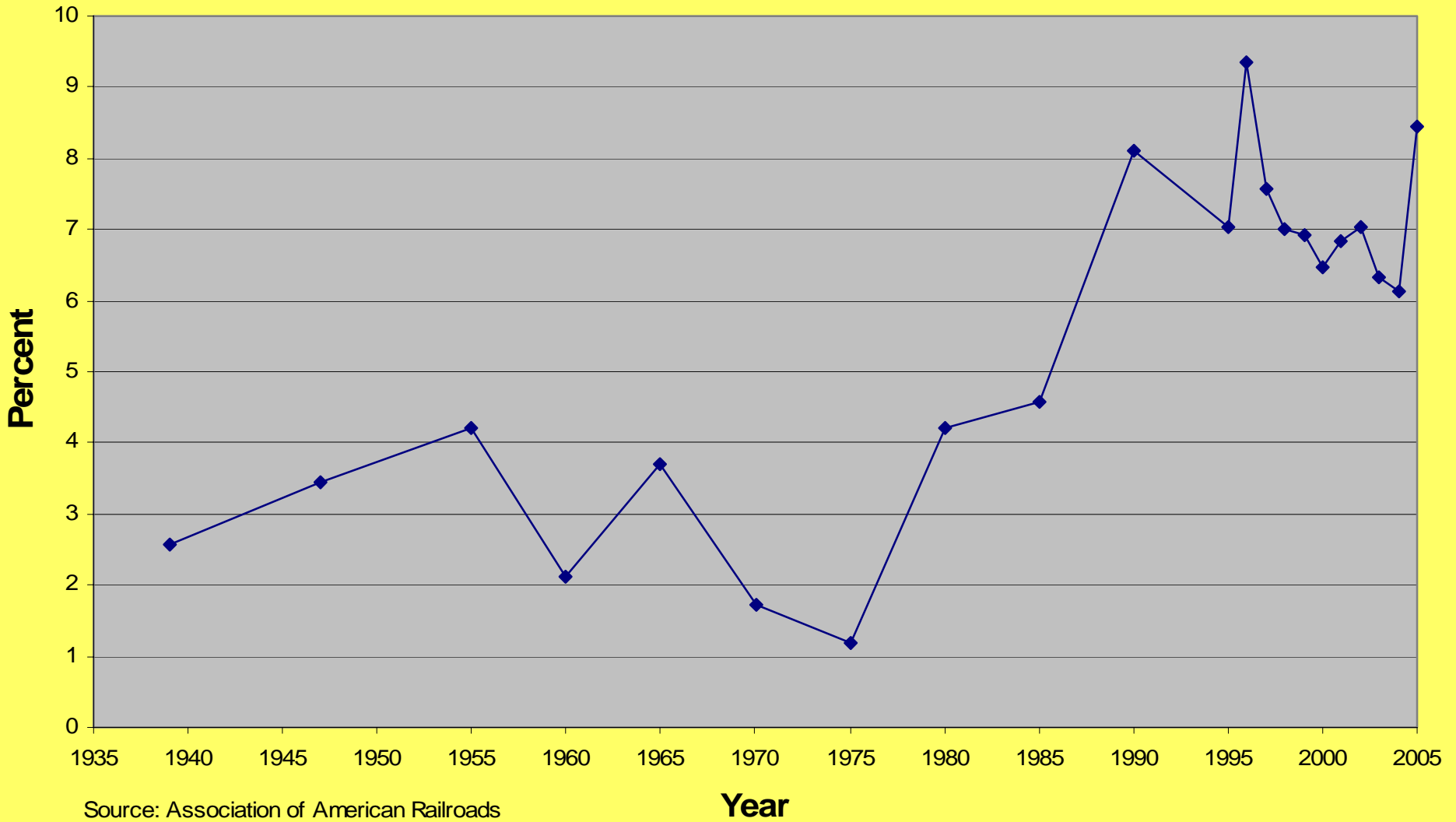


Source: Association of American Railroads, *Railroad Facts* (Washington, DC: various issues).

# Railroad Congestion is Increasing Nationwide

Year	Annual Freight (US) Train-Miles (1,000's)	Miles of Track	Annual Freight (US) Train-Miles per Mile of Track (1,000's)	Index
1991	374,974	196,081	1.91	100
1993	405,446	186,288	2.18	114
1995	458,271	180,419	2.54	133
1997	474,954	172,564	2.75	144
1999	490,442	168,979	2.90	152
2001	499,546	167,275	2.99	156
2003	515,999	169,069	3.05	160
2005	547,566	164,291	3.33	174

# US Railroad Industry Rate of Return on Net Investment



Source: Association of American Railroads

# Many States are Dominated by One Railroad

Largest Railroad Share of Mileage by State<sup>1</sup>  
(45 States served by Class I Railroads, 2002)

State	Largest Railroad	Largest RR: Miles of Road	Class I and Regional RR Miles Total	Largest RR as Pct. of Class I & Regional
Montana	BNSF/MRL	2,948	3,131	94.2%
Delaware	NS	203	246	82.5
Idaho	UP	876	1,101	79.6
Kentucky	CSX	1,837	2,385	77.0
Florida	CSX	1,748	2,283	76.6
Utah	UP	1,334	1,770	75.4
New Mexico	BNSF	1,611	2,172	74.2
Virginia	NS	2,144	3,194	67.1
Washington	BNSF	1,849	2,760	67.0
West Virginia	CSX	1,529	2,371	64.5
Connecticut	P&W	312	486	64.2
South Carolina	CSX	1,302	2,097	62.1
California	UP	3,579	5,798	61.7
Pennsylvania	NS	2,508	4,094	61.3
Nevada	UP	1,200	2,009	59.7
Maine	MM&A	542	914	59.3
Maryland	CSX	565	959	58.9
Colorado	UP	1,799	3,162	56.9
New Jersey	NS	933	1,649	56.6
Nebraska	BNSF	1,700	3,022	56.3
North Carolina	NS	1,441	2,580	55.9
North Dakota	BNSF	2,059	3,785	54.4
South Dakota	BNSF	930	1,729	53.8
Arizona	UP	664	1,259	52.7
Georgia	NS	1,839	3,516	52.3

State	Largest Railroad	Largest RR: Miles of Road	Class I and Regional RR Miles Total	Largest RR as Pct. of Class I & Regional
Wyoming	BNSF	966	1,852	52.2
Texas	UP	6,367	12,344	51.6
Arkansas	UP	1,342	2,604	51.5
Ohio	CSX	2,283	4,525	50.5
Indiana	CSX	1,909	3,867	49.4
Oregon	UP	1,097	2,245	48.9
Tennessee	CSX	1,024	2,111	48.5
Massachusetts	CSX	436	947	46.0
Oklahoma	BNSF	1,198	2,614	45.8
Alabama	NS	1,393	3,149	44.2
Minnesota	BNSF	1,710	3,943	43.4
Mississippi	GTW	843	2,008	42.0
Iowa	UP	1,628	3,943	41.3
Louisiana	UP	1,143	2,784	41.1
Wisconsin	GTW	1,655	4,064	40.7
Kansas	UP	2,355	6,013	39.2
Missouri	BNSF	1,778	4,647	38.3
New York	CSX	1,322	3,599	36.7
Michigan	GTW	1,012	3,151	32.1
Illinois	UP	2,272	8,552	26.6
Forty-five State Total		71,185	137,434	51.8%

Source: AAR, *Railroads and States*, 2002

<sup>1</sup> Total miles of road operated (including trackage rights) by Class I and Regional railroads.

# Trends in Ethanol Plant Size

- **106 Existing Ethanol Plants**
- **54 More Under Construction with Dozens More Planned**
- **90% Produce < 40 Million Gallons**
- **40 million gallon threshold**
- **As Plants Get Larger, Railroad Economics Become More Favorable**

# **THE PAST CANNOT BE PROLOGUE**

- **Concentrated, High Volume Biofuels Production is Best Thought of as a New Type of Traffic.**
- **Historically Small Biofuel Shipment Volumes Offer Little, Useful Precedent to the Handling of Emerging Volumes and Routes.**
- **The Key to Success Will be Developing a Comprehensive, Logistical System:**
  - **Outbound Product Terminals;**
  - **Line-haul Transportation and**
  - **Destination Terminals or Transload Facilities.**

# **A SYSTEMATIC, BIOFUELS TRANSPORTATION APPROACH IS REQUIRED**

## **Required:**

- **Unit Trains - Building Block of the Logistics System**
- **Trains Moving Between Terminals with No Change in Consist**
- **Terminals Designed to Accommodate Unit Trains**
- **Rapid Ingress and Egress from/to Mainline Tracks**

## **Important:**

- **Efficient Switching of Terminal Tracks**
- **Rapid Loading and Unloading of Freight Cars**

# BIOFUELS TRANSPORTATION SYSTEM IMPLICATIONS

## Short Term:

- Rail Car Fleet Can Keep Pace With Production Expansion
- Destination Terminals Could be Problematic

## Medium Term:

- Construction Of State-of-the-Art Destination Terminals is Essential
- Tank Car Production Capacity Could Be An Occasional Issue

## Long Term:

- Rail System Capacity Concerns, But
  - Main Routes Capable of Expansion
  - Improved Rail Earnings and Possible Federal Encouragement (Investment Tax Credits, Etc) Would Support Adequate Capacity Outlays
  - Ethanol Unit Trains can Bypass Congested Terminals
- Selective Market Pipelines Could Play a Role, if Feasible
- Barge Role is Limited if Blending Occurs Near Consumption

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