

The Oil Network in US:

A Closer Look at Pipelines

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History of Oil Network in US

- Origin of pipelines:
 - WWII: Relied on tankers but were sunk by German submarines
 - US Government made an effort to find alternative modes of transportation
- Need for a complex network:
 - Move the raw materials (crude oils), from where they are produced to where they are processed
 - Move refined products from where they are processed to where they are consumed.

Facts about Oil in US

- The U.S. consumes about 19.5 million barrels / day (b/d) of petroleum products.
 - By 2010, it is estimated to be about 22-24 million b/d
- Distances involved can be enormous:
 - Crude and products arriving from the Middle East have already traveled more than 10,000 miles
 - Still need to be shipped thousands of miles across the U.S
- US has largest, system-optimized network of oil pipelines in the world

Modes of Oil Transportation

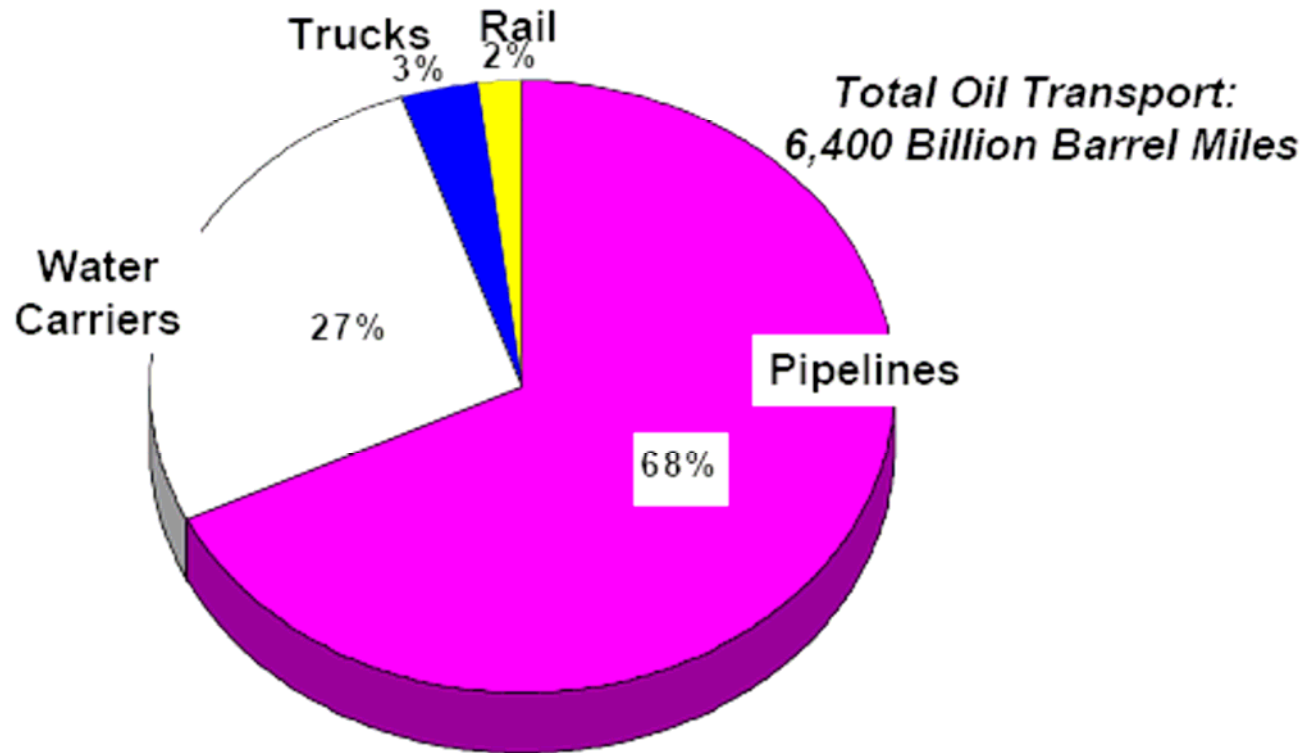
- Pipelines
- Water Carriers (tankers)
- Trucks
- Railcars



Comparing Transportation Modes

- Transportation modes are chosen on the basis of cost
- Pipelines:
 - Most economically feasible
- Tankers:
 - Comparable in cost to pipelines
 - Restricted by geography
- Trains:
 - Replacing a 1000 mile long, 150,000-barrel per day pipeline with a unit train of 2000-barrel tank cars would require a 75-car train to arrive and be unloaded every day, again returning to the source empty, along separate tracks, to be refilled.
- Trucks – Most expensive:
 - Trucking costs escalate sharply with distance
 - Assuming each truck holds 200 barrels, traveling 500 miles per day, it would take a fleet of 3000 trucks, with one truck arriving and unloading every 2 minutes, to replace the same pipeline

Domestic Shipments of Petroleum, 1999

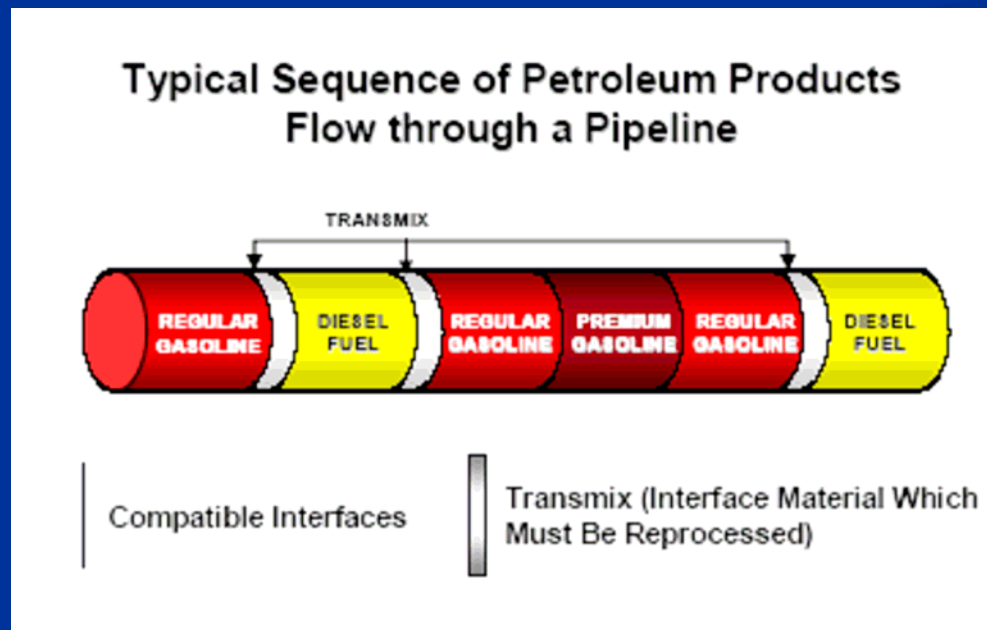


Source: Estimated from Association of Oil Pipe Lines, *Shifts in Petroleum Transportation*, 2000

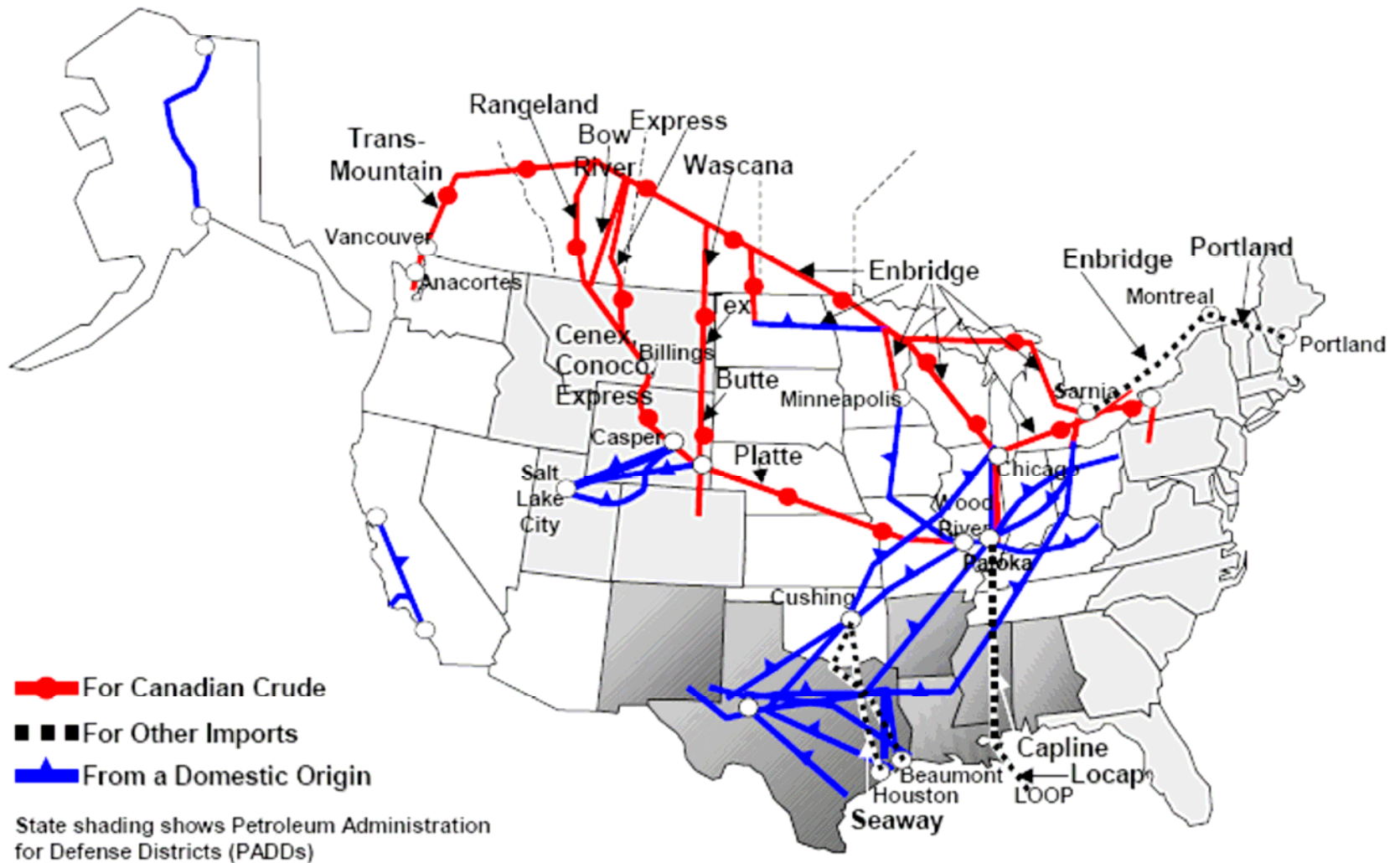
Pipelines deliver more than 2/3 of petroleum in US every year
This is more than 600 billion gallons per year

Reduced Link Cost using Pipelines

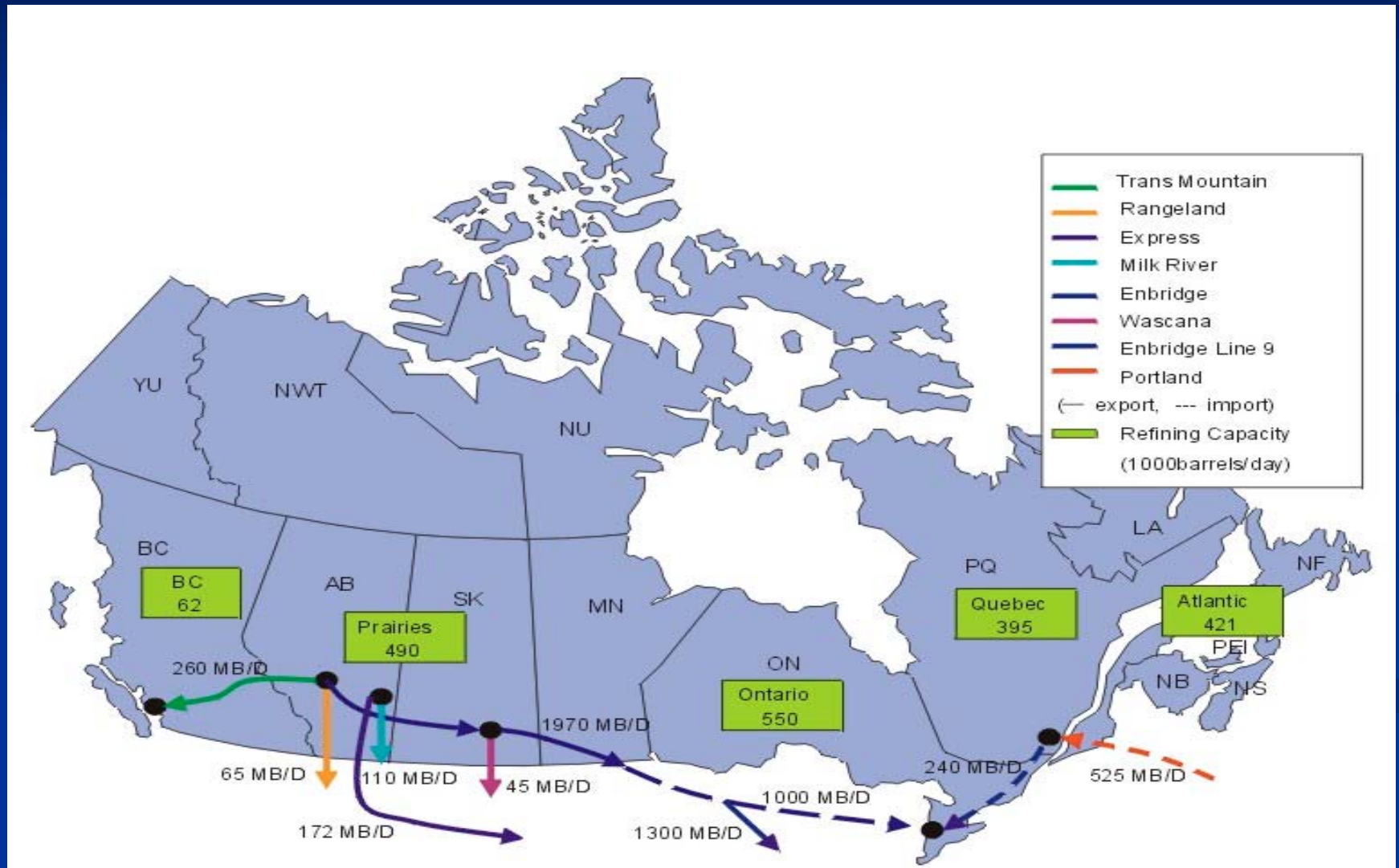
- Pipeline transports a variety of products at once
- No need for a “return trip” that trains and trucks need to take
- Ability to easily move large volumes, long distances



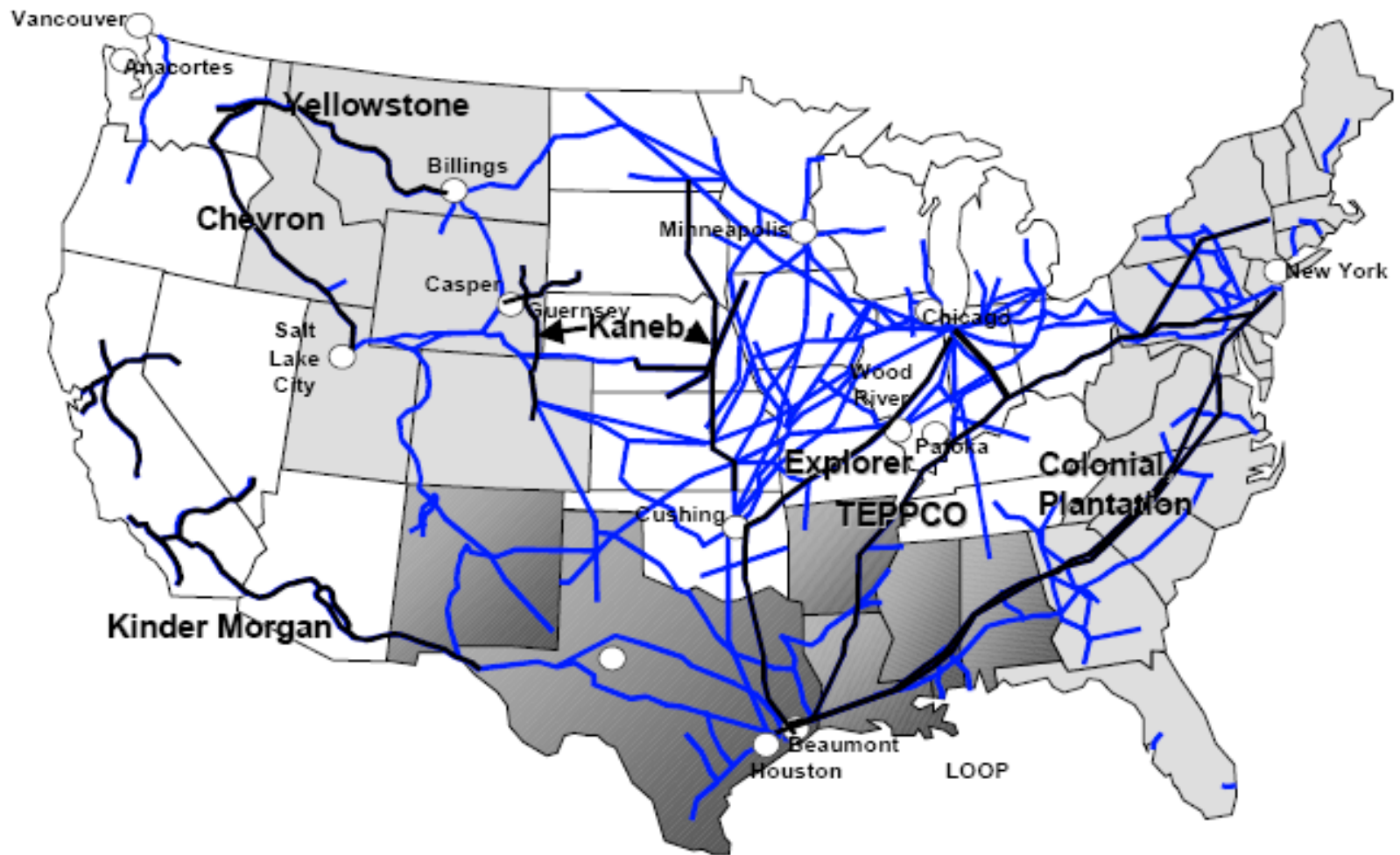
Selected Crude Oil Trunkline Systems



Canadian Crude Oil Flows



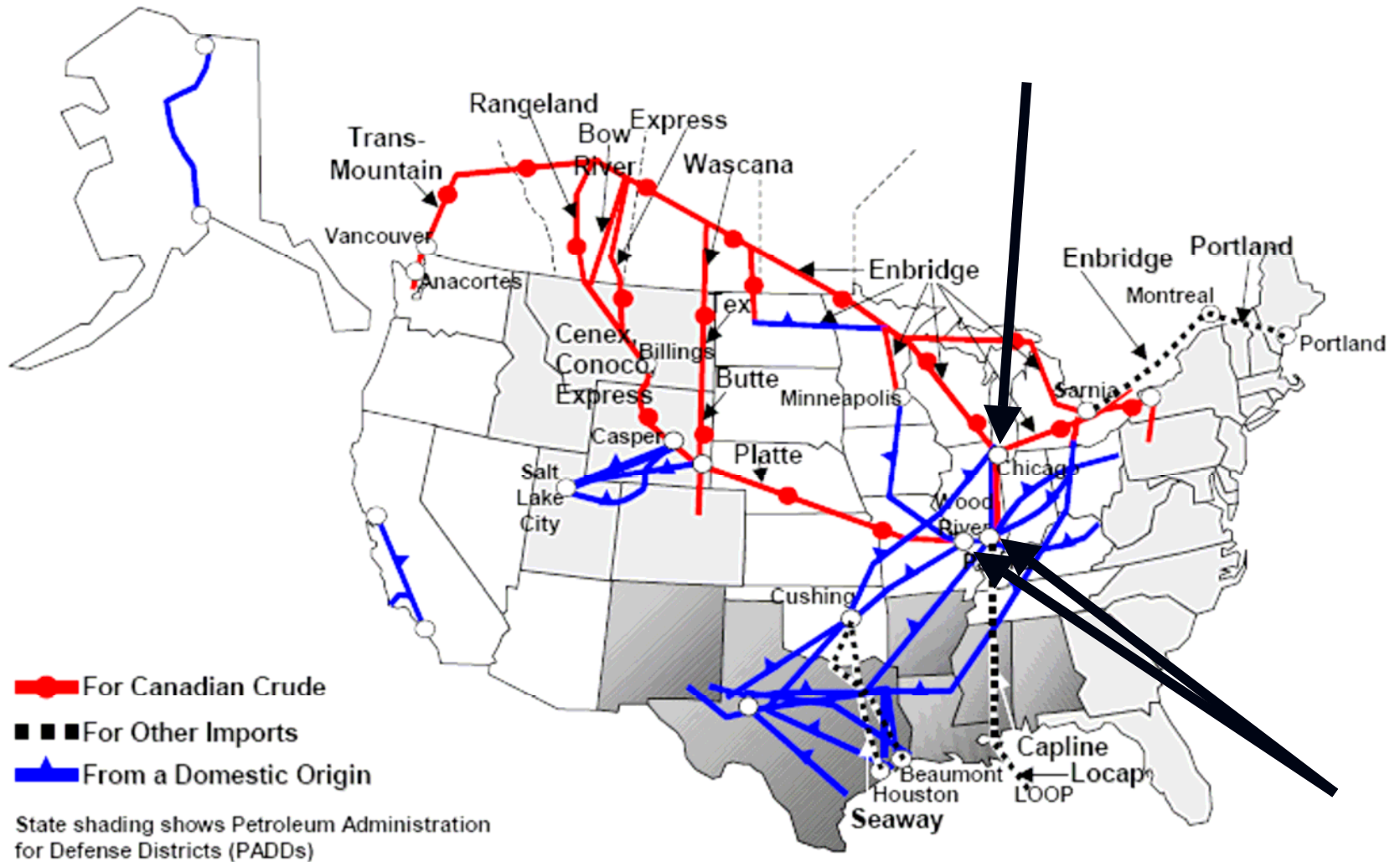
Major Refined Product Pipelines



Possible Problems

- Security threats
 - Node or link destroyed from terrorists
- Natural disasters
 - Corrosion
 - Damage caused the eastern leg of BP pipeline system to cut production in half to 200,000 barrels a day
 - Hurricanes
 - New Orleans

Important Hubs



Summary

- Illinois contains crucial links and nodes
 - Extremely important hubs for both crude and refined oil
 - Connects Canadian supply of crude to the rest of the nation
 - Center of most flows in America
 - Need to insure proper maintenance and security
- Recommend the analysis of an additional hub in the vicinity of Missouri
 - Balance the flow of oil
 - Help prevent catastrophic failure

References

- Association of Oil Pipe Lines, www.aopl.org
- Pipeline 101, www.pipeline101.com
- American Petroleum Institute, www.api.org