Regional Economic Effects of the I-5 Corridor/Columbia River Crossing Transportation Choke Points

prepared for

Oregon Department of Transportation

prepared by

Cambridge Systematics, Inc.

in association with

David Evans and Associates, Inc.

April 2003

final report

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Table of Contents

Executive Summary 1

Introduction 3
- A Shared Transportation Choke Point 3
- A Shared Economy 3
- A Regional Partnership 3
- A Regional Economic Study 5

Local Economic Effects 6
- The Columbia River Highway and Rail Crossings Are Transportation Choke Points for Portland-Vancouver 6
- The I-5 Columbia River Highway Crossing Is Severely Congested 8
- The Portland-Vancouver Rail Network and the Columbia River Rail Crossing Also Are Severely Congested 10
- Transportation Congestion Has Significant Costs for the Portland-Vancouver Area 13

Regional Economic Effects 16
- The Crossings Are Transportation Choke Points for the Pacific Northwest 16
- Congestion at the I-5/Columbia River Highway Crossing Delays Truck Shipments Across Oregon and Washington 16
- Congestion at the Rail Crossing Has a Major Impact on Rail Shippers 18
- Congestion at the Crossings Impedes Oregon and Washington Trade with National Markets 22
- Congestion at the Crossings Weakens the Region's Competitiveness in Global Markets 22
- Regional Growth and Increasing Demand for Freight Transportation Will Magnify the Economic Impacts of the Crossing Choke Points 25

Economic Effects by Industry 27
- The Regional Economy Is Dependent on Safe, Reliable, and Cost-Effective Transportation 27
- Lumber, Wood, and Paper Products Industry 33
- Farm and Food Products Industry 40
- Transportation Equipment and Steel Industry 48
- High-Technology Industry 54
- Distribution and Warehousing Industry 60

Choices for the Future 67

List of Tables

1. Comparison of River Crossings in Selected U.S. Metropolitan Areas of Similar Size 6

2. Contribution to Oregon and Washington Gross Regional Product of Five Freight-Intensive Industries 29

3. Employment in Five Freight-Intensive Industries 30

List of Figures

1. Map of Columbia River Crossings in Portland-Vancouver Area 7
2. I-5/Columbia River Highway Bridge 7
3. Peak-Travel Period Traffic on I-5 Southbound Approaching the I-5/ Columbia River Bridge 7
4. Duration of Morning and Evening Peak-Period Traffic on the I-5/ Columbia River Bridge and Approaches in 2000 and 2020 9
5. Portland-Vancouver Rail "Triangle" 11
6. Landforms of the Pacific Northwest 17
7. Oregon-Washington Origins and Destinations for Truck Freight Crossing the I-5 and I-205 Bridges at Portland-Vancouver 19
8. Volume of Freight on Pacific Northwest Rail Network 20
9. Oregon-Washington Origins and Destinations for Rail Freight Using the Portland-Vancouver Rail Triangle 21
10. Gross Regional Products of Eight U.S. Trade Blocs 23
11. National Freight Flows for Goods with Origins or Destinations in Oregon or Washington 23
12. Oregon-Washington Exports as a Percentage of Oregon-Washington Gross Regional Product and U.S. Exports as a Percentage of U.S. Gross Domestic Product 24
13. Shipping Routes from Southeast and South Asia Load Centers to East Coast and Midwest Markets in U.S. 25
14. Growth in Oregon-Washington Gross Regional Product (GRP) and U.S. Gross Domestic Product (GDP) 26
15. Oregon and Washington Gross Regional Product by Industry Sector 28
16. Oregon and Washington Employment by Industry Sector 28

List of Figures
(continued)

17. Distribution of Freight Tonnage Crossing the I-5 and I-205/ Columbia River Bridges by Industry 31

18. Distribution of Freight Tonnage Using the Portland-Vancouver Rail Triangle by Industry 31

19. Western United States Origins and Destinations for Lumber, Wood, and Paper Products Using the Portland-Vancouver Rail Triangle 34

20. West Coast Origins and Destinations for Lumber, Wood, and Paper Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 35

21. Oregon-Washington Origins and Destinations for Lumber, Wood, and Paper Products Using the Portland-Vancouver Rail Triangle 36

22. Oregon-Washington Origins and Destinations for Lumber, Wood, and Paper Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 38

23. Western United States Origins and Destinations for Farm and Food Products Using the Portland-Vancouver Rail Triangle 41

24. Oregon-Washington Origins and Destinations for Farm and Food Products Using the Portland-Vancouver Rail Triangle 42

25. Port of Portland Barge Commodities 43

26. West Coast Origins and Destinations for Farm and Food Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 44

27. Oregon-Washington Origins and Destinations for Farm and Food Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 45

28. Oregon-Washington Origins and Destinations for Transportation Equipment and Steel Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 50

29. West Coast Origins and Destinations for Transportation Equipment and Steel Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 51

30. Western United States Origins and Destinations for Transportation Equipment and Steel Products Using the Portland-Vancouver Rail Triangle 52

List of Figures
(continued)

31. Oregon-Washington Origins and Destinations for High-Tech Manufacturing Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 55

32. West Coast Origins and Destinations for High-Tech Manufacturing Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver 57

33. Oregon-Washington Origins and Destinations for Distribution and Warehouse Goods Crossing the I-5 and I-205 Bridges at Portland-Vancouver..... 62

34. West Coast Origins and Destinations for Distribution and Warehouse Goods Crossing the I-5 and I-205 Bridges at Portland-Vancouver 63

35. Western United States Origins and Destinations for Distribution and Warehouse Goods Using the Portland-Vancouver Rail Triangle..... 64

Executive Summary

Portland, Oregon and Vancouver, Washington, along with the rest of Oregon and Washington, share a common transportation choke point—the Interstate 5 (I-5) Corridor highway and rail bridges that connect the two cities across the Columbia River. The crossings are of strategic importance to the freight transportation in the Portland-Vancouver area and the Pacific Northwest, but their ability to effectively support freight movement and the regional economy is threatened by growing congestion.

The duration of peak-period congestion at the I-5/Columbia River highway bridge will double from four hours today to nearly 10 hours in 2020. The congestion will spread into the midday period, which is the peak travel time for trucks. This will increase the cost of delay to trucks by 140 percent—from $14 million in 2000 to $34 million in 2020. The rail network within the Portland-Vancouver area is equally congested. Congestion adds about 40 minutes to every train move, twice the delay in Chicago, the nation's largest rail hub.

Congestion at the Columbia River crossings is not just a local problem, it is a Pacific Northwest problem. The region's economy is built on transportation-intensive industries. Agriculture, construction, transportation equipment and utilities, wholesale and retail trade, and manufacturing make up 54 percent of the Oregon-Washington economy, but only 49 percent of the national economy. As a consequence, the Oregon-Washington economy is more dependent on transportation and spends more proportionally on transportation than the nation as a whole. The Oregon-Washington economy spends 3.35 percent of its gross regional product on freight transportation, 6.7 percent more than the national average of 3.14 percent.

The region has an efficient transportation system today, which gives the region's businesses a competitive edge in reaching national and global markets. But if the region loses reliable and cost-effective access to its businesses, farms, ports, airports, and trade partners, the regional economy loses.

Efficient transportation is important because the Oregon-Washington economy is small compared to the other economic regions of the United States—the region's $350 billion economy ranks seventh among the eight national multi-state trade blocs. Reliable transportation is essential to Pacific Northwest businesses moving and selling products to the larger California and Eastern markets. But much of this freight traffic funnels through the congested Portland-Vancouver crossings.

Efficient transportation also is important because the economy of the Pacific Northwest is very dependent on global trade. Oregon and Washington export $45 billion of products each year. As a percentage of the region's economy, this is about twice the national average. Much of this freight traffic also funnels through the Portland-Vancouver crossings.

This study examined the impact of congestion at the I-5/Columbia River crossings on key Oregon-Washington industries, including:

- Lumber, wood, and paper products industry; transportation equipment industry; and farm and food products industry—traditional pillars of the Pacific Northwest economy;
- High-technology industry—a key emerging industry, critical to the region's future growth; and
- Distribution and warehousing industry—the sector that supplies manufacturers, retailers, and the service sector.

The study found that congestion at the I-5/Columbia River crossings was affecting business and industry across the region by increasing shipping and production costs, shrinking labor markets, and reducing the competitiveness of these industries in regional, national, and global markets.

The cost of congestion at the I-5/Columbia River crossings will become an even greater drag on the economy in the future as the region grows and the demand for travel increases. The Portland-Vancouver area and the Pacific Northwest can expect freight volumes to grow at rates faster than the national average—between 1998 and 2020 import-export freight tonnage is forecast to grow 123 percent and domestic freight tonnage 76 percent. The region must provide the capacity to handle this growth effectively or risk weakening its economy and quality of life.

The I-5 Transportation and Trade Partnership, a consortium of state and local transportation planning organizations, elected officials, and stakeholders from the Portland-Vancouver area, has identified transportation improvements needed to relieve highway and rail congestion at the I-5/Columbia River crossings. These improvements will:

- Establish a transportation system that handles the projected 2020 travel demand with improved performance, reliability, predictability, and safety relative to today;
- Minimize the spread of peak-period congestion, preserving the midday period for truck freight movement within and through the Portland-Vancouver area;
- Reduce delays to trucks operating along I-5;
- Maintain or enhance existing accessibility to key port and industrial areas; and
- Accommodate more freight-rail and high-speed passenger-rail service while maintaining or enhancing current rail system performance.

The study recommends that Oregon and Washington make a coordinated effort to act promptly to decide on a course of action and identify sources of funding for the recommended Columbia River crossing improvements in the I-5 transportation corridor. The improvements will benefit Portland-Vancouver and the Pacific Northwest.

Introduction

A Shared Transportation Choke Point

Portland, Oregon and Vancouver, Washington, along with the rest of Oregon and Washington, share a common transportation choke point—the Interstate 5 (I-5) Corridor highway and rail bridges that connect the two cities across the Columbia River. The crossings have become a choke point because they no longer have the capacity to handle the volume of automobile, truck, and rail traffic crossing the Columbia River.

The crossings are of strategic importance to freight transportation in the Portland-Vancouver area and the Pacific Northwest. But their ability to effectively serve freight movement and the regional economy is threatened by growing congestion. The I-5/Columbia River bridge operates at capacity for four hours each day. By 2020 it will operate at capacity for almost 10 hours each day. The parallel I-205/Glenn Jackson bridge will be equally congested by 2020. As the Glenn Jackson bridge reaches capacity it will discourage diversion of I-5 traffic resulting in increased peak-period spreading within the I-5 corridor. With increasing congestion will come more accidents and breakdowns, adding further delays and making travel times less predictable. The cost of congestion delay and accidents is high today and will be even higher tomorrow.

A Shared Economy

The cost of this congestion is paid by Portland-Vancouver commuters and businesses and by all businesses across Oregon and Washington that move freight through the area. Businesses see these costs as increased shipping and production costs, shrinking and more expensive labor markets, and reduced competitiveness in regional, national, and global markets.

The economy of the Pacific Northwest is very dependent on trade, and much of the freight traffic upon which the regional economy depends funnels through the Portland-Vancouver crossings. Congestion is eroding the reliability of freight transportation in the Pacific Northwest, reducing the region's quality of life and threatening the economic well being of business and industry. Congestion will become an even greater drag on the economy in the future as the region grows and the demand for travel increases.

A Regional Partnership

The I-5 Transportation and Trade Partnership, a consortium of state and local transportation planning organizations, elected officials, and stakeholders from the Portland-Vancouver area, has identified transportation improvements needed to relieve highway

and rail congestion at the I-5 Corridor/Columbia River crossings.[1] The key recommendations and their anticipated benefits are:

- **Highway**
  - Widen I-5 to a maximum of three through lanes in each direction from the Fremont Bridge in Portland to the I-205 junction north of Vancouver;
  - Add a new supplemental or replacement bridge across the Columbia River with up to two auxiliary or arterial lanes in each direction and provision for two light-rail tracks; and
  - Add auxiliary lanes between interchanges on I-5 and modify the interchanges to increase safety and capacity and discourage the use of I-5 for local trips.
- **Transit**
  - Construct a light-rail loop connecting the existing transit lines in Portland with the communities across the Columbia River in Clark County, Washington; and
  - Initiate premium, peak-hour express bus services in the I-5 and I-205 corridors, consistent with existing regional transportation plans.
- **Rail**
  - Expand yard capacity and construct bypass tracks so that local trains do not block through trains;
  - Increase track speeds in the Portland-Vancouver area by improving track conditions and repairing or replacing junctions;
  - Add a second track to single-track sections, permitting simultaneous bi-directional movement of trains; and
  - Add sidings to congested sections to allow for temporary storage of trains and locomotives that are waiting to enter terminals and yards and now block other freight and passenger trains.

> *"Yes, there are real constraints, but we can no longer put our head in the sand. We must think creatively and we must act now."*
> Keith Thomson, Port of Portland

- **Transportation System Benefits**
  - Establish a transportation system that handles the projected 2020 travel demand with improved performance, reliability, predictability, and safety relative to today;
  - Minimize the spread of peak-period congestion, preserving the midday period for truck freight movement within and through the Portland-Vancouver area;
  - Reduce delays to trucks operating along I-5;
  - Maintain or enhance existing accessibility to key port and industrial areas; and
  - Accommodate more freight-rail and high-speed passenger-rail service while maintaining or enhancing current rail system performance.

[1] For additional details, see I-5 Trade and Transportation Partnership, *Final Strategic Plan*, June 2002 at www.i-5partnership.com.

A Regional Economic Study

Congestion at the Columbia River crossings is not just a local problem, it is a Pacific Northwest problem. Congestion at the I-5 Corridor/Columbia River crossings affects businesses and communities across the entire region. Making the necessary improvements, reducing congestion, and improving the transportation system will require a partnership across Oregon and Washington as well as neighboring states and provinces.

> *"The region's ability to develop, finance, and implement a strategic multi-modal transportation plan for this corridor will be the key to maintaining the livability and economic vitality of the area."*
> Wesley Hickey, Tidewater Barge Lines

This report expands the I-5 Partnership's prior studies. It investigates the regional economic impacts of the I-5 Corridor/Columbia River crossing transportation choke points. It first reviews the local economic effects, then examines the regional economic effects of congestion at the Portland-Vancouver crossings. It looks at the economy of Oregon and Washington as a whole, then develops case studies of the regional economic impacts on five freight-intensive industries:

- Lumber, wood, and paper products industry; transportation equipment industry; and farm and food products industry—traditional pillars of the Pacific Northwest economy;
- High-technology industry—a key emerging industry, critical to the region's future growth; and
- Distribution and warehousing industry—the sector that supplies manufacturers, retailers, and the service sector.

Local Economic Effects

The Columbia River Highway and Rail Crossings Are Transportation Choke Points for Portland-Vancouver

The Columbia River highway and rail crossings connect the communities of Portland and Vancouver for work, recreation, shopping, and entertainment. They provide critical freight connections to the area's two major ports for deep-water shipping and up-river barging, link its two transcontinental rail lines, and connect much of the region's industrial land.

The crossings are transportation choke points because the Portland-Vancouver area has only two highway bridges and one rail bridge over the Columbia River. Figure 1 shows the location of the I-5 and I-205 Columbia River highway bridges and the Burlington Northern Santa Fe's (BNSF) rail bridge crossing the Columbia River. Figure 2 is an aerial photograph of the I-5/Columbia River highway bridge. The area has fewer crossings than river cities of similar size across the United States. Table 1 compares the number of highway and rail crossings serving the Portland-Vancouver area with the number of crossings serving other river cities. With limited bridge capacity, few alternative routes, and growing travel demand, the Portland-Vancouver crossings have become major traffic bottlenecks. See Figure 3, a photograph of peak-travel period traffic on I-5 southbound, approaching the I-5/Columbia River bridge.

Table 1. Comparison of River Crossings in Selected U.S. Metropolitan Areas of Similar Size

Metro Area	Population	Body of Water	Highway Crossings	Rail Crossings
Norfolk	1.57 million	Hampton Roads/Chesapeake Bay	4	0
Cincinnati	1.65 million	Ohio River	7	2
Kansas City	1.78 million	Missouri River	10	3
Portland-Vancouver	**1.92 million**	**Columbia River**	**2**	**1**
Pittsburgh	2.36 million	Three Rivers	>30	3
St. Louis	2.60 million	Mississippi River	8	2

Figure 1. Map of Columbia River Crossings in Portland-Vancouver Area

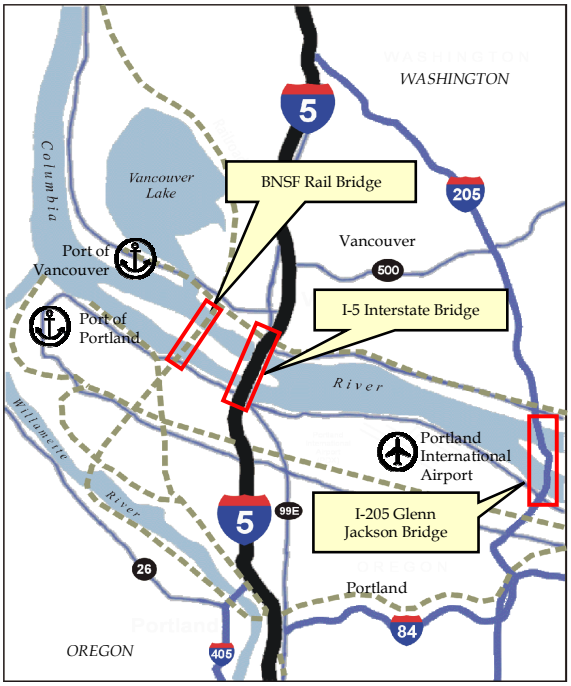
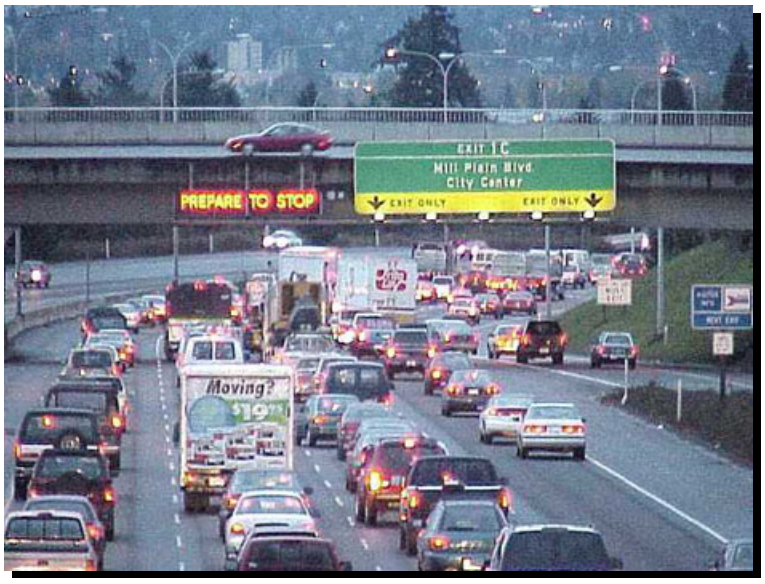


Figure 2. I-5/Columbia River Bridge

Figure 3. Peak-Travel Period Traffic on I-5 Southbound Approaching the I-5/Columbia River Bridge



The I-5/Columbia River Highway Crossing Is Severely Congested

Interstate 5, with its bridge crossing the Columbia River, is the backbone of the Portland-Vancouver area transportation system. On an average day more than 125,000 vehicles, including 10,000 trucks, cross the I-5/Columbia River bridge.[2]

> *"The bridge crossing is the worst bottleneck between Los Angeles and Seattle."*
> Vancouver economic development official, Regional Economic Effects Study interviews

Today the Portland-Vancouver metropolitan area population is about 1.9 million. By 2020, the population is expected to increase to 2.4 million. As the region grows, traffic volume on the bridge is expected to grow proportionally to 180,000 vehicles per day, an increase of 44 percent. Vehicle travel times between downtown Portland and north Vancouver will increase 22 percent, from 38 minutes in 2000 to 44 minutes in 2020.

> *"We are at the brink of either keeping our economy strong or allowing the kind of disastrous gridlock that is going on in California and Seattle."*
> Margaret Carter, Urban League

The I-5/Columbia River highway crossing operates at capacity for two hours during the morning peak-travel period and another two hours during the evening peak-travel period. Unless capacity is added, no additional vehicle trips can be squeezed into those hours. Additional trips will be made earlier or later, more than doubling the duration of the peak-travel periods by 2020. The morning congestion period will spread from two to four hours, and the evening congestion period will expand from two hours to over five and one-half hours. The quiet mid-day period will largely disappear. Instead of a total of four hours of congested travel along the I-5/Columbia River crossing corridor, Portland-Vancouver drivers can anticipate almost 10 hours of congested travel a day by 2020. Figure 4 compares the duration of the morning and evening peak periods in 2000 and 2020 if crossing capacity is not increased.

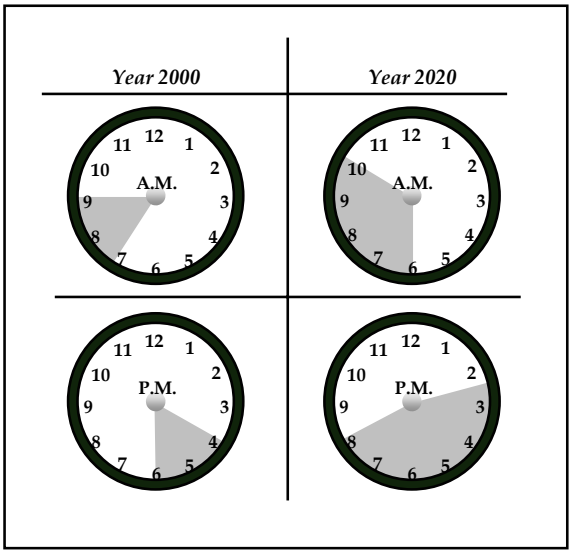
The congestion is caused by limited vehicle through-put capacity on the bridge itself and by the complex traffic patterns on the Oregon and Washington sides of the river:

- The six traffic lanes on the I-5/Columbia River bridge are inadequate for the volume of traffic crossing the river during peak-travel periods;

- Close interchange spacing north and south of bridge does not allow for adequate merging and weaving sections, effectively reducing the capacity available for through traffic;

[2] Oregon Department of Transportation. *2001 Transportation Volume Tables*.

Figure 4. Duration of Morning and Evening Peak-Period Traffic on the I-5/Columbia River Bridge and Approaches in 2000 and 2020



- Short entrance and exit ramps force trucks to accelerate and decelerate on the freeway, further slowing traffic; and

- The bridge's low-level lift span, one of the last remaining on the national Interstate highway system, opens for 10 minutes for barge traffic 20 to 30 times per month in off-peak periods, closing the highway and bringing traffic to a halt for periods of 30 minutes.

The eight-lane Glenn Jackson bridge, which carries I-205 across the Columbia River six miles up river of the I-5/Columbia River bridge, provides an alternate route to the I-5/Columbia River crossing. But the Glenn Jackson bridge, which carries 132,000 vehicles, including 7,800 trucks, across the river each day, also operates near capacity. Growing congestion, due in part to diverted traffic from I-5, is diminishing travel reliability and predictability on I-205 and the Glenn Jackson bridge. As the Glenn Jackson bridge reaches capacity it will discourage diversion of I-5 traffic resulting in increased peak-period spreading within the I-5 corridor. The next closest Columbia River highway crossing is the two-lane bridge between Rainier, Oregon, and Longview, Washington, 53 miles downstream; it provides little relief to the metropolitan area.

With few alternative routes, congestion on I-5 spills onto other roadways in the Portland-Vancouver area. Some drivers heading to the I-5/Columbia River bridge use the arterial roadways paralleling I-5 rather than grind through the traffic on the I-5 approaches to the bridge. During the peak-travel periods, this diverted traffic fills the local north-south streets and jams the interchanges near the bridge, blocking the east-west arterial streets as well.

Freight traffic is disproportionately affected by this congestion:

- Congestion is spreading into the midday period, which is the peak-travel period for trucks. Most truck deliveries are made in the mid-morning after businesses open, and most pick-ups are made in the mid-afternoon before businesses close. Congestion spilling over from the morning and evening commuter peaks into the midday will entangle truck operations, increasing trucking costs, and making pick-up-and-delivery times less reliable;

- Trucks enter and leave the highway at the closely spaced interchanges north and south of the bridge to access the ports, intermodal rail yards, industrial areas, and commercial areas near the Columbia and Willamette Rivers, but the interchanges and ramps cannot safely and efficiently handle the large volumes of truck traffic;

- Bridge openings are limited to off-peak hours to reduce delays for commuters, but bridge lifts during midday and off-peak hours coincide with the heaviest volumes of trucks on I-5. A 10-minute bridge lift during the midday creates a traffic queue that takes 25 to 30 minutes to dissipate. By 2020 it will take 30 to 35 minutes for the northbound queue to clear and 50 to 60 minutes for the southbound queue to clear;

- Traffic congestion increases truck travel times to and from the Ports of Portland and Vancouver, and to and from the BNSF and Union Pacific intermodal rail terminals; and

- Congestion delays trucks moving among the manufacturing plants, warehouses, and distribution centers in the Columbia Corridor on the Portland side of the river and along SR 14 on the Vancouver side of the river.

When an incident on I-5 reduces capacity or temporarily closes the highway during peak-travel periods, the high volume of traffic using the I-5/Columbia River highway crossing and the lack of alternate routes results in gridlock across the Portland-Vancouver area. This happens almost daily.

The Portland-Vancouver Rail Network and the Columbia River Rail Crossing Also Are Severely Congested

The two-track BNSF rail bridge, adjacent to the I-5/Columbia River bridge, is the only rail crossing connecting Portland and Vancouver. The rail bridge carries 63 freight trains and 10 Amtrak passenger trains across the river each day.[3] The next major rail crossing of the Columbia River is 92 miles upstream near The Dalles, Oregon.

Figure 5 shows the Portland-Vancouver rail network. On the Vancouver side of the river, rail lines run north to Seattle and east along the north side of Columbia River Gorge toward the Midwest. On the Portland side of the river, rail lines run west to the port terminals, south to California, and east along the south side of the Columbia River Gorge toward the Midwest and the Gulf.

[3] I-5 Trade and Transportation Partnership. *Final Strategic Plan,* June 2002.

Figure 5. Portland-Vancouver Rail "Triangle"

The primary cause of congestion in the rail system is inadequate capacity within the overall Portland-Vancouver terminal and junction "triangle." On each side of the Columbia River, trains crossing the bridge compete for track space with local and long-distance trains moving to rail yards and terminals. Single tracks connect most junctions, and yard capacity is inadequate for the volume of rail traffic traveling to and from rail yards and port terminals in Portland and Vancouver. Local operations—the movement of locomotives and cars between yards and the movement of trains into and out of port and railroad terminals—must share track time and space with long-distance, through trains, including intermodal trains traveling from Seattle and Tacoma to the Midwest and California through the Portland-Vancouver area.

When measured in terms of delay per train, rail congestion in the Portland-Vancouver area is about twice that of Chicago, the nation's largest rail hub. An analysis of the Portland-Vancouver rail system found that over a typical 96-hour (four-day) period the terminal area handled 600 freight and passenger trains. The average speed of those trains

through the Portland-Vancouver network was 12.3 mph and they accrued 402 hours of delay (about 41 minutes of delay per train). By comparison, over the same period the Chicago rail network handled about 3,500 freight and passenger trains. The average speed was 12.5 mph, and the trains accrued 813 hours of delay. With less than one-fifth the number of trains as Chicago, the Portland-Vancouver rail network experiences nearly half the delay hours of Chicago.

These rail delays affect freight service across the Pacific Northwest, limit opportunities for growth at the ports of Portland, Vancouver, Kalama, Longview, and other Columbia River ports, and make it difficult to expand intercity passenger service along the Seattle-Portland-Eugene corridor.

To relieve rail congestion and provide new capacity, the railroads must invest heavily in new yard capacity, sidings, bypass tracks, switches, and dispatching systems within the Portland-Vancouver rail triangle. And within 10 to 20 years, the railroads also may need to look at investing in an expanded rail bridge across the Columbia River or a rail bypass of the Portland-Vancouver area for through trains.

This will be a challenge for the railroads. The railroad industry today is stable, productive, and competitive, with enough business and profit to operate, but it does not have the resources to replenish its infrastructure quickly or grow rapidly. Most of the benefits of railroad reorganization and productivity over the last 20 years have accrued to shippers and the economy in the form of rate cuts, rather than to the railroads and their investors. The industry's rate of return on investment has improved from about four percent in 1980 to about eight percent in 2000; however, it is still below the cost of capital, which is about 10 percent.

This is a problem for the railroad industry because it is extraordinarily capital-intensive. Railroads spend about five times more to maintain rail lines and equipment than the average United States manufacturing industry spends on plant and equipment. Wary of the gap between the railroads' capital needs and their income, investors have backed away from railroad stocks. This has reduced the amount of money available to invest in the freight-rail system, forcing the railroads either to borrow money to maintain and expand infrastructure or defer maintenance and improvements. The possibility that the railroads may not grow apace with the economy and might shed freight to trucks, adding to already congested highways, has prompted some states to think about investing to correct rail choke points such as the Portland-Vancouver triangle.[4]

[4] American Association of State Highway and Transportation Officials, *Freight-Rail Bottom Line Report*, Washington, DC, January 2003. For additional detail see http://transportation.org/committee/freight/doc/rail_bottomline.pdf.

Transportation Congestion Has Significant Costs for the Portland-Vancouver Area

The Portland-Vancouver metropolitan area as a whole suffered an estimated 34.4 million road-traveler hours of delay in 2000. This is equivalent to 47 hours per road-traveler per year or an entire weekend stuck in traffic. The economic cost to Portland-Vancouver area road-travelers was estimated at $670 million per year, or about $910 per road-traveler.[5]

> *"Businesses in the Puget Sound area are leaving, citing transportation issues. We will only know we've failed when companies stop moving to or expanding in the Portland region."*
> Vancouver economic development official

Congestion at the Columbia River crossings accounted for a portion of this delay and congestion at the crossings will grow over the next 20 years. If no significant capacity is added to the I-5/Columbia River crossing, total vehicle hours of delay during the peak periods will increase 74 percent from 31,000 hours per day in 2000 to 54,000 hours per day in 2020.

Because the I-5/Columbia River crossing serves the industrial core of the region, trucks and the businesses they serve will see significant increases in congestion and delay costs:

- Annual vehicle hours of delay on truck routes in the I-5 corridor will increase by 93 percent from 13,400 hours in 2000 to 25,800 hours by 2020;
- Congested lane-miles on truck routes will increase by 58 percent; and
- The cost of truck delay will increase by 140 percent to nearly $34 million.

Delays at the crossings affect a wide range of transportation users, including employees commuting to work, customers traveling to stores and business meetings, shippers meeting schedules, trucks picking up and delivering goods, and trains moving freight to and from ports and intermodal terminals. The costs of delay are passed on to businesses, either directly or indirectly, by:

[5] Texas Transportation Institute, *2002 Urban Mobility Study*, Mobility Data for Portland-Vancouver, Oregon-Washington for 2000. For additional detail and comparative rankings with other major metropolitan areas see http://mobility.tamu.edu/ums/studymobility_data/tables/portland.pdf.

> *"As moving goods becomes more difficult, it is the smaller businesses that will suffer most."*
> Phil Kalberer, Kalberer Food Service Equipment

- **Increasing Production Costs –** Congestion leads to higher transportation costs for businesses due to delay, unreliable travel times, and increased logistics and inventory costs. Freight carriers must adjust schedules and routes, hire more drivers, and purchase additional vehicles to serve the same customers. Firms must accommodate larger inventories of parts, supplies, and products, causing inventory and operating costs to increase unless they can find savings elsewhere.

- **Shrinking Labor Pools –** Congestion effectively reduces the geographical area in which potential employees can afford to work (or are willing to work) by increasing the time and cost of commuting. As a region's quality of life deteriorates and the cost of living increases, the area also becomes less attractive to new workers. Business productivity declines as the number of workers with specialized skills decreases.

- **Reducing Access to Business Inputs and Markets –** Congestion shrinks business market areas and reduces the economies of scale that can be realized by operating in large urban areas near concentrations of similar firms or concentrations of competing suppliers.

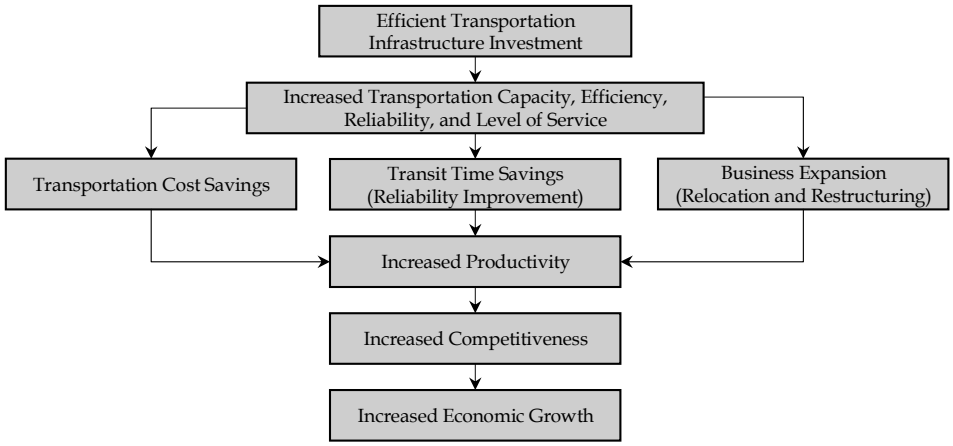
Congestion is one of the costs of doing business, but if it becomes severe, businesses may respond by moving away, going out of business, or adjusting to smaller market areas for workers, suppliers, and customers. All of these lead to a reduction in productivity, which in turn limits economic competitiveness and curtails economic expansion.

Economic Benefits of Investment in Transportation

The economic benefits of investment in transportation include:[6]

- For almost all industry sectors, transportation investments reduce the cost of producing a given level of output. The cost savings can be used by companies to increase profit, make new investments, or expand market share.
- Since lower production costs can lead to lower product prices and increased sales, transportation investments also generate an "output effect" that grows the economy. Expanding output can stimulate increases in employment.
- Investments in roadways accounted for about 15 percent of U.S. productivity growth between 1950 and 1991.
- Transportation investments allow manufacturers and retailers to maintain smaller inventories, resulting in significant business cost savings, but just-in-time operations depend on reliable transportation.
- Transportation investments reduce the per-mile cost of transporting goods, allowing production and distribution facilities to serve larger market areas. By serving larger markets, businesses can more efficiently use labor, equipment, and capital.
- Improvements in the freight transportation system allow businesses to draw supplies from a wider area, potentially yielding savings in material costs and improvements in quality.

Transportation and the Economy



The exhibit above shows how investments in transportation infrastructure can lead to growth in the Oregon-Washington economy. Freight transportation enhancements that reduce the costs of moving goods (and services) to and from local, regional, national, and international markets are critical to economic expansion. This is because the movement of goods is a "factor input" in the production of goods. (Other factor inputs include labor, materials and capital equipment.) Like labor and capital, transportation costs directly affect the price of goods and services and the profits of producers. Consequently, investments that reduce the cost of moving goods to and from markets (via improvements in reliability and reductions in transit times) can help to increase and sustain economic growth. The efficiency and reliability of the freight transportation system affects economic productivity, and productivity is a key determinant to overall economic performance.[7]

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[6] Federal Highway Administration, Office of Policy, 2003.

[7] ICF Consulting and HLB Decision Economics, *Economic Effects of Transportation: The Freight Story*, for the Federal Highway Administration, January 2002.

Regional Economic Effects

The Crossings Are Transportation Choke Points for the Pacific Northwest

Congestion delays in the Portland-Vancouver area are not just a local problem. The economy of the Pacific Northwest is very dependent on trade, and much of the freight traffic upon which the regional economy depends funnels through the Portland-Vancouver crossings. Congestion at the Columbia River highway and rail crossings affects the entire Pacific Northwest.

The physical geography of the Pacific Northwest defines the regional transportation system and makes the crossings at Portland-Vancouver strategic regional choke points. Figure 6 shows the major landforms of Oregon and Washington and the major highways. Mountain ranges across the region have constrained development of most of the region's highways, rail lines, and large population centers to a narrow corridor running from Vancouver, British Columbia through the Portland-Vancouver area to Eugene, Oregon. Highway and rail routes connecting the region to the other major North American trade blocs to the east and south run through difficult mountain passes and the Columbia River Gorge.

> *"Time is [of the] essence in a truck driving company. The slower we go, the less money we make."*
> Truck driver, Survey of Freight Industry Opinions of I-5, Oregon DOT

The region has excellent deepwater ports with access to the West Coast and Pacific Rim, and the Columbia/Snake River system provides barge access to the agricultural areas in the eastern half of the region. The Columbia River is a major regional transportation artery, but the river also is major regional barrier. There are just nine highway bridges and two rail crossings between Umatilla, Oregon, where the river curves northward into Washington State, and the Pacific Ocean, a distance of 292 miles or a little less than the distance between Portland-Vancouver and Vancouver, British Columbia.

Congestion at the I-5/Columbia River Highway Crossing Delays Truck Shipments Across Oregon and Washington

The I-5/Columbia River bridge at Portland-Vancouver is a critical link in the Pacific Northwest's regional highway network. Congestion at the I-5/Columbia River highway crossing and the parallel I-205 crossing affects truck traffic throughout Oregon and Washington, but especially within the I-5 corridor.

Figure 6. Landforms of the Pacific Northwest
With Interstate and Major Highways

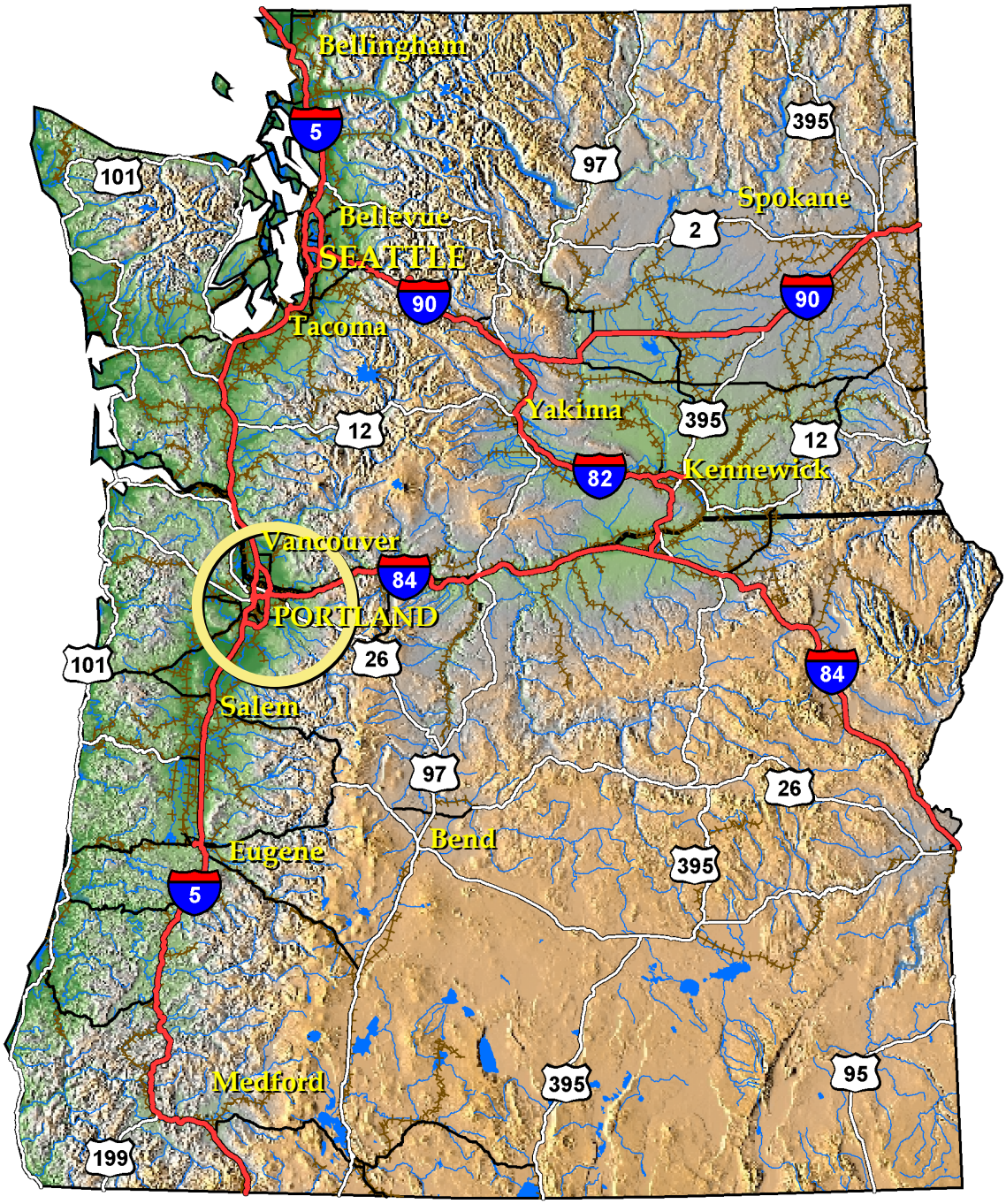


Figure 7 shows Oregon and Washington counties and highways affected by congestion at the I-5 and I-205/Columbia River highway crossings.[8] The figure shows the counties (in gray scale) that ship or receive truck freight using the crossings; the darker gray the county, the more tonnage is shipped or received from that county. (Commodities shipped to and from British Columbia are assigned to Whatcom County.) The figure also shows the highways (in color) that trucks use to move to and from these counties; the wider and redder the bandwidth of the highway line, the greater the truck tonnage carried on the highway.

Congestion at the Rail Crossing Has a Major Impact on Rail Shippers

The rail junction at Portland-Vancouver is a critical link in the Pacific Northwest rail system. Congestion at the rail crossing also has a major impact on Oregon and Washington State rail shippers.

Figure 8 shows freight-rail tonnage on the major rail lines serving Oregon and Washington, including those passing through the Portland-Vancouver rail triangle.[9] The wider and redder the bandwidth of the rail line, the greater the commodity tonnage carried on the rail line. (The figure shows commodity or net tonnage, not gross tonnage, which would include the weight of the locomotive and railcars.)

"The rail system is our life blood. We have to be able to move our grain."
Grain shipper, commenting at an I-5 Partnership public meeting

Figure 9 highlights Oregon and Washington counties and highways affected directly by rail congestion in the Portland-Vancouver triangle. The figure shows the counties (in gray scale) that ship or receive rail freight that moves into, out of, or through the congested Portland-Vancouver rail triangle; the darker gray the county, the more tonnage is shipped or received from that county. (Commodities shipped by rail to and from British Columbia are assigned to Whatcom County.)

Rail congestion at Portland-Vancouver has a major impact on Puget Sound shippers, Washington State's Columbia River ports, and the Portland-Vancouver area. The congestion affects shipments of grain, lumber, and minerals moving west by rail from Montana, Idaho, eastern Washington, and central and eastern Oregon for export through the ports. It also affects intermodal container shipments of merchandise moving east by rail from Seattle-Tacoma, wood products from western Washington moving south and east, and automobiles being carried inland from Portland.

[8] Source: Cambridge Systematics, Inc., based on commodity flow and truck-routing data provided by Reebie Associates from their 1998 TRANSEARCH database.

[9] Source: Cambridge Systematics, Inc., based on commodity flow and rail-routing data provided by Reebie Associates from their 1998 TRANSEARCH database.

Figure 7. Oregon-Washington Origins and Destinations for Truck Freight Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge

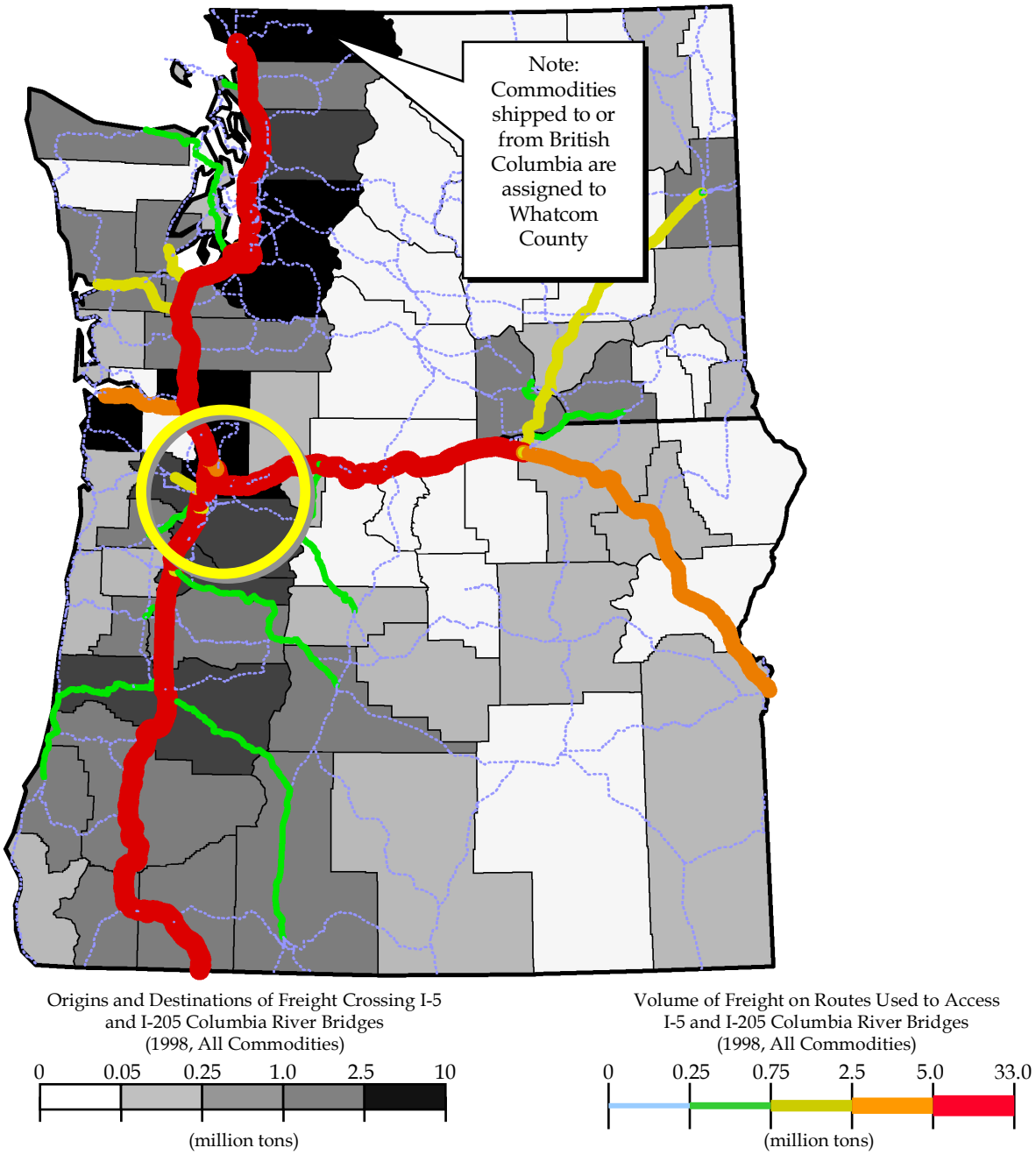


Figure 8. Volume of Freight on Pacific Northwest Rail Network

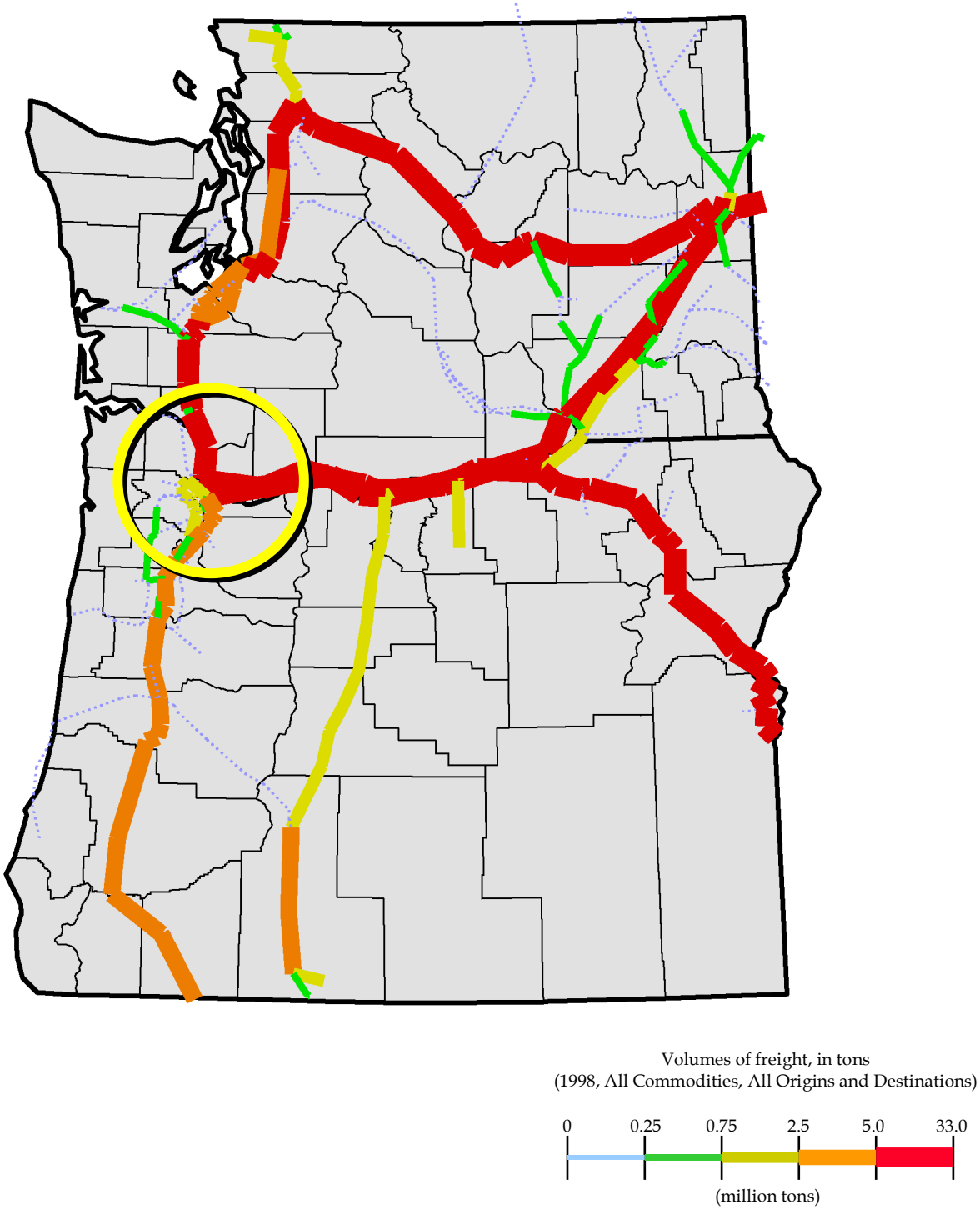
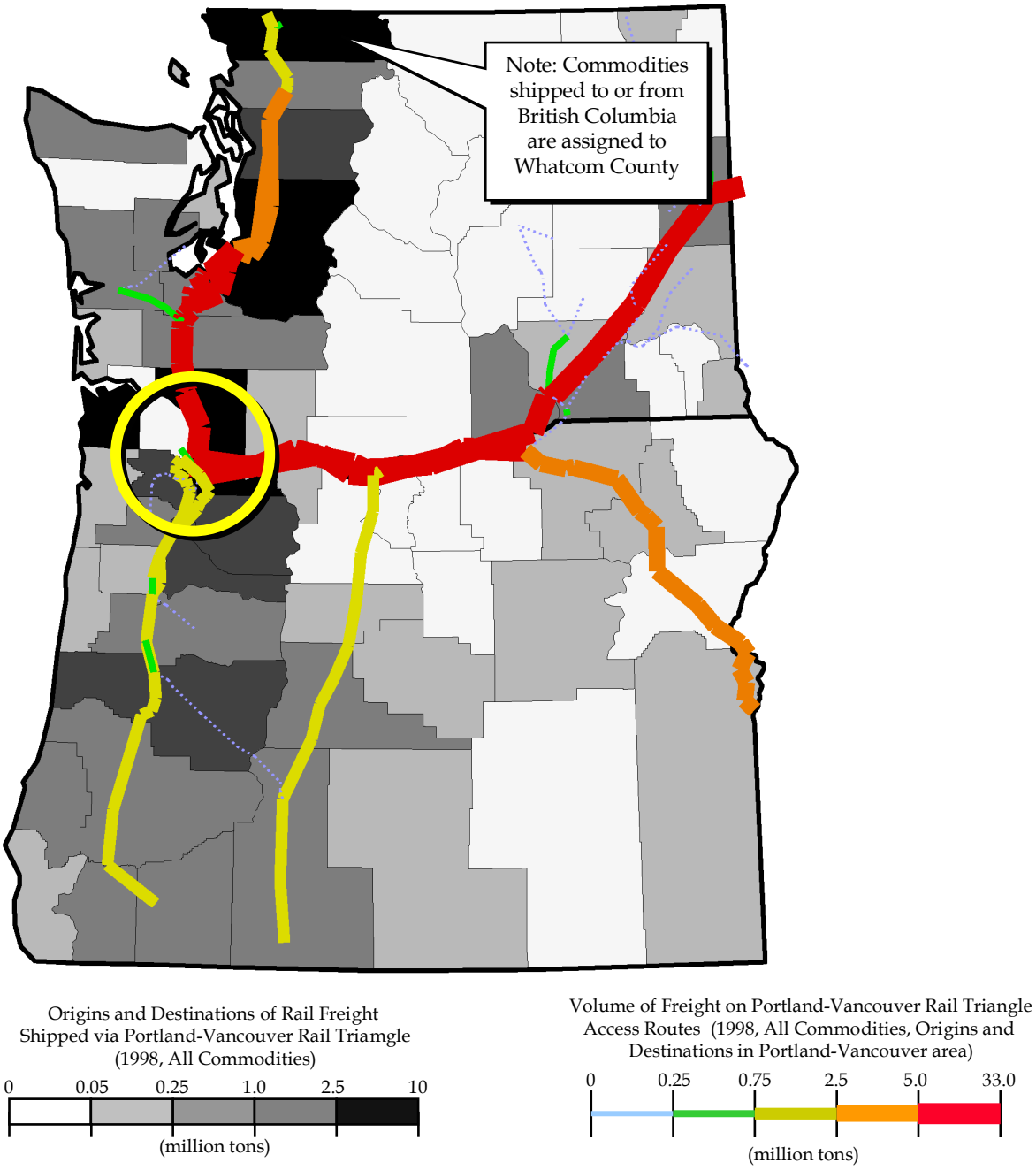


Figure 9. Oregon-Washington Origins and Destinations for Rail Freight Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle



Congestion at the Crossings Impedes Oregon and Washington Trade with National Markets

The population and economy of Oregon and Washington are small compared to the other economic regions of the United States. Transportation is critical for Pacific Northwest businesses moving and selling products to the larger California and Eastern markets. Figure 10 shows the relative sizes of the national trade regions. The shaded circles show the relative population size of the major metropolitan areas, the ovals indicate the geographic scope of the multi-state trade regions, and the columns show the relative size of the regional economies measured as a share of national gross domestic product (GDP). (Florida, shown in the dotted-line oval, is usually counted as part of the Atlanta-Southeast trade region, but is emerging as a major, new, trade and distribution center for the Caribbean and Latin America.)

Figure 11 shows the flows of truck freight between the Oregon-Washington region and the rest of the United States; the wider the bandwidth of the highway line, the higher the tonnage of truck freight moving over that highway. The ovals delineate the multi-state trade regions. The small circle shows the location of the I-5 and I-205/Columbia River highway crossings. The density of truck freight on I-5 and I-84 shows the importance of these trade routes to Oregon and Washington businesses and the influence of congestion at the I-5/Columbia River highway crossings.

Congestion at the Crossings Weakens the Region's Competitiveness in Global Markets

The Pacific Northwest is very reliant on international trade. With exports worth $45 billion per year, Oregon and Washington are more dependent on international trade than the United States as a whole. Figure 12 tracks the value of exports from Oregon and Washington as a percentage of gross regional product compared to the value of exports from the United States as a percentage of gross domestic product.

Good access to Pacific Northwest ports and airports—measured in travel time, cost, and reliability—gives the region's businesses a competitive edge in reaching global markets. However, the Portland-Vancouver area's preeminent position as an export region is being undermined by global competition and rising transportation costs.

Over half of the Pacific Northwest's export trade today is with Pacific Rim countries; much of it is trade in grain that moves through Portland-Vancouver and other Columbia River ports. Grain export sales are particularly sensitive to cost. Differences of a few cents a ton affect buyers' choices among global suppliers. Highway and rail congestion at the Portland-Vancouver crossings increases the cost and decreases the reliability of export shipments, weakening the competitive position of businesses selling to overseas markets.

Figure 10. Gross Regional Products of Eight U.S. Trade Blocs
With Major Population Centers

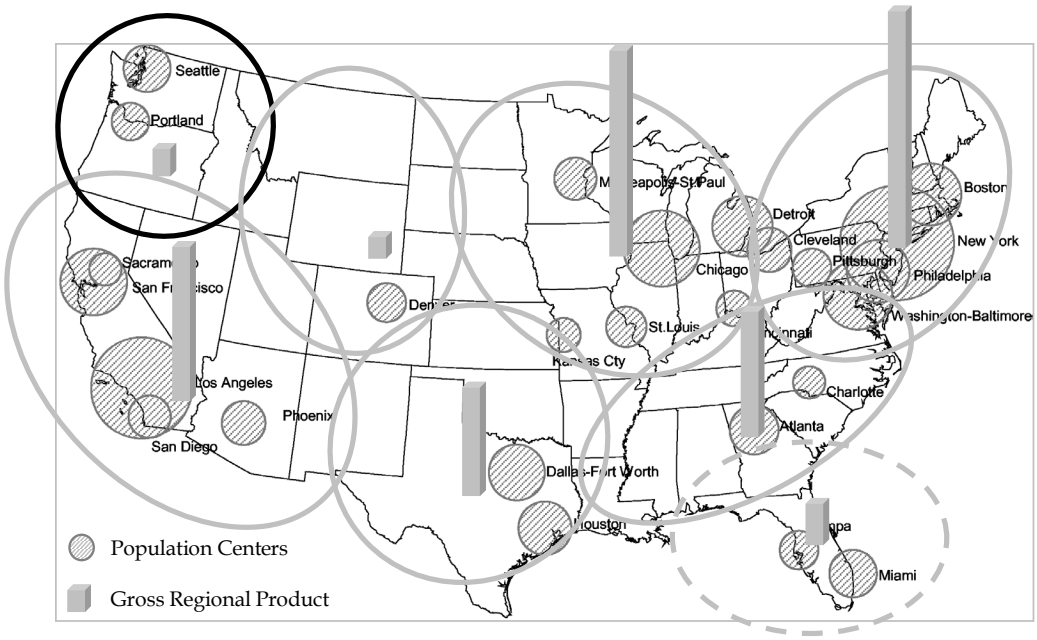


Figure 11. National Freight Flows for Goods with Origins or Destinations in Oregon or Washington

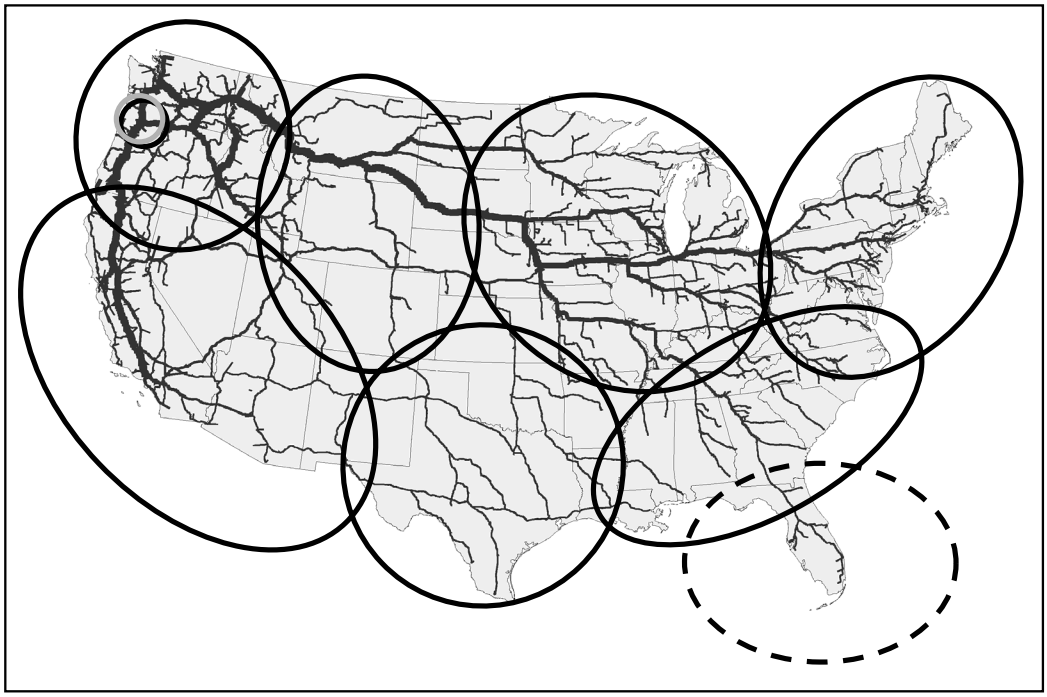
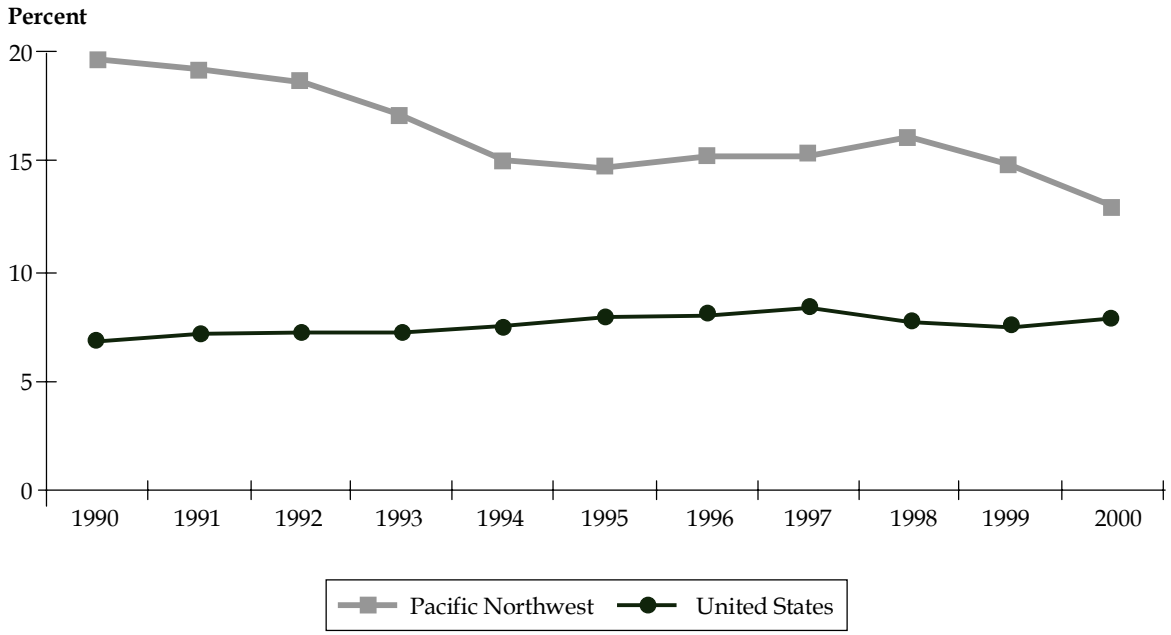


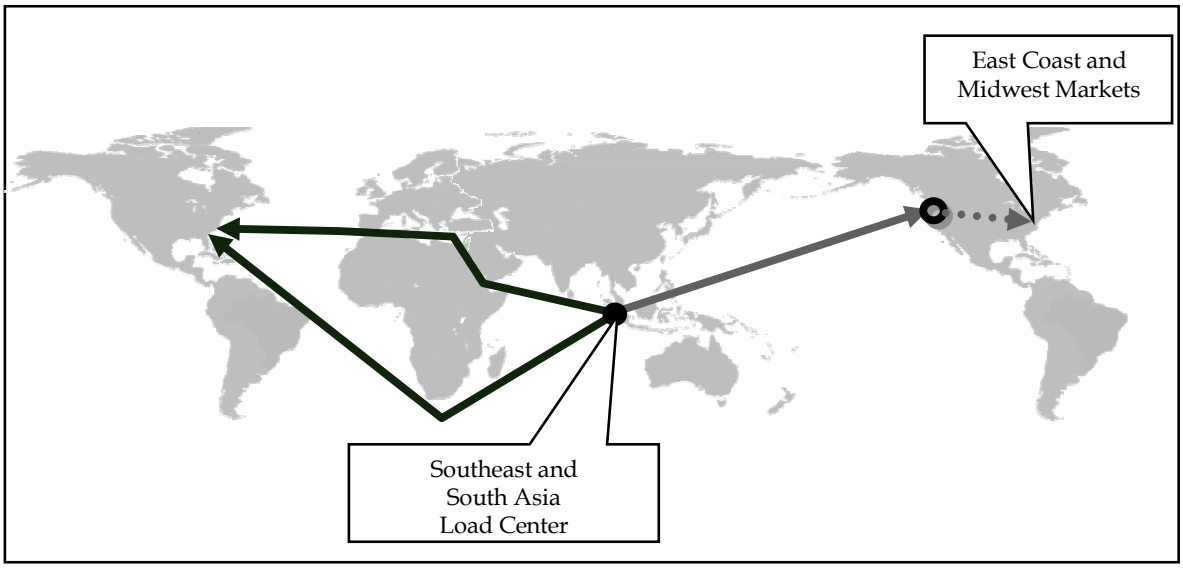
Figure 12. Oregon-Washington Exports as a Percentage of Oregon-Washington Gross Regional Product and U.S. Exports as a Percentage of U.S. Gross Domestic Product



The ports of Seattle and Tacoma have been major transshipment centers for imported merchandise moving from the Pacific Rim to Midwest and East Coast markets. About half of rail shipments originating from Seattle-Tacoma travel south through Portland-Vancouver, then eastward along one of the Columbia River Gorge rail lines.

The Pacific Northwest remains a major trading partner for Korea, Japan, China, and Taiwan. But the Pacific Northwest is no longer on the shortest, most cost-effective route from the growing, global load centers of South and Southeast Asia to the major United States Midwest and East Coast markets. As illustrated in the schematic diagram in Figure 13, when the cost of transporting goods by land across the United States is considered, shipping routes via the Cape of Good Hope or the Suez Canal and the Atlantic Ocean are now competitive with Pacific routes. The Pacific Northwest ports will be competing more and more with the ports in New York, New Jersey, and the Southeast United States as well as the ports of Los Angeles-Long Beach. For Oregon and Washington ports to maintain or increase their share of the global merchandise trade, access to and from its ports must be as reliable and cost-effective as possible.

Figure 13. Shipping Routes from Southeast and South Asia Load Centers to East Coast and Midwest Markets in U.S.



Regional Growth and Increasing Demand for Freight Transportation Will Magnify the Economic Impacts of the Crossing Choke Points

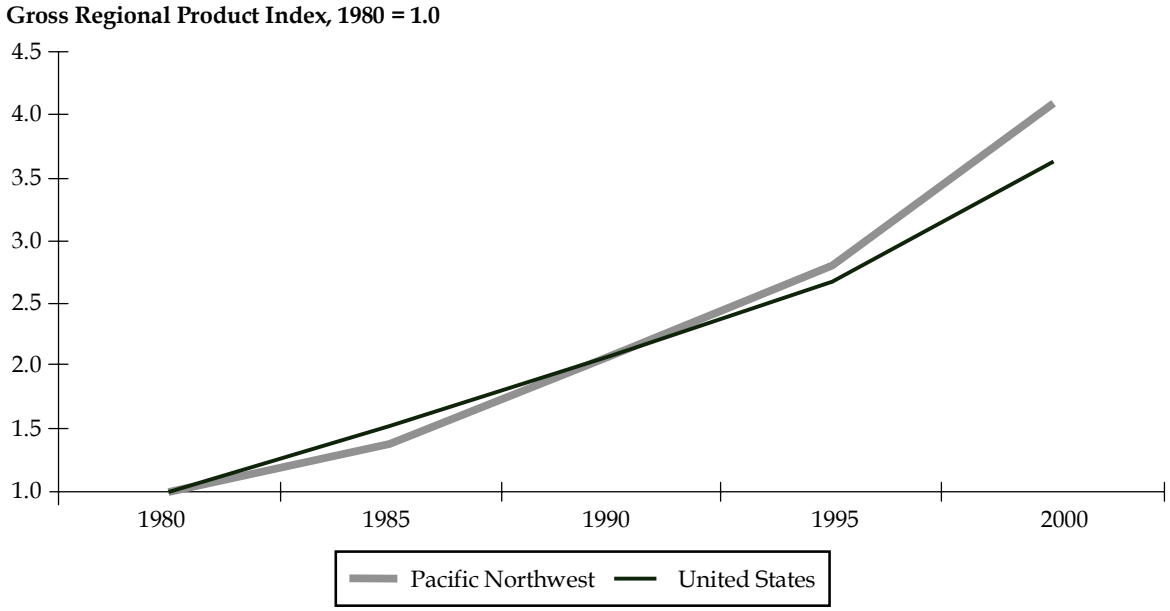
The region has significant potential for economic expansion. Regional economic growth has averaged 3.4 percent per year over the last 20 years, outpacing the United States average in the last decade. Figure 14 compares the growth of the Oregon-Washington economy to the United States average. Regional employment also has grown faster than the national average.

> *"Traffic on I-5 makes it difficult for us to do business in Washington. It takes too long to get there and back."*
> Portland freight shipper

Despite a recent slowdown in the economy, the economy of the Pacific Northwest is forecast to match or exceed the national average over the next 20 years. With this growth will come increased demand for reliable and cost-effective freight transportation. At a moderate, national economic growth rate of 3.1 percent per year, import-export freight tonnage could double by 2020 and domestic freight tonnage could increase by about 70 percent.[10]

[10]Federal Highway Administration, Freight Analysis Framework Project estimates, December 2002.

Figure 14. Growth in Oregon-Washington Gross Regional Product (GRP) and U.S. Gross Domestic Product (GDP)



This growth will strain the national freight transportation system. Over the last two decades, passenger and freight movements on the nation's transportation system have increased dramatically. Vehicle-miles-of-travel (VMT) by passenger cars and trucks grew by 72 percent while construction of new road-lane-miles grew by only one percent.[11] Over the same period, ton-miles-of-freight moving over the nation's railroads increased by 55 percent while rail system mileage actually declined because unused track was removed.[12]

The Portland-Vancouver area and the Pacific Northwest can expect growth in freight volumes to occur at rates faster than the national average, with import-export freight tonnage growing 123 percent between 1998 and 2020 and domestic freight tonnage increasing by 76 percent.[13] If the forecast growth in freight is not accompanied by increases in capacity, worsening congestion will make supply chains less reliable, drive up the cost of labor and materials, and undermine the competitive position of Pacific Northwest businesses.

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[11] Federal Highway Administration, *Highway Statistics*.

[12] Eno Foundation.

[13] Federal Highway Administration, Freight Analysis Framework Project estimates, December 2002. For additional detail and comparative information for other regions see http://www.ops.fhwa.dot.gov/freight/adfrmwrk/index.htm.

Economic Effects by Industry

The Regional Economy Is Dependent on Safe, Reliable, and Cost-Effective Transportation

Transportation underpins the $350 billion economy of Oregon and Washington and the region's 5.5 million jobs.[14] Figure 15 shows the contribution of each major sector to the gross regional product (GRP) of the Oregon-Washington economy. Figure 16 shows the distribution of jobs by sector.

Businesses and employees in all sectors of the Oregon-Washington economy depend on safe, reliable, and cost-effective transportation. Figure 15 also shows the percentage of each sector's contribution to the GRP that is spent on transportation to support that sector. The expenditures range from a high of 7.7 percent in the agricultural sector, which moves heavy, high-bulk products, to a low of 0.6 percent in the finance-insurance-and-real-estate (FIRE) sector, which moves light, high-value products. Compared to other nations, these expenditures are low, reflecting the United States' immense and successful investment in high-quality and cost-efficient transportation systems.

However, the Oregon-Washington economy is more dependent on transportation and spends more proportionally on transportation than the nation as whole. Overall, the Oregon-Washington economy spends 3.35 percent of its GRP on transportation, 6.7 percent more than the national average of 3.14 percent.[15] It is more dependent because five transportation-intensive sectors—agriculture, construction, transportation and utilities, wholesale and retail trade, and manufacturing—make up 54 percent of the Oregon-Washington economy, but only 49 percent of the national economy.

Transportation congestion and delay reduce the productivity and profitability of businesses in the transportation-intensive sectors. These businesses pass along some of the congestion and delay costs to businesses in the service, FIRE, and government sectors that depend on the transportation-intensive sectors. Congestion and delay costs have a multiplier effect that is felt throughout the region's economy. When the transportation-intensive sectors do well, the overall Oregon-Washington economy does well; when productivity in the transportation-intensive sectors drops, so does the health of the region's overall economy.

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[14] Bureau of Economic Analysis.

[15] Bureau of Economic Analysis. Gross domestic product is reported in chained 1996 dollars. The percentage transportation expenditures by sector are based on the U.S. Transportation Satellite Accounts for 1996.

Figure 15. Oregon and Washington Gross Regional Product by Industry Sector

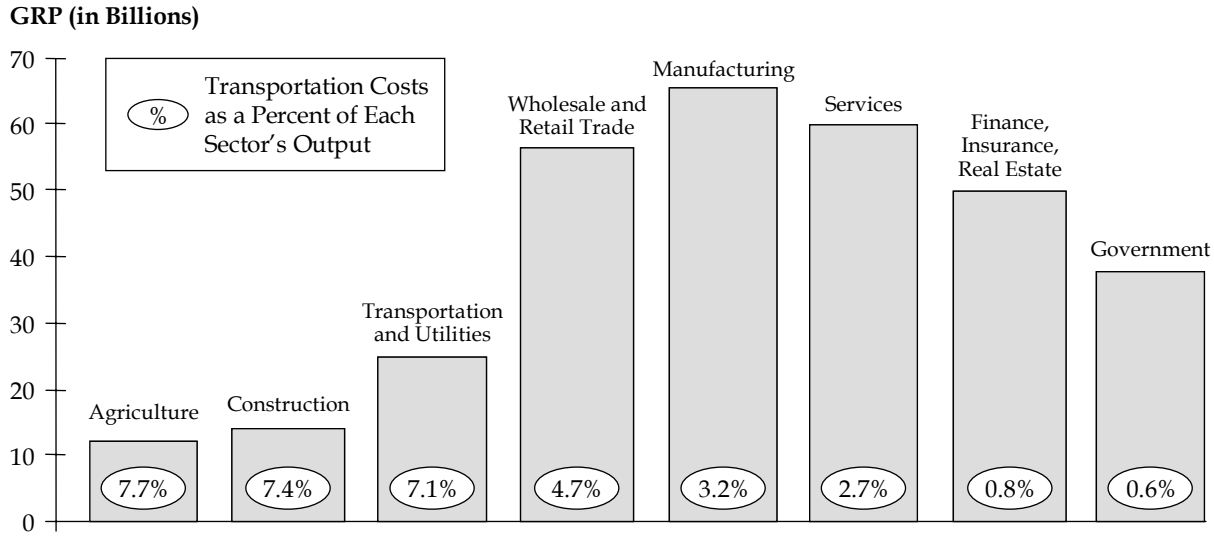
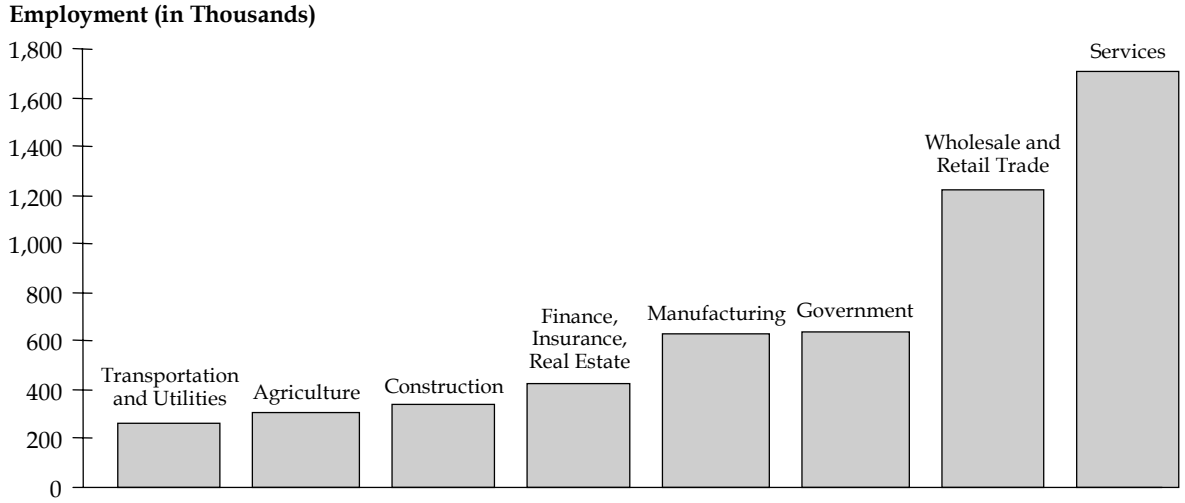


Figure 16. Oregon and Washington Employment by Industry Sector



Within the transportation-intensive sectors, five specific industries are especially sensitive to the Portland-Vancouver highway and rail choke points. These industries are:

- Lumber, wood, and paper products;
- Transportation equipment manufacturing and steel;
- Farm and food products;
- High-technology (electronics and scientific instruments); and
- Distribution and wholesale trade.

These freight-intensive industries account for 30 percent of the Oregon-Washington GRP and 20 percent of the states' employment.[16] Table 2 provides a breakout of contribution of these industries to the GRP. Table 3 provides a breakout of employment by industry.[17]

Table 2. Contribution to Oregon and Washington Gross Regional Product of Five Freight-Intensive Industries

GRP by Industry (in $ Millions)	1990	2000
Lumber/Wood/Paper	10,623	7,293
Distribution/Wholesale Trade	16,074	28,588
Transportation Equipment/Steel	10,937	9,829
Farm and Food Products	12,549	18,983
High-Tech (Electronics and Scientific Instruments)	2,537	34,332
Total	**52,720**	**99,025**
Total as a Percentage of Oregon and Washington GRP	26%	31%

[16] Bureau of Economic Analysis.

[17] American Electronics Association, *Cyberstates 2002*. The high-technology industry numbers shown in the tables cover the electronics industry and the scientific instruments industry, selected because these sectors correspond to the Standard Transportation Commodity Code industry classifications used in analyzing the movement of goods. The American Electronics Association (AEA) uses a broader definition of high-technology that includes high-tech services such as software development. The AEA's classification shows 225,200 high-tech employees in Oregon and Washington in 2001.

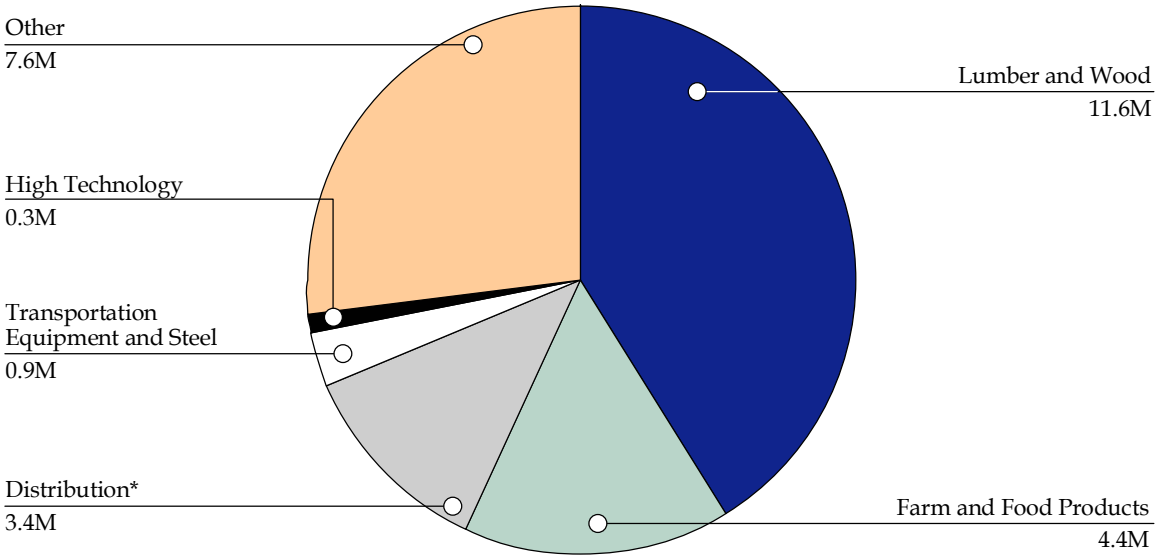
Table 3. Employment in Five Freight-Intensive Industries

Employment by Industry	1990	2000
Lumber/Wood/Paper	143,712	114,331
Distribution/Wholesale Trade	294,668	350,875
Transportation Equipment/Steel	169,254	144,846
Farm and Food Products	208,962	211,655
High-Tech (Electronics and Scientific Instruments)	56,246	85,333
Total	**872,842**	**907,040**
Total as a Percentage of Oregon and Washington GRP	24%	20%

These five industries account for approximately 70 percent of the commodity tonnage crossing the I-5 and I-205/Columbia River bridges by large truck[18] and about 60 percent of the commodity tonnage moving through the Portland-Vancouver rail triangle. Figure 17 shows the distribution of commodity tonnage by industry for the I-5 and I-205/Columbia River bridges. Figure 18 shows the distribution of commodity tonnage by industry for the rail network. (These figures are commodity or net tonnage numbers; they are not gross tonnage numbers, which would include tonnage for truck tractors and trailers or locomotives and cars.)

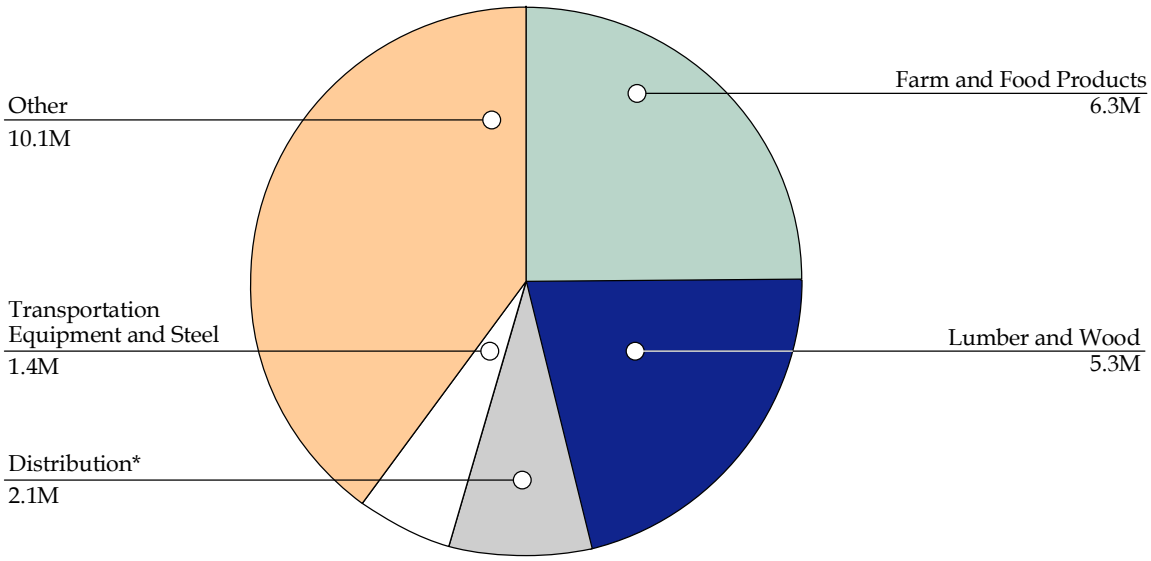
[18]The statistics capture primary and long-haul freight moves (e.g., supplier-to-manufacturer; manufacturer-to-distribution center; and most intermodal moves), but do not capture local distribution-to-retail moves and farm-to-processor moves. The long-haul freight moves are typically made in large over-the-road trucks (e.g., 18-wheel, tractor-semi-trailer trucks or heavy-duty three-axle trucks). The statistics do not capture moves made by smaller trucks and service vehicles. The total of all freight movement by truck will be higher than reported in the figures, but reliable data accounting for all truck moves are not readily available.

Figure 17. Distribution of Freight Tonnage Crossing the I-5 and I-205 /Columbia River Bridges by Industry



* Distribution (or "Miscellaneous Shipments") includes most intermodal shipments.

Figure 18. Distribution of Freight Tonnage Using the Portland-Vancouver Rail Triangle by Industry



* Distribution (or "Miscellaneous Shipments") includes most intermodal shipments.

The five freight-intensive industries represent the Pacific Northwest's:

- Traditional economic strengths—lumber, wood, and paper products; transportation equipment and steel; and farm and food products;
- Key emerging industries that are critical to the region's future growth—high-technology; and
- Goods-moving sectors that supply manufacturers, retailers, and service-sector offices—distribution and warehousing.

These industries place significant demands on the transportation system and are particularly vulnerable to the delays and decreased travel time reliability resulting from roadway and rail congestion in Portland and Vancouver.

The next sections of the report examine each of these five industries, providing an overview of key industry trends, a look at the importance of the Portland-Vancouver choke points to the industry's logistics, and a discussion of the economic effects of the choke points on the industry. Brief case studies of the experience of specific firms are provided for each industry. The industry profiles and case studies were built from interviews with company executives, industry association experts, and regional development economists.

Lumber, Wood, and Paper Products Industry

Standard Industry Classification Codes:	24 and 26
Oregon and Washington Employment (2000):	114,331
Oregon and Washington Value of Production (2000):	$7.3 billion

Industry Trends

Lumber, wood, and paper are traditional pillars of the Pacific Northwest economy. While employment and output in this industry have been declining for years in the region, a shift toward more value-added processing has created new opportunities. This increasing specialization translates to less cost-sensitive export of bulky raw materials and more time-sensitive export of higher-value processed goods. For example, instead of exporting large volumes of logs, more wood is now transformed into high-value items such as structural architectural framings before being shipped to domestic markets or overseas.

Importance of Crossings to Industry

The Pacific Northwest has been a primary source of lumber and wood products for much of the United States market. Lumber and wood products were shipped from the Pacific Northwest to the major United States Midwest and East Coast markets. However, the supplier-market relationship has changed over time. Today, Oregon and Washington continue to be principal suppliers to the large Southern California market, but lumber- and wood-product manufacturers in the South Central states and Ontario now supply the Midwest market, and Southeastern United States and Eastern Canada suppliers serve the East Coast market. This has caused a major reorientation of the industry's shipping patterns—from predominantly west-to-east to predominantly north-to-south today.

Figure 19 presents a western United States picture of rail shipments of lumber, wood, and paper products that move through the Portland-Vancouver rail triangle. The figure shows the counties that ship or receive rail freight moving through the triangle; the darker gray the county, the more tonnage is shipped or received from that county. (Commodities shipped to and from British Columbia are assigned to Whatcom County.) The figure also shows freight-rail tonnage of lumber, wood, and paper products moving on the major rail lines; the wider and redder the bandwidth of the rail line, the greater the commodity tonnage carried on the rail line. (Figure 19 reports net commodities tonnages, not gross tonnages, which would include the weight of the locomotive and railcars.) Oregon and Washington lumber, wood, and paper products moving through the Portland-Vancouver area today is strongly oriented towards the Southern California and Texas markets.

Truck shipments of lumber, wood, and paper products that cross the I-5/Columbia River bridge are even more strongly oriented to the Southern California market. Figure 20 shows West Coast truck shipments of lumber, wood, and paper products that cross the I-5/Columbia River bridge. As in the rail figure, the gray scale indicates the total commodity tonnage shipped and received by county, and the highway bandwidth and color indicate the tonnage of commodities moving by truck along the highways.

Figure 19. Western United States Origins and Destinations for Lumber, Wood, and Paper Products Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle

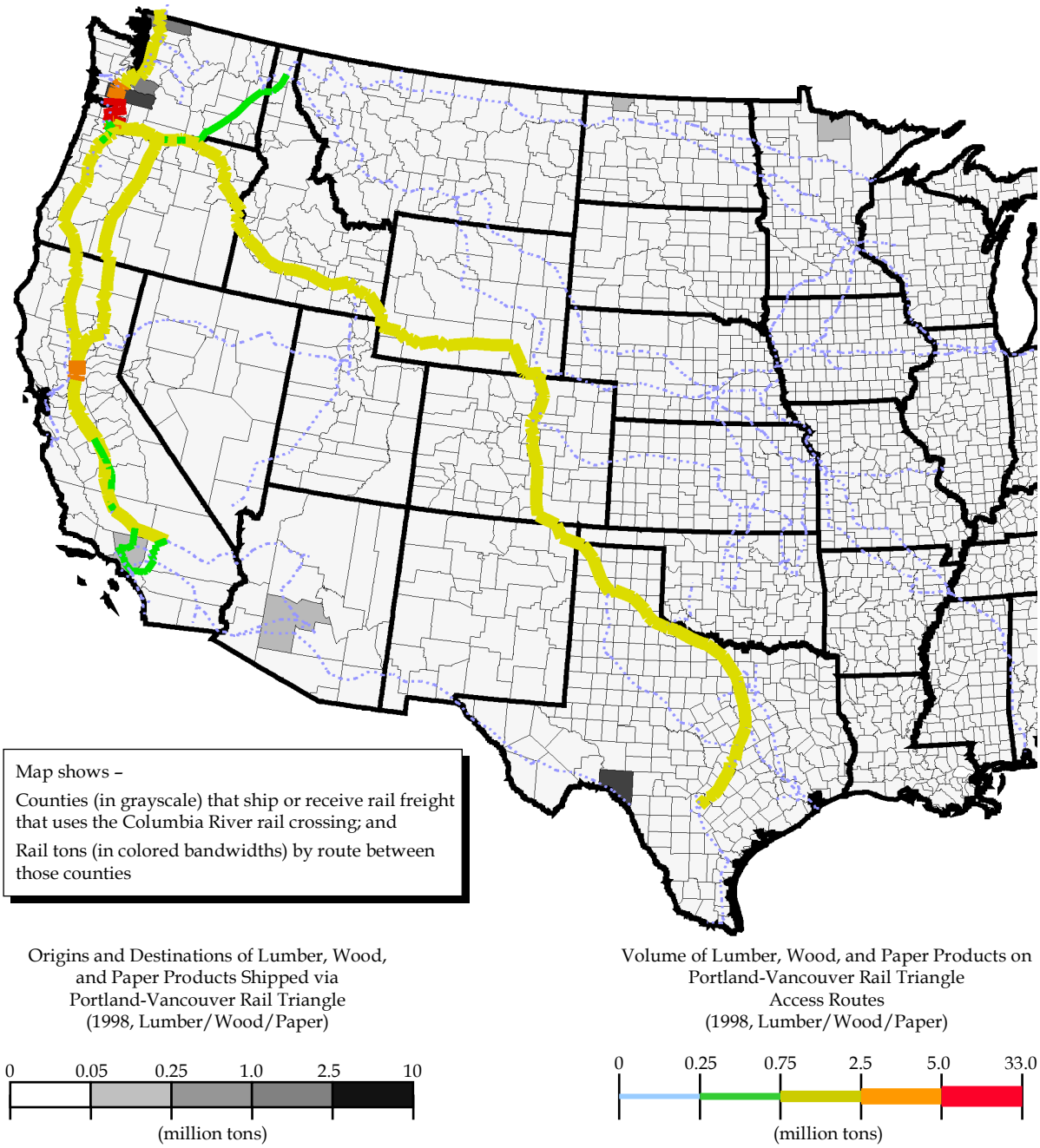


Figure 20. West Coast Origins and Destinations for Lumber, Wood, and Paper Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge

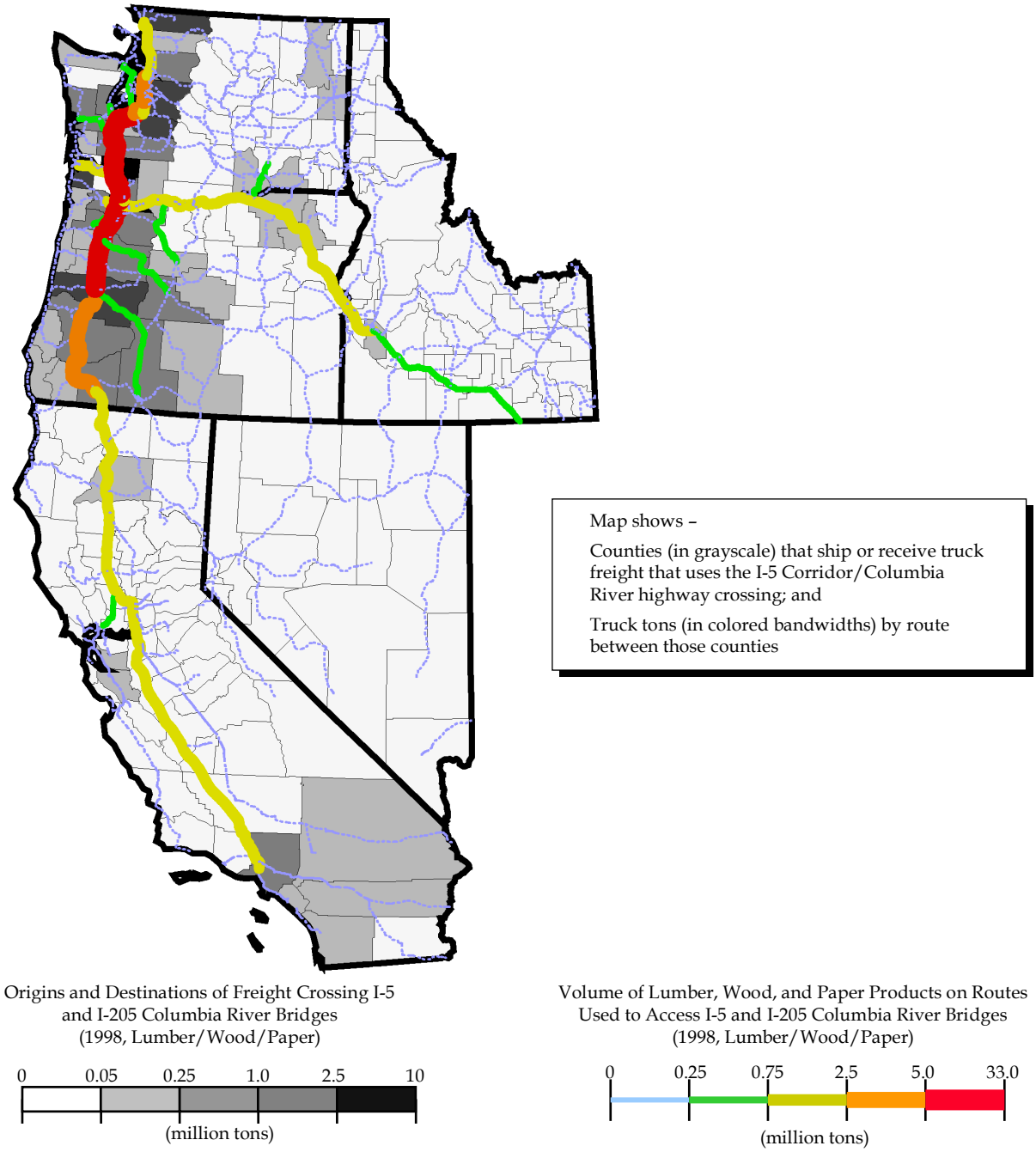


Figure 21 shows more detail of the rail movements of lumber, wood, and paper products through the Portland-Vancouver rail triangle.

Figure 21. Oregon-Washington Origins and Destinations for Lumber, Wood, and Paper Products Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle

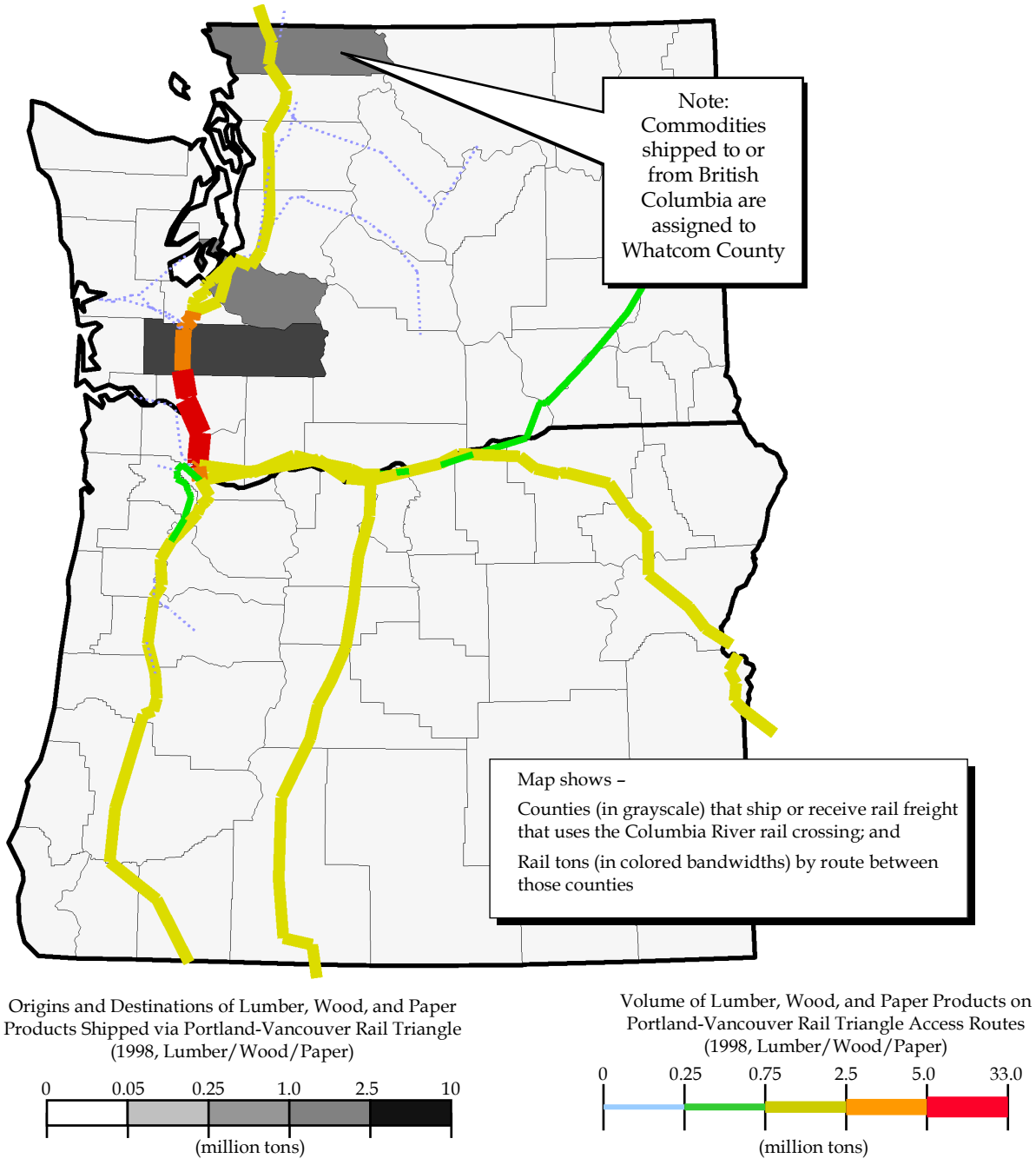


Figure 22 illustrates the pattern of truck movements of lumber, wood, and paper products within Oregon and Washington. It shows that every county in western Oregon and western Washington has a stake in reliable truck movement across the I-5/Columbia River bridge. Again, the figure shows just those truck shipments of lumber, wood, and paper products that cross the I-5/Columbia River bridge, but it includes inter-plant truck moves (described in the case study below) as well as truck moves for export and import. Although North American production accounts for most lumber-related traffic in the region, overseas wood imports are growing. Radiata pine logs from New Zealand arrive at the Port of Portland and then are transported by truck to provide feedstock for Pacific Northwest lumber mills, allowing the mills to be utilized more fully. To reach mills in southwestern Washington, lumber trucks must negotiate port-area congestion exacerbated by I-5 traffic and then cross either the I-5 or I-205 bridges.

Effects of Choke Points on Industry

Highway and rail congestion at the Portland-Vancouver crossings affect the lumber, wood, and paper products industry by:

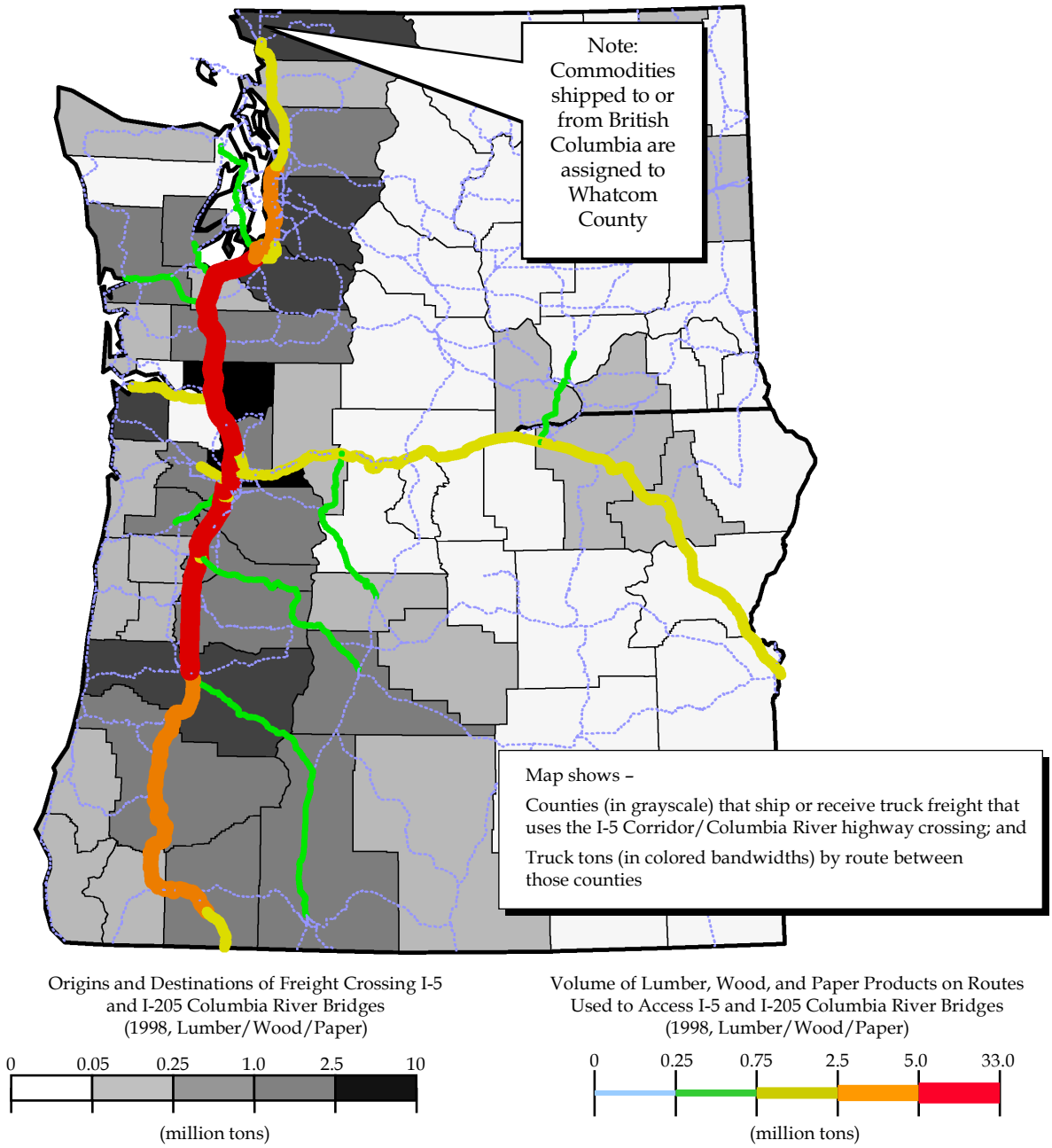
- Shrinking the supply areas that serve mills and reducing manufacturing plant efficiency by making it more costly to move logs, chips, and production materials between mills and manufacturers that are located outside the Portland-Vancouver area;

- Increasing the cost of reaching national markets by raising long-haul trucking and rail costs. Lumber and wood products transported by rail must negotiate congestion in the Portland-Vancouver terminal area before continuing on to more distant domestic markets, including Los Angeles and Dallas-Fort Worth. Congestion leads to longer transit times and deteriorating delivery reliability, making rail less competitive than trucking. However, trucking costs for heavy, bulky lumber and wood products are usually higher than rail costs, especially for long-distance trips. In the long term, increased shipping costs could cause Oregon-Washington businesses to lose market share and profitability.

- Increasing the cost of exports and imports. Exports generate jobs and income for Oregon and Washington, and imports increasingly help keep the region's mills running. Congestion that increases transit times and reduces delivery reliability also undermines the competitiveness of Oregon-Washington businesses in global markets. As trade volumes drop, ports lose economies of scale and may become less cost-efficient and less attractive to shippers.

On a national scale, the delays and costs encountered at the Portland-Vancouver crossings impact the nearly eight percent of United States lumber, wood, and paper production that emanates from Oregon and Washington.

Figure 22. Oregon-Washington Origins and Destinations for Lumber, Wood, and Paper Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge



Lumber, Wood and Paper Products Case Study

Interstate Wood Products

Firm Location: Kelso, Washington.

Products: Hauling of wood chips from lumber mills to processing plants.

Background: Interstate Wood Products is a medium-sized trucking firm that specializes in hauling wood chips from lumber mills to processing plants where the chips are converted to pulp, paper, and board products.

Product Shipping Processes: The company is located 50 miles north of Portland and 125 miles south of Seattle. Serving west-central Washington and northern Oregon, the company uses specialized trucks to pick up scrap wood chips at lumber mills and deliver them to processing plants. The processing plants are capital intensive and require a steady stream of feedstock (wood chips) to keep them operational. Disruptions in production due to a lack of chips are costly.

Effects of I-5/Columbia River Crossing Congestion on Company: Interstate Wood Products has already been priced out of the Seattle market due to congestion. The company formerly linked mills and plants north and south of Seattle, but congestion made round-trip times long, unpredictable, and costly—four-hour round-trips through Seattle frequently extended to six and eight hours due to traffic jams. Now, due to congestion at the I-5/Columbia River and I-205 highway crossings, the company is encountering similar problems in linking clients north and south of Portland.

Impacts on Competitiveness: Congestion has reduced the service area for Interstate Wood Products. Already squeezed out of markets north of Seattle, the company now finds congestion threatening access to clients south of Portland. Fewer and smaller markets translate into less efficient use of the company's capital equipment, resulting in higher costs, possibly fewer jobs, and lower profitability. Poor reliability and increasing delays make the region's lumber, wood, and paper product producers less competitive as costs are either passed on to customers. If costs cannot be passed on due to competition with other regions, the Oregon and Washington companies must absorb the costs themselves, reducing profits and lowering long-term viability.

Farm and Food Products Industry

Standard Industry Classification Codes:	01, 02, 07 and 20
Oregon and Washington Employment (2000):	211,655
Oregon and Washington Value of Production (2000):	$19.0 billion

Industry Trends

The productivity of the Pacific Northwest agricultural industry is growing, with output expanding while overall employment remains steady. The region is a leading grower of grains; grass seed; a wide variety of fruits (including apples, pears, and raspberries), vegetables, and horticultural products (including azaleas and Christmas trees). The region also has a significant food products industry, producing processed items such as wine, pasta, and roasted coffee.

Importance of Portland-Vancouver Crossings to Industry

Washington, Oregon, Montana, Idaho, and portions of the Upper Midwest have some of the most productive agricultural regions in the country. Farm and food products businesses in these areas depend on the Columbia River ports, the Port of Seattle, and the Port of Tacoma to reach export markets.

Rail links to the Port of Portland, the largest grain exporting port on the West Coast, are particularly important. Figure 23 shows the pattern of western United States rail shipments of farm and food products that move through the Portland-Vancouver rail triangle. The figure shows how farm and food export shipments from the entire northwestern tier of the country converge on the Port of Portland and other Columbia River ports. Figure 24 shows the pattern of rail shipments of farm and food products within Oregon and Washington. Rail service provides a vital link between eastern Washington agricultural producers who are exporting farm and food products and the ports of Portland-Vancouver and Seattle-Tacoma.

Rail congestion in Portland-Vancouver would be much worse if it were not for the large volumes—over 12 million tons annually—of grain and other products transported by barge to and from the Port of Portland. Barges can economically ship bulk commodities such as the grains grown in eastern Washington and Oregon that would otherwise be shipped almost entirely by rail or truck. Competition among the three modes generally keeps down the price of shipping farm and foods products although competition varies by location. Figure 25 shows the tonnage and types of commodities moved by barge downriver (inbound) to the Portland-Vancouver ports and upriver (outbound) to eastern Washington and Oregon. Barge shipments within the metropolitan area are not included in this figure.

Figure 23. Western United States Origins and Destinations for Farm and Food Products Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle

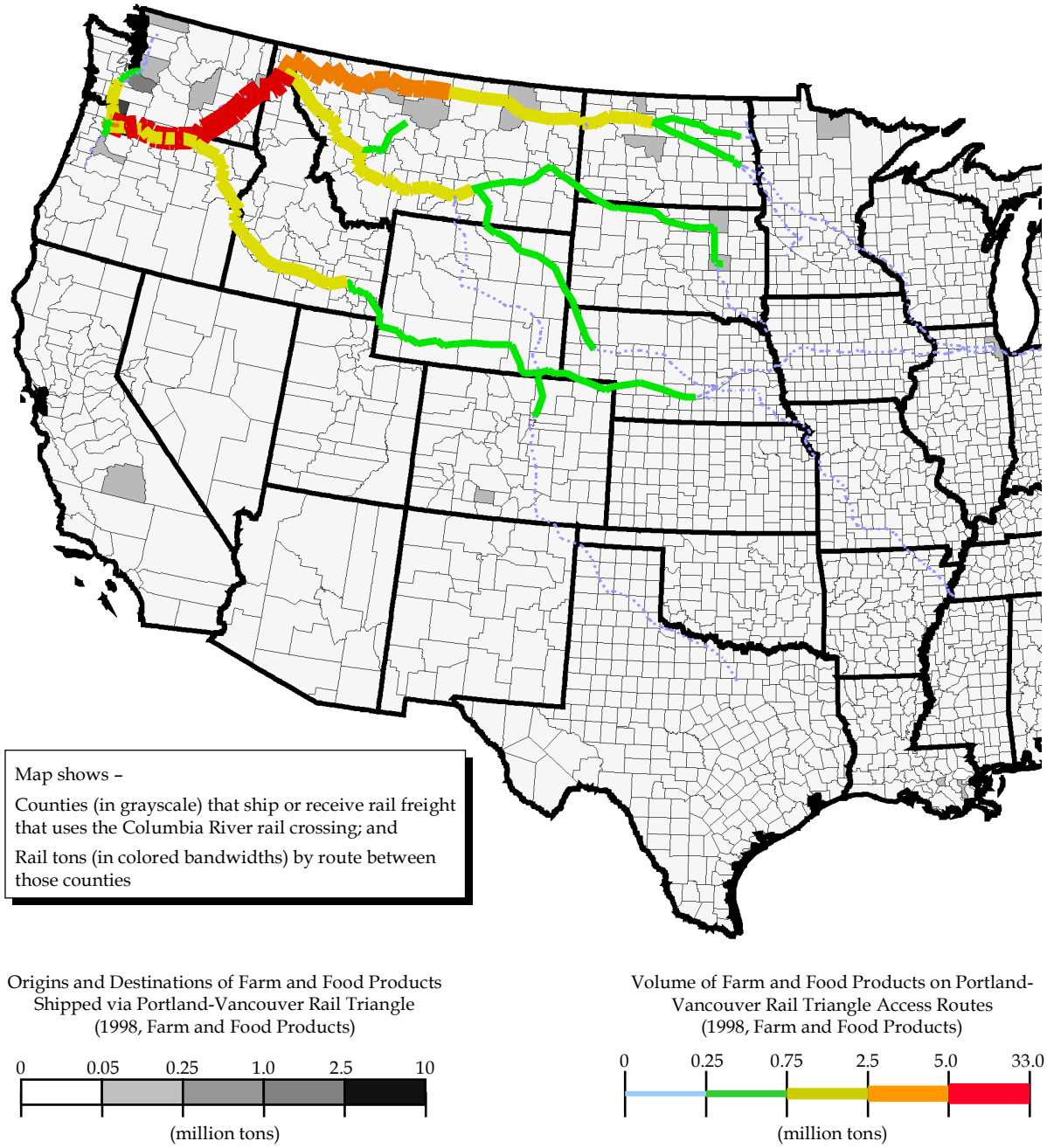


Figure 24. Oregon-Washington Origins and Destinations for Farm and Food Products Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle

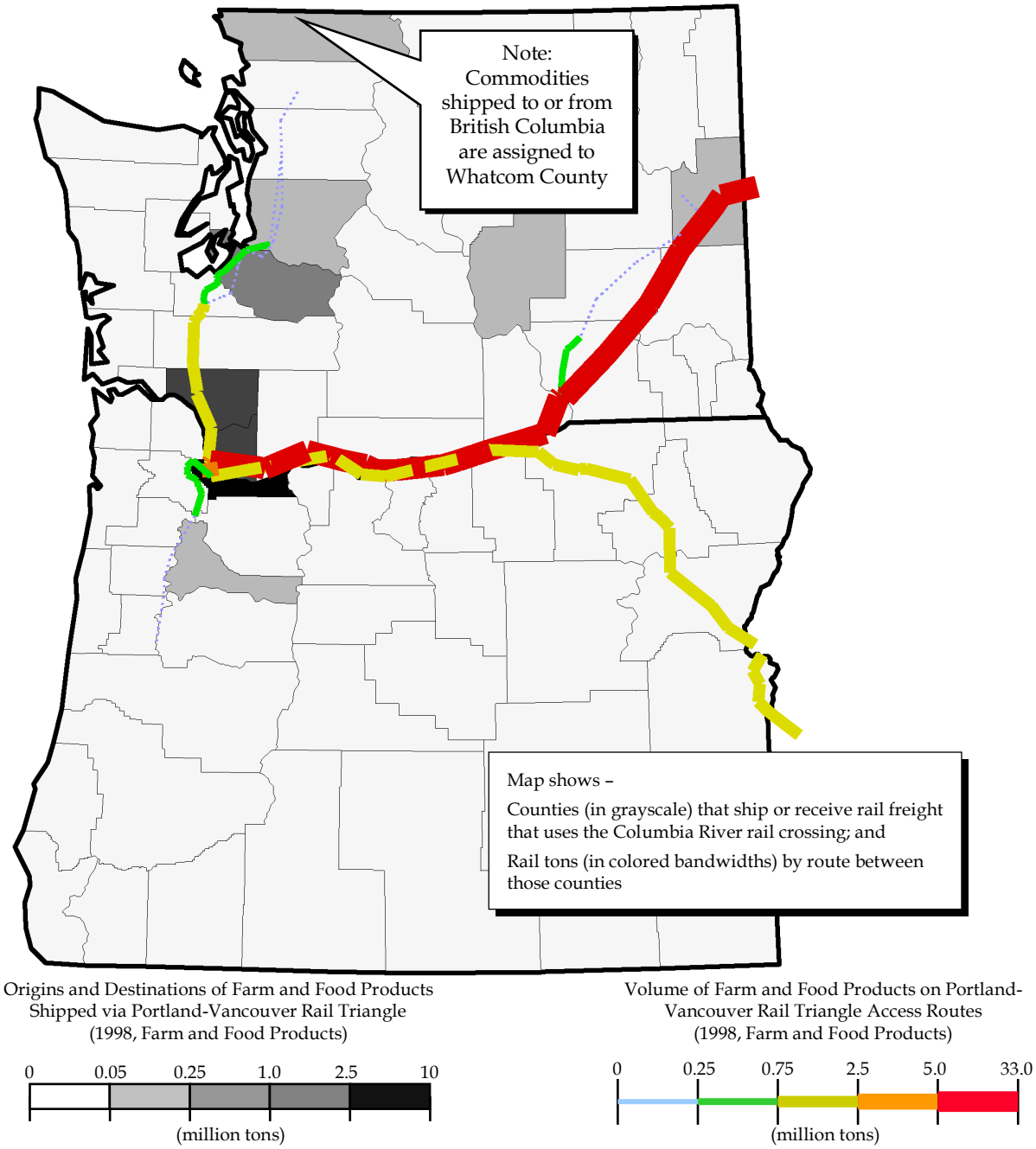
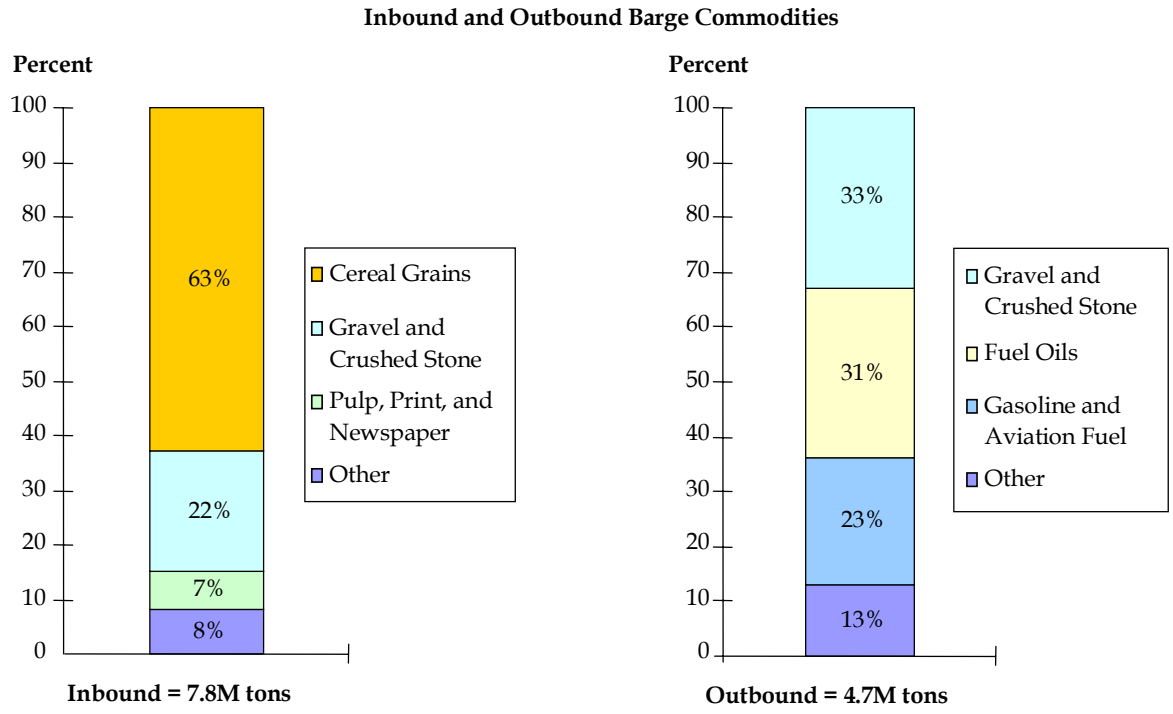


Figure 25. Port of Portland Barge Commodities
Inbound (Downriver) and Outbound (Upriver)



Source: Commodity Flow Database for the Portland Metropolitan Area, 1997.

Trucks, while not used intensively to ship bulk commodities such as grain over long distances, carry large volumes of food products over short distances. Trucks deliver higher value, processed foods to supermarkets and transport highly perishable, time-sensitive food products such as Washington oysters. Figure 26 shows the West Coast movement of farm and food products that cross the I-5/Columbia River bridge by truck. Over 3 million tons of food products are trucked across the I-5/Columbia River bridge annually, with many of these products destined for sale in California markets.

Figure 27 shows the more detailed pattern of truck movements of farm and food products within Oregon and Washington. The gray scale indicates the total commodity tonnage shipped and received by county, and the bandwidth and color of the lines indicate the tonnage of commodities moving by truck along the major highways. The figure makes clear that farm and food products businesses up and down the I-5 corridor, as well as those in central and eastern Oregon and Washington, move products across the I-5/Columbia River bridge.

Figure 26. West Coast Origins and Destinations for Farm and Food Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge

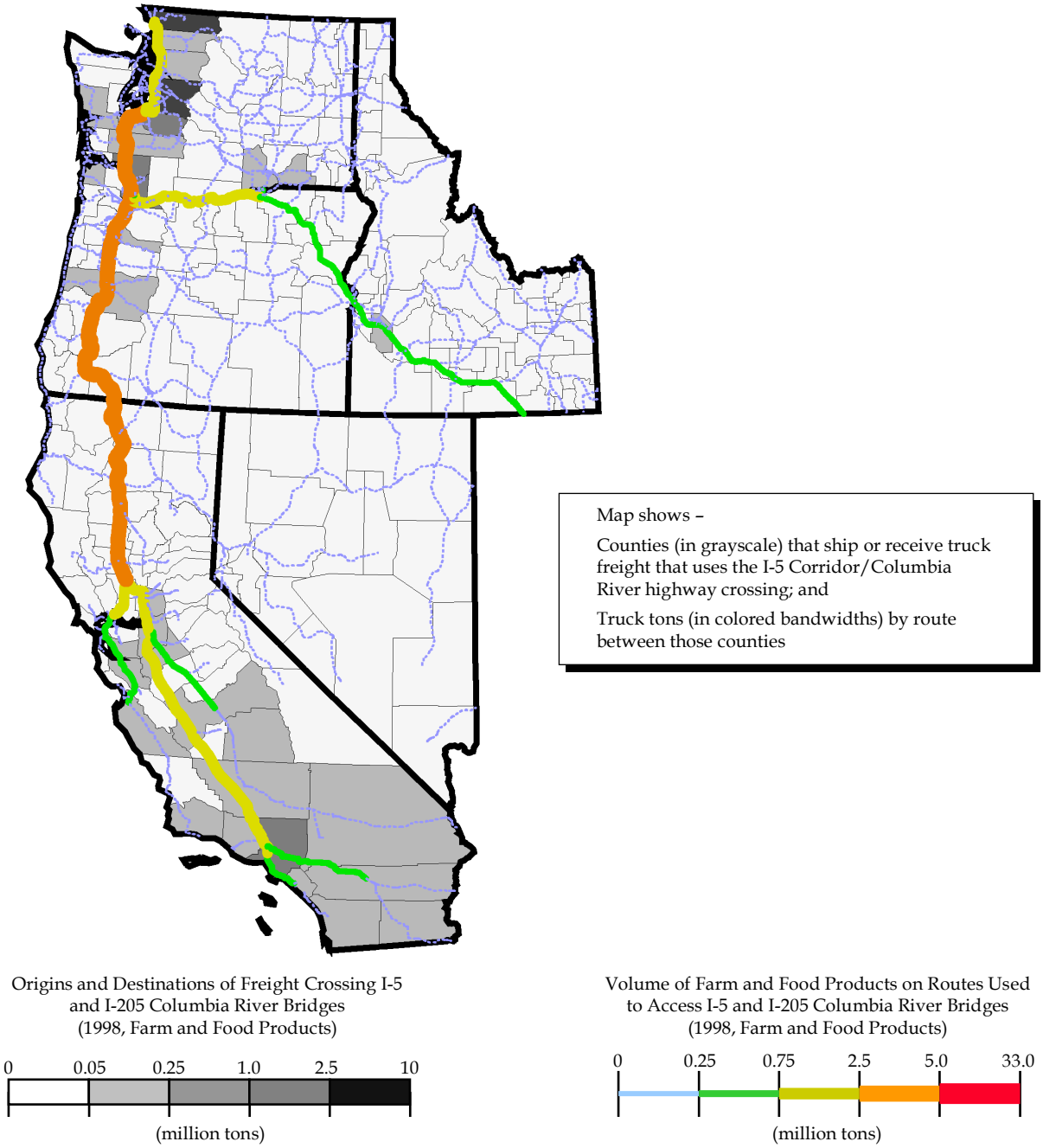
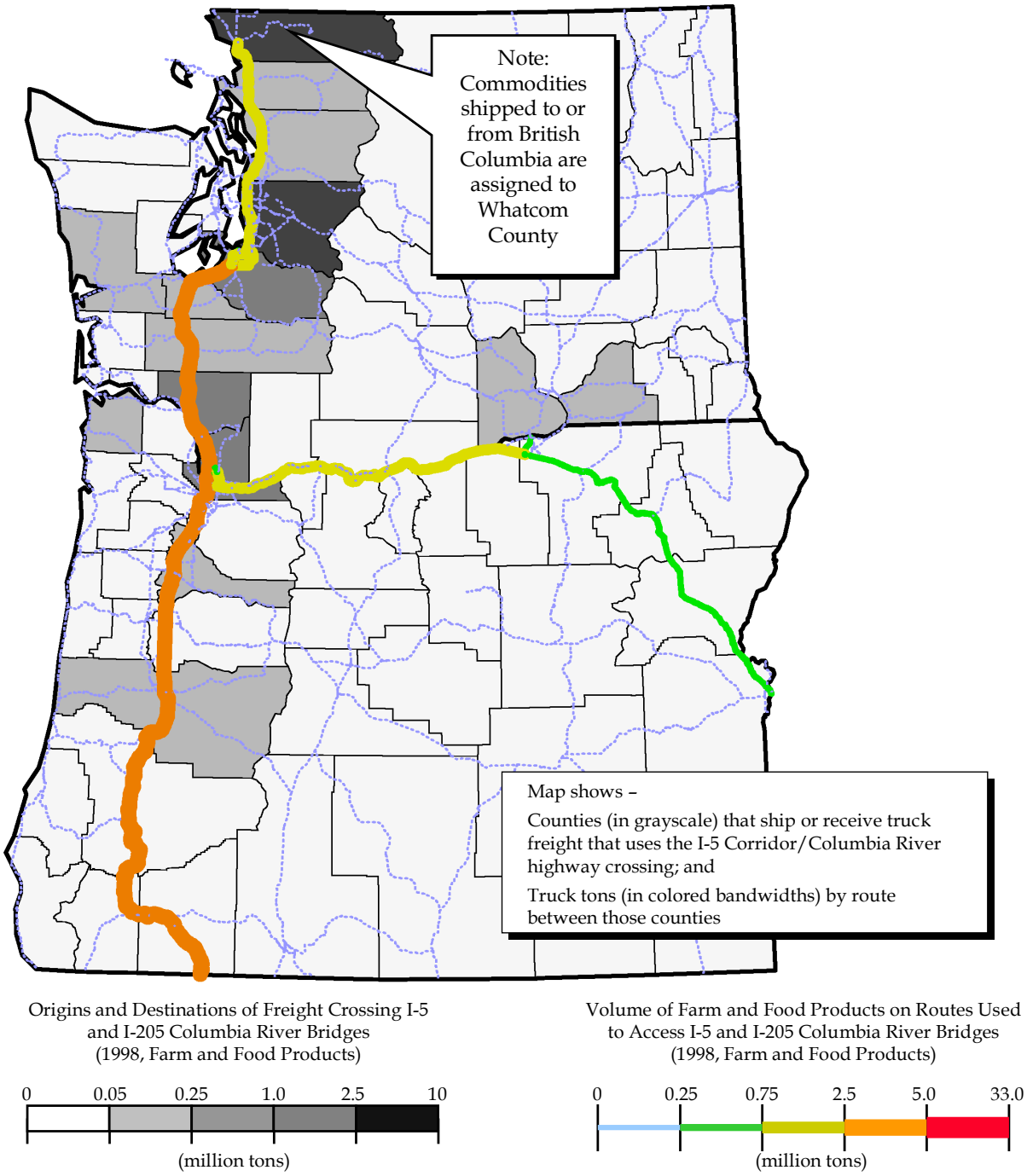


Figure 27. Oregon-Washington Origins and Destinations for Farm and Food Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge



Effects of Portland-Vancouver Choke Points on Industry

Producers of farm and food products face challenges similar to those encountered by the region's lumber, wood, and paper products industry. Congestion raises the cost of inter-plant truck moves for value-added food processors. This sector is forecast to be a long-term growth industry for the region, but rising congestion costs risk dampening the potential for job and revenue growth.

More important for the Oregon-Washington economy, many of the agricultural goods produced in Oregon and Washington are global commodities. The Portland-Vancouver highway and rail choke points raise the cost of exports to worldwide markets where competition is measured in differences of cents to the ton. The railroads have introduced heavier, higher-capacity rail cars and longer trains to gain economies of scale and keep down the cost of transportation, especially for long-haul bulk wheat shipments. But, these improvements to one link of the logistics chain are exacerbating congestion in the Portland-Vancouver rail network, which threatens to increase the cost of all rail movements through the area. If shippers pass through the higher transportation costs in their pricing, Oregon-Washington producers risk losing market share to producers overseas or to competing ports in North America.

A large component of the Pacific Northwest farm and food products industry is wheat. The case study below details how wheat and other grains are dependent on a combination of barge and rail service to the Port of Portland. Given existing demands on the Portland-Vancouver rail infrastructure, a decline in barge service would exacerbate existing rail congestion issues.

Farm and Food Products Case Study

Eastern Washington and Oregon Wheat[19]

Background: The eastern parts of Washington and Oregon are national leaders in wheat production. Overall, Washington ranks 3rd among the states in wheat production and Oregon ranks 13th. Portland and the Columbia River ports of Longview and Kalama are critical export gateways for Washington, Oregon, North Dakota, Montana, Idaho, South Dakota, Colorado, Minnesota, and Nebraska grains.

Wheat Production (in bushels) – Leading States, 2000

1. Kansas	6. South Dakota
2. North Dakota	7. Idaho
3. WASHINGTON	8. Minnesota
4. Montana	9. Colorado
5. Oklahoma	10. Texas
	13. OREGON

[19] United States Department of Agriculture, Statistics Service, 2000 data. County rankings fluctuate from year to year.

In 2000, six Oregon and Washington counties ranked among the top 10 wheat growing counties in the entire nation.

Wheat Production (in bushels) – Top Counties in the United States, 2000

1. **WHITMAN, Washington**
2. **LINCOLN, Washington**
3. **WALLA WALLA, Washington**
4. **ADAMS, Washington**
5. Polk, Minnesota
6. **UMATILLA, Oregon**
7. **GRANT, Washington**
8. Cavalier, North Dakota
9. Bingham, Idaho
10. Ward, North Dakota

Product Shipping Processes: On an annual basis, about 133 million bushels of wheat grown in eastern Washington and Oregon are shipped by rail and barge to the Port of Portland for export to foreign markets. Barges account for 61 percent of this total, rail accounts for 36 percent of shipments, and other modes for 3 percent.

Effects of I-5/Columbia River Crossing Congestion: Farmers in Eastern Washington and Oregon depend on barge and rail service to ensure that grains reach the Columbia ports and critical export markets such as Japan. While barges can transport grains directly to deep-sea vessels, rail shipments must move through the congested Portland-Vancouver terminal area before entering the port. If the Columbia River system were to become non-navigable (e.g., because of breaching of dams or low water), farmers would lose the option to ship by barge and would have to rely on rail and truck. A complete shift from barge to rail would require that the Portland-Vancouver rail triangle accommodate an additional 1,100 65-car train sets per year. This would present an immense challenge given existing constraints.

Impacts on Competitiveness: The Pacific Northwest competes in world grain markets with growers from Australia, Canada, France, and Argentina. Pricing is market-driven. Oregon and Pacific Northwest farmers must be cost-competitive to secure orders and maintain profitability. Rail congestion and deteriorating reliability add to costs and threaten profitability by reducing margins. The Columbia River ports do not have the rail capacity to accommodate the increased rail shipments that would result from a total loss of barge traffic. Additional rail capacity in the Portland-Vancouver area would better insure Eastern Washington and Oregon farmers against any possible reduction in barge service.

Transportation Equipment and Steel Industry

Standard Industry Classification Codes:	33, 37
Oregon and Washington Employment (2000):	144,846
Oregon and Washington Value of Production (2000):	$9.8 billion

Industry Trends

The Pacific Northwest is home to one of the greatest concentrations of transportation equipment manufacturers in the United States, including Boeing and Paccar in Seattle, and Freightliner and Gunderson in Portland. Suppliers that support the aerospace, truck, and railcar manufacturing industries, including aluminum and steel producers, are located throughout the region.

The transportation equipment industry tends to be very cyclical, rising with economic upturns and falling during recessions. After a decade of robust growth, Boeing, the region's largest employer in the transportation equipment industry, is confronting a sharp decline in jet aircraft orders. In contrast, a major railcar manufacturer, Gunderson, has recently noticed an increase in railcar orders despite the economic slowdown. Overall, production levels for transportation equipment in the Pacific Northwest are declining modestly while employment in the industry is falling more rapidly. As the United States economy recovers, orders for trucks and railcars produced in the region are expected to increase.[20] However, the timing of an improvement in Boeing's passenger aircraft sales is less certain because of strong competition and the current glut in the market created by record orders for new planes in the 1990s.

Importance of Portland-Vancouver Crossings to Industry

The transportation equipment sector requires reliable, low-cost access to suppliers and markets located throughout the Pacific Northwest to remain cost-competitive and viable. Parts and supplies are either destined for the Portland-Vancouver area or must transit the area to reach manufacturers in the Puget Sound region. For example, shipments carried by truck from the east or from ports in Washington use I-5 to access the railcar and truck plants in the North Portland industrial complex. The Boeing parts facility in Gresham, Oregon relies on the I-205 bridge to transport supplies to production facilities in the Seattle area, but congestion on that bridge is worsening as growth in the corridor adds new trips and the I-205 bridge draws overflow from I-5.

[20] For example, Freightliner recently consolidated a Canadian production line into its Portland plant. This is a positive indicator for the future of the Portland plant.

Figure 28 shows the approximate distribution of transportation equipment shippers and receivers and the associated truck moves by value within Oregon and Washington. The figure also shows truck shipments of transportation equipment that cross the I-5/ Columbia River bridge. The broad bandwidth of I-5 underscores the importance of the region's ports for import and export of transportation equipment products. The Port of Tacoma is the most important origin and destination for transportation equipment and metal products moved over the I-5/Columbia River bridge by truck. Commodities, including rolled steel, are imported through Tacoma for use by Portland area manufacturers.

Figure 29 shows the corresponding distribution of transportation equipment shippers and truck moves by tonnage (not value as in the prior figure) across the West Coast. Again, the figure shows just those truck shipments of transportation equipment that move across the I-5/Columbia River bridge. The figure reveals the strong interdependence of businesses along the I-5 corridor in Washington and Oregon as well as the strong links between the Oregon-Washington transportation equipment industry and the Southern California aerospace and transportation equipment industries.

The final figure in the series, Figure 30 shows the movement of transportation equipment between Oregon-Washington counties and the western United States. The figure shows counties of origin and destination for products moving through the Portland-Vancouver rail triangle, and the routes used by these products to access the triangle. Many of the transportation equipment industry's finished products are distributed by rail (or air, not captured in these diagrams), rather than by truck. Southern California, the Midwest, and the Port of Houston are primary destinations for transportation equipment passing through the Portland-Vancouver rail network; parts and supplies come from Chicago and east.

Effects of Portland-Vancouver Choke Points on Industry

The manufacturers of transportation equipment require a reliable stream of components and parts to produce aircraft, trucks, ships, and railcars in a timely and cost-effective manner. Congested rail and highway bottlenecks are making the region's transportation system less dependable and are triggering delays that affect the underlying competitiveness of Oregon's and Washington's substantial transportation equipment industry. With strong domestic and foreign competition, the region's transportation equipment industry must remain technically innovative and keep costs low to stay competitive. Growing congestion undermines these efforts.

Parts used in the manufacture of transportation equipment are delayed by congestion at the Portland rail yards. In addition, trucks have difficulty during the peak-travel periods accessing intermodal transfer facilities due to roadway congestion. Congestion in Portland-Vancouver reduces the dependability of deliveries and shipments, adding to business costs in the region.

The case study of Gunderson, below, demonstrates the importance of rail and trucking to maintain the supply streams that keep the company's North Portland production facility running. With its North Portland location, Gunderson is affected first-hand by rail capacity restrictions and congestion on the Columbia River bridges and I-5.

Figure 28. Oregon-Washington Origins and Destinations for Transportation Equipment and Steel Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Value of Freight on Truck Routes Used to Access Bridge

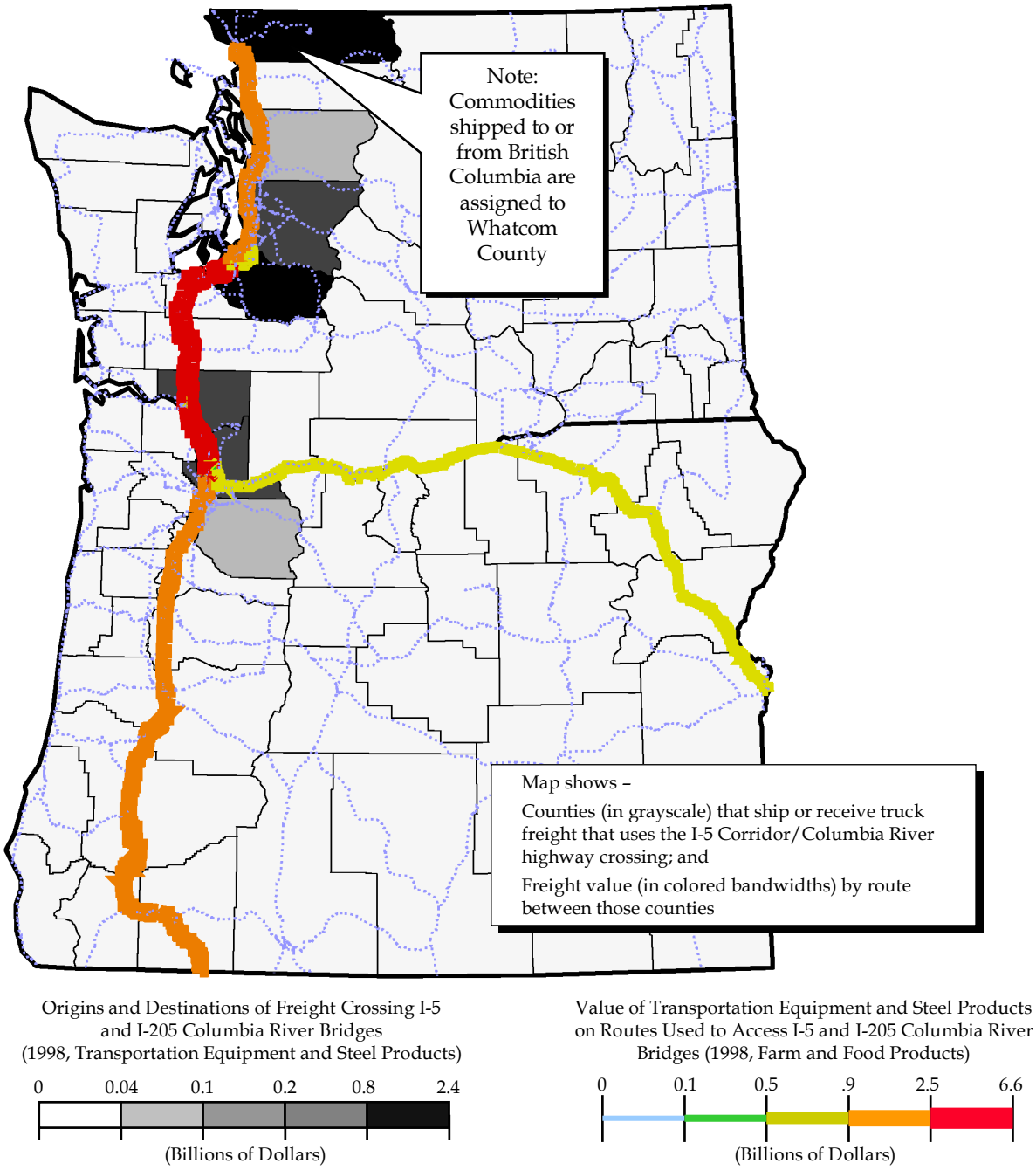


Figure 29. West Coast Origins and Destinations for Transportation Equipment and Steel Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge

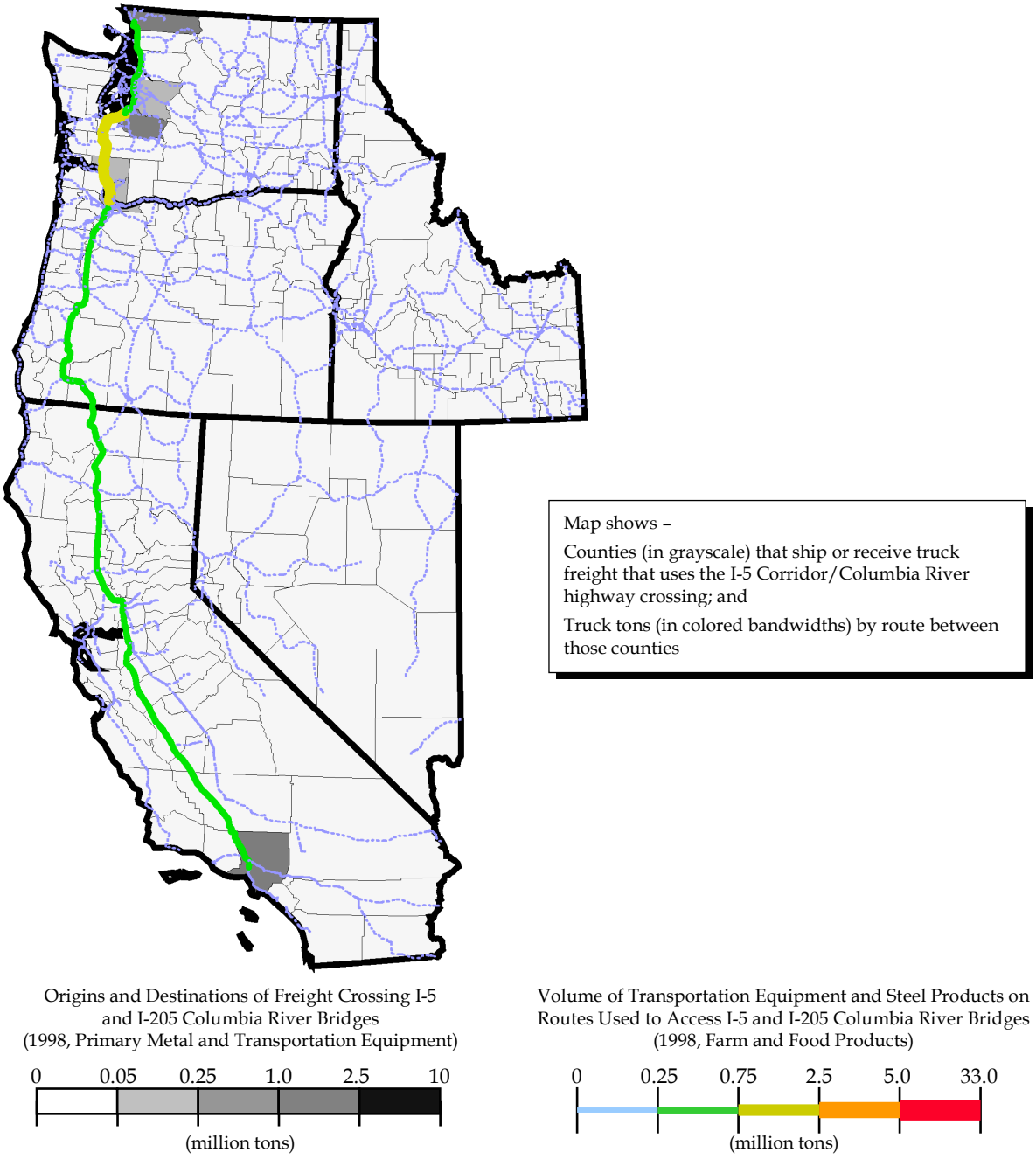
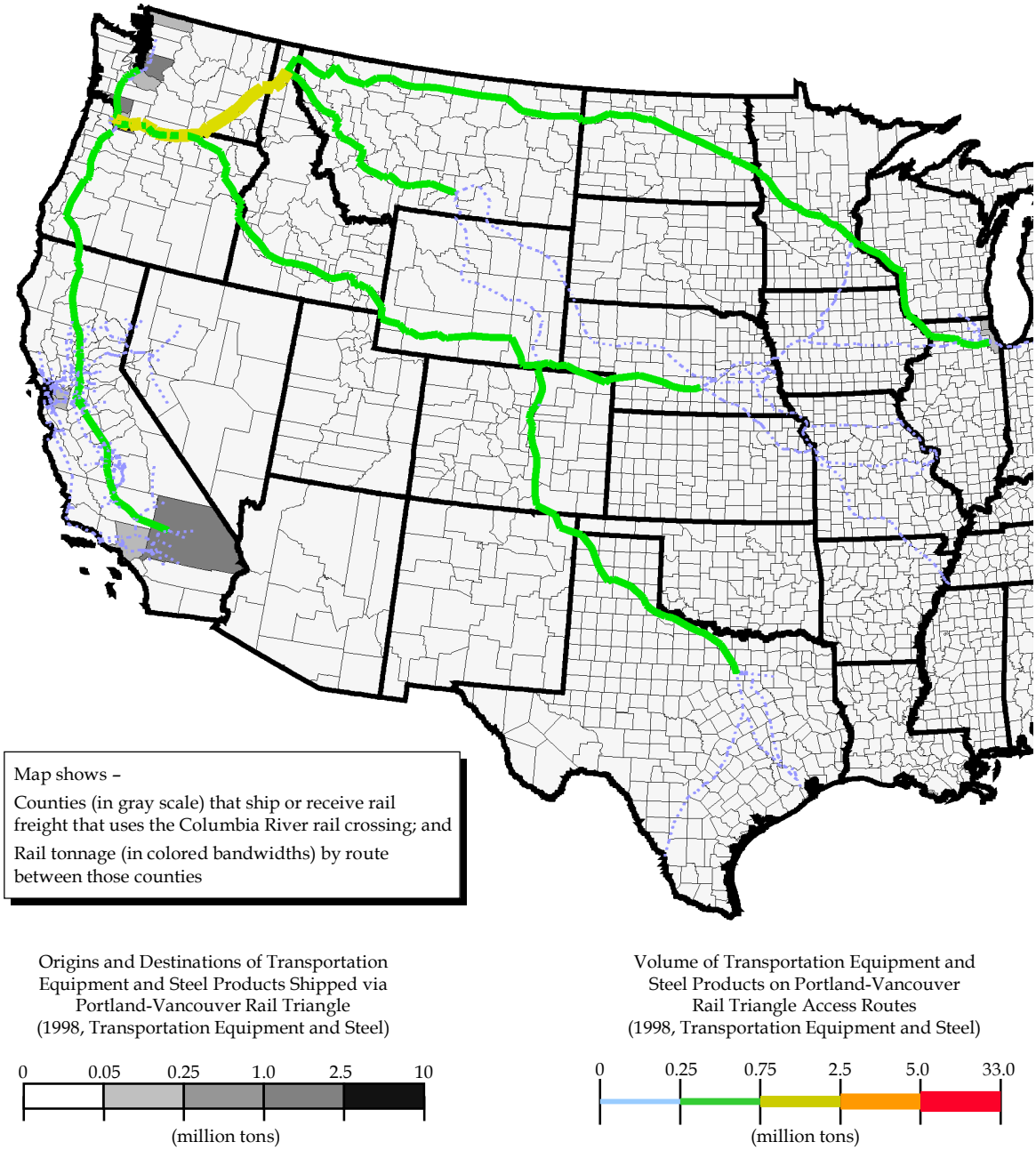


Figure 30. Western United States Origins and Destinations for Transportation Equipment and Steel Products Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle



Transportation Equipment Case Study:
Gunderson, Inc.

Locations: Portland, Springfield, and Tri-Cities (Washington).

Products: Rail car manufacturing.

Background: Gunderson is a builder and refurbisher of freight cars and marine barges, employing about 1,300 people at its Portland, Springfield, and Tri-Cities locations. Innovations in its railcar designs have resulted in robust sales over the past several years. The company has produced more than 100,000 railcars since 1960.

Product Shipping Processes: Heavy castings and other material inputs for Gunderson's Portland manufacturing plant are imported by rail from Chicago and the East via the BNSF line on the north side of the Columbia River. Twenty containers per month arrive at the Port of Tacoma and are transported to Gunderson by rail or by truck. A local Oregon Steel plant supplies Gunderson by rail. Finished rail car products are shipped to customers from Gunderson's Portland facility.

Effects of I-5/Columbia River Crossing Congestion on Company: Inbound rail shipments (e.g., those from the East and the Port of Tacoma) must contend with rail congestion spilling out of the Portland-Vancouver rail triangle to reach the Gunderson facility. Most truck deliveries arrive from the east via I-84, but still are affected by I-5/Columbia River-related congestion at the Columbia Boulevard and North Portland interchanges and at the I-5 and I-84 interchange.

Impacts on Competitiveness: Rail and roadway congestion reduces the reliability and predictability of deliveries and shipments, raising business costs.

High-Technology Industry[21]

Standard Industry Classification Codes:	36, 38
Oregon and Washington Employment (2000):	85,333
Oregon and Washington Value of Production (2000):	$34.3 billion

Industry Trends

A strength of the Pacific Northwest is that it is a "creative economy"—a region that cultivates innovation and successfully attracts well-educated people. These attributes helped guide a spectacular high-technology boom in the region during the 1990s. The growth was led by semiconductors and semiconductor research in the Portland-Vancouver area and software development in the Puget Sound region. By 2000, two high-technology-related industries—electronics and scientific instruments—accounted for over 11 percent of the entire Pacific Northwest's economy, up from just over one percent in 1990.

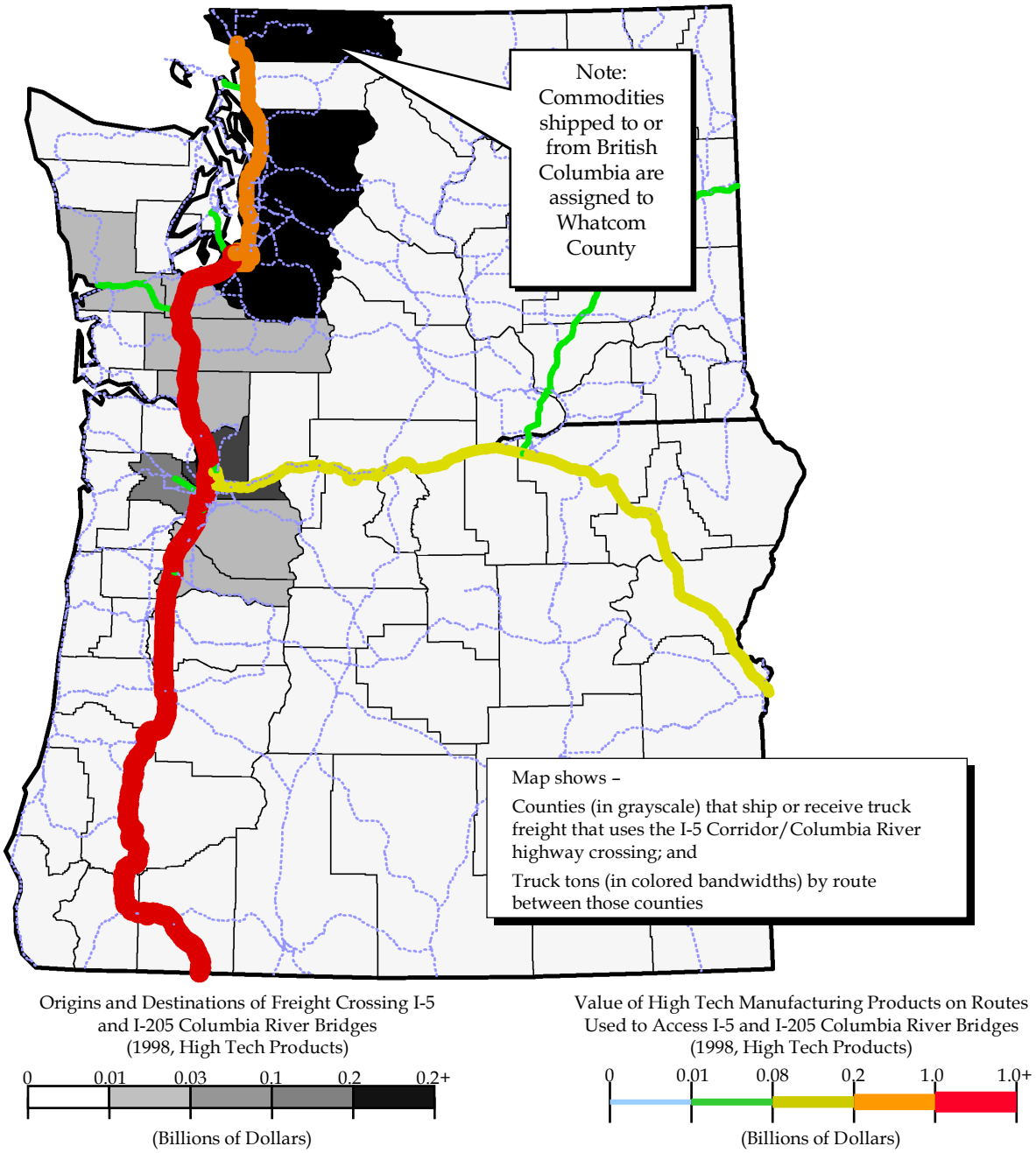
While growth in the high-technology sector in the Pacific Northwest has slowed due to a decline in worldwide demand and a shift in commodity production to overseas markets, the high-tech industry is expected to be a long-term growth engine for the region. The resumption in growth is expected to be led by a new generation of semiconductors, environmental technologies, software, flat panel and infrared displays, and biotechnology.

Importance of Portland-Vancouver Crossings to Industry

Due to their relatively high values and low weights, high-tech goods are generally shipped by truck or air. The value of high-tech goods that cross the I-5/Columbia River bridge exceeds $1.5 billion per year. Figure 31 maps the distribution of high-tech manufacturing shippers and receivers and the associated truck moves by value within Oregon and Washington. Many of the counties that most intensively ship high-tech goods over the I-5/Columbia River bridge are in the Puget Sound area. The figure shows just those truck shipments of high-tech goods that move across the I-5/Columbia River bridge. The gray scale indicates the total commodity value shipped and received by each county, and the bandwidth and color of the lines indicate the value of commodities moving by truck along the major highways.

[21] The high-technology industry analyzed in this section covers the electronics industry and the scientific instruments industry, selected because these sectors correspond to the Standard Transportation Commodity Code industry classifications used for analyzing the movement of goods. The American Electronics Association uses a broader definition of high-technology that includes high-tech services such as software. The AEA's classification shows 225,200 high-tech employees in Oregon and Washington in 2001.

Figure 31. Oregon-Washington Origins and Destinations for High-Tech Manufacturing Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver *(With Value of Freight on Truck Routes Used to Access Bridge)*



The I-5 corridor connects suppliers and manufacturers, but also provides critical access to the region's international airports. In 2001, over $850 million in Oregon exports, much of which was generated by the high-tech industry, was shipped overseas from the Seattle-Tacoma (Sea-Tac) International Airport gateway. Even more of Oregon's high-tech exports traveled via domestic flights from Portland International Airport to other major international air-cargo gateways. Due to the frequency of international flights and availability of cargo carriers at larger out-of-state airports, the value of Oregon exports departing from Sea-Tac, Los Angeles International Airport, and San Francisco International Airport exceeded those leaving from Portland International Airport. In 2001, the value of Oregon exports leaving the country through the Los Angeles International Airport gateway was $1.2 billion, almost two times greater than the $616 million of Oregon goods exported through the Portland International Airport. The reliable movement of high-tech goods by truck from Oregon manufacturers to Portland International Airport, Sea-Tac, and even the more distant gateway airports on I-5 is critical to the future success of the industry in the region.

Figure 32 shows the linkages between the Oregon-Washington high-tech industry and suppliers and markets in San Francisco and Los Angeles. As before, the figure shows just those truck shipments of high-tech goods that move across the I-5/Columbia River bridge. The gray scale indicates the total commodity value shipped and received by county, and the bandwidth and color of the lines indicate the value of commodities moving by truck along the major highways.

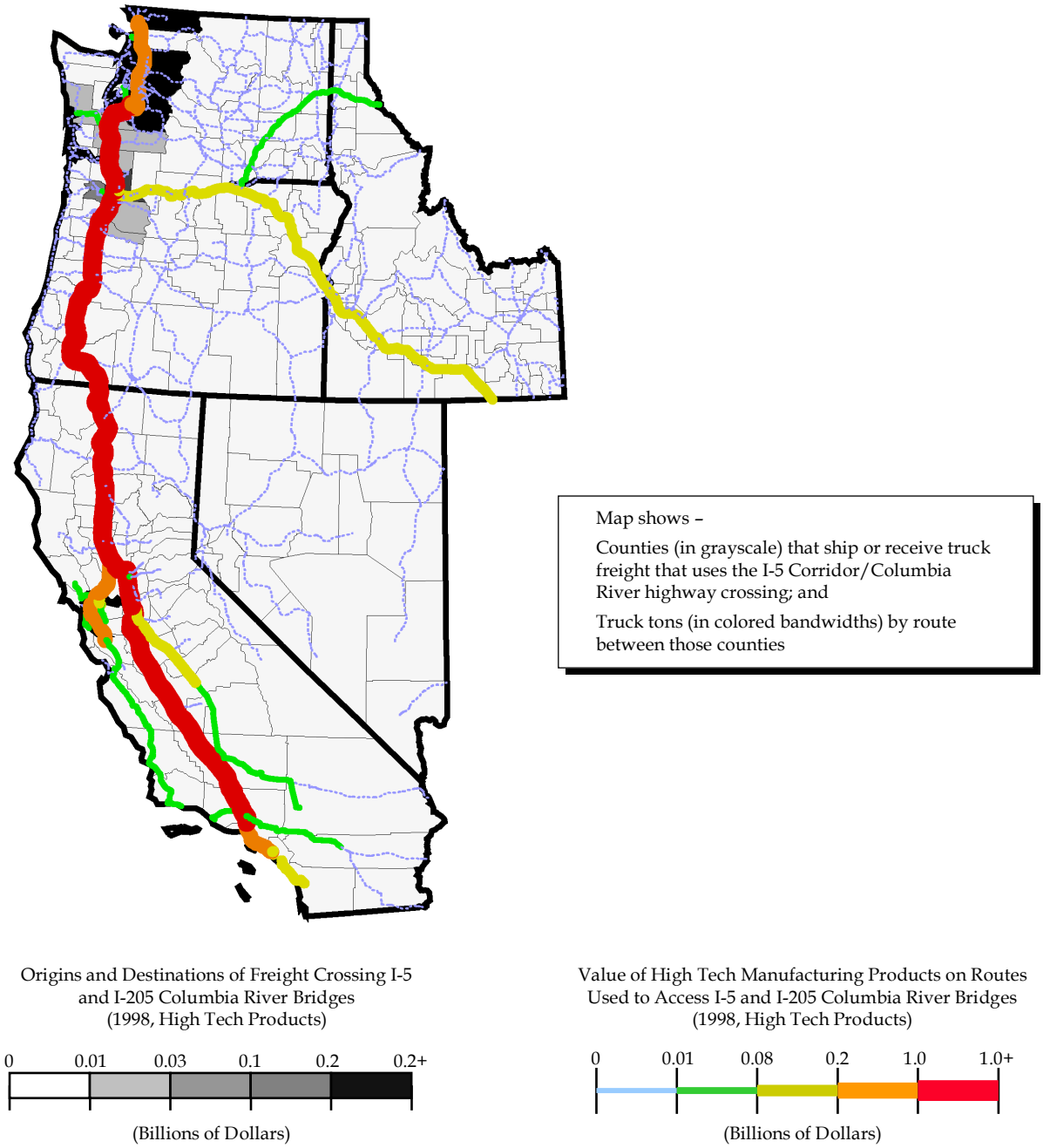
Effects of Portland-Vancouver Choke Points on Industry

High-tech companies are very dependent on air cargo. However, congestion makes it difficult to reliably reach the Portland International Airport from Washington County employment centers such as the Westside technology area. To ensure on-time deliveries, companies have resorted routinely to shipping finished products to the airport during off-peak, midday hours.

In an industry that pioneered low-inventory, just-in-time manufacturing, congestion is making logistics coordination between labor and parts more difficult. Companies are increasing night deliveries to avoid congestion. While this improves the reliability of deliveries, labor costs increase as staffing levels must be maintained during off hours.

Congestion on the I-5/Columbia River bridge adds to business costs in the region by reducing the size and quality of the labor pool that can cost-effectively access places of employment. For example, commuters from relatively affordable residential areas in fast-growing Clark County, Washington face a long, costly, and unpredictable commute to jobs at Westside technology companies. I-5 congestion bifurcates the labor market into smaller subregional markets within the Portland-Vancouver area as workers seek jobs closer to their homes. To continue drawing from a large labor pool, employers must increase wages to maintain their attractiveness in the face of the longer commutes.

Figure 32. West Coast Origins and Destinations for High-Tech Manufacturing Products Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Value of Freight on Truck Routes Used to Access Bridge



High-Technology Case Study

Intel

Location: Hillsboro, Oregon (and other locations in Oregon and Washington).

Products: Semiconductor research and semiconductor production.

Background: Intel is Oregon's largest private employer. In 2001, the company accounted for three percent of employment, 4.4 percent of payrolls (non-farm wages and salary), and six percent of total state output. At its Hillsboro facility, Intel produces extremely high-value semiconductors, the "brains" that enable computers to process information and accept commands. While lower-end "commodity" semiconductors are increasingly being produced overseas in Southeast Asia and Latin America, Intel researches and produces its most advanced products in the Portland area. These include a 300 millimeter chip, currently under development, that will allow computers in the future to operate at much higher speeds. Growth at Intel was a major contributor to the overall expansion of the Oregon economy during the 1990s.

Product Shipping Processes: Intel, with its high-value, low-weight production of semiconductors, is dependent on air cargo. Finished products are shipped by truck from Hillsboro to Portland International Airport (PDX). From PDX, air-freight carriers transport semiconductors to locations throughout the United States. Due to limited international service from Portland, semiconductors destined for overseas markets often transit through Los Angeles International, San Francisco International, or Seattle-Tacoma International Airport.

Effects of I-5/Columbia River Crossing Congestion on Company: Intel ships finished products to PDX early in the afternoon to ensure they arrive before the 5:30 p.m. scheduled departures of overnight express carriers. The early shipments are required because the travel times of trips in the North Portland area are unpredictable, due largely to I-5/Columbia River congestion. Incidents on I-5/Columbia River such as breakdowns, accidents, and the raising of the Columbia River Bridge cause motorists and trucks to use surrounding arterials to reach I-205 in order to avoid prolonged delays and resume their trips. These arterials—the same arterials used by Intel to reach the airport—become clogged with traffic. Intel ships early to avoid this congestion, which is worse during peak late afternoon periods, and to allow sufficient time should heavy congestion be encountered. Congestion also is pushing delivery trucks onto back roads to reach Intel and other technology companies, creating safety concerns, and has made just-in-time coordination between labor and parts deliveries more difficult. To increase reliability, companies increasingly use night deliveries.

Impacts on Competitiveness: While high-tech companies can ship goods to the airport reliably during early afternoon, off-peak-travel periods today, higher traffic volumes in the future will force "peak spreading," making early afternoon travel more congested. The growing congestion and accompanying increase in accidents and auto breakdowns will make shipping during the early afternoon less reliable and predictable. As reliability and predictability deteriorate, businesses must compensate by allowing more driver time for shipping or paying higher labor costs for night shipping and receiving. Both strategies add to business costs.

High-Technology Case Study:
Hewlett Packard

Location: Corvallis, Oregon (and other location in Washington State, Idaho, and British Columbia).

Products: Inkjet printers.

Background: Corvallis, located between Salem and Eugene, is home to a Hewlett Packard design and fabrication facility that employs about 4,000 people. This facility produces advanced inkjet printers and is the second-largest employer in the community after Oregon State University.

Product Shipping Processes: Finished inkjet printers and cartridges are shipped by truck to airports in Portland, Seattle, and Vancouver (British Columbia). I-5/Columbia River and I-205 are the primary highways used to reach these airports.

Effects of I-5/Columbia River Crossing Congestion on Company: Congestion and delays at the I-5/Columbia River crossing increase the travel time between Corvallis and the airports and make it more difficult to predict travel time reliably. This increases the risk that trucks will miss delivery deadlines for domestic and international air cargo flights.

Impacts on Competitiveness: Congestion on I-5 disrupts the delivery of parts and finished goods, adding to business costs. As travel times between Corvallis and key regional airports becomes less predictable, Hewlett Packard must pay truck drivers for additional "buffer" travel time to ensure that they hit delivery window times consistently.

Distribution and Warehousing Industry

Standard Industry Classification Codes:	42, 50
Oregon and Washington Employment (2000):	350,875
Oregon and Washington Value of Production (2000):	$28.6 billion

Industry Trends

Distribution is part of Portland-Vancouver's economic legacy. The area developed as the distribution center for the Pacific Northwest because of its unique geographic advantages. Portland-Vancouver, as well as nearby Longview and Kalama, Washington, have access to interior states via a navigable waterway and sea-level rail and highway routes, giving these ports an advantage over other West Coast ports. Water access, combined with its location in the major valley of a mountainous region and proximity to the Pacific Ocean, make the Portland-Vancouver area an ideal distribution hub. As the rail, water, and roadway network have developed around Portland-Vancouver, the distribution industry in the metropolitan area has grown, attracting distributors that today serve Oregon, Washington, Idaho, the western portions of Montana, and the northern parts of California.[22] In recent decades the distribution and warehousing industry has expanded to accommodate a large influx of new residents into the region. As the Pacific Northwest continues to grow in population, the distribution industry is expected to expand commensurately.

The industry also has been greatly reshaped by the introduction of just-in-time manufacturing and retailing. Just-in-time (JIT) is a "pull" production system that involves scheduling inputs to minimize inventory. Within a pull system, production starts when a buyer has requested a product. Parts and components to build the product arrive at the assembly line only as they are needed. JIT has been adopted by companies worldwide as a way to minimize inventory costs, resulting in lower business expenses and higher profits. Retailers such as Wal-Mart use JIT to minimize merchandise inventories by monitoring sales and replenishing shelves as products are sold. Through JIT, companies lower the financial costs associated with carrying larger inventories and can use their real estate assets more intensively for productive purposes such as manufacturing or sales, rather than having to set aside large amounts of floor space for inventory. However, JIT depends critically on efficient transportation systems to ensure the frequent and reliable delivery of goods.

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[22] One measure of Portland-Vancouver's role as a distribution and transshipment center is the ratio of wholesale to retail sales. The City of Portland, in its Economic Development Strategy (Summer 2002) reported that in 1992 the Portland-Vancouver ports generated $4.36 in wholesale trade for each $1 in retail trade. The ratio was somewhat higher than Seattle-Tacoma's ratio of $3.33, but both areas were significantly higher than the national average at $1.71. The ratios will have changed in recent years, but the numbers indicate the importance of distribution to the regional economy.

Importance of Portland-Vancouver Crossings to Industry

On an annual basis, over 5 million tons of goods tied to the distribution and warehousing industry cross the I-5/Columbia River bridge by truck between Portland and Vancouver. These flows represent a wide range of shipments, including goods bound for retailers and manufacturers, containerized intermodal merchandise (most of which is classified into a "miscellaneous shipments category" that is included here as part of the "distribution" sector), and business supplies.[23]

Figure 33 shows the origins, destinations, and flow patterns of distribution and warehouse goods moving across Oregon and Washington. The figure shows just those truck shipments of distribution and warehousing goods that cross the I-5/Columbia River bridge. The gray scale indicates the total commodity value shipped and received by county, and the bandwidth and color of the lines indicate the value of commodities moving by truck along the major highways. Within the Pacific Northwest, distributors in the most populous counties, including King County, Washington and Multnomah County, Oregon, are the most intensive users of the I-5/Columbia River crossing.

Figure 34 provides comparable information for the West Coast. Trucks crossing the I-5/Columbia River bridge are critical to maintaining the intraregional flow of goods between Oregon and Washington as well the movement of goods up and down the West Coast. Reflecting the importance of I-5 to distributors serving the entire West Coast, over 2 million tons of goods using the I-5/Columbia River bridge either originate in or are destined for California.

The Portland-Vancouver area also is the hub of intermodal rail moves that connect distributors and warehouse operators in the Pacific Northwest with the rest of the country. Figure 35 shows the span of distribution and warehousing freight moving through the Portland-Vancouver rail triangle. This freight activity centers on Seattle-Tacoma and Portland-Vancouver. The Puget Sound ports of Seattle and Tacoma, if combined, would rank as the third-busiest container port in the United States, behind Los Angeles-Long Beach and New York-Northern New Jersey.

[23] Containers are included in this discussion because they typically carry merchandise (e.g., footwear, toys, apparel, household goods, etc.) that are bound for retailers, generally by way of warehouses and distribution centers. Containers constitute a large part of the overall volume of freight movements associated with the distribution and warehousing industry.

Figure 33. Oregon-Washington Origins and Destinations for Distribution and Warehouse Goods Crossing the I-5 and I-205 Bridges at Portland-Vancouver *(With Tonnage of Freight on Truck Routes Used to Access Bridge)*

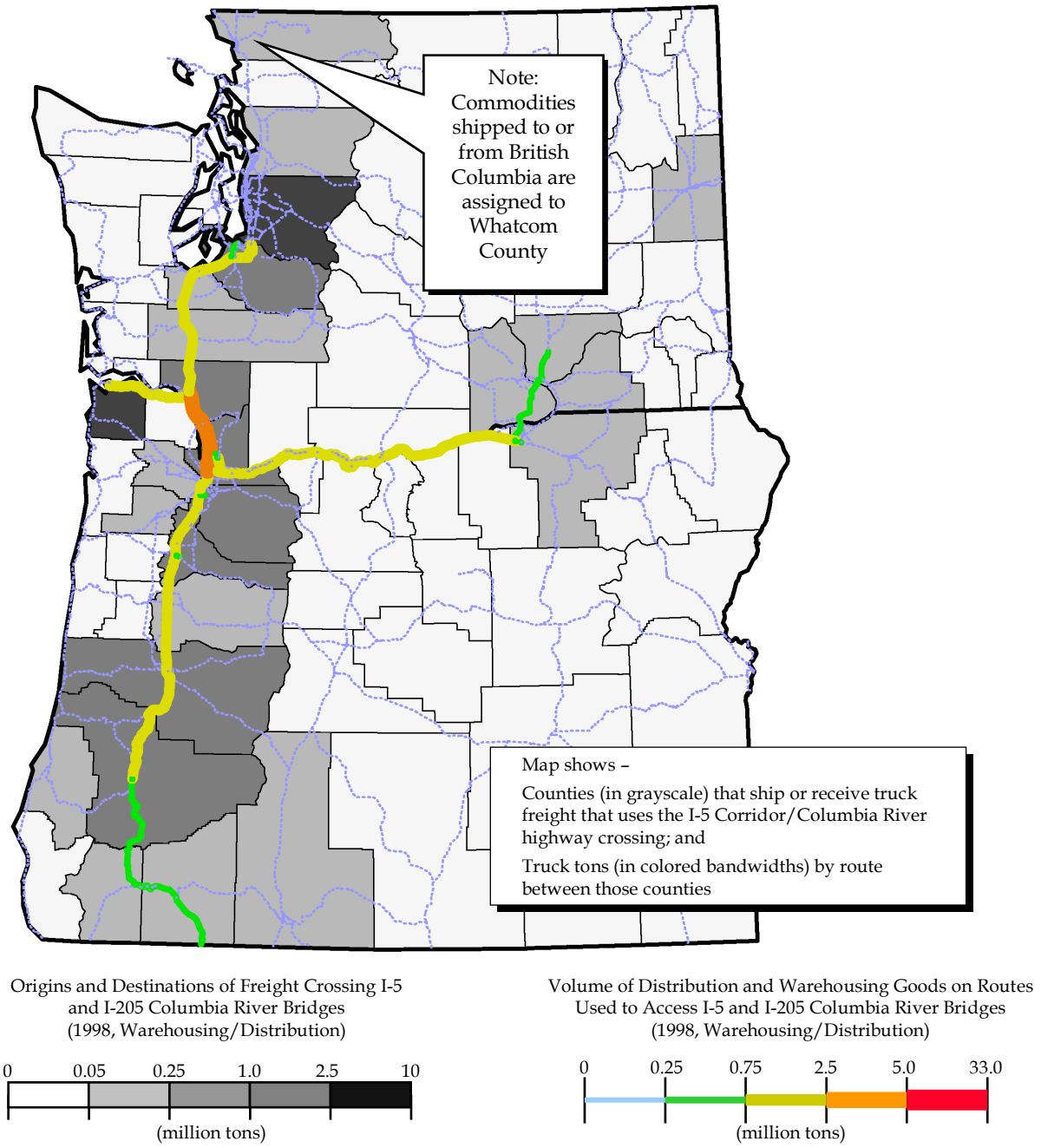


Figure 34. West Coast Origins and Destinations for Distribution and Warehouse Goods Crossing the I-5 and I-205 Bridges at Portland-Vancouver
With Tonnage of Freight on Truck Routes Used to Access Bridge

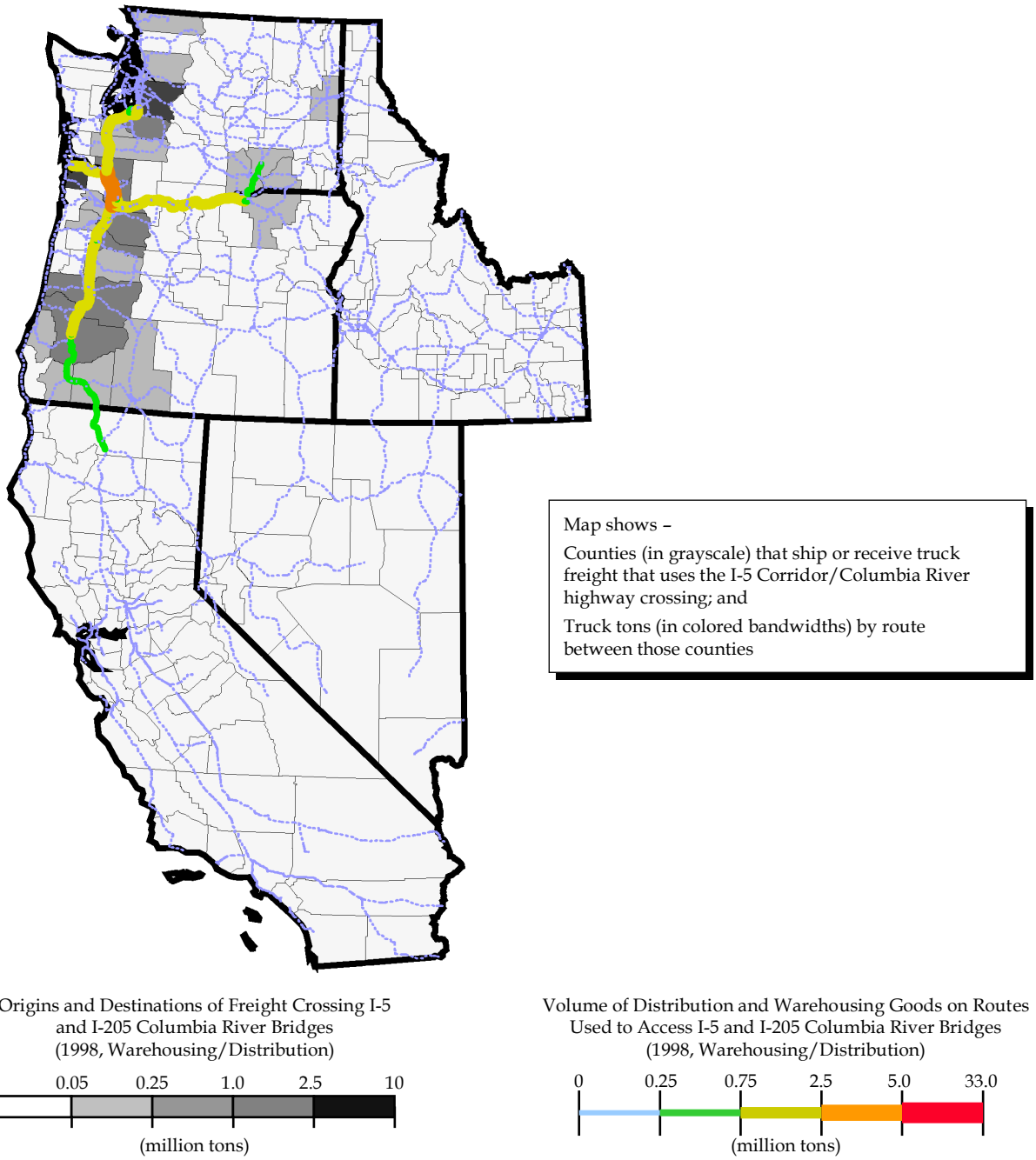
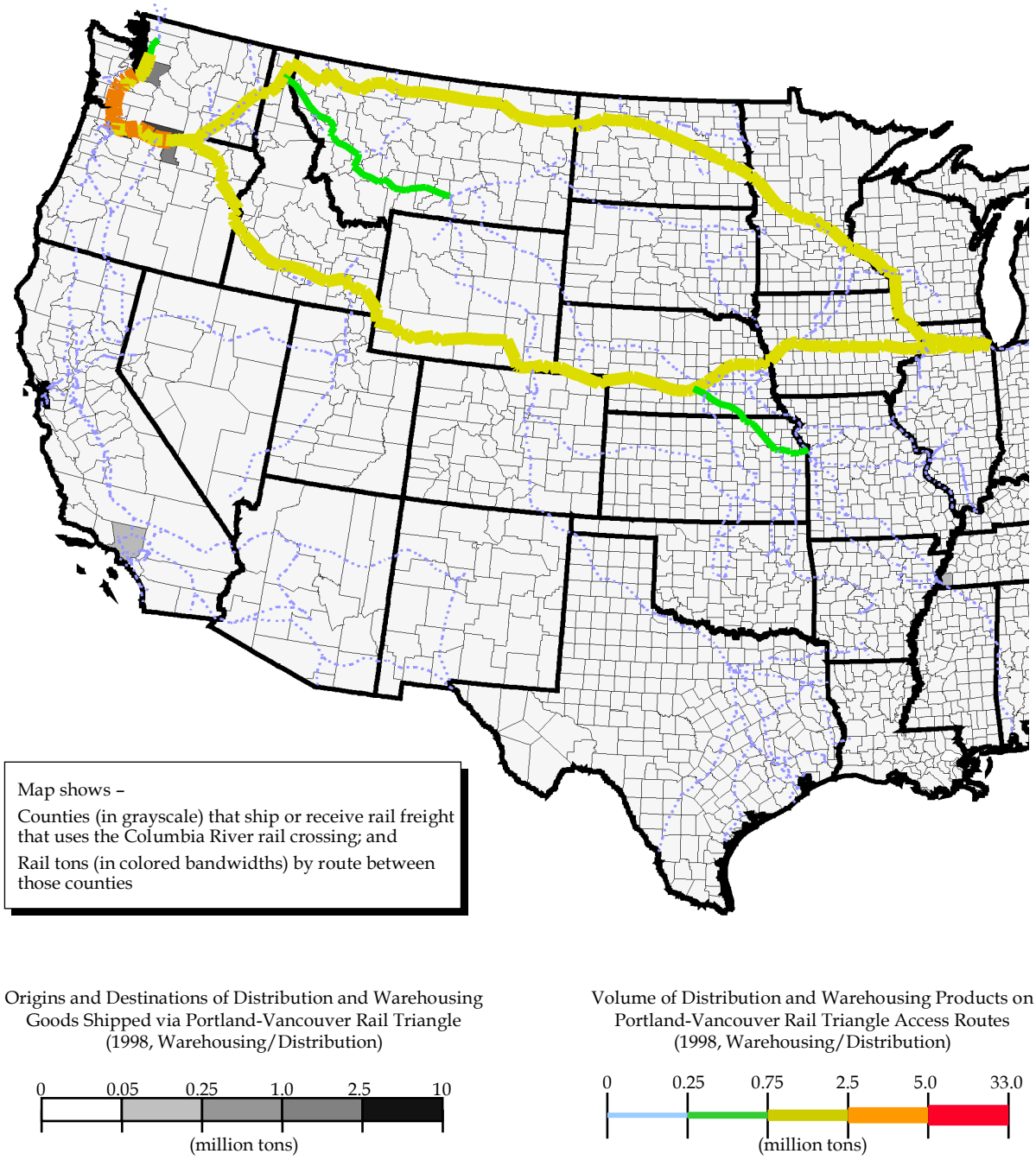


Figure 35. Western United States Origins and Destinations for Distribution and Warehouse Goods Using the Portland-Vancouver Rail Triangle
With Tonnage of Freight on Rail Lines Used to Access Triangle



About half of the containers processed for import and export by ports in Seattle and Tacoma, as well as by the Port of Portland, transit the Portland-Vancouver rail triangle on their journeys to and from the Midwest and East Coast. This traffic is routed through Portland-Vancouver because the BNSF line on the north side of the Columbia River Gorge and the Union Pacific (UP) line on the south side have relatively flatter grades and are easier to navigate in bad weather than the more northerly routes out of Seattle, one of which goes through the high, single-track Stevens Pass tunnel, and the other through the winding Stampede Pass route. For that reason, the competitiveness of Puget Sound ports in attracting and retaining container traffic is affected directly by their ability to move goods reliably through Portland-Vancouver.

Effects of Portland-Vancouver Choke Points on Industry

The I-5 Corridor/Columbia River highway and rail choke points reduce the geographical reach of distributors by raising the costs of getting to markets. Although the distribution and warehousing industry has traditionally been Portland-centered, increasing congestion at the I-5 Corridor/Columbia River highway and rail crossings and spreading peak hours are leading to changes in the region's distribution system.

Congestion, combined with high prices for available industrial land in Portland-Vancouver, is pushing distributors to the periphery of the Portland-Vancouver area and to other parts of the Pacific Northwest. Distributors that serve markets outside Portland-Vancouver are finding it difficult to remain in the area as travel times within the region shrink the size of their service areas. In response, major distribution centers have been moving to the Pasco-Hermiston area to the east and companies that used to serve both the Puget Sound and Portland areas from a single location in Portland-Vancouver are opening additional facilities in Washington (e.g., Centralia) and elsewhere along the I-5 corridor.

While distribution and warehousing remain important in Portland, the lack of available land in Portland is directing new growth to Vancouver and surrounding Clark County, Washington. As the distribution and warehousing industry in Clark County expands, higher volumes of truck traffic will cross the I-5 and I-205/Columbia River bridges to supply the Portland market, contributing further to traffic delays and the cost of distribution and warehousing. These higher transportation expenses ultimately may be passed on to consumers and manufacturers in the form of higher prices or the reduced availability of goods.

Distribution Case Study

Les Schwab Tire Distribution Centers

Locations: Prineville, Portland, Boardman, and Ontario, Oregon; Redding, California.

Products: Tire sales and services.

Background: Les Schwab is one of the largest independent tire companies in the United States. The company has a retail sales network of 344 stores, including both company-owned and member dealer locations, located in Oregon, Washington, Idaho, Montana, northern California, Nevada, and Alaska. Annual sales are approximately $1 billion.

Product Shipping Processes: The hub of Les Schwab operations is a 2 million-square-foot distribution center in Prineville, Oregon which handles over 4,600 containers annually. Tires are imported through the Ports of Seattle, Tacoma, and Portland and are shipped to the Prineville facility and other transfer facilities by truck and some by rail. The company serves regional markets through a network of transfer centers located in Portland, Boardman, Ontario (Oregon), and Redding. At any given time, Les Schwab stocks about one million tires in its stores and warehouses.

Effects of I-5/Columbia River Crossing Congestion on Company: Les Schwab serves both the Portland and Seattle markets from its Portland transfer center. Due to congestion in the I-5/Columbia River corridor, truck operations are scheduled during off-peak, midday, and evening time periods to avoid possible delays. Peak spreading in the I-5 corridor narrows the regions that each facility can serve in a timely manner by truck, reducing economies of scale and increasing delivery costs.

Impacts on Competitiveness: Increased business costs, especially if peak times spread and further limit the periods when trucks can cross the Columbia River without encountering delays.

Choices for the Future

Over the last half-century, the Pacific Northwest has made major investments in its highways, ports, and rail systems. However, the region is seeing diminishing returns from the transportation initiatives of earlier decades. Capacity and congestion problems today are eroding the productivity of the transportation system. Travel time and cost are increasing, service reliability is decreasing, and the ability of the system to recover from emergencies and disruption of service in severely taxed. The capacity and congestion problems are most apparent at the I-5 Corridor/Columbia River highway and rail crossings in the Portland-Vancouver area. The congestion at the crossings has a real and immediate cost to Portland and Vancouver residents and businesses. It has a less visible, but equally real, cost to the Oregon and Washington residents and businesses beyond the metropolitan area who depend on safe, reliable, and cost-effective access into and through the Portland-Vancouver area.

Oregon and Washington residents and businesses as well as Portland and Vancouver residents and businesses have a choice of two futures: a positive one in which the I-5 Corridor/Columbia River highway and rail crossings are improved and make a greater contribution to the economic well being of the entire Pacific Northwest; or a negative one in which the I-5 crossings are not improved, and the burden of congestion becomes more severe.

The region is weathering an economic recession, making it difficult to envision major new transportation investments. However, the region cannot afford to postpone action. Environmental studies, negotiation of funding agreements, stakeholder involvement activities, right-of-way acquisition, design, and construction of major transportation improvements can take five to 15 years to complete. Oregon and Washington must make a coordinated effort to act promptly to decide on a course of action and identify sources of funding for the recommended transportation improvements in the I-5 corridor.

Solving the problems of the I-5 Corridor/Columbia River crossings will require a willingness to plan and fund transportation improvements across boundaries—across the jurisdictional boundaries between states, across the interest boundaries of the public and private sectors, and across the financial boundaries among highway, rail, and port systems. These boundaries are surmountable because all parties to the I-5 Partnership must share the problem, the risks, and the benefits if they are to ensure the economic well being of the region.