The Challenge

In this chapter you will find data and analysis conducted during the Plan update process.

Whether you choose to travel by car, bus, train, bicycle, airplane, or on foot, Washington's statewide transportation system affects you directly and indirectly. When too many people try to travel to the same locations at the same time, the transportation system becomes congested. Congested roadways lead to frustrated drivers. When congestion causes you to be late to pick up a child from day-care, it costs you money. When parts and merchandise are late to our manufacturers and stores, profits are lost. When you can't safely walk or ride a bicycle, the health of our communities suffers. If you can't drive because of age, illness, or other reasons, you may not have access to a job, education, medical care, and social interaction. Transportation is an integral part of our state's social fabric.

Washington's population continues to grow, driving an ever increasing demand for transportation needed to support a desirable quality of life, jobs, and economic growth in all parts of the state and to maintain Washington's competitiveness in a global economy. Meeting this demand will require building a multimodal program based upon prioritized strategic investment strategies and stable funding sources.

The information in this chapter is organized around Five Investment Guidelines:

- Preservation (P)
- Safety (S)
- Economic Vitality (EV)—Strong Economy and Good Jobs, Moving Freight
- Mobility (M)—Transportation Access, System Efficiencies, Bottlenecks and Chokepoints, Building Future Visions
- Environmental Quality (EQ)— Health and the Environment

The value of Washington's existing transportation systems stems from past investments. The previous investments in many cases represent system additions such as the construction of the Interstate System in the 1950s to 1970s, the building of a bridge where none existed before, or the construction of a rail line. Over time the demands placed upon these facilities reach a point where routine maintenance activities and costs cannot keep pace. As a result, there are backlogs of significant transportation work that far exceeds available revenues, and investments must be prioritized due to many needs and limited funds. Future returns must rely on fact-based investment decisions to maximize benefits to the economy, our communities, and the environment. Financial constraint limits the ability of the state to make all needed improvements, the investment needs have been prioritized so that the most important and effective investments are made first.

The statistics and information in this section describe the current condition of the transportation system. Discussion of these conditions is integrated with projected changes and demands for the next 20 years.

The end result is a forecast for Washington's future transportation needs. This chapter provides the foundation for the following chapters, which address how to meet the challenges presented here through targeted investments.

> "The Washington State Transportation Plan is not about the politically correct recitation of modal completeness. It's about the cross-cutting themes that animate our transportation policy goals and choices."
>
> ***Doug MacDonald***
> ***Secretary of Transportation***

The Challenge: Preservation

As our transportation facilities age, a regular schedule of rehabilitation, reconstruction, and replacement is needed to keep system components usable, to reduce maintenance costs, and to address changes in design and performance standards. Lack of system preservation and rehabilitation produces a downward spiral. Short-term savings gained from deferred action means dramatically greater costs later. Worse, deteriorating infrastructure is often invisible to the public, so generating support for funding rehabilitation and reconstruction is difficult.

The System is Aging

While specific transportation investment needs vary across Washington, preserving existing transportation systems is an important issue statewide, regardless of mode, jurisdiction, or region. In fact, there is no more fundamental transportation investment than system preservation—keeping the physical infrastructure in safe and efficient operating condition.

This point was underscored statewide during the development of the WTP as the Transportation Commission received feedback from the Tribal Transportation Planning Organization, San Juan County Commissioners, and Washington's fourteen Regional Transportation Planning Organizations. Transportation facilities in Washington are aging and need attention.

Timing of investments is important in achieving lowest life-cycle cost: the point in an asset's expected duration when it can no longer serve its function without greater costs and risks to related parts.

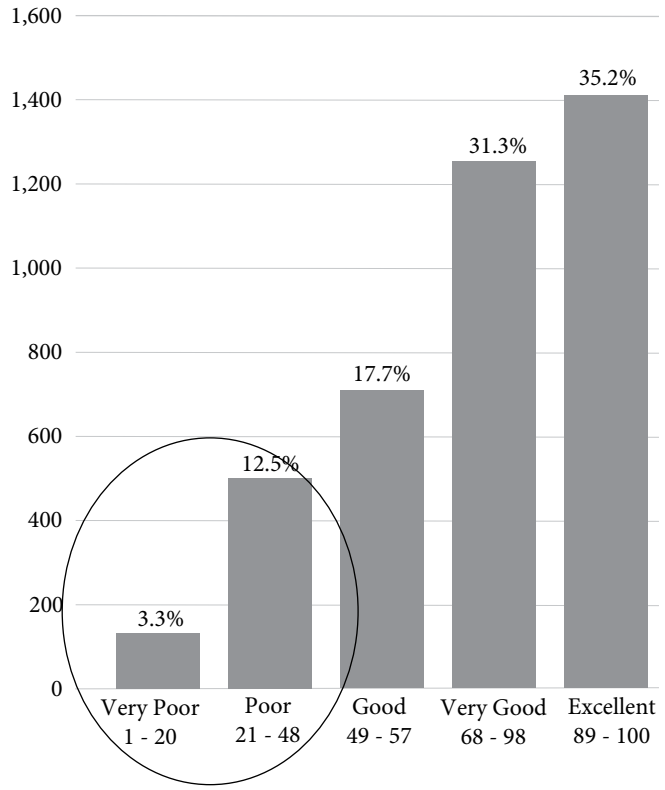
This is the same problem homeowners face when deciding when to replace a house's roofing before a leak causes so much deterioration that other more costly repairs are necessary such as reconstructing damage trusses, replacing the living room ceiling, or replacing water damaged insulation.

Keeping Roadways Serviceable

Several types of road surfaces exist and coexist on Washington's roadways: brick, gravel, dirt, asphalt, concrete. Each surface type has unique functional benefits and costs. Rising costs for construction materials have required increasingly strategic approaches to selecting the most cost effective surface type. One of the challenges faced is that many Washington highways are aging more quickly than they can be rehabilitated, thus resulting in an increase in deteriorated conditions. A new line of thinking is becoming common practice where the most cost effective surface treatment is applied at the time of resurfacing, for example, just because the roadway is concrete or hot mix asphalt, it may not remain so in the future.

Figure II-1

City Roadway Conditions (Lane Miles)



City, County, and Tribal Roadways and Streets

Others face large shortfalls in preserving their pavements and bridges. City, county, and tribal transportation funding is being squeezed by revenue reductions, growing needs of other government services, and competing needs for transportation system expansion. Recent analysis indicates that 16% of city roadways have poor or very poor pavement condition. At current funding levels for repair and rehabilitation, this amount will grow.

A recent survey of tribes in Washington reported that the current conditions and needs of tribal roads statewide are not fully inventoried, as a result the full scope of roadway preservation needs within existing reservation boundaries can not be estimated.

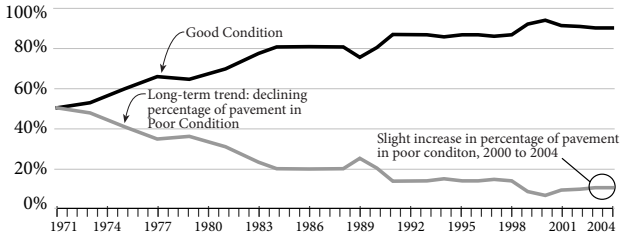
State Highway Pavements

The Department of Transportation has made progress on reducing the backlog of needed resurfacing of highway pavements, and is thereby approaching lowest life-cycle cost for the entire system. However, concrete pavements pose different, more costly problems.

Figure II-2

Pavement Condition Trends

Percent of Pavements



Source: WSDOT Materials Lab

The ratio of highway miles classified to be in poor and good condition has steadily shifted over time to the point where a majority of state highway pavements are in good condition and a minority are in poor condition. Yet there remains a significant number and percentage of lane miles rated as "poor" that have critical improvement needs.

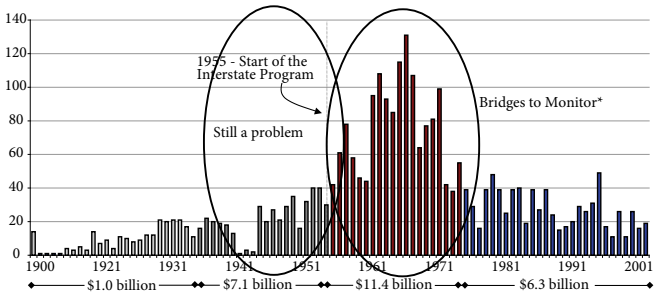
Most interstate highways are paved with Portland Cement Concrete, including high-volume urban areas and those with heavy truck traffic. Many of the more than 2,400 lane miles of these highways were built thirty or more years ago, and have endured many years of increasing traffic volumes. They are now disproportionately represented among pavements rated in poor condition, and without attention in the near future will continue to deteriorate.

Although current funding allocations are adequate to cover asphalt and chip seal repaving needs, funding falls far short of growing concrete rehabilitation needs.

Figure II-3

Bridge Inventory by Year of Construction and Replacement Costs

2004 Dollars



*May last longer than assumed life cycle of 50 years

Bridges in Washington

Washington has a lot of state and local bridges. On state highways alone there are 3,534 structures with a total of 44.3 million square feet of bridge deck area.

All levels of government have made much progress on bridge rehabilitation, but aging bridges represent a growing problem which must be monitored closely. Many bridges in Washington have served transportation needs for far longer that their builders anticipated—a testament to good engineering and durable materials. These same bridges, however, will not last indefinitely. While bridges that are vulnerable to scour and earthquakes are of special concern, bridges that are structurally sound but which serve different traffic patterns than designed for are an emerging concern. Some of these bridges are among our oldest, have narrow lanes, narrow or no shoulders, and provide poor pedestrian or bicycle access.

Washington State Ferries

Washington operates the largest ferry fleet in the nation, with 24 passenger-vehicle and four passenger-only vessels. Current funding assumptions for the next ten years show the Washington State Ferries meeting short-term targets for both vessel and terminal preservation. This includes the replacement of four vessels.

The Steel Electric Class ferries have been in service since 1927. These vessels carry 40-65 vehicles. Since 1927 these vessels have been updated, however, they are reaching the end of their useful lives. The vessels are relatively slow and small in comparison to the newer Issaquah Class of ferries that carry 90-120 vehicles that have been put in service since the 1980's; and the Jumbo Mark II Class ferries that carry over 200 vehicles in the 1990's.

Terminals for the ferry system have over the course of the past 60 years been expanded and updated to accommodate the newer larger vessel classes where those have been put into service. However, as the older, smaller Steel Electric class ferries are replaced with newer vessels, older harbor and terminal facilities throughout the Puget Sound service area will need to be modified to accommodate the larger class ferries that the Ferry system is looking at procuring.

The planned procurement and replacements for the ferry system are detailed in the Appendix.
Current funding assumptions for the next ten years show the Washington State Ferries meeting short-term targets for both vessel and terminal preservation, including the replacement of four vessels in operation since 1927. Further vessel replacement beyond the ten-year period is unfunded.

Local Ferries

There are four county-operated ferries in Washington which have needs for vessel and terminal asset preservation. They are located in and operated by Pierce, Skagit, Wahkiakum, and Whatcom counties.

Weigh Stations

Vehicle weight is a critical factor in determining the life expectancy of roadways and bridges. Inspection and legal weight enforcement activities at weigh stations helps maximize roadway life and extend the time between rehabilitation and replacement activities. Weigh station sites themselves need to be rehabilitated and expanded to keep up with the growth in truck usage across the state.

Figure II-4
Weigh Stations in Washington

Weigh-in-Motion is one of the technological improvements that has been and is being deployed across Washington. The Commercial Vehicle Information Systems and Networks (CVISN) transponder program allows trucks to bypass weigh stations by electronically verifying a truck's legal weight and credentials as a vehicle continues along the roadway at freeway speeds. The use of this technology expedites the weighing process, reducing travel delays for freight companies, and reducing the congestion of existing and merging freight vehicles on the freeway system.

Safety Rest Areas

Safety rest areas provide travelers with a place to rest, to get tourist information about nearby communities and to refresh themselves. In Washington, most safety rest areas were built when the interstate highway system was constructed. These facilities continue to age and when replaced must be brought up to new standards and codes at significant cost. In many cases the existing facility and the utilities must be completely rebuilt.

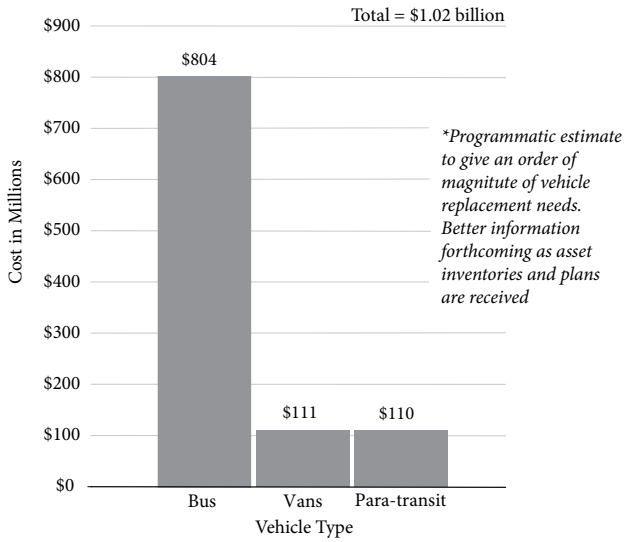
Culverts

Culverts carry water under and along roadways . Recent culvert failures due to corrosion and roadway settlement highlight the need for the development of an inventory and condition survey to help determine level of future investment necessary to prevent roadways from collapsing.

Public Transportation Systems

Transit asset preservation needs include funding stability for bus fleet replacement, park and ride lot preservation needs, and operating needs, especially for some expensive demand-responsive service.

Figure II-5
10-Year Cycle of Bus Fleet Replacement Cost in Millions for Current Fleets



Source: WSDOT Summary of Public Transportation - 2002 and King County Metro average estimates for vehicle cost

Aviation

Washington's commercial and general aviation airports need additional paving, lighting, and navigation aids. An important issue for airports is the need to preserve the airport sites themselves and their operations from encroachment by incompatible land use development.

Federal funding is available for airports within the National Plan of Integrated Airport Systems (NPIAS). The largest impact occurs at smaller community airports that do not qualify for federal grants. A reduction in pavement condition has increased safety risks and increased reconstruction and replacement pavement costs. In 2005 the WSDOT Aviation Division completed evaluating airport facility pavement conditions. Final recommendations are due in the summer of 2006.

Railroads

Short line railroads are mostly owned by private operators, making information about system condition difficult to compile. Indications are that short line rail tracks are facing large rehabilitation needs which may be at least partly unfunded. Worsening track conditions could lead to further abandonment of short line railroad freight lines.

Electrical Systems

Many transportation-related electrical systems across the state are more than forty years old and will need complete replacement in the coming 20 years.

Especially critical are those information gathering and traffic management systems that help to operate the highway system and provide real-time information to travelers so they can make better decisions about whether, when, and by what routes to travel. These systems are primarily electrical, involving computer technology that ages quickly and is expected to require replacement at least twice in the coming 20 years.

> "Southwest Washington Regional Transportation Council appreciates WSDOT's leadership in building a plan that incorporates the individual regional needs while at the same time reflecting statewide transportation policies and needs."
>
> ***Dean Lookingbill***
> *Director, Southwest Regional Transportation Council*

The Challenge: Safety

All types of collisions on Washington's roadways increased 45% from 1980 to 2002. During this time period there was also an increase in the number of people driving and the miles they drove, which tends to increase the number of collisions. Approximately 600 people die in collisions in Washington State each year—an unacceptable number despite our progress made to improve highways, as the following chart shows.

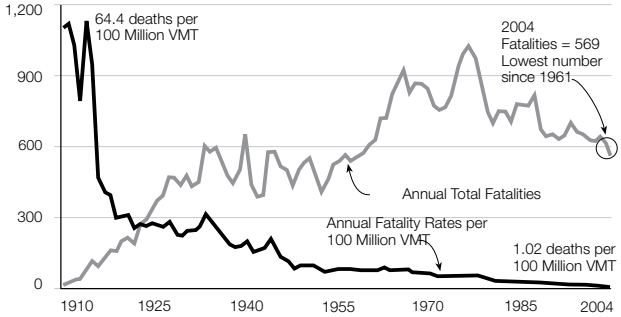
The societal cost of motor vehicle collisions in Washington for all roadways (state, county, city, tribal, and federal) is estimated at $5.4 billion annually. Although disabling and fatal collisions make up only 2.3% of the total number of collisions, they account for 56% of the total societal costs.

Safety for the traveling public is the state's highest priority. The Washington State Patrol, the State Department of Licensing, the Washington State Traffic Safety Commission, local law enforcement agencies, and the State Department of Transportation work collaboratively to increase traveler safety on the state's transportation system through education programs and enforcement campaigns. Significant emphasis is placed on roadway design at all jurisdictional levels statewide, resulting in projects that reduce fatalities and disabling injuries caused by collisions, improving regulations, increasing interagency collaboration, and promoting ongoing research aimed at finding ways to make our transportation system safer.

Figure II-6

Washington Motor Vehicle Total Fatalities and Fatality Rates

1910-2004



Source: WSDOT Transportation Data Office

The Washington State Patrol

The Washington State Patrol put an aggressive driving program into place Memorial Day weekend, 1998. The Aggressive Driving Apprehension Team targets the reduction of: DUIs, incidents of aggressive driving, incidents of dangerous speeding, and increasing seatbelt compliance. The Patrol has also adopted the philosohpy of Problem Oriented Public Safety which is focused on developing working partnerships among the Patrol, citizens, and other stakeholders.

The Department of Licensing

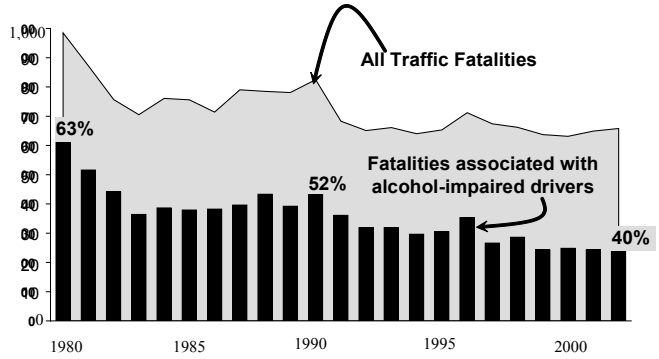
The Washington State Department of Licensing, Motorcycle Safety Program works to improve motorcycle safety through rider training programs and public information campaigns. The program is funded by a fee on motorcycle permits, endorsements, and student tuition for courses, creating a use-funded program.

The Washington State Traffic Safety Commission

The Washington Traffic Safety Commission has developed safety programs to target unsafe behaviors. The programs include: Click it or Ticker, to address seatbelt use; The Child Passenger Safety Program to increase compliance with Washington State child restraint laws; the Youth Traffic Safety Program to provide traffic safety advocates the ability to work with teen drivers to improve traffic safety; and the School Zone Safety Program to save lives and prevent serious injuries in and around schools in Washington.

Figure II-7

Trend in Rate of Driver Alcohol Impairment Associated with Motor Vehicle Fatalities in Washington State
1980 - 2002



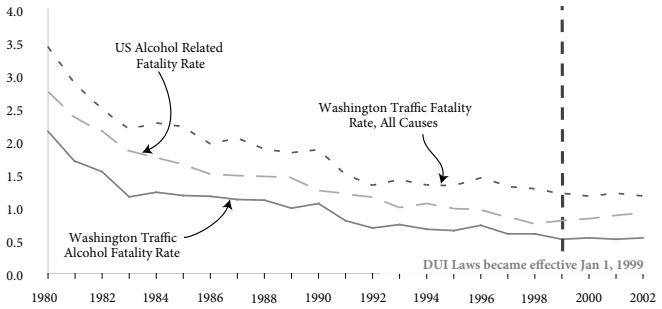
Source: Washington State Traffic Safety Commission

Figure II-8

Alcohol-Related Traffic Fatalities

Comparison of Washington's Public Roadway Fatality Rate And Alcohol-Related Fatalities Per Million VMT

1980 - 2002



Source: WSDOT Transportation Data Office

The Strategic Highway Safety Plan

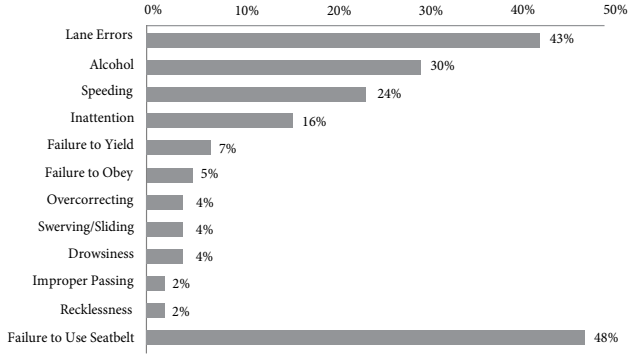
The Washington State Department of Transportation has developed the Strategic Highway Safety Plan: Target Zero with the mission to identify Washington state's traffic safety needs and guide investment decisions to acheive significant reductions in fatalities and serious injuries on all public roads. The vision for this plan is that by the year 2030, Washington state will achieve a transportation system that has zero traffic deaths and zero disabling injuries. In order to achieve Target Zero, the state must experience 24 fewer fatalities each year for the next 25 years.

Technological advances like better crash-worthiness of vehicles and crash-avoidance technologies have increased safety for motorists. Yet crashes are the leading cause of death in the United States for people age 3 to 33. So more needs to be done for motorists, pedestrians and bicyclists.
Sharply reducing fatalities and severe injuries will require more than better vehicle and road engineering.

Reducing the human behavioral causes of accidents like speeding, reckless driving, alcohol or drug impairment, and failure to use safety devices like motorcycle helmets and seatbelts will require targeted education and law-enforcement measures.

Figure II-9

Driver Errors and Behaviors Associated with Fatal Collisions in Washington State 1993 - 2001



Source: WSDOT Transportation Data Office

Behavior is a strong factor

One of the largest contributors to fatal collisions is driving while intoxicated. Impaired drivers are involved in approximately 40% of all the fatal collisions in Washington. Despite an increased focus on reducing numbers of impaired drivers, the rate of alcohol involvement in fatalities remains high.

Bad drivers, including aggressive and drowsy drivers, also contribute to fatalities. Included in this group are drivers that weave in and out of traffic, flash their lights, tailgate, street race, speed at over 100 mph, or fall asleep at the wheel. Young drivers (16-20 years old) have a higher fatal collision rate than any other age group. Legislation passed in July 2001, established the requirement of 50 hours of supervised behind-the-wheel driving time

for drivers under the age of 18 before they can obtain a license. Early statistics collected after the law took effect show about a 30% drop in the number of fatalities and disabling injuries for 16 and 17 year-old drivers.

New strategies and policies will be needed to address aging driver safety needs as Washington State's population ages.

Roadway Factors Affect Collisions
At many locations in Washington State there are opportunities to design and construct roadway improvements that will make roads safer for travelers. Some of these opportunities are part of major road construction projects that help relieve congestion and improve safety. Sometimes safety improvements are smaller scale projects like widened or strengthened shoulders or additional roadway width that provide room for turning lanes.

Roadway safety projects may focus on the following types of improvements:
- Reducing head-on and across-median crashes;
- Improving design and operation of highway intersections;
- Recurring congestion related crashes and
- Reducing bicycle and pedestrian crashes;
- Reducing speed limits to fit changing uses and conditions impacting the roadway.

Roadside Factors Affect Collision Severity
Roadside safety addresses the adjacent area outside of the roadway. It is an important component of total highway design because about one quarter of all fatal and disabling collisions involve fixed objects on the roadside.

There are numerous reasons why vehicles leave the roadway. Regardless of reason, a forgiving roadside can reduce the seriousness of the consequences of doing so. From a safety perspective, the ideal highway has roadsides and median areas that are flat and unobstructed by hazards. Elements such as side slopes, fixed objects, and water are potential hazards that a vehicle might encounter when it leaves the roadway. These hazards present varying degrees of danger to the vehicle and its occupants. The affordable and prudent mitigative measures to be taken therefore, depend on the identified hazard, the probability of an accident occurring, the likely severity, and the available resources.

Roadside safety projects focus on reducing severe and fatal injuries associated with run-off-the-road crashes.

Though there are numerous reasons why vehicles run off the road, a forgiving roadside can reduce the consequences of doing so. From a safety perspective, the ideal roadway has roadsides and median areas that are flat and unobstructed by hazards. Unfortunately, geography and economics do not always allow these ideal conditions. Elements such as side slopes, fixed objects, and water features are potential roadside hazards that a vehicle might encounter when it leaves the roadway. Though these hazards present varying degrees of danger to vehicle occupants, about one-third of all state highway fatalities involve the roadside.

Aviation
Air transportation is one of the safest modes of transportation. Nationwide the number of general aviation accidents per year has been steadily decreasing. In recent years the number of accidents nationwide is 6.40 accidents per 100,000 hours flown and 1.41 fatal accidents per 100,000 miles. However, Washington State ranked 7th in the nation with the highest number of accidents. California, Florida, and Texas had the greatest number of accidents. Weather is one of the leading causes of accidents for general aviation aircraft.

> "The WTP really needs to make sure that the Washington State Department of Transportation and San Juan County Land Bank work together to solve the parking situation at Upright Head on Lopez Island."
>
> ***San Juan County Commissioners***
> *WTP Commission Team Visit*
> *October, 2005*

Washington State Ferries
Washington State Ferries has a strong safety record in both its marine and terminal operations. It operates 28 vessels on 10 routes and carries over 25 million passengers annually. The United States Coast Guard sets safety standards for vessels and crew licensing. In 2002, there were 100 reported injuries to passengers on ferries—all of them minor in nature. There were 33 reported injuries at terminals—all minor in nature.

Bicycle and Pedestrian

The combination of driver actions, pedestrian actions, and the built environment continue to influence pedestrian fatality rates. Roughly one third of the auto-pedestrian accident fatalities that occurred between 1999 and 2004 involved alcohol or drugs.

- In 21% of the cases, the pedestrian was under the influence of alcohol or drugs
- In 7% of the cases, the driver was under the influence of alcohol or drugs
- In 2% of the cases, both driver and pedestrian were under the influence

Lack of roadway crossing opportunities places pedestrians at risk for serious injury and continues to be of concern. We can reduce this risk by implementing roadway improvements and pedestrian crossing safety programs at schools and other pedestrian access locations.

For cyclists, 52% of fatal collisions with motor vehicles occurred while the cyclist was riding in a roadway (e.g., driver following too closely or exceeding safe speeds, bicyclist being hit by an opening car door while riding next to parked cars).

The Challenge: Economic Vitality

Washington's economy and quality of life depend on a transportation system that functions well. Transportation connects people to jobs, family, medical care, education, and goods needed for daily life. Roadways, airports, ferries, transit, water ports, and railways are all necessary for a strong economy, providing access to businesses, jobs, and world markets, as well as moving freight and commerce. As with other basic infrastructure that supports our society—like water or electricity—society may take the transportation system for granted until problems arise effect individuals.

Washington is among our nation's most beautiful and diverse states. From the cities to rural areas, the mountains to the ocean beaches, and the fertile agricultural valleys and plains, Washington has it all. From most locations, a three hour drive takes you to a large variety of different regions offering incredible commercial, recreational, and cultural opportunities and scenic vistas.

The same geographic and natural qualities that attract tourists also lure and retain the highly skilled workforce vital to our economy. The agricultural, tourism, freight movement, aerospace, and information technology industries that power our economy, also depend on a safe and reliable transportation system.

Washington's Economic Structure

The structure of Washington's economy is shifting:

- Population and therefore travel demand will grow but these trends will be felt unevenly around the state
- The continued revolution of information technology can be expected to bring major societal and economic change which is likely to affect the ways people and businesses use transportation
- The continued expansion and globalization in trade will increase the strain on the freight industry

Transportation's Relationship to the Economy

There are three key ways that transportation contributes to Washington's economy:

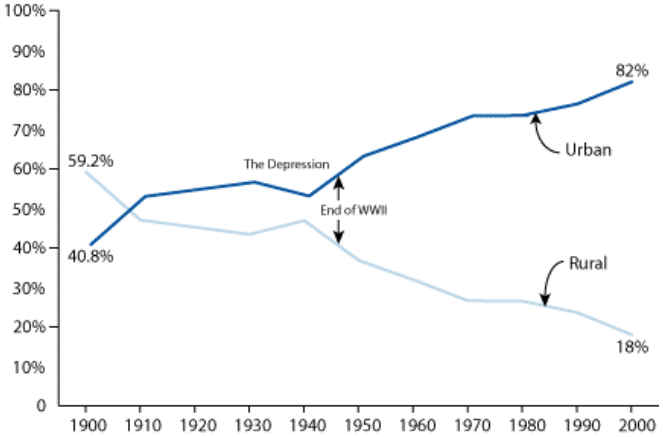
- Moving Freight and Goods
- Moving People
- Reducing societal costs through safer travel

Washington Population Trends and Forecasts

Urban Growth Continues

Since the development of industrial centers near the turn of the last century (1880's to early 1900's) population has become concentrated and distributed into "urban" and "rural" areas. The graph below displays the divergent trends in urban and rural population since 1900.

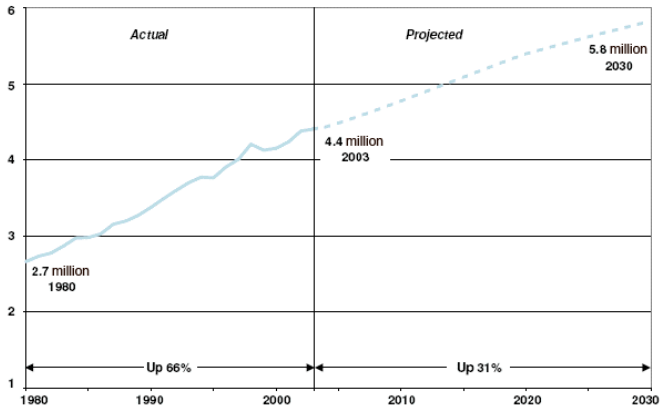
Figure II-10
Population growth in Relation to the State's Metropolitan Areas



The history of Washington State's population distribution is fairly straightforward. In the late 1800's to very early 1900's more people lived in rural areas rather than urban centers in Washington State. Most people worked on farms or made a living from the natural resources of Washington State. This trend reversed by 1910 and the difference in population concentration has continued to widen since. In 1910, the population was divided into 53% urban and 47% rural. By 2000, the population division was 82% urban and 18% rural.

It is expected that Washington's population growth over the next twenty years will continue to follow the shift as illustrated above. As a result, the density of urban areas will continue to increase, creating challenges in maintaining an efficient transportation system and mitigating congestion. Alternatives to single occupant vehicle transportation are key to managing the demands place upon the transportation system in these areas. Public transit, the Commute Trip Reduction program, walking and biking facilities provide alternative modes, relief of demand on highway systems and reduced congestion, as well as increased sustainability of the transportation system.

Figure II-11
Growth in the Number of Licensed Drivers

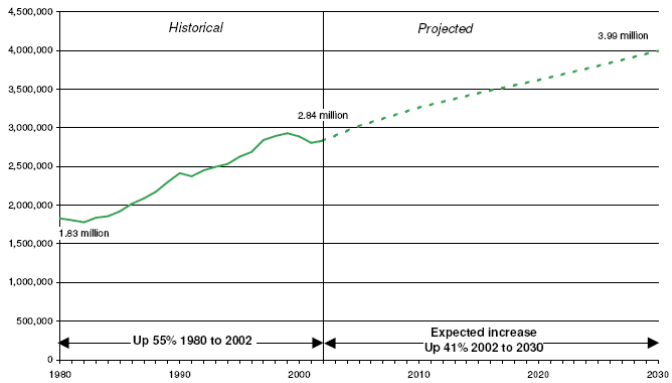


The number of licensed drivers in Washington increased from 2.7 million in 1980 to 4.4 million in 2003, an overall increase of 66%, or an annual average increase of 2.9%. In 2003, 72.1% of the population held a valid driver's license, an increase from 65.9% in 1980. This upward trend is expected to continue, increasing the number of licensed drivers to nearly six million by 2030. The forecasted increases in population and in the number of licensed drivers combined with the shifting concentration of this growth in urban areas will increase the strain on transportation facilities and services.

Washington's Economic Trends and Forecasts

From 1980 to 2002, the number of Washington jobs grew from 1.83 million to 2.84 million, an average annual growth rate of 2 percent. Between 2002 and 2030, 1,158,214 jobs are expected to be added to the Washington economy. Employment in the state is expected to increase at an average annual rate of 1.2 percent, from 2.84 million in 2002 to 3.99 million by 2030.

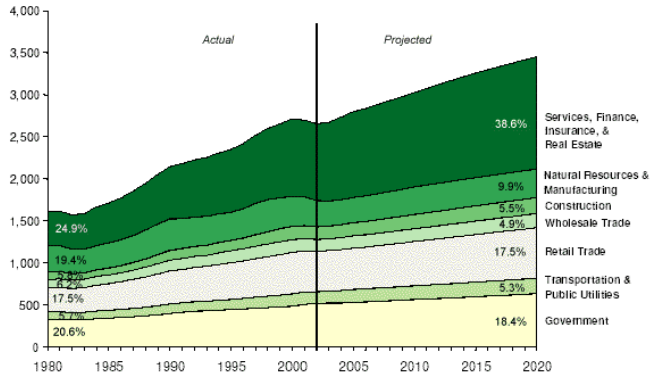
Figure II-12
Growth in Employment: 1980 to 2002 and 2002 to 2030



From 1980 to 2002, the number of jobs for Washington (excluding agricultural employment) grew from 1.61 million to 2.65 million, an average annual growth rate of 2 percent. It is expected that 779,900 jobs will be added to Washington's economy between 2002 and 2020. This represents an average annual growth rate of 1.3 percent, bringing the state's total number of jobs from 2.65 million in 2002 to 3.45 million by 2020.

Figure II-13

Growth in Non-agricultural Employment: 1980 to 2002 and 2002 to 2020, thousands of jobs

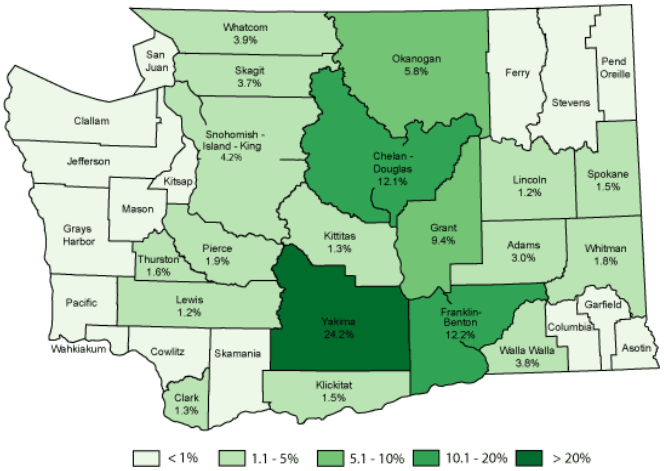


Agricultural Employment: 2002

Agriculture employed more than 87,000 people in Washington State in 2002, representing three percent of all state employment. Eighty percent of all agricultural employment is located in Eastern Washington. Yakima County alone accounts for 24 percent of the entire statewide agricultural employment.

Figure II-14

County Percentage of Total Agricultural Employment* Washington State, 2002



The combined growth in population, households, licensed drivers, and jobs compound the number of daily trips, increasing the demand and stress upon the existing transportation infrastructure.

Moving Freight and Goods

Three components of Washington State's freight system:

- Global Gateways – International and National Trade Flows Through Washington
- Made in Washington – Regional Economies Rely on the Freight System
- Delivering Goods to You – The Retail and Wholesale Distribution System

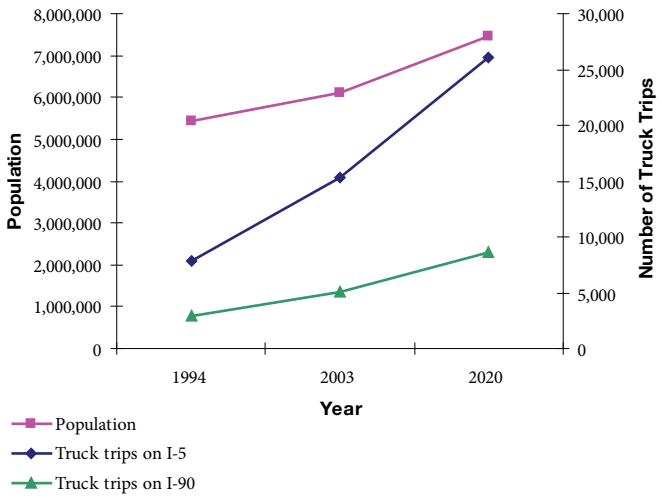
The three components of Washington State's freight system underpin our national and state economies, support national defense, directly sustain hundreds of thousands of jobs, and distribute the necessities of life to every resident of the state everyday.

First, Washington is a gateway state, connecting Asian trade flows to the U.S. economy, Alaska to the Lower 48, and Canada to the U.S. West Coast. About 70% of international goods entering Washington gateways continue on to the larger U.S. market. 30% become part of Washington's manufactured output or are distributed in our retail system.

Second, our own state's manufacturers and farmers rely on the freight system to transport Washington-made products to local customers, to the big U.S. markets in California and on the east coast, and worldwide. Washington's producers generate wealth and jobs in every region in the state.

Finally, Washington's distribution system is a fundamental local utility, since without it our citizens would have nothing to eat, nothing to wear, nothing to read, no spare parts, no fuel for their cars and no heat for their homes. In other words, the state's economy would no longer function.

Figure II-15
Washington Population vs. Truck Trips on I-5 and I-90



Globalization, competitive industry trends, and new technologies are pushing freight volumes up twice as fast as Washington's overall population and traffic growth as shown in Figure II-11. Without strategic investment by the public sector, our natural population growth, intensified by these three trends, will choke international trade flows through the state, undermine regional economies, and spill over into competition for road capacity in congested metropolitan centers. With strategic investment, Washington will continue to compete.

"Encourage the continued vitality of the Columbia River/Snake River transportation system and coastal ports which support the communities in five counties allowing access to the world markets for local and foreign products."

Cowlitz-Wahkiakum Council of Governments *Regional Transportation Plan 2003-2022*

Global Gateways – International and National Trade Flows Through Washington

Globalization, in particular the emergence of China and Asia as important suppliers of consumer goods for the United States, will triple the volume of international container freight moving through the Ports of Seattle and Tacoma by 2025. Midwest and East Coast consumers, at the far end of the Asia-to-United States supply chain, purchased about 70% of the international goods entering Washington ports in 2003. Most of these goods are shipped to the Midwest in containers via rail. But there isn't enough east-west rail capacity to handle a tripling of current volume.

Figure II-16

Comparison of Mainline Rail Capacity with Current and Projected Operations (Trains per day)

	Current Operations			Projected 2025 Operations		
Mainline Segment	Estimated Sustainable Cap.	Ave. Trains/Day	Peak Trains/Day	Estimated Sustainable Cap.	Ave. Trains/Day	Peak Trains/Day
Stevens Pass	28	23	25	28	46	51
Stampede Pass	20	6	7	20	16	18
Blaine to Everett	18	14	15	30	21	23
Everett to Seattle	50	45	50	100	84	92
Seattle to Tacoma	100	85	94	200	189	208
Tacoma to Kalama	60	45	50	120	80	88
Kalama to Longview	80	52	57	160	94	103

BST Associates. *2004 Marine Cargo Forecast:* Original source: MainLine Management and HDR, Inc. (Page 115). Includes passenger trains.

Location Brings Opportunities and Challenges

Global security needs and our national defense depends on the United States' ability to rapidly deploy armed forces when needed. Fort Lewis is the only Power

Projection Platform on the West Coast. In the event of a major conflict, essential equipment and supplies will rush to Fort Lewis from all over the United States by rail and road, then ship through the Ports of Tacoma, Olympia, and Seattle to support the troops. The military traffic will need to surge through two freight systems that have already reached their capacity limits: east-west rail road lines, and on Interstate 5 in Central Puget Sound.

Imports and Exports of Washington

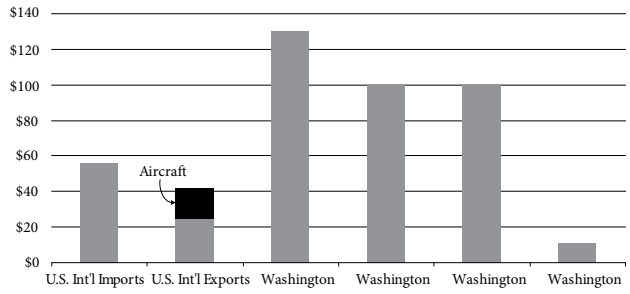
Washington's own largest waterborne export is food, mostly grain. Eighty-five percent of eastern Washington wheat is shipped to Asia via Columbia River ports, but farmers struggle to get product through the state's freight system. Growers can't get produce off the farm up to two months a year due to weight-restrictions on county roads, and the Columbia-Snake River system is at risk due to federal restrictions on dredging and lock maintenance.

Washington State's strategic location positions it as an important and growing gateway for trade access to the Pacific Rim, Canada, and U.S. states.

As shown in the map and diagram to the right, globalization, in particular the emergence of China and Asia as an important new part of the factory floor for the United States, will triple the volume of international container freight moving through the Ports of Seattle and Tacoma by 2025.

By far, Washington's largest waterborne import is crude oil from Alaska, shipped to the state's refineries. Refined product: gas, diesel, and jet fuel, then moves by pipeline or barge to distribution centers and is trucked to gas stations. Washington's citizens and industries consume 17.6 million gallons of petroleum per day, making the state's consumption 17th in the United States, and consumption is growing. However, the Olympic Pipe Line, currently operating at close to 100% capacity, has no plans to add capacity in the state.

Figure II-17
Washington State
Value of Freight Shipments (2004: Billions of Dollars)



> "If we make the right investments in transportation, we will create millions of jobs here at home, we'll make our businesses and workers more productive and we'll lay the foundation for our future economic growth."
>
> ***Honorable Patty Murray***
> *United States Senator*
> *Speech to Former US Transportation Secretary Norm Mineta*
> *March 9, 2004*

Made in Washington – Regional Economies Rely on the Freight System

Our state's regions have built strong and distinct economies based on industry and agriculture. Over 550,000 jobs in regional manufacturing, agriculture, construction, and forestry depend on Washington's freight system and accounted for $130.32 billion, or 28% of all state gross business revenues in 2004. Transportation is especially important for Washington agriculture because the state produces about three times as much food and for some commodities, up to twenty times as much on a tonnage basis as it consumes. Washington is separated by long distances from the majority of the nation's consumers. More efficient freight systems will help Washington manufacturers compete in the larger West Coast market.

> "Of great importance to Washington and other northwest states is the continued viability and reliability of Snoqualmie Pass (I-90) as the primary freight route over the Cascade Mountains to the Ports of Seattle and Tacoma."
>
> ***Benton-Franklin-Walla Walla RTPO***
> *Regional Transportation Plan*
> *2006 Update*

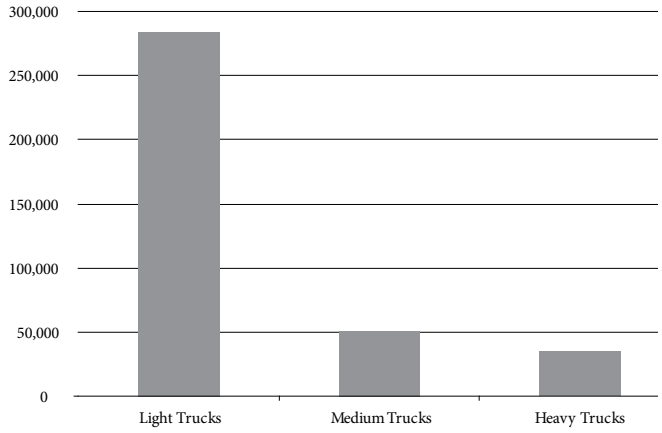
Competitive pressure to cut inventories at every step in the manufacturing chain is reshaping industrial supply chains, and causing more frequent freight shipments. The Boeing Company, employing 53,000 in Central Puget Sound, is Washington's largest manufacturer with $22.4 billion in airplane revenues in 2003. Boeing's dependence on the state's freight system will become even greater as it sets new levels of efficiency in the manufacturing of the new 7E7 Dreamliner. Although Boeing has historically made planes from up to a million smaller pieces and shipped them by truck, train, and boat, its new strategy to gain efficiency is based on major component assembly. Fewer parts, with more frequent deliveries, will support their just-in-time inventory reduction strategy.

Cost-cutting inventory reduction strategies are also underway at thousands of other mid-market manufacturers and producers around the state. For example, a Vancouver food production plant receives up to 50 truckloads of fresh potatoes each week from

growers in the Columbia Basin. The plant keeps just enough potatoes on hand for one eight-hour shift; if the potatoes do not arrive on time, the plant cannot run. A one-million-square-foot semiconductor foundry in East Clark County can't function without fast and reliable air cargo; if a tool is delayed overnight in the supply chain from Taiwan, the plant will shut down and idle 1,000 employees. Farmers ship vegetable produce over 200 miles from Prosser to a major wholesaler distributor chain in Central Puget Sound, and are required to deliver within 15 minutes of their scheduled appointment.

These competitive trends are repeated in thousands of manufacturing plants, construction sites, agricultural growers and processors, and distributors facilities in Spokane, Bellingham, TriCities and across the state - driving logistics practices toward perfect flow that puts more trucks on the road, more frequently, with ever-shorter delivery windows.

Figure II-18
Exhibit 4: Most Commercial Trucks Licensed in Washington State Are Light Weight



Spokane regional manufacturers and health care system practitioners, and Eastern Washington agricultural growers and processors, all cite severe winter weather closures on Interstate 90 at Snoqualmie Pass as Eastern Washington's top freight priority. They ship to customers in Central Puget Sound, so fixing delays on Interstate 5 from Everett to Olympia comes in a close second. Northwest and Southwest Washington manufacturers and trucking firms are also shipping to the Central Puget Sound region, so they put fixing the Interstate 5 corridor at the top of the list.

The Columbia Basin/North Central Washington agricultural center leads the nation in apple and potato production. Apples and potatoes must be shipped in refrigerated truck or rail cars; 90 % are trucked to market. Continued refrigerated truck shortages are likely due to seasonal peak demand and an ongoing pull from other U.S. regions for refrigerated capacity.

> The Top 3 cities with the highest concentration of aerospace firms in the world are: (1) Seattle, Washington (2) Toulouse, France and (3) Montreal, Canada.
>
> *Source: Washington State Department of Community, Trade & Economic Development*

Aerospace and Technology
Washington is the United States' largest exporter within the aerospace industry. This industry produces over 50% of the state's $35 billion in exports.

There are more than 500 companies in the state with a link to the aerospace industry. They represent every segment of the industry, including engineering services, commercial and general aviation, and military and space applications.

Since 1988, total high-tech employment has fluctuated with the economic cycles of the aerospace industry, while non-aerospace high-tech employment showed steady growth during that same period.

Regionally, an interesting shift is occurring in technology job growth. Established technology-rich communities like Seattle, Vancouver, and Spokane saw a drop in technology jobs over the last two years, while Bellingham, the Tri-Cities, and Bremerton all exhibited strong technology job growth.

Technology industries account directly for more than 12% of Washington's total employment. Washington retains a highly educated workforce, critical to the technology industry, ranking twelfth in the nation.

Manufacturing
In 2003, Washington manufacturers grossed $88.3 billion, 21.3% of the total state gross business income. This sector employed more than 285,000 workers in 2002 (11% of Washington's jobs). Employment in the manufacturing sector has been down since 1998 mainly due to a downturn in the aerospace industry. Washington is expected to see an average growth rate of 0.4% in manufacturing employment through 2030.

While remaining relatively steady in the number of jobs, manufacturing employment is expected to drop from 19.4% to 9.9% of all non-agricultural employment between 1980 and 2020. Even with this drop in share, manufacturing will grow, but more slowly than other non-agricultural jobs.

Forest Products and Paper

As the nation's largest exporter of forest products, Washington boasts a prime location on the Pacific Coast, abundant forest resources, and key port facilities to maintain its competitive edge in the world market.

Japan is the largest importer of Washington forest products. Pulp and paper exports in Washington total $1.1 billion. Washington is the largest softwood lumber producer in the United States, exporting $495 million, in domestic and international markets, of softwood lumber. According to a 2004 Washington State Department of Community, Trade and Economic Development report on forest products in Washington:

- Forest products manufacturing is projected to grow by 1% per year through 2007 and 0.9% per year thru 2012. In 2003, logging employed 5,497 workers and forest products and manufacturing employed 17,573 workers.
- Pulp and paper sectors employed an estimated 14,600 Washingtonians in 2002.
- An economic assessment of the global market for forest products estimated that near-term consumption is projected to increase from 300 million to 800 million cubic meters over the next 20 years.

Forest Products in Washington

The forest products industry is one of Washington's key industrial clusters. In combination with a strong resource base, Washington's historical tie to the forest products industry results in and relies upon an infrastructure of roads, rail, and ports.

Agriculture

Agriculture is big business in Washington and employs about 3% of our total workforce. In 2002, Washington produced $5.6 billion in food and agricultural products, ranking ninth nationally and is the number one producer of eleven crops.

Figure II-19
Washington's top five commodities accounted for two-thirds of the state's agricultural receipts in 2002

Commodity	Value of Receipts Thousand $	Percent of State Total Farm Reciepts	Percent of U.S. Value
1. Apples	977,508	18.8	63.6
2. Dairy Products	671,040	12.9	3.3
3. Cattle and calves	614,385	11.8	1.6
4. Potatoes	478,166	9.2	15.8
5. Wheat	475,718	9.1	8.6

Agriculture employed more than 87,000 people in Washington in 2002, 80% of whom work in Eastern Washington. Yakima County alone accounts for 24% of statewide agricultural employment. Transportation infrastructure is critical to getting agricultural products to market.

The total annual economic impact of Washington's wine industry is $3 billion. Washington State is focused on the premium wine market segment (wines sold for $8/bottle and higher). Washington is considered to be the second largest premium wine producer in the United States and is home to more than 400 wineries supplied by over 350 local growers. Together, they produce an estimated $685 million in retail value. The wine industry employs about 14,000 people, earning over $466 million in wages in 2004.

Delivering Goods to You – The Retail and Wholesale Distribution System

Distribution is a critical component of the freight system, as it produces up to 80 % of all truck trips in metropolitan areas and serves the retail, wholesale, and business services sectors. These sectors supported 1,690,000 jobs and accounted for $268 billion in 2004 gross business revenues, equal to 54% of total state revenues. An enormous variety of goods are handled on this system; food and groceries, fuel, pharmaceuticals and medical supplies, retail stock; office supplies and documents; garbage, construction materials, and equipment.

Distribution companies must provide fast and ubiquitous service that is reliable under all conditions. FedEx and UPS drivers do not go home until every package is delivered. Hospital patients cannot wait for drug deliveries. Washington's modern service economy depends on speed of delivery through the freight system.

The most common method of distributing goods is by truck from large distribution centers to stores and businesses. When those trucks run into congestion, companies compensate for delays by sending more trucks out on the road, causing even more congestion.

Land use costs are also causing higher truck volumes. For example, in response to increased consumer demand for a wider variety of food products, grocers are increasing overall store size and shelf space. But back-storage space doesn't generate sales, so modern grocery stores are reducing expensive, non-productive storage space. This requires more frequent deliveries in smaller quantities; one Seattle specialty grocery store, for example, receives 375 truck deliveries per week.

New technologies enable companies to track more and more trucks, balance their inventories and capital usage, while managing very tight delivery windows. For example, UPS and FedEx's high-tech logistics services allow companies to track inventory on the Internet no matter which warehouse, truck, or other location holds their products. By implication, the greatest increase in overall truck volumes will be seen in many more, smaller trucks on the roads.

Moving People

Tourism and Recreation

Transportation has a clear, obvious link to the tourism industry. Several statewide services and programs that support tourism and recreation include infrastructure such as: highways, airports, ferries, passenger rail, safety rest areas, and viewpoints. Traveler information services include highway signing of destinations and businesses, roadside interpretation, maps and other traveler information including traffic cameras, interactive communications, and publications.

Some important components of the transportation system specifically serving tourism and recreation are bicycle touring routes, the state ferry system, aviation, and more than 3,500 miles of scenic byways.

Bicycling Touring Routes

Bicycle touring is an important component of the state's economy. It is growing in popularity and becoming an important component of the state's economy, especially for smaller coastal communities. WSDOT estimates that bicycle touring generates about $4 million each year in revenue for businesses in Washington (e.g. lodging, meals, related activities).

Aviation

Washington's system of 139 airports generated 171,311 jobs, over $4 billion in wages, and over $18.5 billion in annual sales output according to the 2001 Aviation Forecast and Economic Analysis Study. Aviation plays a major role in the state economy and while airports facilitate commerce, they also serve as economic engines and their direct, indirect, and induced benefits accrue throughout the rest of the community as well.

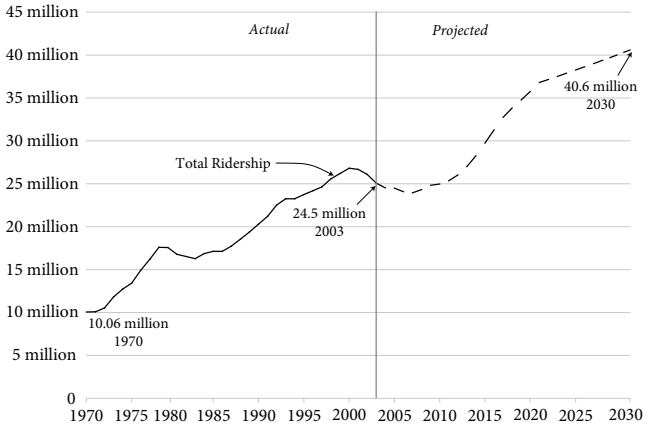
Scenic Byways

Washington's scenic byways serve as tourist destinations. Fifity-six percent of Americans participate in driving for pleasure in rural or natural areas. In 2002, travelers in Washington spent $11.2 billion, supporting 139,000 jobs. (*Source: USDA Forest Service. 2002 National Survey on Recreation and Environment).*

The Ferry System

Washington State Ferries link central Puget Sound with the Olympic Peninsula and Vancouver Island. The ferry system itself is a tourist attraction. In 1980 total ferry ridership was 16.7 million; by 2002 it increased by 50% to 25.1 million. These volumes are projected to continue to increase to 43.4 million riders by 2020.

Figure II-20
Ferry Ridership Will Continue to Grow



Source: WSDOT Ferries and Berk and Associates Policy and Management Consultants

The Challenge: Mobility

In Washington State, the growth in travel demand has outpaced expansion of transportation system capacity. This imbalance of demand and capacity occurs in virtually every mode of transportation: at our airports, on our rail lines, and especially on our roadways.

Congestion in the form of vehicle delay creates inefficiency and has the effect of reducing freeway capacity. Congestion reduces the capacity of roadways by up to 50 percent.

Getting the highest possible performance from our existing transportation investments, from basic maintenance and operations activities to the application of sophisticated technologies means people and goods move more reliably and predictably on the system.

As travel demand grows, the imbalance between roadway demand and capacity will also grow. The roadway capacity in the major urban areas built decades earlier has been consumed. The primary effects will be increased congestion, longer travel times, leading to reduced productivity, higher costs for goods and services, and the significant burden of time lost to congestion in people's lives.

Implementing the vision of the WTP is founded on the principle that long-range planning is an essential on-going process, that relies upon data and periodic analysis over many years. Given that Washington's population and demand for transportation of all kinds is still growing, it is important to think today about shaping the future of transportation systems, even beyond the 20-year time-span of this WTP.

Access to transportation is the passport to independent living for everyone. For residents and visitors in Washington State, and for people with special transportation needs in particular, accessible transportation presents many challenges. Transportation should not be a barrier to full participation in the community and the economy.

Improved accountability is essential. Local, regional, and state transportation providers must base infrastructure investments on performance measurement and performance-based decision-making to ensure the right projects are delivered when needed, and must maintain the public's confidence in government's ability to meet their needs.

Stable transportation funding is needed to provide certainty in plans and programs and prevent expensive, inefficient project starts/stops/starts. Stable funding supports the economy and local land use decisions. Innovative financing, public-private partnerships, and toll facilities or system management approaches will provide additional funding capacity and management tools.

The Demand-Capacity Imbalance—Mobility Challenges in Washington

A key issue for this Plan is that transportation demand is growing, and the imbalance between demand and capacity of the system will continue to grow in the future, leading to more congestion. Achieving a better balance between demand for the system and capacity of the system will require methods to:

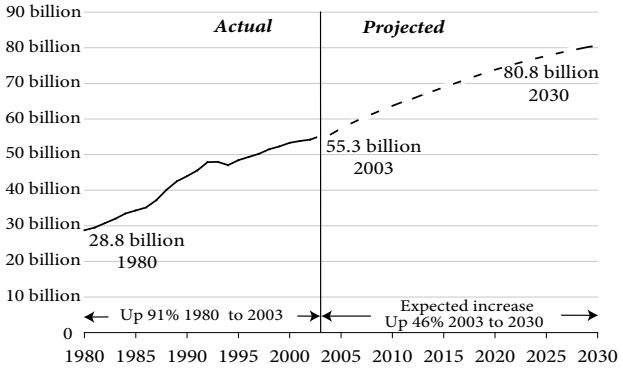
- Maintain flow of traffic
- Maximize throughput
- Improve productivity

By 2025, without substantial new capacity or significant changes that affect how and when we travel, users of Washington's transportation system will experience:

- Increased delay
- Longer travel times
- Reduced system efficiency
- Reduced economic productivity
- Higher consumer costs
- Time lost

Congestion occurs mostly in the urban areas, especially Puget Sound, Vancouver, and Spokane. (92% of all delay on highways occurs in these areas.) Congestion causes lost productivity: Maximum freeway throughput of about 2,000 vehicles per hour occurs at speeds of 45-50 mph. Throughput drops dramatically when traffic volumes force speeds to drop below 50 mph. The capacity of the roadway actually decreases (as much as half) with congestion.

Figure II-21
Vehicle Miles Traveled Will Continue to Grow



How did we get in this situation?
There are several reasons:

- More people are driving and people are driving more.
- Capacity expansion has not kept up with the pace of population and travel demand growth, resulting in an imbalance between demand and capacity.
- Most travelers are auto dependent due to lack of population and employment density, which is essential to make alternative travel options more viable.

The Future of Transportation in Washington
The Washington economy has grown and is projected to continue to grow in the future, adding approximately 2,000,000 people and 900,000 jobs by the year 2025. The three major urban areas will experience 69% of the population growth and 79 percent of the employment growth.

Projected population and employment growth will translate into substantial increases in travel and demand for transportation systems and services. Computer models project that a total of 45 million more vehicle miles of travel (VMT) per day will occur in the state's three major urban areas. Within Central Puget Sound, daily VMT is forecast to increase by nearly 60% by 2025. In Vancouver daily VMT is forecast to increase by 62%, and in Spokane by 30%.

Without substantial new capacity "created" through various methods, projected population and job growth will add even more pressure to the already strained system.

Creating more usable capacity on our transportation system will include:

- Ramp metering, incident response, and high occupancy vehicle lanes to improve flow on the system
- Commute trip reduction programs, better local networks, and transit oriented development provide alternatives to travelling on congested highways
- Basic maintenance and operations are the cornerstones of keeping the system moving

> "Essential to the success of the Spokane area, is the ability to develop a transportation system that can sustain growth and development in a manner that is financially affordable, environmentally friendly and provide the quality of life that Spokane residents expect."
>
> ***Spokane Regional Transportation Council***
> *2025 Regional Transportation Plan*

Transportation Access

People who can't or don't drive face difficulty getting to work, school, and medical care. Personal mobility means having transportation services available that can take you where you need to travel, when you want to travel, being informed about the services, knowing how to use them, being able to use them, and having the means to pay for them.

"Persons with special transportation needs" are defined in RCW 81.66.010(4) as: "those persons, including their personal attendants, who because of physical or mental disability, income status, or age are unable to transport themselves or to purchase appropriate transportation." Persons with special transportation needs fall into four broad groups.

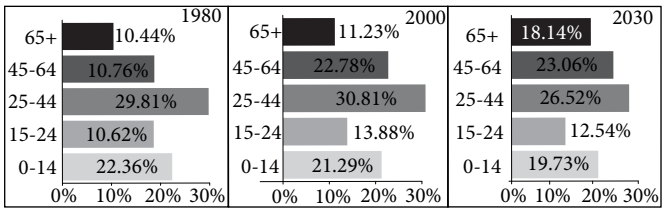
According to the 2000 U.S. Census in Washington State: Elderly people make up 11.2% of the population; 17.5% of the population report some type of disability; 25.7% of the population is under 18; and 10.6% of the population has incomes below the poverty level.

In addition, we recognize that other areas will require attention. Strengthened regional partnerships and collaboration will be required to provide regional investments to fund, build, operate, and maintain additional transportation services and facilities. Such investments will be tailored to promote regional economies and improve quality of life, promote goods movement to and through ports and border crossings, and support programs aimed at developing the state's economic clusters.

Washington's Elderly Population is Growing

The elderly are a growing share of the population. As people age, many give up driving. 17% of Washington's population over 65 does not drive. Of those who do still drive, many are driving more and at an older age than previous generations did. Many people are choosing to continue living in areas where driving is essential and public transit service is not available or difficult to use. The growing proportion of elderly people, especially

Figure II-22
Changing Age Mix in Total Washington State Population 1980-2030



those over 85 years of age, will increase the demand for demand-responsive public transportation. The growing number of older drivers also requires special roadway safety features such as easier to read signs and clearer striping.

Persons with Disabilities in Washington

It is difficult to know how many people in Washington with disabilities also have special transportation needs. We do know that the 2000 U.S. Census identified 1 million people with disabilities in Washington. Not all people with disabilities also need special transportation services.

In Washington, more than 60,000 people with disabilities receive assistance from the Department of Health and Human Services. According to the National Health Information Statistical Database, in Washington, people with sensory limitations severe enough to affect everyday life make up about 5% of the adult population. In addition, about 228,000 people have physical disabilities that affect their ability to walk and get around outside the home.

Washington's Children

From 1990 to 2000, the number of people age 19 and under increased 20.5% and now account for nearly 28% of the total state population. More than 1 million children attend schools in Washington. State funding covers only 65% of the school districts' transportation costs. Transportation for childcare and after school programs is often limited, particularly for children living in rural communities. Homeless children have a number of transportation difficulties, particularly when transitioning from temporary housing locations.

Washington's Low Income Population
In 2002, 1.16 million people with low incomes were assisted by the Department of Social and Health Services, totaling $2.45 billion in assistance. The cost of transportation in growing, and low-income residents spend a higher percentage of their income on transportation than others. The sharp rise in fuel prices beginning in 2005 has increased the burden on people with low-incomes. Low-income people in most rural areas typically do not have access to public transportation services. Low income groups are a significant and growing part of our population. Addressing the transportation needs of these people affects all of us, either directly or indirectly.

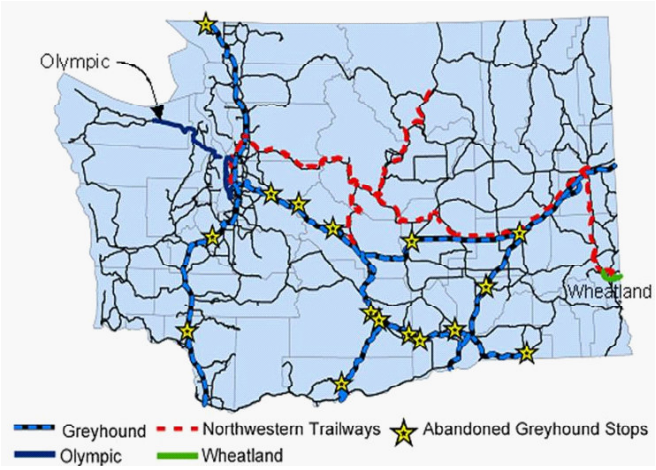
> "Transportation to basic service providers is essential for our region's disabled, low income and senior citizens."
>
> ***Kelly Scalf***
> *Transportation Director, Rural Resources*
> *Northeast Washington Regional Transportation Plan*

Transportation Challenges in Rural Areas
The economic viability of rural communities often revolves around the ability of people in these communities to maintain access to urban centers for shopping, banking, social activities, medical appointments, and other services. In rural areas, access is normally provided by automobile. With limited options and long distances, providing transportation access to people who cannot drive is a challenge.

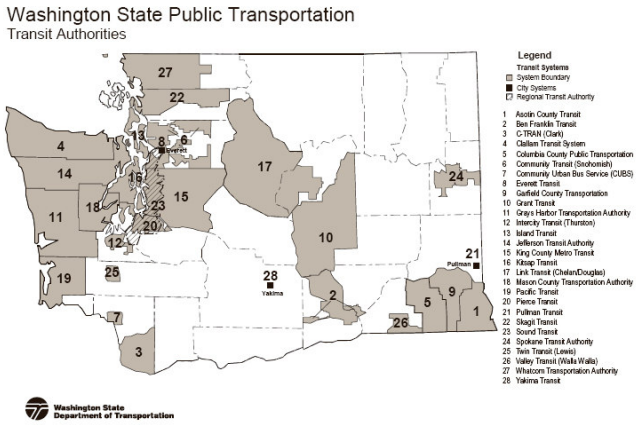
Intercity Services
A network of public and private services provides intercity connections. As private providers change services, smaller rural communities often lose access to national intercity connections. Gaps in programs and funding leave many of Washington's citizens without access to transportation for basic necessities, personal business, education and recreation. This is particularly true in rural and suburban areas outside of areas served by public transportation.
Private intercity bus companies are abandoning service to small communities throughout Washington. In summer 2004, Greyhound cancelled service in 21 mostly rural communities. Greyhound routes and abandoned service stops are shown in the following map. Without access to transportation, many residents will not be able to leave their communities.

As the population ages and more individuals with transportation disabilities remain active members of the community and workforce, the costs associated with providing accessible transportation is expected to increase. In 2003, spending by transit agencies comprised more than two-thirds of public funds spent on transportation access.

Intercity Bus Service



Agency Council on Coordinated Transportation
The Washington State Legislature created the Agency Council on Coordinated Transportation (ACCT) in 1998. ACCT's purpose is to increase transportation access through coordinated transportation services statewide. Significant local, state, federal, and private money is spent on providing a variety of transportation services. Coordination is critically important as it leverages all public and private funds together to improve effectiveness of all these services, reduces duplication and unnecessary service trips, and makes it easier for users to access essential services.



System Efficiencies

Several factors contribute to system inefficiency, such as congestion caused by too much traffic, collisions reducing available lanes, roadway design, weather conditions, mechanical failures in buses or ferries, uncoordinated bus or ferry schedules, unsynchronized traffic signals, and driver behavior itself. Uncoordinated patterns of development also create more daily trips at greater distances, making transportation systems less efficient.

Operating our roadways for maximum throughput is the key to getting the most out of the system. For most roadways, basic day-to-day and seasonal maintenance activities such as snow plowing, picking up debris, controlling vegetation, and pothole patching are the activities needed to keep the road available for optimal use. When more people use the roadway, congestion occurs and more sophisticated operating activities are needed to optimize use.

Efficiencies of Public Transportation

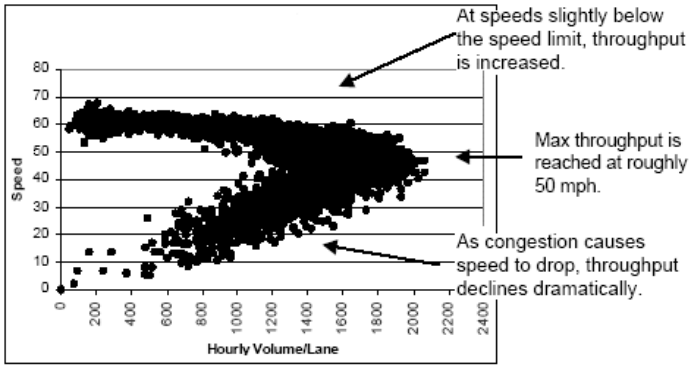
Public transportation plays a critical role in supporting the efficient movement of people, particularly on regional corridors throughout the state. In 2004, Washington residents took over 170 million total trips on public transportation. Transit agencies are increasing the level of service to target the diverse needs of their riders by investing in high capacity transit options, bus rapid transit investments, and improved travel options to keep people moving during WSDOT's many construction projects. Other transit systems are offering more options for commuting by expanding their vanpool programs, online travel information, multiple mode schedule information and coordinated ITS projects.

> "Develop and implement ITS to create safer roads and better informed travelers through technologies such as congestion monitoring; automatic accident alert systems; on-board navigation; and weighing and inspection of commercial vehicles in motion."
>
> ***Intelligent Transportation Systems in Whatcom County***
> *Whatcom Council of Governments*

In addition, major projects underway are improving commuter and intercity rail, developing light rail, and extending the HOV system. Each of these areas will enhance the efficiency and capacity of the public transportation network.

Each roadway has an optimal capacity where throughput (number of vehicles per hour) is at its highest. Traffic volume at given speeds influences vehicle throughput. In this example, the maximum throughput is about 2,000 vehicles per lane per hour and, at this rate, traffic is flowing at about 45 to 50 miles per hour. If demand increases further, speeds slow and throughput actually drops to less than one-half the maximum throughput. This means that under unmanaged congested conditions, the capacity of a roadway is actually less than if flow were maintained at a steady 45 to 50 miles per hour. Knowing how roadways operate can lead to strategies aimed at managing flow and trying to prevent traffic from dropping "below the curve."

Figure II-25
I-405 NB@24th NE, Weekdays in May, 2001



Source: WSDOT Loop detector data

The chart above shows how maximum throughput (an accounting of people or vehicles passing a certain point in a given amount of time) is achieved at speeds between 45 to 50 miles per hour. As more vehicles are gathered together and congestion occurs, speeds drop dramatically and throughput decreases significantly.

As roadway congestion increases, Intelligent Transportation Systems can be used to maintain vehicle throughput. We now use technology to maintain throughput such as ramp metering, traveler information, incident response, border crossing technology, weather responsiveness based on prediction tools, commercial vehicle information systems and networks, and coordinated signals.

In current and future construction areas, surveillance cameras and driver information will be used to monitor corridor traffic and potentially reroute trips to non-congested corridors.

Why does intercity passenger rail service in this corridor make sense?

The viability of corridor rail service is driven by several key factors. Based on research recently conducted by the American Association of State Highway and Transportation Officials (AASHTO), approximately eighty-one percent of all intercity trips greater than one hundred miles do not extend beyond five hundred miles.3 Corridor rail service of five hundred miles or less, with frequent daily departures and travel times of several hours or less between major population centers, can eliminate the need to travel on congested highways, as well as to and from airports located in suburban areas. Corridor rail service can also provide transportation to communities not served by regional air carriers, help relieve aircraft congestion at major airports, and can become an attractive mode of transport for business travelers and those taking single day round trips.

Truck Operations

Trucks are required to be weighed, inspected, and registered for travel in Washington. Stopping at truck scales and ports of entry can inconvenience and delay truck shipments. Advanced technology such as commercial vehicle information systems and networks and weigh-in-motion technologies can improve efficiency and reduce the time spent at the scales in most cases.

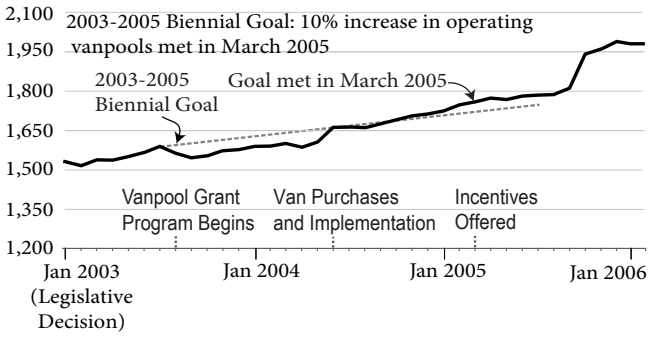
Managed Lanes

Special use lanes, such as those restricted to high occupancy vehicles (HOV) such as carpools and vanpools, have been used successfully to maintain throughput over all lanes. HOV lanes improve the efficiency of the system by carrying more people than other lanes during peak traffic periods. In the Puget Sound region, some HOV lanes actually move more vehicles than the adjacent general purpose lanes because their flow is maintained while the adjacent lanes are congested and have lost throughput. In the future, other types of managed lanes, perhaps toll lanes with variable pricing, will improve the efficiency of travel.

Figure II-26
2005 HOV Lanes

HOV Lane Miles	Interstate Lane Miles
HOV Lane Miles in Existence Prior to 2005	197
HOV Lane Miles Opened to Traffic	13
HOV Lane Miles Under Construction	92
Total	302

Figure II-27
Public Vanpools Operating in Washington
January 2003 to February 2006



Source: WSDOT Vanpool Database

Bottlenecks and Chokepoints

The growing demand/capacity imbalance affects citizens' daily lives and almost every sector of economic activity. Commutes to work on congested roadways are time-consuming and often aggravating. Non-work trips, too, must be planned to avoid congestion or with extra time allowed when the system is not reliable. Freight delivery becomes slower and less reliable. Air pollution is exacerbated by cars and trucks stuck in traffic. Even rural areas that never see traffic jams are penalized when highway congestion associated with urban areas delays agricultural products reaching ports and customers.

Delay Occurs Mostly in Urban Areas

Projected growth in travel will be concentrated in Puget Sound, Spokane, and Vancouver. Ninety two percent of all delay on highways occurs in these areas. Without methods to supply more capacity, either by operating more efficiently or by building more lanes, the gap between demand and capacity will grow wider.

Delay is more prevalent in urban areas with the greatest delay found in the Central Puget Sound area. The total delay across the state is estimated to be more than 365,000 hours per weekday and represents about $1.6 billion annually in lost time.

Congestion Actually Reduces Capacity

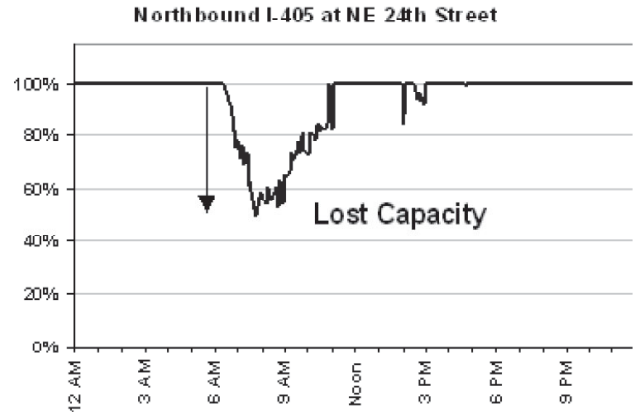
There are locations on the system where system geometry and traffic patterns contribute to congestion and reduce throughput capacity. These are called bottlenecks and chokepoints. Targeted capital investments at these locations would be less expensive than full corridor build-outs, but could deliver significant delay savings and restored productivity. Corridor completion and expansion in certain locations are higher cost ways needed to address the demand-capacity imbalance:

- New or major corridor expansion will need to be considered in the future
- The entire system is interconnected and all parts play a role in improving the demand-capacity imbalance

> "Transportation improvements and programs must be focused on establishing a more balanced transportation system, shifting emphasis from movement of vehicles to movement of people and goods. A balanced system provides travel options that include choices for private vehicles, public transit, ride sharing, walking, biking and various freight modes."
>
> ***Destination 2030***
> *Puget Sound Regional Council*

Efficiency loss can be seen more clearly in the graph below. On a section of I-405 during the morning commute the throughput lost due to congestion was equal to nearly half the highway's capacity. In other words, at the very time when the capacity is most needed the equivalent of one whole lane (out of two general purpose lanes) is lost to congestion. These efficiency losses often occur at bottleneck and chokepoint locations, which can severely hinder the entire system's performance.

Figure II-25
Percent of Lane Capacity Lost Due to Delay



Source: WSDOT Urban Corridors Office

Causes of Delay

Bottlenecks and chokepoints are typically locations on the system where design of the highway or traffic patterns contribute to congestion. Examples of these include:

- locations on the highway where three lanes in one direction drop to two lanes;
- where the distance from the freeway exit to the local road is not very long and cannot accommodate several vehicles to queue up in line;
- where multiple lanes merge and changing lanes is not restricted. This creates unpredictable lane change movements. Roadway examples include the Kirkland crawl on I-405, the Southcenter Hill climb on I-5, SR 18 between I-5 at Federal Way and SR 167 at Auburn, the Renton S-curves on I-405, US 2 near Monroe, and interchanges such as I-5/I-90 in Seattle, I-405/I-90 in Bellevue, and I-5/SR 16 in Tacoma. In addition, weather can cause congestion or affect the passability of a roadway creating a bottleneck or chokepoint. Avalanche control on the I-90 Snoqualmie Pass and county roadways closed due to spring thaw restrictions are examples of weather-related bottlenecks and chokepoints.

Building Future Visions

Long range transportation planning is essential to lay the groundwork to meet the forecasted needs for tomorrow. The construction of the interstate system took decades to plan and construct. Today, environmental regulations, the need for partnerships and innovative financing lengthens the time necessary to build projects as compared to 50 years ago. Implementing the vision of the WTP is founded on the principle that long-range planning is an essential on-going process, that relies upon data and periodic analysis over many years.

The planning for Interstate 82 began in the late 50's after the signing of the Federal-Aid Highway Act of 1956. The planning process for this highway extended over a period of twelve years. Construction, which began in October, 1968, took only 2 years and 9 months.

Building Future Visions—

Today's planning efforts should help shape visions of a transportation system for the future

The duration of time between conception and utilization of the bridges required a combined 15-year period of time, just one example of the need for a future vision when planning.

Fred G. Redmon Memorial Bridges over Selah Creek on I-82 Connecting Ellensburg to Yakima, in Eastern Washington

The Fred G. Redmon Memorial Bridges over Selah Creek on Interstate 82 were the longest single span concrete arch bridges in North America at the time of their completion in June, 1971. The total length of each of the dual bridges is 1,336 feet and the central spans are 549 feet. The bridges were the focus of several magazine and newspaper articles while they were under construction due to the significance of this engineering accomplishment. The Fred G. Redmon Memorial Bridges over Selah Creek have now been in use for over 35 years.

Major Roadway Capacity Expansions

With the population and job growth experienced in the past 20 years, Washington's roadway capacity is inadequate to meet the growing demand and future growth is likely to match or even outpace this historical pattern. WSDOT's highway system plan has identified over $30 billion of unfunded capacity expansion needs on state highways, and regional plans have identified large additional expansion needs on city and county arterials.

Not all increases in demand can be served solely by expanding this highway system. Other methods must be developed and may include some of the following targets.

Adding New Systems

New technologies that are only now being refined or invented will expand system capacity, increase system efficiency, and provide alternatives to driving. These new systems must not only support growth in our population, they must also contribute to our economy by making transportation more efficient.
Examples of new systems include:

High Capacity Transit

A high capacity transit vision is starting to unfold in Washington. Supporting this high capacity transit vision is the 300-mile high occupancy vehicle (HOV) lane system in the Puget Sound region, with over 200 miles already constructed within congested freeway corridors. This HOV system is supported by a broad network of park-and-ride lots, an extensive vanpool fleet, and demand management programs aimed at encouraging transit alternatives. Transit-oriented developments—land uses that provide densities, mixed uses, and pedestrian facilities to build a walk-to market for transit have been built in Bellevue, Issaquah, DuPont, Vancouver, and throughout the city of Seattle, and are being planned along light rail and other transit corridors.

Intelligent Transportation Systems—Smart Vehicles and Smart Roads

Intelligent Transportation Systems (ITS) technology is rapidly evolving and includes such things as smart vehicles and smart roadways. Newer vehicles entering the marketplace are "smart" in that they can sense the location of other vehicles on the road and activate variable cruise control and collision avoidance systems. Vehicles such as these, all communicating directly with each other, will safely travel at close distances and high speeds, improving current highway system efficiency. Vehicles outfitted with smart technologies are starting to enter the marketplace.

There are also ITS technologies designed to meet the special needs of truckers. Roadside weigh stations have traditionally performed a number of inspection and enforcement functions, but waiting in line for these services adds time (and therefore expense) to the trucker's trip. The Commercial Vehicle Information Systems and Networks (CVISN) and Weigh-In-Motion (WIM) systems weigh each truck as it passes a sensor. At the same time, trucks equipped with an Automatic Vehicle Identification (AVI) transponder electronically transmit essential safety rating credentials, weight, size, and other information to the weigh stations. If no problems appear to monitoring staff, the truck can bypass the station and continue down the highway.

Technologies that integrate vehicles with the roadway on which they are traveling takes system management to the next level. Electronic signals exchanged between vehicles and the roadway mean real-time traffic information can be used to manage the flow of traffic, helping to maximize throughput and minimize potential for collisions. Why is this so important? The Congestion Relief Analysis for the Central Puget Sound estimates current delay at 285,500 hours daily, with future delay based on a growth scenario with transit emphasis of 715,000 hours per day. The report estimates that just applying traffic system management measures including optimizing signal coordination and transit sign priority would reduce delay nearly 35,000 hours per day. This represents a 4.8 percent reduction in delay. It is not unrealistic to think that Vehicle Infrastructure Integration could double this reduction.

Tolling Technologies for System Management

New technologies and strategies show promise as a means to both affect the level of system use and increase financial support for transportation projects, especially in congested corridors. Four primary concepts include:

- System-wide tolling, where fees are based on actual road use throughout the entire system. "Dynamic Pricing" (or variable pricing based on demand) is an example. When many cars try to use the same road at the same time, the ability to drive in a free-flowing lane at a reasonable speed increases in value. Variable tolling, or value pricing, can serve to allow only enough cars to use a lane to optimize capacity and speed. Drive during peak demand, pay a peak price. Pricing of theatre tickets and utility rates operate on this principle. Value pricing can spread the demand to allow more vehicles to flow at higher speeds overall.
- Segment tolling, such as traditional, limited-access toll roads, toll bridges, or toll express lanes. Advances in electronic toll collection now provide for "at speed" (no tollbooth) collection of tolls.
- Cordon tolling, where all drivers are charged a toll when entering an area such as a downtown central business district.
- High Occupancy/Toll (HOT) lanes, where drivers of single-occupant vehicles can choose to pay to use HOV lanes when and where there is available capacity. 21 different projects using or studying HOT lane applications are currently underway in the United States including a pilot project on SR 167 here in Washington.

The Challenge: Environmental Quality

Transportation systems touch many complex health and environmental concerns: citizen and community health, natural ecosystems, species protection, climate change, and land use.

Transportation systems not only facilitate how we move from place to place, but play an important role in the health of communities. There is an increasing body of research showing that automobile-oriented land uses (i.e., those that create automobile dependency) limit transportation options, discourage physical activity, and adversely affect air quality, water quality, and safety. Increasingly, Washington communities are developing transportation infrastructure that improves health and, at the same time, realizes other benefits like improved economic vitality and protected and enhanced natural resources.

Communities are using transportation investments to improve the way people live and work together, and change the way we deliver community services and the way we share information about travel. Context Sensitive Design is an innovative approach to designing transportation systems which had much success. The foundation of this approach is the consideration of the compatibility of the project with community character, values, the environment, and the unique needs and desires of the community. Recognizing community needs with this approach has potential to increase collaborative partnerships, financial and otherwise, that address safety and mobility needs, as well as other key WTP issues.

The ability to plan, or participate in planning efforts, or develop a community's transportation future depends on having trained planning staff. This is a key issue with many of Washington's tribes which lack dedicated funding for such planning capacity.

Several communities have identified the number of people bicycling and walking as a primary transportation-related indicator of community health because this number may reflect many different aspects of a community's health including safety, security, economic vitality, public health, and quality of the natural setting. Other indicators for evaluating healthy communities can include information that ranges from land use measures like available housing stock and affordability, land use mix, and economic development to stormwater flows, wetland impacts, or changes in air quality.

"The new proposed sidewalks will make Metaline feel like a town and encourage people to stop and stay awhile."

Ruth Reiber
Metaline City Councilperson
Northeast Washington Regional Transportation Plan

Washington Provides Grant Funding for Pedestrian and Bicycle Projects

The Washington State Legislature included $74 million over the next 16 years to support pedestrian and bicycle safety projects such as pedestrian and bicycle paths, sidewalks, safe routes to school and transit. The Pedestrian & Bicycle Safety program is to address the nearly 400 statewide fatal and injury collisions involving pedestrians and bicycles each year. The following provides details for the Pedestrian & Bicycle Safety program.

The purpose of the Pedestrian and Bicycle Safety program is to aid public agencies in funding cost-effective projects that improve pedestrian and bicycle safety through engineering, education, and enforcement. Eligible projects may address the following:

A. Engineering improvements – Projects may include items such as:

- Intersection improvements such as: curb extensions, lighting, raised median, crosswalk enhancements, signs, signals, and mid-block crossing treatments
- Completing bicycle lanes and sidewalks
- Constructing bicycle and pedestrian paths
- Providing safe routes to transit
- Pedestrian and bicycle safety improvements for at risk groups (children, elderly and people with disabilities)

B. Education efforts – Projects may include items such as:

- Implementation of educational curricula
- Distribution of educational materials
- Walk or bike promotional programs

C. Enforcement efforts – Projects may include items such as:

- Additional law enforcement or equipment needed for enforcement activities
- Pedestrian sting operations
- Vehicle speed feedback signs
- Neighborhood watch program
- Photo enforcement

Figure II-29

Typical Sources of Pollutants in Urban Runoff

	Highways	Residential	Commercial/ Industrial
Phosphorus	4%	39%	53%
Hydrocarbons	16%	28%	54%
Copper	9%	10%	79%
Suspended Sediments	7%	44%	44%

Source: NPDES Municipal Stormwater Permit Application, Volume I,

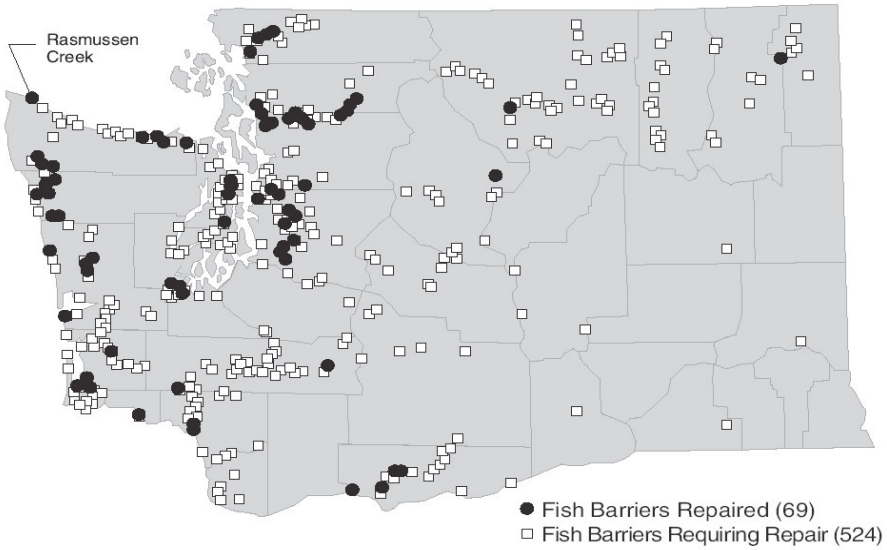
Stormwater Runoff

To improve safety, roadways are designed to carry rainwater off the pavement where cars travel. However, when stormwater flows off roads and through roadway drainage systems, it carries pollutants originating from motor vehicles, the atmosphere, and other sources into surface water bodies. Sediments and pollutants (nutrients, oil, grease, and metals) are carried into rivers and streams, affecting the quality of water.

Controlling the amount of flow is also important as high flows can damage habitat, property, and transportation infrastructure. Managing stormwater flowing over transportation facilities is achieved through use of runoff treatment and flow control technologies and methods. Most of WSDOT's stormwater outfalls were built prior to stormwater regulations and have no treatment facilities. To date, only 4,000 of WSDOT's estimated 18,000 to 24,000 outfalls have been inventoried, so adequate data is lacking to prioritize outfalls for retrofit. A similar situation of inadequate data exists for stormwater outfalls on city streets and county roads. The sensitivity of receiving waters to runoff pollutants must be a factor in prioritizing investments to improve water quality and quantity of runoff.

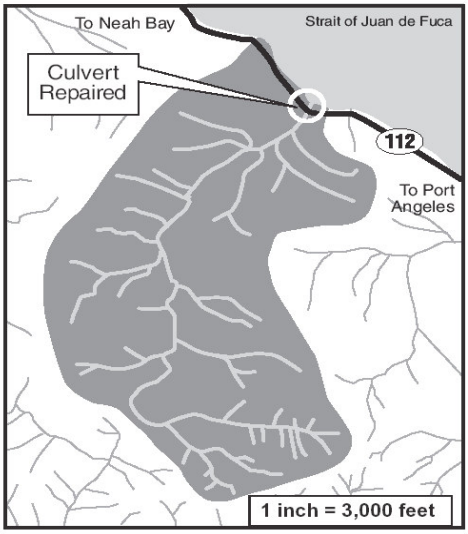
Keeping Track of Results

Washington State highway fish passage barriers and corrective projects to date, as well as the benefits of one corrected culvert at Rasmussen Creek near Neah Bay:



Total benefited acreage to date: Approximately 300 acres of stream habitat, not counting complete assessments for certain projects within independent construction programs.

Rasmussen Creek Watershed



A correction project at Rasmussen Creek on SR 112 near Neah Bay resulted in restored access to about 1 acre of stream habitat.

Source: WSDOT/WDFW Barrier Removal Program

Protecting Habitat and Wetlands

Washington State has a wide diversity of habitats that support more than 650 native fish and wildlife species. As the human population increases and our human footprint expands, added pressure is placed on natural systems that are already heavily stressed in many cases. Roads can fragment habitat for fish and wildlife, restrict the movement of wildlife along waterways and across landscapes, and lead to vehicle collisions with wildlife. (On average, 1,200 reported accidents, 134 injuries, and one fatality occur each year. In 2004, five people were killed in vehicle-wildlife collisions.) Loss of wetlands from construction is another potential impact.

Habitat Connectivity and State Highways

As we plan for the next 20 years, we see that careful analysis is needed to determine the highest priority locations where investments should be made for connectivity, habitat data, inventories and plans where available, need to be better integrated into transportation planning and design. At the same time, existing retrofit programs for fish passage and recurring streambank washout need more dedicated funding to address existing problems.

Addressing barriers and planning for long-term system improvements requires collaboration and coordination if we are to improve the effectiveness of wetlands protection and replacement requirements through opportunities for "watershed-based mitigation." A watershed approach involves looking at an entire watershed's needs and improvement opportunities beyond the immediate area of a construction project. In some watersheds, money can be better spent to deliver large benefits to water quality protection and habitat conservation and enhancement by investing in stormwater and wetlands needs away from the highway, compared to spot mitigation near the highway.

> "The quality and condition of the transportation system have an impact on the quality of life, which impacts a business' or individual's choice to locate in the region."
>
> ***Wenatchee Valley Transportation Council***
> *Confluence 2025 A Strategic Transportation Plan for the Wenatchee Valley.*

Figure II-31
Sources of Diesel Soot in Washington, 2003

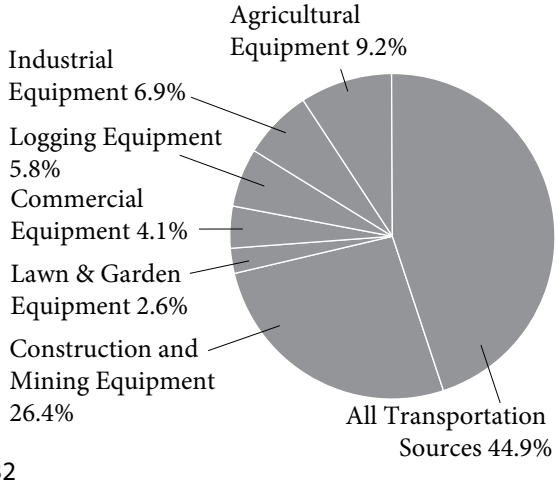
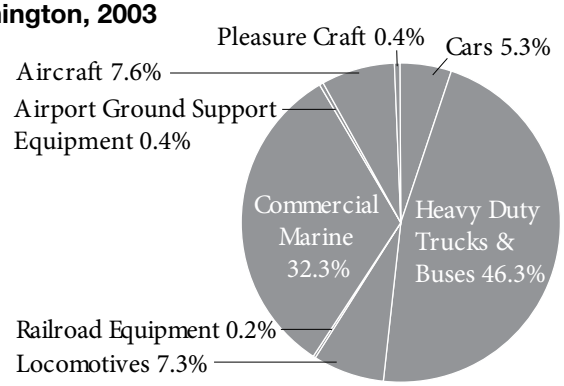


Figure II-32
Transportation Related Soot Emissions in Washington, 2003



According to the Western Regional Air Partnership Regional Haze 2003 Emission Inventory and the Washington State Dept of Ecology, transportation related emissions make up 44.9% of the total diesel soot related emissions in Washington, from a variety of sources (see chart). Heavy duty trucks and buses make up almost half of the transportation related emissions, though the single largest contributor to diesel soot is construction and mining equipment, which releases 26.4% of all diesel soot emissions in the state.