(DRAFT)

Washington Transportation Plan Update

Interim Briefing to the Transportation Commission

Health and the Environment

Charlie Howard
Director, Strategic Planning and Programming

Megan White
Director of Environmental Services

Douglas B MacDonald
Secretary of Transportation

Paula Hammond
Chief of Staff

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This presentation is a public record document. It is a draft and will be revised as needed. 2nd Edition last revised 8/19/2004.

Washington State Department of Transportation

A Straightforward Overview of Complex Issues

- Purpose of today's presentation is to provide introduction and context for the chapter.

- Transportation systems touch and are touched by myriad of health and environment issues
  - Human Health
  - Natural Ecosystem Processes
  - Species Protection
  - Land Use Concerns
  - Climate Change

Aligning Goals for Environment with Goals for Transportation

"WSDOT is overseeing a statewide transportation improvement program that creates new opportunities for aligning our citizens' goals for the environment and our citizens' goals for transportation systems."

- Our primary goal related to human health is safety. Other key issues related to human health and the environment:
  - Air Quality
  - Active Living and Healthy Communities
  - Water Quality – Stormwater
  - Protecting and Connecting Habitat
  - Other Health and Environment Issues
    - Operations and Maintenance
    - Noise
    - Sprawl

- It is all connected!

Current funding of these programs is also complex

- Environmental components of projects are integrated into new construction project's scope and budget
  - Wetland mitigation
  - Stormwater treatment
  - Noise walls
  - Banking of wetlands and stormwater retention is done via the Advance Environmental Mitigation Revolving Account

- Stand-alone environmental projects: Retrofit (I-4 Program)
  - Fish passage barrier removal
  - Stormwater retrofit
  - Chronic Environmental Deficiencies
  - Noise walls

- Active living projects such as paths, trails, and sidewalks are connected to highway improvements and funded through a dedicated percentage of state and federal construction dollars

Improving Air Quality

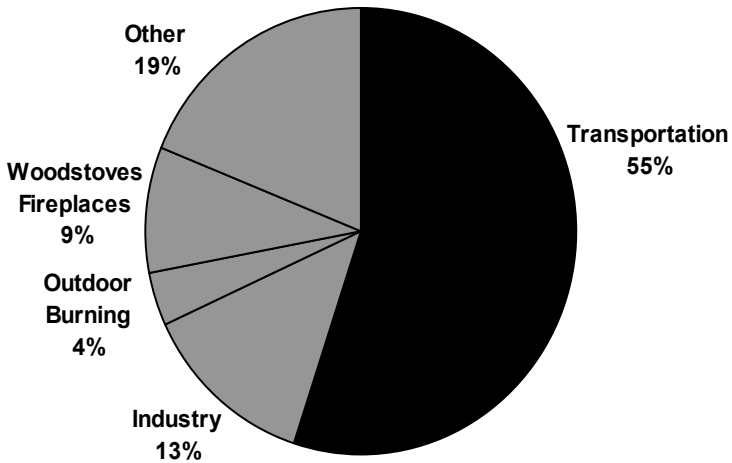
The Air We Breathe…

- EPA has established human health standards for six regulated pollutants:
  - –Carbon monoxide
  - –Ground level ozone
  - –Inhalable particulate matter
  - –Lead
  - –Oxides of nitrogen
  - –Sulfur dioxide

- It is estimated that transportation sources, mostly privately owned vehicles, are responsible for over half of the six regulated air pollutants

- A number of unregulated air toxics from motor vehicles are of growing concern (especially benzene and diesel exhaust)

Sources of Six Regulated Air Pollutants

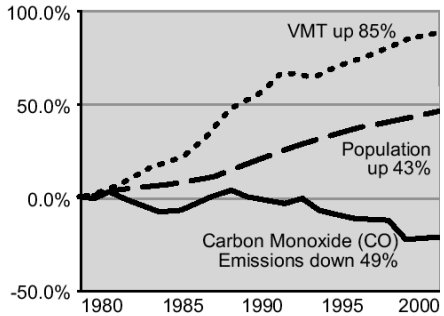


Source: WA State Dept. of Ecology 2001

Air Quality Progress

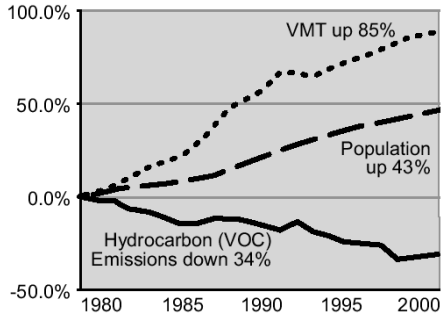
- In Washington State, the annual amounts of regulated pollutants have dropped even as driving has increased
- Most exceedances of air quality standards in the past five years have been for inhalable particulate matter
- WSDOT evaluates proposed transportation projects to assure that emissions of regulated air pollutants will not lead to local and regional exceedances of human health standards

Change in Population, Vehicle Miles Traveled and Carbon Monoxide Emissions (CO) from 1980



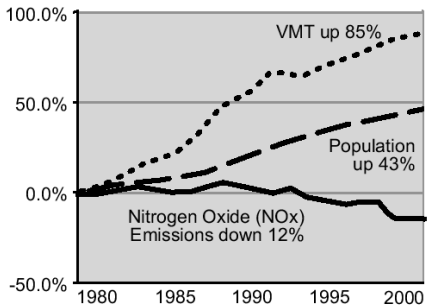
Source: WSDOT.

Change in Population, Vehicle Miles Traveled and Hydrocarbon Emissions (VOC) from 1980



Source: WSDOT.

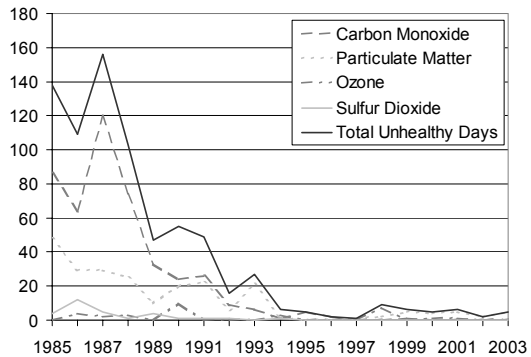
Change in Population, Vehicle Miles Traveled and Nitrogen Oxide Emissions (NOx) from 1980



Source: WSDOT.

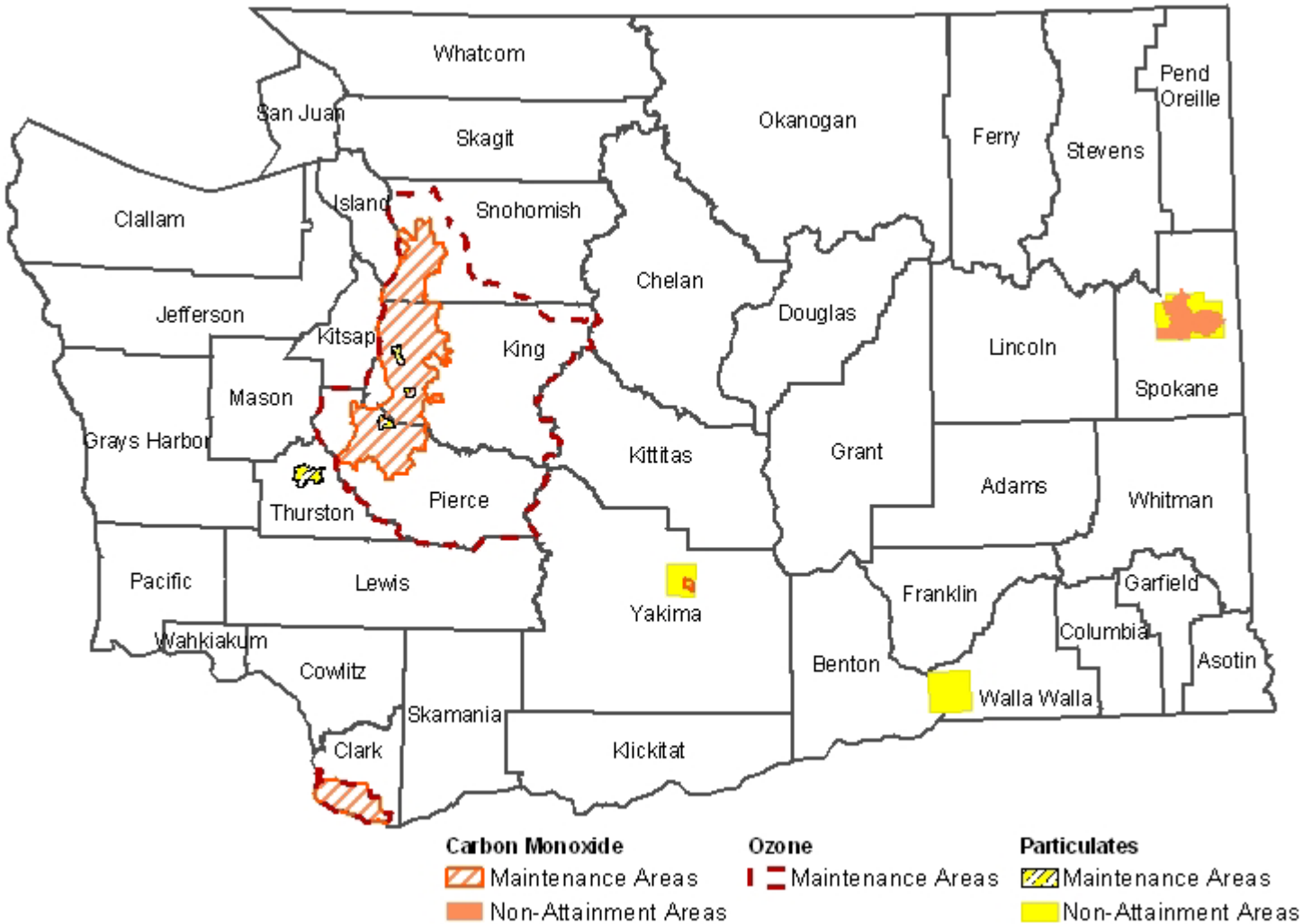
Days With Unhealthy Air Quality in Washington

1985 - 2003



Source: Department of Ecology Air Quality Program

Washington's Non-Attainment and Maintenance Areas



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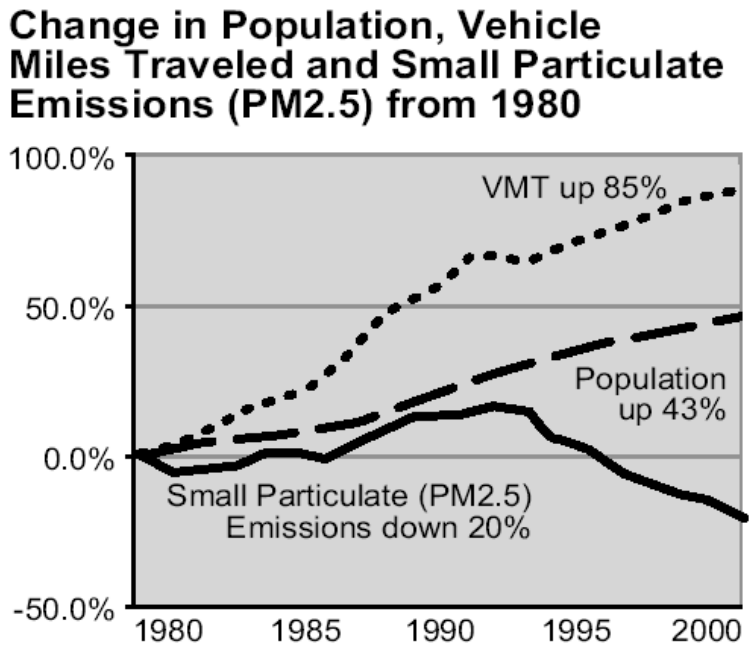
An Emerging Issue: Diesel Exhaust and Inhalable Soot ($PM_{2.5}$)

- Diesel combustion results in very small particulate matter – smaller than 2.5 microns in size.
  - Other sources of $PM_{2.5}$ include agricultural burning, forest fires, construction activities and factory and utility smokestacks.
- Short- and long-term health effects of $PM_{2.5}$ are matters of widespread concern in the public health community.
  - American Lung Association believes that $PM_{2.5}$ is especially harmful to people with heart disease and respiratory problems (especially the young and elderly) and can cause lung cancer.



Diesel Exhaust: What We're Doing Now

- $PM_{2.5}$ has decreased because of federal emission regulation affecting engines and fuels.

- $PM_{2.5}$ will continue to be reduced as new regulatory standards for sulfur levels take effect.

- There are opportunities to do more:
  - Convert diesels used in transportation to low sulfur or ultra low sulfur at an even faster rate than required by regulations.

  - Reduce diesel idling where possible.

  - Technology can be extended; older vehicles could be retired or retrofitted.

Washington State Ferries is switching to low sulfur diesel, which will reduce particulate emissions by 30 percent fleetwide.

Ferries is cutting fuel consumption by revising routes and schedules, and by upgrading to more fuel efficient equipment.

Two new fuels (ultra-low sulfur diesel and biodiesel) will be tested for emission reductions and for performance and engine-wear.

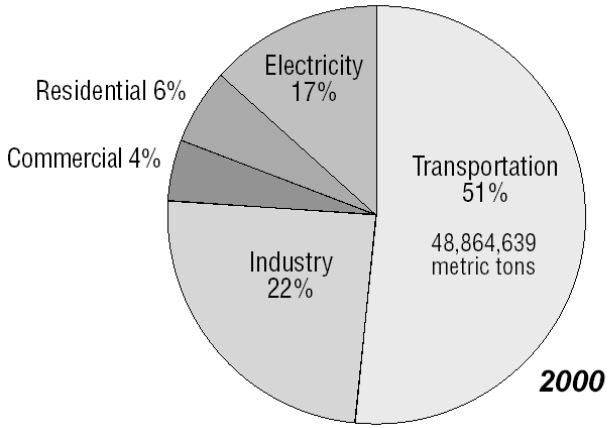
An Emerging Issue: Greenhouse Gases

- There is strong consensus among scientists that
  - The atmosphere is warming: the "greenhouse effect"
  - Human alteration of the atmosphere is contributing to the warming

- A century of sustained increases in carbon dioxide from the operation of internal combustion engines is thought to be a big factor in the greenhouse effect

- **Think globally, act locally**: The citizens of Washington are likely to want action at the state level to address greenhouse gas emissions
  - Governor Locke has been working with the governors of California and Oregon to propose strategies to reduce emissions

Carbon Dioxide ($C0_2$) Emissions in Washington State by Source
Source: Washington State University Energy Program



- There are two ways to reduce transportation's carbon dioxide emissions:
  - Improve vehicle technology
  - Reduce driving

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Others are Taking Action

- One way that other states (such as California) are moving toward these goals is by adopting Low Emission Vehicle programs that target tailpipe emissions for steady declines, and force a higher percentage of advance technology vehicles to be sold in their states. California and the seven states that have adopted California's standards account for nearly 26 percent of the nation's auto market.

- California is now proposing new carbon dioxide pollutant standards for passenger cars and light trucks beginning in 2009
  - Would reduce per vehicle carbon dioxide emissions by 29%
  - Would add $330 in 2009 and $1,210 in 2015 to the price of new vehicle; costs expected to be fully recovered through lower operating expenses for the owner in 1 to 5 years
  - These technologies are available today

The 2004 Ford Focus ZTW Wagon and the 2004 Volkswagen Jetta Sedan GL, two new models that meet California's emissions standards as Partial Zero Emission Vehicles (PZEV).

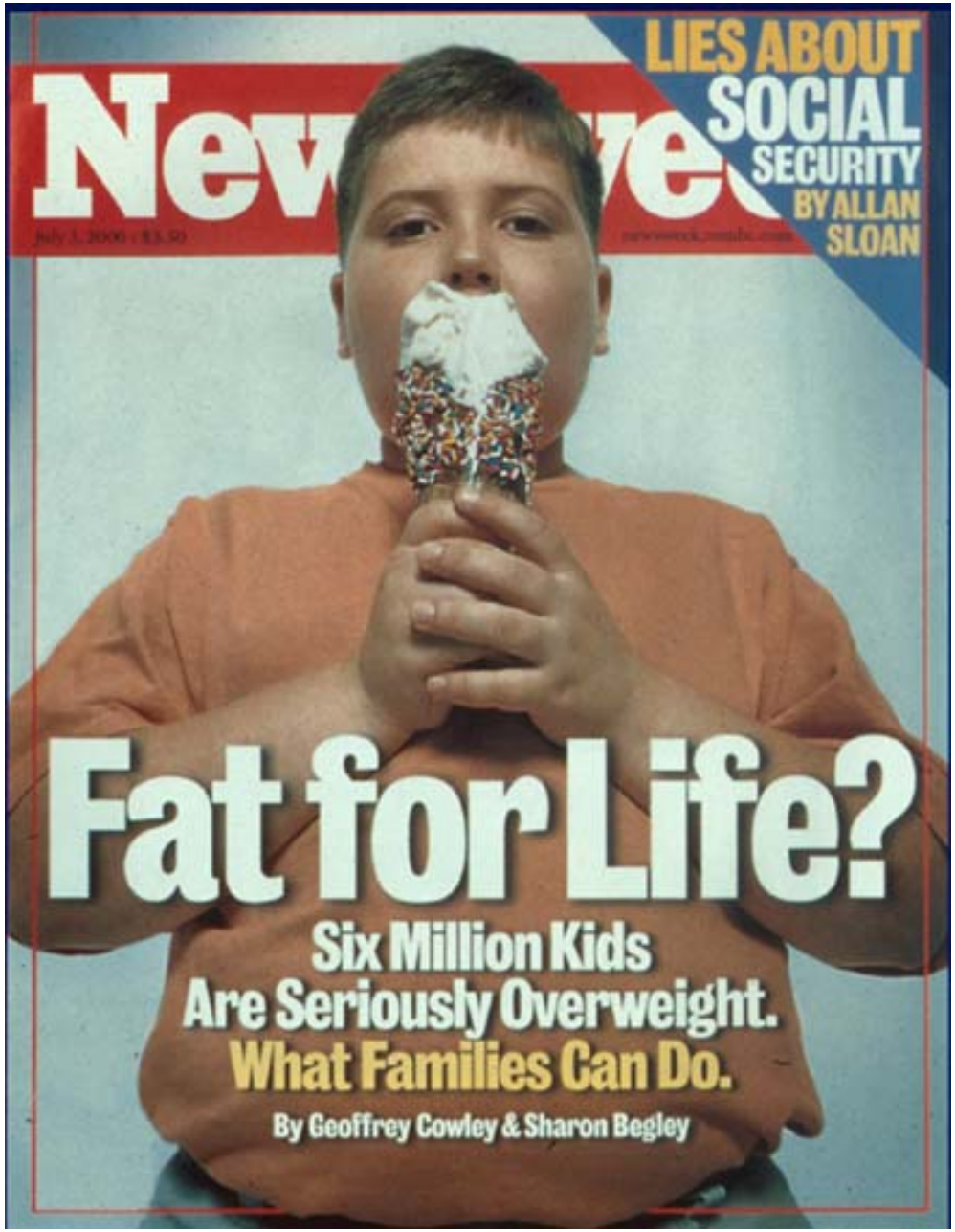
Healthy Communities

The Human Health Connection

Transportation makes a difference…

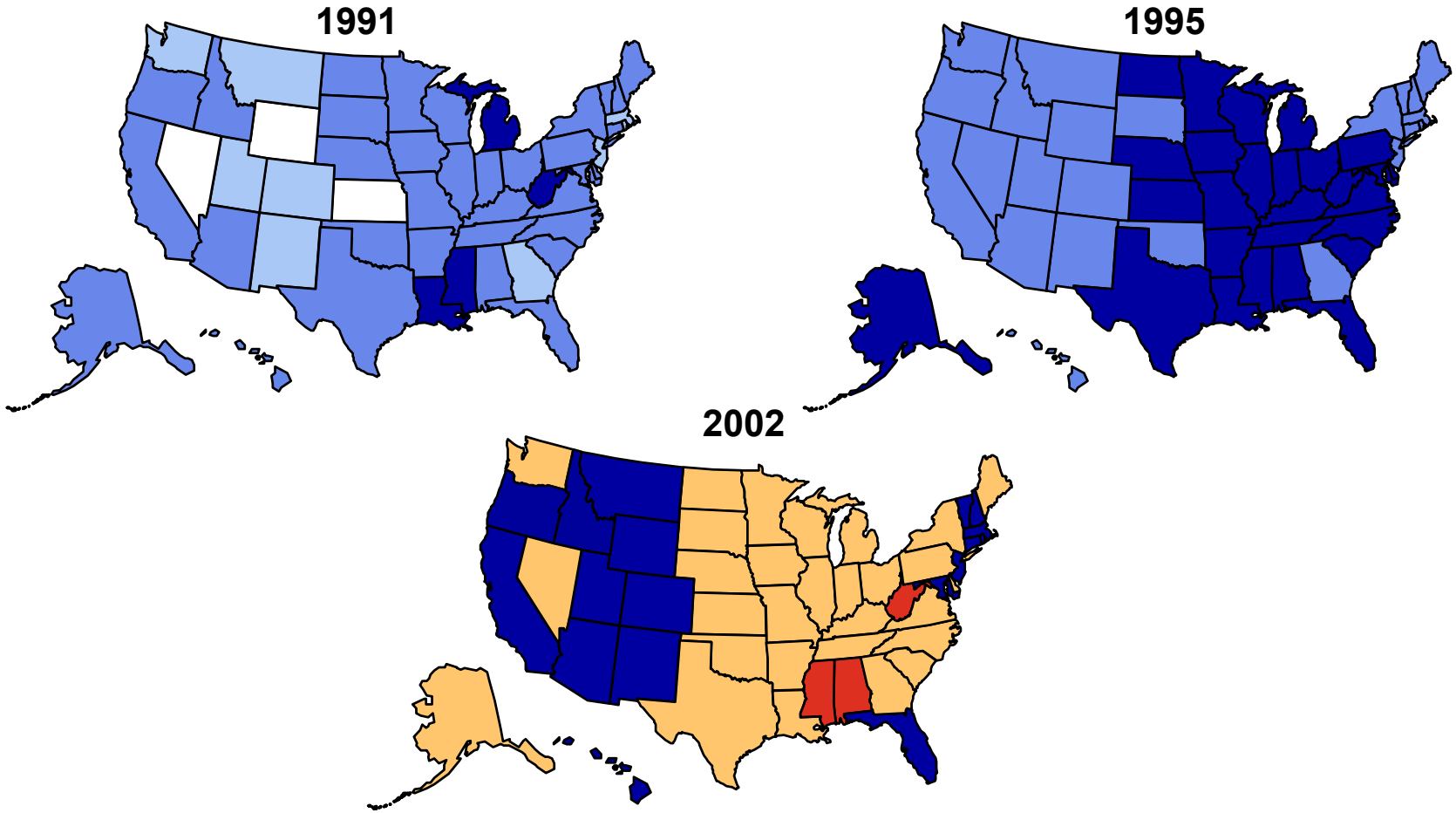
Automobile dependency adversely affects air quality, safety and discourages physical activity.

- One half of all trips people make are less than three miles, but most of these are made by car (FHWA National Personal Transportation Survey).
- Children's walking trips to school have declined by 40% between 1979 and 1999, and children between the ages of 5 and 15 make only 10-12 percent of their school trips by walking or riding their bicycles (Centers for Disease Control 2000).
- Nearly a third of our nation's children and adolescents are overweight or at risk of becoming overweight. This proportion has more than doubled over the past 20 years (Center for Disease Control 2004).


LIES ABOUT
SOCIAL
SECURITY
BY ALLAN
SLOAN
Fat for Life?
Six Million Kids
Are Seriously Overweight.
What Families Can Do.
By Geoffrey Cowley & Sharon Begley

Obesity Trends* Among U.S. Adults, 1991 to 2003

(*Body Mass Index ≥ 30, or ~ 30 lbs overweight for 5' 4" woman)



No Data	<10%	10%–14%	15%–19%	20%–24%	≥25%

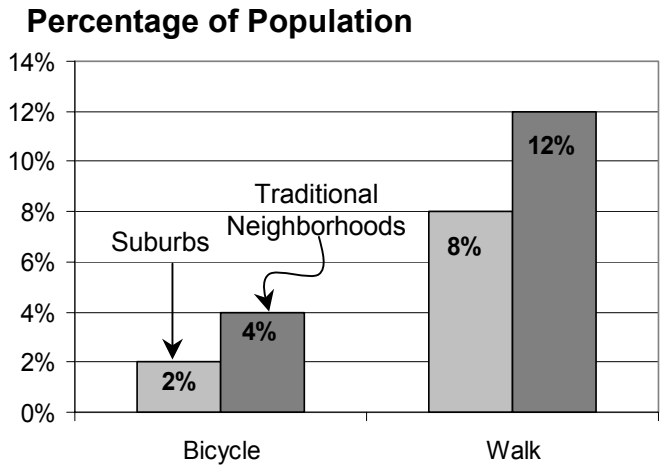
Source: Behavior Risk Factor Surveillance Survey

Active and Livable Communities

Transportation not only determines how we move from place to place, but also the character of our communities.

Walking trips increase with street connections (grid pattern), more intersections and blocks, and lower speeds (Ewing & Cevero, 2001).

People who report having access to sidewalks are 28 percent more likely to be physically active (Am. Journal of Public Health, 2001).



Source: Friedman, Gordon, Peers
Transportation Research Record 1466, 1996

WSDOT Programs Improving Health and Active Living

Making walking and cycling safer and convenient

Safe Routes to Schools

This state-funded grant program provides children a safe, healthy alternative to being driven by parents or riding the bus to school. Eligible projects target:

- Engineering fixes
- Safety education curriculums
- Enforcement programs
- Community health and encouragement initiatives

Active Community Environments

This five year partnership with Departments of Transportation, Health, CTED and RTPOs seeks to incorporate transportation policy and infrastructure changes that improve walking and bicycling safety, and use urban planning approaches related to zoning and land use that promote physical activity with a particular focus on aging populations.

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Water Quality -- Stormwater Runoff

Doing the Right Thing
at a Reasonable Cost

Stormwater Runoff Basics

Excessive runoff from “impervious surfaces”* creates problems for streams, water bodies, and wetlands

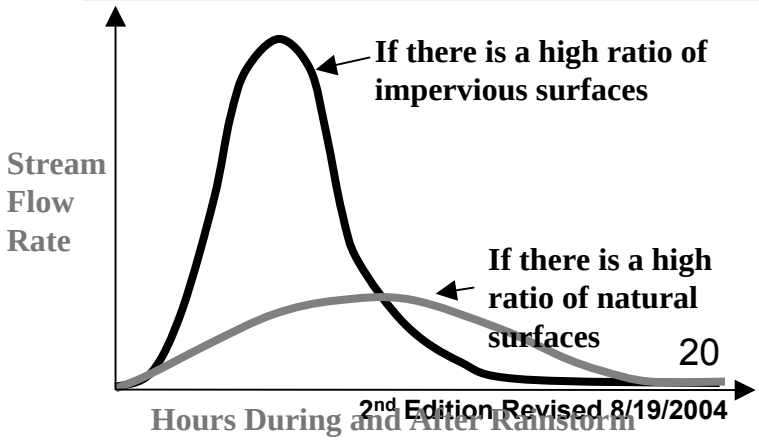
Quality

- Sediments and pollutants (nutrients, oil, grease, metals) carried into the water, and elevated water temperatures

Quantity

- Eroded stream banks, flooding, wetland disturbance, reduced groundwater recharge

Peak flow in a nearby stream after a heavy rainstorm.



* Impervious Surface - a surface area that blocks rainwater’s entry into the soil. For example, roof tops, walkways, patios, driveways, parking lots, and roadways

Where do highways fit into the stormwater *quality* issue?

Highways contribute less to runoff pollution than residential and commercial/industrial sources because highways are a smaller percentage of total impervious surface.

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, Portland OR Metropolitan Area, May 1993

To control runoff pollutants, BMPs for projects can sometimes be simple and cheap

This low cost 50-foot filter strip along Interstate 5 slows and cleanses runoff eventually entering Salmon Creek.

Wetland plants in a 2,000 ft wet pond along SR 3 in Kitsap County absorb nutrients and remove other pollutants.

… or elaborate and expensive

Stormwater Detention Vault, Woodinville, WA installed as part of the I-405 / SR 522 interchange project

- A 90,000 cubic foot, 673,000 gallon detention vault was constructed within a narrow right of way to avoid impacts to the surrounding sensitive area.
- Vault constructed using expensive techniques with soil freezing equipment to minimizing construction impacts and protect groundwater.

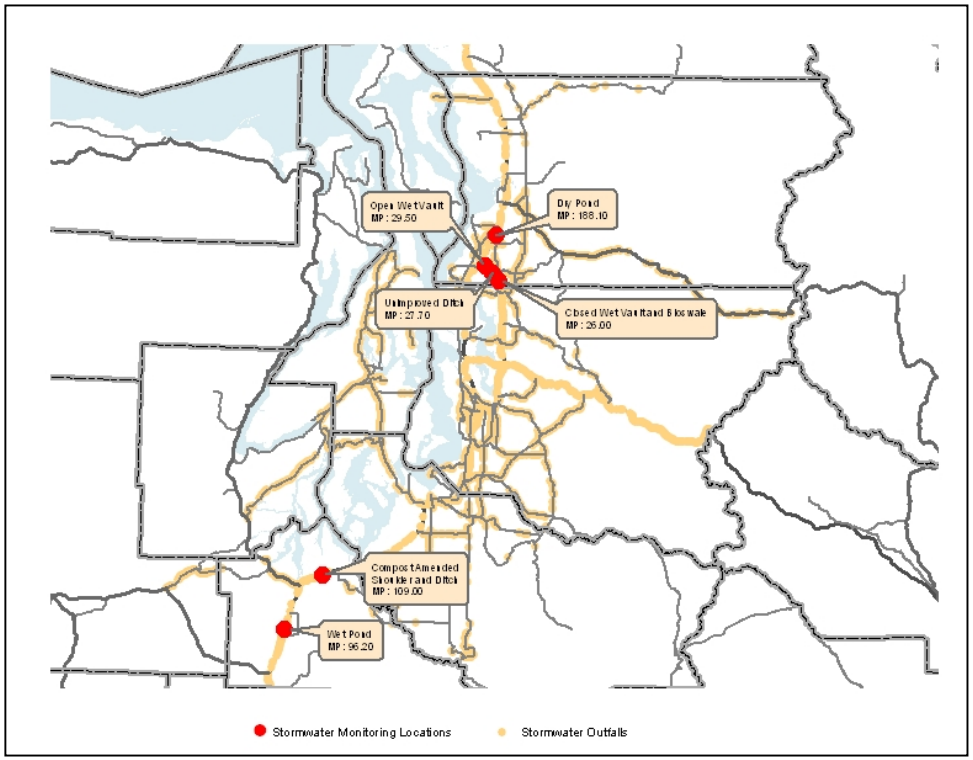
Overview of jobsite

Excavated hole with frozen soil in background

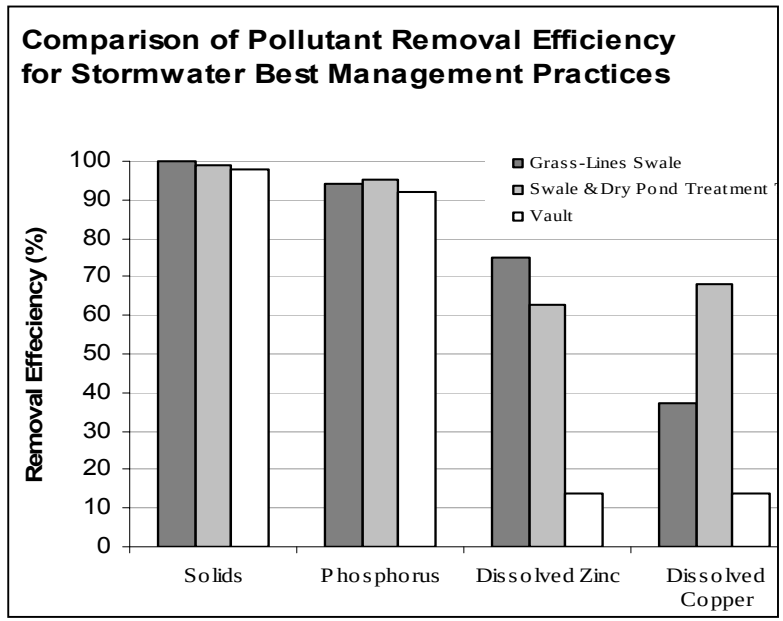
Nearly completed vault and frozen soil shoring covered with insulation

Cost of facility: $460,000

WSDOT evaluates the effectiveness of required stormwater treatment facilities



2004 Stormwater Monitoring Locations in the Central Puget Sound

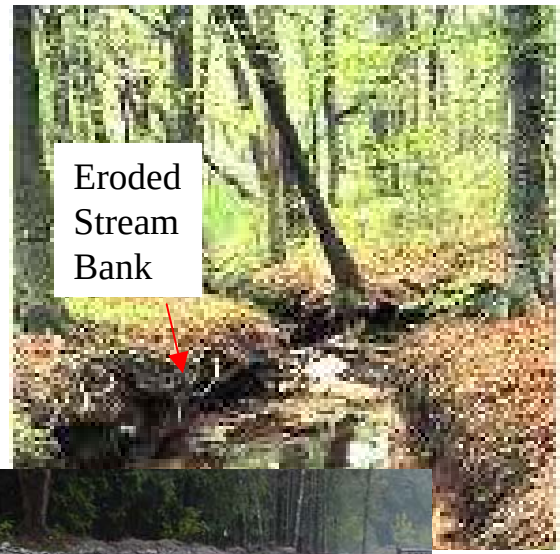


Comparison of treatment efficiencies monitored in 2003-2004

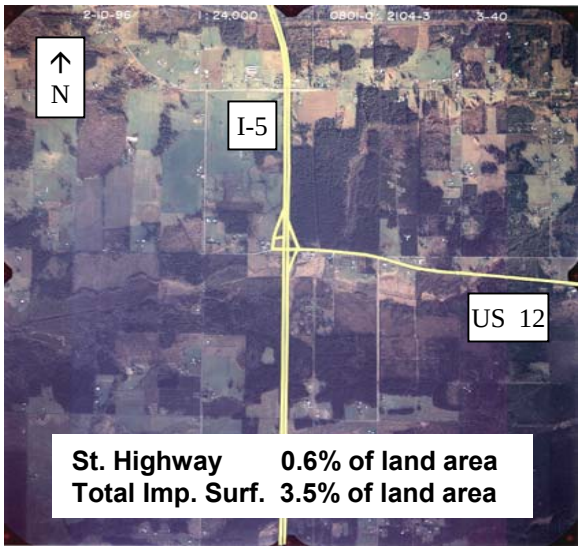
Everyone agrees runoff quantity issues are important

Stormwater can cause serious damage to habitat, property and transportation infrastructure. High flows can:

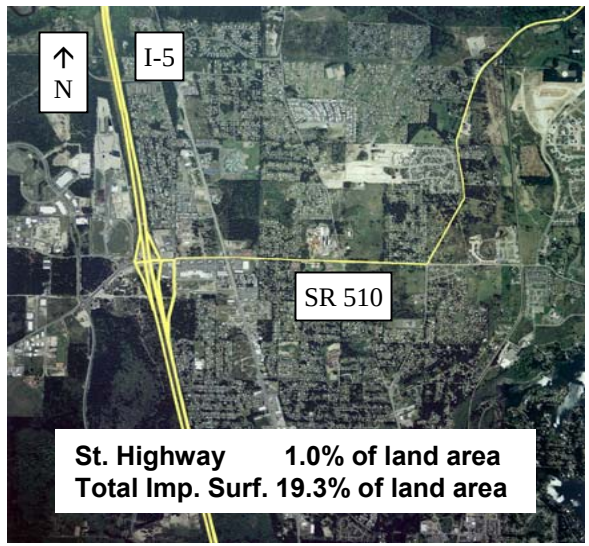
- Cause flooding and erosion that disrupts the movement of people and goods and damages transportation infrastructure
- Cause damage to private and public property by flooding and erosion
- Accelerate erosion and scour away habitat
- Reshape channels and affect side channel habitat
- Increase sedimentation and raise water temperatures causing salmon habitat stress
- Lead to *lower* dry weather flows and elevated stream temperatures, causing more habitat stress



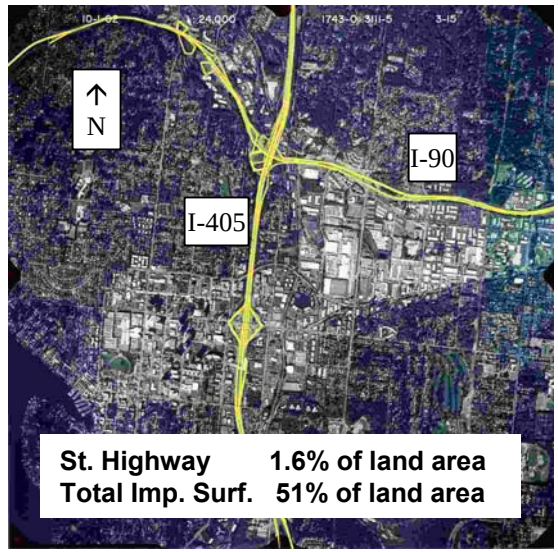
Where do highways fit into the runoff *quantity* issue?



Rural
Lewis County



Suburban
Lacey



Urban
Bellevue/ Factoria/ Newcastle

Depending on locations and surroundings, highway runoff to waterbodies varies widely in volume and as a proportion of the total runoff problem.

BMPs to control runoff quantity can range from simple and cheap ….

This infiltration pond installed along SR 512 in Pierce County captures water and stores it. Water either evaporates or infiltrates to recharge the groundwater. No discharge to surrounding waterbodies occurs.

… to big and expensive

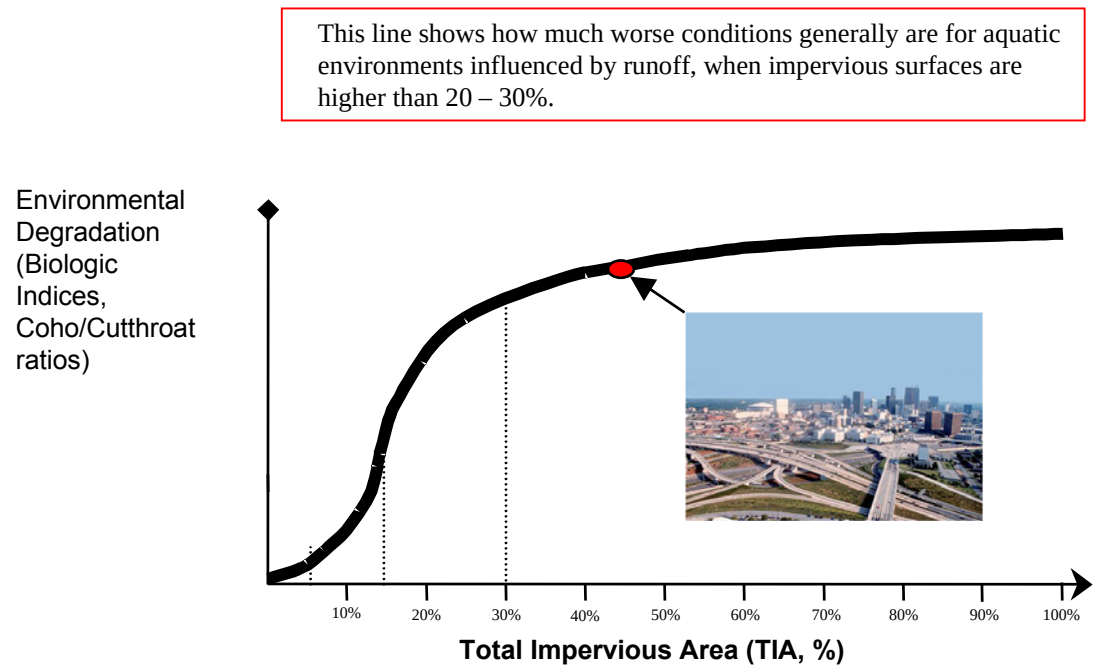
This one acre runoff detention facility built in 2002 on SR 18 holds the expected runoff calculated by a new model. Runoff is allowed to drain into Taylor Creek at a maximum release rate of only 10 gallons per hour. Meanwhile, plants also help filter out pollutants.

Ponds hold water and release it slowly

In urban settings even the highest level of runoff controls may deliver little or only marginal benefits to nearby streams or wetlands or their habitat

Waterbodies in areas with large amounts of impervious surfaces are often already highly degraded.

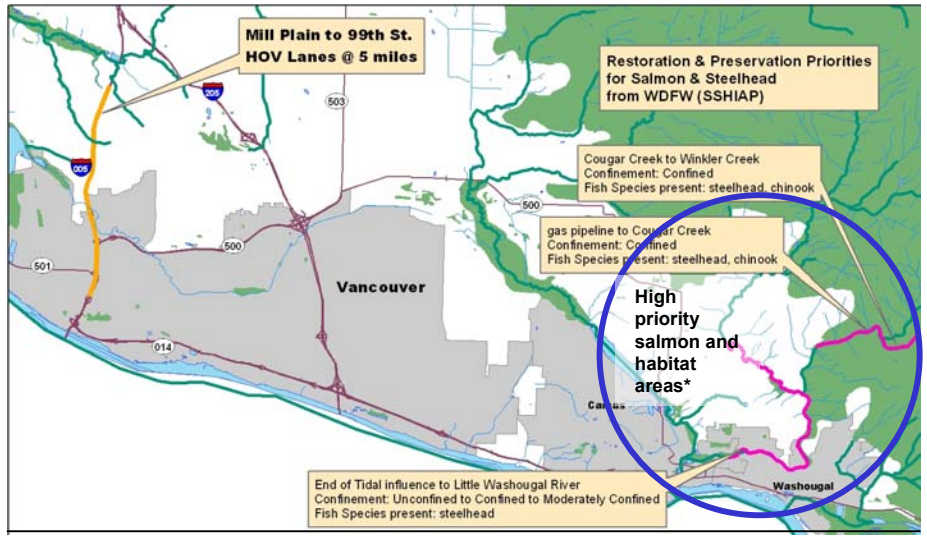
Runoff from non - highway sources, such as residential and industrial commercial, may overwhelm any gain from highway runoff BMPs.



Adapted from the work of Booth and Jackson (10/97); May, Welch, Horner, Karr, & Mar (6/97)

In some watersheds, dollars can be better spent to deliver large benefits to water quality protection, habitat conservation and enhancement

Water quality goals can be better met in some watersheds by investing in water quality protections away from the highway, compared to localized runoff controls by the highway.

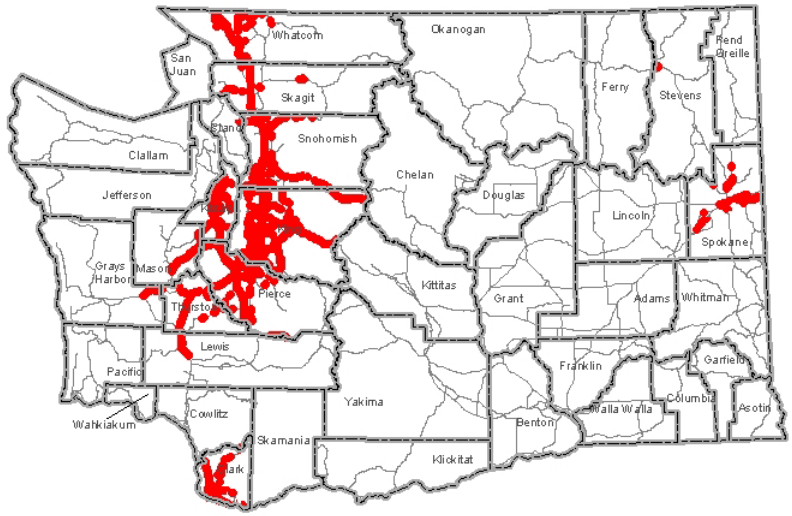


Fish and Wildlife would like to see projects like these five miles from where the I-5 Mill Plain to 99th St HOV project will add one lane in each direction of I-5.

We must also examine existing stormwater management facilities

- Most of WSDOT's outfalls were built prior to stormwater regulations and have no treatment facilities
- There is an incomplete inventory of stormwater facilities – to date, only 4,000 of WSDOT's estimated 18,000 to 24,000 outfalls have been inventoried
- The highway construction program corrects stormwater deficiencies only for active projects
- The stormwater retrofit program fixes some of the highest priority stormwater deficiencies, however the program remains largely unfunded

Highways with Inventoried Stormwater Facilities



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WSDOT is taking steps to ensure that stormwater investments do more and cost less

- In collaboration with the Department of Ecology, WSDOT revised its Highway Runoff Manual. This manual guides how the department manages runoff from highways. Among several improvements, this revised manual incorporates current science and encourages applying newer management techniques.

- We are now working with Ecology on acceptable approaches to managing stormwater more broadly within a watershed, as opposed to immediately next to the project area, when we expect this approach to yield better environmental results

- We are also working with Ecology on a revised stormwater permit

WSDOT's revised stormwater permit will address difficult issues

- What quantity of flow needs to be managed from roadways and other developed areas (e.g., flows based on existing site conditions, flows based on forested or predevelopment site conditions)?
- How much should WSDOT invest in correcting problems from existing roadways and other developed areas?
- How much should WSDOT invest in maintaining stormwater facilities?

Protecting and Connecting Habitat

Roads Affect Fish, Wildlife, and Habitats

- Washington State has a wide diversity of habitats that support more than 650 native fish and wildlife species. This is significant natural biodiversity that is highly valued by the citizens of the state.

- For some time, scientists have recognized what can happen:
  - Direct loss of habitat
  - Collisions with vehicles
  - Fish barriers

- More recently, we have begun to understand how roads:
  - Affect the movement of wildlife across landscapes
  - Affect the quality of remaining habitat

Considering Fish and Wildlife in Our Activities

- As part of our transportation activities, WSDOT identifies where impacts to fish, wildlife and habitat are occurring and works to reduce these effects. Designs for new transportation facilities are developed to avoid and minimize effects to important habitats wherever possible

- In many parts of the State, highways have been constructed through or near high quality habitat

- In some cases, roadsides support very rare plants, such as this showy stickseed, which occurs in only a few places in the world

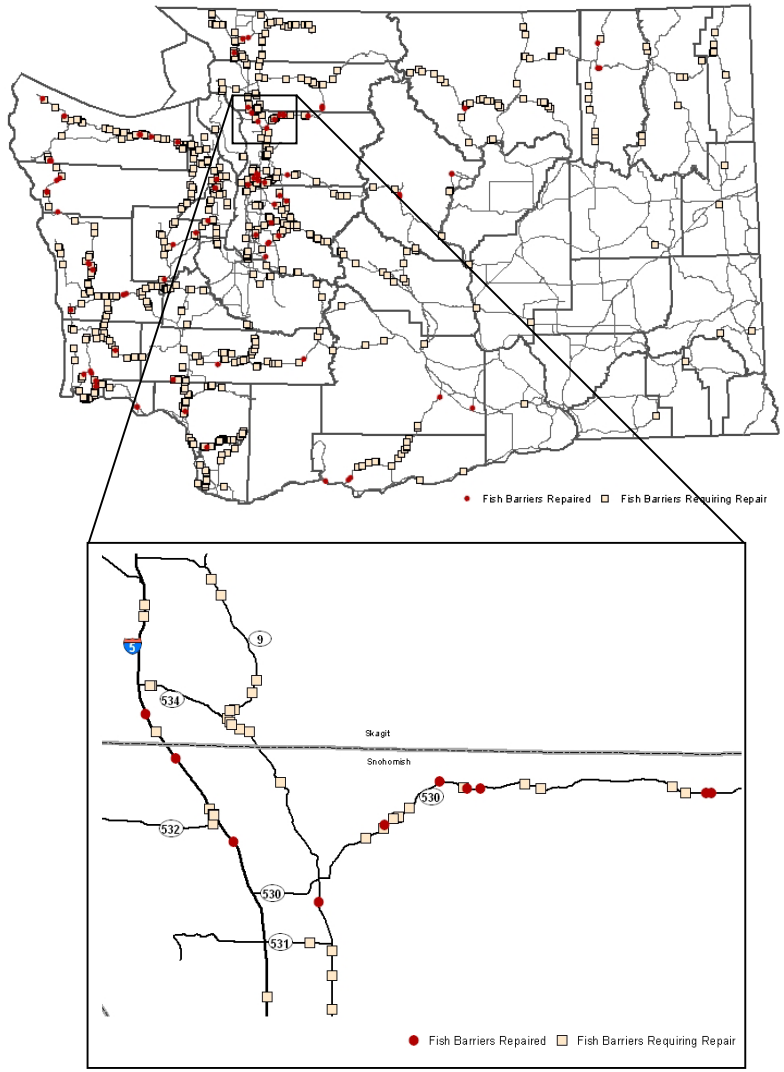
- Stream crossings are sensitive places for many species

Assessing the Extent of Fish Passage Barriers

- For many years, WSDOT has been actively identifying fish passage barriers at road crossings and restoring the connectivity of aquatic systems by correcting these blockages.

- In cooperation with the Washington State Department of Fish and Wildlife, WSDOT is conducting a statewide inventory of fish barrier locations.

- Data on habitat quality upstream of the barriers is collected to help prioritize corrections for where the most habitat can be reclaimed.



Removing Barriers to Fish Passage

- WSDOT corrects fish passage barriers using a three-pronged approach
  - Dedicated funding to correct highest priority barriers
  - As road projects are constructed, whenever a Hydraulic Project Approval (HPA) is required
  - As part of routine maintenance of failing culverts

- Corrections are designed to meet the needs of returning adult salmon as well as the movement of juvenile salmon which can remain in freshwater systems for up to 2 years before migrating out to sea.

Moose Creek

Before Construction

Figure 17. Two round, corrugated steel culverts located on SR 530 at milepost 44.0 were considered barriers due to a slope of 1.7%. The culverts blocked access to 4,151 meters of coho salmon and steelhead trout habitat.

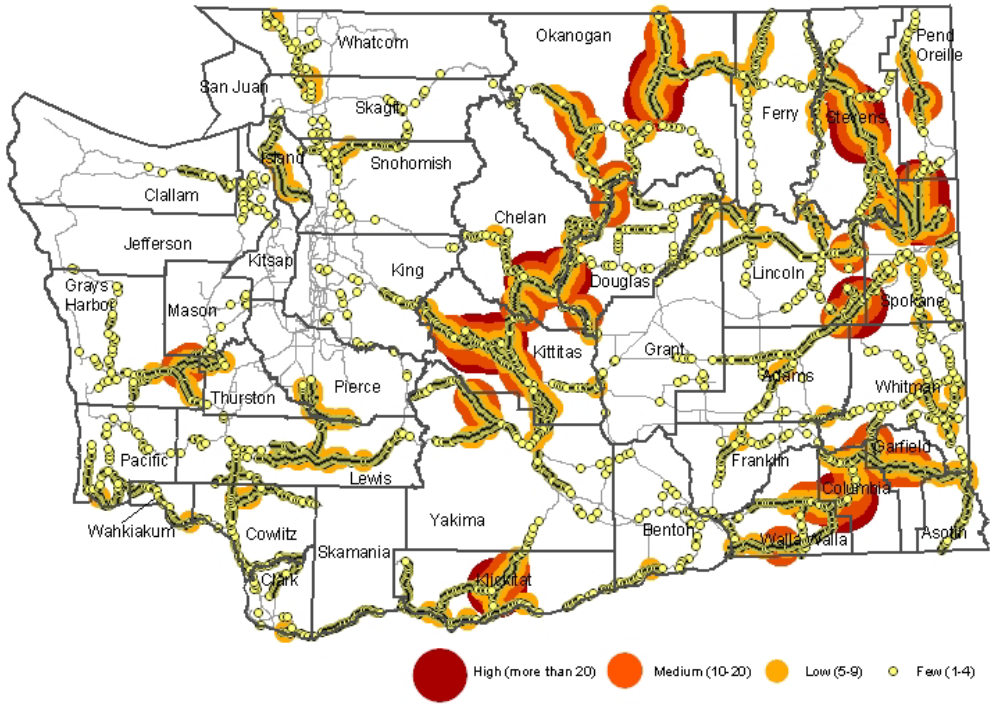
After Construction

Figure 18. A large bottomless arch culvert replaced two round steel culverts. The streambed of the new culvert resembles the natural stream substrate providing fish passage at all flow conditions. A single downstream log control maintains a stable stream gradient throughout the crossing. The new culvert was constructed in 2002.

Highway Collisions Affect People and Animals

- Animal-vehicle collisions are a serious issue for human safety as well as for natural resource protection
- WSDOT maintenance crews record about 3,000 deer and elk killed on highways annually
- From 1999 to 2002, there was an average of 1,200 reported accidents:
  - Average of 134 people injured and one fatality each year

Deer Removal, 1998 to 2003



Reducing Animal Collisions and Improving Habitat Connections

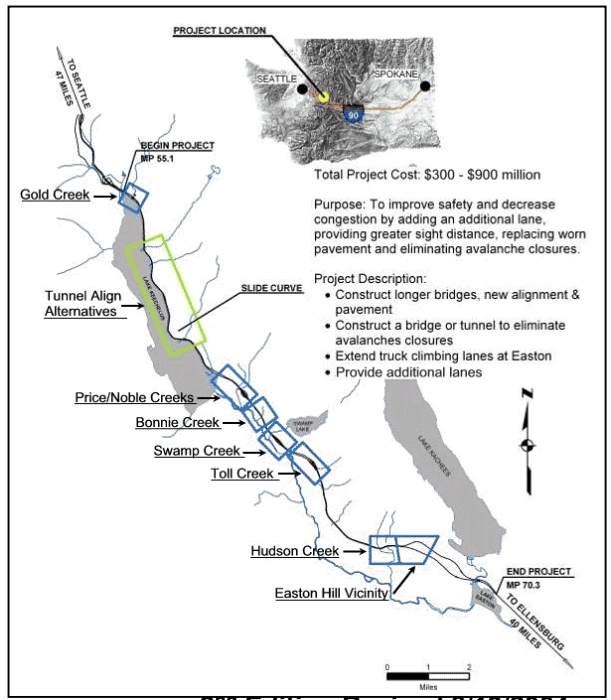
- Special signage including motion-activated and radio collar-activated signs are being tested to warn drivers of wildlife ahead (Sequim).

- Standard animal crossing signs and fences are also used across the state.

- A more comprehensive approach is to incorporate widened bridges, larger culverts, and crossing structures designed specifically for wildlife.
  - This example is on I-90 near North Bend.

Improving Connections at the Project Scale

- WSDOT is currently working to address the need for connections in construction and design of several projects:
  - On SR 240 near the Tri-Cities, additional bridges allow for high water flows as well as wildlife movement in a wildlife refuge
  - Proposed designs for the I-90 Hyak to Easton Project will include several options for improving connections
  - Planning for the Cross Base Highway has involved extensive work to develop measures for reducing fragmentation effects on rare Oak woodlands and prairie habitats

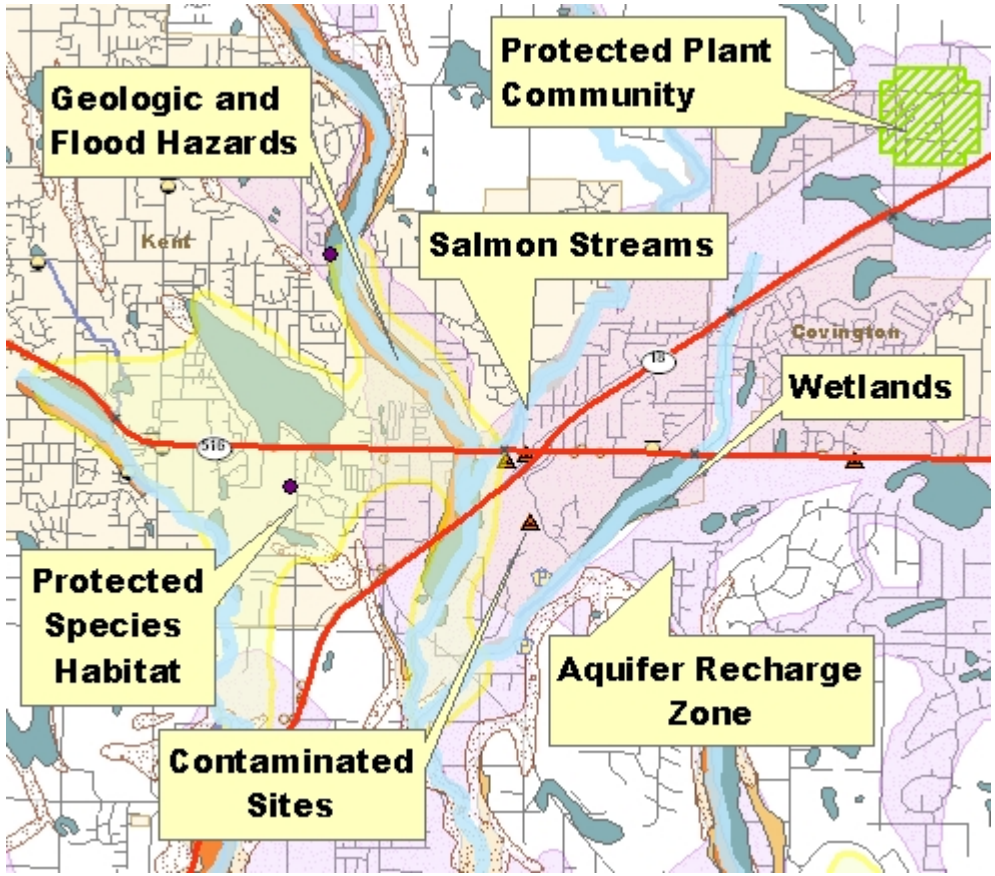


Habitat Data for Transportation Planning

How to better integrate habitat planning with transportation planning is a key challenge as we update the WTP.

- The long-term protection of viable habitats can't be accomplished by WSDOT alone; coordination and partnerships are needed, as are planning and data. There are a number of sources of maps, data, and other information that can help – but there is currently no single plan for habitat connectivity for the state.

- The new Governor's Biodiversity Council may be a forum to help build a statewide plan.



Protecting Wetlands, Estuaries, and Nearshore Marine Habitats

Protecting Wetlands

- Wetland impacts can be avoided or minimized by:
  - Alignment selection
  - Widened bridge structure
  - Retaining walls to limit fill slopes

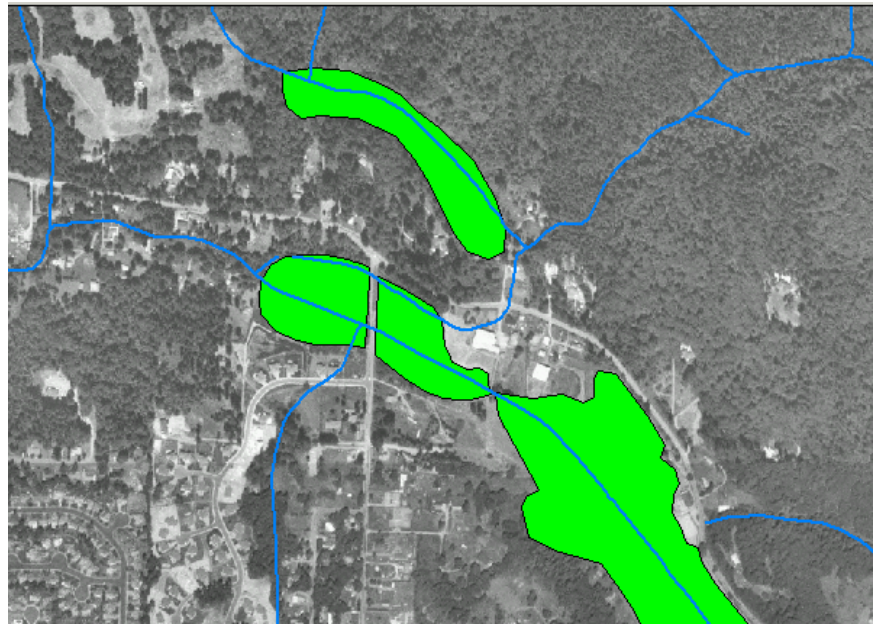
- To compensate for unavoidable wetland impacts WSDOT has developed 116 mitigation sites, totaling 675 acres.

Using Watershed-Based Tools to Improve Environmental Mitigation

- Even with stringent measures to avoid and minimize effects, not all impacts can be avoided.

- Watershed characterization helps find site locations and mitigation objectives that provide the greatest ecological benefit, including
  - Wetland restoration
  - Stormwater treatment
  - Flood protection
  - Groundwater recharge

- By characterizing overall watershed health, mitigation investments can target those areas that most need restoration.



Watershed characterization includes development of a Potential Wetland Restoration Site Database to assess potential mitigation needs.

Protecting Estuaries and Nearshore Marine Habitats

- WSDOT addresses the environmental effects of our projects on marine habitats as well.
  - Replanting of eelgrass habitats
  - Restoration projects on estuaries such as Schel-Chelb on Bainbridge Island
  - Investing in bathymetric surveys for better planning data

Batelle Marine Sciences Laboratory staff harvest eelgrass for replanting underneath the Clinton ferry dock.

The Clinton Terminal at the completion of Phase I in 2000. At that time, a total of 14,230 square feet of eelgrass had been successfully transplanted around the Clinton ferry dock.

Other Health and Environment Issues:

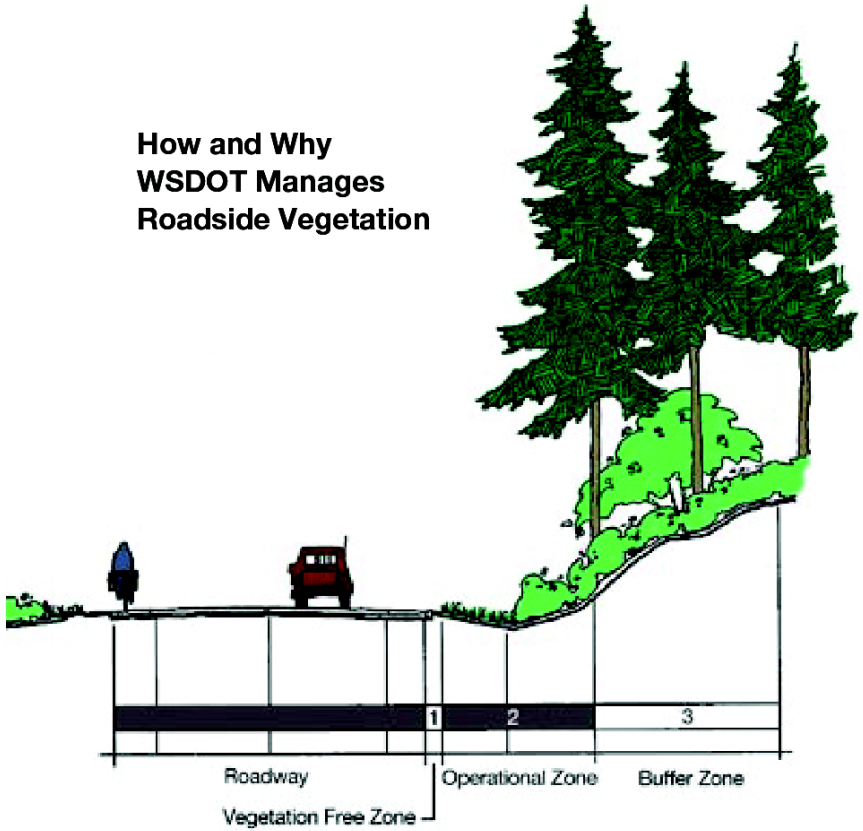
- **Operations and Maintenance Activities**
- **Noise**
- **Sprawl**

Maintaining Roadside Vegetation

- WSDOT manages 75,000 acres of roadside to meet many operational, safety, environmental, and aesthetic objectives.

- **Integrated Vegetation Management:** Using the right tool for the right plant at the right time and place
  - Mowing and trimming
  - Weeding
  - Planting desirable native vegetation
  - Releasing weed-eating insects
  - Selectively applying herbicides

- WSDOT is implementing regional IVM plans and will continue to monitor herbicide use trends



Vegetation Free Zone
Gravel Shoulder
Maintained using machines and chemicals to improve drainage and protect pavement.

Operational Zone
Low Vegetation
Maintained using a variety of methods for sight distance, safety, and weed control.

Buffer Zone
Native/Natural Vegetation
Maintained using integrated vegetation management to encourage native self-sustaining plant communities.

Other Environmental Issues Associated with Operations and Maintenance

- Hazardous Materials cleanup, spill kits, tank decommissioning

- Regional Road Maintenance Endangered Species Act Program Guidelines
  - Product of a lengthy collaboration between local government agencies, WSDOT, the National Marine Fisheries Service, and others

  - Provide a set of road maintenance policies and practices to conserve ESA-listed species and meet critical roadway safety and maintenance needs

  - 10 program elements include best management practices and an in-depth workforce training program

- Environmental Management System
  - Will integrate environmental activities into everyday operations, training programs, and regular performance reports

  - Written procedures, training, record keeping, auditing

Highway Noise

Reducing Highway Noise

- Level of highway traffic noise depends on multiple factors
  - Volume, speed, and the mix of trucks, motorcycles and other vehicles in the flow of traffic
  - Pavement age and type
  - Tire configuration
  - Distance, terrain, vegetation, and objects between listener and highway
  - Weather
- Three strategies to lessen highway noise
  - Motor vehicle control: regulations and local ordinances to make vehicles quieter
  - Land use control: require reasonable distances between buildings and roads
  - Highway planning and design: noise studies and consideration of measures to minimize adverse noise impacts
- Noise reduction options
  - The outdoor environment – 1st priority: construct barriers, create buffer zones at least 100 feet wide with thick vegetation, manage traffic (reduce speed, reduce trucks), move the road away from listeners. Outdoor noise reduction allow full use of environment.
  - Interior noise for public buildings (schools, hospitals, libraries): noise insulation in walls and ceilings, window replacement, weatherproof/seal openings (cracks), installation of central air conditioning to keep windows closed.

Reducing Highway Noise: Where are We?

- Noise studies are considered for every project that adds through-lanes, significantly realigns roadways or changes ground contours that audibly increase traffic noise
  - Noise mitigation that is meaningful and cost effective is considered for outdoor noise impacts (66+ decibels or +10 decibel increase) on locations like homes, schools, churches, day cares and hospitals (e.g., walls, earth berms)

- From 1963 to 2000, WSDOT built approximately 65 miles of noise barriers throughout the state
  - Noise barriers have generally halved residents' perception of traffic noise
  - Current noise wall construction averages $32 per square foot; a 9-foot high wall costs about 1 ½ million dollars per mile. One mile of the average 14-foot high wall (to protect against truck exhaust noise) would cost $2.4 million. Retrofit walls in urban settings may be as much as $100 to $200 per square foot.

- WSDOT is prepared to retrofit existing highways with noise barriers where homes existed before May 1976
  - Before 1976, noise was not accounted for on highway projects
  - Seventy locations are currently on the retrofit priority list, subject to funding
  - Highest priority areas are addressed first (priority is based on location with the most number of homes at highest noise levels, for reasonable cost)

Sprawl and Growth Management

Sprawl and Growth Management

- The Growth Management Act lays out an anti-sprawl goal for the state:

  "Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development." RCW 36.70A.020

- Transportation expansion projects are often discussed and debated in connection with sprawl impacts: federal environmental review laws require that the secondary and cumulative impacts, including development impacts, must be addressed for each transportation project.

Two viewpoints on transportation and sprawl: a double-edged sword

- Inappropriate or poorly designed transportation facilities outside of the urban growth boundary can influence growth in these areas, and can be said by some to promote “sprawl”

- On the other hand, failure to build adequate transportation capacity inside the urban growth boundaries makes those areas less attractive for growth: congestion can undermine a growth management goal of encouraging businesses and residents to locate in targeted urban areas and may lead to more pressure outside of urban boundaries

Cumulative effects of transportation projects

- Sprawl is an issue that emerges often in the environmental review of transportation projects – especially proposals to add highway lanes

- Project-specific questions don't work – we need to find a better way to look at our system improvements in context with all other "reasonably foreseeable future projects"

- We will be looking at this issue in the WTP update

Photo by E. Lanzer

As we move ahead…

The 2005 WTP Update will explore opportunities to align citizens' goals for healthy communities and the environment with transportation. These may include:

1. Meeting environmental priorities:
   - Help shape the state's response to calls for reductions in greenhouse gas emissions
   - Invest in watershed-based tools to better address stormwater and wetlands needs
   - Actively address habitat connections across transportation corridors

2. Defining an appropriate transportation role in the area of active living

3. Recommending a systems approach for addressing cumulative effects of transportation projects and induced growth issues