



Green/Duwamish Watershed Advisory Group (WAG) Air Quality Overview



WAG Meeting
January 21, 2016



- Air pollution and public health context
- Home to “highly impacted” communities
- Exposure to harmful air pollutants
 - Fine particle pollution*
 - Diesel pollution
 - Summertime ozone*
- Exposure to industrial sources
- Climate Change

**pollutant has National Ambient Air Quality Standard*



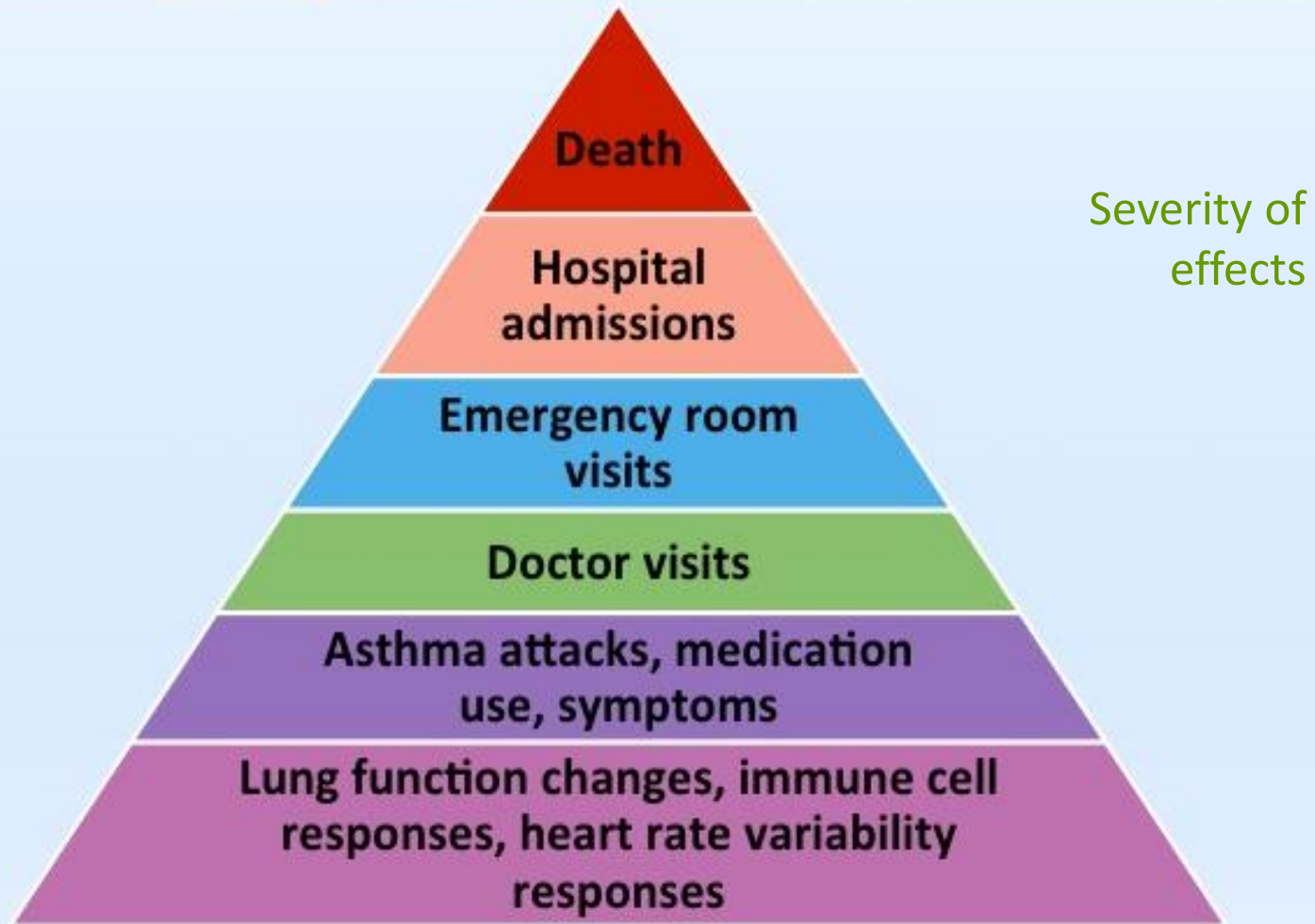
“Clean healthy air for everyone, everywhere, all the time.”



***Fine particle pollution
responsible for
~ 2x as many deaths as motor
vehicle accidents.***

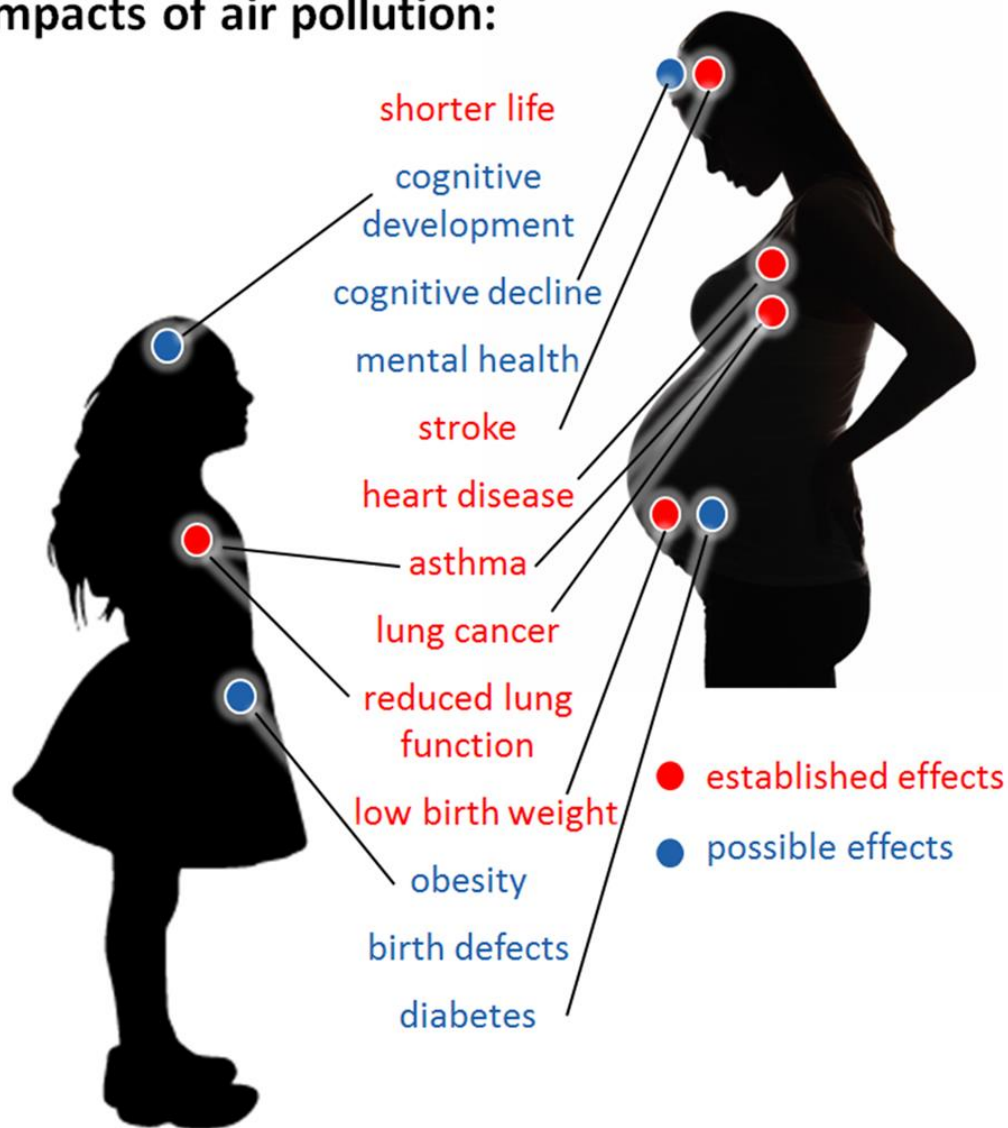
- Cancer
- Heart disease
- Respiratory Disease
- Cerebrovascular Diseases
(stroke)
- *Pneumonia*
- *Diabetes*
- *Alzheimer's*
- *Liver Diseases*
- *Accidents*
- *Suicide*

PM_{2.5} pyramid of health effects



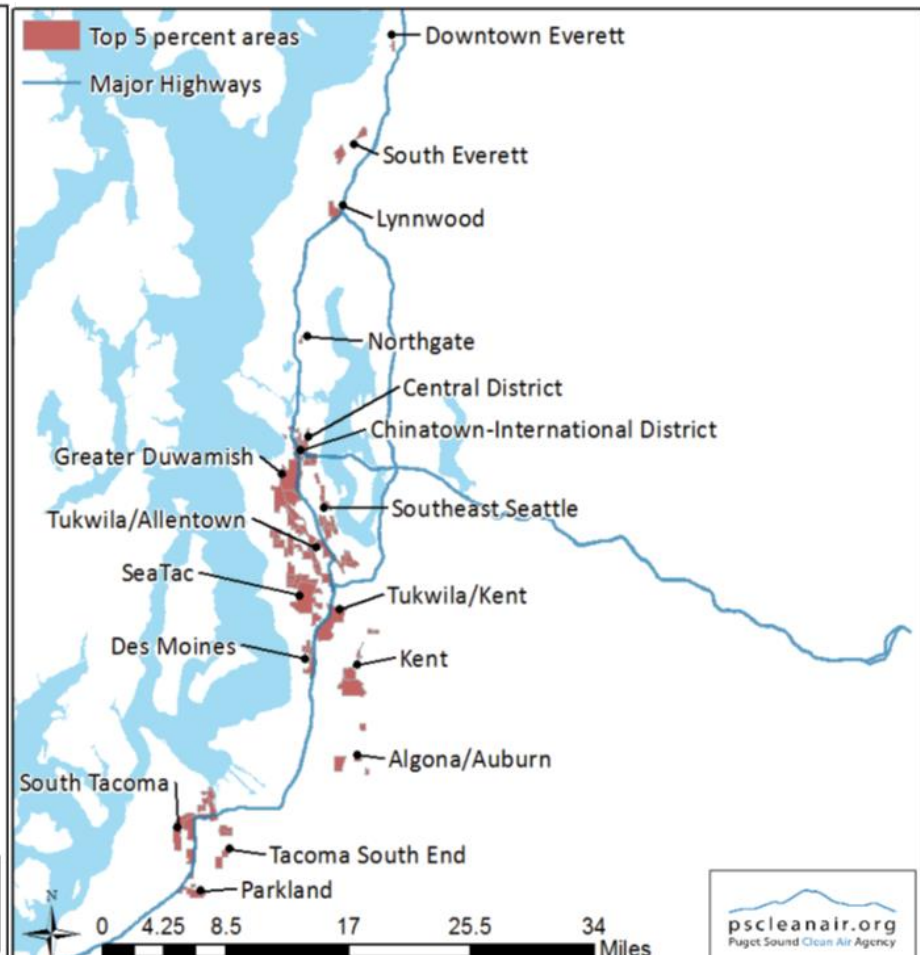
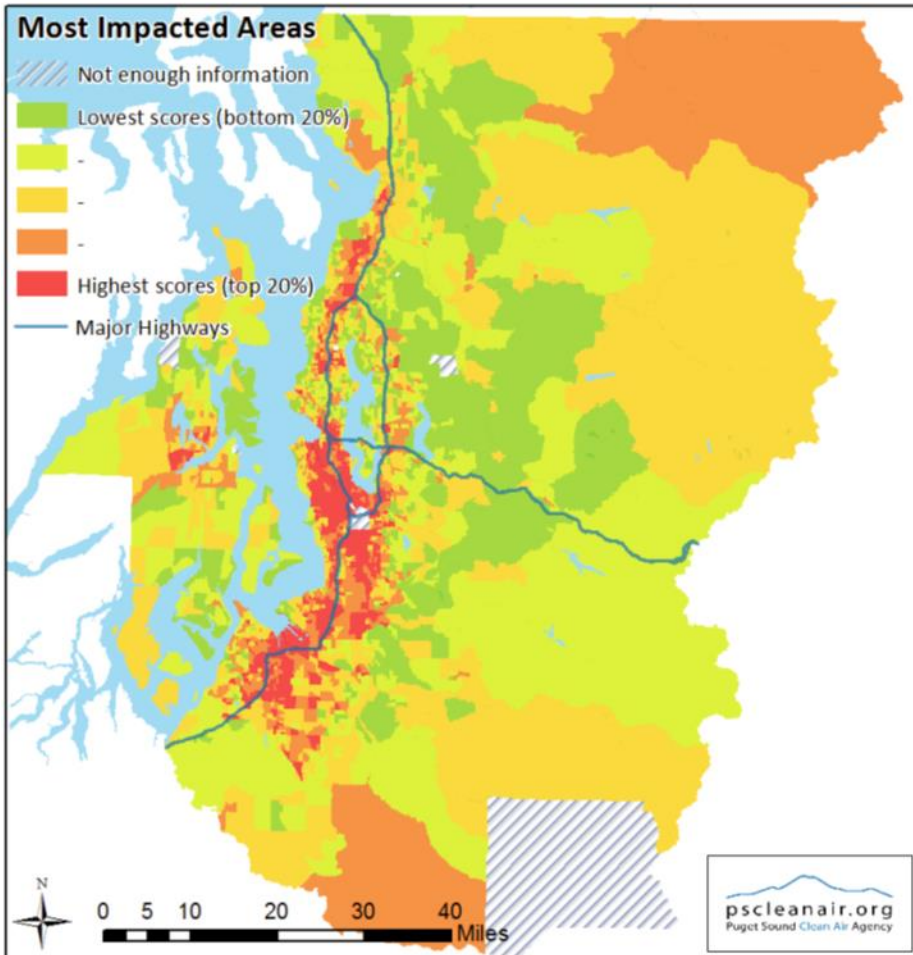
Magnitude/Proportion of population effected

Health impacts of air pollution:





Vision: All the people and natural systems in our region benefit from clean and healthy air all the time, regardless of socio-economic status or geographic location.



- Diesel pollution (onroad and nonroad)
- Industrial density – large and small air pollution sources
- Primary wood burning households
- Household income
- Race
- Limited English proficiency
- Health sensitivity – i.e. individuals who suffer from asthma, chronic pulmonary obstructive disease (COPD), or cardiac illness

Air Pollution in the Green-Duwamish Watershed

Downtown Seattle

Bellevue

Tacoma



Green-Duwamish Watershed

Freeways

Major Roads

Other Main Roads

Areas of wood burning

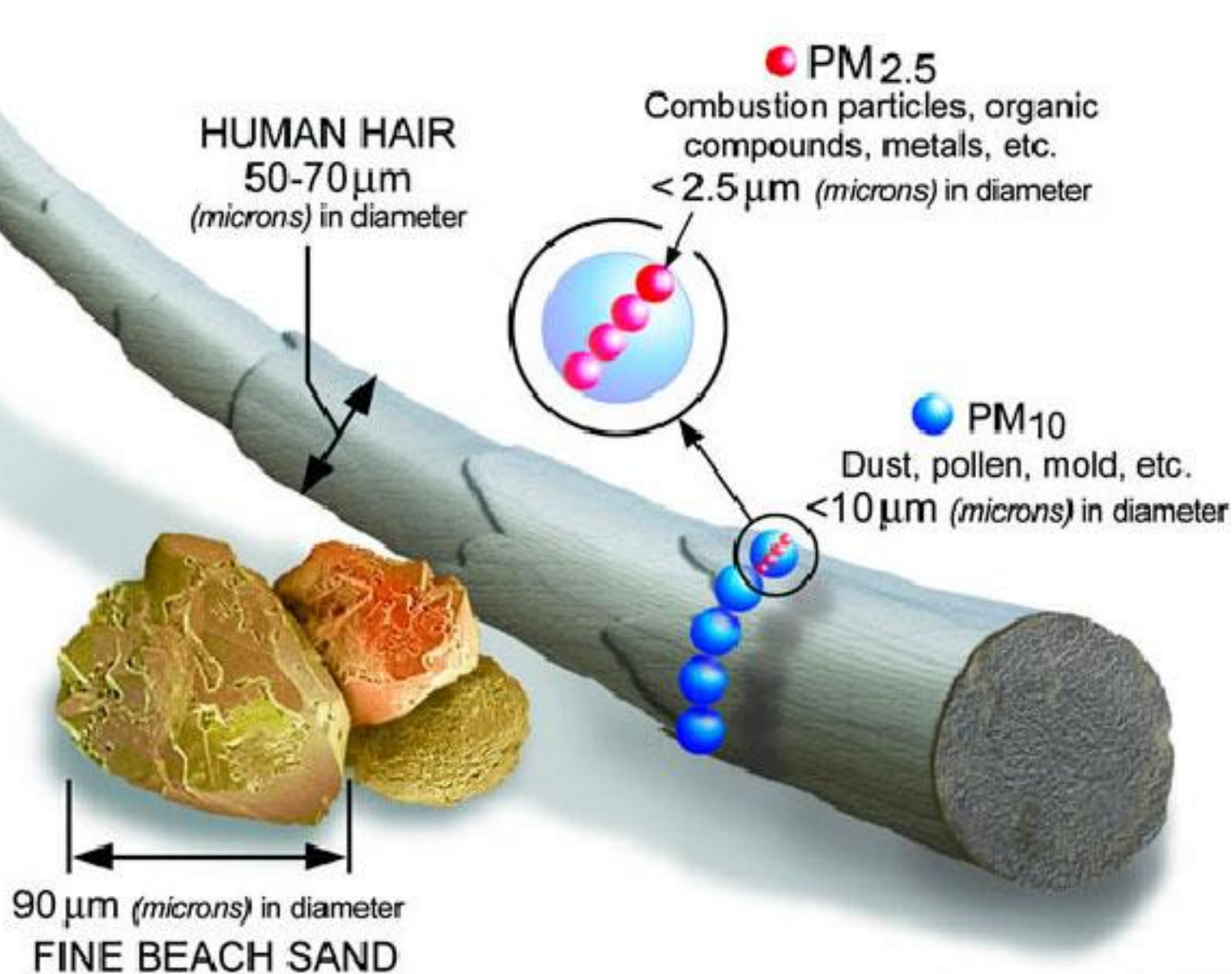
Ozone impacted regions

Diesel Particle Concentrations over 2 ug/m³

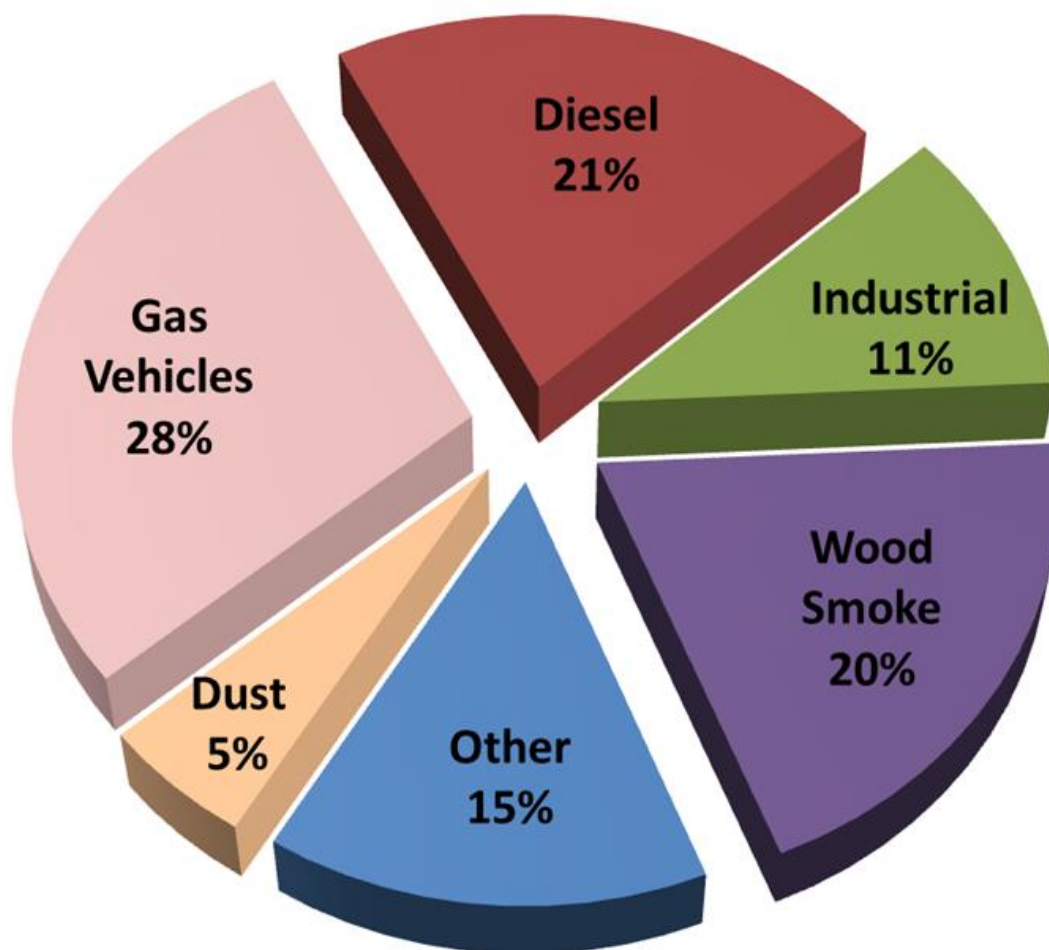
High Industrial Source Density

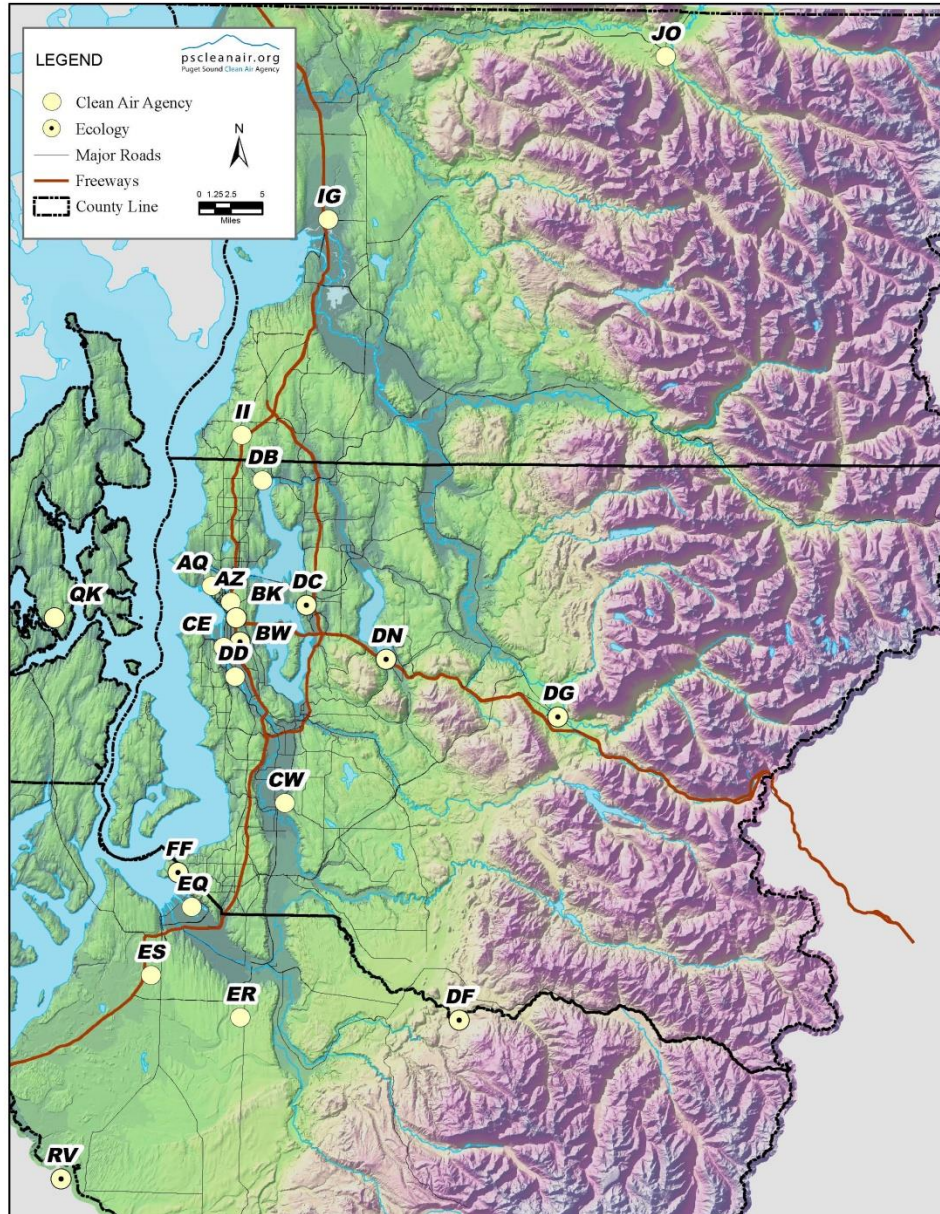
Fine Particle Pollution

Small size; Cardiac and Respiratory Effects

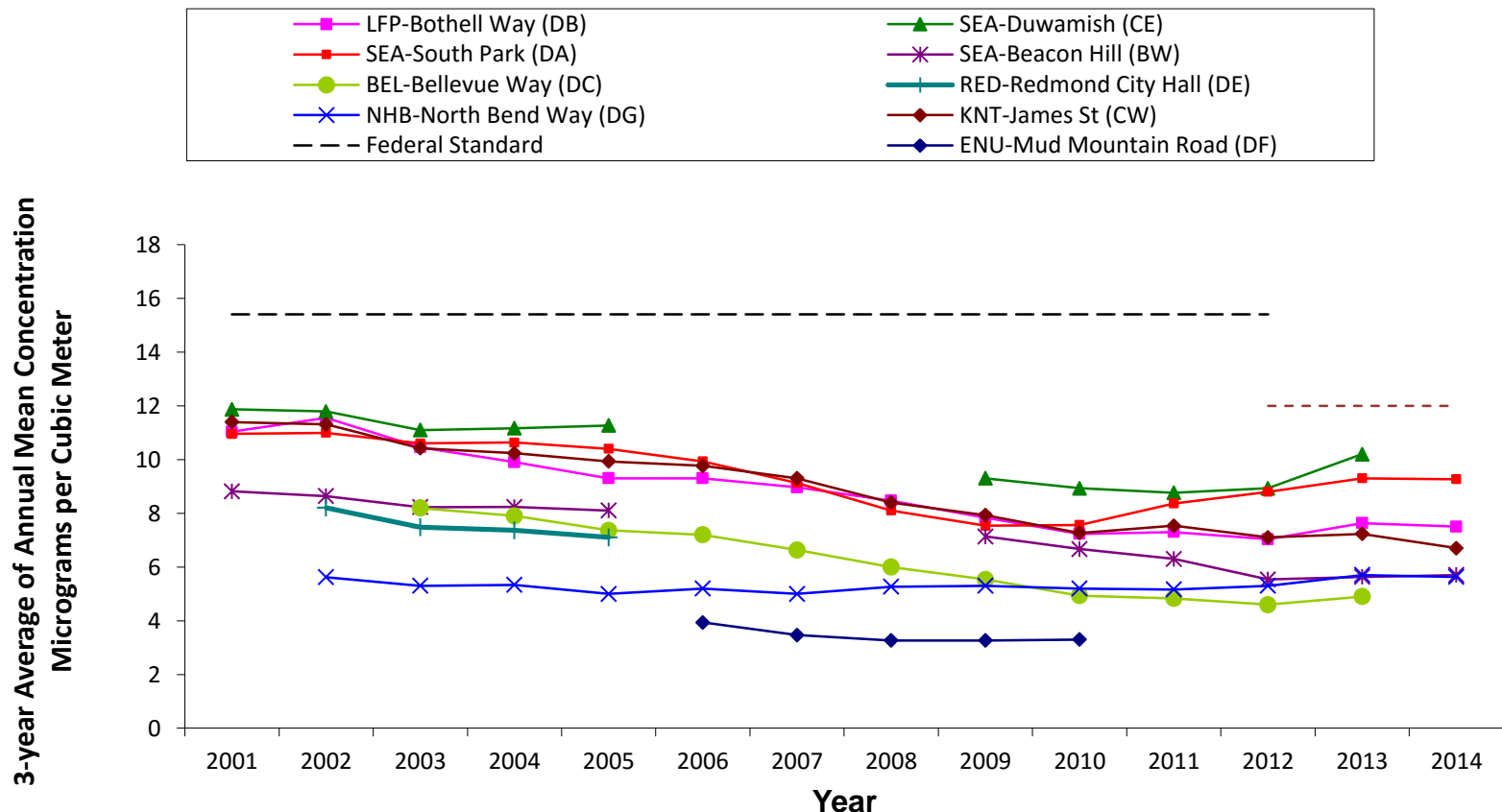


Seattle E Marginal Way S & S Idaho St





3-Year Average of the Annual Mean Reference and Continuous Methods

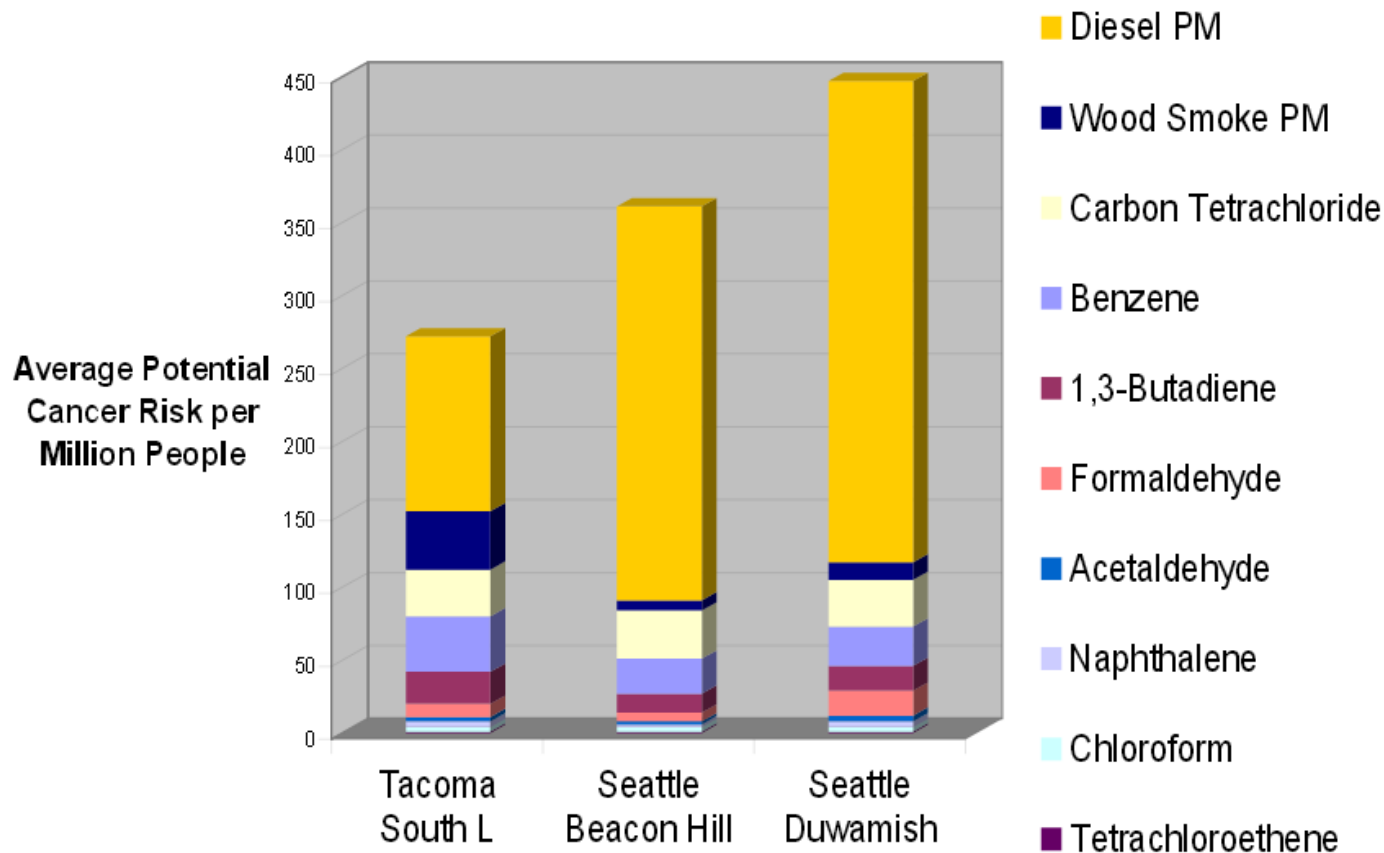


Note: Lake Forest Park (DB) data are FRM from 1999-2007, nephelometer in 2008-2014. Beacon Hill (BW) data are FRM from 1999-2014. Duwamish (CE) data are FRM from 1999-2009, nephelometer 2010, TEOM-FEM 2011-2014. South Park (DA) data are FRM from 1999-2002, nephelometer from 2003-2014. Redmond (DE) data are FRM from 2000-2002, nephelometer from 2003-2005. Bellevue Way (DC) data are FRM from 2001-2003, nephelometer from 2004-2014. Kent (CW) data are FRM from 1999-2003, nephelometer 2004-2010, TEOM-FEM 2011-2014. North Bend (DG) data are FRM 2000-2004, nephelometer in 2005. Enumclaw data are FRM in 2004, nephelometer in 2005-2014.

Diesel Particulate Pollution

Highest Levels and Cancer Risk in Duwamish Valley

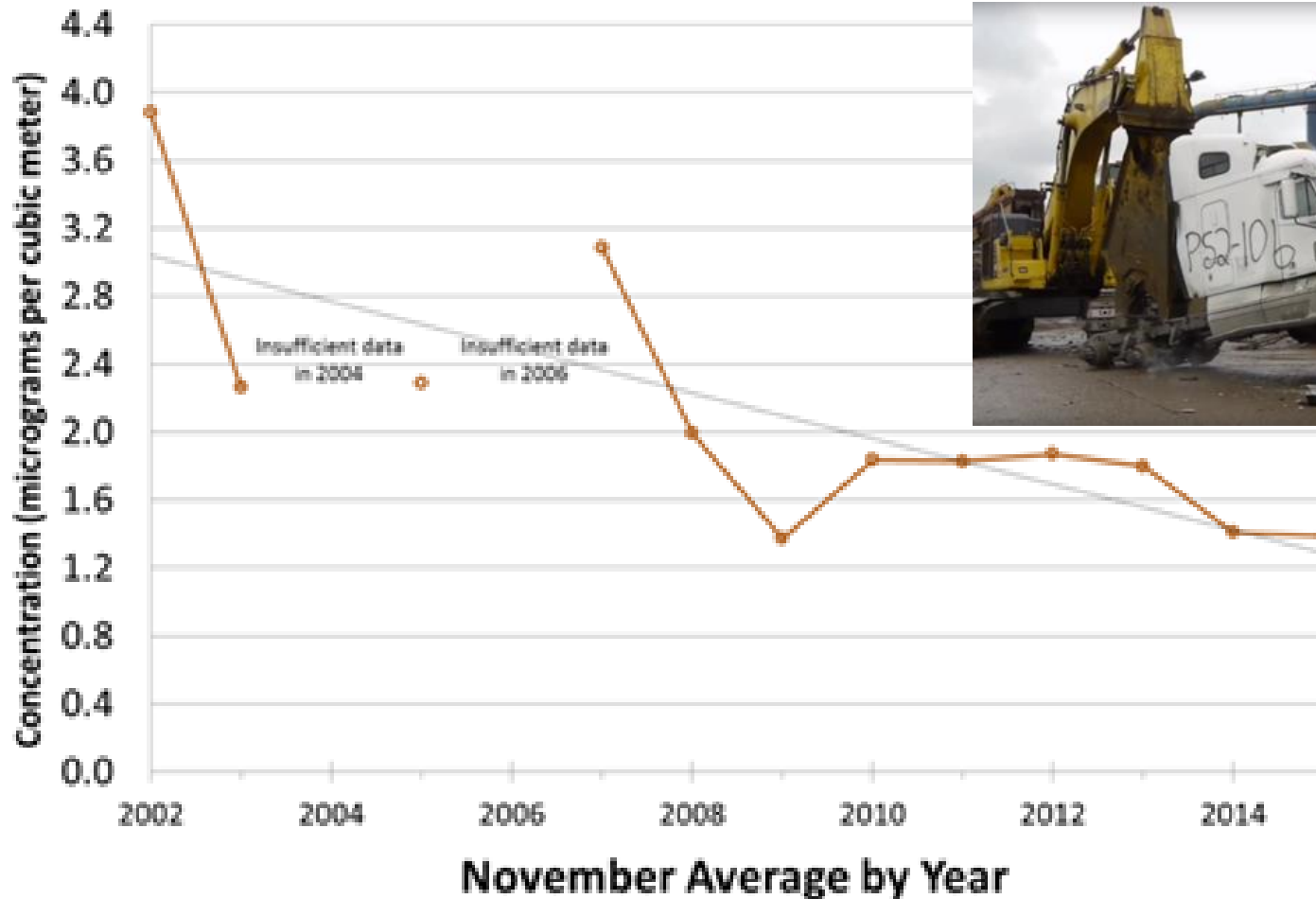
Figure B: Potential Cancer Risks with Diesel and Wood Smoke



Diesel and wood smoke particulate matter results are based on recent estimates from other studies.^{2,3}

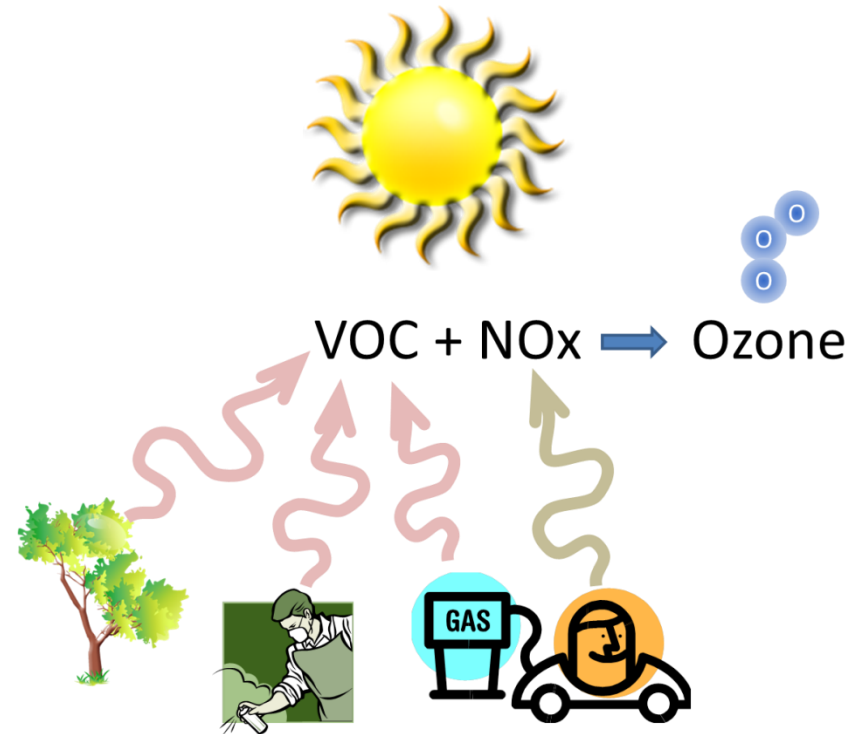
Source: PSCAA 2009 Air Toxics Study http://www.pscleanair.org/library/Documents/2010_Tacoma-Seattle_Air_Toxics_Report.pdf

Historical November Monthly Average Black Carbon Levels



Ozone Background

- Ozone is a summertime pollutant.
- Ozone affects health – mainly respiratory.
- Transportation is largest contributor to precursors.
- Enumclaw monitor has highest levels in our region.
- Levels at Enumclaw are close to EPA's 2015 health-based standard; some risk of violation.



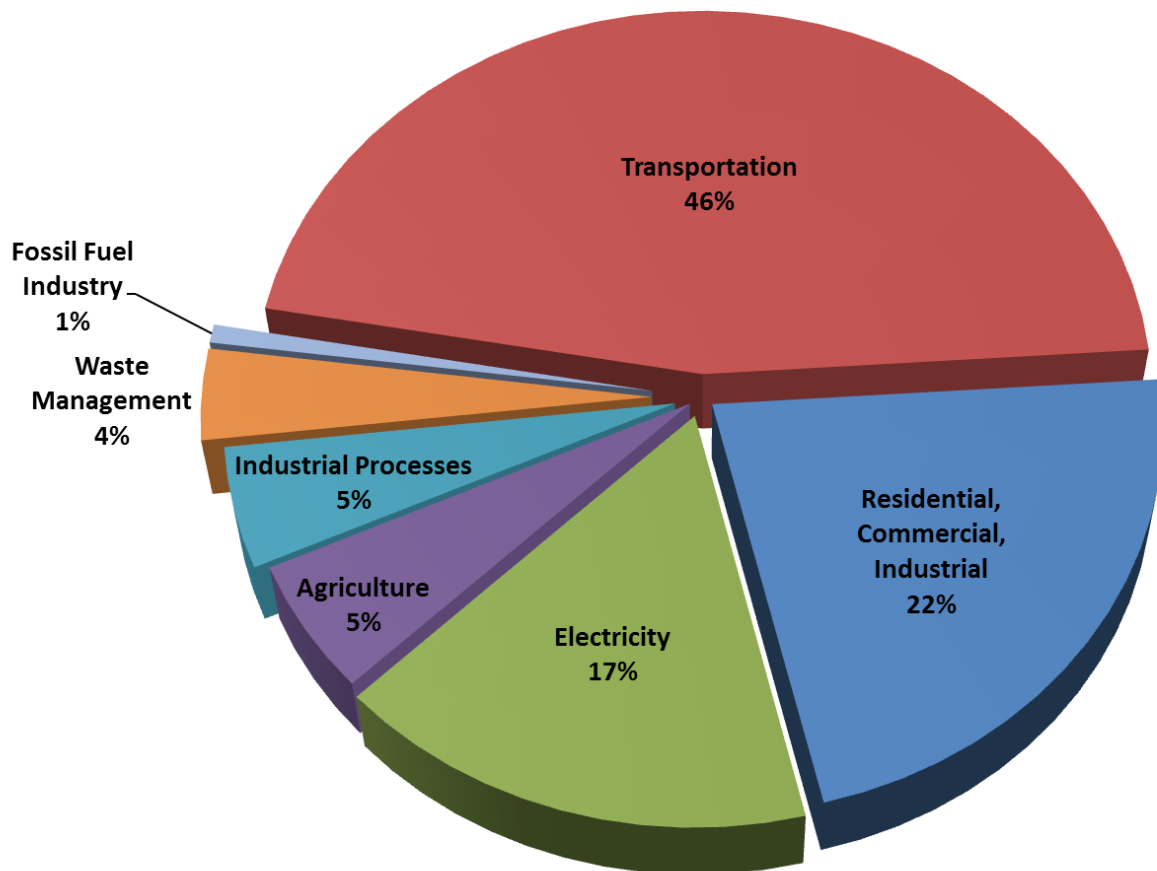
Exposure to Industrial Sources



- Watershed is home to many industrial sources
- Legal framework is technology-based

Climate Change Great potential for co-benefits

Sources of Washington State Annual Greenhouse Gas Emissions



WA State Dept of Ecology, 2012 Washington State Greenhouse Gas Inventory

- Home to “highly impacted” communities
 - We will need to actively engage these communities to identify and implement solutions
- Exposure to harmful air pollutants
 - Elevated fine particle pollution; levels below federal health-based standards
 - Making strides to reduce diesel pollution – still more old legacy engines to remove
 - Ozone elevated in the Enumclaw area; some risk of violating federal health-based standard

- Exposure to industrial sources
- Climate Change
 - Transportation must be addressed to meet state climate goals.
 - Great potential for cobenefits - reduce CO₂, criteria pollutants, and air toxics
 - Improve health for current and future generations



Thank you and Questions

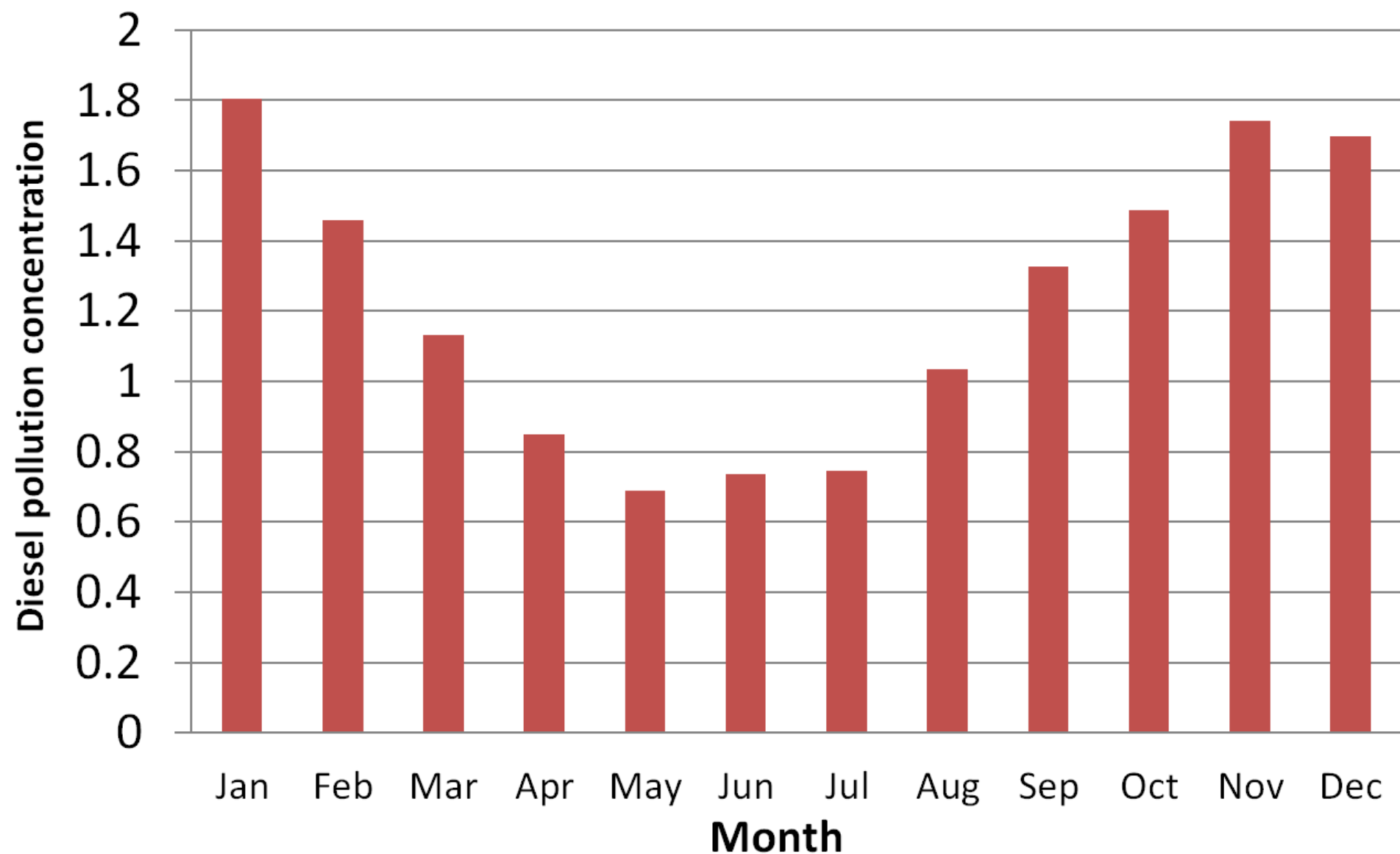
Kathy Strange

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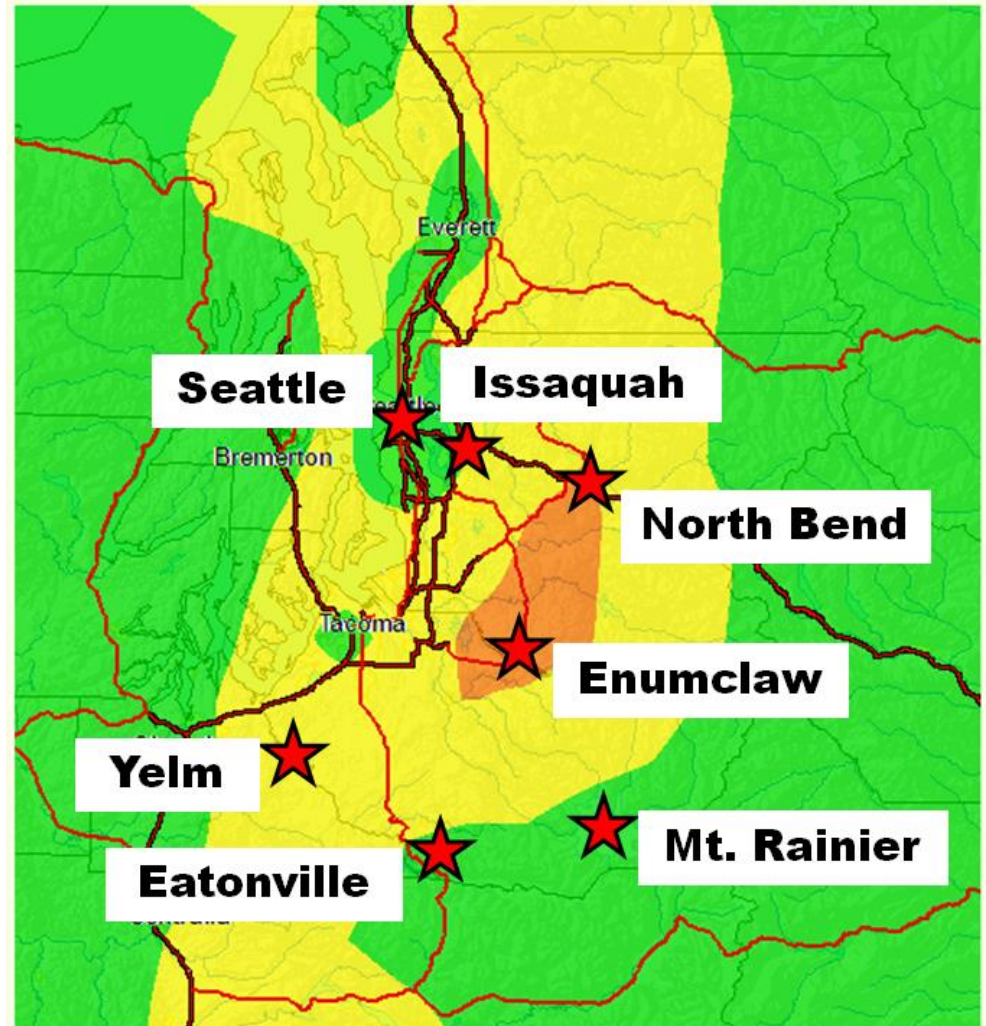
EXTRA SLIDES

In which months are diesel exhaust levels highest?

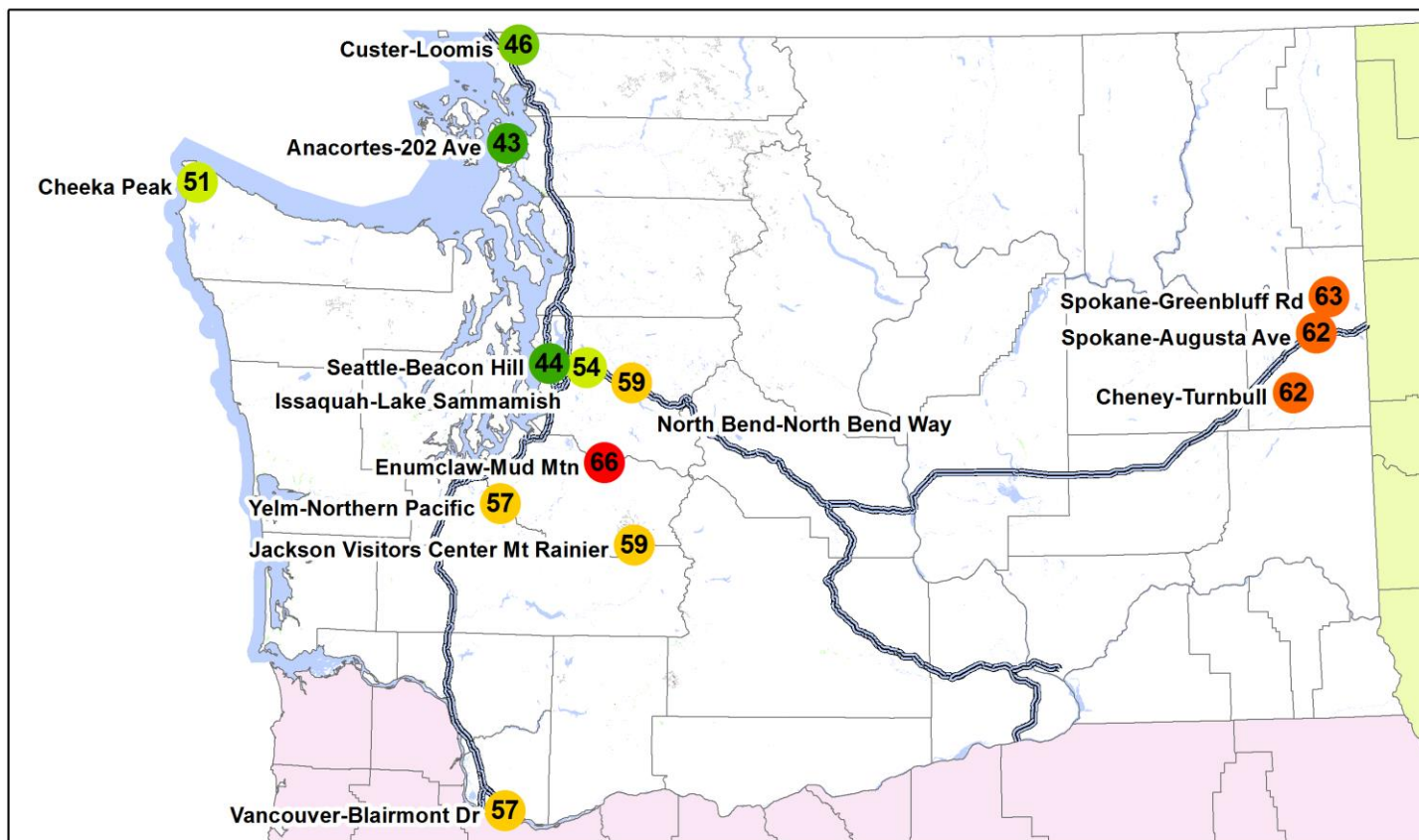


Seattle Duwamish monitored black carbon levels in micrograms per cubic meter (averaged by month for 2010-2014)

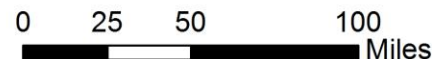
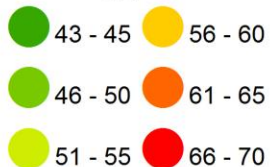
Where ozone is highest



2014 Washington Ozone Design Values (Estimated)

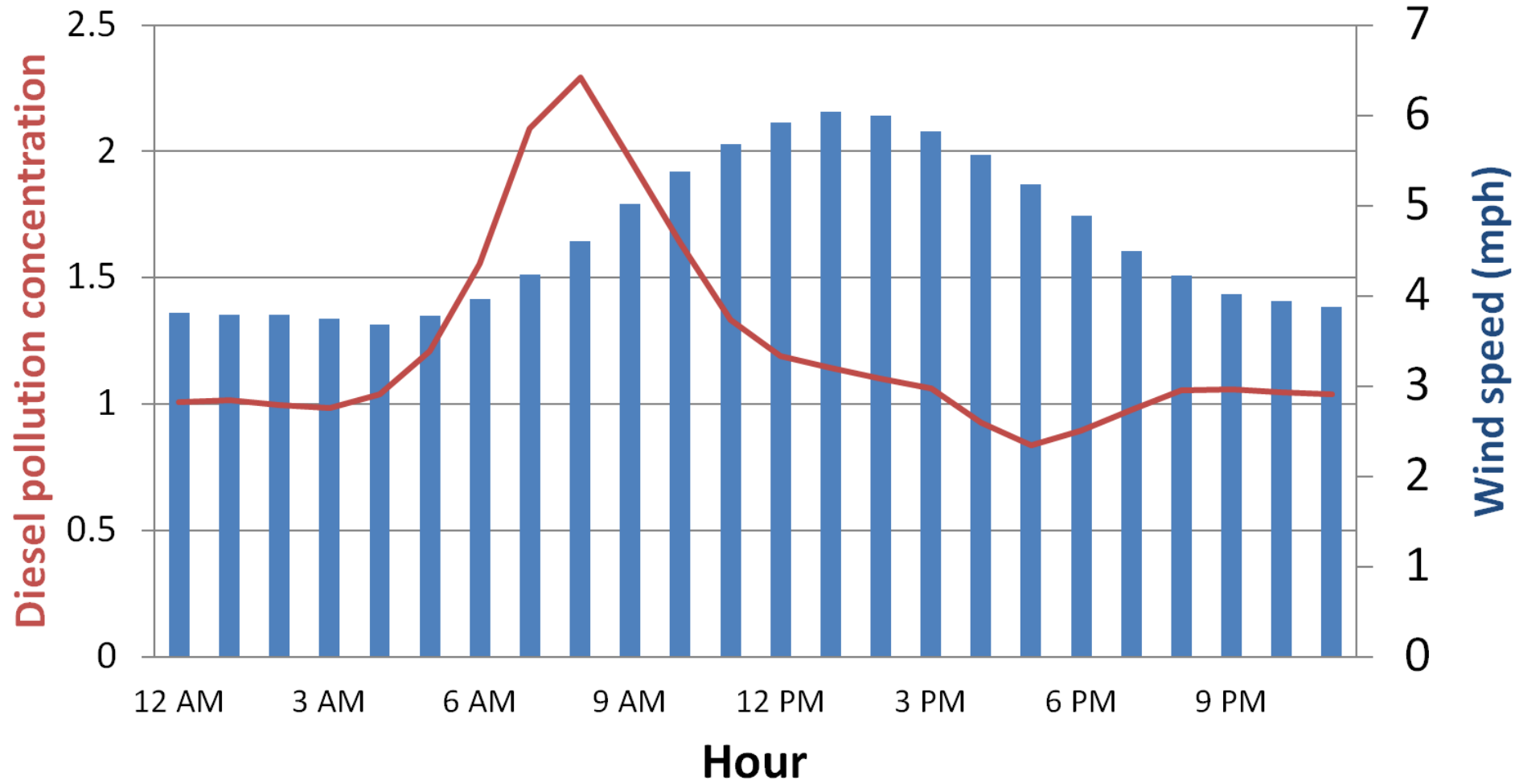


Ozone (ppb)



9/3/2014

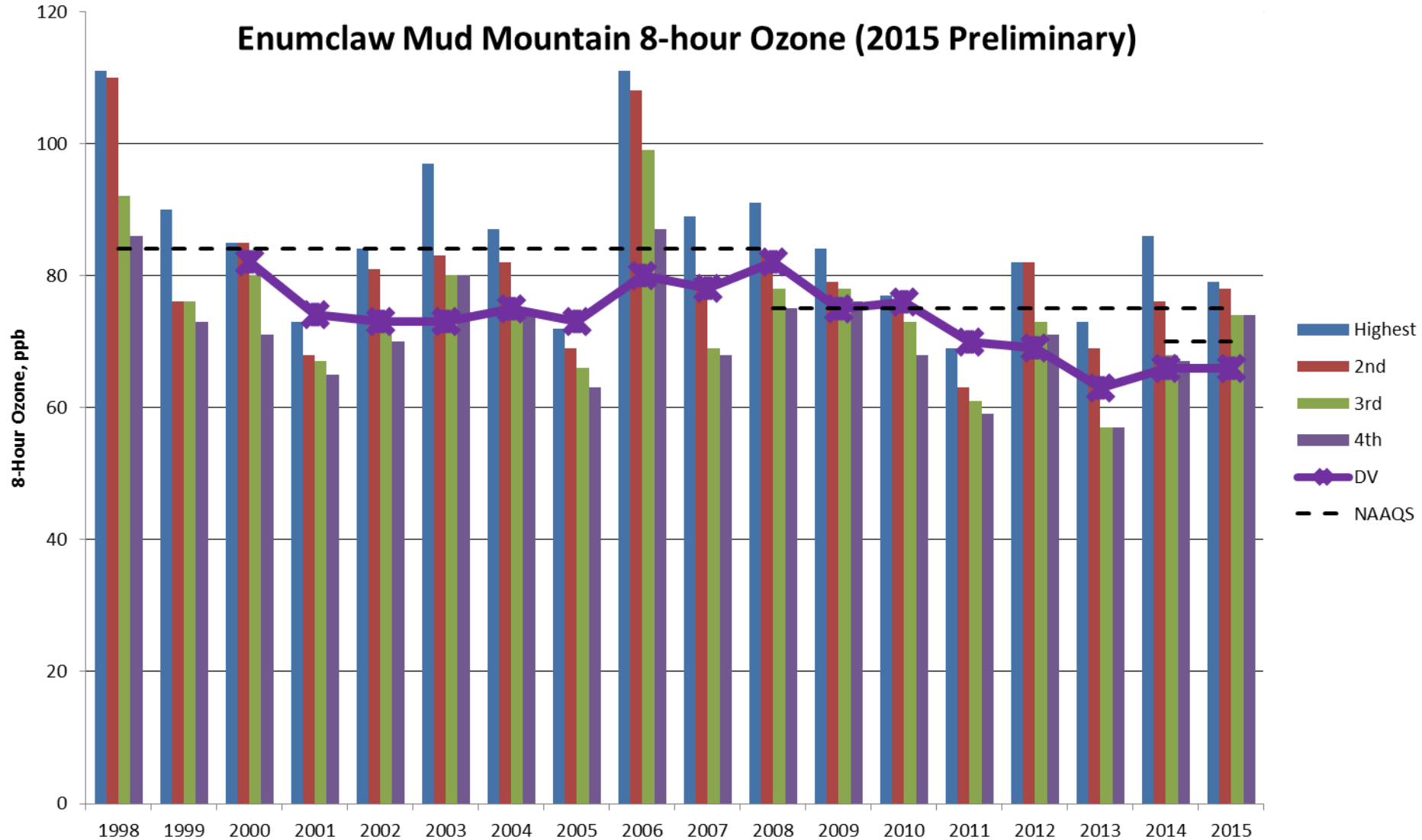
At what time of day are diesel exhaust levels highest?



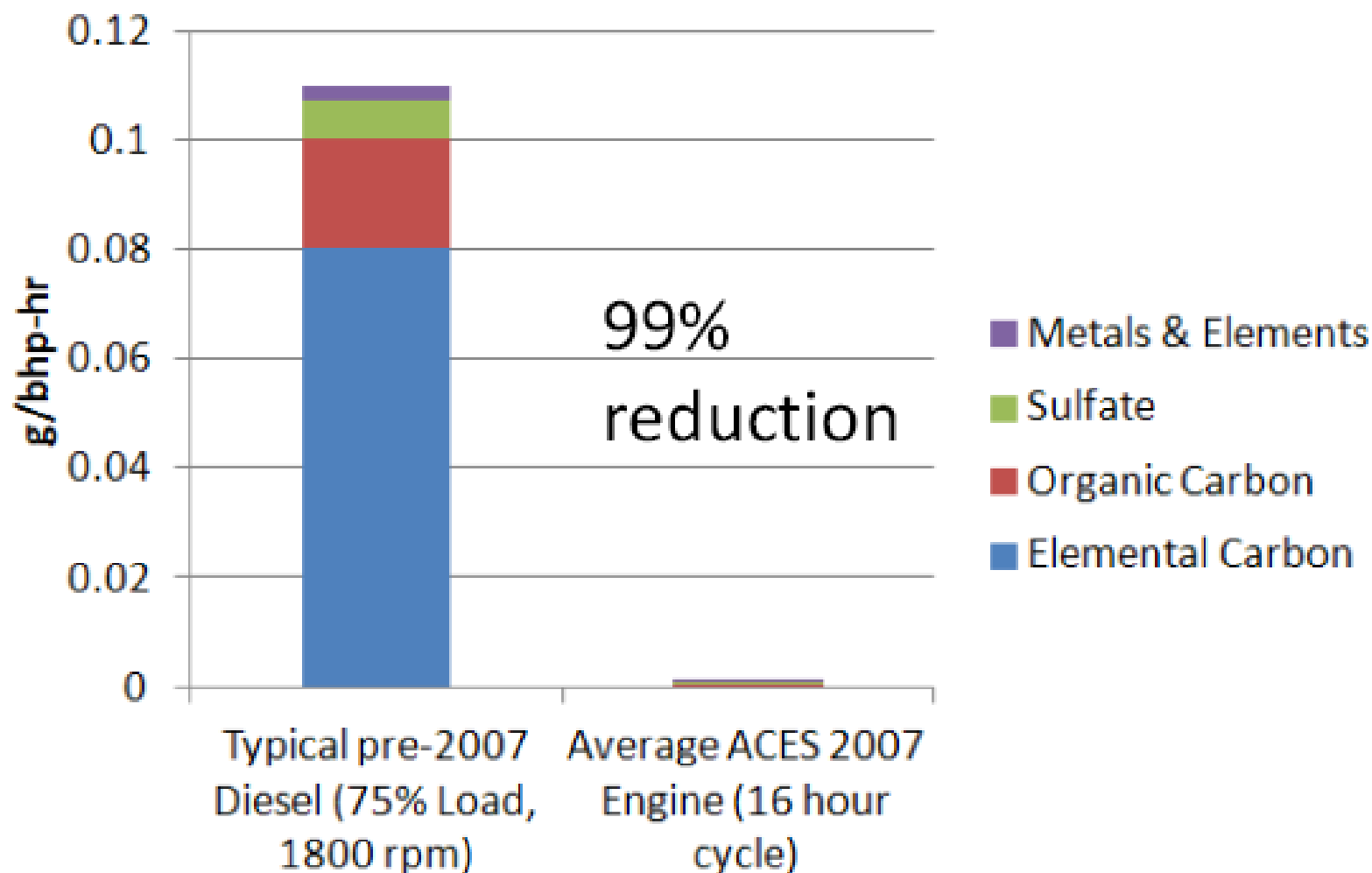
Form of the Standard - Enumclaw

Eye on the 4th high - Purple

Enumclaw Mud Mountain 8-hour Ozone (2015 Preliminary)

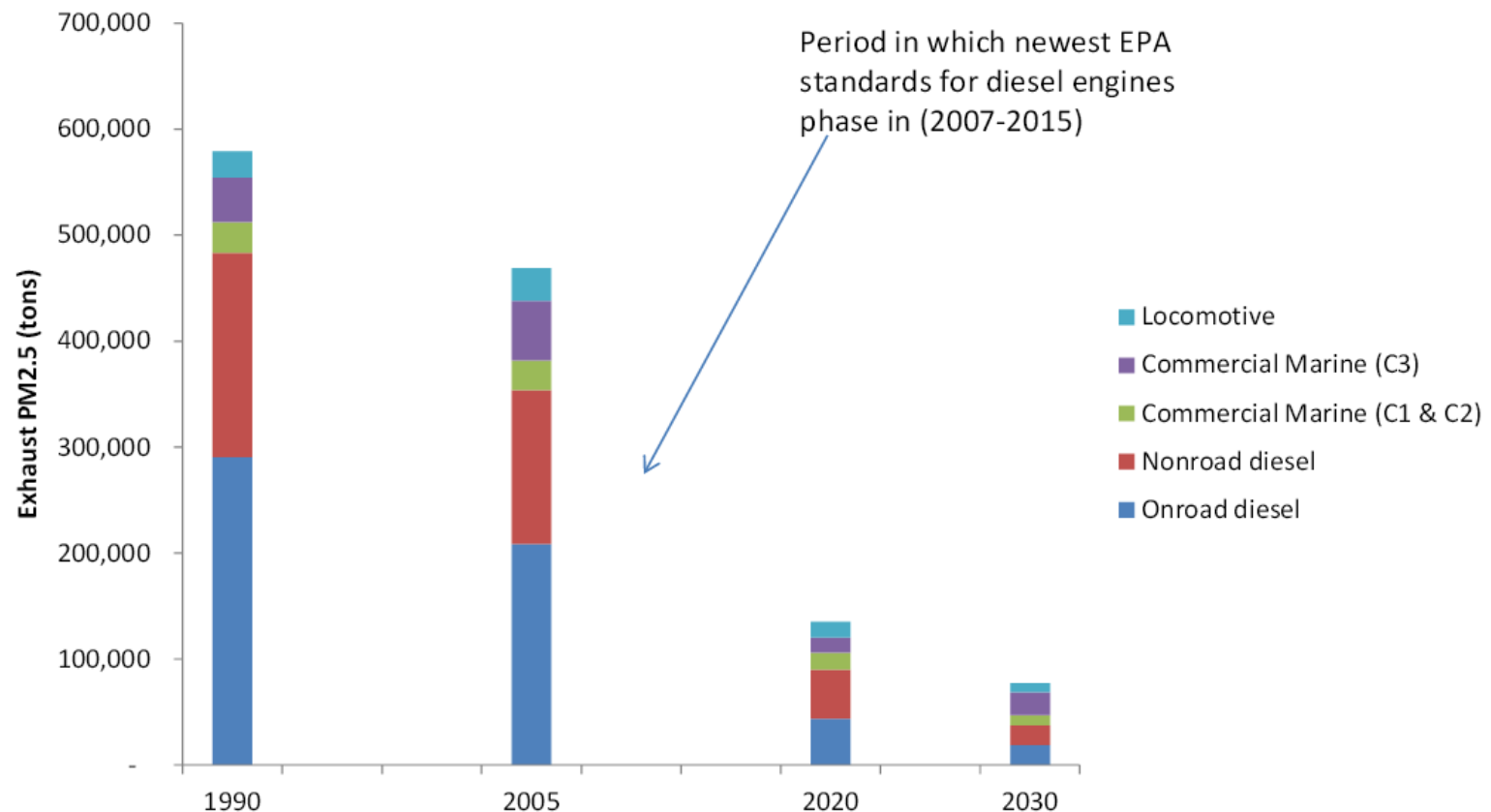


New technology improvements



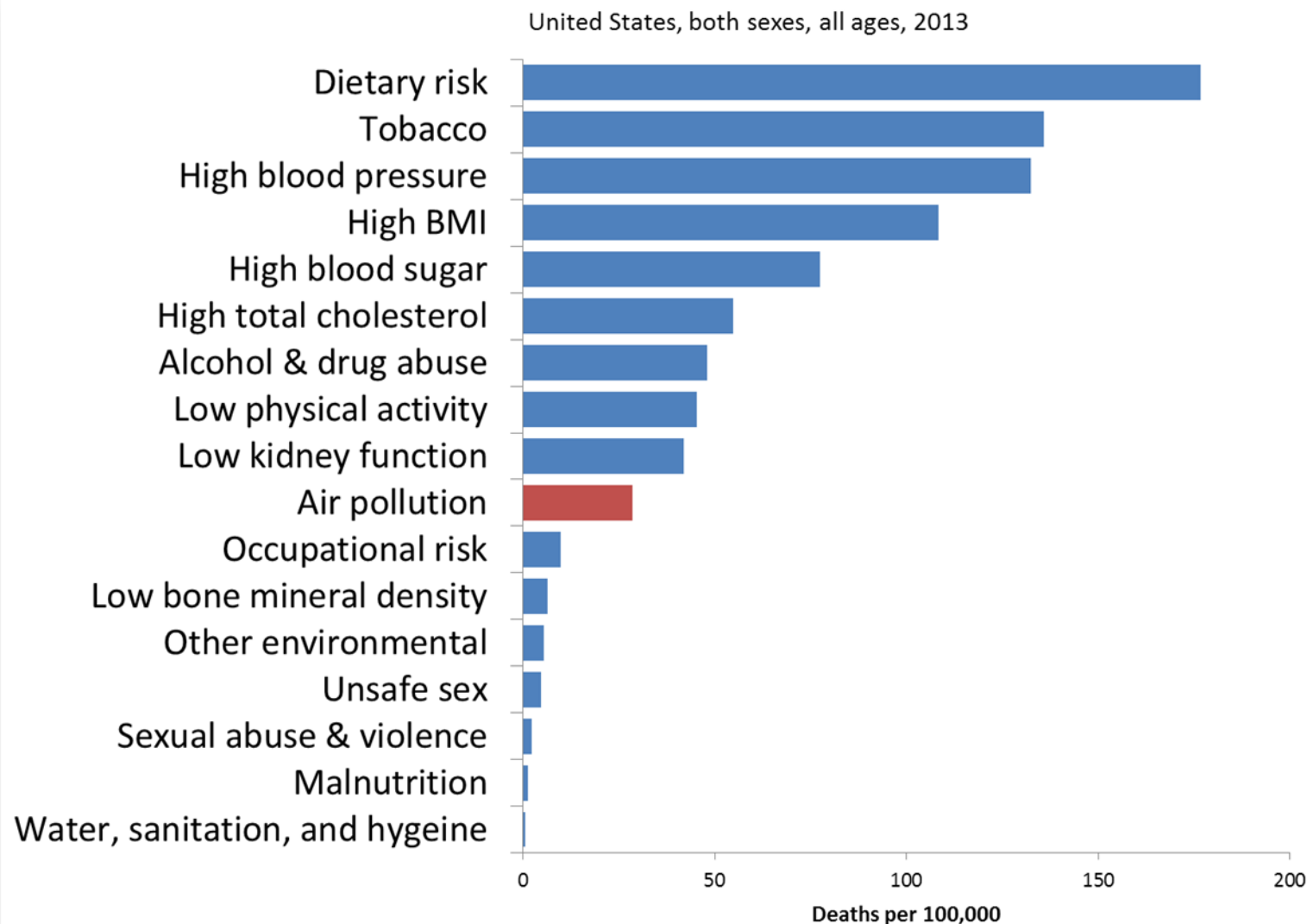
New technology improvements

Diesel PM_{2.5} Emission Trends

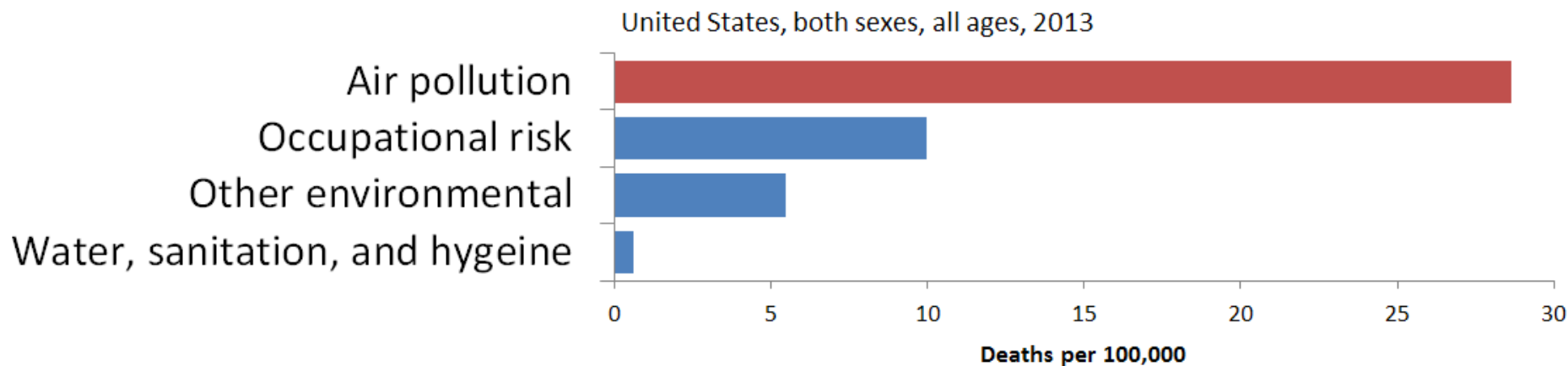


Air Quality and Health

National Context



Source: *Lancet*, 2010 Global Burden of Disease, <http://ihmeuw.org/3pcr>



Annual $\text{Pm}_{2.5}$ Black Carbon Aethalometer

