DEPARTMENT OF ECOLOGY
State of Washington

Washington State Implementation Plan Revision

Removal of Vehicle Inspection and Maintenance Program

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Bajo la ley del estado, el programa de chequeo de emisiones de vehículos terminara el 31 de diciembre de 2019. Este plan actualiza el Plan de Implementación del estado de Washington para remocionar el programa de chequeo de emisiones. El plan muestra que la remoción del programa no resultara en calidad de aire malsano. Para más información sobre el plan, comuníquese con Joanna Ekrem, Programa de Calidad de Aire, al 360-407-6826.

Washington State Implementation Plan Revision

Removal of Vehicle Inspection and Maintenance Program

Air Quality Program

Washington State Department of Ecology

Olympia, Washington

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Executive Summary

Ecology is submitting a State Implementation Plan (SIP) revision to EPA. This SIP revision asks EPA to:

- Remove the vehicle inspection and maintenance (I/M) program and regulation from Washington's SIP.
- Transfer the vehicle I/M program from an active control measure to a contingency measure for six maintenance plans.

Ecology is submitting this SIP revision for several reasons:

- Under state law, the vehicle I/M program expires on December 31, 2019.
- EPA must approve Ecology's request to revise the SIP and remove the vehicle I/M program.
- To meet federal Clean Air Act requirements.

For EPA to approve the removal of the vehicle I/M program from the SIP, Ecology must show that removal would not prevent Washington from meeting or continuing to meet National Ambient Air Quality Standards (NAAQS) or other federal Clean Air Act requirements. This SIP revision includes Ecology's analysis of air quality monitoring data, trends, and emission projections for the five counties where Ecology implements the vehicle I/M program:

- Clark
- King
- Pierce
- Snohomish
- Spokane

Ecology used EPA's Motor Vehicle Emissions Simulation (MOVES) model to project vehicle emissions of the following criteria pollutants: nitrogen oxides (NOx), carbon monoxide (C0) and volatile organic compounds (VOCs).

Ecology calculated emissions for 2000 to 2040 in 5-year increments, and for 2019, the last year of the vehicle I/M program. The projections take into account expected population growth and increases in vehicle travel as well as fleet turnover. For 2000 to 2019, Ecology calculated emissions with and without the vehicle I/M program. For 2020 to 2040, Ecology projected emissions without the vehicle I/M program.

The projections show that the vehicle I/M program reduces emissions of the criteria pollutants analyzed through 2019, the last year of the program. The emission reductions range from 2.8 percent to 6.7 percent depending on pollutant measured, location and time of year.

Emissions are projected to decline from 2019 to 2020 after the end of the vehicle I/M program, for all pollutants of concern for King, Pierce, Snohomish, and Spokane counties. In Clark county, small increases in emissions from 2019 to 2020 are projected for winter CO (+0.4 percent), summer CO (+2.5 percent), and summer VOCs (+0.3 percent), with a small emission reduction (-4.7 percent) projected for summer NO_x emissions.

Onroad vehicle emissions are projected to go down by 86 to 95 percent from 2000 to 2040. The vehicle I/M program reduces onroad emissions from 2000 through 2019, and emissions continue to decline significantly from 2020 to 2040 with no vehicle I/M program. This is mainly because of advances in vehicle technology and because people are replacing older, higher-polluting vehicles with newer, less polluting vehicles.

Based on our analysis, Ecology finds that the removal of the vehicle I/M program will not prevent Washington from meeting or continuing to meet the NAAQS or other federal Clean Air Act requirements. Ecology will continue to monitor air quality. If a violation occurs or a contingency provision is triggered under a maintenance plan, Ecology and the relevant local clean air agency will evaluate the need for additional pollution control measures. If Ecology and the local clean air agency determine that vehicle I/M is the appropriate control measure, Ecology will ask the Legislature to reinstate the vehicle I/M program.

Introduction

Passenger cars and trucks are a major source of air pollution in Washington State. These vehicles emit a significant amount of air pollutants, including:

- Carbon monoxide (CO).
- Nitrogen oxides (NO_x).
- Volatile organic compounds (VOCs).
- Fine particulate matter ($PM_{2.5}$).
- Greenhouse gases.
- Toxic air pollutants.

In the presence of sunlight and heat, NO_x and VOCs react to form ground-level ozone (O_3), or smog. Air pollution from cars and trucks is harmful to people's health. It is especially harmful to people with existing lung or heart problems, adults age 65 and older, children, and pregnant women.

In 1982, the Department of Ecology (Ecology) started a vehicle inspection and maintenance program (also known as vehicle I/M, or emission check program) in the Seattle area. Ecology expanded the program to the Spokane area in 1985, and the Vancouver area in 1993. The vehicle I/M program requires owners to test their vehicles every two years. The bulk of the gasoline-vehicle tests determine if the vehicle's emission controls are functioning properly to control levels of VOCs, NO_x, and CO. The tests help identify vehicles that are not working properly and may be in need of repair.

Ecology implemented the vehicle I/M program to meet requirements in the federal Clean Air Act (CAA) to bring these areas into compliance with health-based National Ambient Air Quality Standards (NAAQS) for CO and O_3 pollution. Ecology submitted the vehicle I/M program regulation, Chapter 173-422 Washington Administrative Code (WAC), as part of Washington's State Implementation Plan (SIP) in 1995, and also included the vehicle I/M program as a control strategy for six maintenance plans. The vehicle I/M program was a key control strategy that helped the Puget Sound, Vancouver, and Spokane areas lower air pollution and meet the NAAQS.

In 2005, the Washington Legislature adopted California's Low Emission Vehicle (LEV) regulations which set stricter emission standards for motor vehicles. The California standards apply to 2009 and newer passenger cars, light duty trucks, and medium duty vehicles registered and sold in Washington. The Legislature exempted 2009 and newer vehicles from emission testing requirements, and included an end date for the vehicle I/M program of December 31, 2019.

Air quality has improved significantly in the Puget Sound, Spokane, and Vancouver regions and the areas are all in attainment with the NAAQS. Older cars are being replaced with newer models, which are much cleaner. The vehicle I/M program is testing fewer vehicles, since it exempts from testing vehicles over 25 years and 2009 or newer. As a result, the vehicle I/M program is achieving smaller emission reductions and is less cost-effective. The more stringent motor vehicle emission standards, and turnover of the fleet, are achieving greater reductions in air pollution.

Purpose of SIP Revision

Under state law, the vehicle I/M program ends on December 31, 2019.[1] Ecology is requesting approval from EPA to remove the vehicle I/M program from the Washington State Implementation Plan (SIP). Rules and programs in the SIP are federally enforceable. The federal Clean Air Act requires Ecology to obtain EPA's approval to remove the vehicle I/M program from the SIP through a SIP revision.

The purpose of this SIP revision is to demonstrate to EPA that Ecology has met the federal Clean Air Act (CAA) requirements to remove the vehicle I/M program from the SIP. The requirements include:

1. Demonstrate that removal of the vehicle I/M program from the SIP will not interfere with attainment or maintenance of the NAAQS or any other applicable CAA requirement,[2] and
2. Transfer the vehicle I/M program from an active control strategy to a contingency measure in the six maintenance plans that include vehicle I/M.[3]

Ecology is requesting that EPA:

1. Remove the vehicle I/M program rule (Washington Administrative Code, Chapter 173-422—Motor Vehicle Emission Inspection) from the SIP.
2. Remove the vehicle I/M program SIP approved by EPA September 25, 1996.[4]
3. Transfer the vehicle I/M program from a control strategy to a contingency measure for: the: Seattle-Tacoma, Vancouver, and Spokane CO maintenance areas; the Puget Sound and Vancouver portion of the Vancouver-Portland O_3 maintenance areas; and the Seattle-Kent-Tacoma PM_{10} maintenance area.

Public Involvement

Ecology accepted comments on this SIP revision from December 17, 2018 through January 28, 2019. We received two written comments. We did not hold a public hearing because we did not receive a request for one. Ecology documented the public involvement process in the Response to Comments prepared for this SIP revision.[5]

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[1] Revised Code of Washington (RCW) 70.120.170(6).
[2] CAA Section 110(l).
[3] CAA Section 175A(d).
[4] 61 FR 50235, September 25, 1996, https://www.gpo.gov/fdsys/pkg/FR-1996-09-25/pdf/96-24523.pdf#page=1.
[5] Washington Dept. of Ecology, May 2019, Response to Comments: Washington State Implementation Plan Revision Removal of Vehicle Inspection and Maintenance Program, Publication 19-02-010, https://fortress.wa.gov/ecy/publications/summarypages/1902010.html.

Overview of the Vehicle I/M Program

On road motor vehicles are a major source of air pollution in Washington, accounting for:

- 24 percent of total annual CO emissions.
- 50 percent NO_x emissions.
- 8 percent VOC emissions.
- 2 percent of $PM_{2.5}$ emissions[6].

Onroad motor vehicles are also the largest source of greenhouse gas emissions in Washington State, and are a significant source of toxic air pollution.

Ecology first implemented a vehicle inspection and maintenance program (also known as vehicle I/M, or emission check program) in the Seattle area in early 1982. The program had six centralized, idle-only testing facilities in King and Snohomish counties. The vehicle I/M program helps improve air quality primarily by identifying cars and trucks that have malfunctioning emission control systems and may be in need of repairs. The tests also identify tampering of vehicle emission control systems.

The vehicle I/M program has expanded and evolved over the past 35 years to reflect advances in vehicle technology. In 1993, the emission check program expanded to Pierce and Clark Counties. The testing procedures included two speed idle (TSI), acceleration simulation mode (ASM), and diesel-snap testing. In 2002, on-board diagnostic (OBD) II testing began on all applicable passenger vehicles and light duty trucks. The OBD II device plugs into the vehicle's computer system and scans emissions related components and systems to check for problems, and identify where repairs may be needed. For diesel vehicles, the program tests the opacity, or smoke density, of the exhaust plume.

Ecology's contractor, Applus Technologies, runs 15 emissions testing stations in parts of the five most populous counties in Washington:

- Clark County
- King County
- Pierce County
- Snohomish County
- Spokane County

In July 2012 the revised state emission test rule, Chapter 173-422A WAC, took effect.[7] The emission check program expanded to allow decentralized testing at an Authorized Testing Facility (ATF), such as auto dealerships and repair shops. Any business may apply to become an ATF.

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[6] Washington Department of Ecology, 2014 Air Emissions Inventory, June 18, 2018, https://ecology.wa.gov/Asset-Collections/Doc-Assets/Air-quality/Emissions/2014EmissionInventoryTonYear.

[7] See Appendix B.

Emissions tests are required every other year, and the test costs $15. Drivers must show passing results when they renew their license tabs or register their vehicles. Ecology inspects state and local government vehicles annually.

Ecology exempts some vehicles from the emission testing requirement, including:

- Model year 2009 and newer gasoline vehicles.
- Gasoline vehicles over 25 years old.
- Motorcycles.
- Toyota Prius and Honda Insight.
- Diesel vehicles model year 2007 and newer.
- Diesel passenger vehicles weighing less than 6,001 pounds.

Washington's program includes a waiver process that allows some vehicle owners to register their vehicles even if they don't pass their final test. The owners must show they spent at least $150 on diagnosis and/or appropriate emissions repairs by an Authorized Emission Specialist after the initial test failure.

The vehicle waiver rate is increasing over time. This is likely because the cost to repair a vehicle is increasing over time, and the requirement to spend at least $150 on repairs in order to receive a waiver has stayed the same. In 2010, Ecology issued repair waivers to 27 percent of vehicles that failed the first test, or 2 percent of total vehicles tested. In 2017, Ecology issued repair waivers to 36 percent of the vehicles that failed the first test, or 4 percent of total vehicles tested.

The number of vehicles requiring emission tests is declining over time (see Figure 1 below). In 2017, 896,667 vehicle emission tests were conducted, a decrease of 13.4 percent from 2015. Eighty-eight percent of vehicles tested in 2017 passed the first test, and 12 percent failed.[8]

[8] Washington Department of Ecology, 2016 Annual Report: Washington Inspection/Maintenance (I/M) Program, June 2017.

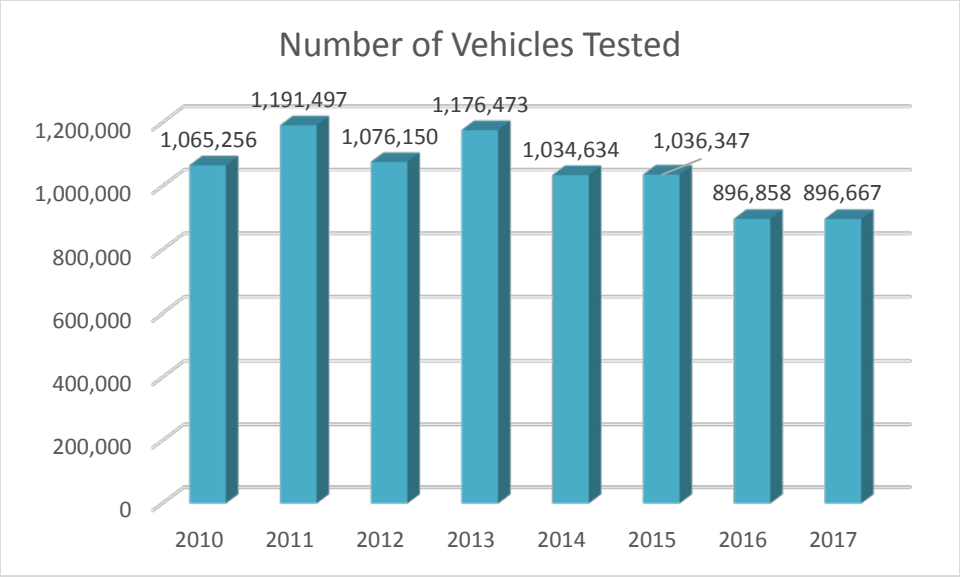


Figure 1: Number of Vehicles Tested, 2010 - 2017

Vehicle I/M and Washington's State Implementation Plan

The federal Clean Air Act (CAA) established National Ambient Air Quality Standards (or NAAQS) for six harmful pollutants in the outdoor air, including:

- Ozone (O_3).
- Carbon monoxide (CO).
- Fine particulate matter ($PM_{2.5}$) and coarse particulate matter (PM_{10}).
- Lead (Pb).
- Nitrogen dioxide (NO_2).
- Sulfur dioxide (SO_2).

The federal CAA also requires states to develop State Implementation Plans (SIPs) to improve air quality in areas not meeting the NAAQS, and submit the SIPs to EPA for approval. After EPA approval, the SIP is federally enforceable. Ecology maintains Washington's SIP that describes how Washington implements, maintains, and enforces the NAAQS.

The federal CAA Amendments of 1977 required many states to implement vehicle I/M for areas not meeting NAAQS for CO. These requirements expanded to O_3 nonattainment areas under the 1990 CAA Amendments.

Ecology submitted a vehicle I/M program SIP to EPA in 1995. In 1996 EPA approved the SIP and adopted the vehicle I/M rule, Chapter 173-422 WAC – Motor Vehicle Emission Inspection, into Washington's SIP.[9] Ecology adopted new regulations that continue the program from 2012 through 2019. Those regulations were not submitted to EPA, and therefore, are not part of this SIP revision.[10]

EPA also approved the vehicle I/M program as a control strategy for CO, O_3, and PM_{10} in several maintenance plans listed in Table 1 below. Maintenance plans describe how former nonattainment areas will maintain the NAAQS.

Table 1: Maintenance Plans with Vehicle I/M Control Strategies

Maintenance Areas	Attainment Date	End of 20-year maintenance period
Seattle-Tacoma CO	10/11/1996	10/11/2016
Vancouver CO	10/21/1996	10/21/2016
Vancouver-Portland O_3	6/18/1997	6/18/2017
Spokane CO	8/29/2005	8/29/2025

[9] The SIP-approved rule is included in Appendix A.
[10] The rule currently implemented by Ecology is in Appendix B.

Maintenance Areas	Attainment Date	End of 20-year maintenance period
Puget Sound O_3	11/25/1996	11/25/2016
Seattle-Kent-Tacoma PM_{10}	5/14/2001	5/14/2021

Vehicle I/M Program Sunset

In 2005, the Washington Legislature adopted California motor vehicle emission standards.[11] The standards apply to 2009 and newer passenger cars, light duty trucks, and medium duty vehicles registered and sold in Washington. The Legislature exempted 2009 and newer vehicles from emission testing requirements.

Also in 2005, the Legislature decided to end the vehicle I/M program by December 31, 2019.[12] Ecology projected that improvements in air quality resulting from the implementation of the more stringent motor vehicle emissions standards and fleet turnover would make the vehicle I/M program obsolete.

Air quality has improved significantly in the Puget Sound, Spokane, and Vancouver regions and the areas are all in attainment with the NAAQS. Puget Sound continues to be an area of concern for O_3 pollution, and Tacoma and Vancouver are areas of concern for $PM_{2.5}$ pollution. However, the contribution of onroad motor vehicles to O_3 precursors and $PM_{2.5}$ pollution in those areas has declined significantly since 2000 and is projected to continue to decline through 2040.

Newer cars are much cleaner, and older cars are being replaced with newer models. The vehicle I/M program is testing fewer vehicles, since vehicles over 25 years and 2009 or newer are exempted from testing. As a result, the vehicle I/M program is achieving smaller emission reductions and is less cost-effective. The more stringent California motor vehicle emission standards are achieving greater reductions in air pollution for newer vehicles.

[11] RCW 70.120A.010, Chapter 173-423 WAC.
[12] RCW 70.120.170.

Demonstration of Continued Attainment

Because the vehicle I/M program is ending by December 31, 2019, Ecology is requesting that EPA remove the vehicle I/M rule and program from the SIP, and remove it as a control strategy for the six maintenance areas listed in Table 1. Rules and programs in the SIP are federally enforceable. The federal Clean Air Act requires Ecology to obtain EPA approval to remove the vehicle I/M program from the SIP.

Under section 110(l) of the federal Clean Air Act, EPA may not approve a SIP revision if the revision would interfere with attainment or maintenance of the NAAQS or any other applicable Clean Air Act requirement. In order for Washington to remove the vehicle I/M program, Ecology must submit to EPA a demonstration that any emissions increases associated with removing the vehicle I/M program would not hinder any area from attaining and/or maintaining the NAAQS. As part of this demonstration, Ecology evaluated:

- NAAQS compliance and air quality trends.
- Onroad vehicle emissions trends.
- Projections of future onroad vehicle emissions.

Current NAAQS Designations

EPA currently designates all areas in Washington State as attainment/unclassifiable for the NAAQS, except for a few counties designated unclassifiable because there was insufficient monitoring data.[13] Those counties are:

- Benton, Franklin, and Walla Walla counties – unclassifiable for 2015 O_3 NAAQS.
- Lewis and Thurston counties – unclassifiable for 2012 SO_2 NAAQS.

Attainment/unclassifiable means that areas with compliance monitors meet the NAAQS, and there is insufficient data to designate areas that lack official compliance monitors.

Air Quality Design Values

The vehicle I/M program reduces emissions of CO, VOCs, and NO_x. VOCs and NO_x react in summer sunlight and heat to form O_3. Table 2 below includes the 2015-2017 design values for O_3, NO_2, and CO for compliance monitors located in the counties where vehicle I/M is currently operated.

[13] See Appendix B.

Table 2: 2015-2017 Air Quality Design Values for O_3, NO_2, and CO in Vehicle I/M Counties

Monitor Location	Pollutant	NAAQS	2015-2017 Design Value
Clark (Vancouver-Blairmont)	8-hr O_3	0.070 ppm	0.063 ppm
King (Enumclaw Mud Mtn)	8-hr O_3	0.070 ppm	0.076 ppm
Spokane (Spokane-Greenbluff)	8-hr O_3	0.070 ppm	0.062 ppm
King (Beacon Hill)	1-hr NO_2	100 ppb	45* ppb
King (Seattle-10th and Weller)	1-hr NO_2	100 ppb	63* ppb
King (Seattle-10th and Weller)	8-hr CO	9 ppm	2.1 ppm
King (Seattle-Beacon Hill)	8-hr CO	9 ppm	0.9 ppm

Ppm = parts per million; ppb = parts per billion
*These are estimated DVs based on incomplete data

The current design values for CO and NO_2 are well below the NAAQS, and the risk of CO or NO_2 nonattainment is low for all areas in the state. Spokane Regional Clean Air Agency (SRCAA) and Ecology discontinued the CO monitor in Spokane after obtaining approval from EPA. SRCAA and Ecology used an alternate method and verified continued attainment with the CO NAAQS.[14]

The main pollutant of concern among areas implementing the vehicle I/M program is O_3 in the Puget Sound region. Figure 2 below shows the annual 4th highest O_3 values at Enumclaw from 2013 to 2017, as well as the three year design values. The design value for O_3 is calculated based on the three year average of the annual fourth highest daily 8-hour maximum concentration.

[14] Department of Ecology, 2018, Verification of Continued Attainment in Limited Maintenance Areas (2018), In the 2018 Ambient Air Monitoring Network Plan, Publication 18-02-019, https://fortress.wa.gov/ecy/publications/SummaryPages/1802019.html.

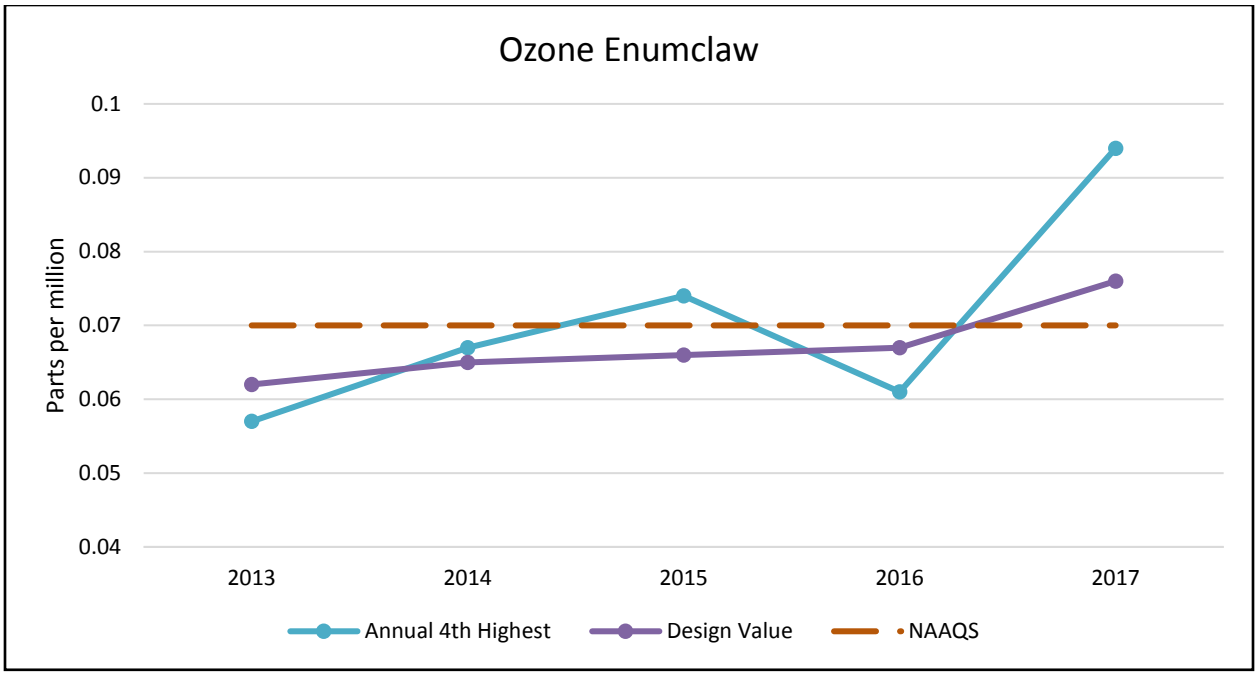


Figure 2: Enumclaw Mud Mountain O_3 Annual 4th Highest Values and design values, 2013 - 2017

Design values at Enumclaw-Mud Mountain have been below the NAAQS in four of the past five years, with the exception of 2017. There were 13 exceedances of the O_3 NAAQS in 2017. While these exceedances coincided with periods of hot sunny weather, nine of the 13 exceedances were also influenced by smoke from wildfires.

If we exclude the monitoring data from the days influenced by wildfire smoke, the O_3 design value for Enumclaw would be 0.068 ppm, which is below the NAAQS of 0.070 ppm.

Table 3: Estimated Enumclaw O_3 Design Value Excluding 2017 Wildfire Related Exceedances

Year	Annual 4th Highest O_3 8-hour average running max (ppm)	2015-2017 Design Value Excluding 2017 Wildfire Exceedances (ppm)
2015	0.074	0.066
2016	0.061	0.067
2017	0.070	0.068

Table 4 below includes the exceedance dates and daily maximum temperatures. The Puget Sound region was highly affected by wildfire smoke during two O_3 episodes: from August 1 through August 10, 2017, and August 29, 2017. Satellite images of the smoke over the region are included in Appendix C.

Table 4: 2017 O_3 Exceedances and Temperatures at the Enumclaw Monitor, with Wildfire Related Exceedances Highlighted in Yellow

Date of Exceedance	O_3 8-hour average running max (ppm)	Temperature 1-hour average daily max (F)
5/28/2017	0.070	85
6/24/2017	0.076	88
6/25/2017	0.082	92
7/6/2017	0.072	83
8/1/2017	0.079	87
8/2/2017	0.092	91
8/3/2017	0.103	93
8/4/2017	0.095	89
8/7/2017	0.073	84
8/8/2017	0.087	86
8/9/2017	0.098	89
8/10/2017	0.094	88
8/29/2017	0.073	86

Figure 3 below shows the sources of summer NOx emissions in Puget Sound (King, Pierce, and Snohomish counties) using the 2014 Ecology inventory and 2014 National Emissions Inventory (NEI) data, and Figure 4 shows the sources of summer VOCs. Onroad mobile sources are the main source of NOx emissions in the region, whereas trees and other natural biogenic sources are the largest source of VOCs. These pie charts exclude emissions from wildfire.

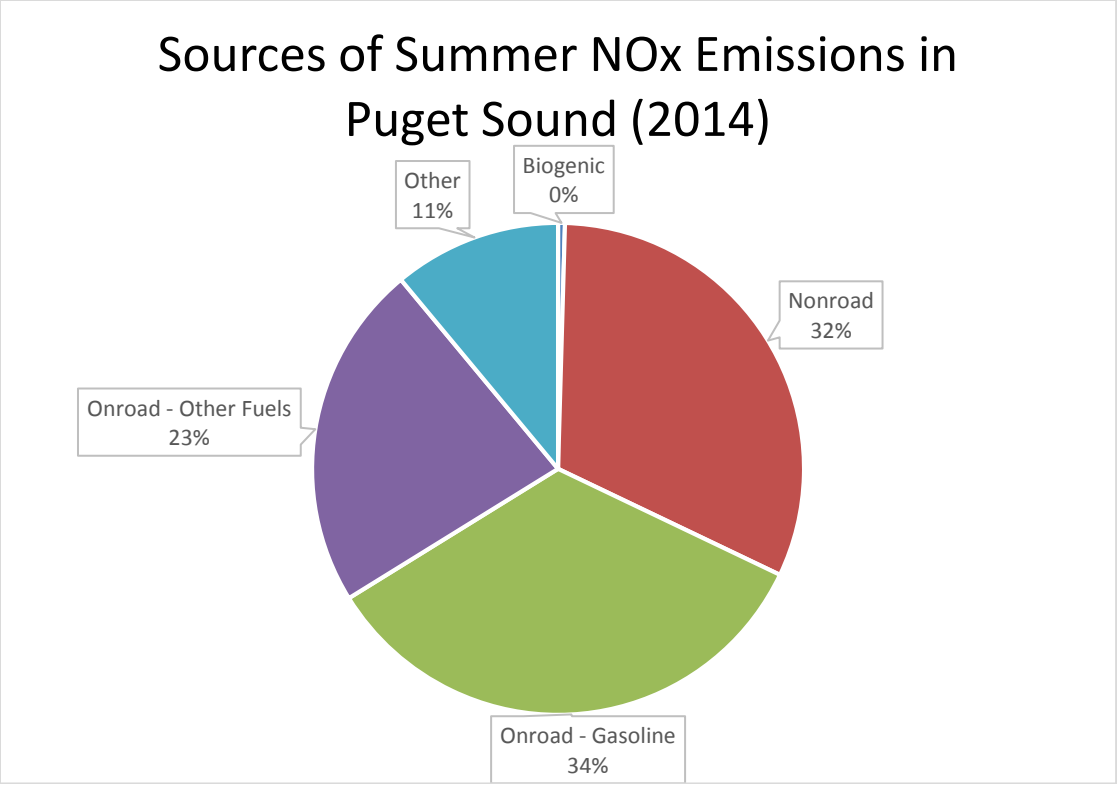


Figure 3: Sources of Summer NOx Emissions in Puget Sound (2014)

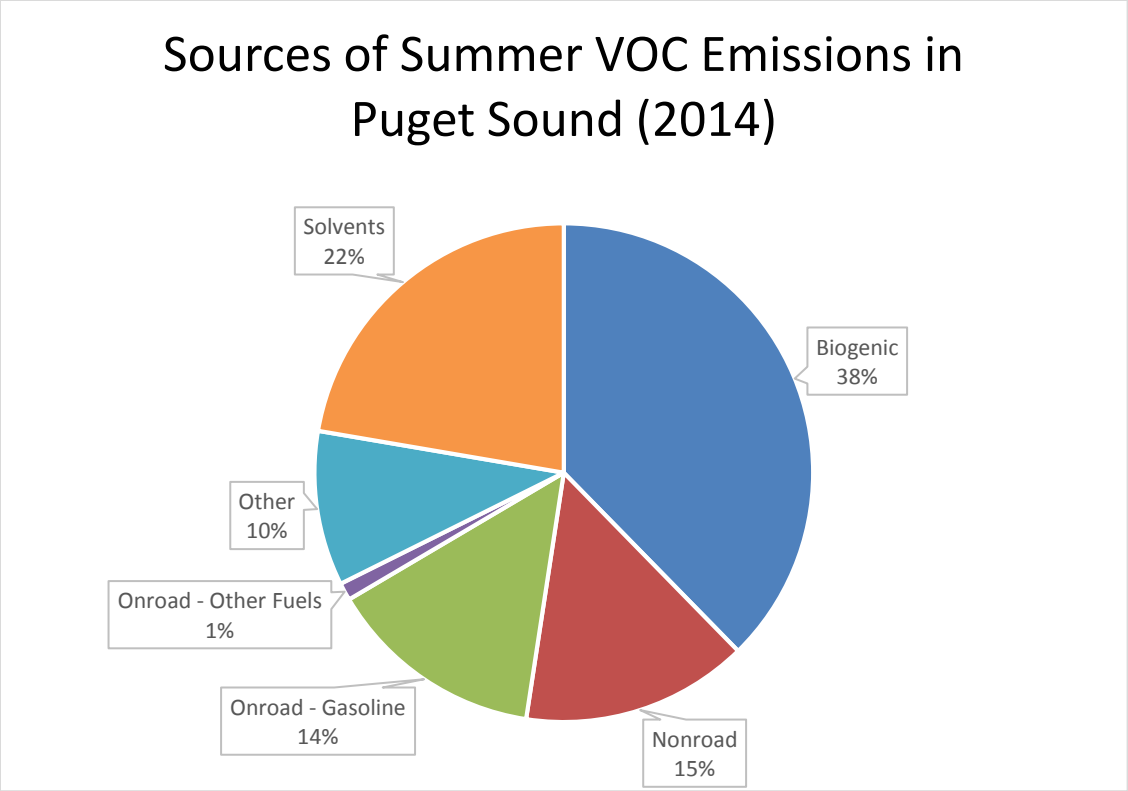


Figure 4: Sources of Summer VOC Emissions in Puget Sound (2014)

NO_x and VOCs from light-duty vehicles also contribute to relatively small levels of secondary fine particle ($PM_{2.5}$) formation. Table 5 shows the design values for $PM_{2.5}$ in the counties with a vehicle I/M program. The design values are below the 24-hour $PM_{2.5}$ NAAQS of 35 µg/m^3. $PM_{2.5}$ levels are highly influenced by residential wood smoke in the winter, and by wildfire smoke in the summer. The table includes the monitored design values, as well as estimates of the design values excluding exceedances during wildfire smoke incidents.

Table 5: 2015-2017 Air Quality Design Values for $PM_{2.5}$ in Vehicle I/M Areas, with and without wildfire exceedances

Monitor Location	2015-2017 Design Value	2015-2017 Design Value excluding Wildfire Exceedances
Clark (Vancouver-NE 84th)	31 µg/m^3	28 µg/m^3
King (Kent-Central & James)	27 µg/m^3	24 µg/m^3
King (Seattle-Duwamish)	25 µg/m^3	23 µg/m^3

Monitor Location	2015-2017 Design Value	2015-2017 Design Value excluding Wildfire Exceedances
King (Seattle-10th & Weller)	24 µg/m^3	21 µg/m^3
Snohomish (Marysville-7th)	29 µg/m^3	29 µg/m^3
Snohomish (Darrington)	34 µg/m^3	30 µg/m^3
Pierce (Tacoma-L St)	31 µg/m^3	28 µg/m^3
Spokane (Spokane-Augusta)	Not available*	Not available*

There is not enough data to determine the PM2.5 design value for Spokane-Augusta. The monitor is located on the roof of Spokane Regional Clean Air Agency, and was offline for five months in 2015 when the roof was being repaired.

Onroad mobile sources are small contributors to PM_{10} pollution, contributing 6.6 percent of total annual PM_{10} emissions in King and Pierce Counties.[15] The Seattle-Kent-Tacoma PM_{10} maintenance plan included emission testing of heavy duty diesel vehicles as a supporting control strategy. However, the maintenance plan did not rely on this strategy in the demonstration of maintenance for the area. This area has been in attainment with the PM_{10} NAAQS since 1990, and the risk of nonattainment is low. EPA approved removal of the PM_{10} monitors in the region. Table 6 below estimates the design values based off of nearby $PM_{2.5}$ monitors using the table look up method and the statistical fit method.

Table 6: Estimated 2017 PM_{10} Design Values for Seattle, Kent, and Tacoma[16]

Monitor Location	PM_{10} NAAQS	2014-2016 Estimated PM_{10} Design Value
King (Kent-Central & James)	150 µg/m^{3*}	59 ±12 µg/m^3
King (Seattle-Duwamish)	150 µg/m^{3*}	58 ±6 µg/m^3
Pierce (Tacoma-Alexander)	150 µg/m^{3*}	66 ±23 µg/m^3

*µg/m^3 = micrograms per cubic meter

[15] Department of Ecology, 2014 Comprehensive Emissions Inventory Summary, https://ecology.wa.gov/Asset-Collections/Doc-Assets/Air-quality/Emissions/2014EmissionInventoryTonYear.
[16] Department of Ecology, Verification of Continued Attainment in Limited Maintenance Areas (2018), Publication no. 18-02-019, https://fortress.wa.gov/ecy/publications/SummaryPages/1802019.html.

Onroad mobile sources contribute 2 percent of the total annual PM_{10} emissions in Spokane County. The main sources of PM_{10} pollution are from road dust, dust from construction activities, and dust from agricultural tilling and harvesting. In 2017, the western U.S. and Canada experienced a severe wildfire season, resulting in significant wildfire smoke impacts that caused four PM_{10} exceedances (September 4-7) in Spokane County. In 2013, eastern Washington experienced a haboob, a very strong dust storm, contributing to one PM_{10} exceedance (September 15, 2013) in Spokane. Ecology flagged these exceedances in EPA's Air Quality Systems as exceptional events. Table 7 below includes 5- year PM_{10} design values with and without the flagged exceedances. The 5-year design values were calculated to verify continued eligibility for the Limited Maintenance Plan approach.

Table 7: 2013-2017 PM_{10} Design Value for Spokane[17]

Monitor location	Design Value with All Data	Design Value Without Flagged Data
Spokane (Spokane-Augusta)	168 $\mu g/m^3$	79 $\mu g/m^3$

Emission Trends and Projections

Methods

Ecology used EPA's Motor Vehicle Emissions Simulation (MOVES) to estimate onroad motor vehicle emissions trends to show the effects of phasing out the vehicle I/M program while taking into account changing traffic volumes, motor vehicle emissions standards, and fuel standards.

Ecology evaluated emission trends and projections for the counties and pollutants listed in Table 8 below. These regions and pollutants were selected based on the maintenance status history for each area and based on the pollutants reduced by the vehicle I/M program.[18]

Table 8: Pollutants Evaluated for Counties Implementing Vehicle I/M Programs

County	Pollutants Evaluated
Clark	Summer NO_x, summer VOCs, summer and winter CO
King	Summer NO_x, summer VOCs, summer and winter CO
Pierce	Summer NO_x, summer VOCs, summer and winter CO, winter $PM_{2.5}$
Snohomish	Summer NO_x, summer VOCs, summer and winter CO
Spokane	Winter CO

[17] Ibid.

[18] PM_{10} was excluded from the MOVES analysis because the model does not credit PM_{10} reductions from the vehicle I/M program, and because the risk of PM10 nonattainment from onroad motor vehicle emissions is low.

Ecology calculated emissions at 5-year intervals from 2000 to 2040. Ecology also calculated the year 2019 since it is the last year of the vehicle I/M program. For 2000 to 2019, Ecology calculated emissions with and without the vehicle I/M program. For 2020 to 2040, Ecology projected emissions without the vehicle I/M program.

Ecology calculated weekday emissions under seasonal and meteorological conditions which are likely to produce the highest concentrations. We used attainment or maintenance plan season and temperatures for each area and pollutant.

The emissions projections also account for projected population growth, increases in vehicle miles traveled (VMT), and fleet turnover. Table 9 below shows the percent change in average daily VMT by county between 2000 and 2040.

Table 9: Percent Change in Average Daily Vehicle Miles Traveled, 2000 to 2040

County	Percent Change
Clark	126
King	17
Pierce	38
Snohomish	36
Spokane	45

Appendix D includes a description of the modeling and the key assumptions and parameters.

Results

The projections show that the vehicle I/M program reduces emissions of the criteria pollutants analyzed through 2019, the last year of the program. The emission reductions range from 2.8 percent to 6.7 percent depending on pollutant measured, location and time of year. Figure 5 shows the reduction in onroad emissions resulting from the vehicle I/M program in 2019, compared to no vehicle I/M program.

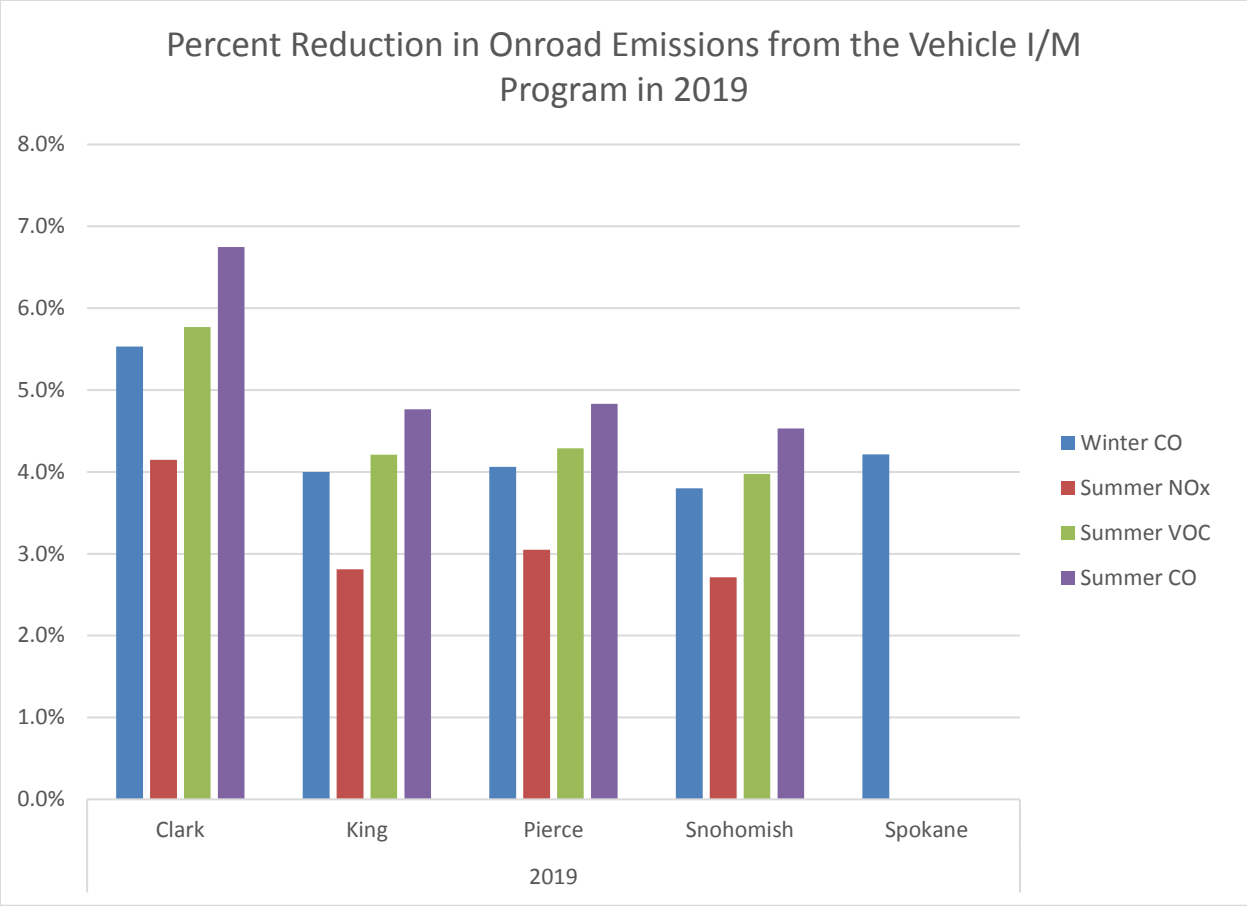


Figure 5: 2019 Percent Reduction in Onroad Emissions from the Vehicle I/M Program (compared to no Vehicle I/M Program)

Table 10 below shows the change in total onroad mobile source emissions from 2019, the last year of the vehicle I/M program, to 2020, with no vehicle I/M program. Emissions are projected to decline from 2019 to 2020 after the end of the vehicle I/M program, for all pollutants of concern for King, Pierce, Snohomish, and Spokane counties. In Clark county, small increases in emissions from 2019 to 2020 are projected for winter CO (+0.4 percent), summer CO (+2.5 percent), and summer VOCs (+0.3 percent), with a small emission reduction (-4.7 percent) projected for summer NO_x emissions.

Table 10: Percent Change in Onroad Emissions from 2019 (with vehicle I/M) to 2020 (without vehicle I/M)

	Clark	King	Pierce	Snohomish	Spokane
Winter CO	0.4	-1.6	-1.8	-1.6	-1.6
Summer CO	2.5	-0.3	-0.5	-0.4	-
Summer NO_x	-4.7	-7.5	-6.9	-7.1	-

	Clark	King	Pierce	Snohomish	Spokane
Winter $PM_{2.5}$	-	-	-6.2	-	-
Summer VOC	0.3	-2.0	-1.7	-1.7	-

Table 11 below shows the projected long-term reductions in onroad emissions from 2000 to 2040. The projections take into account the end of the vehicle I/M program on December 31, 2019. Onroad vehicle emissions are projected to go down by 86 to 95 percent from 2000 to 2040. The vehicle I/M program reduces onroad emissions from 2000 through 2019, and emissions continue to decline significantly from 2020 to 2040 with no vehicle I/M program. This is mainly because of advances in vehicle technology and because people are replacing older, higher-polluting vehicles with newer, less polluting vehicles.

Table 11: Percent Change in Onroad Emissions from 2000 to 2040 (with Vehicle I/M Program Removed in 2020)

	Clark	King	Pierce	Snohomish	Spokane
Winter CO	-88	-91	-91	-91	-91
Summer CO	-86	-91	-91	-90	-
Summer NO_x	-90	-95	-95	-94	-
Winter $PM_{2.5}$	-	-	-91	N/A	-
Summer VOC	-85	-90	-88	-88	-

The sections below include detailed results for each pollutant and county.

Winter CO Season

The vehicle I/M program reduces winter CO in the five vehicle I/M counties, as shown in Figure 6 below. The emission reduction benefit from the vehicle I/M program increased for most counties between 2000 and 2005, then declined gradually from 2005 to 2019, the last year of the vehicle I/M program. In 2019, the vehicle I/M program is expected to reduce winter CO between 3.8 percent in Snohomish County to 5.5 percent in Clark County, compared to winter CO levels if there was no vehicle I/M program.

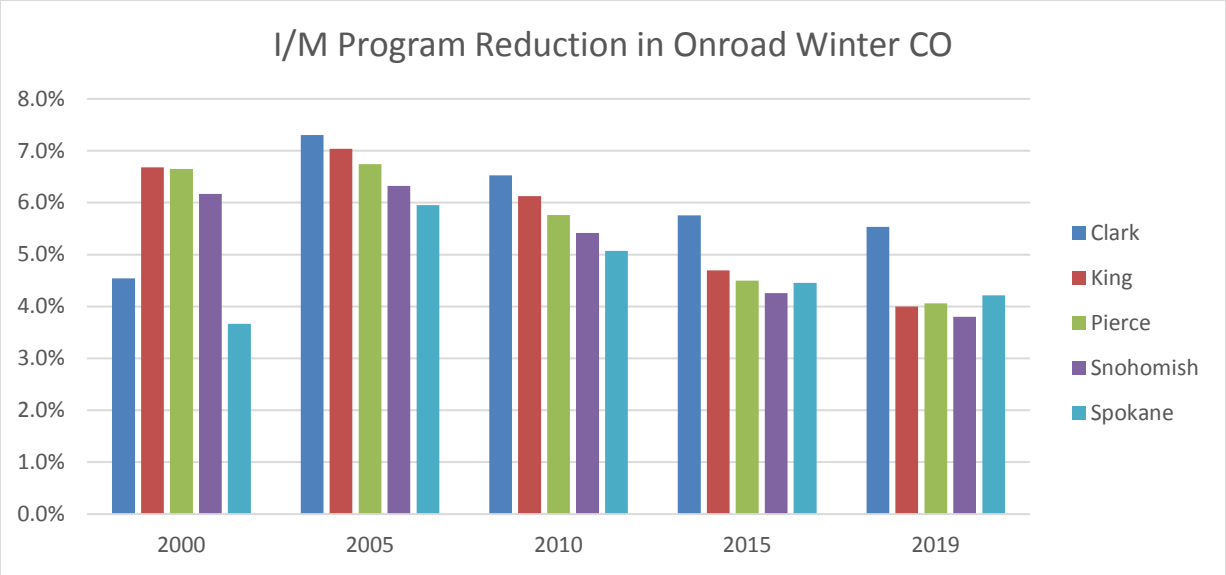


Figure 6: I/M Program Reduction in Onroad Winter CO

Figure 7 below shows the long-term reduction in onroad winter CO for King County of 91 percent from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019. The reduction in winter CO from the vehicle I/M program is small relative to the reduction from fleet turnover and stronger vehicle emission standards.

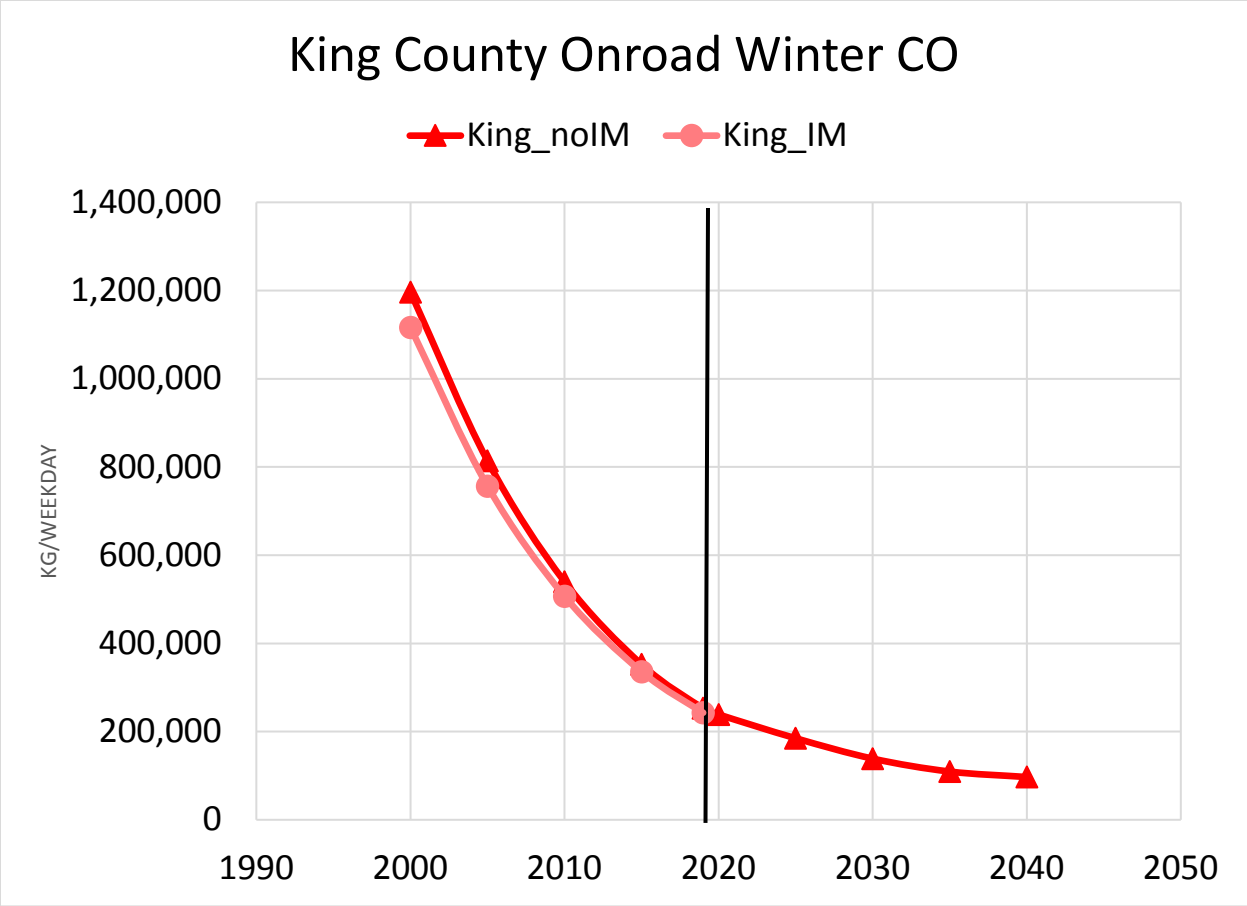


Figure 7: King County Onroad Winter CO

Figure 8 below shows the long-term reduction in onroad winter CO for Clark, Pierce, Snohomish, and Spokane counties from 2000 to 2040 of 88 to 91 percent, as well as the added reduction from the vehicle I/M program from 2000 to 2019.

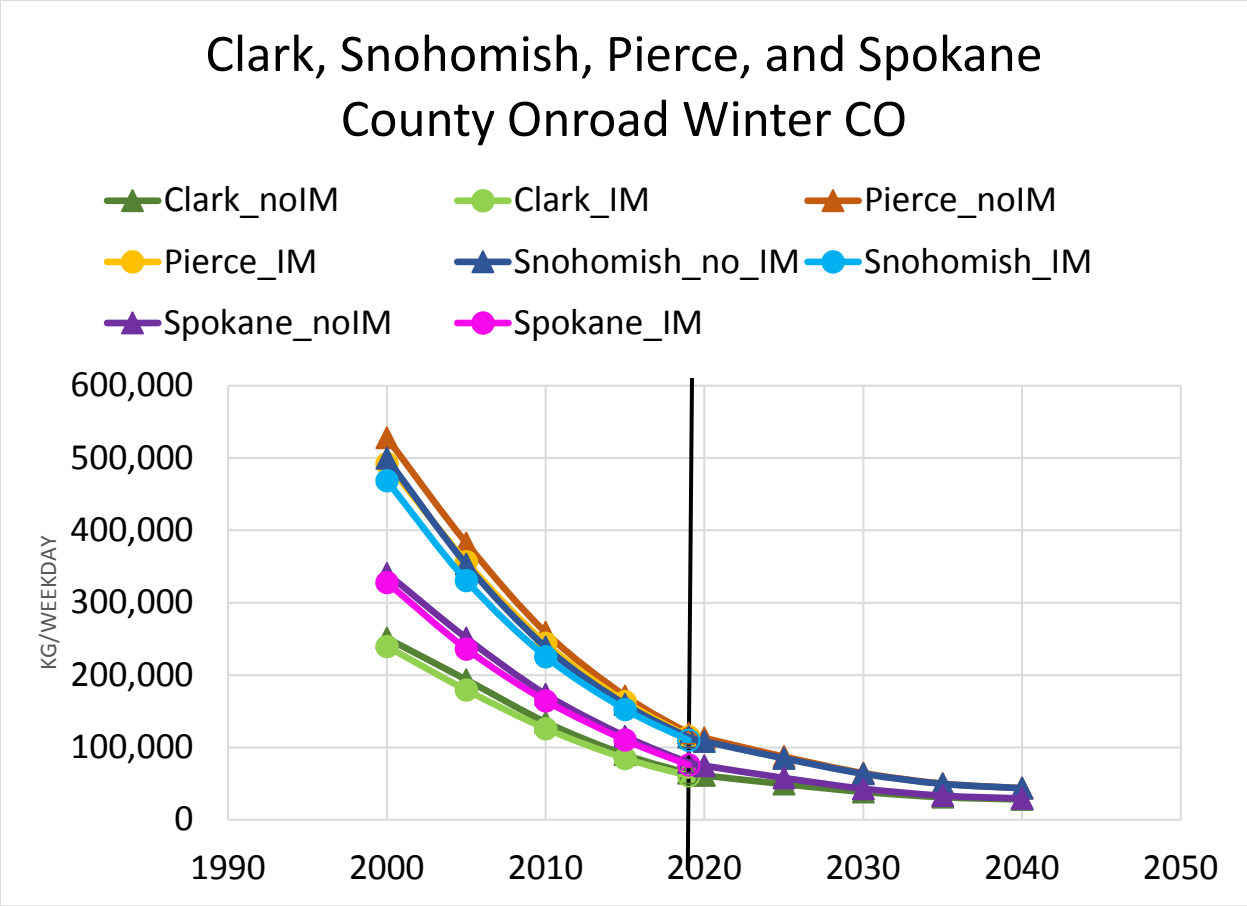


Figure 8: Clark, Snohomish, Pierce, and Spokane County Onroad Winter CO

Summer O_3 Season

NO_x

The vehicle I/M program reduces onroad summer NO_x emissions in Clark, King, Pierce, and Snohomish counties. The reduction is relatively small. In 2019, the reduction ranges from 2.7 percent in Snohomish County to 4.1 percent in Clark County.

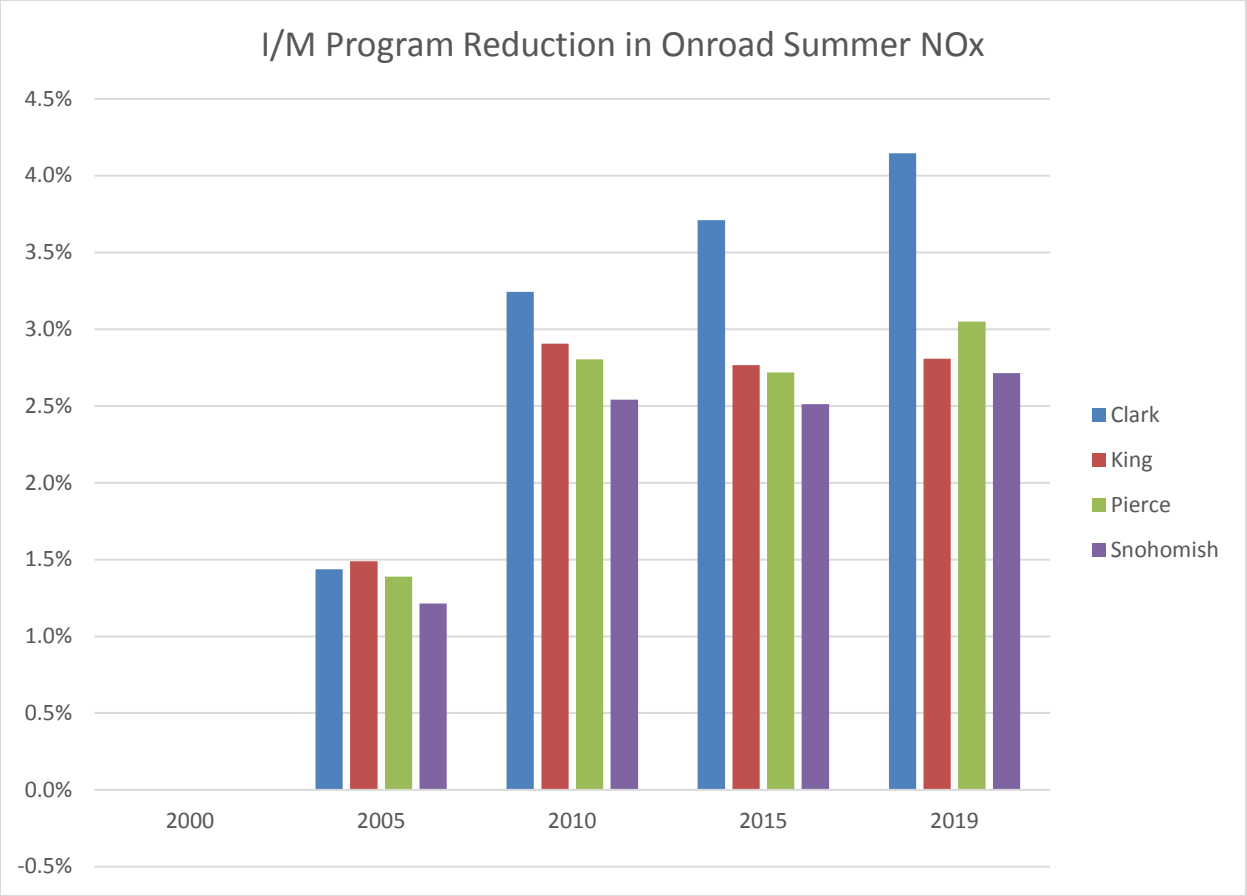


Figure 9: I/M Program Reduction in Onroad Summer NO_x

Figure 10 below shows the long-term reduction in onroad summer NO_x by 95 percent in King County from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019. The reduction in summer NO_x from the vehicle I/M program is small relative to the reduction from fleet turnover and stronger vehicle emission standards.

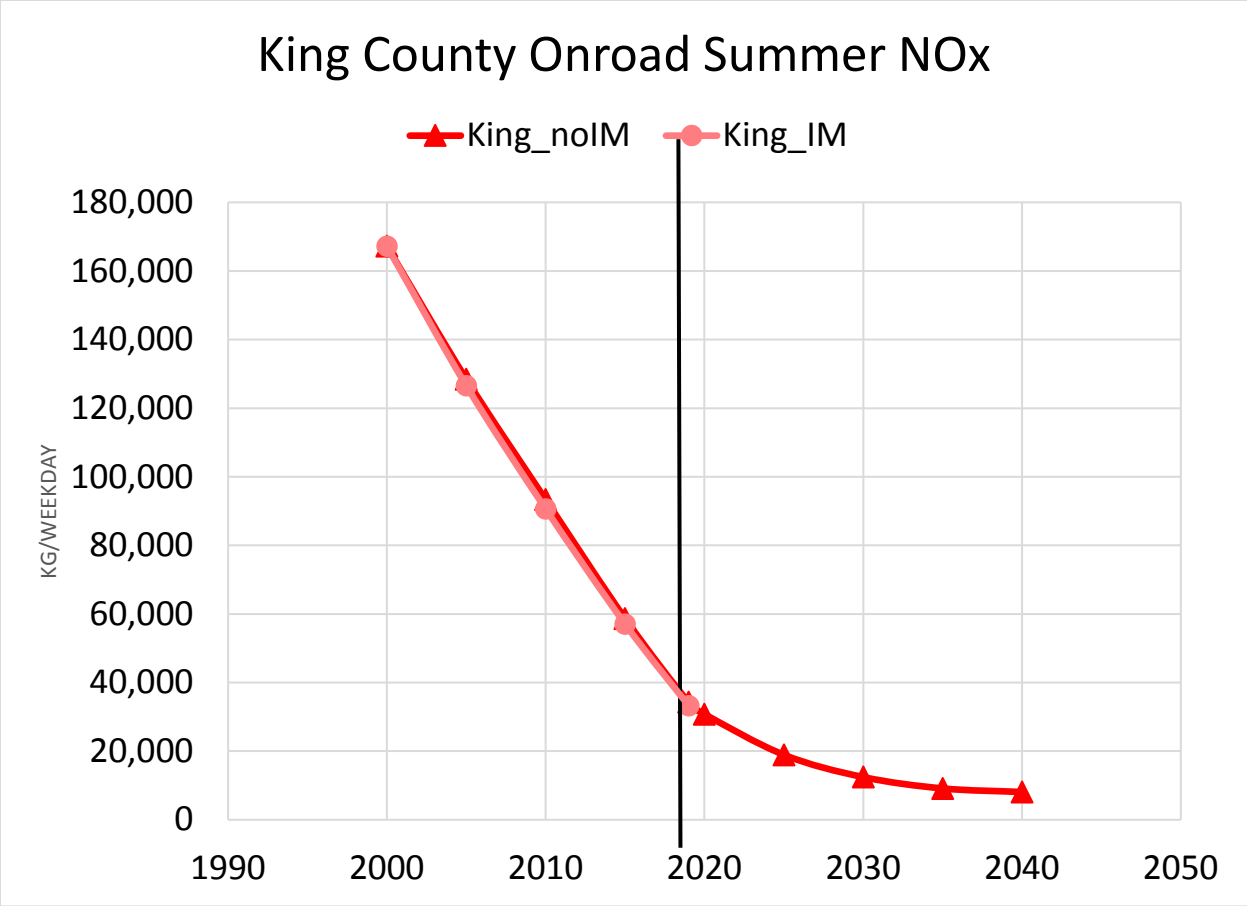


Figure 10: King County Onroad Summer NO_x

Figure 11 below shows the long-term reduction in onroad summer NO_x of over 90 percent for Clark, Pierce, and Snohomish counties from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019.

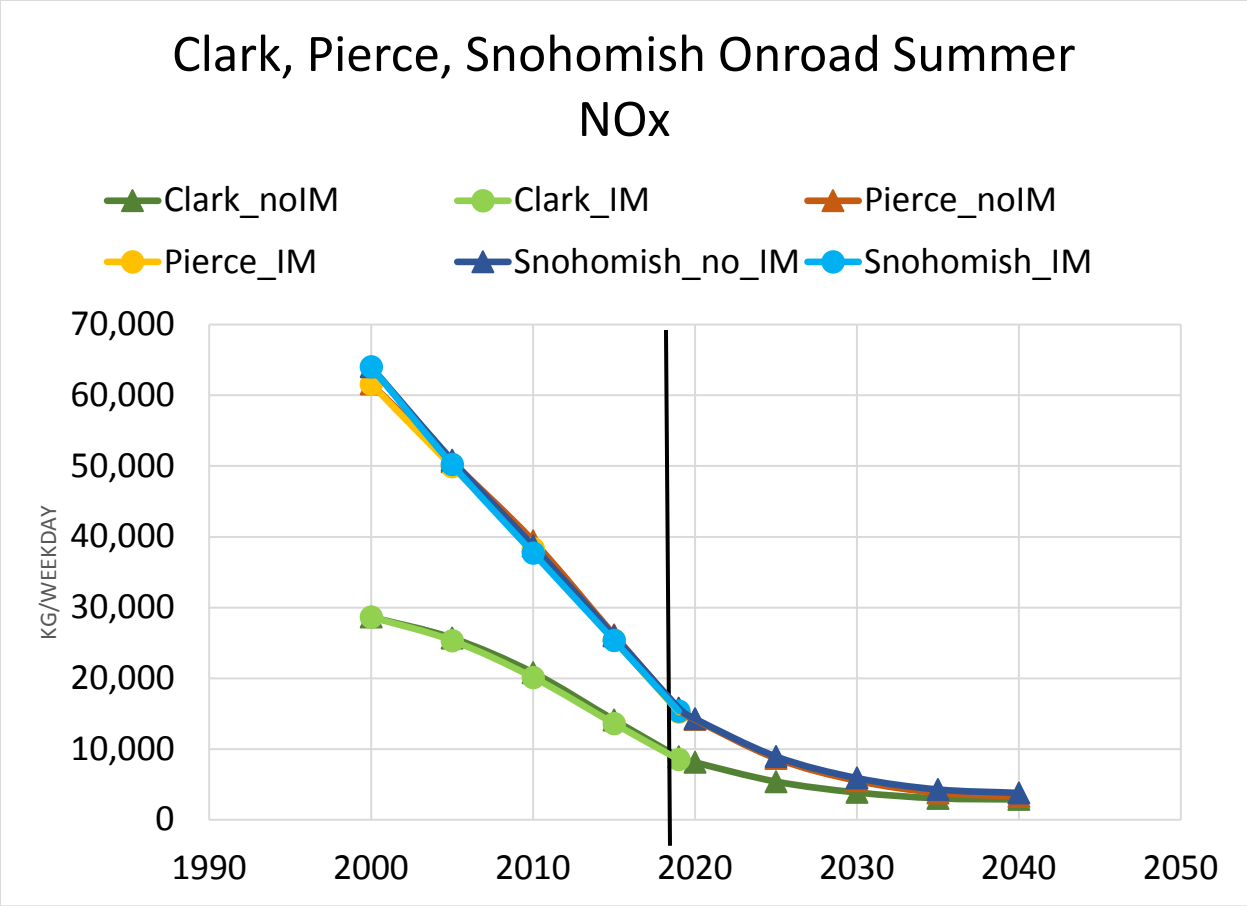


Figure 11: Clark, Pierce, Snohomish Onroad Summer NO_x

VOCs

The vehicle I/M program reduces onroad summer VOCs for Clark, King, Pierce, and Snohomish counties, as shown in Figure 12 below. The reductions increased slightly from 2000 to 2005 and declined from 2005 to 2019. For 2019, the reductions are expected to range from 4 percent in Snohomish County to 5.8 percent in Clark County.

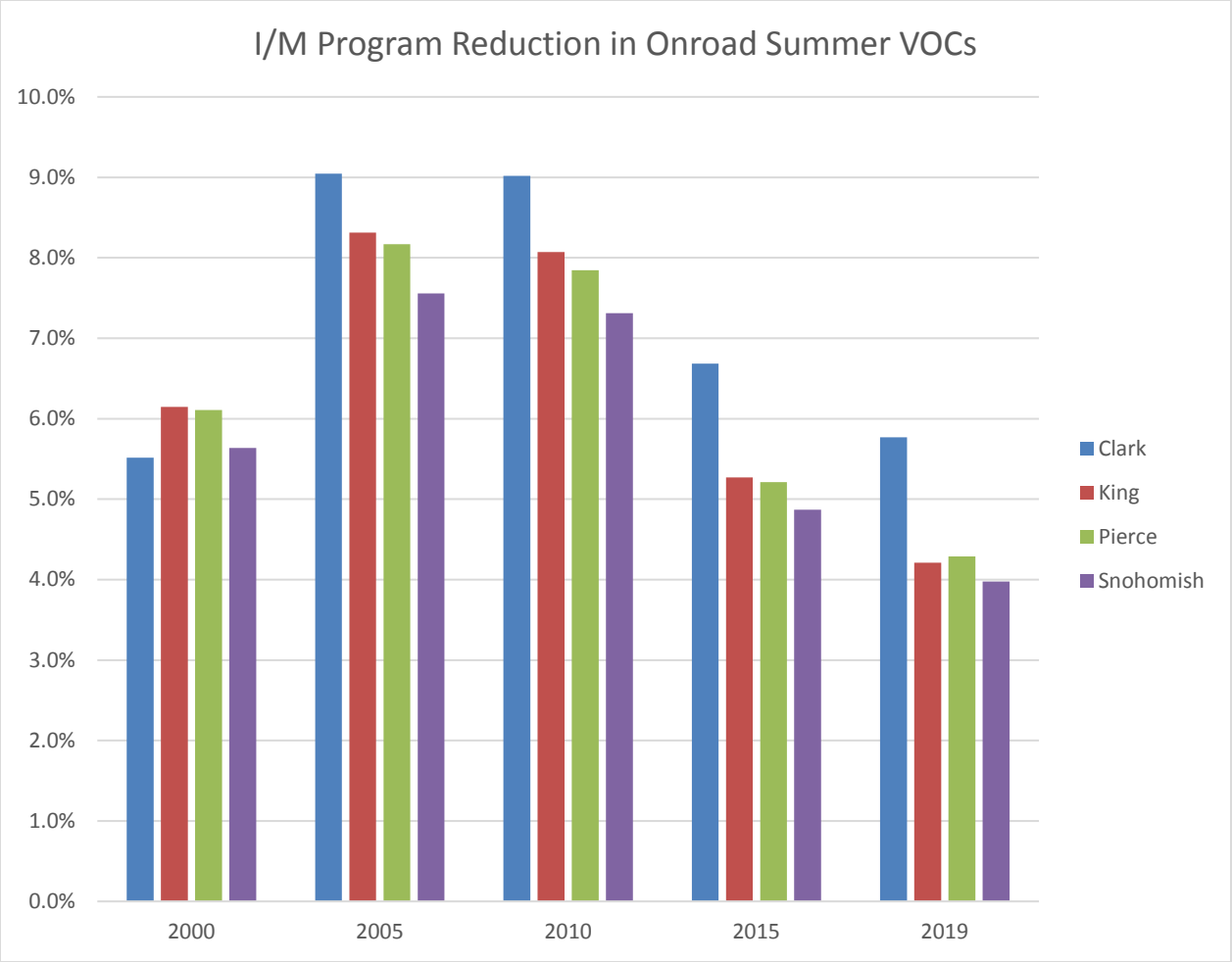


Figure 12: I/M Program Reduction in Onroad Summer VOCs

Figure 13 below shows the long-term reduction in onroad summer VOCs of 90 percent for King County from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019. The reduction in summer VOCs from the vehicle I/M program is small relative to the reduction from fleet turnover and stronger vehicle emission standards.

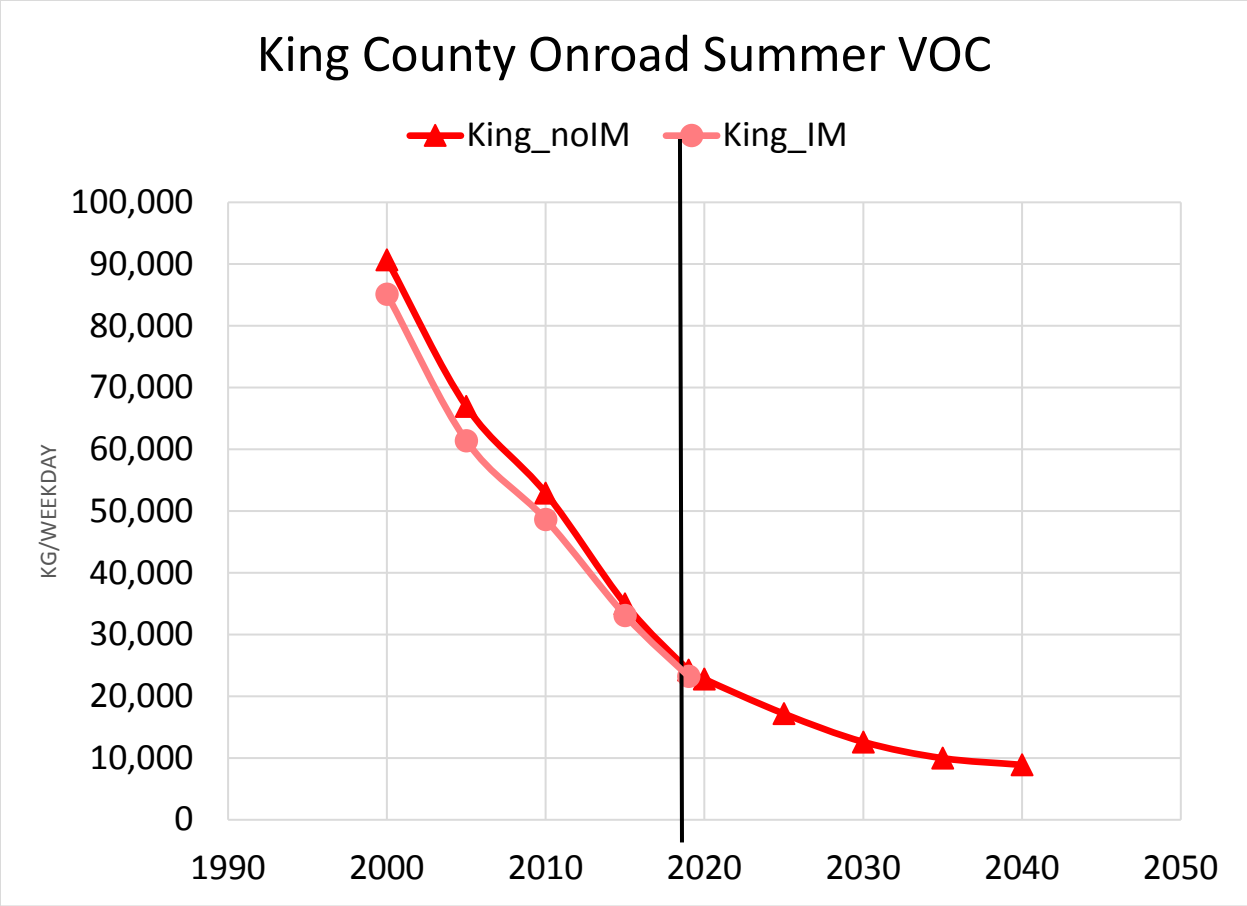


Figure 13: King County Onroad Summer VOC

Figure 14 below shows the long-term reduction in onroad summer VOCs of 85 to 88 percent for Clark, Pierce, and Snohomish counties from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019.

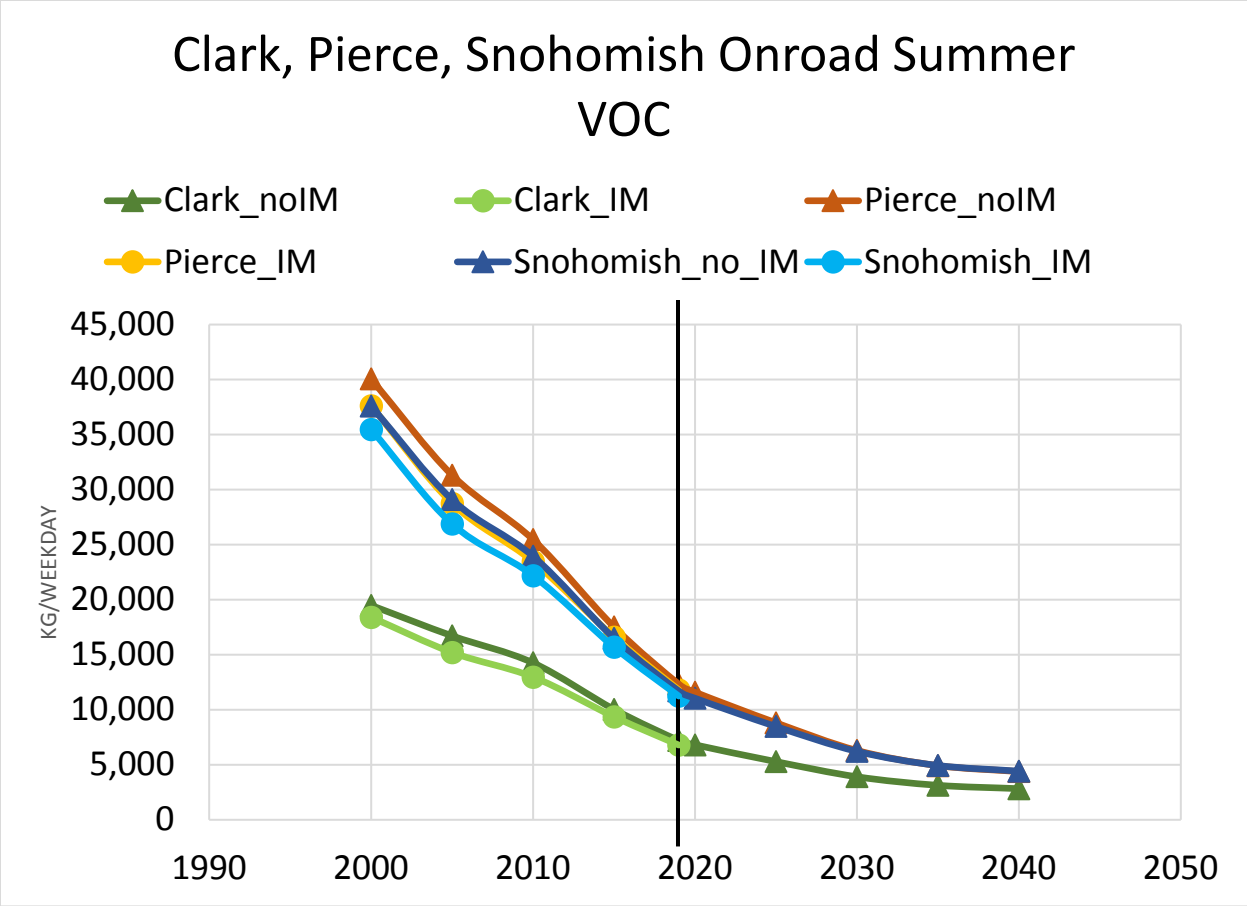


Figure 14: Clark, Pierce, Snohomish Onroad Summer VOC

Summer CO

The vehicle I/M program reduces onroad summer CO in Clark, King, Pierce, and Snohomish counties, as shown in Figure 15 below, although the reduction has been declining over 2005 to 2019. For 2019, the reduction is expected to range from 4.5 percent for Snohomish County to 6.7 percent for Clark County.

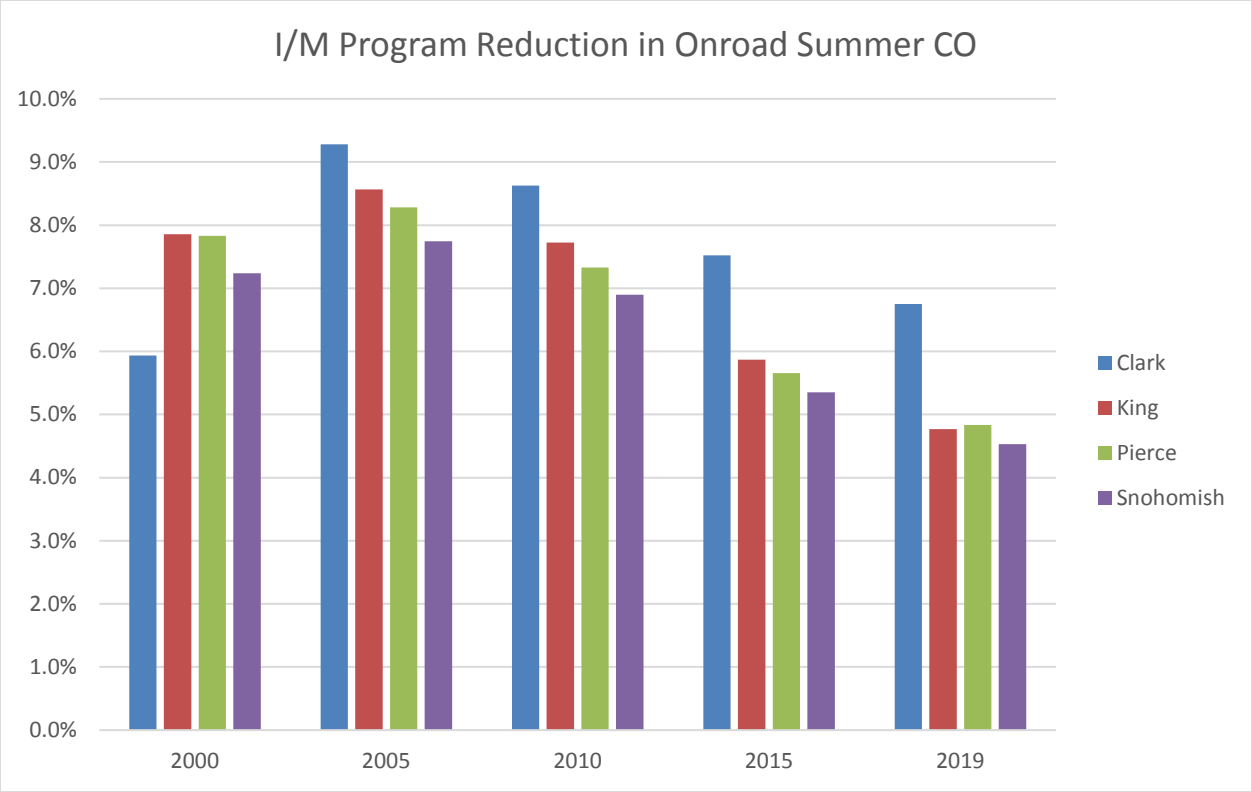


Figure 15: I/M Program Reduction in Onroad Summer CO

Figure 16 below shows the long-term reduction in onroad summer CO of 91 percent for King County from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019. The reduction in summer CO from the vehicle I/M program is small relative to the reduction from fleet turnover and stronger vehicle emission standards. Emissions continue to decline after the sunset of the vehicle I/M program.

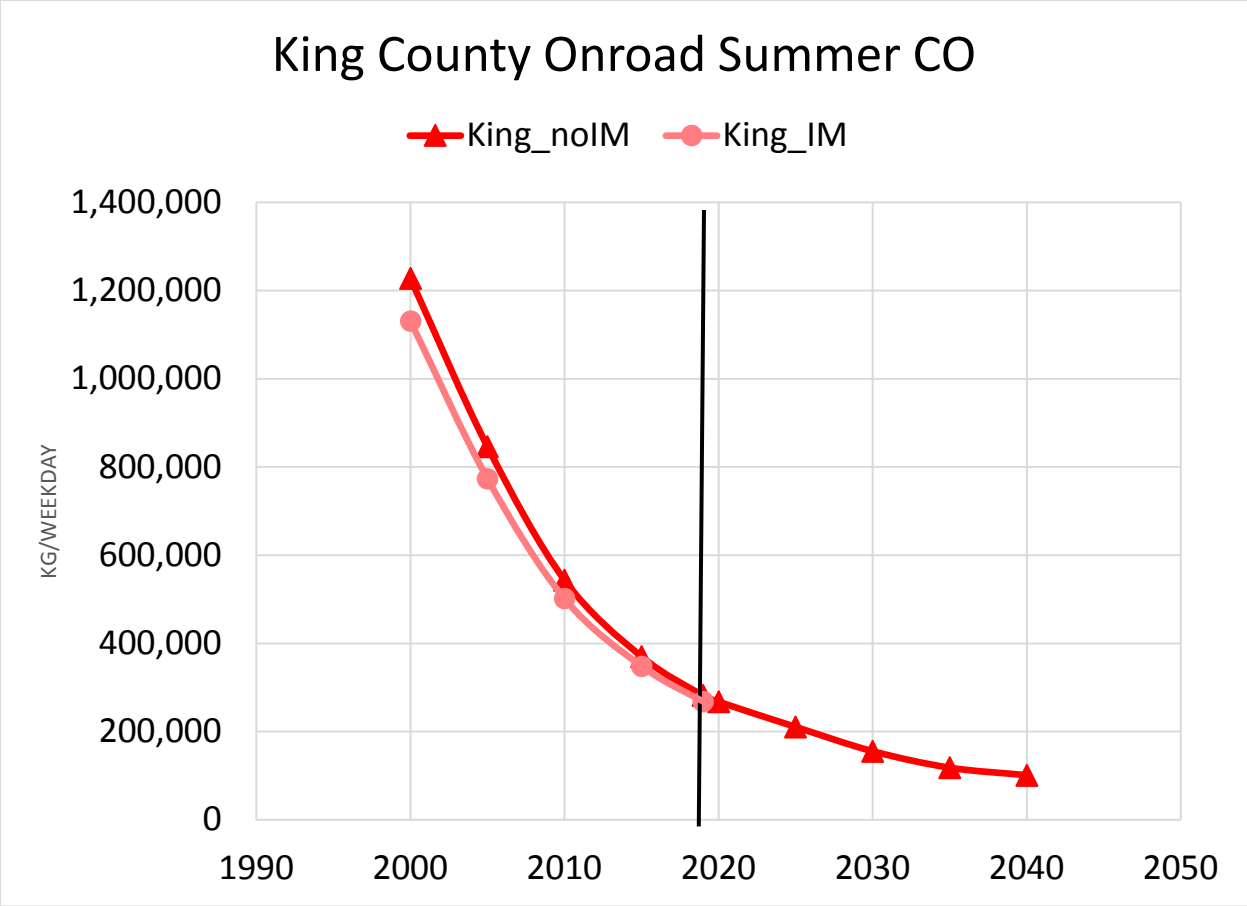


Figure 16: King County Onroad Summer CO

Figure 17 below shows the decline in onroad summer CO of 86 to 91 percent for Clark, Pierce, and Snohomish counties from 2000 to 2040, as well as the added reduction from the vehicle I/M program from 2000 to 2019. Emissions continue to decline after the sunset of the vehicle I/M program.

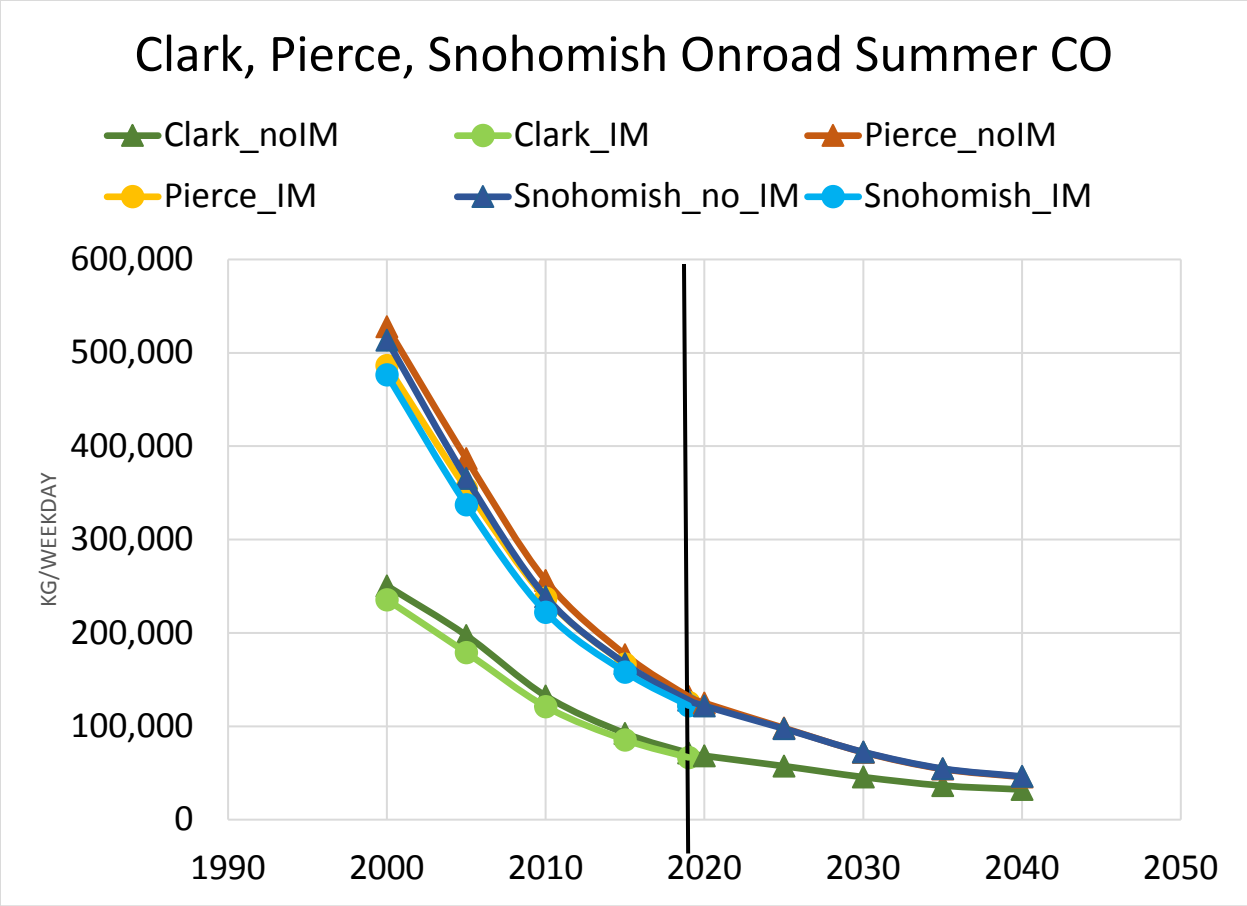


Figure 17: Clark, Pierce, Snohomish Onroad Summer CO

Winter $PM_{2.5}$ Season

Figure 18 below shows the projected reduction in onroad motor vehicle emissions of $PM_{2.5}$ by 91 percent from 2000 to 2040 for the Tacoma-Pierce County region, a current $PM_{2.5}$ maintenance area. NO_x emissions from onroad mobile sources is a relatively small contributor to secondary $PM_{2.5}$. EPA's MOVES model does not give credit for reducing winter $PM_{2.5}$ from the vehicle I/M program.

The main source of $PM_{2.5}$ in the Tacoma-Pierce County maintenance area is from residential wood smoke.[19] Tacoma-Pierce County was re-designated to attainment for $PM_{2.5}$ in 2015 as a result of successful strategies to reduce residential wood smoke.

[19] Washington Department of Ecology, October 2014, Tacoma-Pierce County Maintenance Plan and Redesignation Request, Pub no. 14-02-021, https://fortress.wa.gov/ecy/publications/documents/1402021.pdf

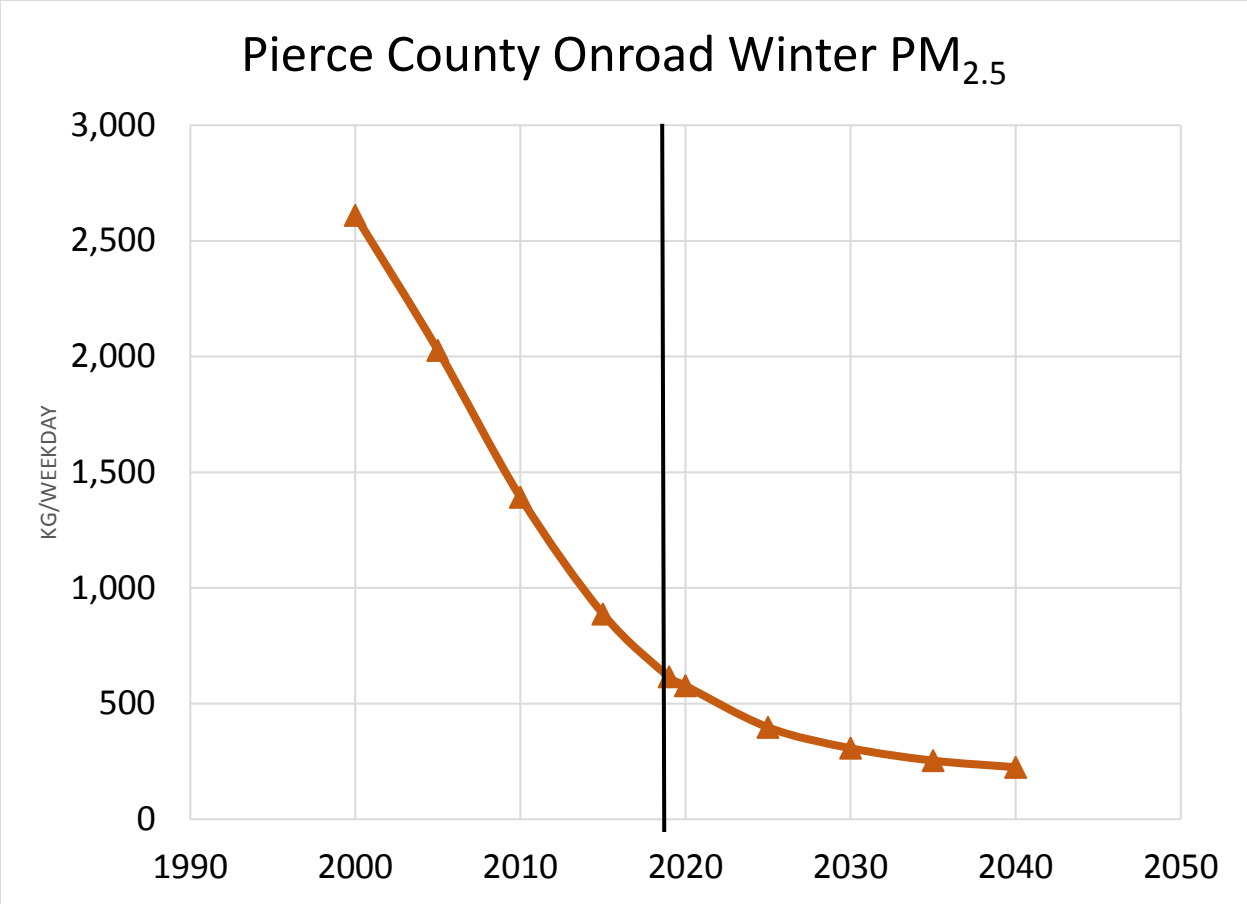


Figure 18: Pierce County Onroad Winter $PM_{2.5}$

Consistency with maintenance plans

Ecology reviewed the maintenance plan transportation conformity analysis for the Spokane CO maintenance area,[20] and the emissions inventory and conformity analysis for the Tacoma Pierce County $PM_{2.5}$ Maintenance area.[21] We determined that we do not need to update the emissions projections and motor vehicle emissions budgets. This is because the maintenance plans already demonstrated continued attainment with the vehicle I/M program concluding in 2019. The vehicle I/M program was not included in the maintenance demonstration for the Seattle-Kent-Tacoma PM_{10} limited maintenance plan, so we don't need to make any adjustments to the technical analysis in the maintenance plan.

[20] Spokane Regional Clean Air Agency, in conjunction with Washington Department of Ecology, April 2016, SIP Revision for the Spokane County, Washington Second 10-Year Limited Maintenance Plan for Carbon Monoxide, https://www.spokanecleanair.org/documents/air%20quality%20monitoring%20reports%20studies/COLMP.pdf.
[21] Washington State Department of Ecology, Proposed State Implementation Plan Revision: Tacoma-Pierce County PM2.5 Redesignation Request and Maintenance Plan, October 2014, Pub. no 14-02-021, https://fortress.wa.gov/ecy/publications/documents/1402021.pdf.

Conclusion

The vehicle I/M program was a key strategy that helped Clark, King, Pierce, Snohomish, and Spokane counties reduce air pollution and meet and maintain the NAAQS. The Seattle-Tacoma area was re-designated to attainment for CO in 1996, Puget Sound for O_3 in 1996, Vancouver for CO in 1996, and Vancouver-Portland for O_3 in 1997, Seattle-Kent-Tacoma for PM_{10} in 2001, and the Spokane area for CO in 2005.

Emissions from onroad motor vehicles continued to decline significantly since the areas achieved attainment, and we expect them to decrease after 2019, as a result of fleet turnover and adoption of the stronger California LEV II vehicle emission standards. The benefits of fleet turnover and stronger vehicle emission standards outweigh the relatively small benefits of the vehicle I/M program. The vehicle I/M program is achieving smaller emission reductions over time.

Levels of CO and NO_x in the ambient air are well below the health-based NAAQS. Levels of O_3 remained below the NAAQS in Puget Sound through 2016. The wildfire smoke in the summer of 2017 contributed to an extraordinary number of exceedances, which pushed the O_3 design value over the NAAQS at Enumclaw.

In conclusion, this analysis shows that the ongoing reductions of VOCs, NO_x, and CO from implementation of the California LEV II motor vehicle emission standards are achieving and will continue to achieve greater emissions reductions than the vehicle I/M program. $PM_{2.5}$ emissions from onroad motor vehicles are also projected to continue to decline in Pierce County. Ecology concludes that the removal of the vehicle I/M program will not interfere with attainment and maintenance of the NAAQS or any other Clean Air Act requirement.

Request to EPA

The vehicle I/M program is no longer required under federal regulations, and the Washington Legislature established the December 31, 2019 date for the program to end in Washington. Since the program is ending in 2019, Ecology requests that EPA:

1. Remove Chapter 173-422 WAC – Motor Vehicle Emission Inspection from the SIP and the list of EPA approved statewide regulations.
2. Remove Washington's vehicle I/M program from the SIP.
3. Remove the vehicle I/M program as an active control measure and add it to the list of contingency measures that Ecology will consider if a violation of the NAAQS occurs in the future for the following maintenance plans:
    - Seattle-Tacoma CO
    - Puget Sound O_3
    - Seattle-Kent-Tacoma PM_{10}
    - Vancouver CO
    - Vancouver portion of the Vancouver-Portland O_3
    - Spokane CO

If a contingency measure is triggered under the maintenance plan, Ecology will work with the local clean air agency to evaluate the cause of the NAAQS violation, and determine if the vehicle I/M program is the appropriate control measure. Ecology will work with the Legislature to seek the authority to adopt the vehicle I/M program regulations if a vehicle I/M program is found to be an appropriate and effective control strategy. Ecology will adopt or consider adopting regulations to implement the vehicle I/M program to correct the violation of the NAAQS, in accordance with the maintenance plan.

The maintenance plans provide a schedule that involves a commitment to adopt and expeditiously implement necessary corrective actions should the need be triggered, and a commitment to put the measures in place within 18 months of a triggering event.

Appendices

Appendix A. Washington's SIP Approved Chapter 173-422 WAC – Motor Vehicle Emission Inspection

173-422-010 Purpose.

This chapter implements the Washington Clean Air Act, chapter 70.94 RCW, as supplemented by the motor vehicle emission inspection provisions codified as chapter 70.120 RCW.

Gasoline motor vehicles are the primary emitters of CO and emit significant quantities of hydrocarbons and oxides of nitrogen. Diesel motor vehicles are emitters primarily of particulates, hydrocarbons, and oxides of nitrogen. Emission controls required by the federal government are designed to reduce motor vehicle related air pollution. However, the effectiveness of these controls is substantially reduced through deterioration, maladjustment and tampering. Motor vehicle emission inspection serves to identify high polluting vehicles and vehicles with tampered or missing emission controls and to reduce their emissions, when such reduction can be accomplished at reasonable cost. These rules establish the emission standards, testing procedures, and associated activities necessary to implement a program of air pollution prevention and control resulting from motor vehicle emission inspections.

State effective: 6/3/93; EPA effective: 9/25/96

173-422-020 Definitions.

Unless a different meaning is clearly indicated by context, the following definitions will apply:

(1) "Appropriate repair" means the diagnosis of the cause(s) of an emission test failure and/or the repair of one or more of these causes. An appropriate repair should reduce at least one emission test reading or diagnose and/or repair an emission problem identified by the on-board diagnostic (OBD) system.

(2) "Certificate of acceptance" means an official form, issued by someone authorized by the department, which certifies that the following conditions have been met:

(a) The vehicle failed an emission inspection; and

(b) The vehicle failed a re-inspection; and

(c) All primary emission control components installed by the vehicle manufacturer, or its appropriate replacement, are installed and operative; and

(d) The recipient has provided original receipts listing and providing the cost of each appropriate repair performed by an authorized emission specialist between the initial and last inspection; and

(e) The total cost of the appropriate repairs must equal or exceed:

Pre-1981 vehicles $100
1981 and newer $150

(3) "Certificate of compliance" means an official form, issued by someone authorized by the department, which certifies that the recipient's vehicle on inspection complied with applicable emission inspection standards.

(4) "Authorized emission specialist" means an individual who has been issued a certificate of instruction by the department as authorized in RCW 70.120.020 (2)(a) and has maintained the certification by meeting requirements of WAC 173- 422-190(2).

(5) "Dealer" means a motor vehicle dealer, as defined in chapter 46.70 RCW as amended, that is licensed pursuant to chapter 46.70 RCW.

(6) "Department" means the department of ecology.

(7) "Emission contributing area" means a land area within whose boundaries are registered motor vehicles that contribute significantly to the violation of motor vehicle related air quality standards in a noncompliance area.

(8) "Fleet" means a group of fifteen or more motor vehicles owned or leased concurrently by one owner assigned a fleet identifier code by the department of licensing.

(9) "Gross vehicle weight rating (GVWR)" means the manufacturer stated gross vehicle weight rating.

(10) "Motor vehicle" means any self-propelled vehicle required to be licensed pursuant to chapter 46.16 RCW.

(11) "Noncompliance area" means a land area within whose boundaries any air quality standard for any air contaminant from the emissions of motor vehicles will probably be exceeded.

(12) "PPM" means parts per million by volume.

(13) "Primary emission control components" means the components of the vehicle installed by the manufacturer for the purpose of reducing emissions or its replacement or modification which is acceptable to the United States Environmental Protection Agency. These components are, but are not limited to, the catalytic converter or thermal reactor, the air injection system components, the thermostatic air cleaner, the exhaust gas recirculation system components, the evaporative emission system components including the gas cap, the positive crankcase ventilation system components, and the electronic control unit components that control the air/fuel mixture and/or ignition timing including all related sensors.

The primary emission control components of a vehicle with a different engine than the engine originally installed shall be an Environmental Protection Agency certified

engine/emission control combination for that vehicle or its newer model.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-030 Vehicle Emission Inspection Requirement.

All motor vehicles, not specifically exempted by WAC 173-422-170, which are registered or reregistered within the boundaries of an emission contributing area, as specified in WAC 173- 422-050, are subject to the vehicle emission inspection requirements of this chapter. In addition, the department may require an emission inspection of a motor vehicle, except military tactical vehicles, operated for more than sixty days a year on a federal installation located within an emission contributing area, or a vehicle garaged at a location within an emission contributing area, or a vehicle which has previously passed an emission inspection but has been identified using on road testing as likely to no longer comply with the inspection standards. Neither the department of licensing, county auditors nor subagents appointed under RCW 46.01.140 may change the registered owner or may issue or renew a motor vehicle license for any vehicle registered in an emission contributing area, as that area is established under RCW 70.120.150, unless the application for issuance or renewal is: (1) Accompanied by a valid certificate of compliance issued pursuant to RCW 70.120.080 or 70.120.170 or a valid certificate of acceptance issued pursuant to RCW 70.120.070; or (2) exempted from this requirement pursuant to RCW 46.16.015(2). Certificates must have a date of validation which is within twelve months of the assigned license renewal date.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-031 Vehicle Emission Inspection Schedules.

(1) Vehicles defined in RCW 46.16.015(2) or WAC 173-422-170 are exempt from emission inspections. Vehicles five through twenty- five years old, other than state and local government vehicles, shall be inspected every other year as described in the table below. This inspection schedule does not apply to vehicles that have already been issued a certificate of compliance or a certificate of acceptance within twelve months of the assigned license renewal date.

Year	Model Year of Vehicles Needing Inspection
2002	1978, 1980, 1982, 1984, 1986, 1988, 1990, 1992, 1994, 1997
2003	1979, 1981, 1983, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 1998
2004	1980, 1982, 1984, 1986, 1988, 1990, 1992, 1994, 1997, 1999
2005	1981, 1983, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 1998, 2000
2006	1982, 1984, 1986, 1988, 1990, 1992, 1994, 1997, 1999, 2001
2007	1983, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 1998, 2000, 2002
2008	1984, 1986, 1988, 1990, 1992, 1994, 1997, 1999, 2001, 2003
2009	1985, 1987, 1989, 1991, 1993, 1995, 1996, 1998, 2000, 2002, 2004
2010	1986, 1988, 1990, 1992, 1994, 1997, 1999, 2001, 2003, 2005

2011 1987, 1989, 1991, 1993, 1995, 1996, 1998, 2000, 2002, 2004, 2006
2012 1988, 1990, 1992, 1994, 1997, 1999, 2001, 2003, 2005, 2007

(2) State and local government vehicles five through twenty-five years old shall be inspected yearly as described in the table below.

Year Model Year of Vehicles Needing Inspection

2002 1977 through 1997
2003 1978 through 1998
2004 1979 through 1999
2005 1980 through 2000
2006 1981 through 2001
2007 1982 through 2002
2008 1983 through 2003
2009 1984 through 2004
2010 1985 through 2005
2011 1986 through 2006
2012 1987 through 2007

State effective: 7/4/02; EPA effective: 9/10/15

173-422-040 Noncompliance areas.

The Following Areas Are Designated Noncompliance Areas For The Air Contaminants Specified: Carbon Monoxide

(1) The City of Seattle.

(2) The City of Bellevue.

(3) The City of Spokane.

(4) The City of Tacoma.

(5) The City of Vancouver.

(6) The City of Everett.

State effective: 6/3/93; EPA effective: 9/25/96

173-422-50 Emission Contributing Areas.

Emission contributing areas within which the motor vehicle emission inspection program

applies are designated by the following United States Postal Service ZIP codes as of September 1, 1994, set forth below:

PUGET SOUND REGION

98001	98036	98083
98002	98037	98092
98003	98038	98093
98004	98039	98101 thru 98199 inclusive except 98110
98005	98040	98201 thru 98208
98006	98041	98258
98007	98042	98270
98008	98043	98271
98009	98046	98275
98011	98047	98290
98012	98052	98291
98015	98053	98327
98020	98054	98332
98021	98055	98335
98023	98056	98338
98025	98057	98344
98026	98058	98352
98027	98059	98354
98028	98062	98371 thru 98374
98031	98063	98387
98032	98064	98388
98033	98071	98390
98034	98072	98401 thru 98499
98035	98073	

SPOKANE REGION

99001

99005

99014

99016

99019

99021

99025

99027

99037

99201 thru 99299

VANCOUVER REGION

98604 except north of N.E. 279th

Street 98606

98607

98629 except east of N.E. 50th

Avenue 98642

98660 thru 98668

98761 except Skamania

County 98682 - 86

State effective: 11/9/96; EPA effective: 6/18/97

173-422-060 Gasoline Vehicle Emission Standards.

Gasoline motor vehicles subject to this chapter shall:
(1) When tested using the exhaust emission testing procedures described in (II) Two Speed Idle Test of Appendix B Test Procedures of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of Chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992, meet the applicable exhaust emission standards from the following table during both the idle and higher speed mode.

Two Speed Idle Test Exhaust Emission Standards

Model Year	CO(%) *	HC (ppm) *
80 and earlier	3.0	600

81 and newer (0-8500 GVWR)	1.2	220
81 and newer (Greater than 8500 GVWR)	3.0	400

*Carbon monoxide(CO) and hydrocarbons (HC), measured as a percentage (%) or parts per million (ppm) of the exhaust volume.

(2) When tested using the acceleration simulation mode (ASM) procedure specified in WAC 173-422-070 meet the following standards during that mode and the applicable standard from WAC-173-422-060(1) during the idle mode.

ASM Mode Exhaust Emission Standards

Model Year Weight (lbs.)	CO(%) *	HC (ppm) *
1980 and earlier model year cars and trucks (0-8500 lbs. GVWR)		
1750	4.2	400
1875	4.0	380
2000	3.8	350
2125	3.6	340
2250	3.4	320
2375	3.2	300
2500	3.0	290
2625	2.9	270
2750	2.8	260
2875	2.7	250
3000	2.6	240
3125	2.5	230
3250	2.4	220
3375	2.3	220
3500	2.2	210

3625	2.1	200
cars 3750 & greater	2.1	200
trucks 3750 & greater	2.5	300
1981 & later model year cars and trucks (0-8500 lbs. GVWR)		
1750	1.8	250
1875	1.7	240
2000	1.6	220
2125	1.5	210
2250	1.5	200
2375	1.4	190
2500	1.3	180
2625	1.3	180
2750	1.2	170
2875	1.2	160
3000	1.1	160
3125	1.1	150
3250	1.0	150
3375	1.0	150
3500	1.0	150
3625	1.0	150
cars 3750 & greater	1.0	150
trucks 3750 & greater	1.5	200

*Carbon monoxide(CO) and hydrocarbons (HC), measured as a percentage (%) or parts per million (ppm) of the exhaust volume.

(3) The gasoline filler cap must not leak more than 60 cubic centimeters per minute at a pressure of 30 inches of water.

(4) Standardized on-board diagnostic (OBD) systems (also known as OBDII) were required by Environmental Protection Agency starting with 1996 model gasoline vehicle cars and light trucks. If a 1996 or newer model vehicle is equipped with an Environmental Protection Agency certified on-board diagnostic (OBD) system, the information stored in the on-board computer must indicate that all emission-related functional checks have been completed except for 1996 to 2000 model year vehicles that can have up to two readiness monitors not set to ready, or 2001 or newer model year vehicles that have one readiness monitor not set to ready, and no malfunctions detected that would command the malfunction indicator light to be illuminated.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-065 Diesel Vehicle Exhaust Emission Standards.

(1) Diesel motor vehicles subject to this chapter shall meet the following opacity standards when using the snap-acceleration test procedures specified in WAC 173-422-075.

Model Year Opacity (%)

1991 and earlier	55
1992 and later	40

(2) When using the Acceleration Simulation Mode (ASM) test procedures specified in WAC 173-422-070 adapted for the testing of diesel cars or light trucks (0-8500 pounds gross vehicle weight rating), these vehicles shall meet a 20% opacity standard.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-70 Gasoline Vehicle Exhaust Emission Testing Procedures.

All persons certified by, or under contract to, the department to conduct motor vehicle emission inspections shall use the exhaust emission testing procedures described in (II) Two Speed Idle Test of Appendix B-Test Procedures of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992, except that the department may require that the following Acceleration Simulation Mode (ASM) test procedure replace the 2500 rpm mode of the Two Speed Idle Test. Equivalent procedures may be approved by the department.
Variations to the procedures specified may be established by the department for all or certain vehicles. Vehicles, not repaired as required by an emission recall for which owner notification was attempted after January 1, 1995, shall not be inspected until compliance with the recall is established.

Acceleration Simulation Mode (ASM)

1. Dynamometer Load: Set dynamometer horsepower load equal to [Vehicle Weight (lbs.) + 300]/300. An Environmental Protection Agency specified loading may also be used.

2. Vehicle Gear Selection: Vehicles with automatic transmissions use Drive (not Overdrive), vehicles with manual transmissions use second gear. Shift to the next higher gear if the engine speed exceeds 2500 revolutions per minute.

3. Vehicle Speed: Set vehicle speed at 25 miles per hour (mph) 1.5 ± mph.

4. Pass or Fail Determinations: Once the vehicle has been operating at 25 mph for 15 seconds, begin measuring exhaust HC, CO, and CO2, each second. The reading for pass or fail determinations is the running average of five measurements. When a final pass or fail determination is made, this mode will be stopped and the final readings recorded.

5. Fast Pass: Once HC and CO readings are equal to or less than the HC and CO standards and are within 20 ppm HC and 0.20% CO of each other.

6. Fast Fail: The vehicle will fail after 15 or more seconds of measurements when the HC reading exceeds 1800 ppm, or the CO reading exceeds 9.0 percent.

7. Full Term Pass/Fail: The vehicle will pass or fail the ASM mode after 90 seconds of measurements unless emission readings are declining at a rate that indicates that a failing vehicle will pass within the next 30 seconds. Then the failing vehicle will receive up to an additional 30 seconds of measurements before the final pass/fail determination is made.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-075 Diesel Vehicle Inspection Procedure.

Diesel vehicles shall be tested using the following snap- acceleration test procedure unless the department requires the Acceleration Simulation Mode (ASM) test procedure specified in WAC 173-422-070 adapted for the testing of diesel cars or light trucks (0-8500 pounds gross vehicle weight rating) be used in lieu of the snap-acceleration test procedure.
Prior to beginning the test verify the engine is within its normal operating temperature range, all vehicle accessories including air conditioning are off, the parking brake and an engine brake or retarder is off, the transmission is in neutral (and clutch released if manual transmission).
(1) The vehicle shall receive at least three preliminary snap-acceleration test cycles until consistent engine operation is achieved. The snap-acceleration test cycle consists of moving the accelerator pedal from normal idle as rapidly as possible to the full power position, then fully releasing the throttle so the engine returns to idle.

(2) Then perform additional snap-acceleration test cycles while measuring the smoke opacity with an opacity meter which meets the requirements specified in WAC 173-422-095. The engine must be allowed to remain at idle for at least ten seconds between snap-acceleration test cycles. If a subsequent snap- acceleration cycle is not begun within 45 seconds, the entire sequence of snap-acceleration test cycles must be restarted. The three preliminary snap- acceleration test cycles described in (1) need not be repeated.

(3) Record peak opacity readings from each snap-acceleration test cycle up to nine times if necessary to obtain a peak opacity reading and two consecutive peak readings that are equal to or less than the standard established in WAC 173-422-065.
If a peak opacity reading and two consecutive peak readings that are equal to or less than the standard established in WAC 173-422-065 are not obtained, the vehicle fails the test.

(4) Steps 2 and 3 are repeated for any additional exhaust pipes.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-090 Exhaust Gas Analyzer Specifications.

Only exhaust gas analyzers meeting the specifications contained in (I) Steady-State Exhaust Analysis System of Appendix D-Steady-State Short Test Equipment of Subpart S-

Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992, at the time of certification testing may be used for certification testing, unless equivalent specifications have been approved by the department.

State effective: 3/31/95; EPA effective: 9/25/96

173-422-095 Exhaust Opacity Testing Equipment.

The exhaust opacity measurement shall be conducted using an opacity meter approved by the department. The opacity meter shall:

(1) Automatically calibrates itself before each test.

(2) Provide for continuous measurement of exhaust opacity unaffected by rain or wind.

State effective: 3/11/94; EPA effective: 9/25/96

173-422-100 Testing Equipment Maintenance and Calibration.

(1) Unless alternative procedures have been approved or required by the department all equipment used in the inspection shall be calibrated and maintained according to the manufacturer's specifications and recommendations. Complete logs as approved by the department shall be kept for maintenance, repair, and calibration.

(2) The procedures for equipment maintenance and calibration procedures described in (I) Steady-State Test Equipment of Appendix A-Calibrations, Adjustments and Quality Control of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992, shall be followed by all testing facilities unless equivalent procedures have been approved by the department.

State effective: 3/31/95; EPA effective: 9/25/96

173-422-120 Quality Assurance.

The department, or its designee, may monitor the operation of each authorized emission inspection/certification facility with unidentified or unannounced and unscheduled inspections to check the calibration and maintenance of the exhaust analyzers, test procedures, and records.

The department (or its designee) may immediately require the suspension of vehicle

inspections/certifications in all or part by the inspection/certification facility if violations of this chapter are found during an audit of the inspection facility.

State effective: 3/31/94; EPA effective: 9/25/96

173-422-145 Fraudulent Certificates of Compliance/Acceptance.

(1) (a) Obtaining or attempting to obtain a certificate of compliance by (i) providing false information or (ii) any fraudulent means; or

(b) Obtaining or attempting to obtain a certificate of acceptance (i) through the use of receipts or other documentation containing false information, or (ii) any fraudulent means shall be construed as a violation of these rules implementing chapter 70.94 RCW as supplemented by chapter 70.120 RCW.

(2) Any person who commits such violation or who aids or abets another in committing the same shall be subject to a civil penalty not to exceed two hundred fifty dollars for each violation.

(3) For the purposes of this section the term "expended" refers to the net actual cost to the vehicle owner in the purchase of repairs or parts derived after the amount of any rebate, discount or cash-return has been subtracted.

(4) Any civil penalty imposed by the department hereunder shall be appealable to the pollution control hearing board as provided for in chapter 43.21B RCW.

State effective: 4/6/90; EPA effective: 9/25/96

173-422-160 Fleet and Diesel Owner Vehicle Testing Requirements.

The department may authorize emission inspections by fleet operators including government agencies and the owners of diesel motor vehicles with a gross vehicle weight rating in excess of 8500 pounds or by an automotive service or testing facility engaged by the vehicle owner for such activity. Authorizations to conduct emission tests and issue certificates of compliance under this section are limited to authorized fleet vehicles or diesel vehicles with a gross vehicle weight rating in excess of 8500 pounds.

(1) All persons engaged in testing of gasoline fleet or diesel vehicles must comply with all applicable provisions of this chapter except as approved by the department.

(2) All persons conducting tests for the purpose of issuing certificates for fleet or diesel vehicles shall be ecology authorized emission specialists.

(3) Legibly completed forms will constitute certificates of compliance for licensing

purposes. Any person conducting testing under this section shall forward to the department within ten working days after the end of each month, a copy of each certificate of compliance issued during that month. Copies of each certificate of compliance shall be retained by the person issuing the certificate for at least two years from date of issuance. Alternative arrangements for providing and or storing this information using automated data storage devices may be approved or required by the department.
Forms must be purchased from the department in advance of issuance through payment ~~of twelve or less dollars~~ to the department for each certificate requested. Refunds or credit may be given for unused certificates returned to the department.

Payment for fleet forms is waived for state and local government fleets.

Test forms provided under this section are official documents. Persons receiving the forms from the department are accountable for each form provided.

Voided forms must be handled the same as certificates of compliance. One copy shall be sent to the department within ten days after the end of the month in which the form was voided and one copy shall be retained by the person accountable for the forms for at least two years after date of voiding. Refunds will not be made for voided forms.

(4) All persons authorized to conduct fleet or government vehicle inspections under this section shall be subject to performance audits and compliance inspections by the department, during normal business hours.

(5) Fleet vehicles may be inspected any time between their scheduled license renewals.

(6) Certificates of acceptance may not be issued under this section.

State adopted: 03/31/95; EPA effective: 9/10/15

173-422-170 Exemptions.

The following motor vehicles are exempt from the inspection requirement:

(1) Vehicles proportionally registered pursuant to chapter 46.85 RCW.

(2) New motor vehicles whose equitable or legal title has never been transferred to a person who in good faith purchases the vehicle for purposes other than resale; this does not exempt motor vehicles that are or have been leased.

(3) Motor vehicles that use propulsion units powered exclusively by electricity.

(4) Motor-driven cycles as defined in chapter 46.04 RCW as amended.

(5) Farm vehicles as defined in chapter 46.04 RCW as amended.

(6) Vehicles not required to be licensed.

(7) Mopeds as defined in chapter 46.04 RCW as amended.

(8) Vehicles garaged and operated out of the emission contributing area.
(9) Vehicles registered with the state but not for highway use.

(10) Used vehicles at the time of sale by a Washington licensed motor vehicle dealer.

(11) Motor vehicles fueled by propane, compressed natural gas, or liquid petroleum gas and so registered by the department of licensing.

(12) Motor vehicles whose manufacturer or engine manufacturer provides information that the vehicle cannot meet emission standards because of its design. In lieu of exempting these vehicles, alternative standards and or inspection procedures may be established.

(13) Motor vehicles whose registered ownership is being transferred between parents, siblings, grandparents, grandchildren, spouse or present co-owners and all transfers to the legal owner or a public agency.

(14) Vehicles less than five years old.

(15) Vehicles more than twenty-five years old.

State effective 12/2/00; EPA effective 6/13/2005

173-422-175 Fraudulent Exemptions.

(1) Obtaining or attempting to obtain an exemption from emission inspection requirements by false statements, or failure to comply with the exemption procedures established to implement WAC 173-422-170, shall be construed as a violation of these rules implementing chapter 70.94 RCW as supplemented by chapter 70.120 RCW.

(2) Any person who commits such violation or who aids or abets another in committing the same shall be subject to a civil penalty not to exceed two hundred fifty dollars for each violation.

(3) Any civil penalty imposed by the department hereunder shall be appealable to the pollution control board as provided for in chapter 43.21B RCW.

State effective: 1/2/84; EPA effective: 9/25/96

173-422-190 Emission Specialist Authorization.

(1) To become an authorized emission specialist an individual shall:

(a) Pass a course of study, approved by the department; and

(b) Agree in writing to meet the requirements of subsection (2) of this section and all requirements of law or regulation regarding the serving of motor vehicle emission control systems or the motor vehicle emission inspection program.

(2) To maintain certification, an authorized emission specialist shall:

(a) Successfully complete a department-approved course on emission repair within ninety days of being required to do so by the department unless an extension has been granted in writing by the department; and

(b) Sign, including the specialist identification number, all receipts and other forms required by the department for emission repairs or adjustments performed. These receipts must be prenumbered, preprinted with the business's name and address and clearly itemize all appropriate repairs performed by the specialist; and

(c) Record on all receipts:

(i) The vehicle’s emission readings after appropriate repairs or the diagnosis and/or repair of problem(s) identified by the on-board diagnostic (OBD) during an emission inspection; and

(ii) A vehicle description including the license number and vehicle identification number (VIN); and

(iii) Any missing or inoperative primary emission control components; and

(iv) Any further recommended appropriate repairs; and

(d) Not tamper with emission control systems, including adjusting an engine outside of the manufacturer's specifications (chapter 173-421 WAC); and

(e) Not obtain or attempt to obtain a certificate of compliance, a certificate of acceptance (repair waiver) or an exemption from the inspection requirements by providing false information or by any fraudulent means (chapter 173-422 WAC); and

(f) Not aid or abet any individual in committing a violation of chapter 173-421 or 173- 422 WAC.

(3) The certification of an authorized emission specialist may be revoked for a first violation of chapter 173-421 WAC or WAC 173-422-145, for a period of no more than one year, and may be permanently revoked for a second violation of chapter 173-421 or 173-422 WAC.

The certification of an authorized emission specialist may be temporarily revoked for violation of subsection (2) of this section and may be permanently revoked for continued willful violation of subsection (2) of this section.

An authorized emission specialist whose certification is revoked permanently or temporarily may appeal to the pollution control hearings board as provided for in RCW 43.21B.310.

(4) An authorized emission specialist whose certification has been temporarily revoked may reapply for certification twelve months after the date of revocation by applying to the department and meeting all requirements of subsection (1) of this section. An application for certification by a permanently revoked authorized emission specialist will be denied.

State effective: 7/4/02; EPA effective: 9/10/15

173-422-195 Listing of Authorized Emission Specialists.

(1) A list of authorized emission specialists will be available to the public. Specialists will be listed under one employer's business name when the business is approved for listing. The list will be updated by the department at least once every six months.

(2) The employer's business name and address will be listed by the department, when the employer agrees in writing to:

(a) Require the use of a properly maintained and correctly calibrated exhaust analyzer and a scan tool capable of communicating with the on-board diagnostic (OBD) systems installed on all U.S. Environmental Protection Agency certified 1996 model year and newer gasoline vehicles to diagnosis emission test failures and as a final check for emission repairs or adjustments;

(b) Have all emission repairs or adjustments performed by an authorized emission specialist;

(c) Require the authorized emission specialist to sign the customer's receipt for emission repairs or adjustments, and to record the vehicle's emission readings or which problem(s) identified by the on-board diagnostic (OBD) system during an emission inspection that have been diagnosed and/or repaired on the receipt after the work is completed;

(d) Require that all employees not aid or abet any person to tamper with emission control systems, including adjusting a vehicle outside of the manufacturer's specifications (chapter 173-421 WAC); and

(e) Require that all employees not aid or abet any person to obtain a fraudulent certificate of compliance, certificate of acceptance or an exemption from the inspection requirement (repair waiver) (chapter 173-422 WAC).

(f) Notify the department when an authorized emission specialist begins or

ends employment.

(3) An employer may be removed from the authorized emission specialist list for a first violation of chapter 173-421 or 173- 422 WAC for a period of no more than one year and may be permanently removed after a second violation of chapter 173-421 or 173-422 WAC. An employer may be temporarily removed from the authorized emission specialist list when failing to comply with the requirements of subsection (2) of this section and may be permanently revoked for continued and willful violation of subsection (2) of this section.

(4) An employer who has been temporarily removed from the authorized emission specialist list may reapply for listing twelve months after the date of removal from the listing by applying to the department and meeting all requirements of subsection (2) of this section.

An application for listing from an employer permanently removed from the authorized emission specialist list will be denied.

(5) An employer who is removed from an authorized emission specialist list or denied listing in an authorized emission specialist list may appeal to the pollution control hearings board as provided for in RCW 43.21B.310.

(6) (a) An employer approved for listing may display the "state authorized emission specialist" sign available from the department. Any employer advertising or providing of information to the public based on the department's certification of an authorized emission specialist must be discontinued immediately when the employer no longer meets the requirements.

(b) An employer violating (a) of this subsection shall be subject to a civil penalty not to exceed two hundred fifty dollars for each violation.

(c) A civil penalty imposed by the department may be appealed to the pollution control hearings board as provided for in RCW 43.21B.310.

State effective: 7/4/02; EPA effective: 9/10/15

Appendix B. Chapter 173-422A WAC, Motor Vehicle Emission Inspection

Last Update: 8/10/11

173-422A-010
Purpose.

These rules implement the motor vehicle emission test program required by state law (chapter 70.120 RCW Motor vehicle emission control). They are intended to encourage appropriate emission repairs of vehicles to reduce air pollution.
[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-010, filed 8/10/11, effective 7/1/12.]

173-422A-020
Definitions.

Unless the context clearly indicates otherwise, the following definitions will apply:

"Appropriate repair" means the diagnosis or repair of the cause(s) of an emission test failure.

"Authorized tester" means a vehicle owner or business authorized by ecology to conduct testing other than ecology's contractor.

"Ecology" means the department of ecology.

"OBD" means the standardized on-board diagnostic system required to be installed on all 1996 and newer model year gasoline cars and light trucks sold in the United States. This system monitors the operation of the vehicle's emission control systems to detect possible problems. If problems are found a check engine light alerts the driver and trouble codes are stored to help an automotive repair technician diagnose the problem.

"Online" means to electronically communicate during the emission test as directed by ecology.

"Waiver" is an exemption from further testing for twelve months when all the following conditions apply:

(a) The vehicle failed an emission test;

(b) The vehicle failed a retest or is unable to be retested;

(c) All primary emission control components (or appropriate replacements) are installed and operative;

(d) An ecology authorized emission specialist has performed at least one hundred fifty dollars of appropriate repairs;

(e) The appropriate repairs were performed between the initial and last test; and

(f) Ecology or its designee has received original receipts listing and providing the cost of each appropriate diagnosis or repair of the cause(s) of an emission test failure.
[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-020, filed 8/10/11, effective 7/1/12.]

173-422A-030
Vehicle emission test requirements and testing schedule for private and United States government vehicles.

The department of licensing, county auditors and their subagents shall issue or renew a vehicle license or change the registered owner only if the vehicle meets emission test requirements. Privately owned and United States government vehicles must obtain a passing test or waiver within the twelve months before the department of licensing renewal date for the vehicle. See the following table for the testing schedule.

Testing Schedule for Private and United States Government Vehicles	
Year License Expires	**Model Years**
2012	1988, 1990, 1992, 1994, 1997, 1999, 2001, 2003, 2005, 2007
2013	1989, 1991, 1993, 1995, 1996, 1998, 2000, 2002, 2004, 2006, 2008
2014	1990, 1992, 1994, 1997, 1999, 2001, 2003, 2005, 2007
2015	1991, 1993, 1995, 1996, 1998, 2000, 2002, 2004, 2006, 2008
2016	1992, 1994, 1997, 1999, 2001, 2003, 2005, 2007
2017	1993, 1995, 1996, 1998, 2000, 2002, 2004, 2006, 2008
2018	1994, 1997, 1999, 2001, 2003, 2005, 2007
2019	1995, 1996, 1998, 2000, 2002, 2004, 2006, 2008

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-030, filed 8/10/11, effective 7/1/12.]

173-422A-040
Emission test schedule for state and local government vehicles.

State and local government vehicles must be tested according to the following table.

Testing Schedule for State and Local Government Vehicles	
Year	**Model Years**
2012	1987 through 2007
2013	1988 through 2008
2014	1989 through 2008
2015	1990 through 2008
2016	1991 through 2008

2017	1992 through 2008
2018	1993 through 2008
2019	1994 through 2008

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-040, filed 8/10/11, effective 7/1/12.]

173-422A-050
Emission test areas.

Vehicles registered within the following United States Postal Service zip codes (as of September 1, 1994) require emission tests. Zip code changes by the United States Postal Service after September 1, 1994, do not change emission test area designations.

Puget Sound Region	
98001-98009	98201-98208
98011	98258
98012	98270
98015	98271
98020	98275
98021	98290
98023	98291
98025-98028	98327
98031-98043	98332
98046	98335
98047	98338
98052-98059	98344
98062-98064	98352
98071-98073	98354
98083	98371-98374
98092	98387
90893	98388
98101-98109	98390
98111-98199	98401-98499

Spokane Region	
99001	99021
99005	99025
99014	99027
99016	99037
99019	99201-99209

Vancouver Region
98604 except north of N.E. 279th Street
98606
98607
98629 except east of N.E. 50th Avenue
98642
98660-98668
98671 except Skamania County

98682-98686

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-050, filed 8/10/11, effective 7/1/12.]

173-422A-060
Exemptions.

The following vehicles are exempt from emission testing:

(1) Newer vehicles. Vehicles less than five years old and 2009 or newer model year vehicles.

(2) Older vehicles. Vehicles more than twenty-five years old.

(3) Motorcycles and mopeds as defined in chapter 46.04 RCW.

(4) Prorated vehicles as defined in chapter 46.85 RCW.

(5) Vehicles garaged and operated outside a test area.

(6) Farm vehicles as defined in chapter 46.04 RCW.

(7) Vehicles not intended for highway use.

(8) Vehicles registered as powered by electricity, propane, compressed natural gas, or liquid petroleum gas.

(9) Honda Insight and Toyota Prius model vehicles.

(10) Diesel powered vehicles weighing less than 6001 pounds or with an engine that was certified by its manufacturer as meeting the EPA 2007 exhaust emission standards or equipped with an exhaust particle filter acceptable to ecology.

(11) Vehicles being sold or being offered for sale by a Washington licensed motor vehicle dealer.

(12) An emission test is not required to transfer the registered ownership between parents, siblings, grandparents, grandchildren, spouses, legal domestic partners, or present co-owners or to a public agency and for all changes of the legal owner.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-060, filed 8/10/11, effective 7/1/12.]

173-422A-100
Gasoline vehicle emission test standards.

Gasoline motor vehicles are tested to determine if they meet one of the following requirements:

(1) Two-speed idle exhaust emission test standards:

Model Year	Carbon Monoxide (CO) (%)	Hydrocarbons (HC) (ppm)
1995 and older	3.0	400
1996-2008 (8500 or less GVWR)	1.2	220

1996-2008 (greater than 8500 GVWR)	3.0	400

(2) Instead of a two-speed idle exhaust emission test, ecology may require a 1996 or newer model vehicle be tested using the vehicle's on-board diagnostic (OBD) system. To pass the OBD test:

(a) The check engine light must not be commanded on while the engine is operating.

(b) The emission related monitors must have completed their checks and be ready to report potential problems, except:

(i) A 2001 or newer model year vehicle may have one monitor not ready to report.

(ii) A 2000 or older model year vehicle may have up to two monitors not ready to report.

(c) For the vehicle to pass a retest, the monitor(s) that commanded the check engine light on during the initial test must be ready to report.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-100, filed 8/10/11, effective 7/1/12.]

173-422A-110
Gasoline vehicle emission testing procedures.

(1) All persons testing gasoline vehicles shall, as directed by ecology, either:

(a) Connect the OBD testing equipment to determine what diagnostic codes may be commanding the check engine light on and whether each emission related monitor is ready to report; or

(b) Follow the two-speed idle exhaust emission testing procedures described in Appendix B-Test Procedures of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992.

(2) Ecology may require variations to the testing procedures to accommodate the design of certain vehicles.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-110, filed 8/10/11, effective 7/1/12.]

173-422A-120
Gasoline vehicle emission testing equipment specifications.

(1) Exhaust gas analyzers must meet the specifications in (I) Steady-State Exhaust Analysis System of Appendix D-Steady-State Short Test Equipment of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992.

(2) OBD testing equipment must be capable of:

(a) Communicating with all OBD systems used on 1996 through 2008 model year gasoline vehicles approved to be sold in the United States;

(b) Recording the readiness status of each emission-related OBD monitor; and

(c) Recording the diagnostic trouble code(s) that could command the check engine light on.

(3) The testing equipment must be able to perform the test online unless ecology grants prior approval.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-120, filed 8/10/11, effective 7/1/12.]

173-422A-200
Exhaust emission test standards for diesel vehicles.

Model Year	Opacity (%)
1991 and older	50
1992-1996	40
1997-2008	30

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-200, filed 8/10/11, effective 7/1/12.]

173-422A-210
Test procedure for diesel vehicles.

(1) Before beginning the test, the tester shall verify all of the following:

(a) The engine is within its normal operating temperature range;

(b) All vehicle accessories including air conditioning are off;

(c) The parking brake and an engine brake or retarder is off; and

(d) The transmission is in neutral (and clutch released if manual transmission).

(2) During the snap-acceleration test the tester shall do all of the following:

(a) Perform at least three preliminary snap-accelerations until the engine achieves consistent operation.

(i) A snap-acceleration consists of moving the accelerator pedal from normal idle as rapidly as possible to the full power position, then fully releasing the throttle so the engine returns to idle. Allow the engine to remain at idle for at least ten seconds between snap-accelerations.

(ii) Insert the opacity meter into an exhaust pipe.

(b) Perform additional snap-accelerations while measuring the smoke opacity.

(i) The tester must either begin a subsequent snap-acceleration within forty-five seconds or restart the test without removing the opacity meter.

(ii) The tester need not repeat the three preliminary snap-accelerations.

(c) Perform snap-accelerations (up to nine times if necessary) to obtain three consecutive peak opacity readings that meet ecology's standards. If this does not occur, the vehicle fails the test. Record the three final opacity readings.

(d) If the vehicle passes the first series of snap-accelerations, repeat these procedures for each additional exhaust pipe.

(3) Ecology may require variations to the testing procedures to accommodate the design of certain vehicles.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-210, filed 8/10/11, effective 7/1/12.]

173-422A-220
Diesel vehicle testing equipment specifications.

(1) An opacity meter that:

(a) Automatically recalibrates before each test.

(b) Provides for continuous measurement of exhaust opacity unaffected by rain or wind.

(2) The testing equipment must be able to perform the test online unless ecology grants prior approval.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-220, filed 8/10/11, effective 7/1/12.]

173-422A-300
Testing equipment maintenance and calibration.

(1) The tester must:

(a) Calibrate and maintain all test equipment according to the manufacturer's specifications and recommendations.

(b) Maintain logs approved by ecology of maintenance, repair, and calibration of testing equipment.

(c) Use, for exhaust gas analyzer calibration, the procedures in the following document: (I) Steady-State Test Equipment of Appendix A-Calibrations, Adjustments and Quality Control of Subpart S-Inspection/Maintenance Program Requirements of Part 51 of chapter 1, Title 40 of the Code of Federal Regulations adopted November 1, 1992.

(2) Ecology may require additional maintenance and calibration procedures if they are needed to ensure the accuracy of the testing equipment.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-300, filed 8/10/11, effective 7/1/12.]

173-422A-310
Quality assurance.

Ecology (or its designee) may:

(1) Monitor (remotely or on location) ecology's contractor and authorized testers' operations.

(2) Access the testing/reporting equipment and records.

(3) Stop or limit emission testing due to this monitoring.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-310, filed 8/10/11, effective 7/1/12.]

173-422A-320
Test fees.

(1) An ecology contractor shall charge fifteen or less dollars for a test. The first retest will be free for up to twelve months after a vehicle fails the initial test.

(2) Authorized testers may set their own fees.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-320, filed 8/10/11, effective 7/1/12.]

173-422A-340
Authorized testers.

(1) Authorized testers must meet the following conditions:

(a) Use ecology approved testing equipment. The test must be done online unless ecology grants prior approval.

(b) Follow the testing procedure described in section 110 for gasoline vehicles and section 210 for diesel vehicles.

(c) As directed by ecology, provide information to vehicle owners and obtain their approval for emission-related repairs.

(d) Properly maintain testing equipment.

(e) Maintain logs approved by ecology of maintenance, repair, and calibration of testing equipment.

(f) Allow ecology to conduct performance audits and compliance inspections.

(g) Take corrective actions required by ecology.

(2) Violations of this rule by an authorized tester will result in their authorization being permanently or temporarily revoked unless it is the first lesser rule violation such as an administrative or recordkeeping error.

(a) For the first lesser rule violation, the authorized tester will receive a written warning that further rule violations of this type will result in their authorization being temporarily revoked for thirty to ninety days.

(b) For the first major, deliberate rule violation, such as fraudulent testing or reporting, their authorization will be temporarily revoked for six months.

(c) A second major violation will result in their authorization being permanently revoked.

(d) Reauthorization of a temporarily revoked authorization requires a new application for authorization.

(3) Notifications of violations will be documented in writing.

(4) An authorized tester whose authorization has been revoked may appeal this decision to the pollution control hearings board as provided for in RCW 43.21B.310.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-340, filed 8/10/11, effective 7/1/12.]

173-422A-400
Emission specialist authorization.

(1) To become an authorized emission specialist an individual shall:

(a) Successfully complete an ecology-approved course on emission repair every two years.

(b) Agree in writing to meet all requirements of this rule and all Washington state and federal laws and regulations regarding emission control systems.

(2) To maintain authorization, an authorized emission specialist shall:

(a) Complete required training within ninety days of notification by ecology. Ecology may grant written extensions;

(b) Sign and include their specialist identification number on all receipts for appropriate diagnoses and repairs of vehicles that have failed an emission test. These receipts must:

(i) Be numbered and printed with the business's name and address;

(ii) Include the customer's name, telephone number, and address;

(iii) Include the vehicle's make, model, license number and vehicle identification number (VIN);

(iv) Itemize all appropriate diagnoses and repairs performed by the specialist;

(v) Include any missing or inoperative primary emission control components; and

(vi) Include any further recommended appropriate repairs and diagnoses.

(3) To maintain authorization, an authorized emission specialist may not:

(a) Tamper with emission control systems (a violation of chapter 173-421 WAC), including adjusting an engine outside of the manufacturer's specifications; or

(b) Obtain or attempt to obtain a passing test, waiver, or an exemption from the test requirements by providing false information or by any other fraudulent means that violate this rule; or

(c) Assist any individual in committing a violation of this rule or chapter 173-421 WAC.

(4) Violations of this rule by an authorized emission specialist will result in their authorization being permanently or temporarily revoked unless it is the first lesser rule violation such as an administrative or recordkeeping error.

(a) For the first lesser rule violation, the authorized emission specialist will receive a written warning that further rule violations of this type will result in their authorization being temporarily revoked for thirty to ninety days.

(b) For the first major, deliberate rule violation, such as fraudulent testing or reporting, their authorization will be temporarily revoked for six months.

(c) A second major violation will result in their authorization being permanently revoked.

(d) Reauthorization of a temporarily revoked authorization requires a new application for authorization.

(5) Notifications of violations will be documented in writing.

(6) An authorized emission specialist whose authorization is revoked may appeal to the pollution control hearings board as provided for in RCW 43.21B.310.

[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-400, filed 8/10/11, effective 7/1/12.]

173-422A-410
Requirements for listing businesses with authorized emission specialists.

(1) Ecology will maintain a list of businesses where a vehicle owner can have an authorized emission specialist diagnose and repair the causes of an emission test failure.

(2) Ecology will include the business's name, address and telephone number on the list when the business agrees in writing to require all of the following:

(a) The authorized emission specialist use an ecology-approved OBD scan tool to diagnose an emission test failure of a 1996 or newer gasoline vehicle equipped with an OBD system. For an OBD scan tool to be approved by ecology it will need:

(i) To provide mode 1 through mode 9 diagnostic data requests.

(ii) Support all communication protocols used by the vehicle manufacturers for 1996 through 2008 model year gasoline vehicles sold in the United States.

(b) That the diagnosis of the cause(s) of an emission tests failure and the repairs or adjustments to correct the cause(s) of an emission test failure are performed by an authorized emission specialist.

(c) That the authorized emission specialist:

(i) Sign the customer's receipt for emission repairs or adjustments; and

(ii) List on the receipt, the emission diagnosis or repairs done and those that are still needed.

(d) All employees not to tamper or assist anyone in tampering with emission control systems, including adjusting a vehicle outside the manufacturer's specifications.

(e) All employees to obtain or assist anyone in obtaining a fraudulent passing test, waiver, or an exemption from the test requirement.

(f) Notification of ecology when an authorized emission specialist begins or ends employment.

(3) When a business no longer meets the requirements for listing, it must discontinue any representation of listing immediately.

(4) Violations of this rule by a listed business will result in their listing being permanently or temporarily revoked unless it is the first lesser rule violation such as an administrative or recordkeeping error.

(a) For the first lesser rule violation, the listed business will receive a written warning that further rule violations of this type will result in their listing being temporarily revoked for thirty to ninety days.

(b) For the first major, deliberate rule violation, such as fraudulent testing or reporting, their listing will be temporarily revoked for six months.

(c) A second major violation will result in their listing being permanently revoked.

(d) Relisting of a temporarily revoked listing requires a new application for listing.

(5) Notifications of violations will be documented in writing.

(6) A business whose listing has been revoked may be appealed to the pollution control hearings board as provided for in RCW 43.21B.310.
[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-410, filed 8/10/11, effective 7/1/12.]

173-422A-500
Civil penalty.

Except for a lesser violation of this rule, such as an administrative or recordkeeping error, ecology may impose a civil penalty not to exceed two hundred fifty dollars on anyone who violates any requirement of this rule. This penalty may be appealed to the pollution control hearings board as provided for in RCW 43.21B.310.
[Statutory Authority: RCW 70.120.120. WSR 11-17-041 (Order 08-01), § 173-422A-500, filed 8/10/11, effective 7/1/12.]

Appendix C: Air Quality Designations for Washington State

Table 12 below shows the most current air quality standards for the six criteria air pollutants and Washington's designation status for each standard.

Table 12: Current National Ambient Air Quality Standards and Designation Status

Pollutant	Year Adopted by EPA	Primary / Secondary NAAQS	Averaging Time	Current NAAQS	Designation status
Ozone (O_3)	2015	Primary and secondary	8-hour	0.070 ppm	Benton, Franklin, Walla Walla counties unclassifiable Rest of state attainment/unclassifiable
Nitrogen dioxide (NO_2)	2010	Primary	1-hour	100 ppb	Attainment/unclassifiable statewide
Nitrogen dioxide (NO_2)	2010	Primary and Secondary	Annual	53 ppb	Attainment/unclassifiable statewide
Carbon monoxide(CO)	2011	Primary	1-hour 8-hour	35 ppm 9 ppm	Attainment/unclassifiable statewide
Fine particulate matter ($PM_{2.5}$)	2012	Primary	Annual	12 µg/m^3	Attainment/unclassifiable statewide
Fine particulate matter ($PM_{2.5}$)	2012	Secondary	Annual	15 µg/m^3	Attainment/unclassifiable statewide
Fine particulate matter ($PM_{2.5}$)	2006	Primary and secondary	24-hour	35 µg/m^3	Attainment/unclassifiable statewide
Coarse particulate matter (PM_{10})	2012	Primary and secondary	24-hour	150 µg/m^3	Attainment/unclassifiable statewide
Sulfur dioxide (SO_2)	2012	Primary	1-hour	75 ppb	Lewis, Thurston counties unclassifiable Rest of state attainment/unclassifiable, except areas near sources with new monitors that EPA will designate by 2020
Sulfur dioxide (SO_2)	2012	Secondary	3-hour	0.5 ppm	Attainment/unclassifiable statewide
Lead (Pb)	2008	Primary and secondary	Rolling 3 month average	0.15 µg/m^3	Attainment/unclassifiable statewide

Appendix D: Wildfire Related O_3 Exceedances

Introduction

The purpose of this appendix is to show that the elevated ozone concentrations in August of 2017 at the Enumclaw monitor were influenced by smoke from wildfires. These ozone exceedances were exceptional events in that they produced ozone levels outside the historical range. The exceedances would not have likely occurred if not for the wildfire smoke. These events do not have regulatory significance in regards to this SIP revision, so Ecology is not submitting formal exceptional event demonstrations at this time.

Background

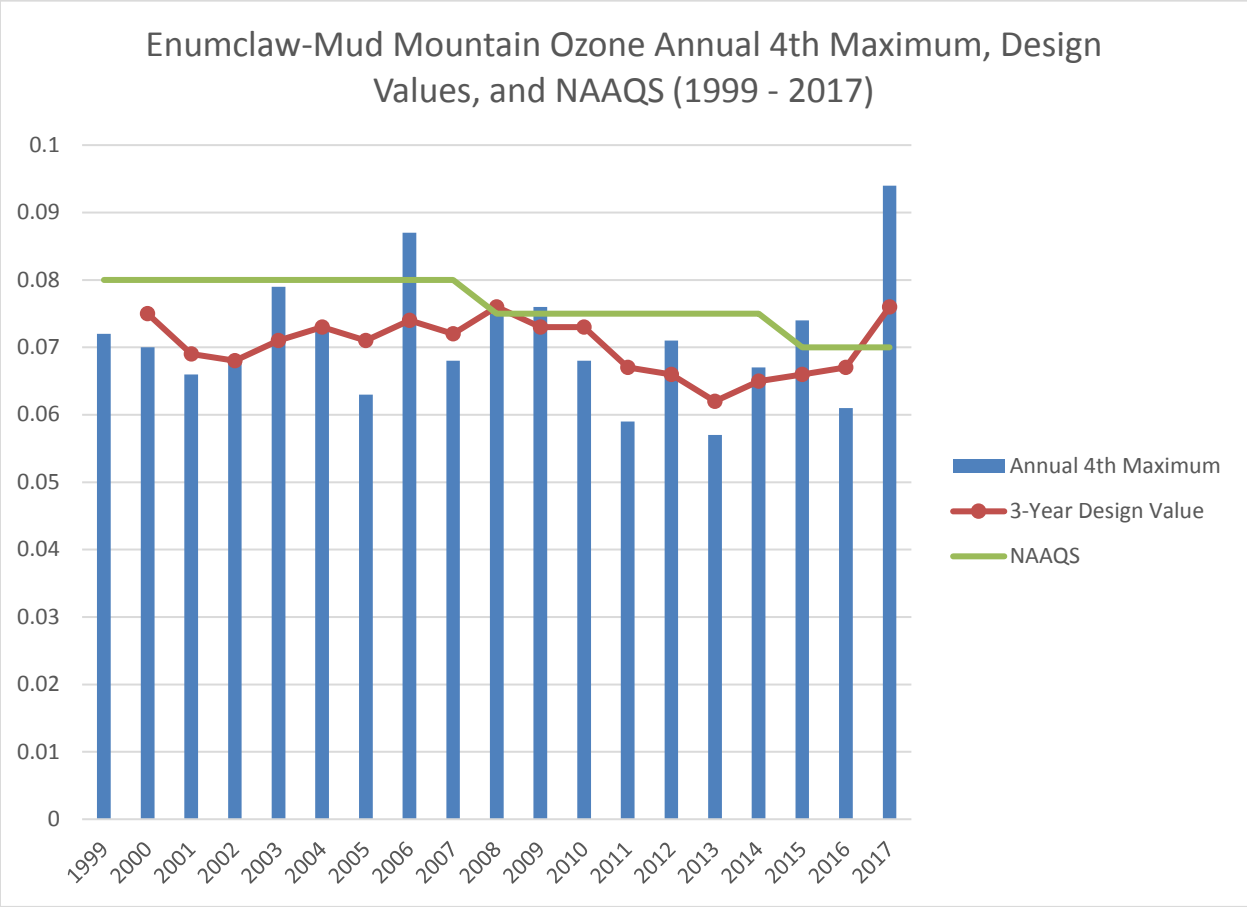
In the summer of 2017, the Pacific Northwest region had the worst air quality in decades for both $PM_{2.5}$ and O_3 as a result of smoke from wildfires. Smoke from wildfires in Washington, with a total of 404,223 acres burned[22], and from wildfires in British Columbia, with over 3,000,000 acres burned[23], lingered for several weeks in western Washington. The smoke contributed significantly to the $PM_{2.5}$ and O_3 concentrations.

[22] Northwest Interagency Coordination Center, "Northwest Annual Fire Report 2017," https://gacc.nifc.gov/nwcc/content/pdfs/archives/2017_NWCC_Annual_Fire_Report_FINAL.pdf.
[23] British Columbia Government, BC Wildfire Service, "Statistics & Geospatial Data: Wildfire Averages," https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-statistics/wildfire-averages

Enumclaw Ozone Design Values

Table 13 shows the long term trend in O_3 levels at the Enumclaw monitor from 1999 to 2017.

Table 13: Enumclaw-Mud Mountain O3 Annual 4th Maximum, Design Values, and NAAQS (1999 - 2017)2017 Enumclaw Ozone Exceedances



The Enumclaw monitor had several exceedances of the O_3 standard in 2017, which pushed the 3-year design value up above the NAAQS. Nine of the thirteen O_3 exceedances in 2017 were influenced by smoke from wildfires (see Table 14). Without the smoke from wildfires, it would be unlikely for the O_3 design value to have exceeded the NAAQS on those days.

Table 14: 2017 O_3 Exceedances and temperatures at the Enumclaw Monitor, with wildfire related exceedances highlighted in yellow

Date of 2017 Exceedances	O_3 Values (ppm, 8-hr running max)	Temperature (F-1Hr Avg Day Max)
5/28/2017	0.070	85
6/24/2017	0.076	88
6/25/2017	0.082	92

Date of 2017 Exceedances	O_3 Values (ppm, 8-hr running max)	Temperature (F-1Hr Avg Day Max)
7/6/2017	0.072	83
8/1/2017	0.079	87
8/2/2017	0.092	91
8/3/2017	0.103	93
8/4/2017	0.095	89
8/7/2017	0.073	84
8/8/2017	0.087	86
8/9/2017	0.098	89
8/10/2017	0.094	88
8/29/2017	0.073	86

Description of 2017 Wildfire Events

On August 1, 2017, winds carried smoke south into the State of Washington from wildfires in British Columbia (BC), Canada. Moderate smoke impacted Washington for many days. On August 11, a weather ridge built up along the west coast and started to move inland, eventually clearing smoke out of the state by August 13.[24] On August 29, smoke from southwestern Oregon and Northern California moved over Washington State.[25]

Satellite Imagery of Smoke Plume

Figure 19 below contains images from the NASA Satellite showing smoke blanketing the region from August 1 to 11, 2017.[26] Figure 20 through Figure 30 contain NASA Aqua/MODIS satellite

[24] Washington Smoke Blog, August 1 to 9, 2017. http://wasmoke.blogspot.com/2017/08/its-stuck-until-friday-at-least.html; http://wasmoke.blogspot.com/2017/08/882017-canadian-fires-still-raging-no.html ; http://wasmoke.blogspot.com/2017/08/deja-vu-today-and-tomorrow-but-not-in.html ; http://wasmoke.blogspot.com/2017/08/monday-and-tuesday-will-be-like-sunday.html ; http://wasmoke.blogspot.com/2017/08/smoke-might-spare-western-wa-by.html; http://wasmoke.blogspot.com/2017/08/mild-recovery-started-and-paused.html ; http://wasmoke.blogspot.com/2017/08/smoke-monster-overran-washington-but.html ; http://wasmoke.blogspot.com/2017/08/smoke-is-getting-cozy-here-it-blanketed.html ; http://wasmoke.blogspot.com/2017/08/812017-afternoon-satellite-image-of.html: See also http://komonews.com/news/local/wildfire-smoke-now-leaves-washington-with-worst-air-quality-in-the-nation; http://wildfiretoday.com/2017/08/10/wildfire-smoke-and-air-quality-august-10-2017/

[25] Washington Smoke Blog, August 29, 2017, http://wasmoke.blogspot.com/2017/08/smoke-on-west-side-should-start.html,; http://wasmoke.blogspot.com/2017/08/overnight-smoke-forecast-for-central-wa.html.

[26] NASA, Modis, USA1 Subsets, https://lance3.modaps.eosdis.nasa.gov/imagery/subsets/?project=fas&subset=USA1.

images for August 1 through August 11, 2017 with an overlay of the 24-hour average $PM_{2.5}$ Air Quality Index (AQI) levels at monitors across the region. This provides evidence that the wildfire smoke was transported and reached ground level.

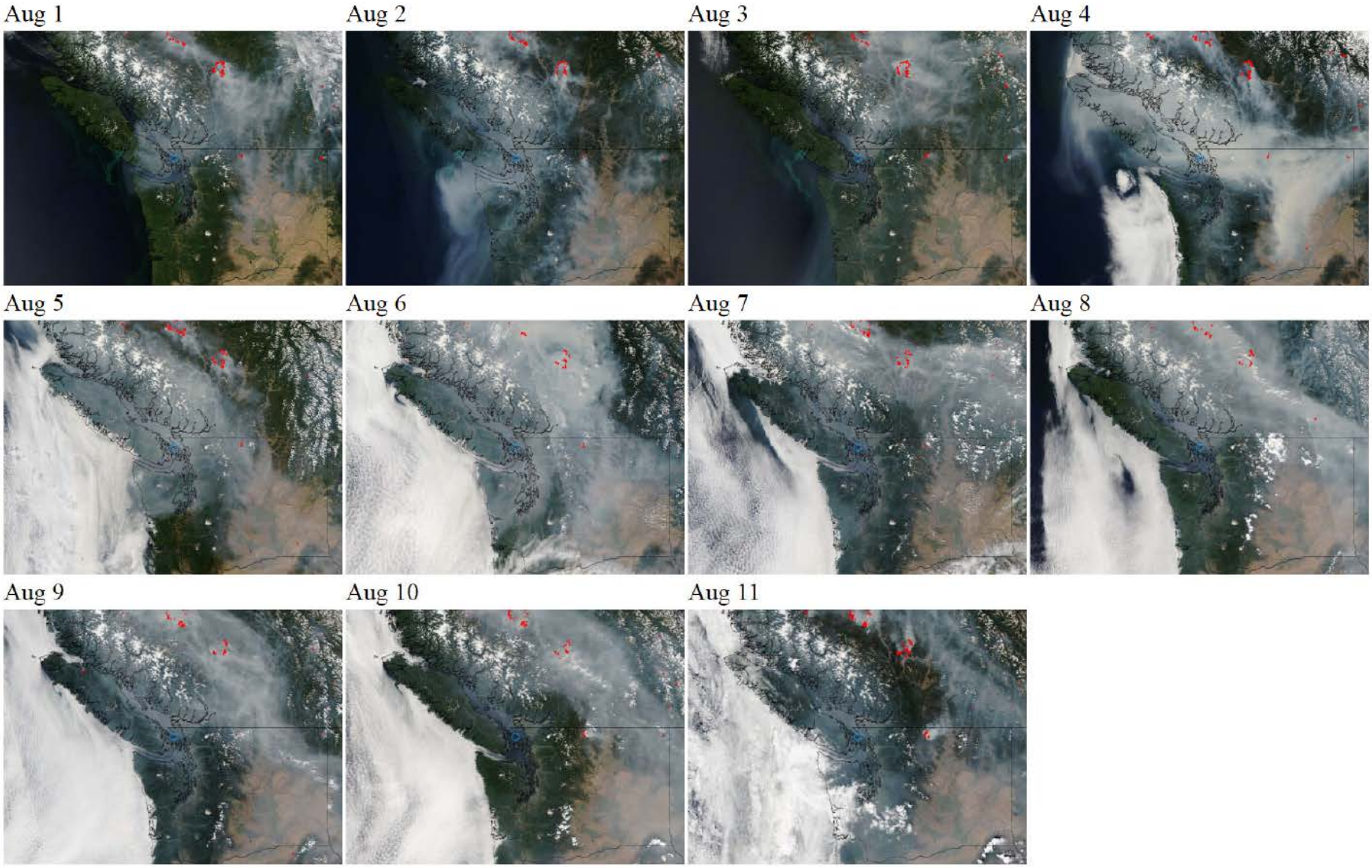


Figure 19: Aqua/MODIS Satellite Images for August 1 to 11, 2017.

August 1, 2018 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

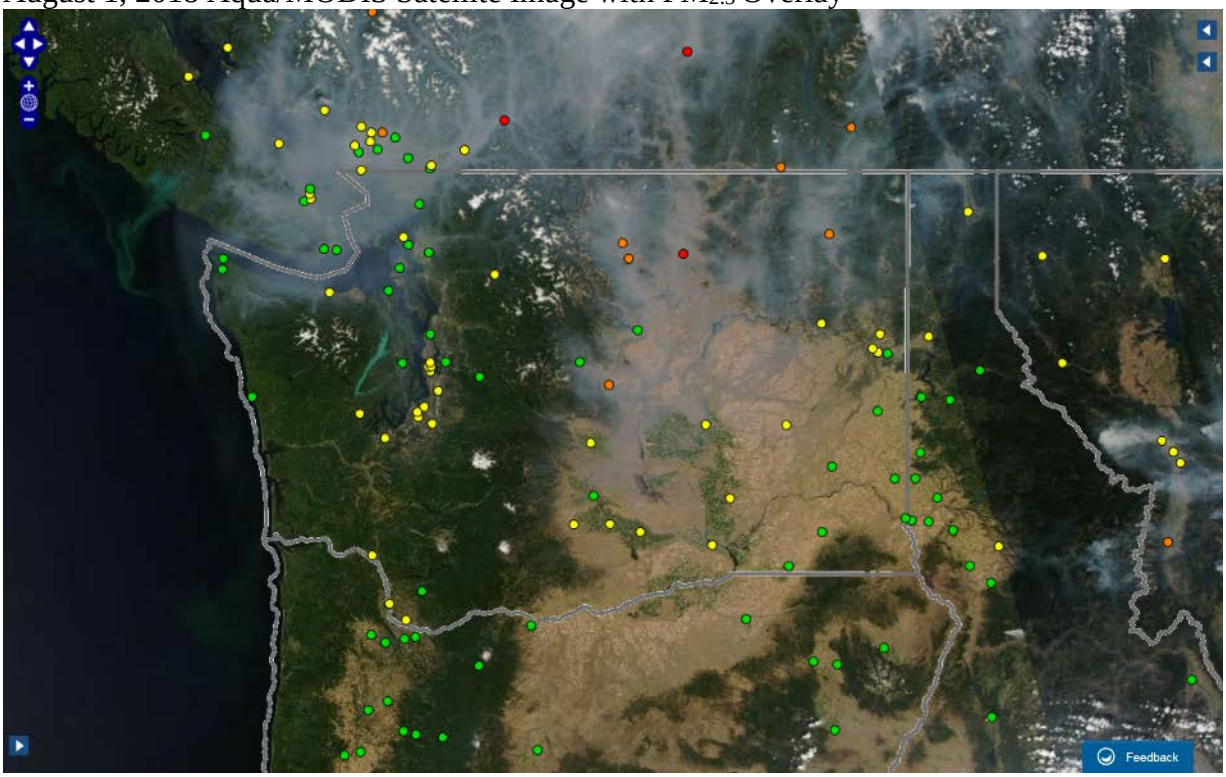


Figure 20: August 1, 2018 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

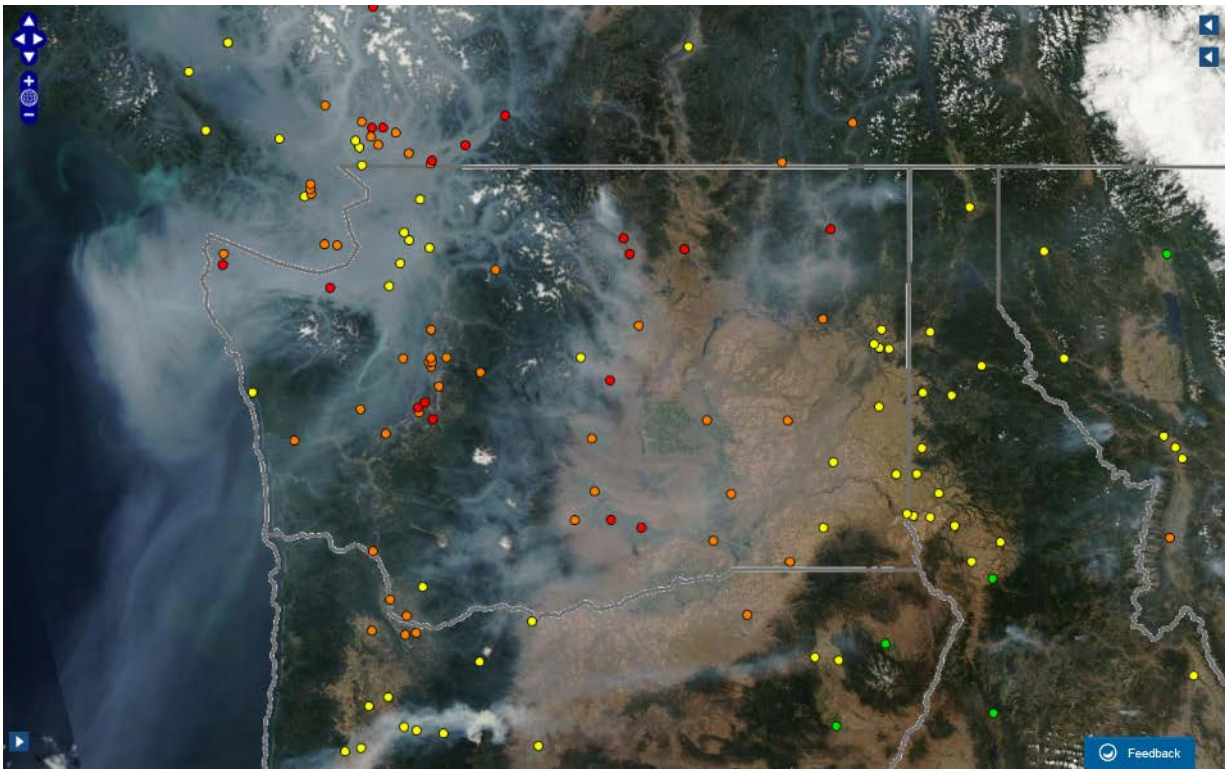


Figure 21: August 2, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

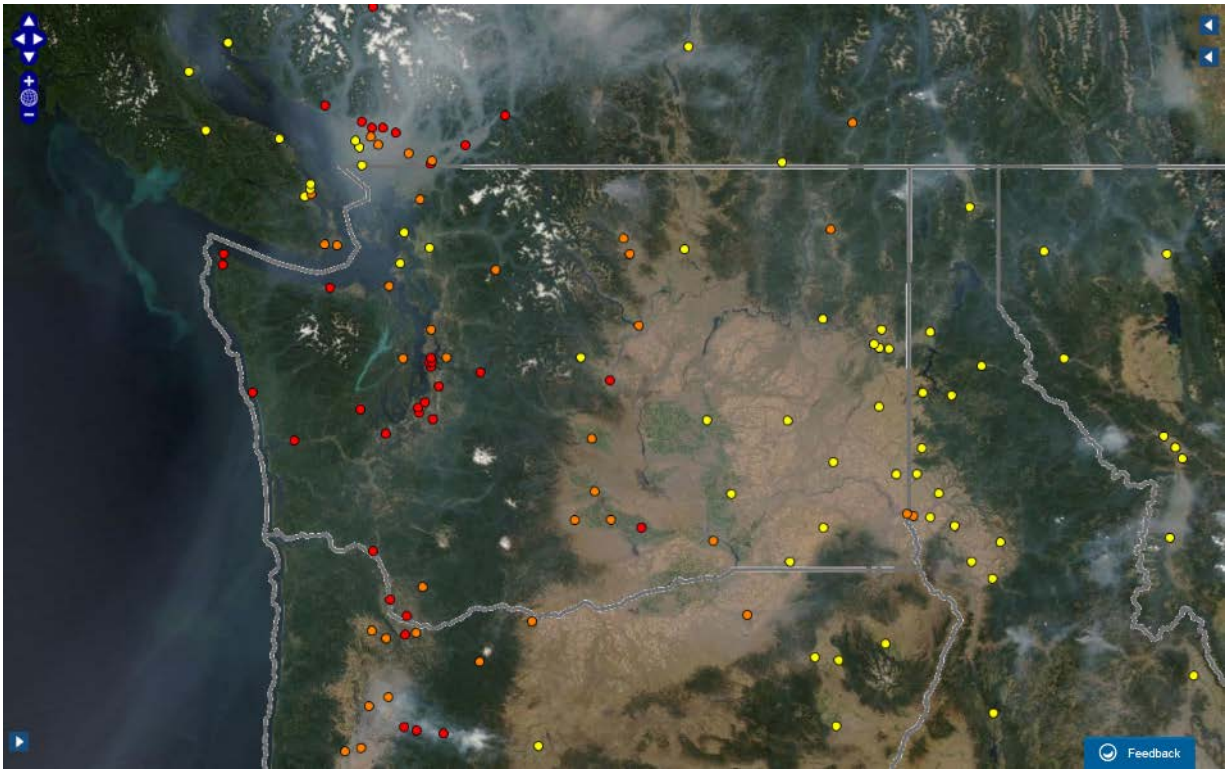


Figure 22: August 3, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

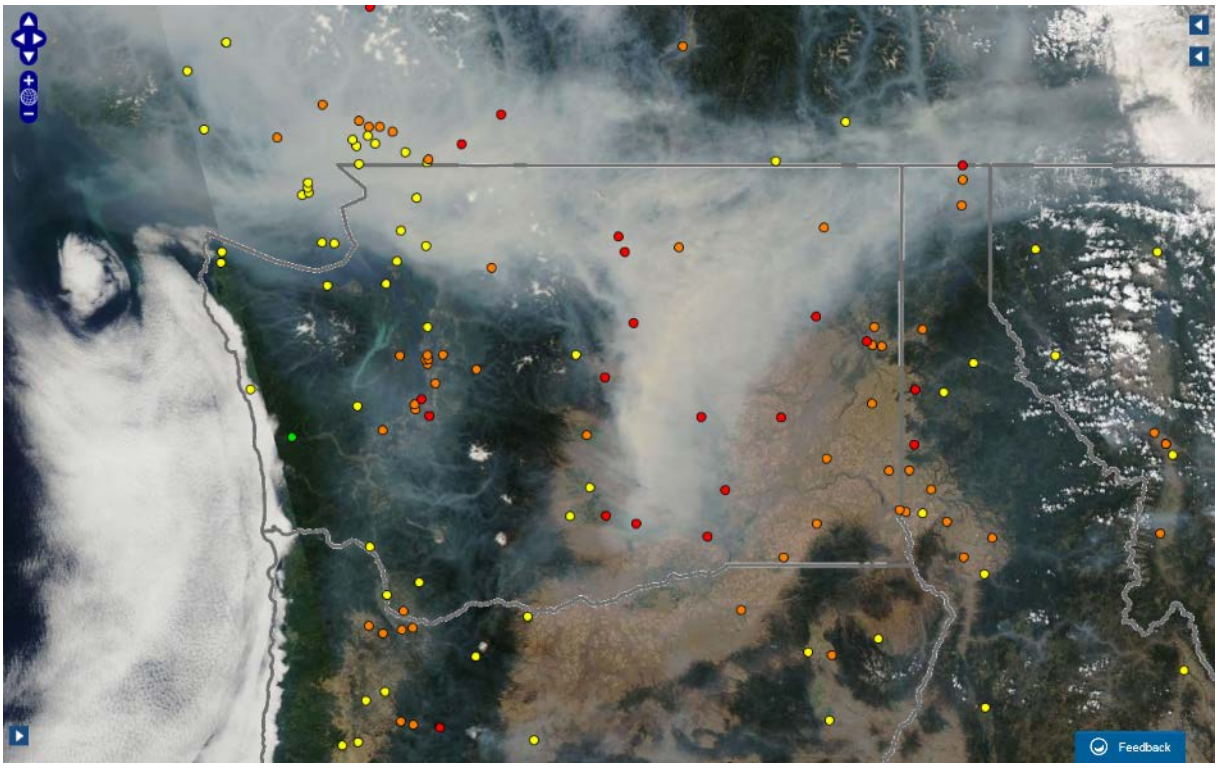


Figure 23: August 4, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

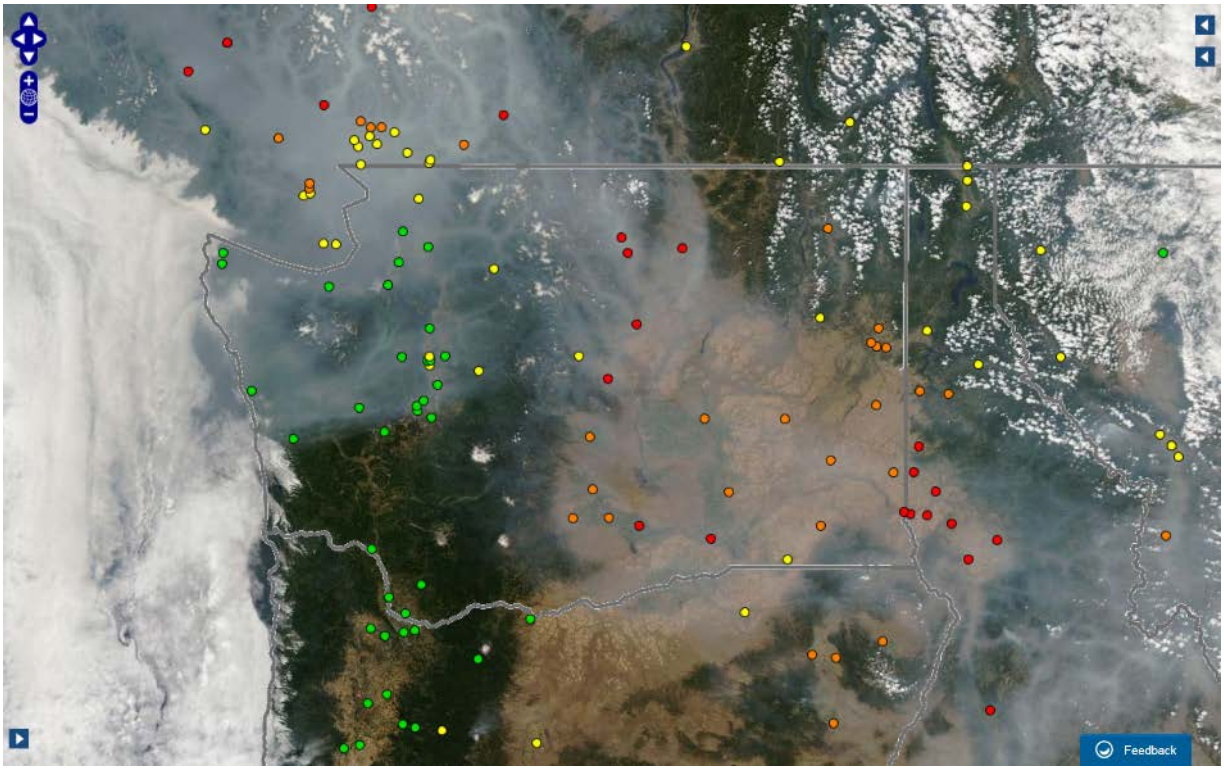


Figure 24: August 5, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

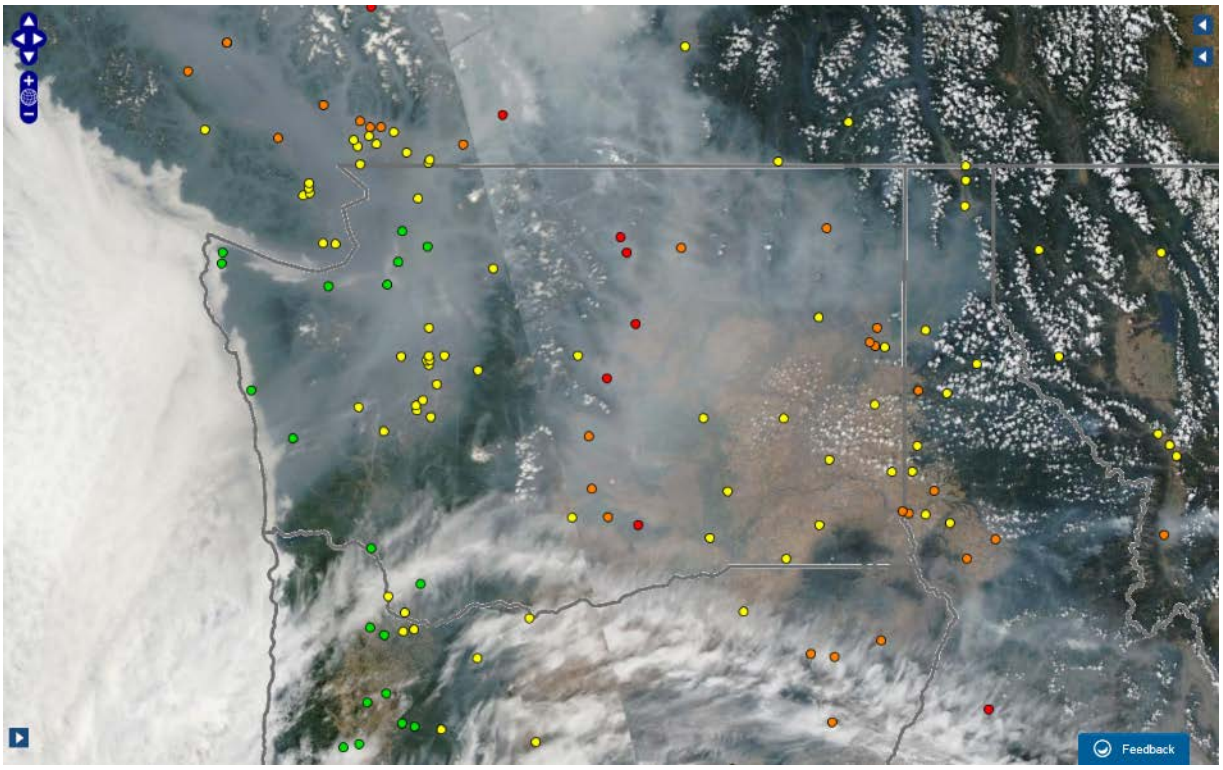


Figure 25: August 6, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

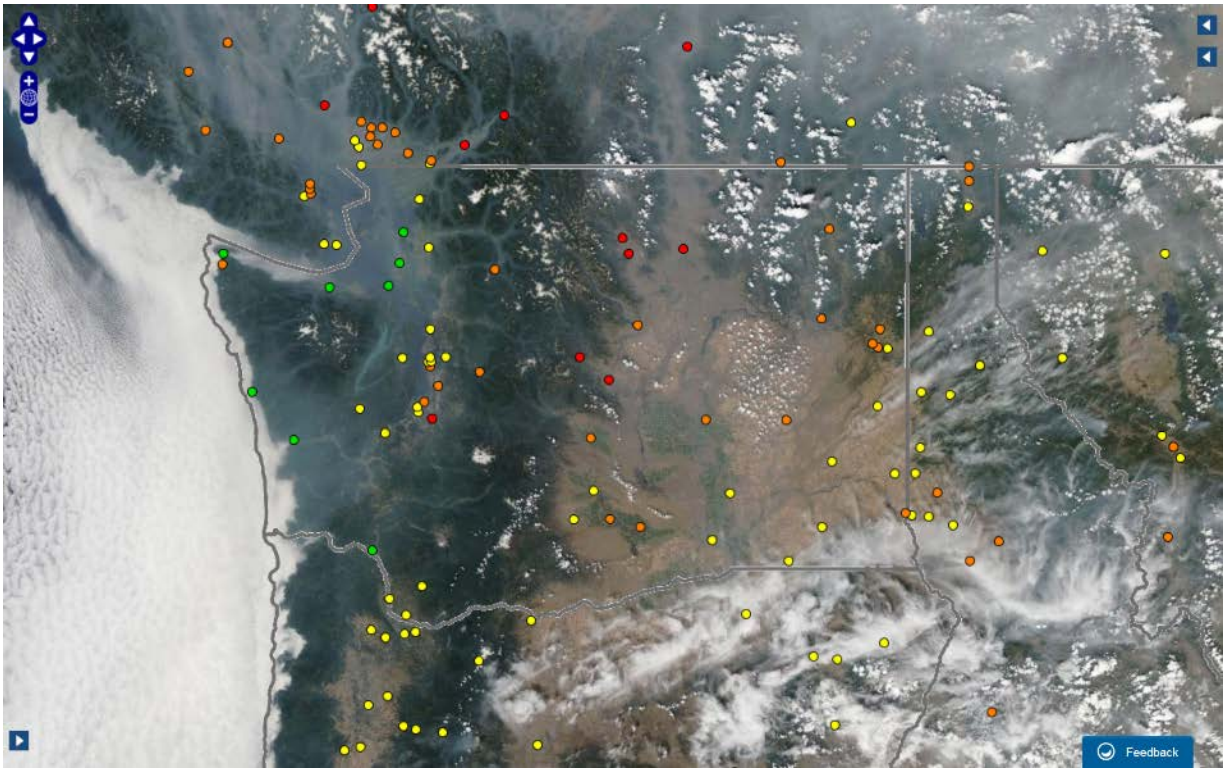


Figure 26: August 7, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

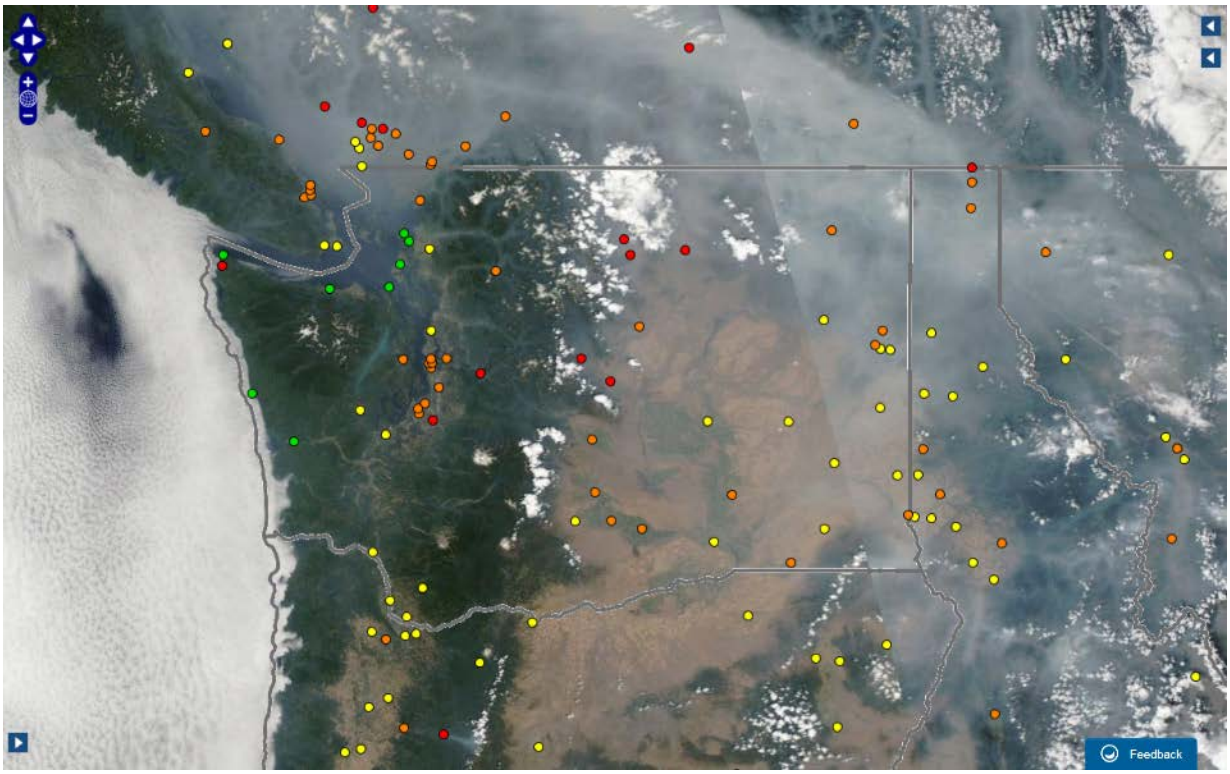


Figure 27: August 8, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

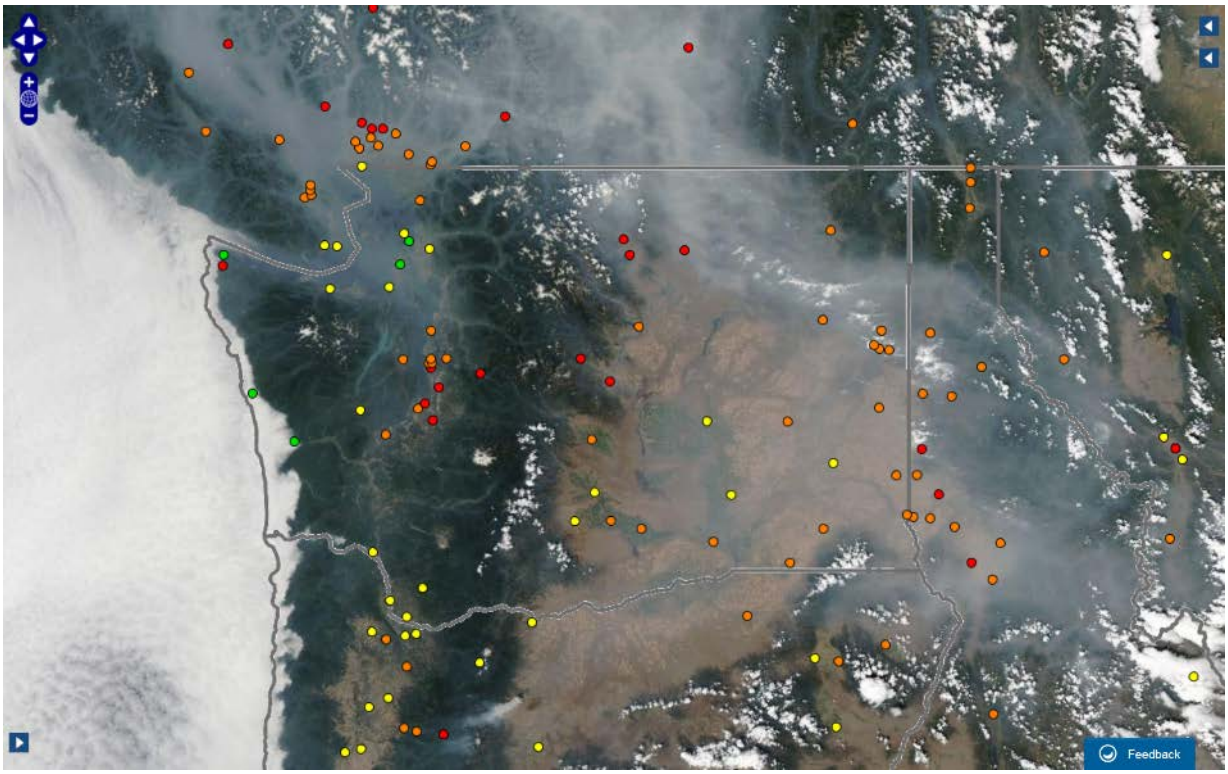


Figure 28: August 9, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

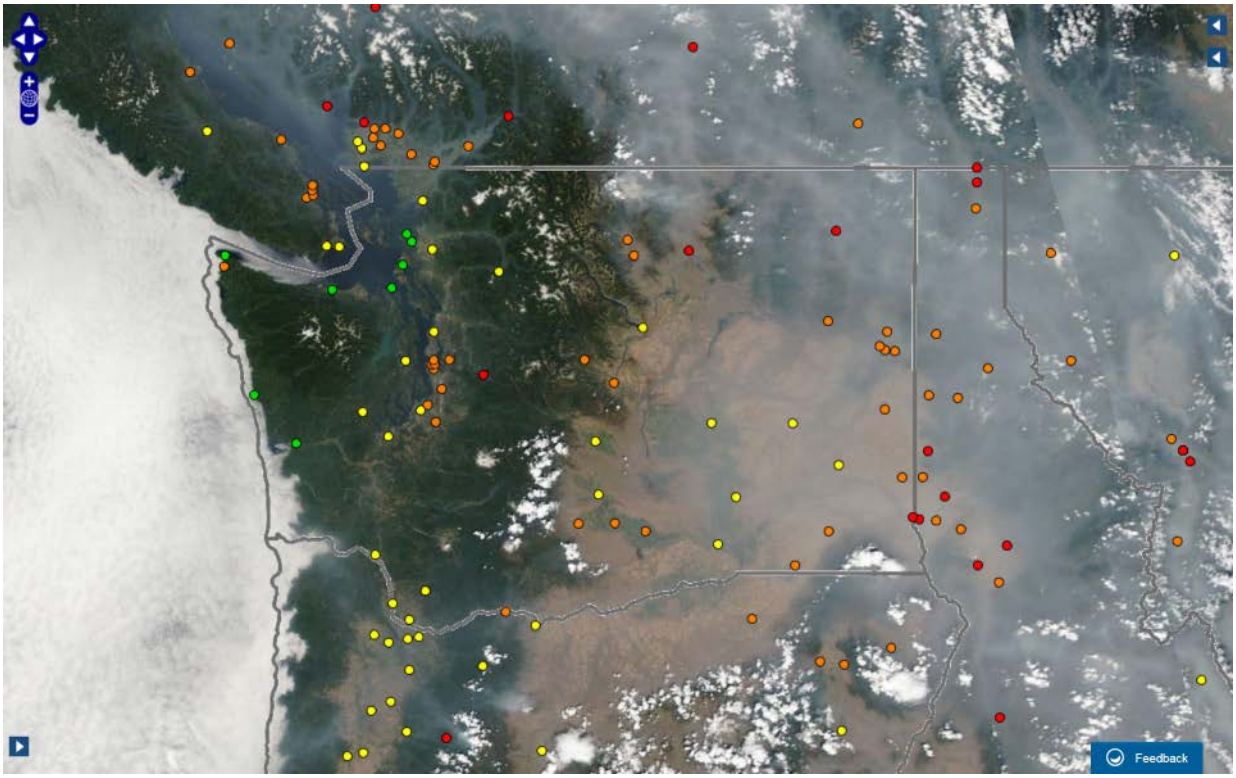


Figure 29: August 10, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

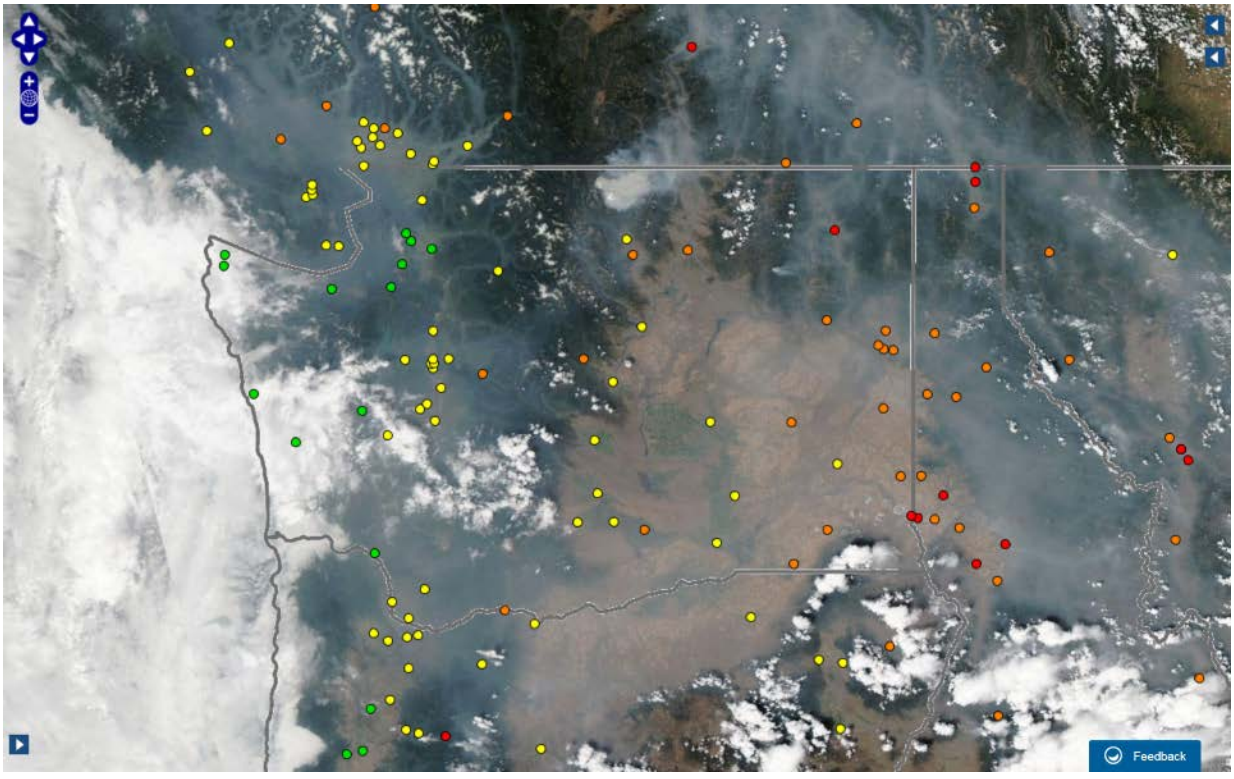


Figure 30: August 11, 2017 Aqua/MODIS Satellite Image with $PM_{2.5}$ Overlay

On August 29, smoke from southwestern Oregon and Northern California moved over Washington State.[27] Figure 31 shows a satellite image of the wildfire smoke from fires in Northern California, Oregon, and Washington. Figure 32 shows the satellite image of the wildfire plume over Washington with 24-hour average $PM_{2.5}$ AQI levels overlaid.

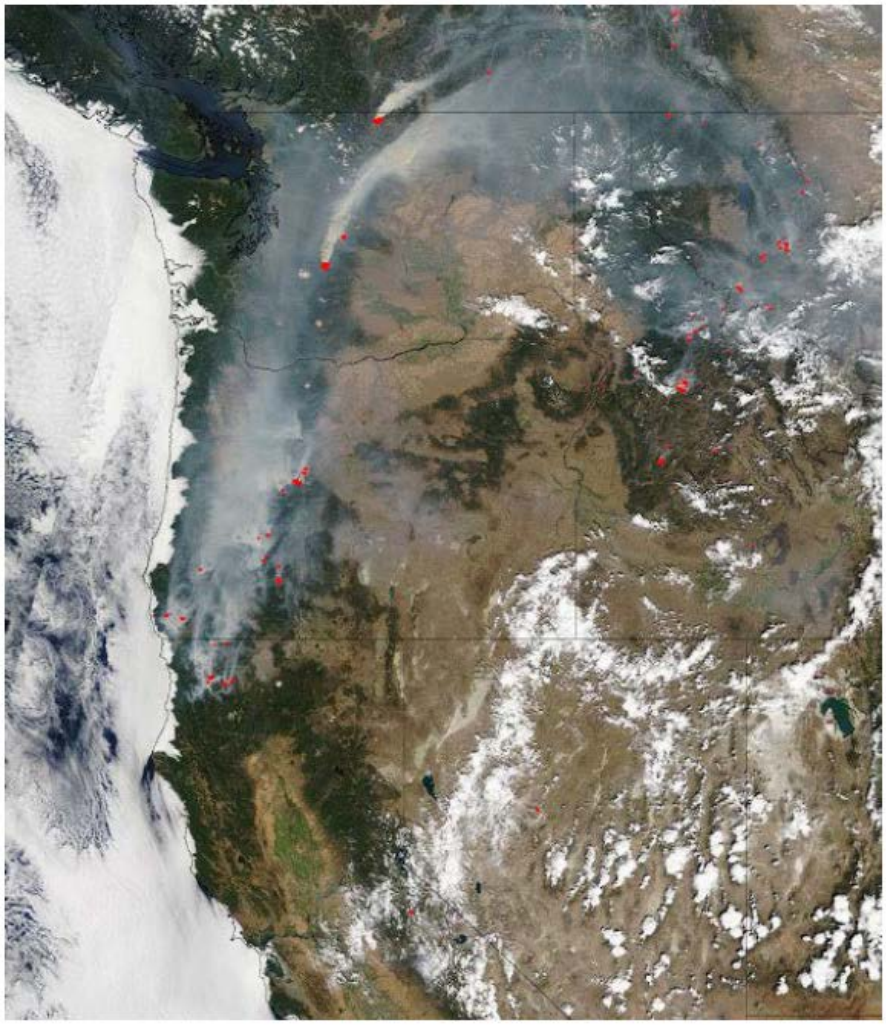


Figure 31: Aqua/MODIS Satellite Image for August 29, 2017

[27] Washington Smoke Blog, August 29, 2017, http://wasmoke.blogspot.com/2017/08/smoke-on-west-side-should-start.html,; http://wasmoke.blogspot.com/2017/08/overnight-smoke-forecast-for-central-wa.html.

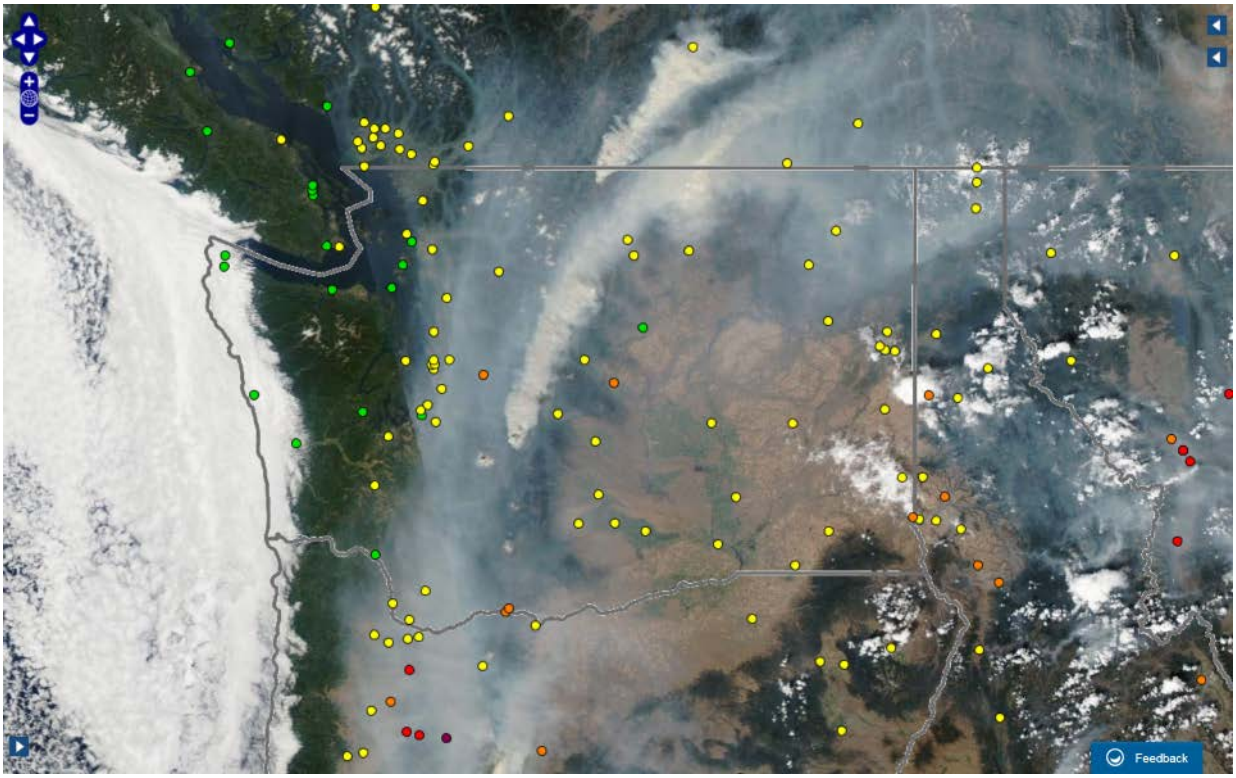


Figure 32: Aqua/MODIS August 29, 2017 Satellite Image with $PM_{2.5}$ Overlay

Fire Emissions and Distance from Enumclaw Monitoring Site

Ecology calculated the wildfire emissions divided by the distance (Q/D) from the Enumclaw monitor for the days in August of 2017 with ozone exceedances influenced by wildfires. The Q/D is a screening tool used in ozone/wildfire exceptional event demonstrations to evaluate the influence of the wildfire smoke on the ozone exceedances at a downwind monitor.

Q is defined as the daily sum of the NOx and VOC emissions from the wildfires in tons per day (tpd). D is the distance in kilometers (km) between the fire's location and the affected O_3 monitor for each fire for each day. Ecology used the emissions weighted average distance:

Emissions Weighted Average Distance = (DQ + DQ + DQ …) / (Q + Q + Q …)

A Q/D value greater than or equal to 100 tpd/km is a conservative indicator that the wildfire emissions affected ozone concentrations at the Enumclaw monitor.

Emissions are from BlueSky Canada using forecasted emissions based on their last forecast of the day, and were augmented on August 29 using BlueSkyPlayground to calculate emissions for four locations in the USA which had area burned but no emissions calculated.

EPA's guidance on preparing ozone/wildfire exceptional event demonstrations for wildfires that influence ozone concentrations lists considers Q/D a key factor for determining a clear causal link between the wildfire event and elevated ozone concentrations, and recommends that the Q/D be greater than or equal to 100 tons per day/kilometers (tpd/km).

Table 15 below includes the Q/D values. The Q/D values are just below 100 for August 1, and 2, and above 100 for the remaining days. These are conservative values. The Q/D values would be well over 100 for all days listed if Ecology increased BlueSky VOC emissions by a factor of 3, as suggested by the USFS, or added in fire emissions from the previous day, as suggested in the EPA guidance.

Table 15: Emissions over Distance (Q/D) for Enumclaw

Date	Sum of Q	Weighted D	Q/D
8/1/2017	49546	518	96
8/2/2017	47215	545	87
8/3/2017	67476	551	122
8/4/2017	88413	577	153
8/7/2017	61341	585	105
8/8/2017	59158	571	104
8/9/2017	71339	580	123
8/10/2017	66426	580	115
8/29/2017	67801	455	149

Ecology only included fire locations that appeared to influence the Enumclaw monitor for each day of the Q/D analysis. Figure 33 shows the fire locations included in the Q/D analysis for August 3, 2017. Figure 33 also is a good representation of the fire locations included for the entire early August episode. The fire locations included in the Q/D analysis for August 29 2017 are shown in Figure 34. The fire locations included are marked red in the figures while fires not included in the Q/D analysis are marked orange.

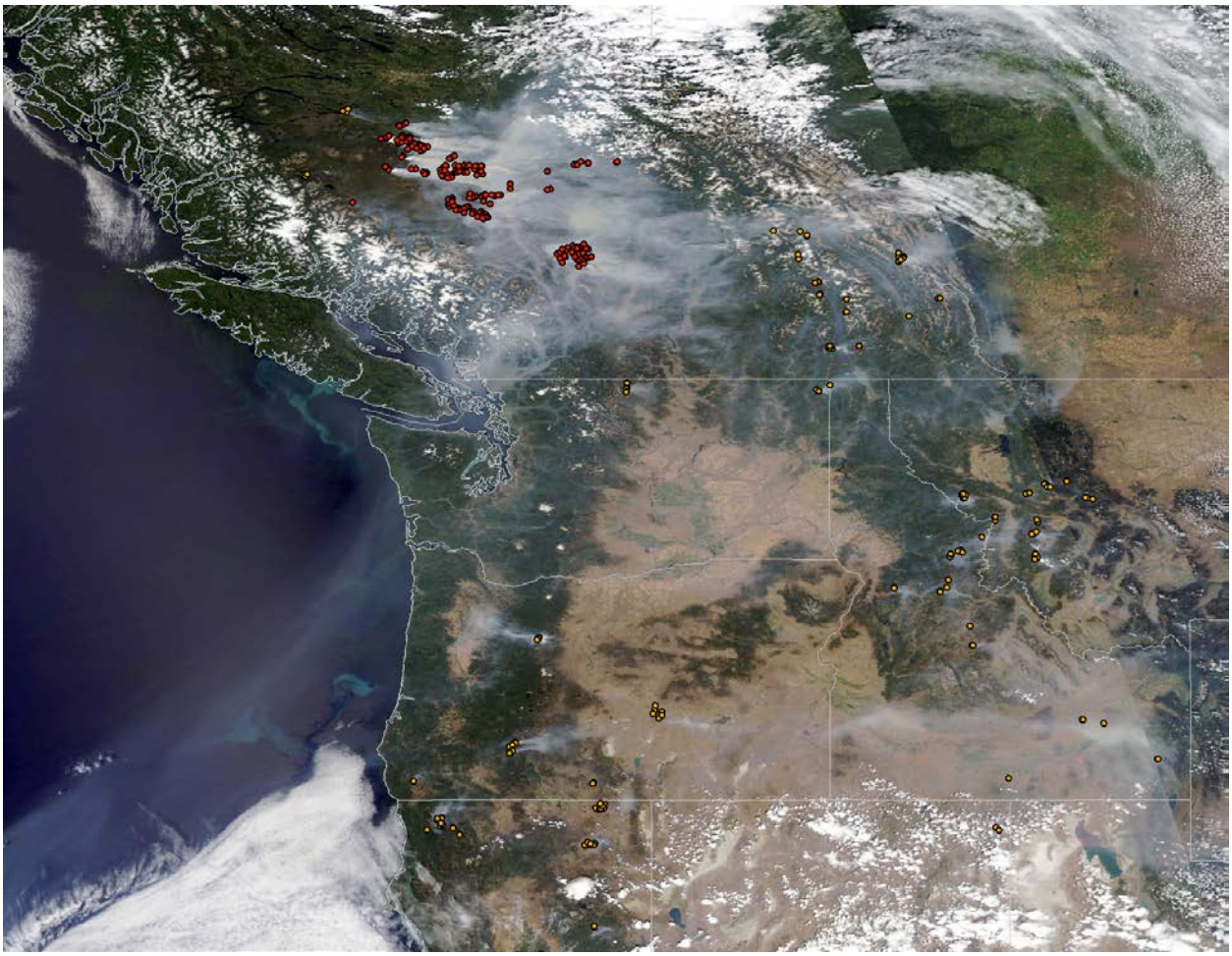


Figure 33: Q/D Fire Locations for August 3, 2017

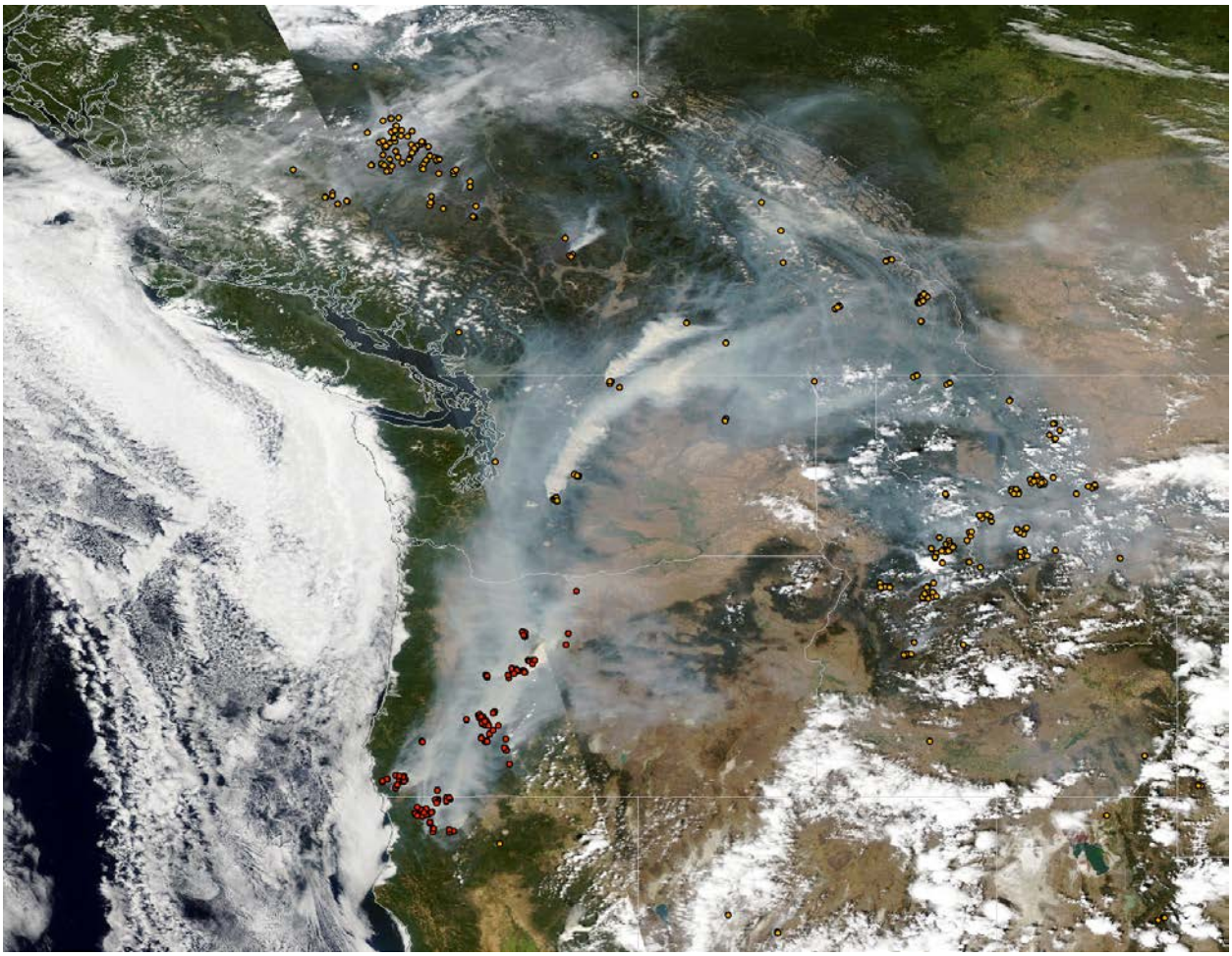


Figure 34: Q/D Fire Locations for August 29, 2017

Trajectory Analysis

Ecology developed HYSPLIT back trajectories to assess whether wind flow likely transported wildfire smoke to the Enumclaw monitor (see Figure 35 through Figure 43 below). The HYSPLIT back trajectory images below were created using AirNowTech Navigator and show MODIS/Aqua true color imagery (~ 2 pm local time) as a background and HMS hotspots as red triangles. The back trajectories use the Enumclaw monitor location as the receptor point with starting heights of 50 m (green), 500 m (blue), and 1000 m (red) and start times of 10 am, noon, 2 pm, and 4 pm.

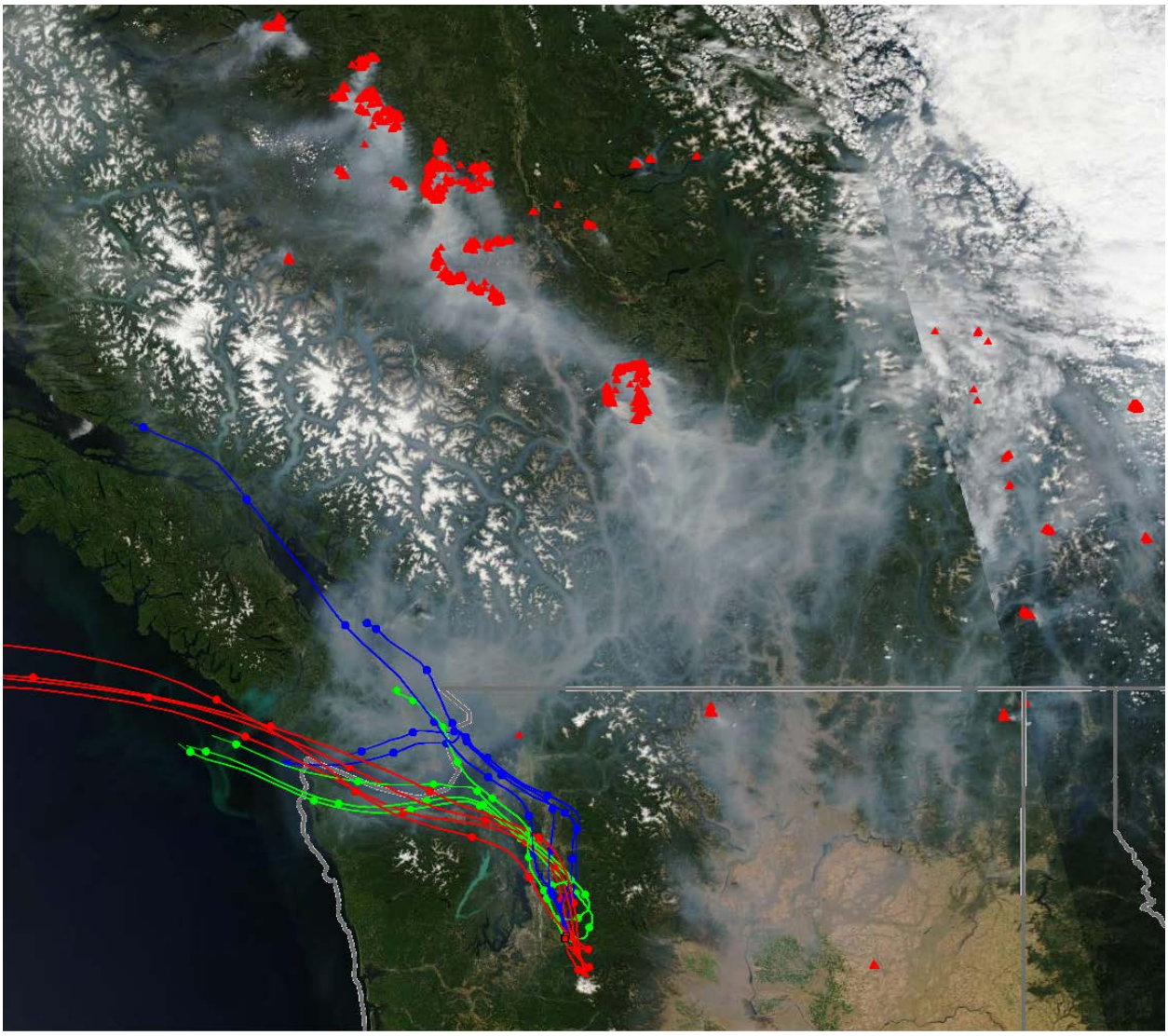


Figure 35: August 1, 2017 Back Trajectories from Enumclaw

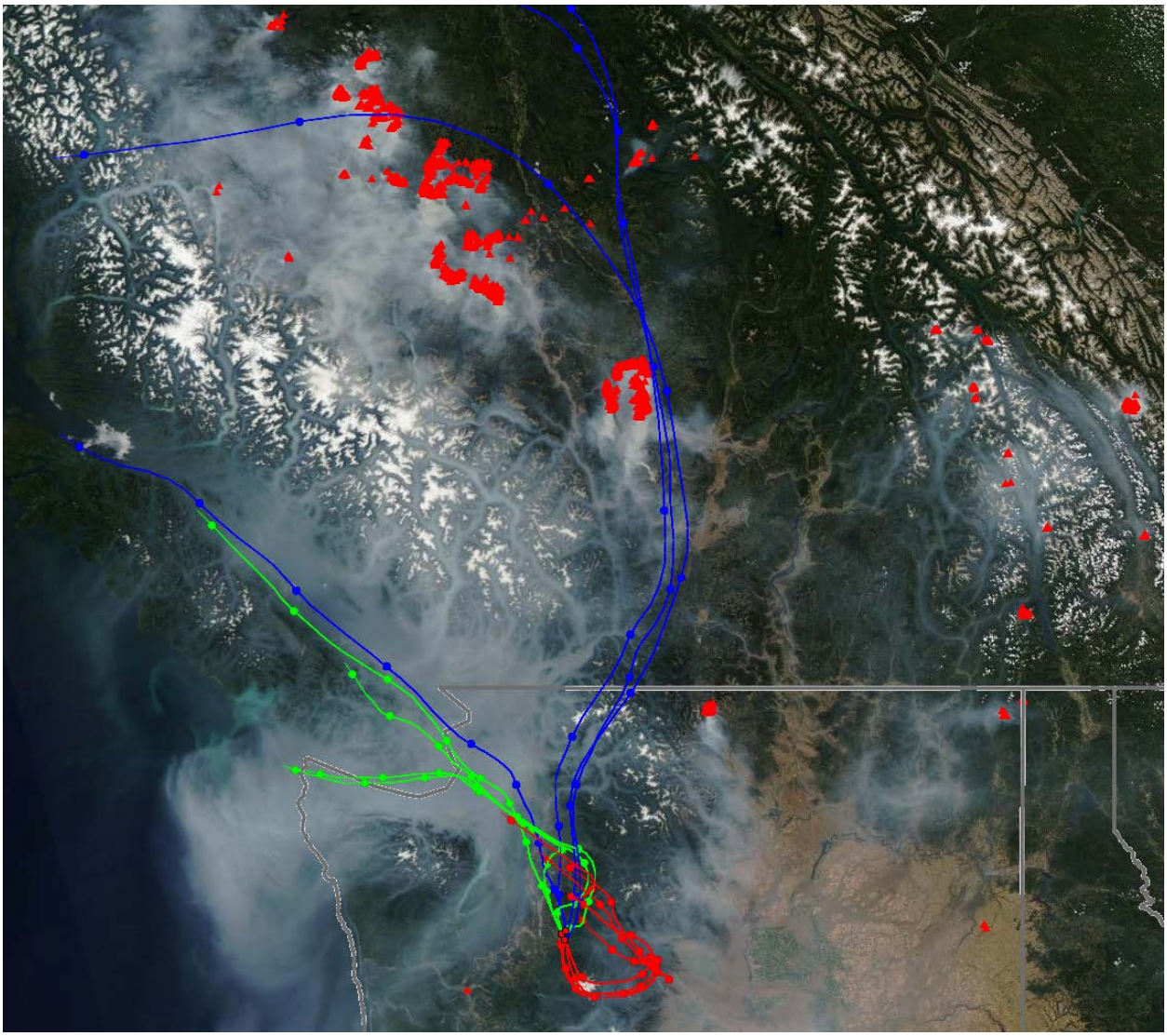


Figure 36: August 2, 2017 Back Trajectories from Enumclaw

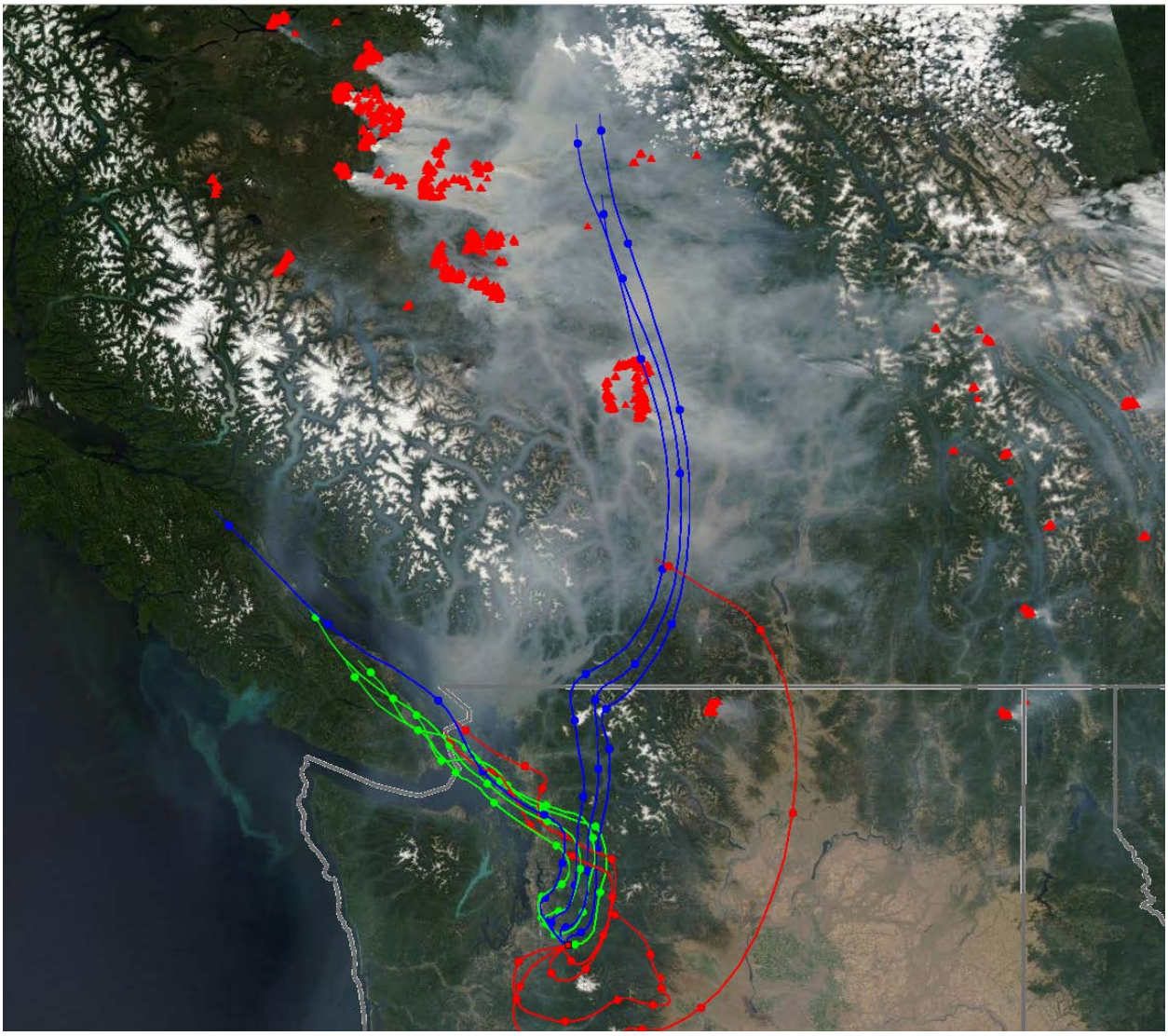


Figure 37: August 3, 2017 Back Trajectories from Enumclaw

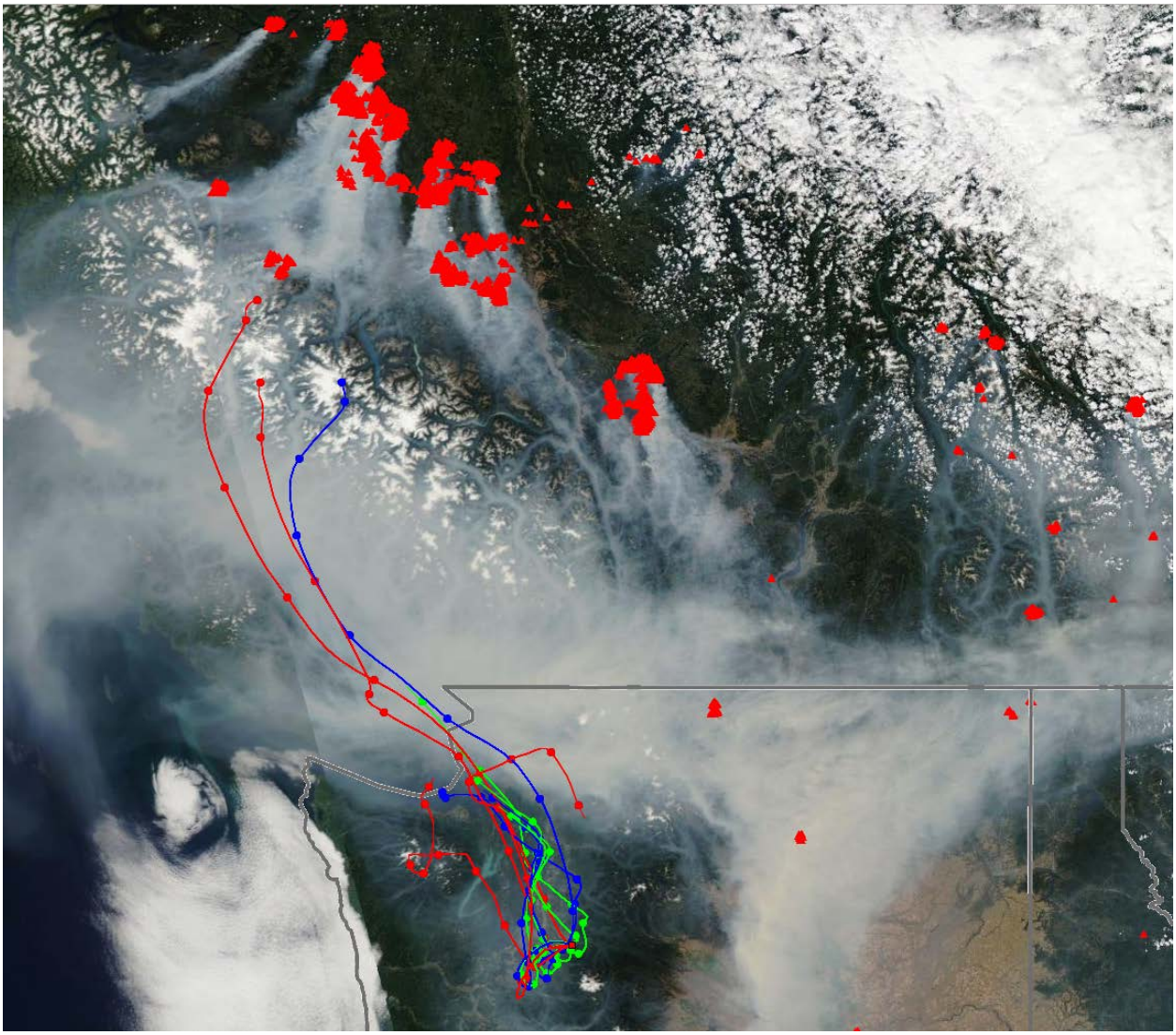


Figure 38: August 4, 2017 Back Trajectories from Enumclaw

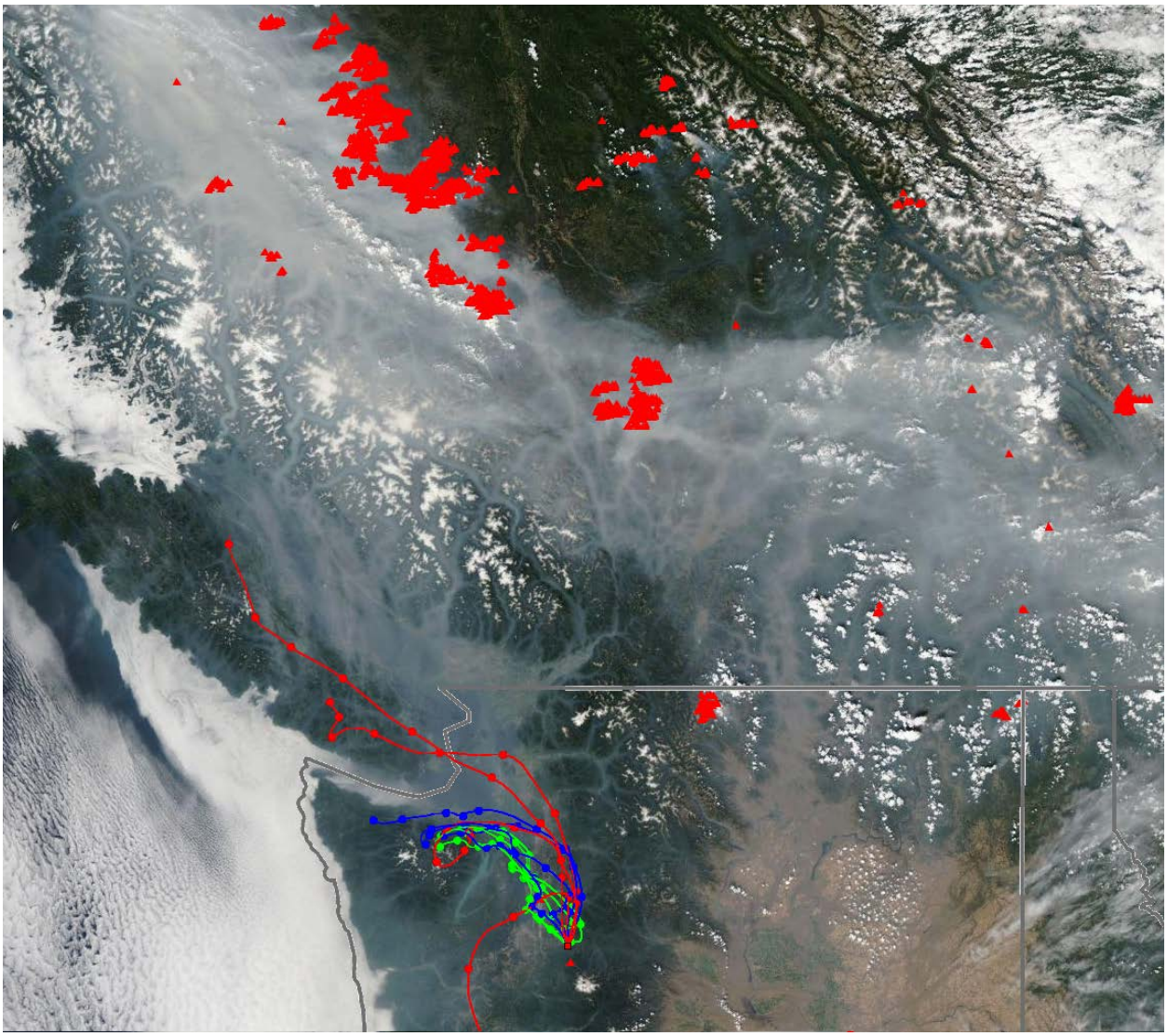


Figure 39: August 7, 2017 Back Trajectories from Enumclaw

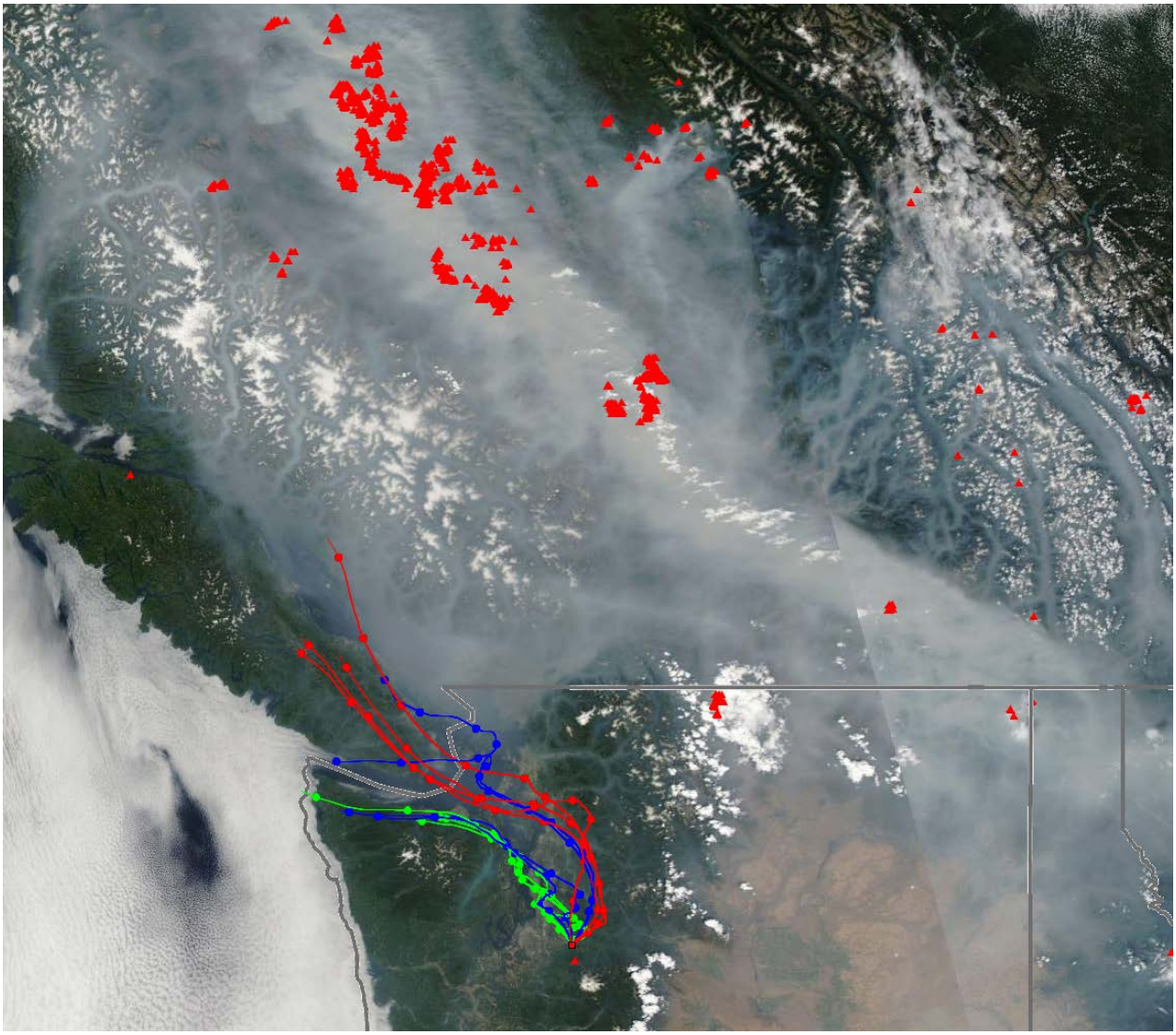


Figure 40: August 8, 2017 Back Trajectories from Enumclaw

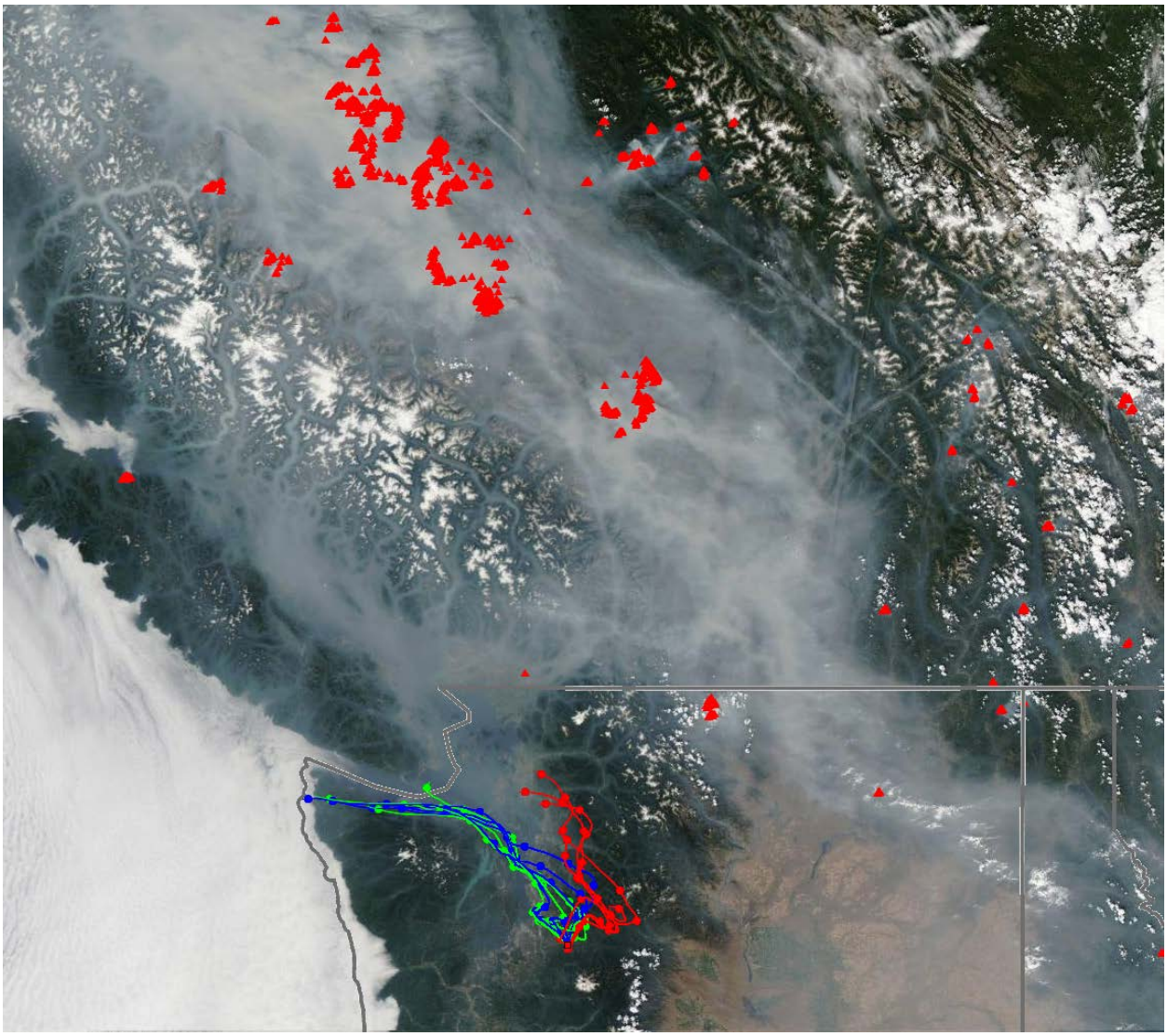


Figure 41: August 9, 2017 Back Trajectories from Enumclaw

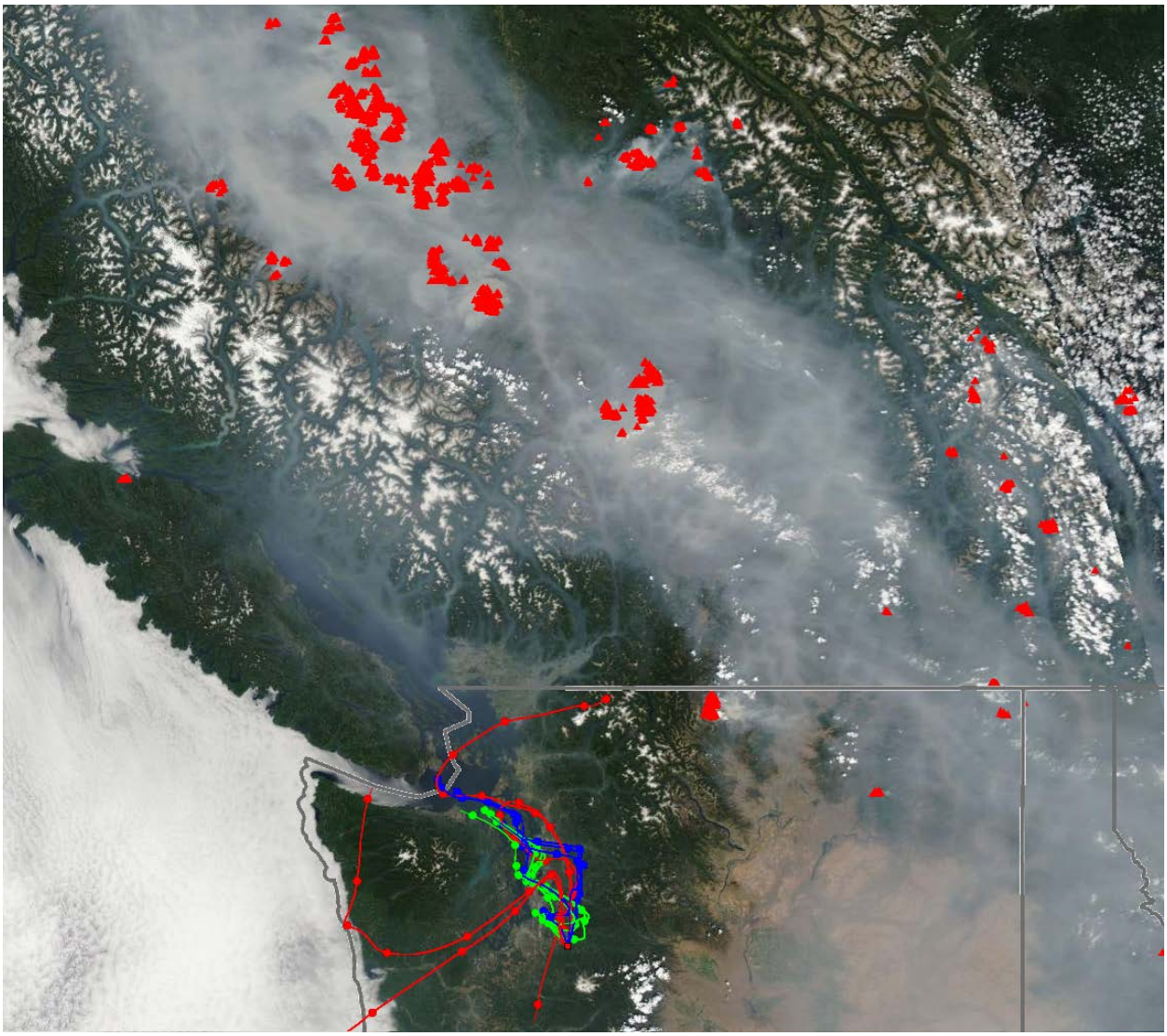


Figure 42: August 10, 2017 Back Trajectories from Enumclaw

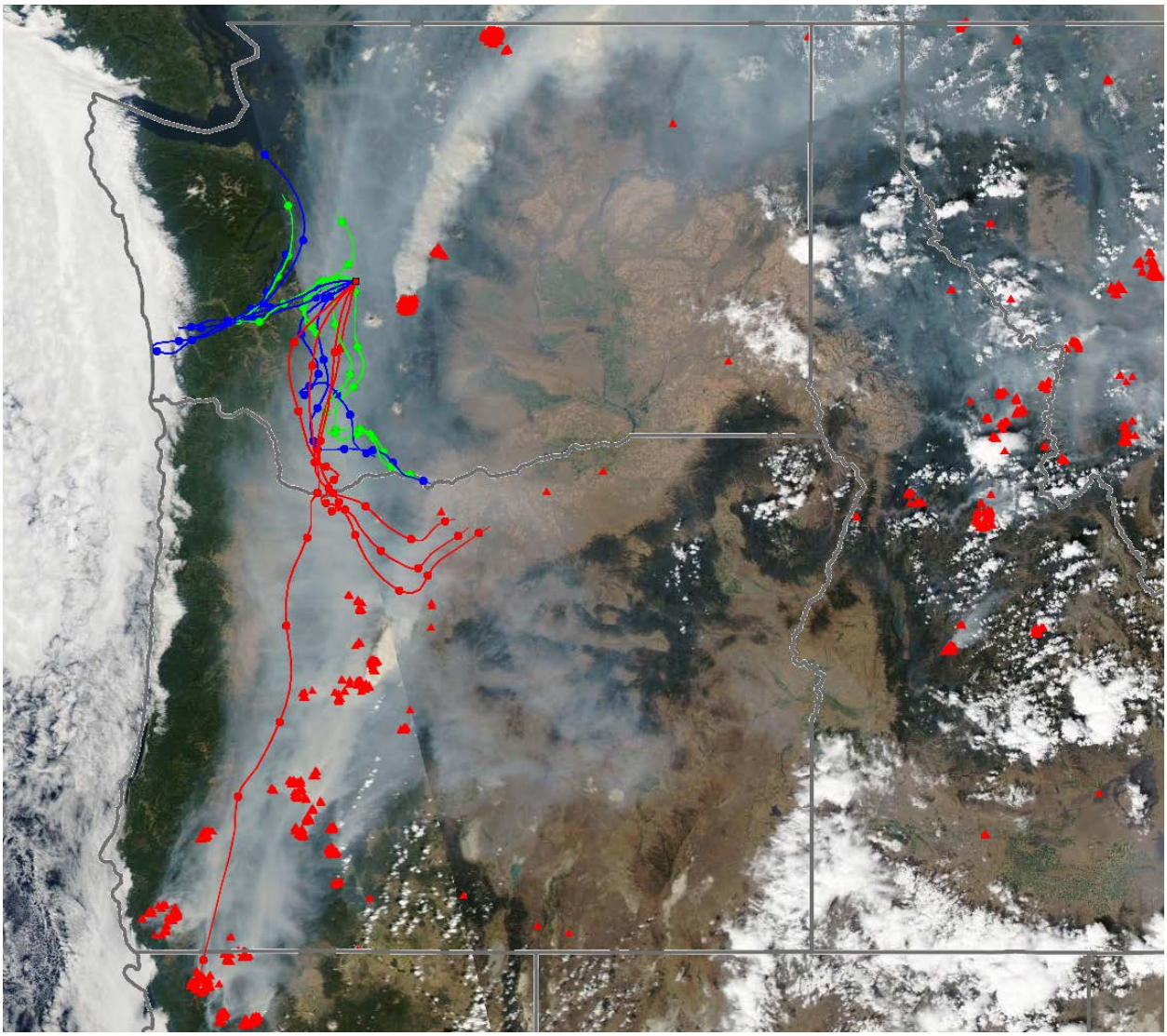


Figure 43: August 29, 2017 Back Trajectories from Enumclaw

$PM_{2.5}$ Data for Nearby Monitors

The extended smoke events in August impacted $PM_{2.5}$ concentrations statewide for over a week. Nearby $PM_{2.5}$ monitors showed elevated concentrations on all ozone exceedance days, and exceedances of the $PM_{2.5}$ standard were recorded at one or more Washington monitors on all but one of the ozone exceedance days (8/29).

Figure 44 below shows the range of 24-hour concentrations observed at statewide FEM and FRM $PM_{2.5}$ monitors (parameter code 88101) for each day in August. Days on which the Enumclaw ozone monitor exceeded the NAAQS are marked in blue.

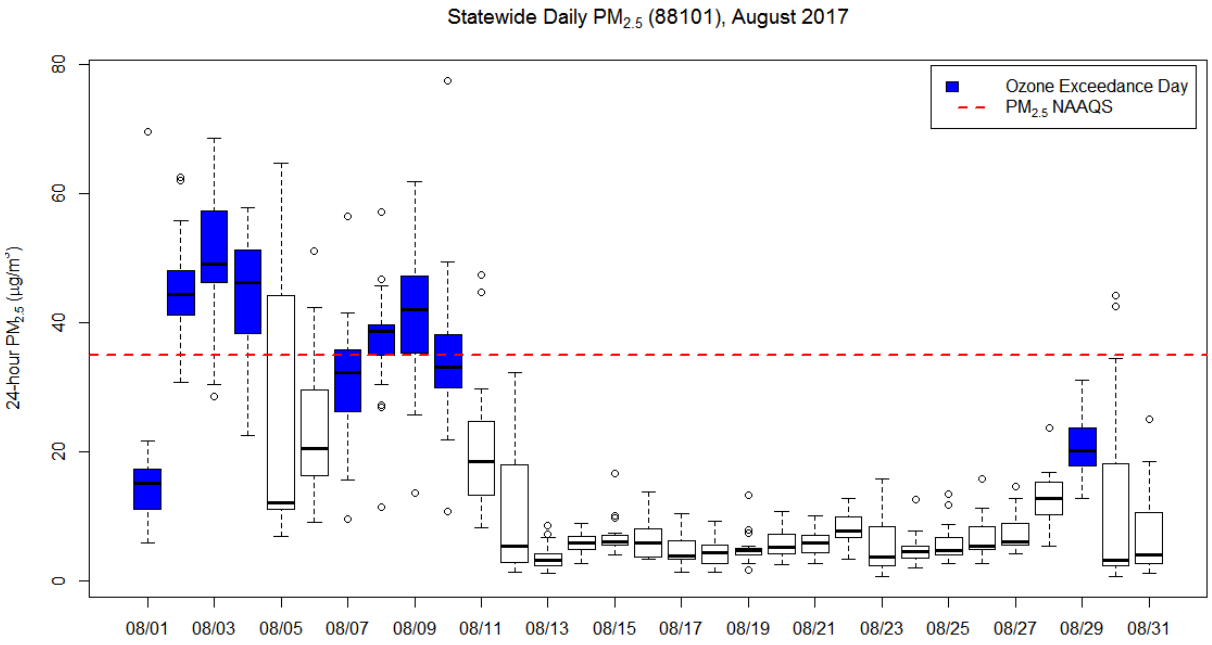


Figure 44: Statewide $PM_{2.5}$ Boxplots

Table 16 below summarizes the number and percent of $PM_{2.5}$ sites statewide exceeding the $PM_{2.5}$ standard on each of the high-ozone days.

Table 16: $PM_{2.5}$ Exceedances

Date	Number of Exceedances	Percent of Sites Exceeding $PM_{2.5}$ NAAQS
8/1/2017	1	5.6%
8/2/2017	18	85.7%
8/3/2017	16	84.2%
8/4/2017	15	78.9%
8/7/2017	6	31.6%
8/8/2017	15	71.4%

Date	Number of Exceedances	Percent of Sites Exceeding $PM_{2.5}$ NAAQS
8/9/2017	12	75.0%
8/10/2017	8	44.4%
8/29/2017	0	0.0%

Figure 45 below shows the 24-hour $PM_{2.5}$ impacts at monitors nearest Enumclaw (both parameter codes 88101 and 88502) along with the daily 8-hour maximum ozone concentration at Enumclaw. Nearby monitors begin to show elevated concentrations (>10 µg/m^3) on August 1 and rise above the level of the NAAQS on August 2. $PM_{2.5}$ concentrations did not return to baseline August levels until after the concurrent drop in ozone concentrations after August 10th. $PM_{2.5}$ sites again showed elevated concentrations >10 µg/m^3 on August 29th, though not in excess of the NAAQS.

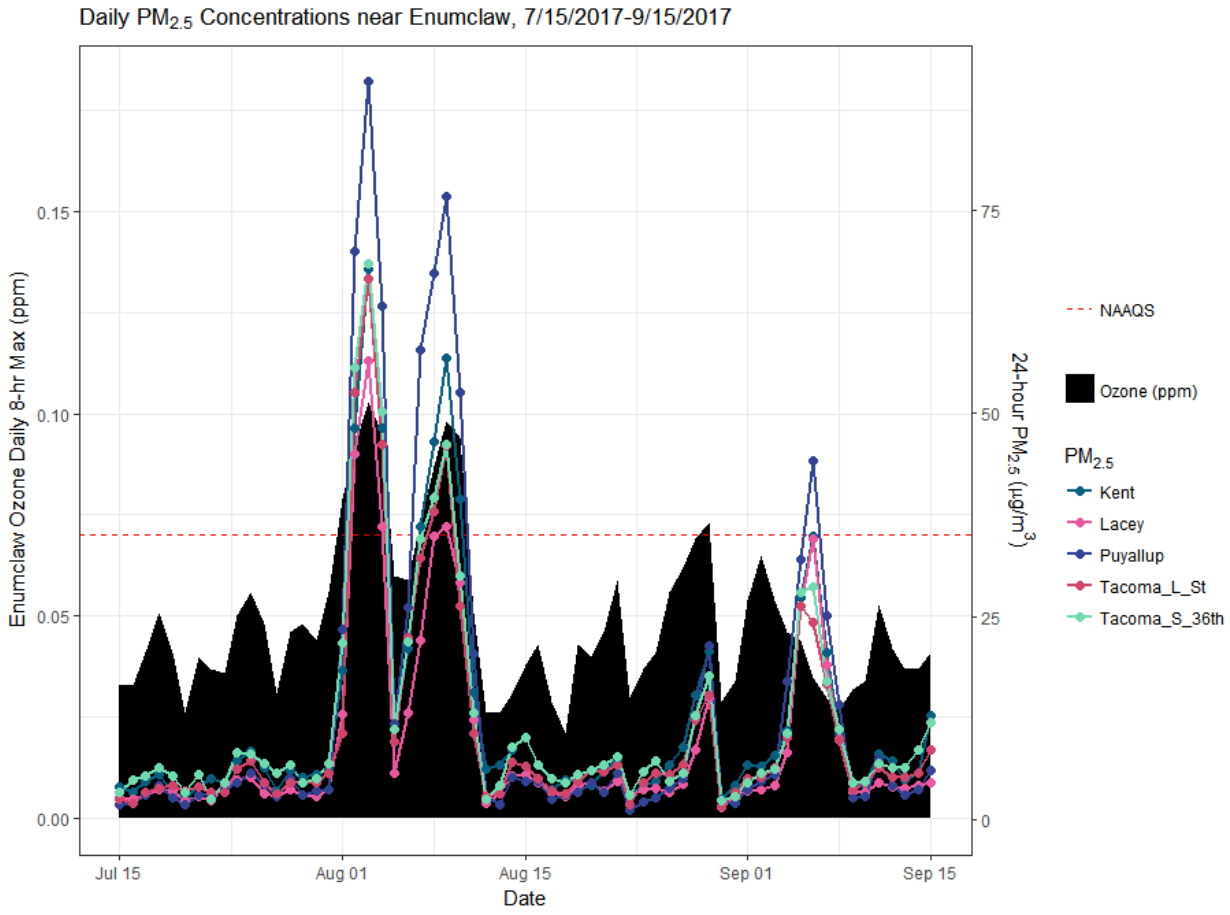


Figure 45: Daily $PM_{2.5}$ Time Series

Figure 46 below shows the mass concentrations of speciated $PM_{2.5}$ parameters at the Mt. Rainier IMPROVE site along with the daily 8-hour maximum ozone concentration at Enumclaw. Days with high ozone at Enumclaw correspond to days with high total $PM_{2.5}$. On high-ozone days in August, speciated $PM_{2.5}$ was dominated by organic carbon (dark green), which indicates that biomass burning was a predominant source of $PM_{2.5}$ pollution. Organic carbon ordinarily comprises less than half of the total $PM_{2.5}$ mass. On high-ozone days not associated with wildfire smoke, such as July 6th (2nd bar from the left), the total $PM_{2.5}$ concentration was higher than typical summer days later in July, but organic carbon comprised a relatively small fraction of total $PM_{2.5}$.

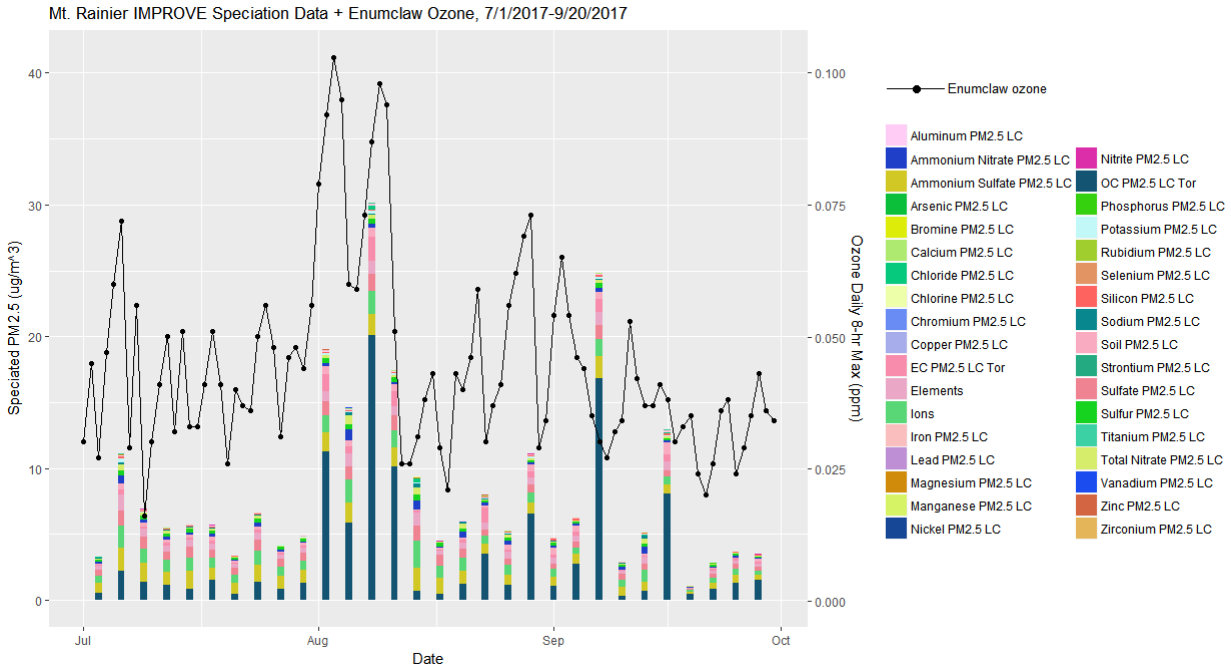


Figure 46: Mt. Rainier IMPROVE Speciation Data

Comparison of 2017 Smoke-Related Ozone Levels to Historical Concentrations

The table below summarizes the percentile ranks for the 9 ozone exceedances in August 2017, both within the 5-year period 2013-2017 and within year 2017. With the exception of 8/1, 8/7 and 8/29, the ozone exceedance days are above the 99th percentile concentration in the 5-year period. All exceedance days are above the 97th percentile in the 5-year period. It should be noted that in the 5-year dataset of 756 days, only 7 days can be at or above the 99th percentile. Since this document describes 9 ozone exceedances, it would not be mathematically possible for them to all be above the 99th percentile.

Table 17: Percentile Rank for O_3 Compared to Last 5 Years

Date	5-Year Percentile Rank	1-Year Percentile Rank	1-Year Rank
8/1/2017	98.5	94.7	8
8/2/2017	99.3	96.6	5
8/3/2017	99.8	99.3	1
8/4/2017	99.5	98	3
8/7/2017	97.1	92.7	10
8/8/2017	99.1	96	6
8/9/2017	99.7	98.6	2
8/10/2017	99.3	97.3	4
8/29/2017	97.1	92.7	11

Figure 47 below shows a scatterplot of daily maximum 8-hour ozone levels and temperature for July 20 to September 30 for selected monitoring sites in Washington. The black dots show ozone levels for days with no smoke, and the colored dots show days affected by wildfire smoke. The different colors indicate the year of the smoke event. This shows the influence of temperature and smoke on ozone levels for the monitoring locations. The wildfire smoke events

on hot days in 2017 resulted in high ozone levels that were outside the historic norm in Enumclaw.

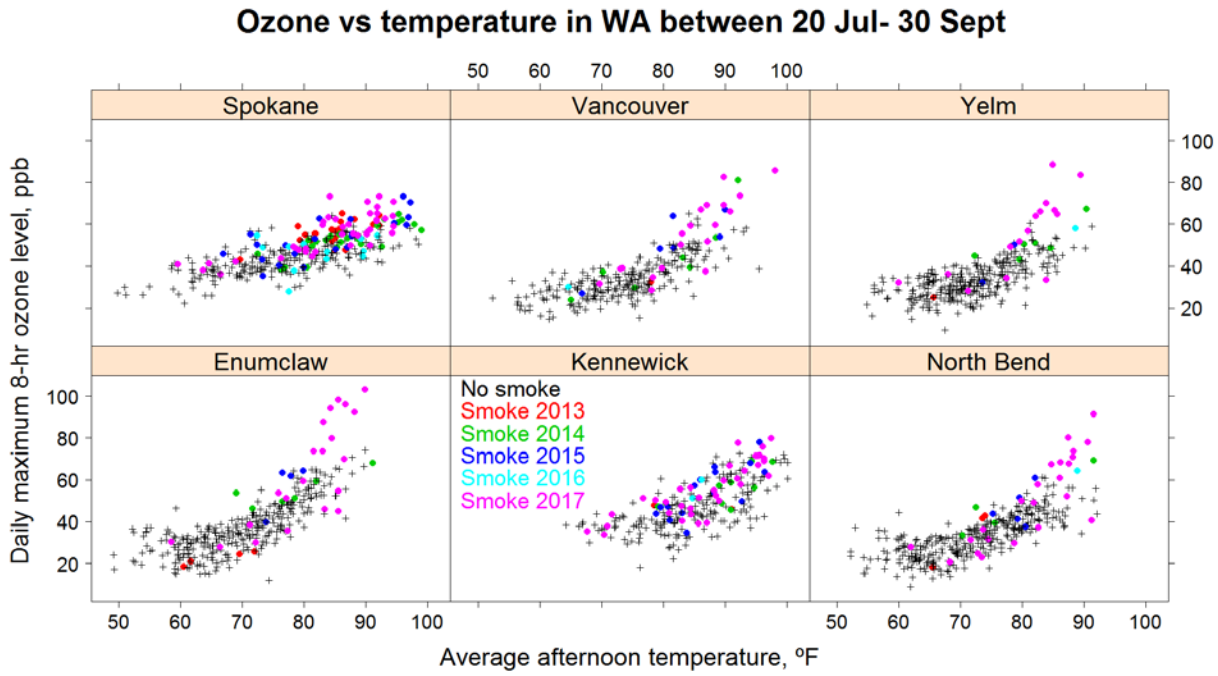


Figure 47: Ozone vs. temperature in Washington, July 20 to Sept. 30, 2017

Figure 48 below also shows that ozone levels in Enumclaw during the 2017 wildfire events were above the historic norms.

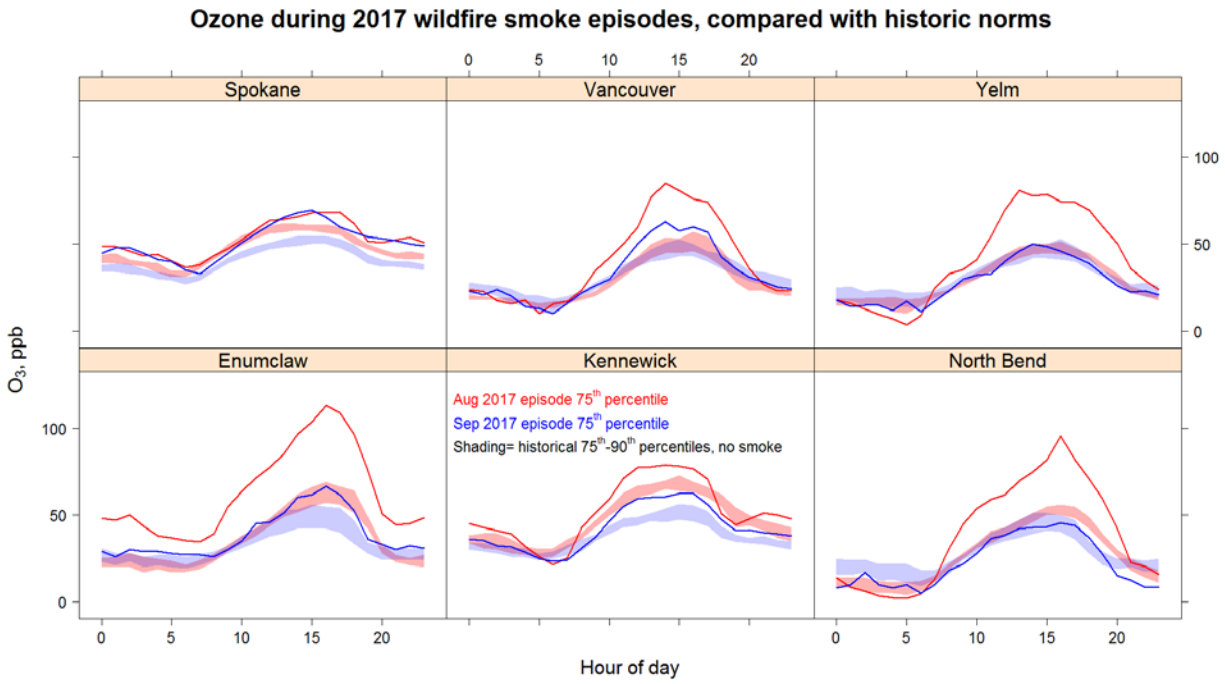


Figure 48: Ozone during 2017 wildfire smoke episodes, compared with historic norms

Hourly O3 Time Series

The images below contain hourly time series graphs for the days with ozone exceedances.

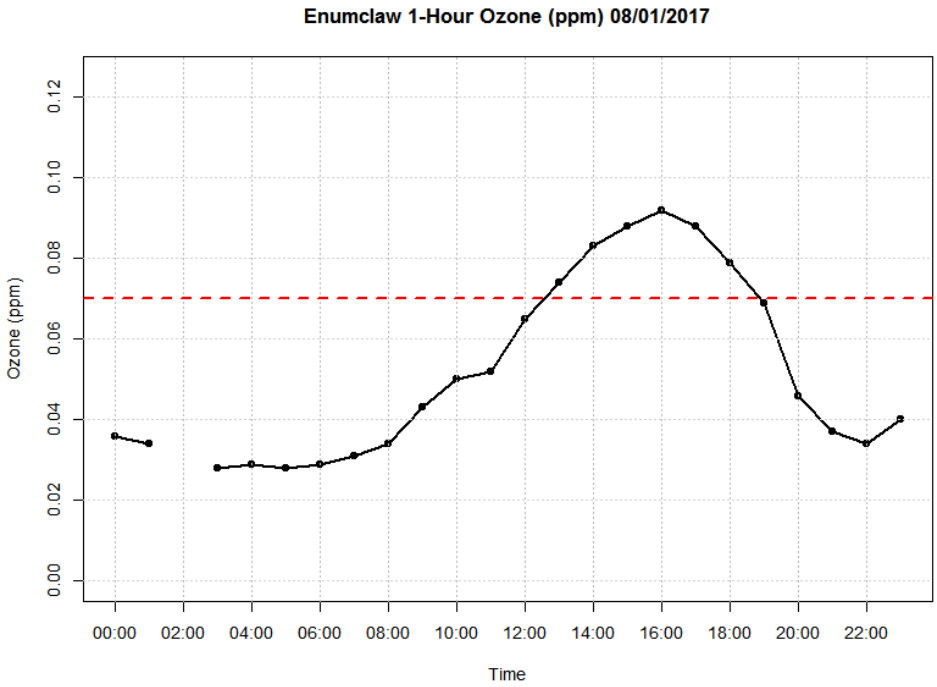


Figure 49: 8/1/2017 Enumclaw 1-Hour Ozone

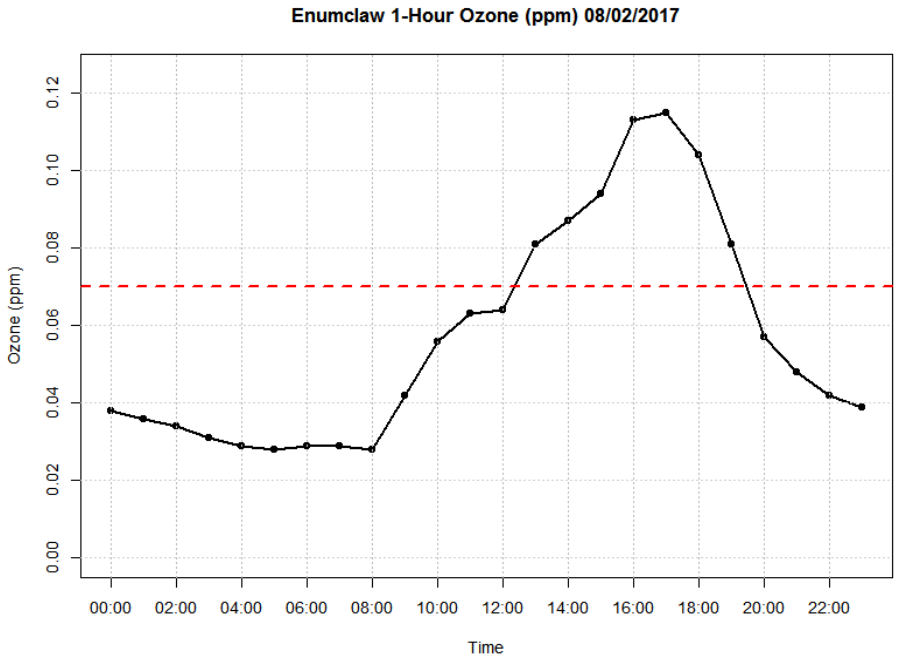


Figure 50: 8/2/2017 Enumclaw 1-Hour Ozone

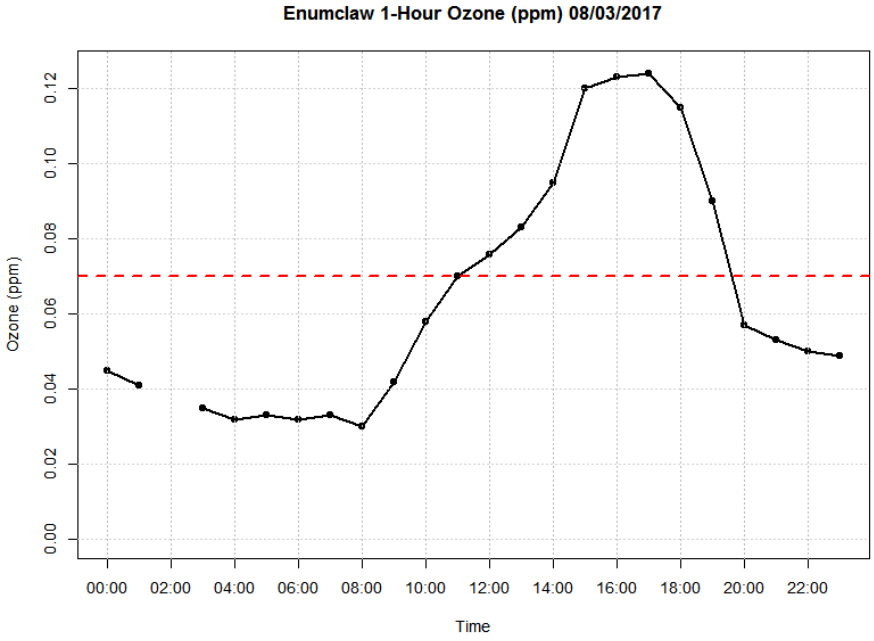


Figure 51: 8/3/2017 Enumclaw 1-Hour Ozone

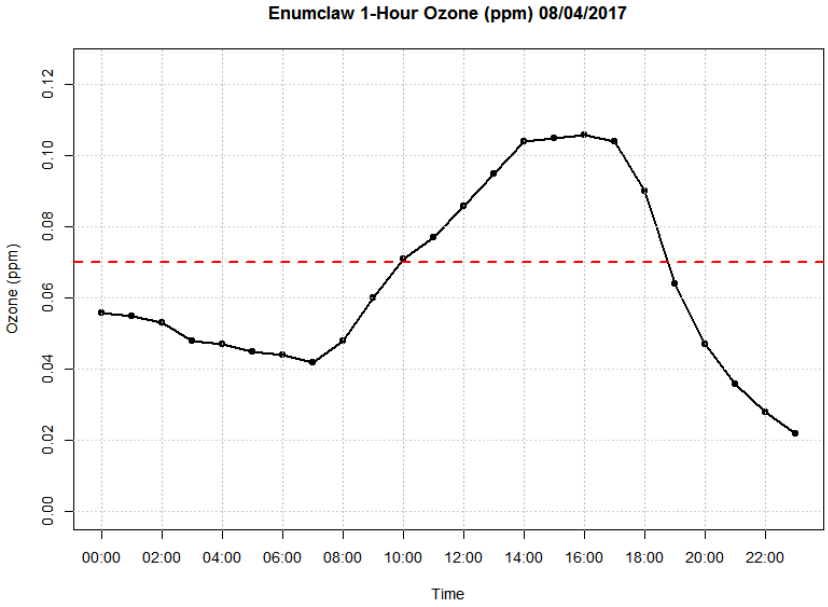


Figure 52: 8/4/2017 Enumclaw 1-Hour Ozone

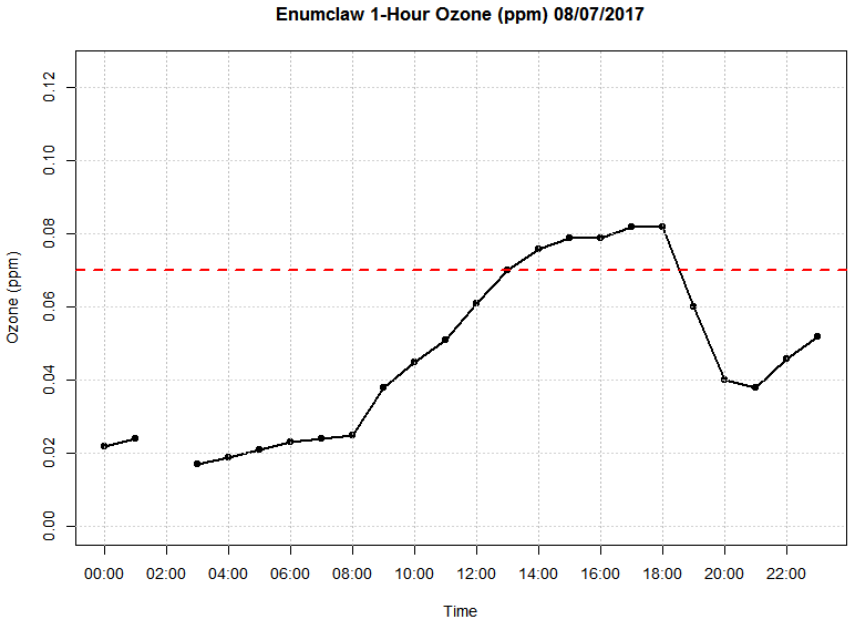


Figure 53: 8/7/2017 Enumclaw 1-Hour Ozone

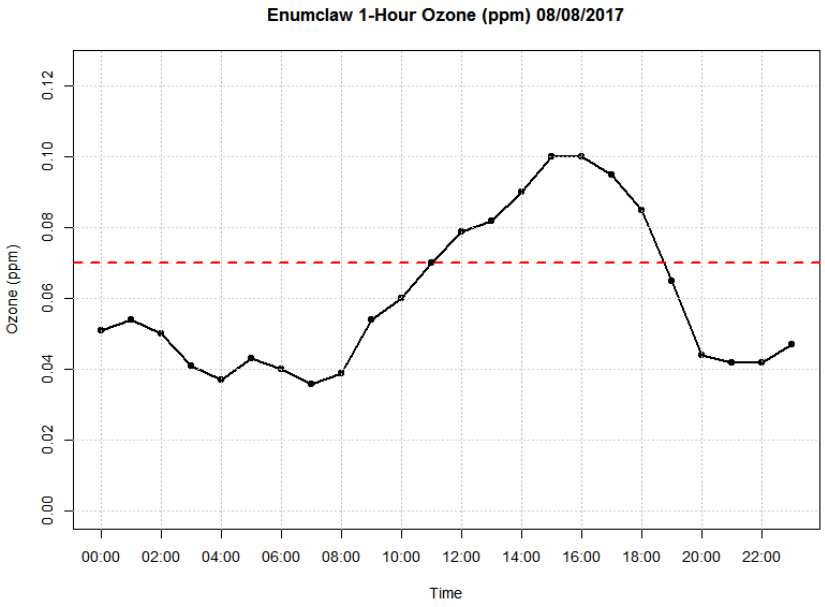


Figure 54: 8/8/2017 Enumclaw 1-Hour Ozone

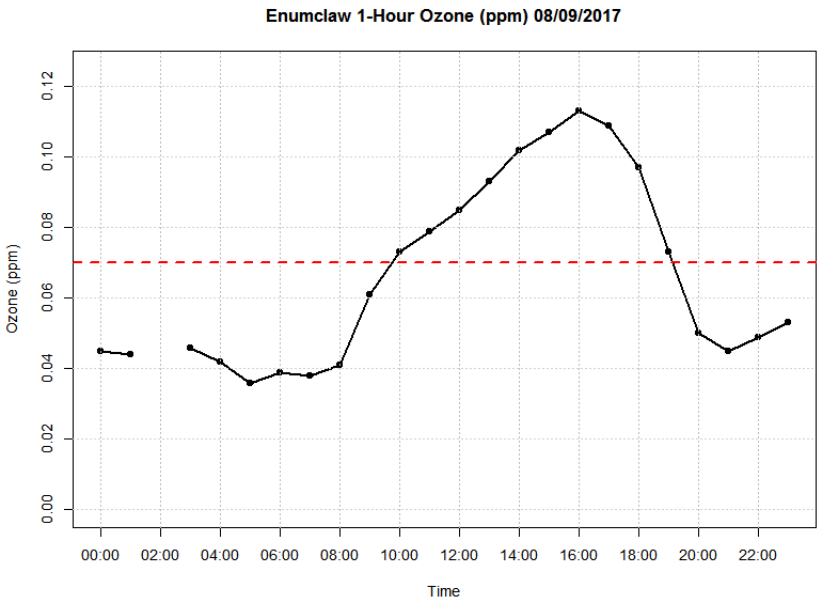


Figure 55: 8/9/2017 Enumclaw 1-Hour Ozone

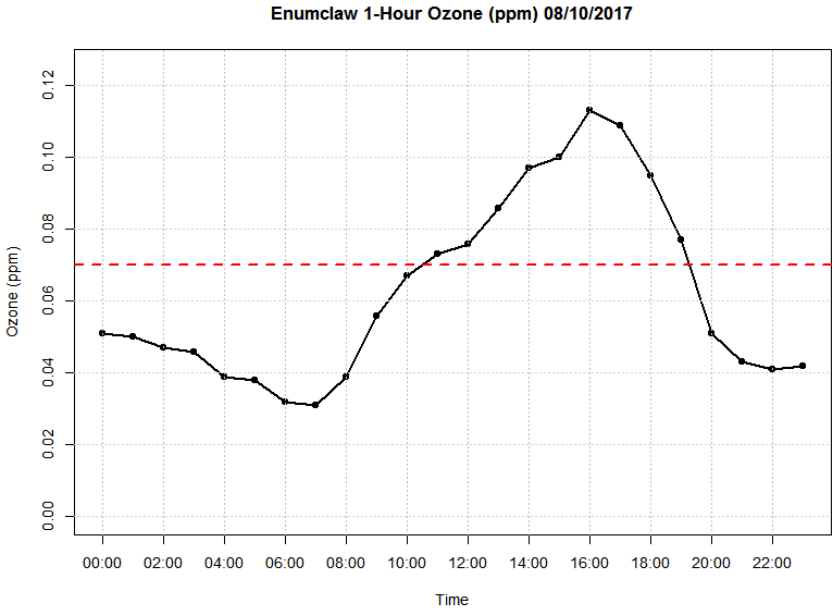


Figure 56: 8/10/2017 Enumclaw 1-Hour Ozone

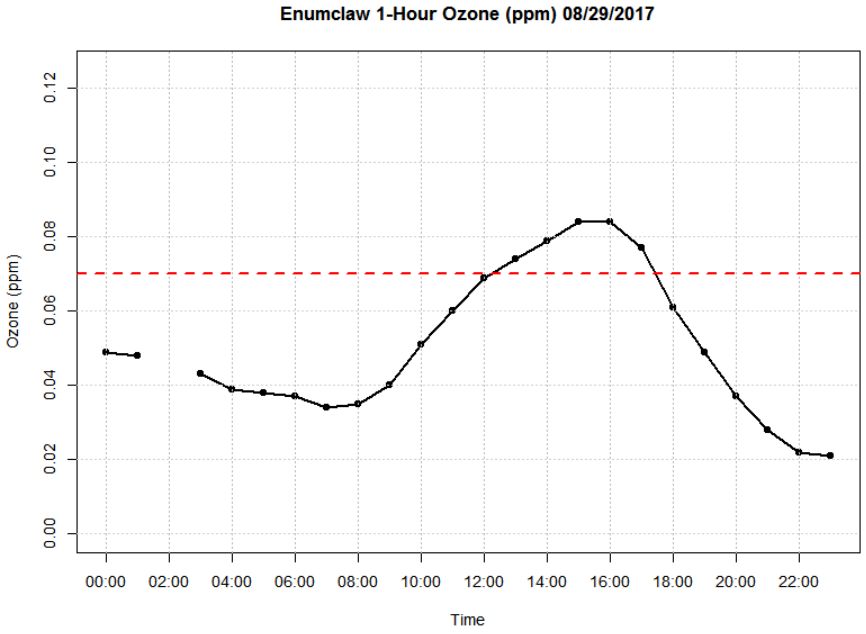


Figure 57: 8/29/2017 Enumclaw 1-Hour Ozone

Comparison of Ozone Sensitivity

Wildfire smoke can increase O_3 levels in urban and rural areas. Statistical models show that fires contribute up to 0.030 parts per million (ppm) to 8-hour average concentrations on occasion, jeopardizing compliance with the 0.070 ppm standard.[28] For example, on August 3, 2017, the wildfire smoke from British Columbia contributed an estimated 0.027 ppm to the 8-hour average O_3 value at the Enumclaw monitor, resulting in a daily maximum 8-hour average of 0.103 ppm.[29]

Compared to the influence of wildfire smoke, the vehicle I/M program has a relatively small impact on O_3 levels. Table 18 below shows the on-road mobile source emissions of VOC and NOx from King, Pierce and Snohomish Counties, and the emissions reductions attributed to the I/M program. Their impacts on Enumclaw O_3 was estimated using the sensitivity coefficients found in a modeling study conducted in the Puget Sound area. [30]

[28] McClure and Jaffe, 2018, Presentation to NW-Airquest, http://lar.wsu.edu/nw-airquest/docs/20180612_meeting/NWAQ_Jaffe_20180614.pdf.
[29] Ibid.
[30] Trail and Russell, Georgia Tech University, 2018, Air Pollution Episodes in the Pacific Northwest, http://nwcleanairwa.gov/?wpdmdl=5217.

Table 18: Impact of Vehicle I/M Program on Enumclaw O_3

King, Pierce and Snohomish Counties	VOC	NOx
Onroad contribution to total emissions	14%	34%
Emissions reduction from I/M program	4.2%	2.8%
Modeled sensitivity coefficients (min- max)	0.18 -0.23 ppb/ %	0.2- 0.5 ppb/%
Estimated reduction in 8-hr O_3 at Enumclaw	0.11- 0.13 ppb	0.19- 0.48 ppb
Overall Enumclaw O_3 sensitivity to I/M program	0.30- 0.61 ppb	

At the Enumclaw monitor, daytime peak O_3 is positively sensitive to anthropogenic NO_x emissions from King, Pierce and Snohomish counties with an increase between 0.2 and 0.5 ppb per percent, and is positively sensitive to VOC emissions by up to 0.18 and 0.23 ppb per percent. Ecology calculates that the reduction in onroad mobile source emissions of VOCs and NO_x from the vehicle I/M program is estimated to result in up to 0.61 ppb (or 0.00061 ppm) decline in the average 8-hour O_3 running maximum value in 2019, the last year of the program.

Conclusion

On August 1-11, 2017, smoke from numerous wildfires in British Columbia affected air quality in Washington State. On August 29, 2017, smoke from numerous wildfires in Oregon, northern California, and Washington affected air quality in Washington State. The wildfire smoke from these two events generated ozone precursors and resulted in elevated ozone concentrations at the Enumclaw monitor.

The monitored ozone concentrations were outside the historic range. The 2017 smoke episodes caused the abnormal number of exceedances of the O_3 standard in Enumclaw in 2017. The comparisons and analyses provided in this appendix support Ecology's position that the wildfire event clearly caused and/or contributed to the monitored ozone exceedances at the Enumclaw monitor. The effect of the wildfires on ozone concentrations was significant (up to 0.030 ppm increase) compared to the relatively small reduction from the vehicle I/M program (up to 0.00061 ppm reduction). This supports Ecology's conclusion that removal of the vehicle I/M program will not interfere with attainment of the O_3 NAAQS.

Appendix E: Vehicle I/M Sunset MOVES Documentation

Project

Washington's Motor Vehicle Inspection and Maintenance Program (I/M) ends on December 31, 2019. Onroad motor vehicle emissions trend were estimated to show the effects of phasing out the vehicle I/M Program while taking into account changing traffic volumes, motor vehicle emissions standards, and fuel standards.

Evaluation Years

Emissions were calculated at 5 year intervals from 2000 to 2040. The year 2019 was also calculated since it is the last year of the vehicle I/M program.

Geographic Scope, Season, and Pollutants

The vehicle I/M program operates in the central Puget Sound area (King, Pierce, and Snohomish Counties), Spokane County, and Clark County. Emissions were calculated for the areas and pollutants in the table below. These regions and pollutants were selected based on the maintenance status history for each area and based on the pollutants reduced by the vehicle I/M program.

Table 19: Pollutants analyzed

County	**Pollutants**
King, Pierce, Snohomish and Clark	NO_x and VOC
King, Pierce, Snohomish, Spokane and Clark	CO
Pierce	$PM_{2.5}$

Weekday emissions were calculated under seasonal and meteorological conditions which are likely to have the most impact on the highest concentrations. We used attainment or maintenance plan season and temperatures for each area and pollutant.

Modeling Tool

EPA's Motor Vehicle Emission Simulator (MOVES) model, version MOVES2014a-20151201 with database movesdb20161117 was used to generate the emissions estimates. MOVES includes the capability of modeling the essential design elements of vehicle I/M programs. Local county data were used as input parameters to reflect local conditions. Parameters and their data sources are documented below.

Table 20: MOVES Parameters and Data Sources

Parameter	**Data Source**
Vehicle population	DOL, OSPI, FTA, OFM

Parameter	Data Source
Vehicle age distribution	DOL, OSPI, FTA
Vehicle miles traveled (VMT)	PSRC, SRTC, SWRTC, WSDOT
Road type distribution	WSDOT
Month, day, and hour VMT distribution	WSDOT
I/M Program	Dept. of Ecology I/M program records
California emissions standards	CA standards option in MOVES
Fuel parameters	State regulations and MOVES default data
Temperature and humidity	SIP temperatures with MOVES default humidity
Speeds	MOVES Default
Ramp Fraction	MOVES Default

Vehicle Population and Vehicle Age Distribution

County baseline vehicle population by age and vehicle type for 2015 (2014 for FTA) was calculated from vehicle data from the Washington State Department of Licensing (DOL), Washington State Office of the Superintendent of Public Instruction (OSPI) (school buses), and the Federal Transit Administration (FTA) (intercity and transit buses).

Human population was used to project and back-cast the baseline vehicle population to the evaluation years. Human population estimates by county came from the Washington State Department of Financial Management (OFM). Projected years' estimates were based on OFM's medium series projections for the State Growth Management Act.[31]

The vehicle age distribution is the fraction of each model year by vehicle type. The fractions were calculated using the DOL, OSPI, and FTA vehicle data.

Vehicle Miles Traveled (VMT)

Average weekday VMT (ADVMT) was obtained from the local metropolitan planning organizations (MPOs): Puget Sound Regional Council (PSRC), Spokane Regional Transportation Council (SRTC), and Southwest Regional Transportation Council (SWRTC).[32, 33, 34] The MPOs included baseline and projected ADVMT. Interpolation was used

[31] Washington State Office of Financial Management, 2012, Projections of the total resident population for the Growth Management Act. Medium series: 2010 to 2040 by single year after 2015.
[32] Email from Anna Ragaza-Bourassa, Spokane Regional Transportation Council to Sally Otterson, Washington State Department of Ecology. 2015 and 2040 VMT estimates from *Horizon 2040 Update*. October 4, 2017.
[33] Email from Rebecca Frohning, Puget Sound Regional Council to Sally Otterson, Washington State Department of Ecology. 2017 and 2025 VMT estimates from *Transportation 2040*, last amendment adopted in June 2015. March 11, 2016.
[34] Email from Mark Harrington, Southwest Regional Transportation Council to Sally Otterson, Washington State Department of Ecology. SWRTC regional travel demand model outputs. Sept. 27, 2017.

to estimate ADVMT for years not specifically estimated by an MPO. The MOVES model requires annual VMT. The MPO weekday ADVMT was converted to annual VMT using day of week adjustment factors from the Washington State Department of Transportation (WSDOT).[35]

PSRC and SRTC did not have VMT for some of the early evaluation years. The missing years were back-cast from their earliest year of VMT using county VMT information from WSDOT.[36] The WSDOT VMT were used to construct ratios of the earliest year to the missing years. The ratios were multiplied by the MPO's earliest year of VMT to estimate the missing years.

Road Type Distribution

The road type distribution is the fraction of VMT accumulated on each of the four MOVES road types by vehicle type. WSDOT travel data by vehicle and road type was used to develop a distribution for 2015. The distribution was applied to all evaluation years.[37]

Month, day, and hour VMT distribution

The MOVES model calculates emissions based on hourly data. WSDOT provided VMT adjustment factors by road type for month, day-of-week, and hour (weekday and weekend) based on 2006-2008 traffic counts.[35]

I/M Program

The programs began in different years for each area, and experienced various changes over the years. Both gasoline and diesel vehicles are tested, but MOVES only models I/M benefits for gasoline vehicles. The remainder of this section addresses the vehicle I/M program for gasoline vehicles.

In MOVES, the vehicle I/M program is defined for each county and evaluation year. The required parameters are test frequency, pollutant, test type, first and last model year tested, fuel type, vehicle type, emissions process, and compliance factor.

The test frequency is biennial. The pollutant and emissions processes tested are exhaust and evaporative hydrocarbons, nitrogen oxides, and carbon monoxide. The program includes multiple test types.

For evaluation years 2000 - 2010, vehicles between 25 and 5 years old are tested. Ecology adopted California standards beginning with model year 2009 and exempted them from testing; therefore, for evaluation years 2015 and 2019, vehicles between 25 years old and model year 2008 are tested.

The compliance factor is the product of the compliance rate and (100 - waiver rate)/100. The compliance rate is the percentage of vehicles required to test that either pass the test or receive a waiver. The compliance factor was calculated for each geographic area based on testing and licensing data for the years closest to the evaluation year. The waiver rate is the percentage of

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[35] Email from Guorong Liu, Washington State Department of Transportation to Sally Otterson, Washington State Department of Ecology. Transmitting spreadsheets with monthly, day-of-week, and hourly adjustment factors. Nov. 24, 2009.

[36] Washington State Department of Transportation, Reports for 2005 – 2015, HPMS Mileage and Daily Travel Summary.

[37] Washington State Department of Transportation, 2014 Travel Activity by Vehicle Type and Functional Class.

vehicles that fail an initial test and do not pass a retest, and finally receive a waiver. Waiver rates were calculated for each test type and geographic area based testing data for the years closest to the evaluation year.

I/M program parameters are shown in the tables below.

Table 21: Year of Waiver and Compliance Rate Data

Year	Waiver Year	Compliance Year
2000	1999-00	2002
2005	2004-05	2005
2010	2007-08	2007
2015	2015-16	2007
2019	2015-16	2007

Table 22: Vehicle Inspection and Maintenance Program, 2000 - 2019

Year	Duty	Test Type	Pollutants	model years tested	Compliance Factor (%)			
					Clark	King	Pierce & Snohomish	Spokane
2000	LD	Two-mode, 2500 RPM/Idle Test	CO, HC	1976 - 1995	n/a	85.2	85.2	n/a
2000	LD	ASM 2525 Phase-in Cutpoints	CO, HC	1977 - 1996	85.8	n/a	n/a	85.0
2000	LD	Evaporative Gas Cap Check	HC	1976 - 1995	85.8	n/a	n/a	n/a
2000	HD	Two-mode, 2500 RPM/Idle Test	CO, HC	1976 - 1995	85.8	85.2	85.2	85.0
2000	HD	Evaporative Gas Cap Check	HC	1976 - 1995	85.8	n/a	n/a	n/a
2005	LD	ASM 2525 Phase-in Cutpoints	CO, HC	1981 - 1995	88.6	84.6	84.6	87.0
2005	LD	Evaporative Gas Cap Check	HC	1981 - 2000	88.6	84.6	84.6	87.0
2005	LD	Evaporative System OBD Check	HC	1996 - 2000	88.6	84.6	84.6	87.0
2005	LD	Exhaust OBD Check	CO, HC, NO_x	1996 - 2000	88.6	84.6	84.6	87.0
2005	HD	Two-mode, 2500 RPM/Idle Test	CO, HC	1981 - 2000	92.5	89.8	89.8	92.1
2005	HD	Evaporative Gas Cap Check	HC	1981 - 2000	88.6	84.6	84.6	87.0
2010	LD	ASM 2525 Phase-in Cutpoints	CO, HC	1986 - 1995	80.7	75.1	75.1	78.8
2010	LD	Evaporative Gas Cap Check	HC	1986 - 1999	96.4	94.5	94.5	95.9
2010	LD	Evaporative System OBD Check	HC	1996 - 2005	76.1	68.1	68.1	76.4
2010	LD	Exhaust OBD Check	CO, HC, NO_x	1996 - 2005	76.1	68.1	68.1	76.4
2010	HD	Two-mode, 2500 RPM/Idle Test	CO, HC	1986 - 2005	84.9	81.6	81.6	84.5
2010	HD	Evaporative Gas Cap Check	HC	1986 - 1999	96.4	94.5	94.5	95.9
2015	LD	Two-mode, 2500 RPM/Idle Test	CO, HC	1991 - 1995	68.3	61.8	61.8	74.7

Year	Duty	Test Type	Pollutants	model years tested	Compliance Factor (%)			
					Clark	King	Pierce & Snohomish	Spokane
2015	LD	Evaporative System OBD Check	HC	1996 - 2008	64.6	50.5	50.5	61.7
2015	LD	Exhaust OBD Check	CO, HC, NO_x	1996 - 2008	64.6	50.5	50.5	61.7
2015	HD	Two-mode, 2500 RPM/Idle Test	CO, HC	1991 - 2008	70.3	59.3	59.3	75.7
2019	LD	Two-mode, 2500 RPM/Idle Test	CO, HC	1995 - 1995	68.3	61.8	61.8	74.7
2019	LD	Evaporative System OBD Check	HC	1996 - 2008	64.6	50.5	50.5	61.7
2019	LD	Exhaust OBD Check	CO, HC, NO_x	1996 - 2008	64.6	50.5	50.5	61.7
2019	HD	Two-mode, 2500 RPM/Idle Test	CO, HC	1995 - 2008	70.3	59.3	59.3	75.7

Duty: LD = light duty, HD = heavy duty
Test Type: ASM = acceleration simulation mode, OBD = on-board diagnostics

California Emissions Standards

WA adopted California Low-Emission Vehicle (LEV II) standards beginning with 2009 model year vehicles. The standards were substituted for the federal standards through use of a special MOVES input file.

Fuel Parameters

Gasoline fuel parameters are Reid vapor pressure (RVP); sulfur content; oxygenate types, volume, and market share; aromatic, olefin, and benzene content; the volume percentage of gasoline evaporated at 200 and 300 degrees Fahrenheit, and the temperatures where 50% and 90% of gasoline is vaporized.

EPA divided the country into fuel regions and developed default parameters for each region and year. All Washington counties were assigned to the same region. The defaults were used in all counties except Clark County. Gasoline used in Clark County is likely supplied through distributors servicing Multnomah County (Portland), Oregon. Gasoline in Clark County was assigned the default fuel properties for Multnomah County, Oregon.

Temperature and Humidity

Weekday emissions were calculated under seasonal and meteorological conditions which are likely to have the most impact on the highest concentrations. We used attainment of maintenance plan season and temperatures for each area and pollutant. MOVES default humidity values were used.

Table 23: Minimum and Maximum Temperatures

Scenario	Clark	King	Pierce	Snohomish	Spokane
Summer Ozone (NO_x, VOC, CO)	61 - 98	60 - 92	60 - 92	60 - 92	
Winter CO	34.4 - 48.4	34 - 50	34 - 50	34 - 50	24.9 - 34.9
Winter $PM_{2.5}$			27 - 46		

Speeds

Vehicle power, speed, and acceleration affect vehicle emissions. MOVES models these emissions effects via speed distributions based on default distributions of vehicle hours traveled (VHT) by average speed. The MOVES default speed distributions were used.

Ramp Fraction

To model restricted-access roads (e.g. freeways) in MOVES, vehicle hours traveled must be split between the ramps and the roadway. The MOVES ramp fraction default of 8% was used.