Exceptional Event Demonstration for 2023 $PM_{2.5}$ Exceedances Due to Wildfires

At Colville E. 1st St. (AQS ID: 53-065-0005)
Washington Department of Ecology

Air Quality Program

Washington State Department of Ecology
Olympia, Washington

November, 2024 public review draft

Publication Information

This document is available on the Department of Ecology's website at:
https://apps.ecology.wa.gov/publications/summarypages/XXXXXX.html

Related Information

- Ecology Air Quality Targets Website,[1]
- EPA Exceptional Events Website,[2]
- Washington Smoke Blog,[3]

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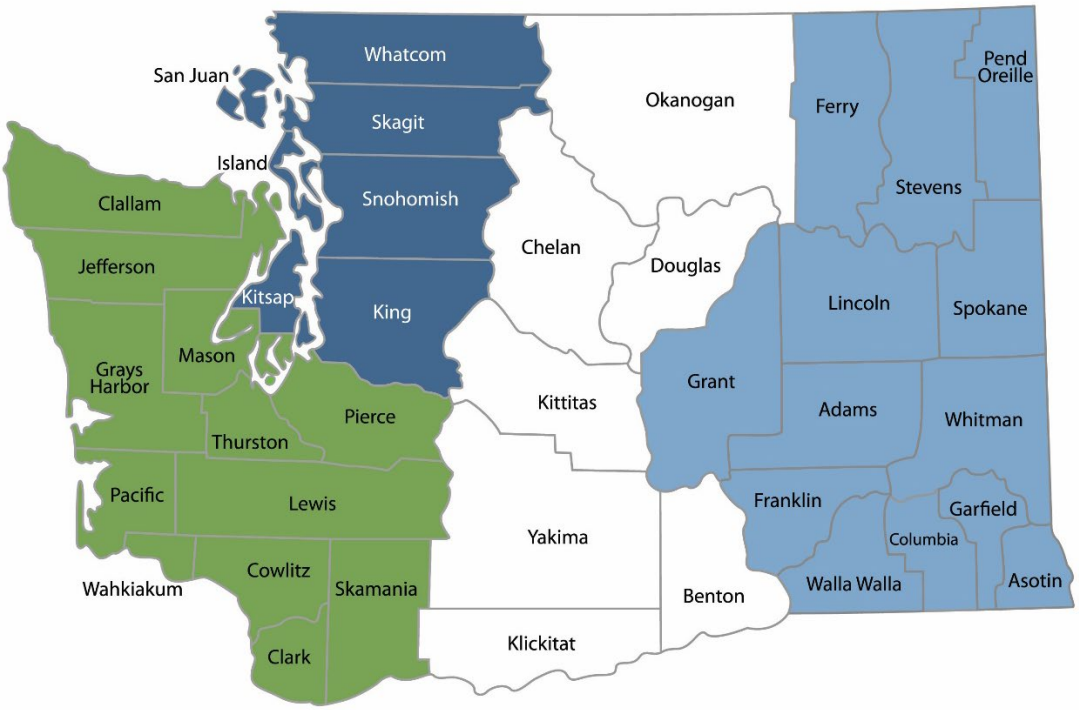
[1] ecology.wa.gov/air-climate/air-quality/air-quality-targets
[2] www.epa.gov/air-quality-analysis/treatment-air-quality-monitoring-data-influenced-exceptional-events
[3] https://wasmoke.blogspot.com/
[4] www.ecology.wa.gov/contact

Department of Ecology's Regional Offices

Map of Counties Served



Southwest Region 360-407-6300	Northwest Region 206-594-0000	Central Region 509-575-2490	Eastern Region 509-329-3400

Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	P.O. Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	P.O. Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 West Alder Street Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 North Monroe Spokane, WA 99205	509-329-3400
Headquarters	Statewide	P.O. Box 46700 Olympia, WA 98504	360-407-6000

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Acronyms and Abbreviations

AQA – Air Quality Alert

AQI – Air Quality Index

AQS – Air Quality System

CAA – Clean Air Agency

DNR – Department of Natural Resources

DOH – Department of Health

Ecology – Department of Ecology

EER – Exceptional Events Rule

HMS – Hazard Mapping System (from NOAA)

HYSPLIT - HYbrid Single-Particle Lagrangian Integrated Trajectory

L&I – Department of Labor & Industries

MODIS - Moderate Resolution Imaging Spectroradiometer

NAAQS – National Ambient Air Quality Standards

NOAA – National Oceanic and Atmospheric Administration

Executive Summary

Washington State Department of Ecology (Ecology) found that an air quality monitoring site located in Colville, Washington was impacted by smoke from wildfires. It caused brief exceedances of the 2024 annual national ambient air quality standard for fine particles ($PM_{2.5}$ NAAQS). Colville is located in central Stevens County. Local sources of $PM_{2.5}$ pollution include residential woodburning, agricultural and transportation activities – all of them are well controlled.

The Environmental Protection Agency (EPA) wrote the Exceptional Events Rule (EER)[5] to allow states to flag air quality data as exceptional and request EPA to exclude those data from influencing decisions to control industrial or other controllable human-caused sources of pollution. An exceptional event (EE) is a natural or unusual event that can overwhelm existing pollution control strategies. Examples of exceptional events include, but are not limited to, smoke from wildland fires, dust from high winds, volcanic activities, stratospheric ozone intrusions, and pollution from traditional national, ethnic, or other cultural events (e.g. fireworks). Data that is excluded by an exceptional event demonstration remains in both the state and federal databases and is used for health-based notifications and exposure evaluations.

Ecology flagged values at the Colville (E. 1st St.) monitoring site and requests EPA concurrence that certain flagged values are exceptional events. The $PM_{2.5}$ flagged values are over 9 micrograms per cubic meter ($\mu g/m^3$) and affect Washington's attainment of the 2024 annual PM2.5 NAAQS. Ecology demonstrates that these exceptional concentration values:

- occurred as a result of wildfire smoke
- were not reasonably controllable or preventable by the State of Washington
- are not likely to reoccur and fully meet the EER criteria for excluding monitor values from the data used to determine attainment of the NAAQS

Ecology is only requesting concurrence for days that are of regulatory significance, but is also providing information for days that may become regulatorily significant in the future.

Required elements of the Exceptional Events Rule

The EER requires that demonstrations justifying data exclusion for exceptional events must include the following:

a) A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);

[5] https://www.epa.gov/air-quality-analysis/federal-register-notice-final-revisions-exceptional-events-rule

b) A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;

c) Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the clear causal relationship requirement;

d) A demonstration that the event was both not reasonably controllable and not reasonably preventable;

e) A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event; and

f) Documentation that the State followed the public comment process and conducted at least a 30-day comment period.

In addition, a state must submit the public comments with the demonstration and address in the demonstration those comments disputing or contradicting factual evidence provided in the demonstration (40 CFR 50.14 (c)(3)(v)).

Introduction

Ecology requests an exclusion of the wildfire measured exceedances of the 2024 annual $PM_{2.5}$ (fine particulate matter) National Ambient Air Quality Standards (NAAQS) at Colville, Washington for 4 days, 8/17/2023, 8/19/2023, 8/20/2023, and 8/21/2023. Information has also been included for 8/18/2023 in case this day becomes regulatorily significant in the future. This demonstration provides evidence and narrative satisfying all the requirements set forth in the Exceptional Events Rule. The exceedances were the direct result of wildfire events that affected air quality at the Colville monitor (AQS Site ID 530650005, Parameter Code 88101, Parameter Occurrence Code 5).

The regulatory significance of the requested exceptional event days was evaluated using the 2022-2023 mean $PM_{2.5}$ at the Colville monitor, calculated following the procedures described in Appendix N to 40 C.F.R. Part 50, compared to the annual $PM_{2.5}$ NAAQS of 9.0 µg/m^3. The 2022-2023 mean $PM_{2.5}$ was considered the best available surrogate for the 2024 annual design value based on currently available data, following guidance from EPA Region 10. Ecology recognizes that the 2024 annual design value will ultimately determine the regulatory significance of the requested exceptional event exclusions. Table 1 shows the 2022-2023 mean $PM_{2.5}$ calculated after excluding each of the four requested exceptional event days in descending order of daily mean $PM_{2.5}$. Exclusion of all four exceptional event days is necessary in order for the 2022-2023 mean $PM_{2.5}$ to reach at or below 9.04 µg/m^3, which is the highest mean expected to attain the 2024 annual $PM_{2.5}$ NAAQS.

Table 1 Regulatory Significance of Requested Exceptional Events Days

Date	**Daily PM2.5 (µg/m^3)**	**Qualifier Flags**	**Request Exclusion from the regulatory decision?**	**2022-2023 Mean after Exclusion (µg/m^3)**
8/20/2023	154.2	IF, IT	Yes	9.325
8/19/2023	140.9	IF, IT	Yes	9.143
8/21/2023	70.5	IF, IT	Yes	9.057
8/17/2023	61.6	IF	Yes	8.981

The conceptual model describes the events and how the emissions from the events led to the exceedances on the monitor each day. It demonstrates that a clear causal relationship exists between the wildfire smoke events and the monitored exceedances. Ecology compared the historical concentrations at the Colville monitor to the exceedance concentrations to support the clear causal relationship requirement. The wildfire events were both not reasonably controllable, not reasonably preventable, and were natural events. Ecology worked with its partners to promptly notify the public of the event and provided public education so individuals may reduce exposure to wildfire smoke.

Conceptual Model

In August 2023, smoke from regional wildfires was transported to the Colville monitor. The Colville monitor recorded several daily exceedances of the annual $PM_{2.5}$ NAAQS from 8/6/2023 to 8/29/2023 as a result of wildfire smoke. The conceptual model describes the source of the fine particulate matter that impacted the monitor, the transport weather conditions that brought aerosols to the monitor, and the timing and magnitude of the events' impacts on the monitor.

Overview

Wildfires occur every year in the Pacific Northwest during summer and fall. The 2023 wildfire smoke season started early, due to a heat wave in May that affected the Pacific Northwest. Large multi-day wildfires didn't occur in Washington until July, but Canada had many large fires that started in the Spring and burned for several months. Additional fire starts due to lightning occurred throughout the summer across the region. The 2023 wildfire season had the most area burned in Canada's recorded history with more than 45 million acres burned, sending smoke to many parts of the USA. Significant Canadian smoke influenced Washington State from August 15 to August 22, which coincided with significant smoke impacts from Washington wildfires in the Cascades. Moderate smoke persisted for several more days until a frontal system in late August produced rain and cooler weather, which mostly put an end to the wildfire season. Washington saw over 151,000 acres burn in wildfires in 2023.[6] There were also 202,000 acres burned in Oregon, 87,000 acres burned in Idaho, and 7,017,000 acres burned in British Columbia.[7]

Several fires in Washington, Idaho, and British Columbia impacted the Colville monitor during the mid-August 2023 event. Colville was directly impacted by the Crater Creek fire in BC, just north of the USA/Canada border, for several days. However, many more fires influenced the area, especially from August 19 to August 22 when a low-pressure weather system (remnants of Hurricane Hilary) allowed wide-spread smoke to persist across the region. Additional fires of influence included the Ross Moore Lake fire in BC, the Lower East Adams Lake fire in BC, the Bush Creek East fire in BC, the Sourdough fire in Washington, the Airplane Lake fire in Washington, and other regional fires.

[6] https://www.nifc.gov/fire-information/statistics
[7] https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

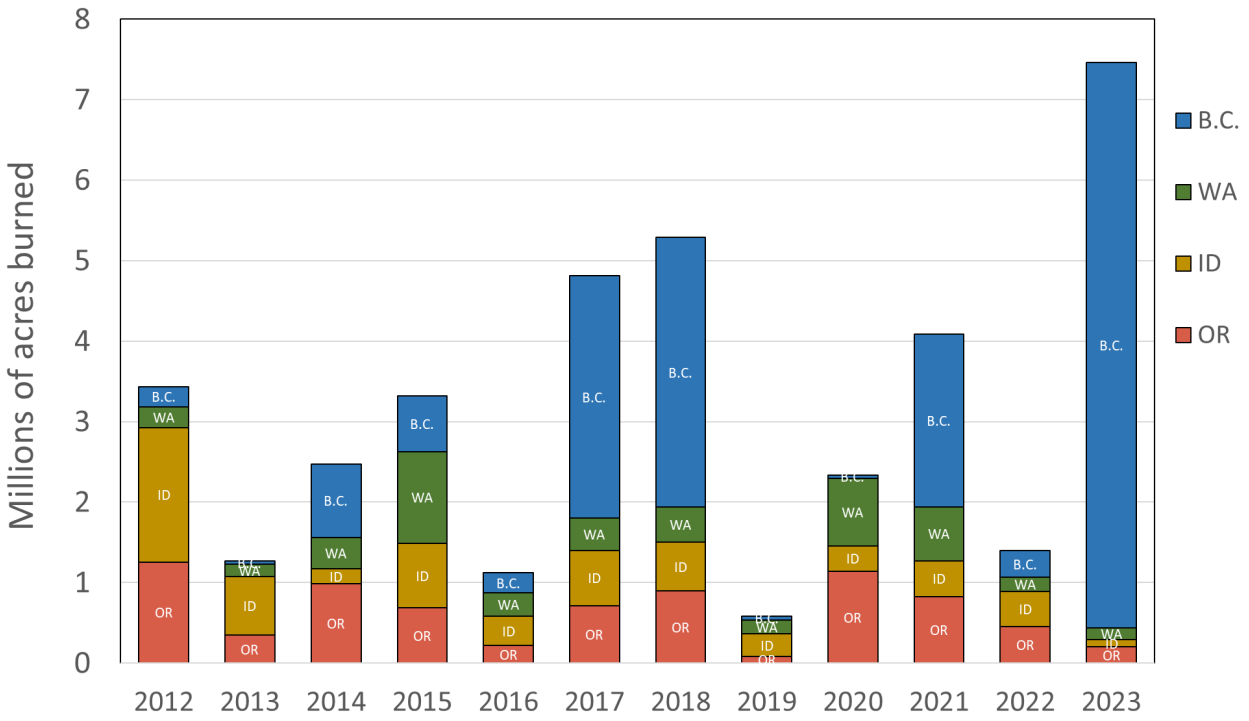

Figure 1. Total area burned for wildfires in Oregon, Idaho, Washington, and British Columbia from 2012 to 2023 from NIFC[8] and the Government of British Columbia.[9]

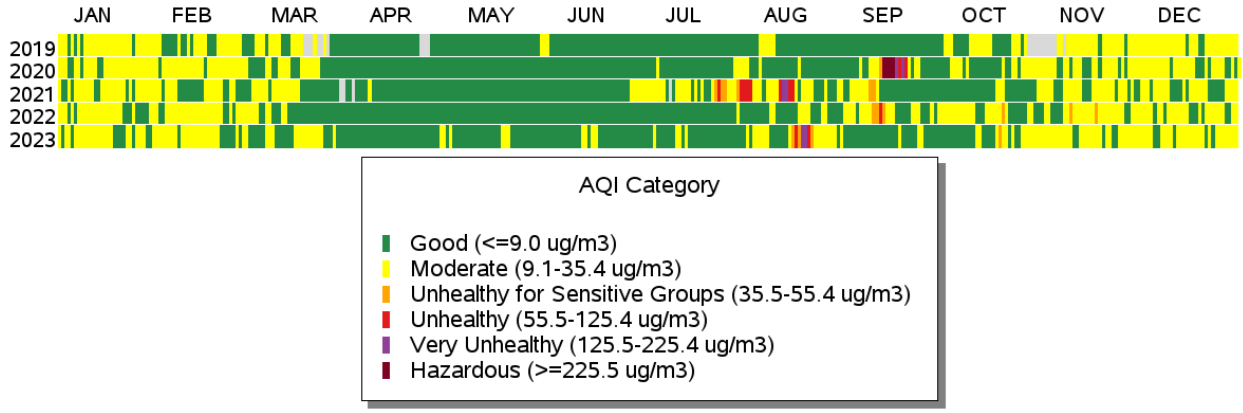

Figure 2 $PM_{2.5}$ Daily AQI Values 2019-2023 Colville E 1st St monitor, AQS Site ID 53-065-0005[10]

[8] www.nifc.gov/fire-information/statistics
[9] https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-statistics/wildfire-averages
[10] Created with EPA's Multi-Year Tile Plot tool for Exceptional Event Analysis. https://www.epa.gov/air-quality-analysis/multiyear-tile-plot-exceptional-events-analysis

General weather conditions

The first week of August 2023 included an overcast weather event that allowed haze and smoke from regional fires to persist on August 5th and 6th. Over the next week, after the residual smoke cleared, temperatures increased and conditions became extremely hot and dry across the West. Strong westerly winds on August 15 allowed fires to grow quickly, increasing smoke production across the region. Significant smoke production occurred across the region for the next few days, as extreme temperature and strong winds continued. A low-pressure weather system traveled past the state on August 17, which cleared some residual smoke out, but the hot and windy conditions exacerbated fires. A large residual smoke layer was evident across most of Washington on August 19, as winds shifted and allowed smoke to pool in the Columbia Basin and persist in mountain valleys. The National Weather Service (NWS) Area Forecast Discussion (AFD) on August 20 noted remnants of Hurricane Hilary affecting the region, as shown in the Figure below. The NWS AFD went on to say "A slight cloud shield is brushing our southeast WA corner and the southern Idaho Panhandle but is thinning out. The local and regional fires can still be seen on satellite as hot spots and coincident our air quality is some of the worst in the country and near the top of the worst in the world. Not something we want to be winning at, but here we are. Northerly winds down the Okanogan Valley will begin to relax through the day today (Sunday) while the northeast wind from the Purcell Trench in northern Idaho through the West Plains and Palouse will relax and weaken by early this afternoon. However, the smoke filtering into the Inland Northwest from Canadian wildfires and local wildfires will stick around through at least mid-day Monday, per the latest HRRR smoke model."[11]

[11] https://mesonet.agron.iastate.edu/wx/afos/p.php?pil=AFDOTX&e=202308201026

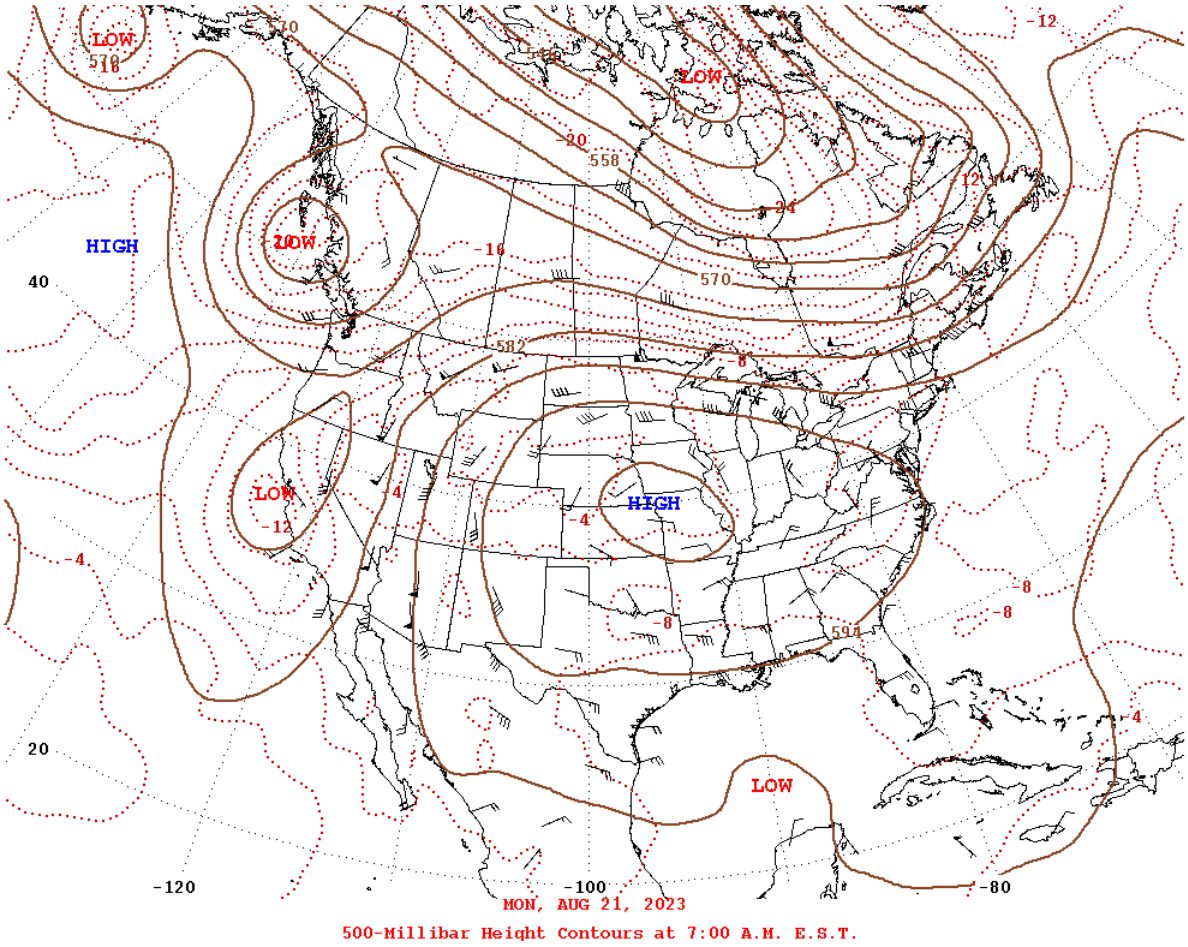

Figure 3. 500 mb height contours on August 21, 2023 (4 a.m. PST) acquired from the NOAA Weather Prediction Center Product Archive.[12]

Source area and affected region

The Colville community in Stevens County, Washington, is a forest-oriented community (population 4,917) in a valley of the Colville River situated in the east Okanogan Highlands. Colville is the largest city in Stevens County and is about 65 miles north of Spokane. Many of the homes are heated by wood. As a result, the major contributor to the historical particulate air pollution has been residential wood combustion for home heating, especially on stagnant winter days when temperature inversions form over the small valley. In contrast, wildfire season is often at its peak in late summer in the Pacific Northwest, which can cause serious smoke impacts.

[12] https://www.wpc.ncep.noaa.gov/archives/web_pages/wpc_arch/get_wpc_archives.php

Fires

In 2023, wildfire smoke events in Washington became significant in the last week of July. Considerable fire activity in Washington and the nearby region increased in mid-August, with wildfire smoke impacting many parts of the state from August 15 to August 22, followed by moderate smoke for several more days. A frontal system in late August produced rain and cooler weather, which mostly put an end to the wildfire season.

On August 15, fires in the Cascades increased smoke production as strong westerly winds were evident across the region. On August 16, north-westerly winds transported smoke from BC fires to northeast Washington. On August 18, smoke production from BC fires was extreme and greatly influenced northeast Washington. By the morning of August 19, smoke had filled the Columbia Basin and most of the state was covered in smoke. Smoke production continued for the next few days as wide-spread smoke persisted across the region. MODIS imagery from Worldview[13] clearly shows the buildup of smoke over several days.

The Crater Creek fire was the most impactful to the Colville site during the August 2023 multi-day smoke event, but several other fires influenced the region and contributed to residual smoke. See Figure 3 for a map of wildfires in the region; see Table 1 for details about the most significant wildfires that impacted Colville.

[13] https://worldview.earthdata.nasa.gov/?v=-128.35916752308734,42.337961387770605,-110.62305263927004,51.196781269843925&l=Reference_Labels_15m,Reference_Features_15m,Coastlines_15m,MODIS_Combined_Thermal_Anomalies_All,MODIS_Aqua_CorrectedReflectance_TrueColor&lg=false&t=2023-08-18-T00%3A00%3A00Z

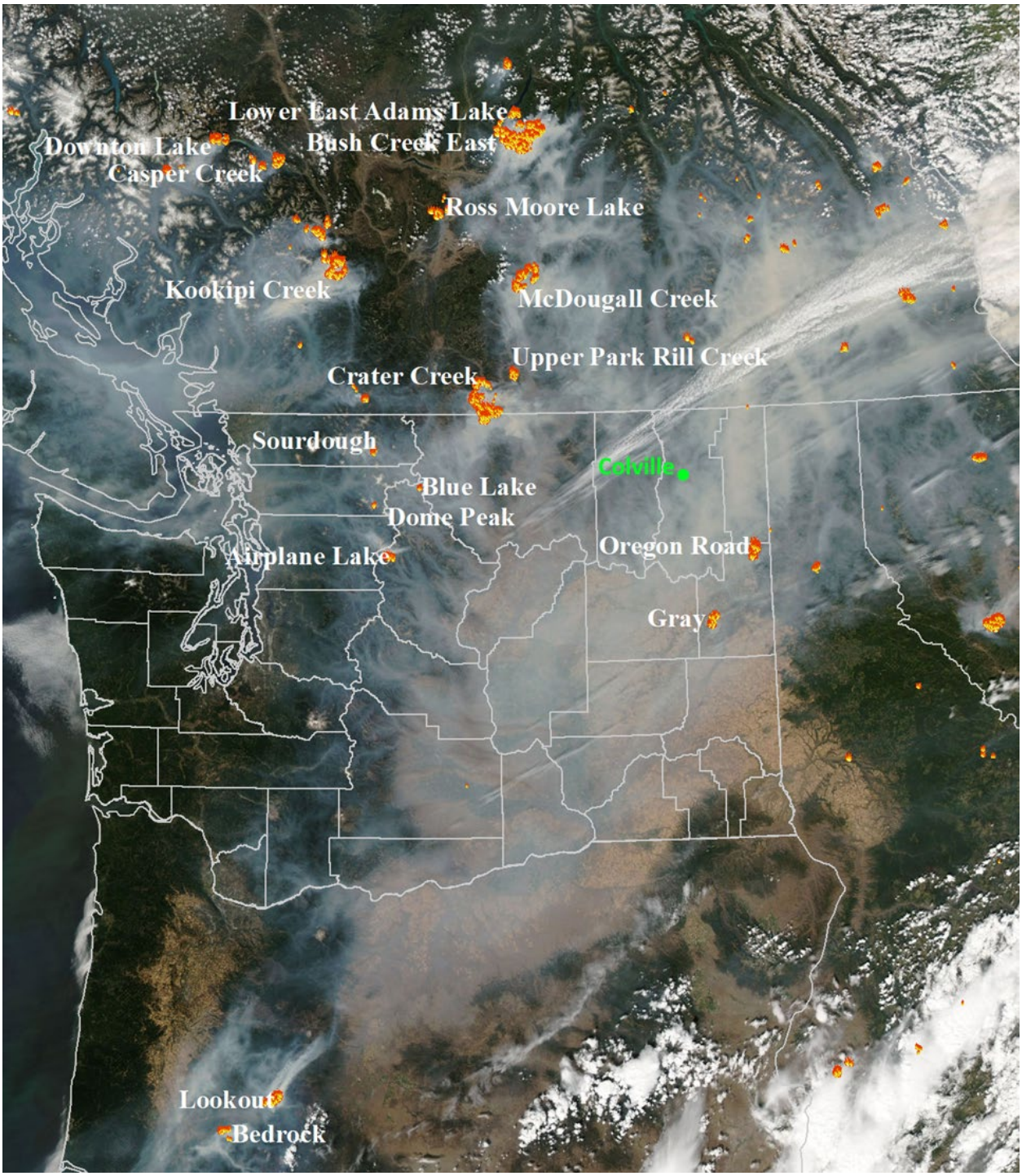

Figure 4. Map of regional wildfires on August 19, 2023 that contributed to smoke events. The background layer is Aqua/MODIS imagery (~2 pm LT). HMS hot-spot locations are shown as red/orange fire symbols.

Table 2. Wildfires that contributed to exceedances at Colville in 2023

Wildfire Name	Location	Discovery Date	Acres Burned
Kookipi Creek	Lytton, BC	July 8	44,590
Casper Creek	Anderson Lake, BC	July 11	27,180
Adams Lake Complex	Adams Lake, BC	July 12	64,225
Downton Lake	Mt. Penrose, BC	July 13	20,880
Ross Moore Lake	Ross Moore Lake, BC	July 21	23,304
Crater Creek	Cathedral Provincial Park, BC	July 23	100,000+
Eagle Bluff	Oroville, WA / Osoyoos, BC	July 29	16,428
McDougall Creek	Kelowna, BC	August 15	33,883
Upper Park Rill Creek	NE of Keremeos, BC	August 18	5,048
Bedrock	Lane County, OR	July 22	31,590
Lookout	Lane County, OR	August 8	25,754
Airplane Lake	Chelan County, WA	July 26	6,956
Sourdough	Whatcom County, WA	August 1	7,377
Dome Peak	Snohomish County, WA	August 9	1,477
Blue Lake	Chelan County, WA	August 14	1,074
Gray	Spokane County, WA	August 18	10,085
Oregon Road	Spokane County, WA	August 18	10,817

Clear Casual Relationship

The EER requires that a clear causal relationship exists between the event that affected air quality and the monitored exceedance. In 2024, EPA released the "$PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document"[14] that provides three tiers of analyses that apply to the "clear causal relationship" criterion included in an exceptional event demonstration. The tiered approach recognizes that some wildfire events are easily recognizable, so fewer pieces of evidence are needed to show a clear causal relationship. The tiering threshold is based on the most recent 5-year period of monitoring data (2019-2023), as the lesser value of either (a) the month-specific 98th percentile for 24-hour $PM_{2.5}$data or (b) the minimum annual 98th percentile for 24-hour $PM_{2.5}$data with Informational (I) qualifiers on the monitoring data excluded.

- Tier 1: intended for wildfire events that cause unambiguous $PM_{2.5}$impacts well above historical 24-hour concentrations, thus requiring fewer pieces of evidence to establish a clear causal relationship. Tier 1 demonstrations are appropriate for 24-hour $PM_{2.5}$ greater than or equal to 1.5 times the threshold determined.
- Tier 2: should be used for events when $PM_{2.5}$ concentrations are less distinguishable from historical concentrations, and thus require more pieces of evidence than a Tier 1 analysis. Tier 2 demonstrations are appropriate for 24-hour $PM_{2.5}$ greater than or equal to the threshold but less than 1.5 times the threshold.
- Tier 3: should be used for events when $PM_{2.5}$ concentrations are near or within the range of historical concentrations, and thus require more pieces of evidence to establish the clear causal relationship than Tier 2 or Tier 1. Tier 3 demonstrations are appropriate for 24-hour $PM_{2.5}$ less than the threshold.

The "EPA $PM_{2.5}$ Tiering Tool for Exceptional Events Analysis"[15] was used to determine the thresholds at Colville for August 2023. For the month of August, the 5-year month-specific 98th percentile (13.9 ug/m^3) from 2019 to 2023 was less than the annual 5-year 98th percentile (18.0 ug/m^3). Therefore the value of 13.9 ug/m^3 (the month-specific 98th percentile) was used as the tiering threshold for August 2023. Thus, Tier 1 demonstrations are appropriate for concentrations of 20.85 µg/m^3 or greater, while Tier 2 demonstrations are appropriate for concentrations greater than or equal to 13.9 µg/m^3 but less than 20.85 µg/m^3. A total of 7 Tier-1 exceedances and 5 Tier-2 exceedances occurred in August 2023 due to wildfire smoke.

[14] www.epa.gov/system/files/documents/2024-04/final-pm-fire-tiering-4-30-24.pdf
[15] www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis

Table 3. $PM_{2.5}$ daily average concentrations and Tiers for August 2023 at Colville

Date	Daily mean concentration (ug/m³)	Tier	Request for exclusion from regulatory decision
8/6/2023	19.2	Tier 2	False
8/16/2023	31.4	Tier 1	False
8/17/2023	61.6	Tier 1	True (RF flag)
8/18/2023	50.9	Tier 1	False
8/19/2023	140.9	Tier 1	True (RF, RT flags)
8/20/2023	154.2	Tier 1	True (RF, RT flags)
8/21/2023	70.5	Tier 1	True (RF, RT flags)
8/22/2023	34.4	Tier 1	False
8/23/2023	16.1	Tier 2	False
8/27/2023	15.2	Tier 2	False
8/28/2023	21	Tier 2	False
8/29/2023	19.3	Tier 2	False

$PM_{2.5}$ and wind data time series

The three-tiered time series graph below shows hourly wind speed and wind direction as well as hourly $PM_{2.5}$ at the Colville monitor during the wildfire smoke event. Meteorological data were collected on site at Colville-E 1st St and submitted to EPA's AQS database. On August 16, northwesterly winds carried smoke into the Colville valley, causing hourly $PM_{2.5}$ concentrations to grow to 50 µg/m³. Winds died down and hourly $PM_{2.5}$ exceeded 100 µg/m³ for several hours on August 17. On the afternoon of August 17, wind speeds increased again, clearing most of the smoke from the Colville valley. On August 18, wind speeds were very strong and wildfires generated extreme smoke plumes which dispersed smoke across the region. Hourly $PM_{2.5}$ at Colville exceeded 150 µg/m³ on the evening of August 18 but dropped down to 60 µg/m³ in the early morning hours of August 19 as winds shifted direction and died down. Strong northwesterly winds returned on August 19, and more smoke traveled into the area, adding to the residual that was still there from the day before. Hourly $PM_{2.5}$ concentrations reached 250 µg/m³ midday on August 19, leveling out at 200 µg/m³ as winds died down in the evening. Hourly concentrations stayed above 100 µg/m³ on August 20 and the morning of August 21, but a weather system decreased smoke production across the region and brought southeasterly winds. Fire activity slowed down on August 22 with cooler temperatures and moisture in the region, which allowed smoke to slowly clear out. However, hourly concentrations remained above 25 µg/m³ on August 22 as wind speeds were relatively low.

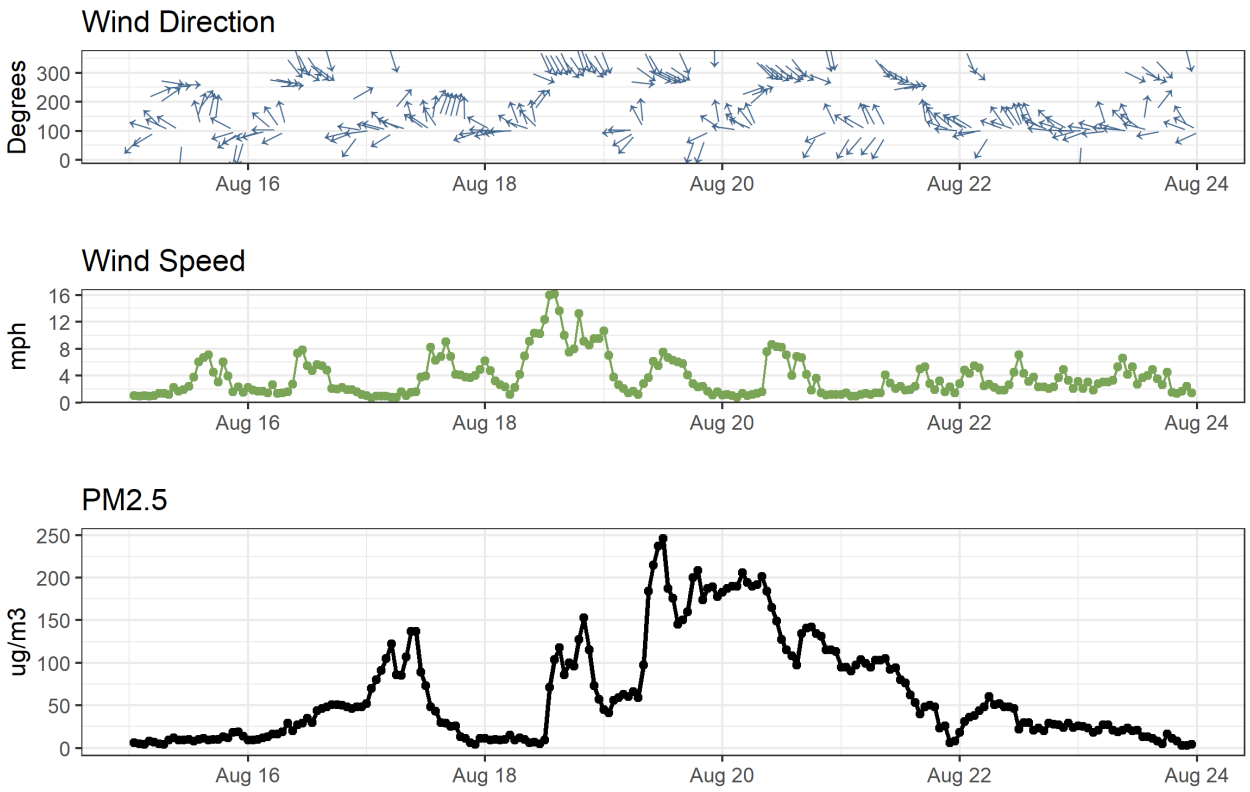

Figure 5. Hourly $PM_{2.5}$, wind speed, and wind direction at Colville from August 15 through August 24, 2023.

Satellite data and back trajectories

Satellite imagery give visual evidence of the size and direction of the smoke plumes that affected Colville. Both MODIS[16] and GOES[17] satellite imagery were analyzed for the wildfire season. HYSPLIT back trajectory modeling was conducted through EPA's AirNowTech website. The HYSPLIT model shows the back trajectory from the monitor to show that smoke traveled from the direction of the wildfires relative to the monitor. The HYSPLIT model also shows the trajectory of smoke at varying heights. The figures below show satellite imagery and HYSPLIT back trajectories for Colville on August 17, 18, 19, 20, and 21.

[16] worldview.earthdata.nasa.gov
[17] www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/

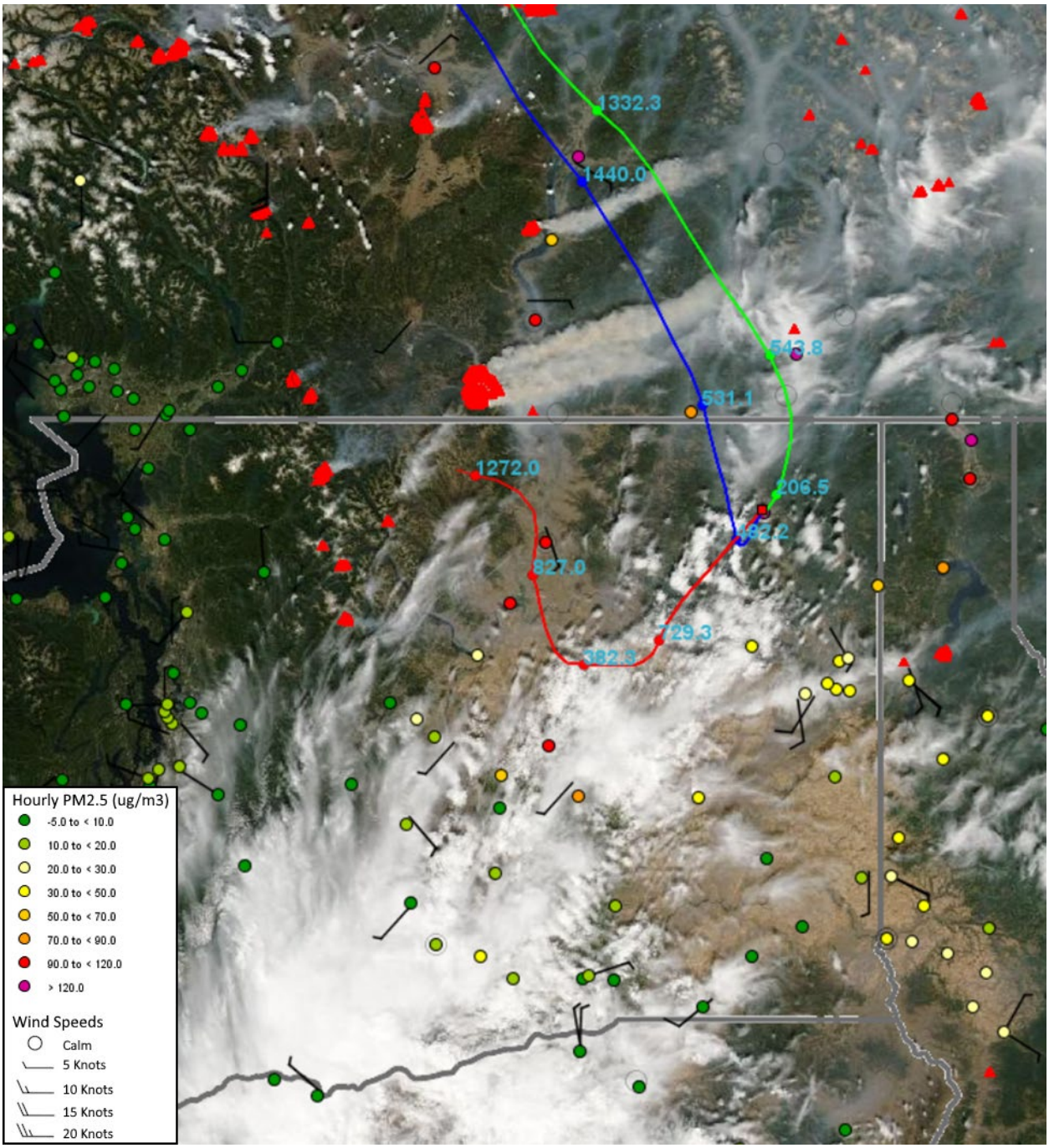

Figure 6. HYSPLIT back-trajectories on August 17, 2023 for Colville.
24-hour back-trajectories were initiated at 200 (green), 500 (blue), and 1000 (red) meter starting heights. The trajectories, wind barbs, and $PM_{2.5}$ monitors shown are for 9 am PST, when concentrations were highest that day. Blue labels along trajectories are heights above ground level in meters. The background layer is Aqua/MODIS imagery (~2 pm LT). HMS-detected hot-spots are shown as red triangles.

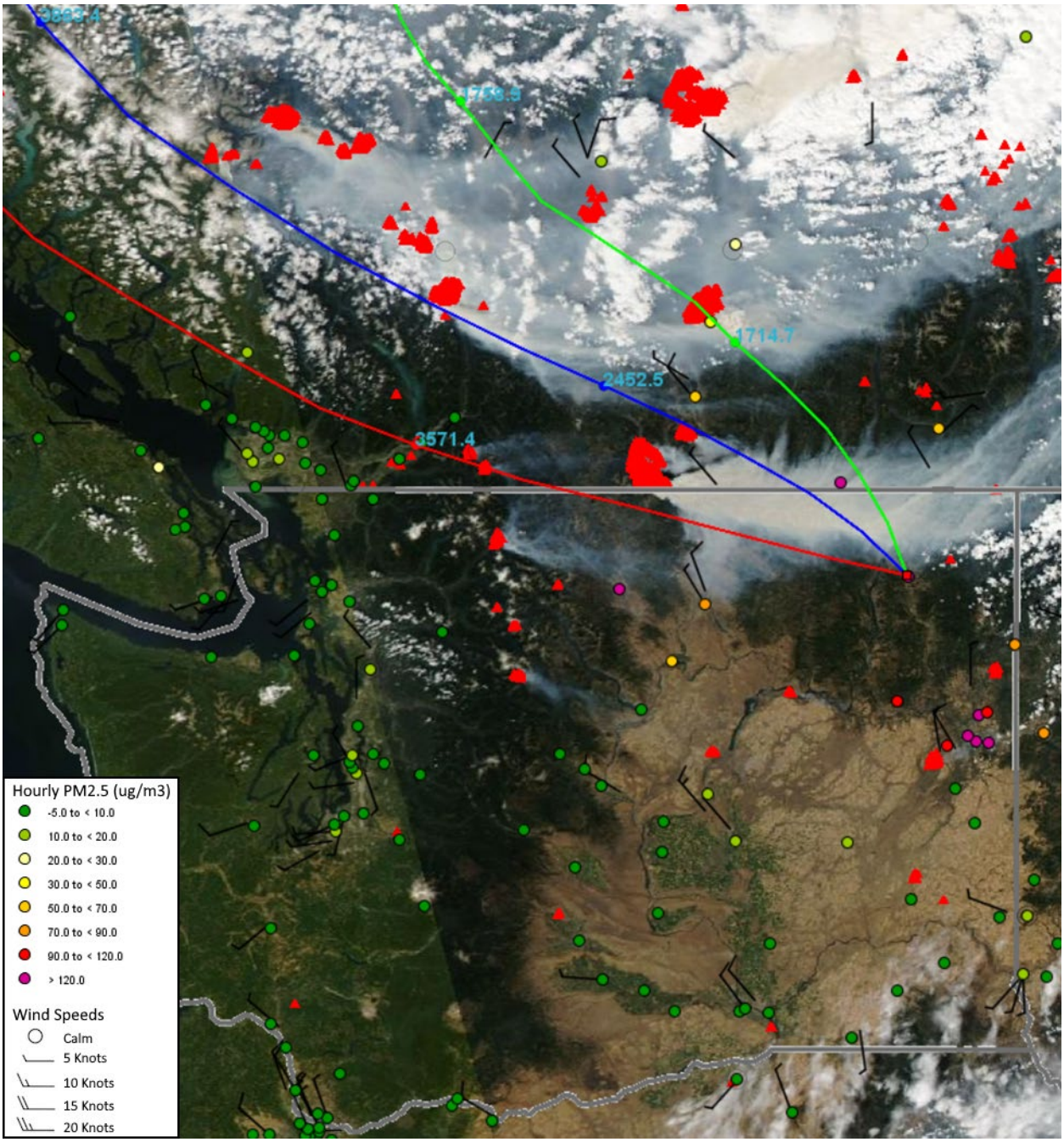

Figure 7. HYSPLIT back trajectories on August 18, 2023 for Colville.
24-hour back-trajectories were initiated at 500 (green), 1500 (blue), and 3000 (red) meter starting heights. The trajectories, wind barbs, and $PM_{2.5}$ monitors shown are for 8 pm PST, when concentrations were highest that day. Blue labels along trajectories are heights above ground level in meters. The background layer is Aqua/MODIS imagery (~2 pm LT). HMS-detected hot-spots are shown as red triangles.

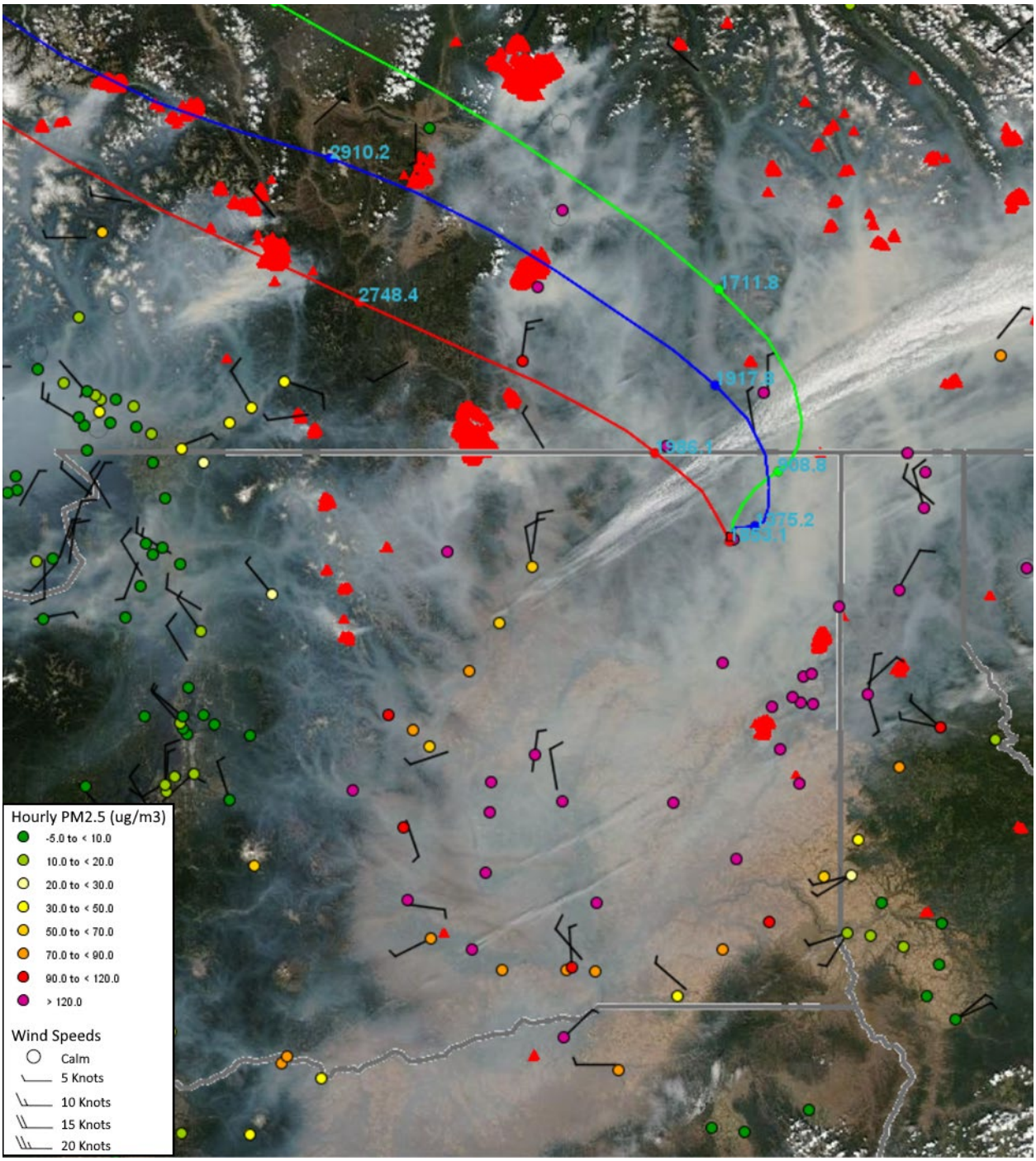

Figure 8. HYSPLIT back trajectories on August 19, 2023 for Colville.
24-hour back-trajectories were initiated at 500 (green), 1000 (blue), and 1500 (red) meter starting heights. The trajectories, wind barbs, and $PM_{2.5}$ monitors shown are for 4 am PST, when concentrations were highest that day. Blue labels along trajectories are heights above ground level in meters. The background layer is Aqua/MODIS imagery (~2 pm LT). HMS-detected hot-spots are shown as red triangles.

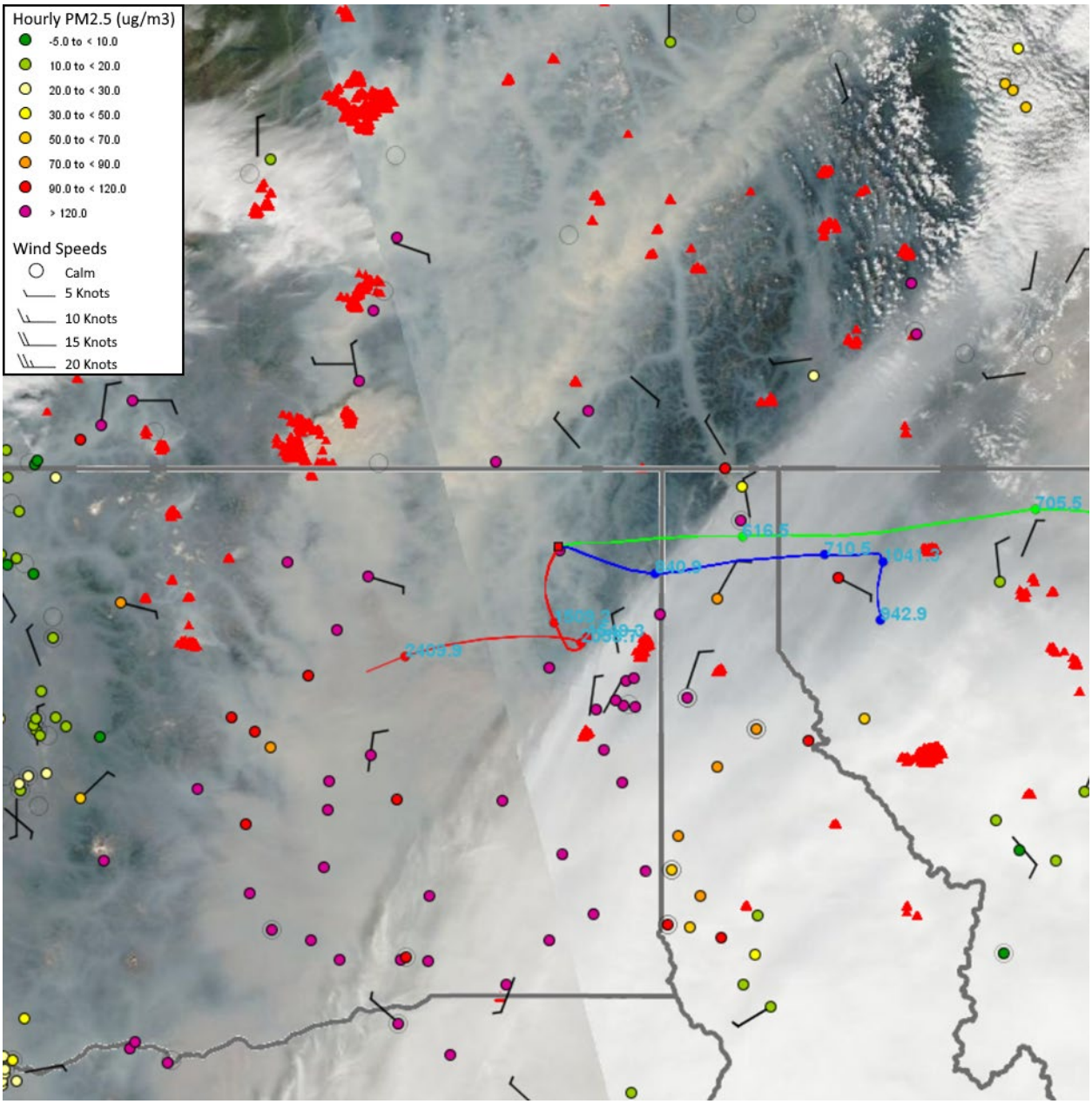

Figure 9. HYSPLIT back trajectories on August 20, 2023 for Colville.
24-hour back-trajectories were initiated at 500 (green), 1200 (blue), and 1900 (red) meter starting heights. The trajectories, wind barbs, and $PM_{2.5}$ monitors shown are for 4 am PST, when concentrations were highest that day. Blue labels along trajectories are heights above ground level in meters. The background layer is Aqua/MODIS imagery (~2 pm LT). HMS-detected hot-spots are shown as red triangles.

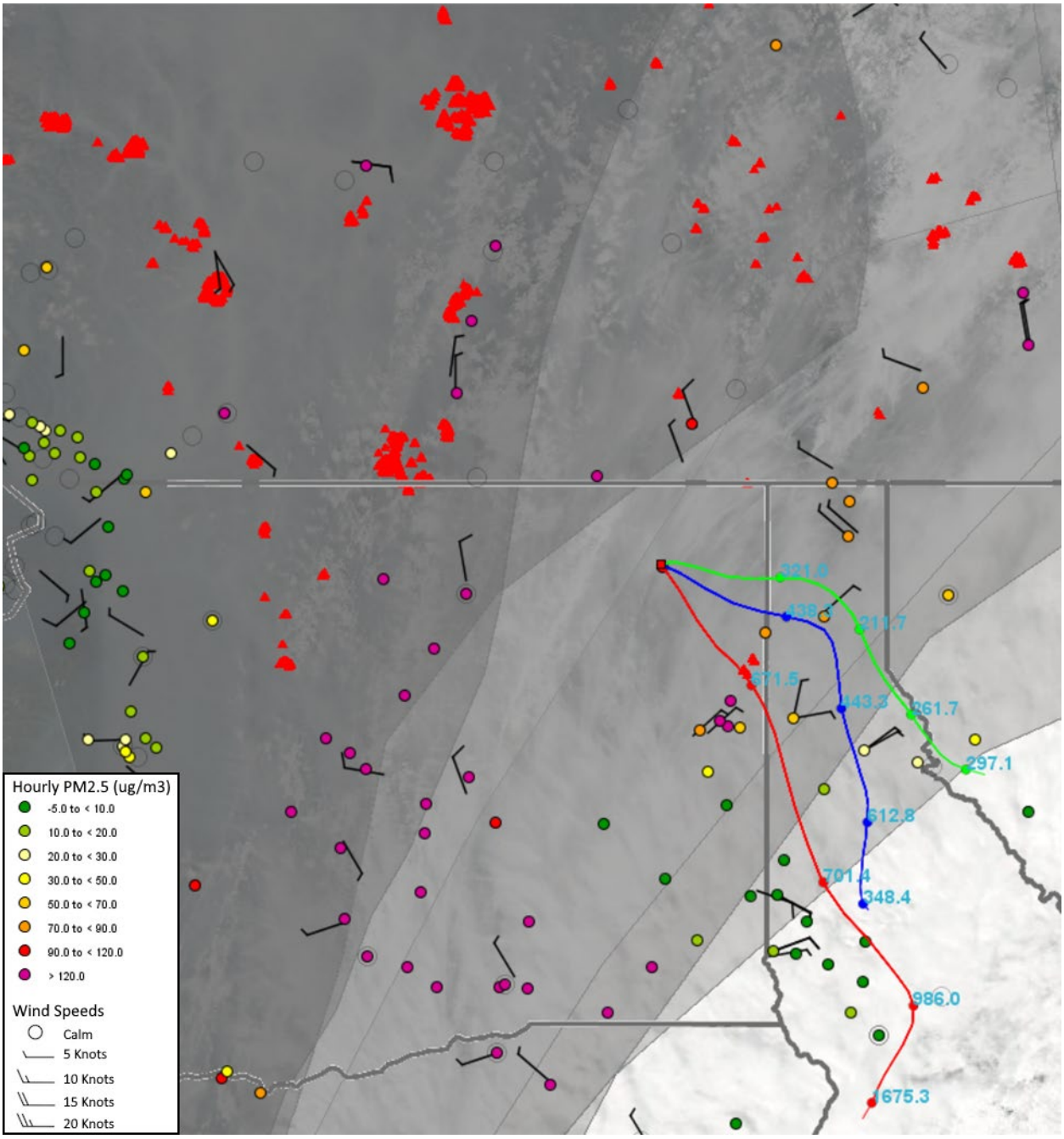

Figure 10. HYSPLIT back trajectories on August 21, 2023 for Colville.
24-hour back-trajectories were initiated at 200 (green), 500 (blue), and 1000 (red) meter starting heights. The trajectories, wind barbs, and $PM_{2.5}$ monitors shown are for 9 am PST, when concentrations were highest that day. Blue labels along trajectories are heights above ground level in meters. The background layer is Aqua/MODIS imagery (~2 pm LT) with the HMS smoke polygon overlay. HMS-detected hot-spots are shown as red triangles.

Alternative source hypotheses

Alternative source hypotheses are an important element of the clear causal relationship demonstration. These hypotheses consider alternative sources that could cause large $PM_{2.5}$ concentrations on the days requested for exclusion, such as, prescribed burning, agricultural burning, residential wood combustion, outdoor open burning, and vehicle emissions.

Temperatures were warm during the wildfire event, thus residential wood combustion for home heating would not have contributed to large $PM_{2.5}$ concentrations. In general, the measured values during the exceedance period are well above the normal historical concentrations (see Historical Fluctuations below), thus routine anthropogenic sources (e.g. residential wood combustion, vehicles, industry, etc.) were not the cause of high $PM_{2.5}$ concentrations. DNR did not approve any prescribed burns in the region due to a fire-safety burn ban. Ecology did not approve any agricultural burns during the wildfire events.

There were no reported episodic events such as high wind dust storms, prescribed burning, or agricultural burning. Thus, Ecology concludes that the alternative hypotheses discussed above were unlikely to have impacted the monitors during the wildfire event. The smoke that caused large $PM_{2.5}$ concentrations came from regional fires within Washington, British Columbia and Idaho.

Comparison to Historical Fluctuations

To support the clear causal relationship requirement of the EER, the event-influenced concentrations at Colville were compared to historical concentrations. Evidence supports the conclusion that $PM_{2.5}$ concentrations at the monitor on the flagged days were elevated due to wildfire smoke.

The most recent 5 years of monitored concentrations at Colville, shown below, indicate that PM2.5 remains below 15 $\mu g/m^3$ during the spring and summer months, with larger concentrations related to wildfire events. Concentrations go up slightly in the fall and winter, usually due to residential wood combustion and cold-weather inversions in the valley.

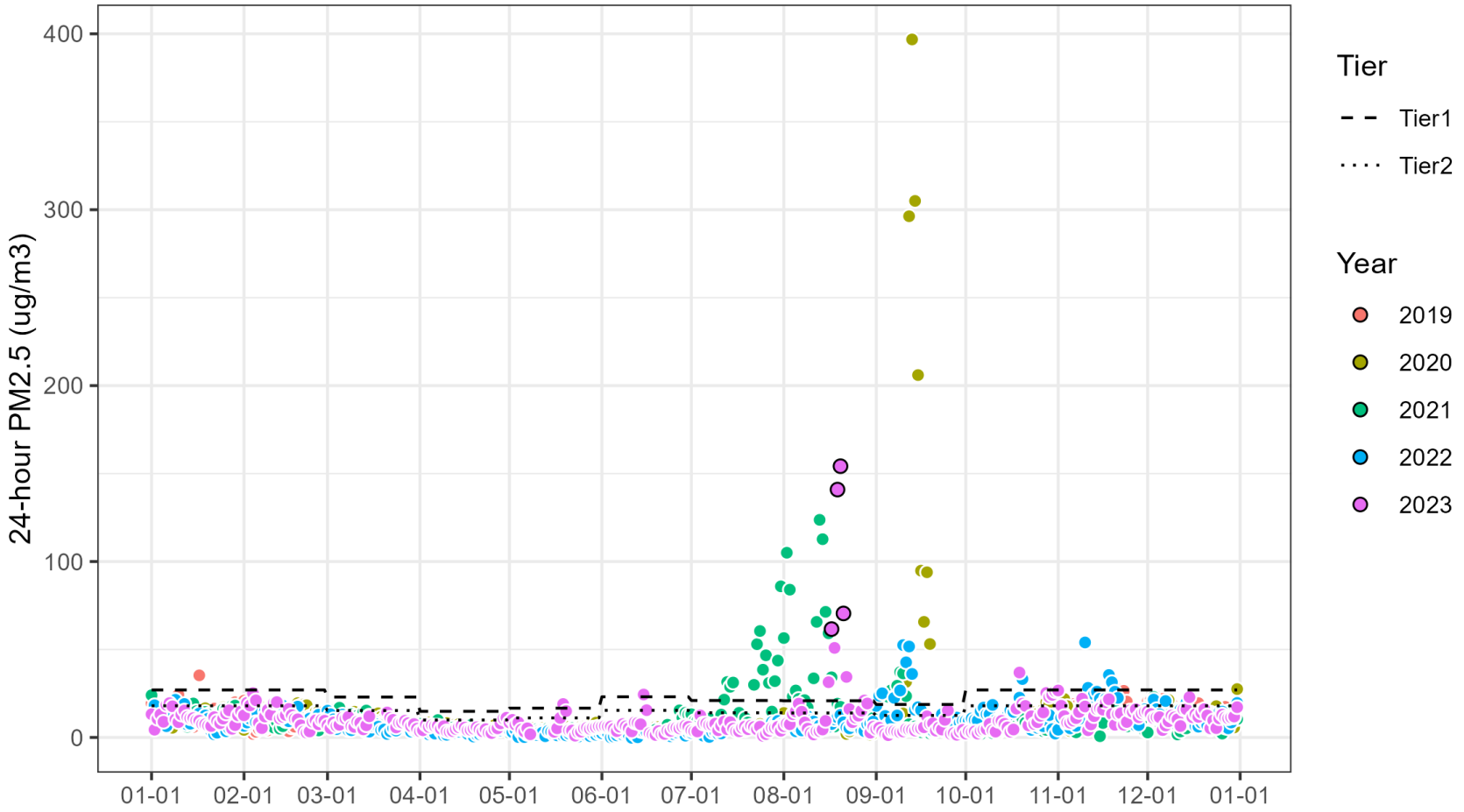

Figure 11. Colville 24-hour $PM_{2.5}$ for the most recent 5 years.
Tiering thresholds are shown as dashed lines. Days requested for exclusion in 2023 are shown as pink circles with black outlines.

Not Reasonably Controllable or Preventable

This EER element requires a demonstration that the event was neither reasonably controllable nor preventable, and this requirement has been met for wildfire events (40 CFR 50.14(b)(4)). Ecology presents sufficient evidence in this demonstration showing the source of the event was indeed wildfires. Ecology contends that the events of August 2023 at the Colville E 1st St monitor were not reasonably controllable or preventable.

Natural Event or Human Activity Unlikely to Recur

The EER requires that agencies must document that the identified source of an exceptional event is either a natural event (NE) or a human activity unlikely to recur at the same location (HAURL) such as to affect the monitors in question again. EPA's 2016 Exceptional Events rule indicates that if an agency has adequately demonstrated that the source is a natural event or, if not natural, is a human activity unlikely recur at the same location and that there is a clear causal relationship between the identified source(s) and the affected monitor, then the HAURL/Natural Event criterion is also satisfied.

During August 2023, weather conditions in the Pacific Northwest quickly spread any fire that started or was already burning. The data included in the Conceptual Model and Clear Causal Relationship Sections demonstrate the clear causal relationship between the source of the smoke and monitor data for each day that Ecology requests concurrence. Thus, the NE/HAUR criterion is satisfied.

Mitigation

The EER requires states to take appropriate and reasonable actions to protect public health from exceedances or violations of the NAAQS (40CFR 51.930). Ecology presents evidence of prompt public notification of the event, public education so that individuals could make behavioral changes to reduce exposure to unhealthy air, and implementation of appropriate measures to protect public health from the impacts of exceptional events.

State, county, and local jurisdictions provide primary fire protection on public and private lands. The Washington State Department of Natural Resources (DNR) is the primary wildfire fighting force[18] and author of the Washington State Wildland Fire Protection 10-Year Strategic Plan.[19] Primary fire program duties on federal lands are the responsibility of the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, and other federal partners.[20] The U.S. Fire Administration works with county and local fire departments and state forestry programs are represented by the National

[18] www.dnr.wa.gov/FightingFire
[19] www.dnr.wa.gov/publications/rp_wildfire_strategic_plan.pdf
[20] www.fs.usda.gov/managing-land/fire/partners/federal

Association of State Foresters. As partners, fire teams work together on fire management issues such as safety and planning, science, preparedness, operations, strategy development, logistics, intelligence, and emergency response. Control of large wildland fires is coordinated under the National Interagency Fire Center (NIFC). The NIFC Interagency Standards for Fire and Fire Aviation Operations (Red Book) defines the National Response Framework, National Incident Management System, and fire incident command organization.[21]

Washington State agencies (ECY, DNR, local CAAs, DOH, L&I) coordinate with the US Forest Service, EPA, and the National Weather Service to alert the public about dangerous smoke levels through social media, news releases, air quality alerts, and wildfire smoke forecasting.

Public Notification

Air quality notifications

Ecology Air Quality Program provides notification of wildfire smoke events to the public through Air Quality Alert messages distributed by the National Weather Service. Ecology coordinated with NWS to issue Air Quality Alert messages for Stevens County (and other areas) along with health information from August 17 to August 23. Air Quality Alerts were also in effect for other nearby parts of Washington on August 15 and 16. Iowa State University provides archives of all NWS text products, including the Air Quality Alerts served by the NWS Spokane office in August 2023. [22]

Washington's air monitoring network webpage[23] contains current air quality conditions and a link to 5-day smoke forecasts. The webpage features a map of air quality data for monitoring sites in the state. Each color-coded monitor shows the most recent NowCast AQI.

The Washington Smoke Blog provides current air quality conditions and fire information by displaying the fire.airnow.gov map with a 5-day smoke forecast overlay. Additional information is posted to the blog by state and federal agencies. Local smoke outlooks are also available on the blog, as provided by USFS Air Resource Advisors.[24] Ecology and DNR posted statewide smoke updates to the blog on August 1, 3, 7, 13, 15, 17, 18, 19, 21, 24, and 31.[25]

Ecology also posted daily on the Agency Twitter and Facebook with smoke updates, forecasts, trends, air quality conditions, etc. during the wildfire smoke season.

[21] www.nifc.gov/standards
[22] mesonet.agron.iastate.edu/wx/afos/p.php?pil=AQAOTX&e=202308171454
[23] ecology.wa.gov/AirQualityWA
[24] outlooks.airfire.org/outlook
[25] wasmoke.blogspot.com/2023/08/

Flagging and initial notification

Ecology properly documented the exceedances of the annual $PM_{2.5}$NAAQS at the Colville monitor for August 2023. Ecology flagged the data with informational flags (i-flag) in EPA's AQS in May 2023 to notify EPA that wildfire events caused exceedances. Ecology discussed flagging of these $PM_{2.5}$exceedances in AQS during the regular meetings between Ecology and EPA Region 10 in May 2024. Since then, Ecology and EPA Region 10 staff engaged in regular communication, discussed regulatory significance, and that Ecology would submit this exceptional event demonstration. Ecology notified EPA of its intent to submit this demonstration during multiple regular meetings since May 2024. Through these actions, Ecology met the initial notification requirement.

Public involvement and public comments

A public comment period will be held in November 2024. Updates to this section will be added after the public comment period has closed.

Changes to document based on public comment

A public comment period will be held in November 2024. Updates to this section will be added after the public comment period has closed.

Summary

With the weight of evidence discussed in this report, Ecology has shown that the fires in Washington, Idaho, and British Columbia impacted the Colville E 1st St monitor in August of 2023. Ecology therefore requests EPA's concurrence for 4 days to be flagged: 8/17/2023 (RF), 8/19/2023 (RF and RT), 8/20/2023 (RF and RT), and 8/21/2023 (RF and RT). Ecology requests that these values not be used to calculate the relevant design values for the 2024 $PM_{2.5}$ NAAQS revision designation cycle.

Ecology has also submitted data for 8/18/2023 which does not currently have regulatory significance to qualify for exclusion in case this day becomes regulatorily significant in the future.