

Moxee Valley Community 2025 Environmental Justice Report



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Executive Summary

The Moxee Valley Community Report provides community information, demographic data, greenhouse gas emissions data, and information about criteria air pollutant levels and their health impacts. This document provides information about air quality and health impacts to those who live, work, and play in the Moxee Valley.

For more information about the background and methodology of this document, please visit *2025 Environmental Justice Report: Overburdened Communities Highly Impacted by Air Pollution* (2025 EJ Report).



Community Overview

The Moxee Valley community was identified as overburdened and highly impacted by air pollution because it met the statewide screening criteria based on the EJScreen demographic index¹ and previous modeling results indicate that this community experiences elevated levels of short-term exposure to fine particulate matter (PM_{2.5}) and ozone (O₃). Community identification is described in more detail in the [Overburdened Communities Highly Impacted by Air Pollution StoryMap](#).

Land Area: 38 sq. mi

Population: 9,556

County: Yakima

Municipal Government: Moxee City Council

Ecology Region: Central

Local Clean Air Authority: Yakima Regional Clean Air Agency

Local Health Jurisdiction: Yakima Health District

Primary languages spoken: English, Spanish

Primary pollutant of concern: Short-term PM_{2.5}, cumulative criteria air pollution



Geographic characteristics

The Moxee Valley community is in Yakima County, approximately 5 miles east of the city of Yakima and the Yakima River. It is surrounded by the Yakima Ridge and Rattlesnake Hills; it is primarily an agricultural area. This community contains nearly all of the small suburban city of Moxee and an adjacent area to the east along State Route 24.

¹ EJScreen demographic index <https://www.epa.gov/ejscreen>

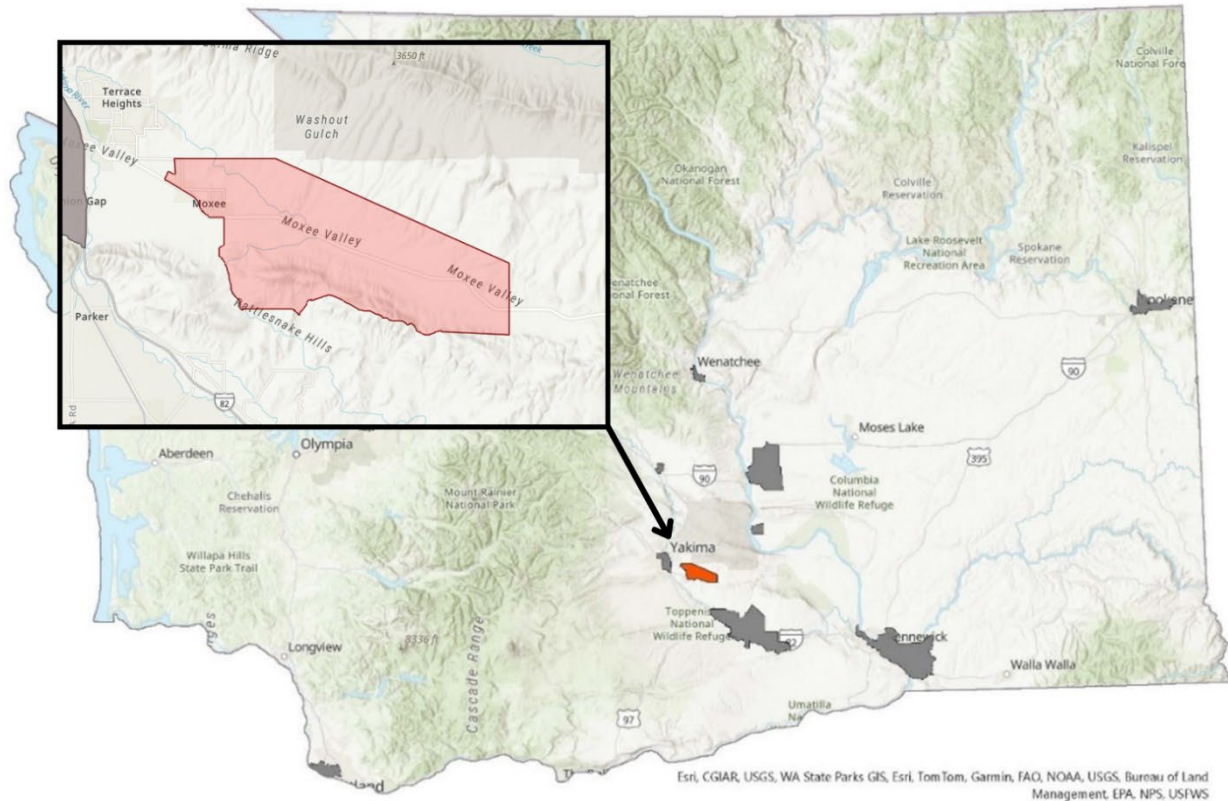


Figure 1. Map of the 16 overburdened communities highly impacted by air pollution (gray) in Washington state, with Moxee Valley highlighted (red).

Socioeconomic characteristics

Nearly half of Moxee Valley’s population is Hispanic, and about 3 in 10 residents are children.^{2,3} One-fifth of workers in this community are employed in natural resources, construction, and maintenance occupations. Community members experience relatively high rates of chronic obstructive pulmonary disease, which may increase susceptibility to illness resulting from air pollution.⁴

² American Community Survey Data <https://www.census.gov/programs-surveys/acs/data.html>

³ WA Office of Financial Management, Estimates of April 1 population by age, sex, race and Hispanic origin <https://ofm.wa.gov/data-research/population-demographics/forecasts-projections/age-sex-race-and-hispanic-origin/information/>

⁴ U.S. Centers for Disease Control and Prevention, PLACES Data Portal <https://www.cdc.gov/places/tools/data-portal.html>

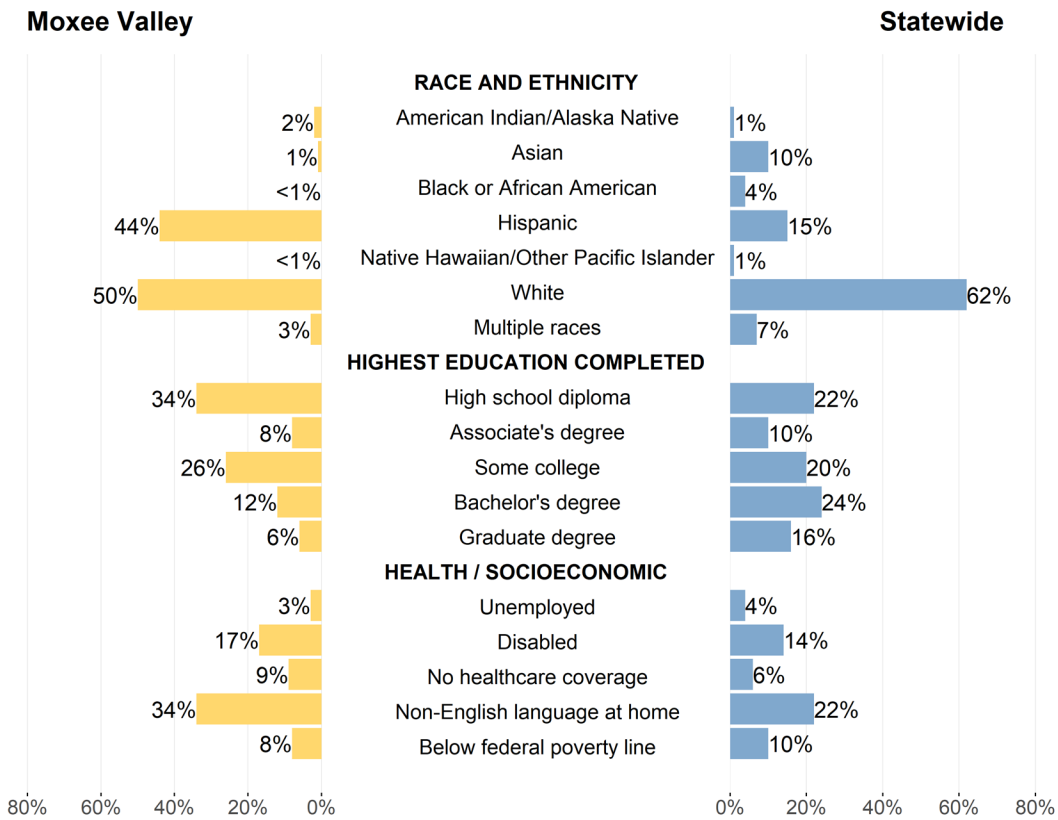


Figure 2. Sociodemographic characteristics of the Moxee Valley community compared to statewide percentages, based on Washington State's 2024 estimated population of 8,035,700.⁵

Health characteristics

According to 2022 CDC health survey data,⁶ Moxee Valley has slightly elevated prevalences of chronic health conditions among individuals aged 18 years and older relative to the statewide population, including asthma (11.6% vs. 11.4%), cardiovascular disease (6.3% vs. 5.7%), COPD (6.5% vs. 5.7%), diabetes (11.1% vs. 9.6%), and stroke (3.4% vs. 3.1%). These prevalences are not necessarily attributable to air pollution. Community and statewide prevalences that have overlapping 95% confidence intervals, as shown in Figure 3, might not be statistically significant.

⁵ WA Office of Financial Management, Nov 2024 Data Tables, Population by age and sex https://ofm.wa.gov/wp-content/uploads/sites/default/files/public/dataresearch/pop/stfc/stfc_2024.xlsx

⁶ U.S. Centers for Disease Control and Prevention, PLACES Data Portal <https://www.cdc.gov/places/tools/data-portal.html>

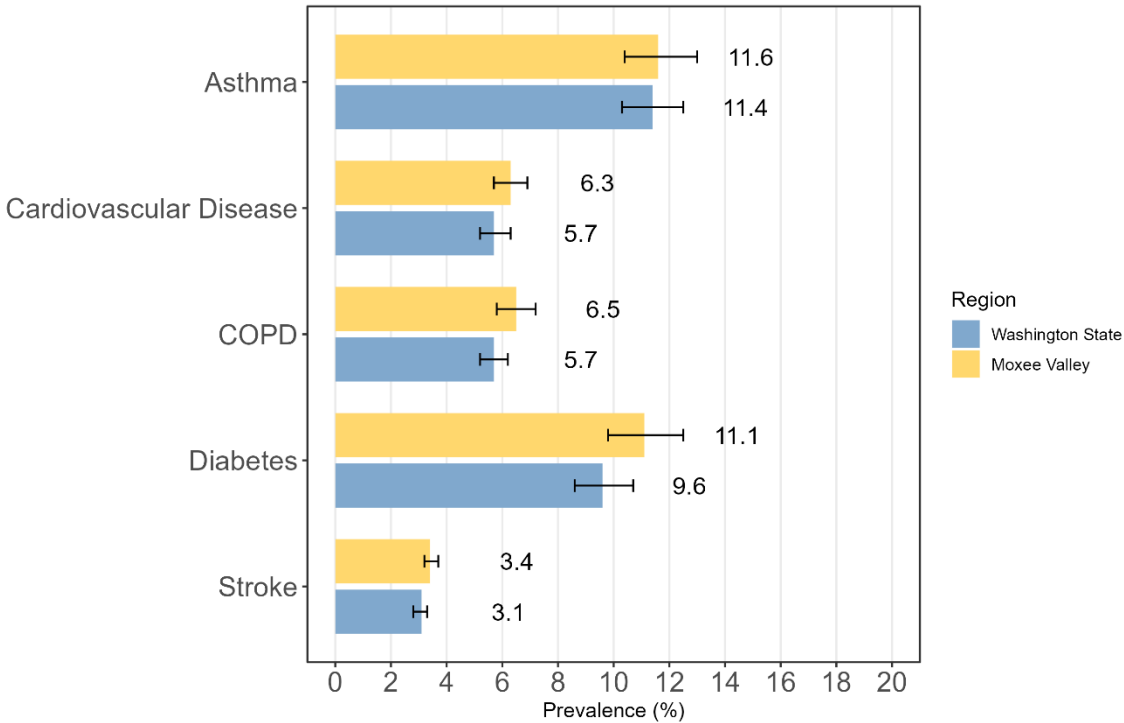
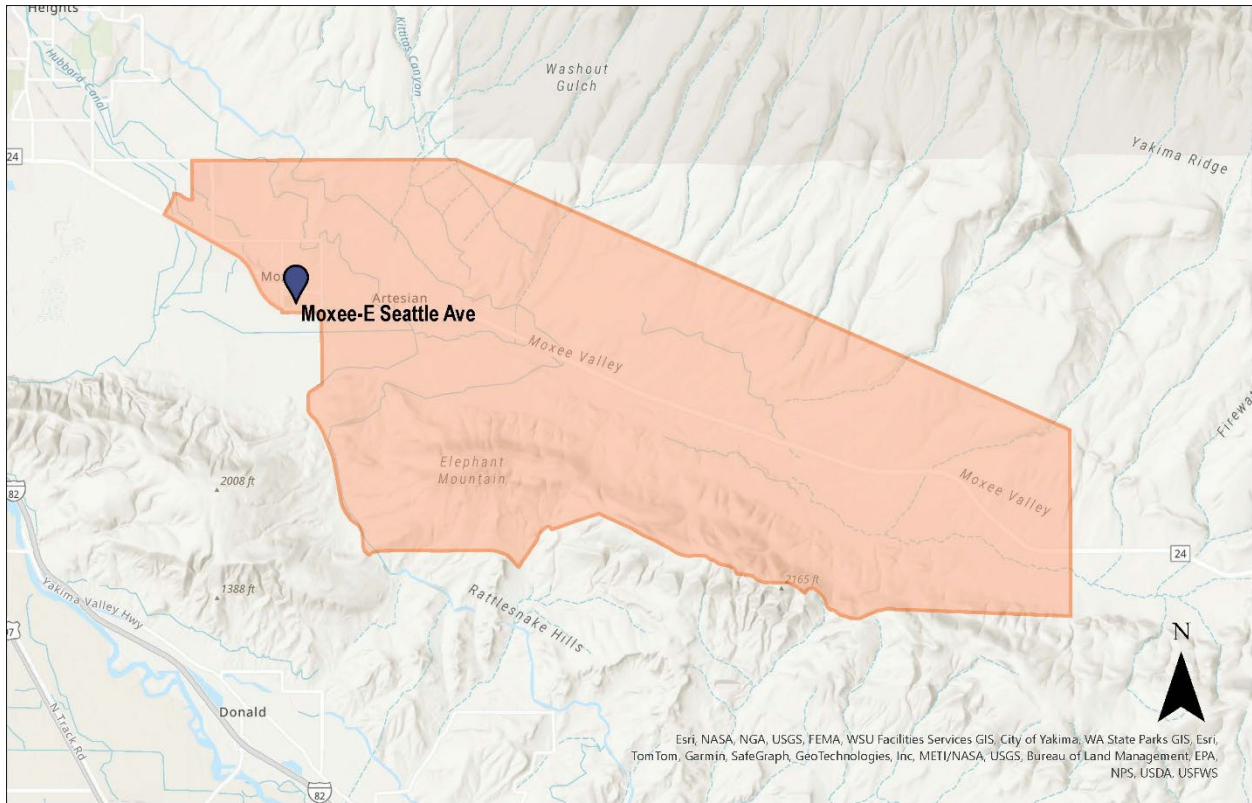


Figure 3. Prevalence of chronic health conditions among people ages 18 years and older in Moxee Valley census tracts compared with Washington State.

Data come from CDC PLACES, 2024 release, which uses 2022 survey data.⁶ Yellow and blue bars indicate the estimated prevalence of each condition. Black lines indicate the 95% confidence interval.

Air Monitoring

In May 2024, Ecology’s Central Regional Office (CRO) installed a PM_{2.5} sensor (SensWA) in the Moxee Valley community using Climate Commitment Act (CCA) funding. The low-cost, high accuracy sensor continuously monitors PM_{2.5} at the Moxee-E Seattle Ave site. This report includes partial-year data from 2024. No other criteria air pollutants are currently monitored in the community.



-  Air monitoring sites - Included in analysis
-  Moxee Valley community boundary



Figure 4. Map of Moxee Valley air monitoring sites.

Table 1. Moxee Valley criteria air pollutant monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
Moxee-E Seattle Ave	SensWA ¹	Ecology-CRO	PM _{2.5}

¹ Installed as part of Climate Commitment Act implementation

Criteria Air Pollution

This report summarizes criteria air pollution (CAPs) concentrations in the Moxee Valley community in 2024. CAPs concentrations for PM_{2.5} are calculated using data from the Washington Ambient Air Monitoring Network and reported according to the Environmental

Protection Agency’s (EPA) methodology. More information can be found in the background and methods sections of the 2025 EJ Report.

In addition to analyzing monitored criteria air pollution concentrations, we calculated the number of days per year residents of the Moxee Valley community experienced unhealthy air quality, according to EPA’s Air Quality Index (AQI). The AQI is a six-category color-coded scale used to communicate daily air quality levels to the public. Days when an AQI above 100 are considered “unhealthy for sensitive groups” or worse.

From May-December 2024, the Moxee Valley community experienced two days with unhealthy air quality (Figure 5).

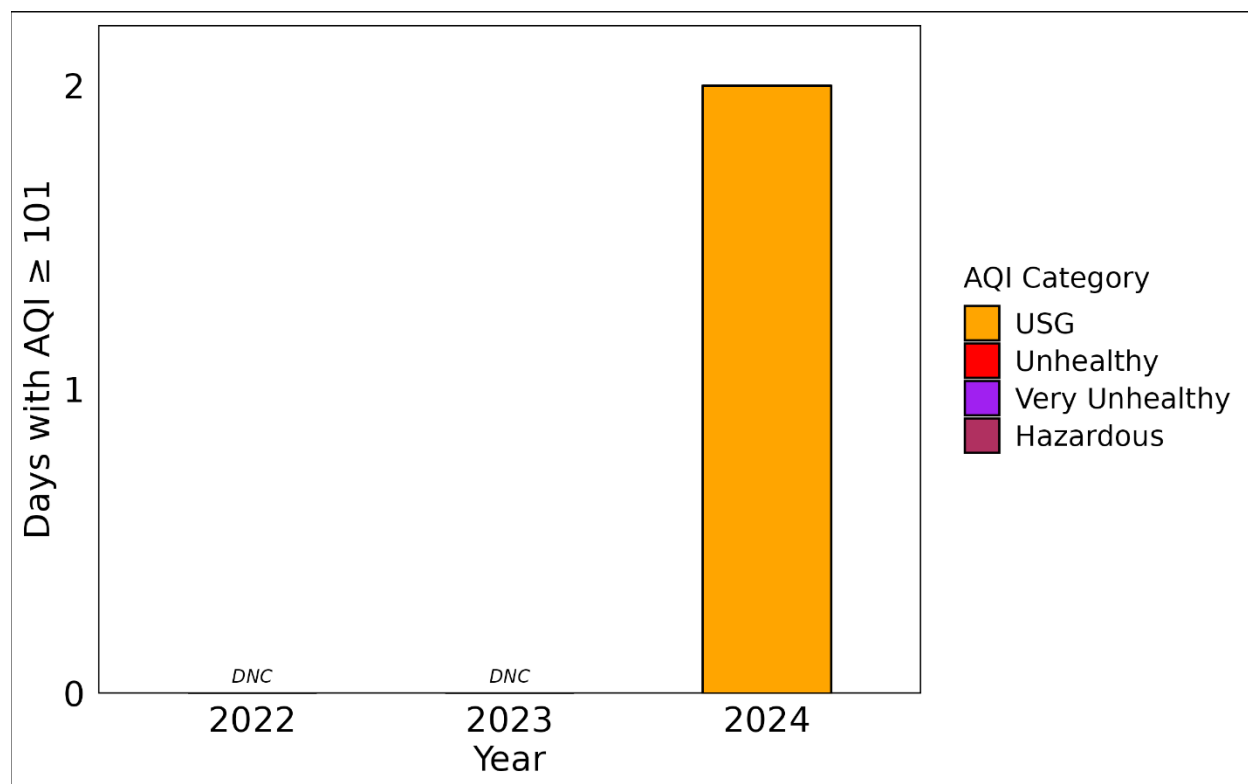


Figure 5. Number of days 2024 with unhealthy air quality. Includes days impacted by wildfire smoke. DNC = Data not collected.

Table 2 includes 24-hour PM_{2.5} (98th percentile) summary statistics. PM_{2.5} concentrations are measured over 24-hour periods in micrograms per cubic meter (µg/m³). The EPA establishes national ambient air quality standards (NAAQS), which define the maximum allowable levels (thresholds) for each criteria pollutant. The NAAQS threshold for 24-hour PM_{2.5} (98th percentile) is 35 µg/m³. The design value for 24-hour PM_{2.5} (98th percentile) is a statistic that describes the

air quality of a location relative to the NAAQS over a three-year period and is used to describe short-term fine particulate exposure.

We calculated the 24-hour PM_{2.5} (98th percentile) concentrations using partial-year data since the Moxee-E Seattle Ave monitor was installed in May 2024. This value was below the NAAQS threshold (Table 2; Figure 6). Excluding wildfire smoke days reduced the value by 10%. Future reports will include more complete 24-hour PM_{2.5} data as additional monitoring years become available.

Table 2. 24-hour PM_{2.5} (98th percentile) summary statistics (2024). Units are in µg/m³. Brackets [] exclude wildfire days when 24-hour average PM_{2.5} concentration exceeded 35.4 µg/m³. 24-hour PM_{2.5} (98th percentile) NAAQS is 35 µg/m³.

Monitoring Site	2022 24-hour 98th Percentile	2023 24-hour 98th Percentile	2024 24-hour 98th Percentile	2024 Design Value
Moxee-E Seattle Ave	DNC	DNC	26.1 [23.2]	*

Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m³ = micrograms per cubic meter, * = incomplete data for 3-year design value.

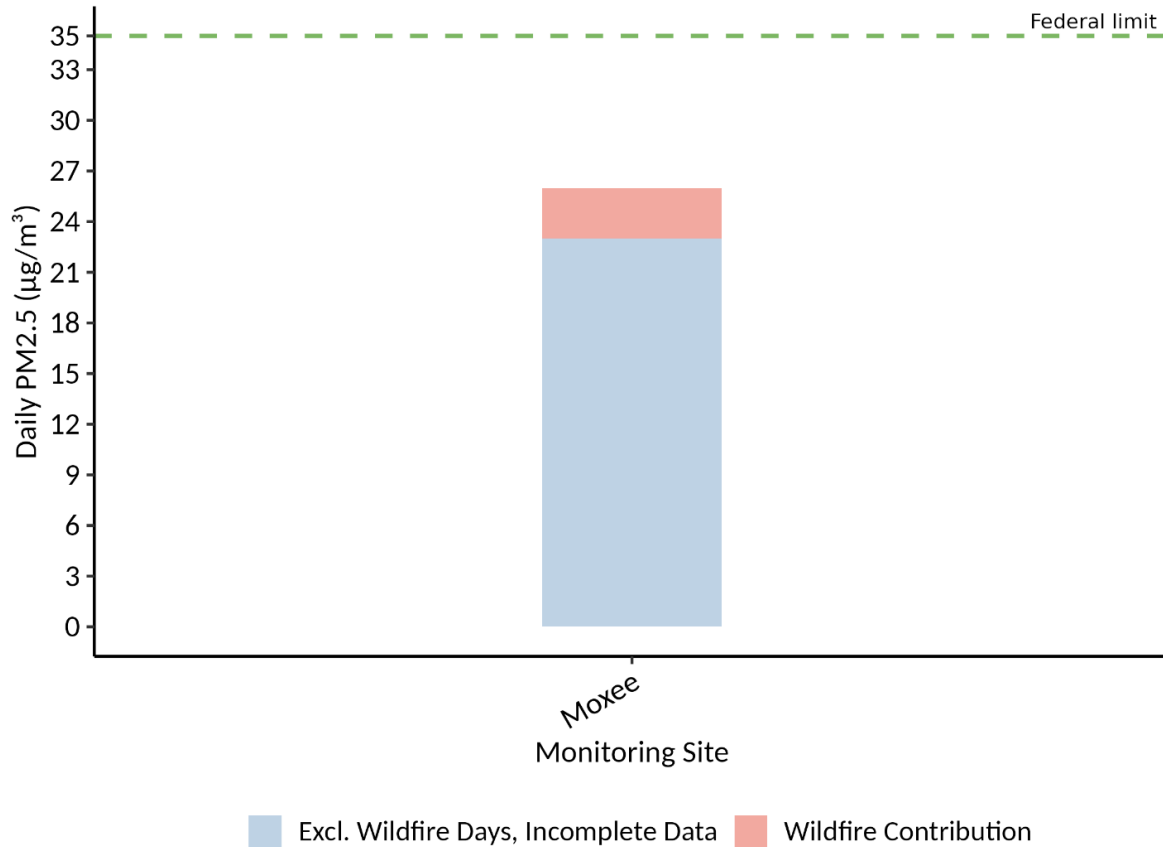


Figure 6. 24-hour PM_{2.5} (98th percentile) summary statistics, 2024. Annual summary statistics calculated with and without days elevated from wildfire smoke. Light blue bars include average of available data from 2024. Dashed line is the federal limit (NAAQS) for 24-hr PM_{2.5}.

Table 3 includes annual mean PM_{2.5} concentrations for 2024. The annual PM_{2.5} design value is a three-year average of annual mean concentrations used to describe long-term exposure; however, we did not have three-years of data available. Using available data from May through December 2024, the annual mean PM_{2.5} concentration remained below the NAAQS threshold of 9.0 µg/m³. We will include more complete annual PM_{2.5} datasets as additional years of monitoring data become available.

Table 3. Annual mean PM_{2.5} concentrations (2024). Units are in µg/m³. Brackets [] exclude wildfire days when the average PM_{2.5} concentration exceeded 15.0 µg/m³. Annual PM_{2.5} NAAQS is 9.0 µg/m³.

Monitoring Site	2022	2023	2024	2024 Design Value
Moxee-E Seattle Ave	DNC	DNC	5.49 [4.57]	*

*Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m³ = micrograms per cubic meter, * = incomplete data for 3-year design value*

Health Impacts of Criteria Air Pollution

We estimated the number and rate of deaths and morbidities associated with PM_{2.5} and ozone concentrations by age range and using health effect estimates from peer-reviewed studies (Appendix B, Table 2 in the 2025 EJ Report). All estimates are rounded to the nearest whole number. We present ranges of deaths or morbidities where multiple studies assessed that health outcome.

PM_{2.5}

We estimated 3 deaths by any cause (38 deaths per 100,000 population, Table B1) related to yearly PM_{2.5} exposure. Among older adults, which is a smaller portion of the population, we estimated 2 total deaths (124 deaths per 100,000 population) each year associated with annual PM_{2.5} exposure (Table B2).

Among different racial and ethnic groups (Figure 7), we estimated most PM_{2.5}-related death by any cause per year to be among Hispanic and non-Hispanic White people (1 death among 18–84-year-olds). However, when accounting for the ages of people in each racial and ethnic group⁷, the annual age-adjusted mortality rate was highest among Hispanic people (54 deaths per 100,000 population) and non-Hispanic Black people (32 deaths per 100,000 population).

⁷ Age-adjusted mortality rates represent the mortality rate if the age distribution in that race category matched the age distribution of the total Washington State population. This allows for better comparability given that different race groups can have different age distributions and the risk of death is higher in older age groups. We see higher age-adjusted rates for race categories other than the non-Hispanic White group given that these groups are generally younger in overburdened communities compared to the statewide age distribution; when we standardize these groups to the state age distribution (which has a higher proportion of older people) the estimated mortality rates are higher. More information about our age-adjustment methods can be found in the 2025 EJ Report.

Figure 7 is based on the study by Pope et al. (2019),⁸ where AIAN refers to American Indian and Alaska Native; NH to non-Hispanic; and NHOPI to Native Hawaiian and Other Pacific Islander. The bars indicate the 95% confidence interval (CI) for each rate.

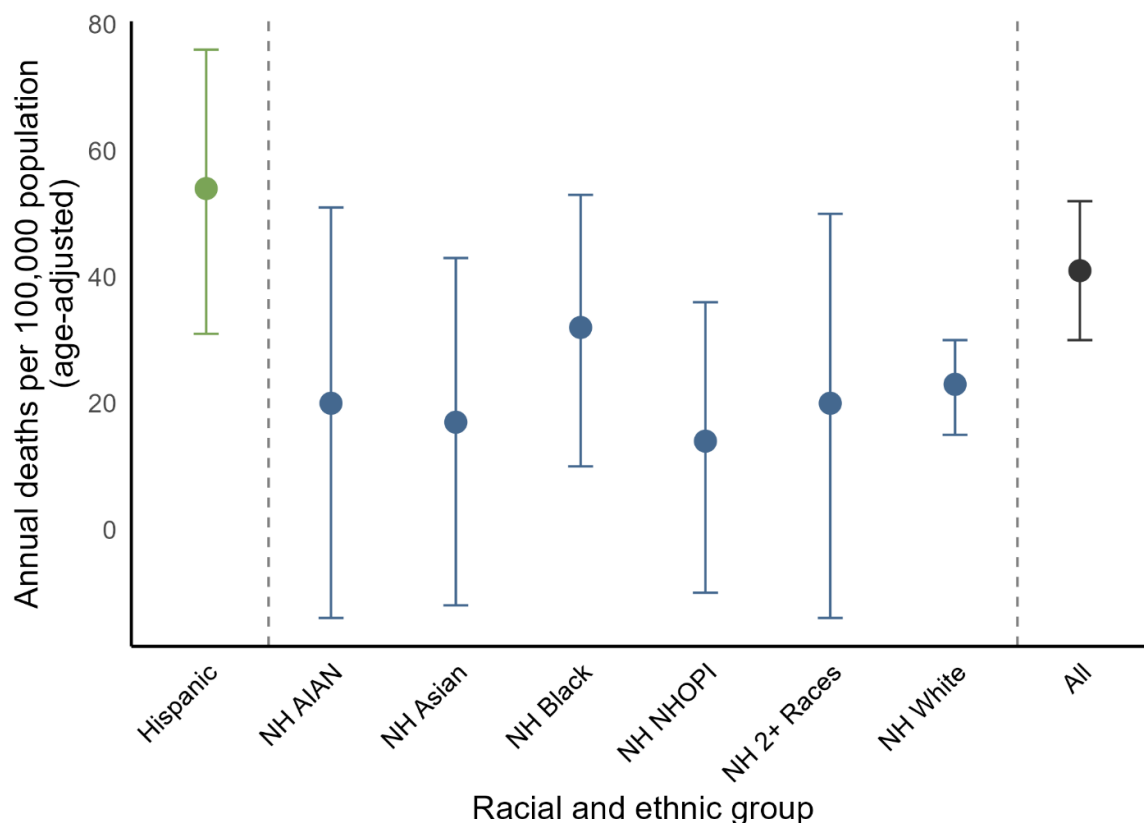


Figure 7. Age-adjusted annual death rates by any cause associated with yearly $PM_{2.5}$ exposure among ages 18-84 by racial and ethnic group in Moxee Valley.

When assessing specific causes of death related to yearly $PM_{2.5}$ concentrations (Table B3), we estimated 1 death due to cardiovascular disease (11 deaths per 100,000 population), 1 to 2 deaths due to ischemic heart disease (17 to 27 deaths per 100,000 population), and <1 death per year due to lung cancer (2 to 3 deaths per 100,000 population) among adults.

Regarding non-fatal health outcomes (Table B3), we estimated that 2 hospital admissions (25 visits per 100,000 population) for acute non-fatal myocardial infarction were associated with yearly $PM_{2.5}$ concentrations among adults. Additionally, 1 lung cancer diagnosis per year was

⁸ Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

associated with annual PM_{2.5} exposure among all people (11 diagnoses per 100,000 population).

Daily PM_{2.5} exposure (Table B4) was associated with <1 death by any cause (1 per 100,000 population) among all people and <1 death by any cause (11 per 100,000 population) among older adults ages 65 to 99. For non-fatal conditions, daily PM_{2.5} was associated with <1 acute non-fatal myocardial infarction admission (4 to 5 per 100,000 population) among all adults, 1 respiratory admission (35 per 100,000 population) among older adults, <1 asthma hospital admission (5 per 100,000 population) among people ages 0 to 64 years. Additionally, 1 to 2 asthma-related emergency department (ED) visits (9 to 17 per 100,000 population) among all people and 1 asthma-related ED visit (47 per 100,000 population) among youths ages 0 to 17 years were associated with daily PM_{2.5} exposure.

Ozone

We estimated that O₃ exposure during the warm season (Table B5) was associated with 1 seasonal death by any cause among older adults ages 65 to 99 (42 deaths per 100,000 population). Daily O₃ exposure was associated with <1 death by any cause (2 per 100,000 population), 3 asthma-related ED visits (25 per 100,000 population) among all people, and 3 respiratory hospital admissions (192 per 100,000 population) among older adults ages 65–99.

Greenhouse Gas Emissions

Greenhouse gas results for the Moxee Valley overburdened community highly impacted by air pollution include: 1) Emissions from greenhouse gas reporting entities per RCW 70A.65⁹ and WAC 173-441,¹⁰ -446;¹¹ and 2) Mobile source emissions.¹²

We did not collect information or model greenhouse gas emissions from other sources at this time. The greenhouse gas information provided in this report aligns with the Climate Commitment Act's (CCA) requirements. For further information on methods and statewide results, refer to the 2025 EJ Report.

Facilities

Washington State requires certain businesses that emit more than 10,000 metric tons of carbon dioxide equivalents (MT CO_{2e}) to report to the Washington Greenhouse Gas Reporting

⁹ Greenhouse Gas Emissions – Cap-and-Invest Program <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65>

¹⁰ Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

¹¹ Climate Commitment Act – Program Rule <https://app.leg.wa.gov/WAC/default.aspx?cite=173-446>

¹² Environmental Justice Review <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.020>

Program.¹³ Businesses that emit over 25,000 MT CO₂e are also subject to the Cap-and-Invest Program (covered sources). Each reporting facility is required to follow a compliance plan.

In the Moxee Valley community, two facilities (Figure 8; Table 4) near the community boundary reported their emissions in 2022 and 2023. The total reported emissions from these facilities was 174,253 MT CO₂e in 2022 and 178,342 MT CO₂e in 2023, a 2.3% year-to-year increase. Some facilities in other communities report biogenic carbon (biogenic CO₂)¹⁴ emissions, which are expected to be partially recaptured as part of the natural carbon cycle. For reporting purposes, biogenic CO₂ is subtracted from total metric tons of CO₂e, even though it has the same atmospheric warming effect as non-biogenic CO₂. There were no facilities that reported biogenic CO₂ in Moxee Valley. Since 2020, total reported greenhouse gas emissions from facilities within and near OBCs have decreased by 20.3%, and by 6.3% after subtracting biogenic CO₂ emissions. Some year-to-year fluctuations in emissions from individual facilities are expected.

The facilities near the Moxee Valley community are landfills, which are exempt from CCA coverage because Washington established a landfill-specific methane-reduction program adopted by Ecology under Chapter 173-408 WAC¹⁵ in 2024. They are still required to report their emissions to the Greenhouse Gas Reporting Program.

¹³ Mandatory greenhouse gas reports <https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/mandatory-greenhouse-gas-reports>

¹⁴ Biogenic carbon refers to greenhouse gases released from the combustion, decomposition, or processing of materials derived from biological sources – such as wood, paper, biomass fuels, agriculture residues, food waste, or biogas. Under the Washington Greenhouse Gas Reporting Program, these emissions are reported separately from fossil-derived emissions because they result from carbon that circulates within the short-term natural carbon cycle rather than long-term carbon stores. Biogenic CO₂ acts the same way in the atmosphere as non-biogenic CO₂. Anthropogenic processes that include these emissions reduce a facility’s environmental impact.

¹⁵ Landfill Methane Emissions <https://ecology.wa.gov/regulations-permits/laws-rules-rulemaking/closed-rulemaking/wac-173-408>

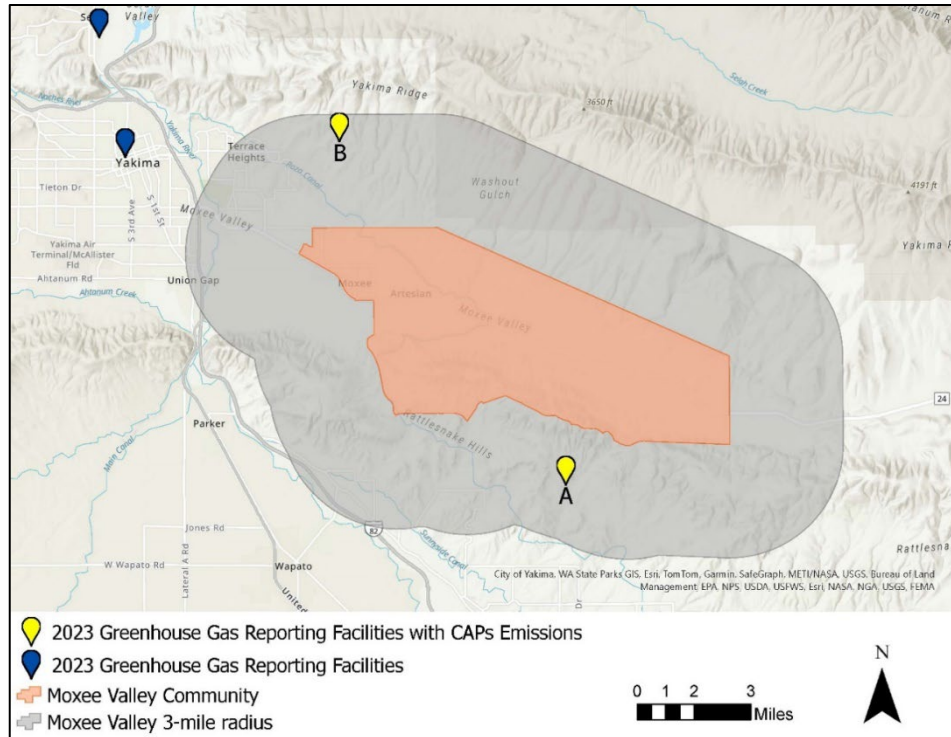


Figure 8. Reporting facilities as of 2023 that are in or near the Moxee Valley community boundary. Facility letters correspond with Table 4.

The emissions in Table 3 are in MT CO₂e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR4 GWP¹⁶, to convert emissions into CO₂e. A GWP describes how much heat a greenhouse gas traps in the atmosphere relative to carbon dioxide over a specific time horizon (20, 100, or 500 years). AR4 GWPs are published in the 2007 Intergovernmental Panel on Climate Change (IPCC).¹⁷ The Greenhouse Gas Reporting Program uses AR4 GWPs mainly for regulatory stability, consistency, and alignment with other federal programs.

¹⁶ Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

¹⁷ Intergovernmental Panel on Climate Change <https://www.ipcc.ch/>

Table 4. Facility emissions in or nearby¹⁸ the Moxee Valley community. Biogenic CO₂ is in brackets [].

	Facility Name/City	Facility Sector	Within Community Boundary	CCA-Covered Facility ¹⁹	Source of CAPs ²⁰	2022 Emissions (MTCO ₂ e)	2023 Emissions (MTCO ₂ e)
A	Cheyne Landfill-Zillah	Waste	Nearby	Exempt	Yes	45,783 [0]	47,466 [0]
B	Terrace Heights Landfill-Yakima	Waste	Nearby	Exempt	Yes	128,470 [0]	130,876 [0]

¹⁸ “Nearby” refers to facilities within a three-mile radius of the community boundary that were included in this analysis.

¹⁹ Large emitters of greenhouse gases, specifically those emitting 25,000 or more MT CO₂e annually in Washington State that are part of the Cap-and-Invest program established by the Climate Commitment Act.

²⁰ Major sources of criteria air pollutants are designated in the Air Operating Permit program. A major source is any stationary source that has the actual or potential to emit ≥100 tons per year for any air pollutant. Many sources emit far below the threshold. More information can be found at <https://ecology.wa.gov/regulations-permits/permits-certifications/air-quality-permits/air-operating-permit>

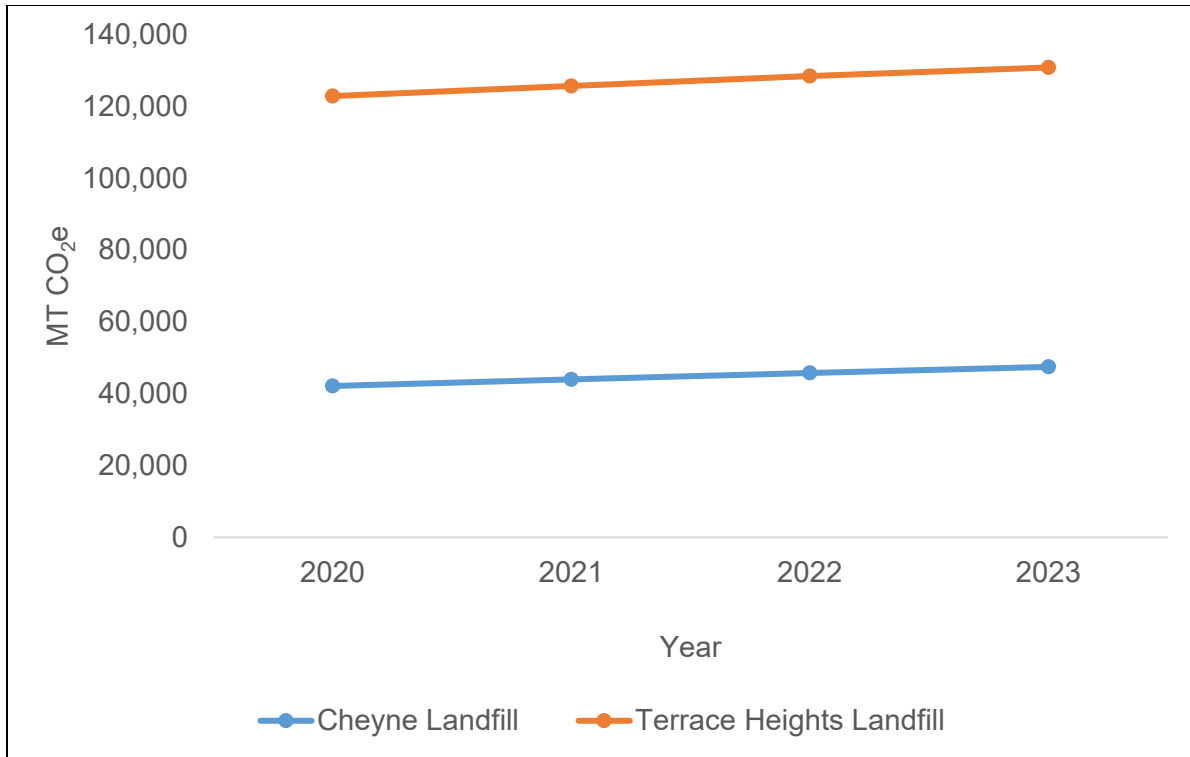


Figure 9. Greenhouse gas reporting facilities and their emissions from 2020-2023.

Mobile sources

In the Moxee Valley community, greenhouse gas emissions from mobile sources increased by 21% from 2020 to 2021 (Table 5) but have decreased by 5.4% between 2019 to 2021.²¹ Mobile sources consist of on-road and non-road emissions. The drop in emissions in 2020 was largely due to a decrease in vehicle traffic that was attributed to the COVID-19 pandemic.^{22,23}

Similar to Table 4, the results in Table 5 use AR5 GWPs to convert greenhouse gas emissions into CO₂e. In 2013-2014, the IPCC published AR5 GWPs and AR6 GWPs in 2021-2022. The Washington Greenhouse Gas Emissions Inventory²⁴ uses AR5 GWPs in mobile source emission

²¹ Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report <https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html>

²² Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 <https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

²³ Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024 <https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf>

²⁴ Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 <https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

estimates, as the inventory models for greenhouse gas accounting are revised as science improves.

Table 5. Greenhouse gas emissions from mobile sources per capita from 2020-2021.

Population	2020 Emissions (MT CO ₂ e)	2020 Per Capita MT CO ₂ e	2021 Emissions (MT CO ₂ e)	2021 Per capita MT CO ₂ e
5,793	24,879	4.3	30,097	5.2

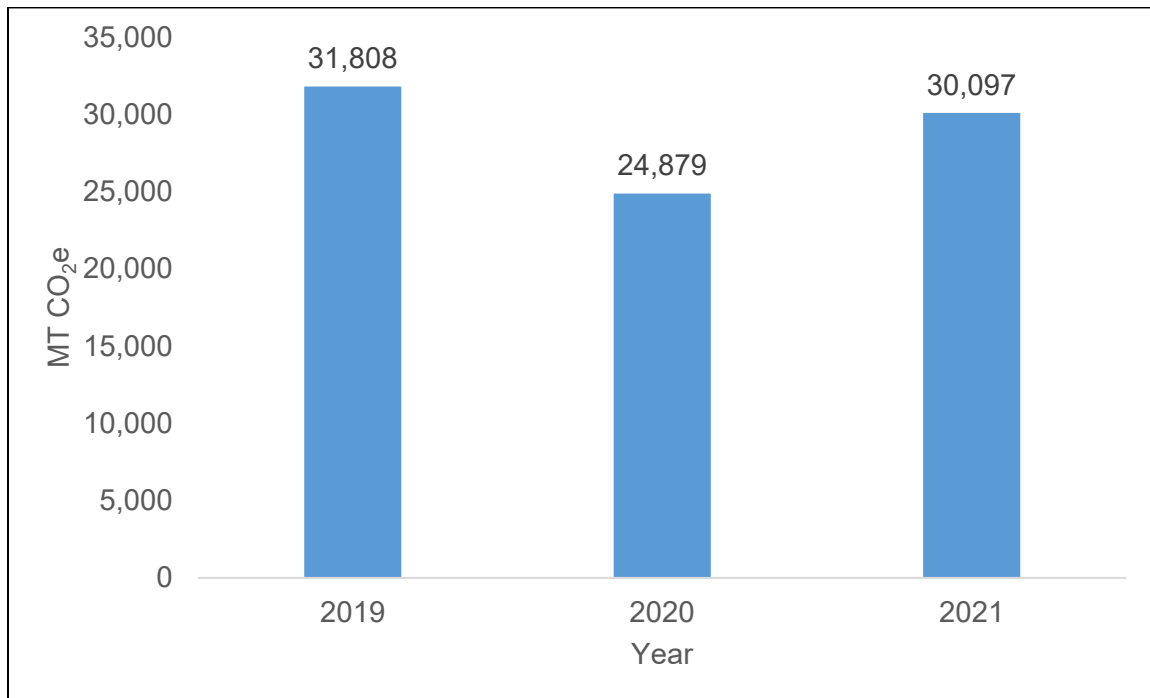


Figure 10. Annual greenhouse gas emissions from mobile sources in the Moxee Valley community, 2019-2021.

Community Resources

These resources provide more information about air quality and health in the Moxee Valley community:

- [Yakima Health District data and reports page](#)²⁵

²⁵ <https://www.yakimacounty.us/277/Community>

- [Yakima Memorial Hospital 2022 Community Health Needs Assessment](#)²⁶
- [Yakima Valley Trends - Health indicators](#)²⁷
- [Zero-emission and electric vehicles mapping tool | WSDOT](#)²⁸
- [Home | Washington Climate Action](#)²⁹

²⁶ <https://www.multicare.org/wp-content/uploads/2024/05/yakima-chna-2022.pdf>

²⁷ <https://yakimavalleytrends.org/category.cfm?id=7>

²⁸ <https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool>

²⁹ <https://climate.wa.gov/>

Appendix A. Criteria Air Pollution

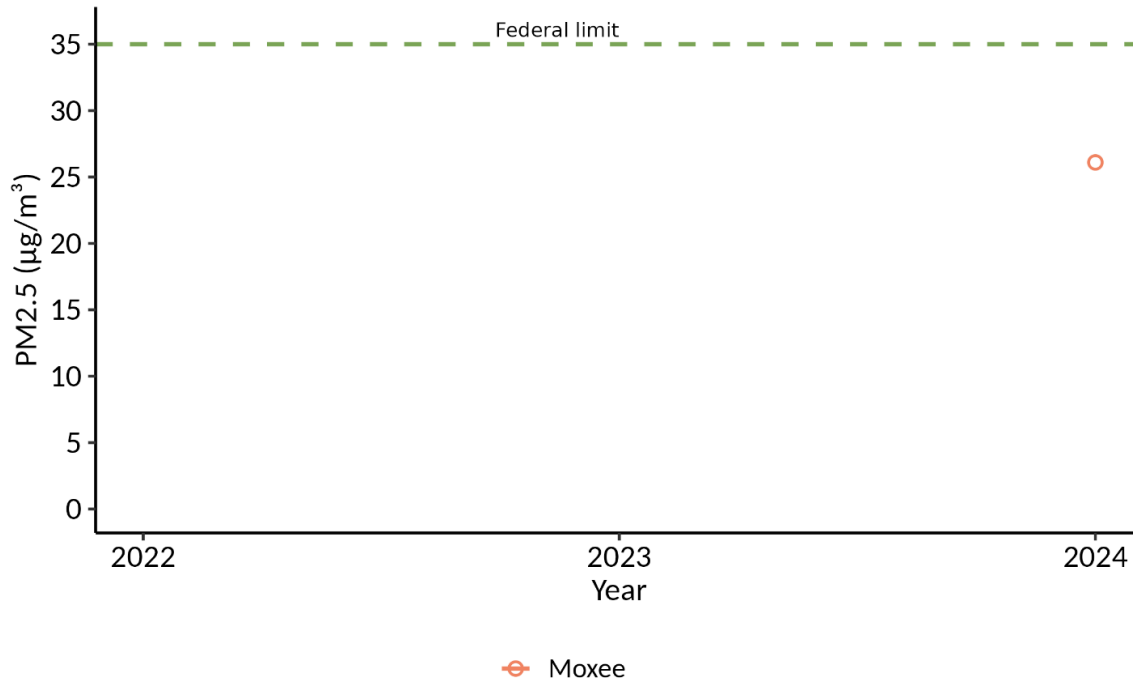


Figure A1. 24-hour PM_{2.5} (98th percentile) concentration at the Moxee Valley monitoring site using available 2024 data. Days impacted by wildfire smoke are included. Dashed line is the federal limit for 24-hr PM_{2.5} (35 µg/m³).

Appendix B. Supplemental Health Impacts Tables

Table B1. Estimated annual deaths by any cause related to yearly $PM_{2.5}$ exposure among 18–84-year-olds in Moxee Valley by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019⁸).

Racial and Ethnic Group	Population (18-84-year-olds)	Estimated Annual Deaths [95% CI]	Estimated Annual Deaths per 100,000 Population [95% CI]	Estimated Age-Adjusted Annual Deaths Per 100,000 Population [95% CI]
All	7,929	3 [2 to 4]	38 [28 to 48]	41 [30 to 52]
Hispanic	2,945	1 [1 to 1]	30 [17 to 42]	54 [31 to 76]
Non-Hispanic AIAN	134	<1 [range <1]	15 [-10 to 37]	20 [-14 to 51]
Non-Hispanic Asian	75	<1 [range <1]	13 [-9 to 33]	17 [-12 to 43]
Non-Hispanic Black	44	<1 [range <1]	38 [12 to 62]	32 [10 to 53]
Non-Hispanic NHOPI	14	<1 [range <1]	18 [-13 to 46]	14 [-10 to 36]
Non-Hispanic 2+ races	263	<1 [range <1]	17 [-12 to 42]	20 [-14 to 50]
Non-Hispanic White	4,455	1 [1 to 2]	27 [18 to 36]	23 [15 to 30]

AIAN: American Indian and Alaska Native; CI: confidence interval; NHOPI: Native Hawaiian and Other Pacific Islander.

Race categories only include people who identify as non-Hispanic to reflect the race categories used in the study by Pope, et al.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington State.

Table B2. Estimated annual deaths by any cause related to yearly PM_{2.5} exposure among 65–99-year-olds in Moxee Valley by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017³⁰).

Racial and Ethnic Group	Population (65-99-year-olds)	Estimated Annual Deaths [95% CI]	Estimated Annual Deaths Per 100,000 Population [95% CI]	Estimated Age-Adjusted Annual Deaths Per 100,000 Population [95% CI]
All	1,534	2 [2 to 2]	124 [120 to 127]	127 [123 to 130]
Hispanic	210	<1 [range <1]	136 [118 to 154]	150 [130 to 169]
AIAN	35	<1 [range <1]	40 [25 to 55]	41 [25 to 56]
Asian	10	<1 [range <1]	33 [26 to 40]	35 [28 to 42]
Black	20	<1 [range <1]	65 [63 to 68]	57 [54 to 59]
NHOPI	4	<1 [range <1]	19 [12 to 26]	33 [20 to 45]
2+ races	74	<1 [range <1]	44 [27 to 61]	46 [28 to 63]
White	1,390	<1 [range <1]	22 [22 to 23]	23 [22 to 24]

AIAN: American Indian and Alaska Native; CI: confidence interval; NHOPI: Native Hawaiian and Other Pacific Islander.

Race categories include people who identify as Hispanic and non-Hispanic to reflect the race categories used in the study by Di, et al.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington State.

³⁰ Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

Table B3. Annual mortality and morbidity associated with annual PM_{2.5} exposure (yearly 24-hour average concentrations) in Moxee Valley, 2022-2023. Brackets [] include 95% confidence interval.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated Annual Rate Per 100,000 Population [95% CI]
Deaths – Any cause	65 to 99	Di et al., 2017 ³¹	1,534	2 [2 to 2]	124 [120 to 127]
Deaths – Any cause	18 to 84	Pope et al., 2019 ³²	7,929	3 [2 to 4]	38 [28 to 48]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023 ³³	8,047	1 [0 to 1]	11 [4 to 17]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017 ³⁴	6,391	1 [1 to 1]	18 [13 to 22]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009 ³⁵	6,391	2 [1 to 2]	27 [22 to 31]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019 ³⁶	6,391	1 [1 to 1]	17 [12 to 21]

³¹ Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

³² Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

³³ Alexeeff SED, K.Van Den Eeden, S.Schwartz, J.Liao, N. S.Sidney, S. Association of Long-term Exposure to Particulate Air Pollution with Cardiovascular Events in California. *JAMA Network Open*. 2023;6(2):e230561.

³⁴ Jerrett, 2017. Comparing the Health Effects of Ambient Particulate Matter Estimated Using Ground-Based Versus Remote Sensing Exposure Estimates. *Environmental Health Perspectives*. 2017 Apr;125(4):552-559. doi: 10.1289/EHP575. Epub 2016 Sep 9.

³⁵ Krewski D, Jerrett M, Burnett R, et al. 2009. Extended Follow-Up and Spatial analysis of the American Cancer Society Linking Particulate Air Pollution and Mortality. Health Effects Institute, Cambridge MA

³⁶ Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

Deaths – Lung Cancer	30 to 99	Krewski, et al., 2009 ³⁷	6,391	<1 [range <1]	3 [1 to 5]
Deaths – Lung Cancer	30 to 99	Turner et al., 2016 ³⁸	6,391	<1 [range <1]	2 [1 to 3]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023 ³⁹	8,047	2 [1 to 3]	24 [13 to 34]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016 ⁴⁰	6,391	1 [0 to 1]	11 [4 to 17]

CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with PM_{2.5} in this group in this community.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington State.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 EJ Report for more information.

³⁷ Krewski D, Jerrett M, Burnett R, et al. 2009. Extended Follow-Up and Spatial analysis of the American Cancer Society Linking Particulate Air Pollution and Mortality. Health Effects Institute, Cambridge MA

³⁸ Turner, M.C., Jerrett, M., Pope, C.A., III, Krewski, D., Gapstur, S.M., Diver, W.R., Beckerman, B.S., Marshall, J.D., Su, J., Crouse, D.L., & Burnett, R.T. (2016). Long-term ozone exposure and mortality in a large prospective study. *American Journal of Respiratory Critical Care Medicine* 193(10): 1134-1142.

³⁹ Alexeeff SED, K. Van Den Eeden, S.Schwartz, J.Liao, N. S.Sidney, S. Association of Long-term Exposure to Particulate Air Pollution with Cardiovascular Events in California. *JAMA Network Open*. 2023;6(2):e230561.

⁴⁰ Gharibvand, L., Shavlik, D., Ghamsary, M., Beeson, W.L., Soret, S., Knutsen, R., & Knutsen, S.F. (2016). The association between ambient fine particulate air pollution and lung cancer incidence: results from the AHSMOG-2 study. *Environmental Health Perspectives* 125 (3): 378?384

Table B4. Annual mortality and morbidity associated with daily PM_{2.5} exposure (daily 24-hour average concentrations) in Moxee Valley, 2022-2023. Brackets [] include 95% confidence interval.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated Annual Rate Per 100,000 Population [95% CI]
Deaths – Any cause	0 to 99	Ito et al., 2013 ⁴¹	10,889	<1 [range <1]	1 [0 to 1]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014 ⁴²	1,534	<1 [range <1]	11 [7 to 15]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022 ⁴³	10,889	<1 [range <1]	1 [0 to 2]
Deaths – Respiratory	0 to 99	Liu et al., 2022 ⁴⁴	10,889	<1 [range <1]	1 [0 to 3]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005 ⁴⁵	8,047	<1 [0 to 1]	4 [-6 to 14]

⁴¹ Ito, K., Ross, Z., Zhou, J., Nádas, A., Lippmann, M. and Thurston, G.D., 2013. NPACT Study 3. Time-series analysis of mortality, hospitalizations, and ambient PM_{2.5} and its components. National Particle Component Toxicity (NPACT) Initiative. <https://www.healtheffects.org/publication/national-particle-component-toxicity-npact-initiative-integrated-epidemiologic-and>

⁴² Zanobetti, A., Dominici, F., Wang, Y. and Schwartz, J.D., 2014. A national case-crossover analysis of the short-term effect of PM_{2.5} on hospitalizations and mortality in subjects with diabetes and neurological disorders. *Environmental Health*, 13(1), p.38.

⁴³ Liu, R.A., Wei, Y., Qiu, X., Kosheleva, A. and Schwartz, J.D., 2022. Short term exposure to air pollution and mortality in the US: a double negative control analysis. *Environmental Health*, 21(1), p.81.

⁴⁴ Liu, R.A., Wei, Y., Qiu, X., Kosheleva, A. and Schwartz, J.D., 2022. Short term exposure to air pollution and mortality in the US: a double negative control analysis. *Environmental Health*, 21(1), p.81.

⁴⁵ Sullivan, J., L. Sheppard, A. Schreuder, N. Ishikawa, D. Siscovick and J. Kaufman. 2005. Relation between short-term fine-particulate matter exposure and onset of myocardial infarction. *Epidemiology*. Vol. 16 (1): 41-8.

Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Zanobetti et al., 2009 ⁴⁶	8,047	<1 [0 to 1]	5 [2 to 7]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009 ⁴⁷	1,534	1 [1 to 2]	81 [46 to 114]
Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003 ⁴⁸	9,355	<1 [0 to 1]	5 [2 to 8]
ED Visits – Asthma	0 to 99	Mar et al., 2010 ⁴⁹	10,889	2 [0 to 3]	17 [4 to 29]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005 ⁵⁰	10,889	1 [-1 to 3]	9 [-8 to 25]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999 ⁵¹	2,842	1 [1 to 2]	47 [24 to 67]

ED: emergency department; CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with PM_{2.5} in this group in this community.

⁴⁶ Zanobetti, A., Franklin, M., Koutrakis, P. and Schwartz, J., 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. *Environmental Health*, 8(1), p.58.

⁴⁷ Zanobetti, A., Franklin, M., Koutrakis, P. and Schwartz, J., 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. *Environmental Health*, 8(1), p.58.

⁴⁸ Sheppard, L. Ambient Air Pollution and Nonelderly Asthma Hospital Admissions in Seattle, Washington, 1987-1994. In: Revised Analyses of Time-Series Studies of Air Pollution and Health. 2003, Health Effects Institute: Boston, MA. p. 227-230.

⁴⁹ Mar, T. F., J. Q. Koenig and J. Primomo. 2010. Associations between asthma emergency visits and particulate matter sources, including diesel emissions from stationary generators in Tacoma, Washington. *Inhalation Toxicology*. Vol. 22 (6): 445-8.

⁵⁰ Slaughter, J. C., E. Kim, L. Sheppard, J. H. Sullivan, T. V. Larson and C. Claiborn. 2005. Association between particulate matter and emergency room visits, hospital admissions and mortality in Spokane, Washington. *Journal of Exposure Analysis and Environmental Epidemiology*. Vol. 15

⁵¹ Norris, G., et al. An association between fine particles and asthma emergency department visits for children in Seattle. *Environmental Health Perspectives*, 1999. 107(6): p. 489-93.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington State.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 EJ Report for more information.

Table B5. Annual mortality and morbidity associated with seasonal and daily O₃ exposure (seasonal and daily 8-hour maximum concentrations) in Moxee Valley, 2022-2023. Brackets [] include 95% confidence interval.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated Annual Rate Per 100,000 Population [95% CI]
Deaths – Any cause (Seasonal)	65 to 99	Di, et al. 2017 ⁵²	1,534	1 [0 to 1]	42 [28 to 54]
Deaths – Any cause (Daily)	0 to 99	Zanobetti and Schwartz, 2008 ⁵³	10,889	<1 [range <1]	2 [1 to 3]
ED Visits – Asthma (Daily)	0 to 99	Mar and Koenig, 2009 ⁵⁴	10,889	3 [1 to 5]	25 [6 to 41]
Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995 ⁵⁵	1,534	3 [1 to 5]	192 [55 to 315]

⁵² Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

⁵³ Zanobetti, A. and Schwartz, J., 2008. Mortality displacement in the association of ozone with mortality: an analysis of 48 cities in the United States. *American Journal of Respiratory and Critical Care Medicine*, 177(2), pp.184-189.

⁵⁴ Mar, T.F. and Koenig, J.Q. (2009). Relationship between visits to emergency departments for asthma and ozone exposure in greater Seattle, Washington. *Annals of Allergy, Asthma & Immunology*, 103, 474-479.

⁵⁵ Schwartz, J., 1995. Short term fluctuations in air pollution and hospital admissions of the elderly for respiratory disease. *Thorax*, 50(5), pp.531-538.

ED: emergency department; CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with O3 in this group in this community.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

Age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington State.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 EJ Report for more information.