Northeast Puyallup Community
2025 Environmental Justice Report

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Executive Summary

The Northeast Puyallup 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 Northeast Puyallup community.

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

Community Overview

The Northeast Puyallup community was identified as overburdened and highly impacted by air pollution because it met the statewide screening criteria based on the Washington Environmental Health Disparities map[1] ranking, the EJScreen demographic index,[2] and previous modeled levels of fine particulate matter ($PM_{2.5}$), ozone (O_2), and nitrogen dioxide (NO_2). Community identification is described in more detail in the Overburdened Communities Highly Impacted by Air Pollution StoryMap.

Land Area: 2.8 sq. mi

Population: 9,621

County: Pierce

Municipal Government: Puyallup City Council

Ecology Region: Southwest

Local Clean Air Authority: Puget Sound Clean Air Agency

Local Health Jurisdiction: Tacoma-Pierce County Health Department

Primary languages spoken: English, Spanish

Primary pollutant of concern: Cumulative criteria air pollution

Geographic characteristics

Puyallup is a mid-sized city in Pierce County, approximately 10 miles east from downtown Tacoma. The identified community includes the northeast portion of the city, bounded by State Route 512 on the west, 23rd Avenue to the south, and the Puyallup River to the north. This community is primarily residential with some limited manufacturing along a rail line near the river.

[1] Washington Environmental Health Disparities map https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/washington-environmental-health-disparities-map
[2] EJScreen demographic index https://www.epa.gov/ejscreen

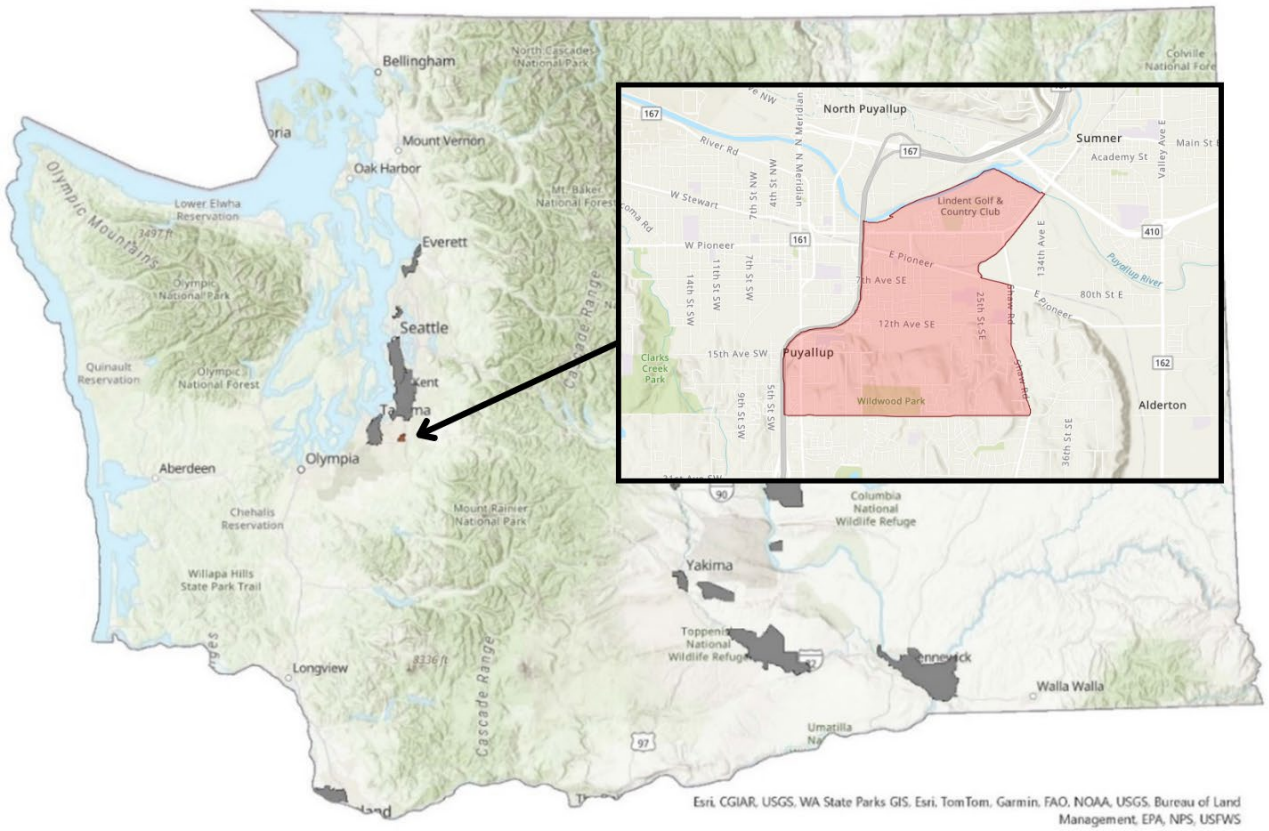

Figure 1. Map of the 16 overburdened communities highly impacted by air pollution in Washington state (gray), with Northeast Puyallup highlighted (red).

Socioeconomic characteristics

Northeast Puyallup has the highest share of workers employed in installation, maintenance, and repair occupations among the 16 identified communities. One-fifth of residents in this community are children, and over 1 in 7 are aged 65 and older; both age groups may be more sensitive to health impacts from air pollution.[3,4]

[3] American Community Survey Data https://www.census.gov/programs-surveys/acs/data.html
[4] 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/

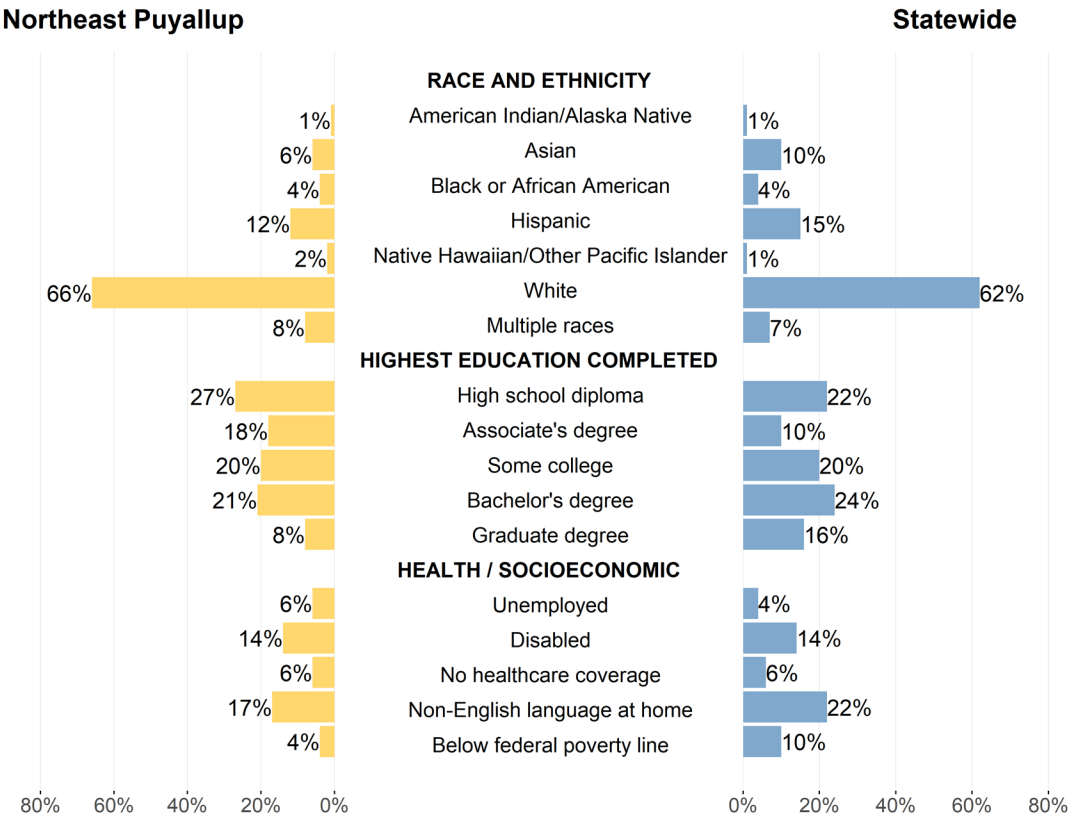

Figure 2. Sociodemographic characteristics of the Northeast Puyallup community compared to statewide percentages, based on Washington State's 2024 estimated population of 8,035,700.[5]

Health characteristics

According to 2022 CDC health survey data,[6] Northeast Puyallup has an elevated prevalence of asthma among individuals aged 18 years and older relative to the statewide population (12.9% vs. 11.4%), and lower prevalences of cardiovascular disease (5.1% vs. 5.7%), diabetes (9.0% vs. 9.6%), stroke (2.8% vs. 3.1%), and a comparable prevalence of COPD (5.7% vs. 5.7%). 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

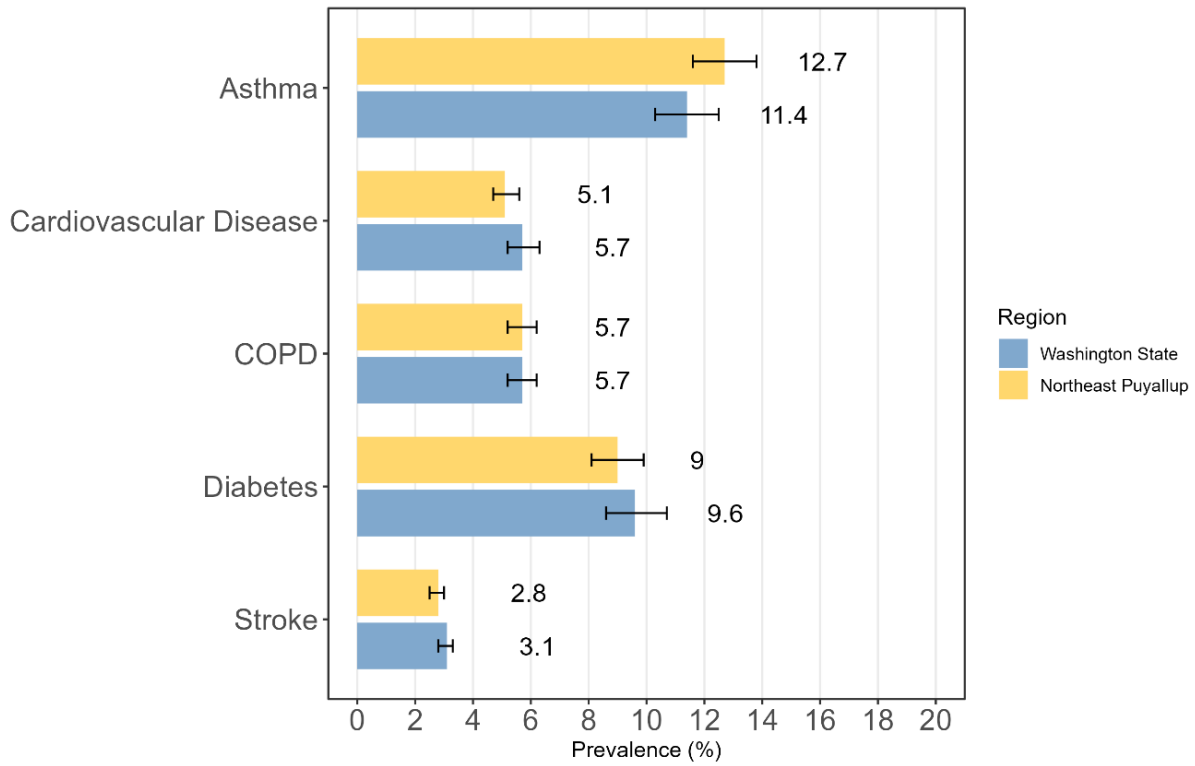

Figure 3. *Prevalence of chronic health conditions among people ages 18 years and older in Northeast Puyallup census tracts compared with Washington State.*

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 late 2024, Ecology's Southwest Regional Office (SWRO) installed a low-cost, high accuracy $PM_{2.5}$ sensor (SensWA) in the Northeast Puyallup community using Climate Commitment Act (CCA) funds. This report includes partial-year data from 2024. No other criteria air pollutants are currently monitored in the community.

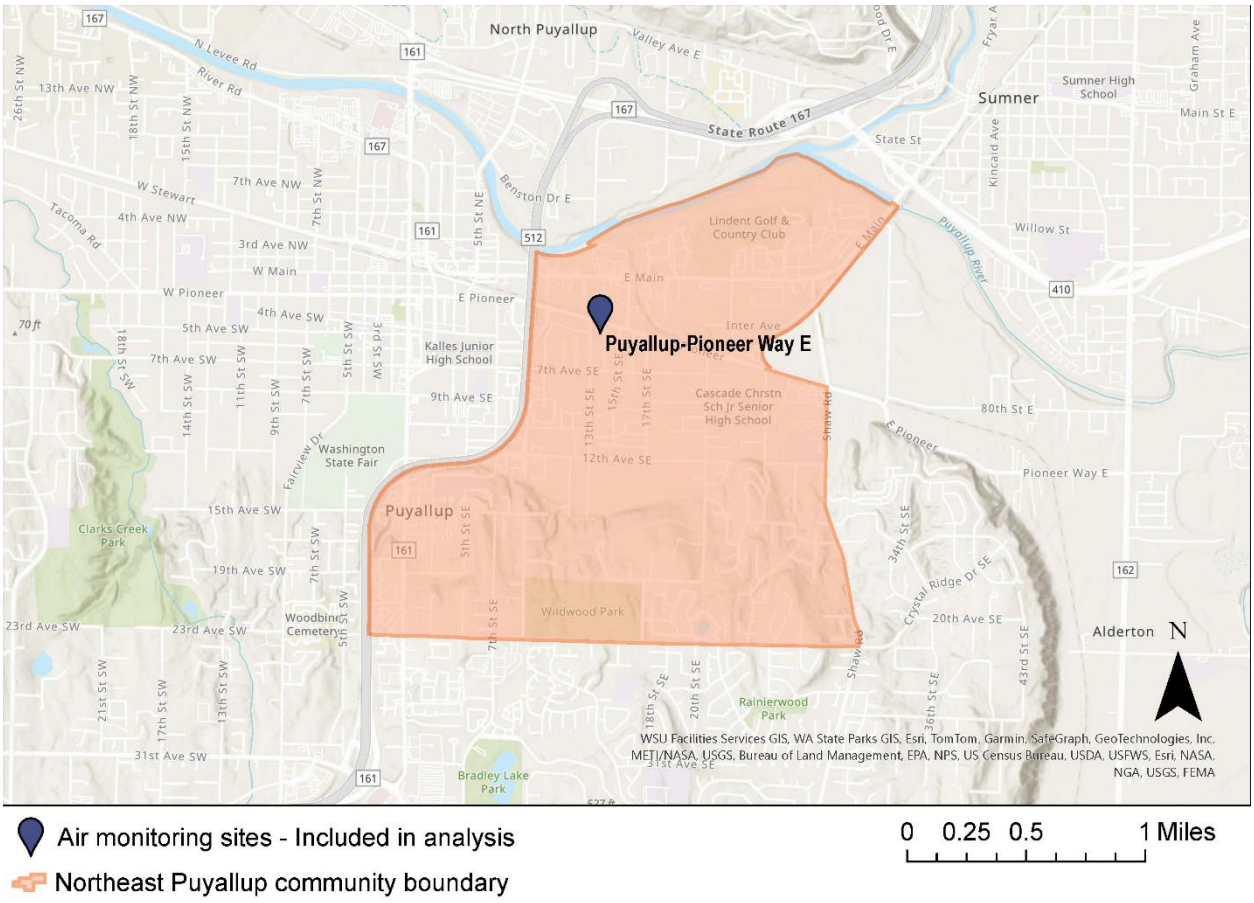

Figure 4. Map of Northeast Puyallup air monitoring sites.

Table 1. Northeast Puyallup criteria air pollutant monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
Puyallup-Pioneer Way E	SensWA [1]	Ecology-SWRO	$PM_{2.5}$

[1] Installed as part of Climate Commitment Act implementation

Criteria Air Pollution

This report summarizes criteria air pollutant (CAPs) concentrations in the Northeast Puyallup community from 2022 through 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.

Table 2 includes 24-hour $PM_{2.5}$ (98^{th} 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 $PM_{2.5}$ (98^{th} percentile) is 35 µg/m³. The design value for 24-hour $PM_{2.5}$ (98^{th} 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.

The Puyallup-Pioneer Way E monitor site began operating in October 2024. We included partial-year data in Table 2. Because only a partial year of data was available, these values are not yet representative of daily $PM_{2.5}$ concentrations in Northeast Puyallup. The 24-hour $PM_{2.5}$ level remained below the NAAQS threshold. Future publications of the biennial EJ report will include additional $PM_{2.5}$ data as it becomes available.

The impact of wildfire smoke on daily $PM_{2.5}$ concentrations were not reported since the monitor was installed in 2024 after the warm season was over.

Table 2. ***24-hour $PM_{2.5}$ (98^{th} percentile) summary statistics (2024).*** *Units are in µg/m³. 24-hour $PM_{2.5}$ (98^{th} percentile) NAAQS is 35 µg/m³.*

Monitoring Site	2022 24-hour 98^{th} Percentile	2023 24-hour 98^{th} Percentile	2024 24-hour 98^{th} Percentile	2024 Design Value
Puyallup-Pioneer Way E	DNC	DNC	*18.5*	*

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

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 $PM_{2.5}$ concentrations used to describe long-term exposure; however, three full years of data are not yet available. Based on the available data, the 2024 annual mean $PM_{2.5}$ level is below the federal standard.

Table 3. ***Annual mean $PM_{2.5}$ concentrations (2024)****. Units are in µg/m³. Annual $PM_{2.5}$ NAAQS is 9.0 µg/m³.*

Monitoring Site	2022	2023	2024	2024 Design Value
Puyallup-Pioneer Way E	DNC	DNC	*8.06*	*

Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m^3 = 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 (43 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 3 total deaths (214 deaths per 100,000 population) each year associated with annual $PM_{2.5}$ exposure (Table B2).

Among different racial and ethnic groups (Figure 5), we estimated most $PM_{2.5}$ related deaths by any cause per year to be among non-Hispanic White people (3 deaths among 18–84-year-olds). However, when accounting for the ages of people in each racial and ethnic group[7], the annual age-adjusted mortality rate was highest among Hispanic people (132 deaths per 100,000 population) and non-Hispanic NHOPI people (85 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 5 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.

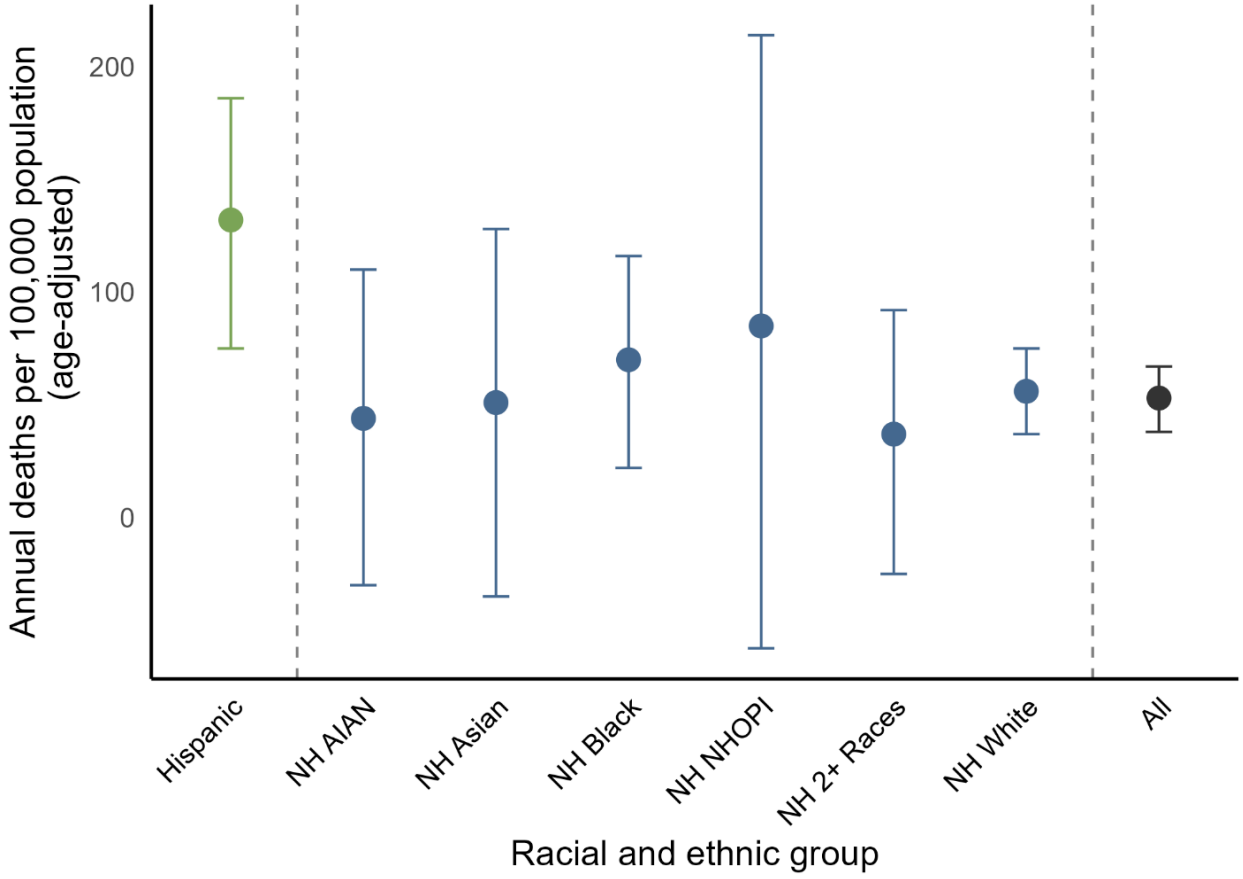

Figure 5. Age-adjusted annual death rates by any cause associated with annual $PM_{2.5}$ exposure among ages 18-84 by racial and ethnic group in Northeast Puyallup.

When assessing specific causes of death related to yearly $PM_{2.5}$ concentrations (Table B3), we estimated 1 death due to cardiovascular disease (14 deaths per 100,000 population), 1 death due to ischemic heart disease (15 to 25 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 1 hospital admission (16 visits per 100,000 population) for acute non-fatal myocardial infarction was associated with

[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.

yearly $PM_{2.5}$ concentrations among adults. Additionally, 2 lung cancer diagnosis per year were associated with annual $PM_{2.5}$ exposure among all people (29 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 (19 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 (3 per 100,000 population) among all adults, 2 respiratory admissions (114 per 100,000 population) among older adults ages 65 to 99, 1 asthma hospital admission (10 per 100,000 population) among people ages 0 to 64 years. Additionally, 3 to 5 asthma-related emergency department (ED) visits (27 to 51 per 100,000 population) among all people and 3 asthma-related ED visits (133 per 100,000 population) among youths ages 0 to 17 years were associated with daily $PM_{2.5}$ exposure.

Ozone

We estimated that O_3 exposure during warm season (Table B5) was associated with 1 seasonal all-cause death among older adults ages 65 to 99 (39 deaths per 100,000 population). Daily O_3 exposure was associated with <1 death by any cause (1 per 100,000 population), 3 asthma-related ED visits (36 per 100,000 population) among all people and 2 respiratory hospital admissions (133 per 100,000 population) among older adults ages 65–99.

Greenhouse Gas Emissions

Greenhouse gas results for the Northeast Puyallup overburdened community highly impacted by air pollution include: 1) Emissions from greenhouse gas reporting entities per RCW 70A.65[9] 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.

[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

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 Program.[13] Businesses that emit over 25,000 MT CO_2e are also subject to the Cap-and-Invest Program (covered sources). Each reporting facility is required to follow a compliance plan.

In the Northeast Puyallup community, two facilities (Figure 6; Table 3) near the community boundary reported their emissions in 2022 and 2023. The total reported emissions from these facilities was 47,294 MT CO_2e in 2022 and 62,121 MT CO_2e in 2023, a 31.4% year-to-year increase. Some facilities in other communities report biogenic carbon (biogenic CO_2) [14] emissions, which are expected to be partially recaptured as part of the natural carbon cycle. For reporting purposes, biogenic CO_2 is subtracted from total metric tons of CO_2e, even though it has the same atmospheric warming effect as non-biogenic CO_2. There were no facilities that reported biogenic CO_2 in Northeast Puyallup. 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 CO_2 emissions. Some year-to-year fluctuations in emissions from individual facilities are expected.

[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 CO_2 acts the same way in the atmosphere as non-biogenic CO_2. Anthropogenic processes that include these emissions reduce a facility's environmental impact.

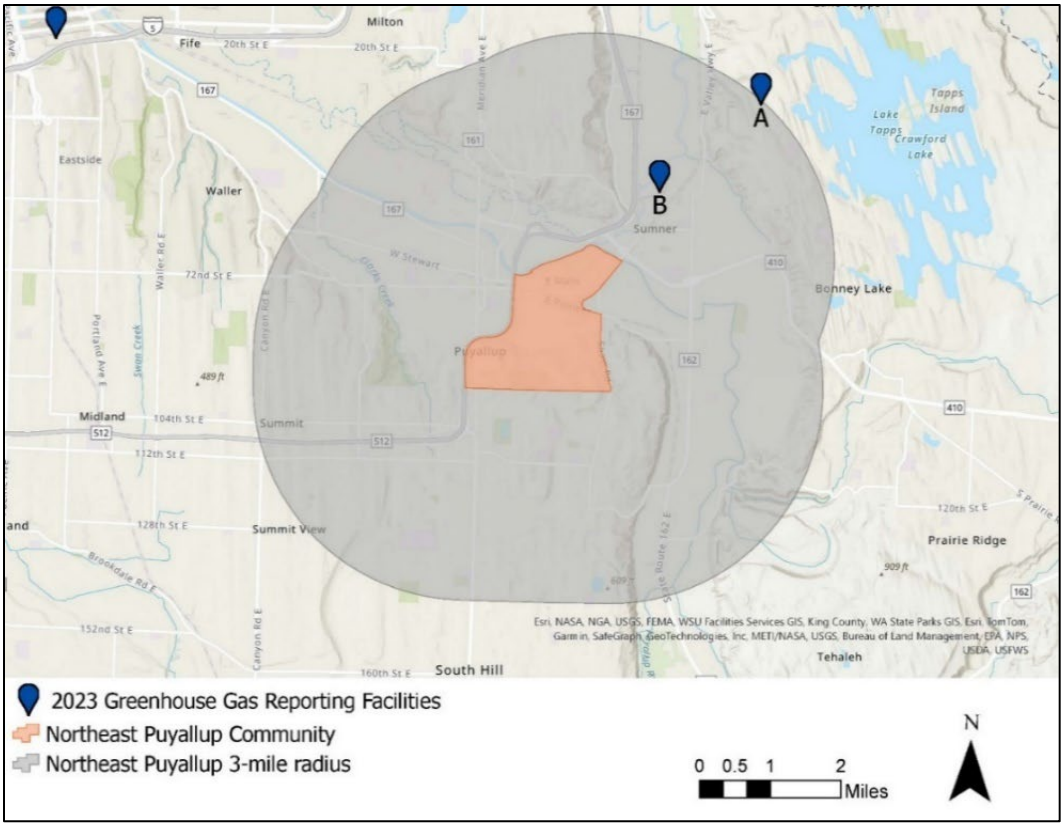

Figure 6. Reporting facilities as of 2023 that are in or near the Northeast Puyallup community boundary. Facility letters correspond with Table 4.

The emissions in Table 4 are in MT CO_2e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR4 GWP[15], to convert emissions into CO_2e. 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).[16] The Greenhouse Gas Reporting Program uses AR4 GWPs mainly for regulatory stability, consistency, and alignment with other federal programs.

[15] Reporting of Emissions of Greenhouse Gases https://app.leg.wa.gov/WAC/default.aspx?cite=173-441
[16] Intergovernmental Panel on Climate Change https://www.ipcc.ch/

Table 4. Facility emissions in or nearby[17] the Northeast Puyallup community. Biogenic CO_2 is in brackets [ ].

	Facility Name/City	Facility Sector	Within Community Boundary	CCA-Covered Facility[18]	Source of CAPs[19]	2022 Emissions ($MTCO_2e$)	2023 Emissions ($MTCO_2e$)
A	Northwest Pipeline Compressor Station - Sumner	Natural Gas Systems	Nearby	Yes	No	36,474 [0]	51,136 [0]
B	Sonoco Products - Sumner	Pulp and Paper	Nearby	No	Yes	10,820 [0]	10,985 [0]

[17] "Nearby" refers to facilities within a three-mile radius of the community boundary that were included in this analysis.
[18] Large emitters of greenhouse gases, specifically those emitting 25,000 or more MT CO_2e annually in Washington State that are part of the Cap-and-Invest program established by the Climate Commitment Act.
[19] 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

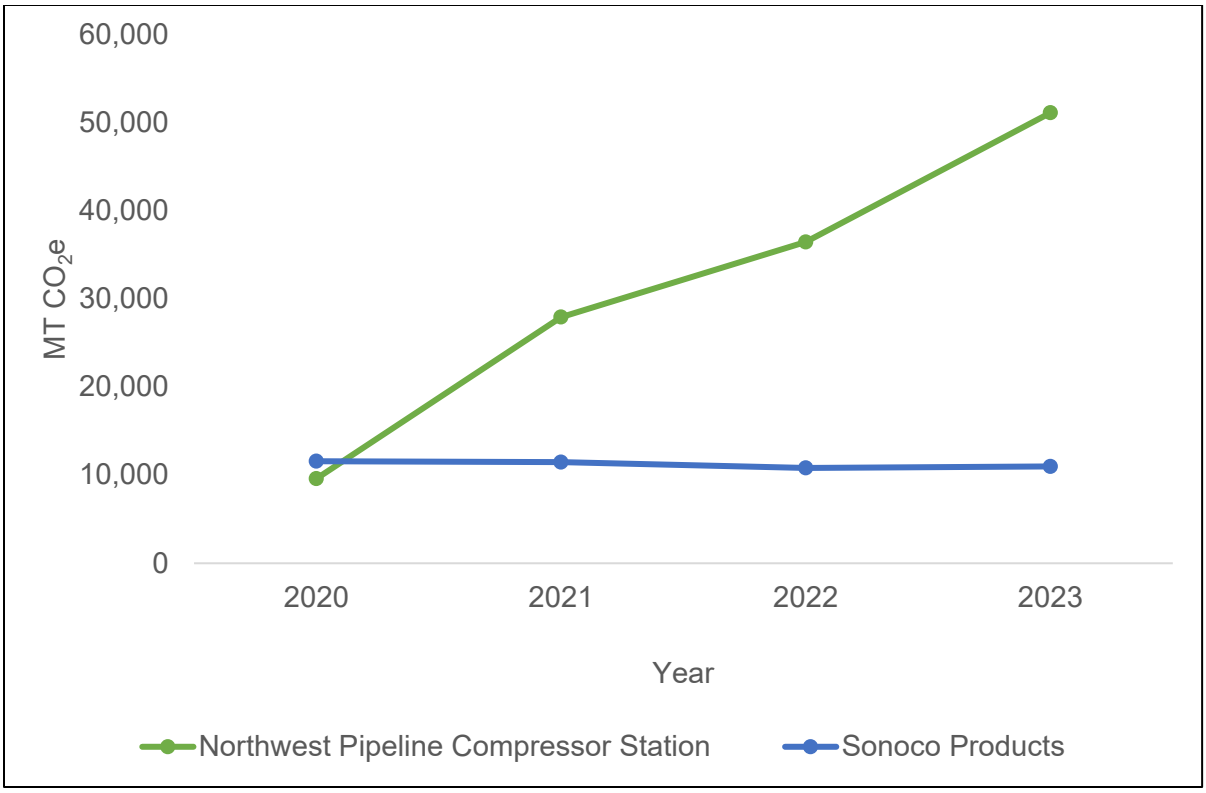

Figure 7. Greenhouse gas reporting facilities and their emissions from 2020-2023.

Mobile sources

In the Northeast Puyallup 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.[20] 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.[21,22]

Similar to Table 4, the results in Table 5 use AR5 GWPs to convert greenhouse gas emissions into CO_2e. In 2013-2014, the IPCC published AR5 GWPs and AR6 GWPs in 2021-2022. The Washington Greenhouse Gas Emissions Inventory[23] uses AR5 GWPs in mobile source emission

[20] Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html
[21] Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html
[22] Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024 https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf
[23] 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_2e)	2020 Per Capita MT CO_2e	2021 Emissions (MT CO_2e)	2021 Per Capita MT CO_2e
9,574	33,592	3.5	40,636	4.2

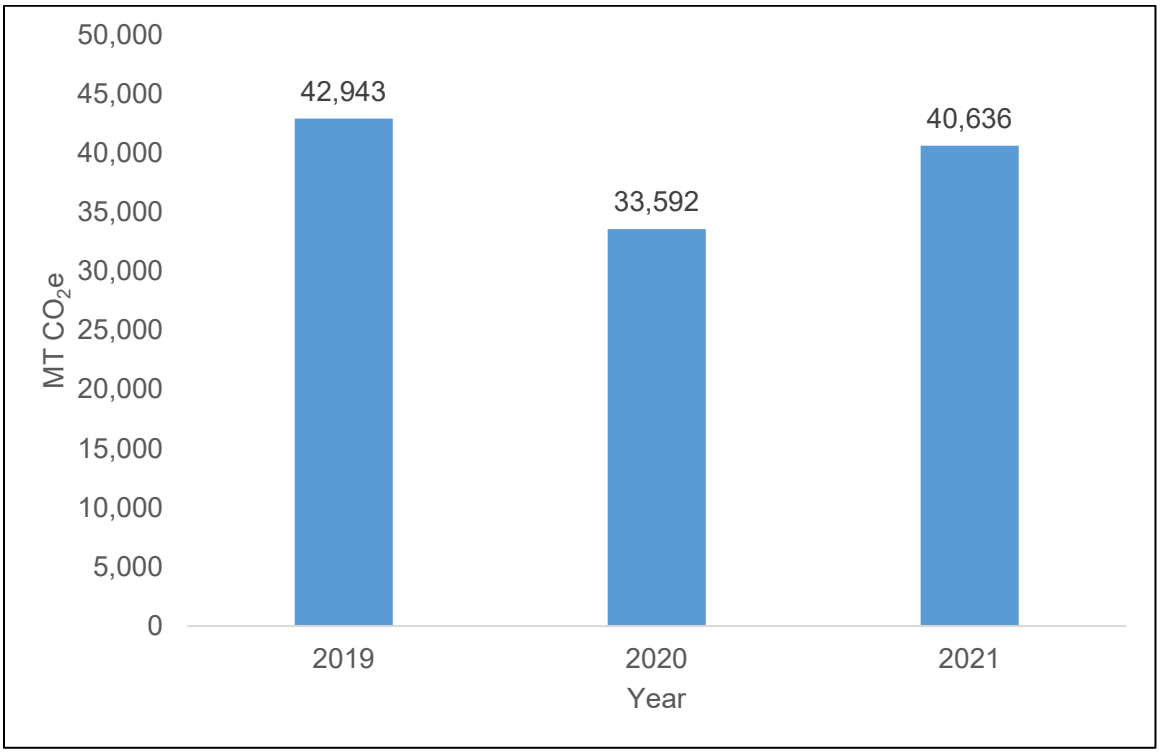

Figure 8. Annual greenhouse gas emissions from mobile sources in the Northeast Puyallup community, 2019-2021.

Community Resources

These resources provide more information about air quality and health in the Northeast Puyallup community:

- Pierce County 2019 Community Health Assessment[24]
- Pierce County 2020 Community Health Improvement Plan[25]
- Pierce County 2020 Community Health Improvement Plan At-A-Glance[26]
- Tacoma-Pierce County Health District Community Health Improvement Plan information page[27]
- Tacoma-Pierce County Health District public health data page[28]
- Virginia Mason Franciscan Health 2022 Pierce County Community Health Needs Assessment[29]
- Virginia Mason Franciscan Health Community Health Needs Assessment information page[30]
- Zero-emission and electric vehicles mapping tool | WSDOT[31]
- Home | Washington Climate Action

[24] https://tpchd.org/wp-content/uploads/2023/12/CHA-2019.pdf
[25] https://tpchd.org/wp-content/uploads/2023/12/2020-Pierce-County-CHIP.pdf
[26] https://tpchd.org/wp-content/uploads/2023/12/CHIP-At-A-Glance-2020.pdf
[27] https://tpchd.org/info/data/community-health-improvement-plan/
[28] https://tpchd.org/info/data/
[29] https://doh.wa.gov/sites/default/files/2023-06/CHNA-081.pdf
[30] https://www.vmfh.org/about-vmfh/why-choose-vmfh/reports-to-the-community/community-health-needs-assessment
[31] https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool

Appendix A. Criteria Air Pollution

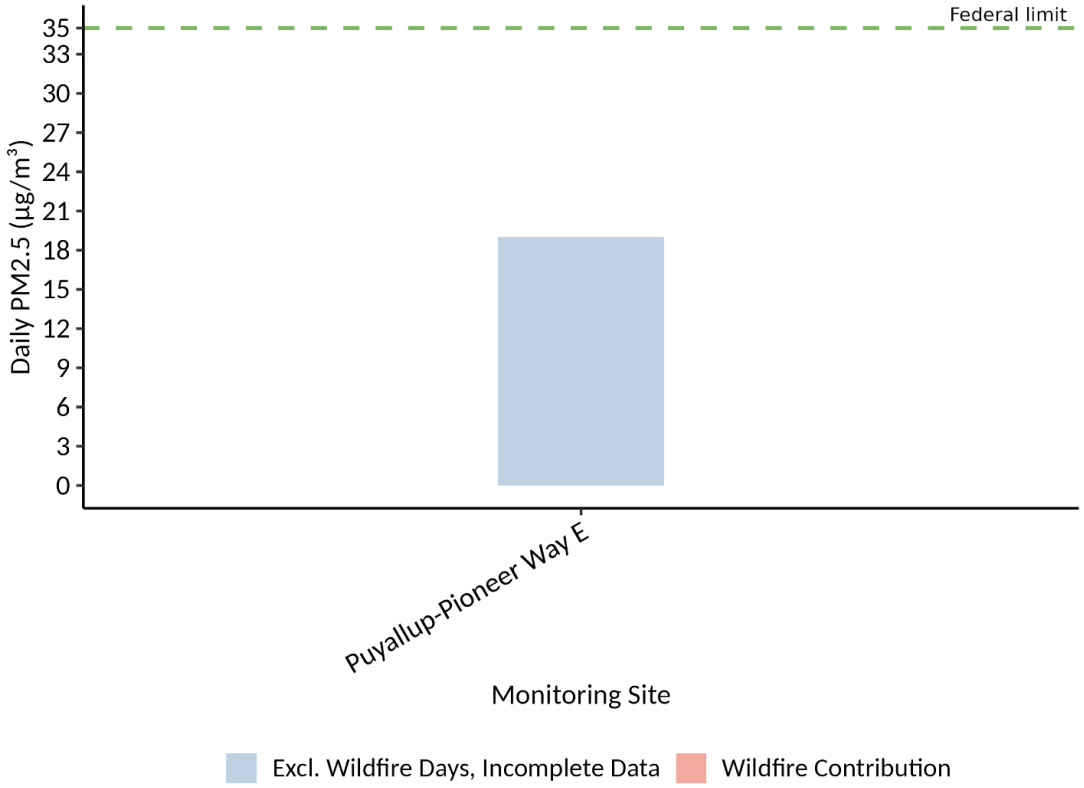

Figure A1. 24-hour $PM_{2.5}$ (98^{th} percentile) summary statistics at the Northeast Puyallup monitoring site. Annual summary statistics calculated with available data; light blue bar includes average of available data from 2024; dashed line is the federal limit for 24-hr $PM_{2.5}$ (35 µg/m³).

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 Northeast Puyallup by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019[8]).

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	7,460	3 [2 to 4]	43 [31 to 54]	53 [38 to 67]
Hispanic	727	<1 [range <1]	29 [16 to 40]	132 [75 to 186]
Non-Hispanic AIAN	64	<1 [range <1]	28 [-19 to 71]	44 [-30 to 110]
Non-Hispanic Asian	468	<1 [range <1]	40 [-28 to 102]	51 [-35 to 128]
Non-Hispanic Black	320	<1 [range <1]	46 [14 to 75]	70 [22 to 116]
Non-Hispanic NHOPI	111	<1 [range <1]	15 [-10 to 37]	85 [-58 to 214]
Non-Hispanic 2+ races	510	<1 [range <1]	17 [-12 to 44]	37 [-25 to 92]
Non-Hispanic White	5,260	3 [2 to 4]	53 [34 to 70]	56 [37 to 75]

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 Northeast Puyallup by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017[32]).

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	1,327	3 [3 to 3]	214 [208 to 219]	221 [215 to 227]
Hispanic	58	<1 [range <1]	158 [137 to 178]	291 [252 to 329]
AIAN	14	<1 [range <1]	291 [178 to 397]	283 [174 to 387]
Asian	82	<1 [range <1]	278 [219 to 334]	294 [232 to 354]
Black	37	<1 [range <1]	421 [405 to 437]	420 [403 to 435]
NHOPI	3	<1 [range <1]	506 [311 to 692]	631 [387 to 863]
2+ races	45	<1 [range <1]	216 [132 to 295]	203 [125 to 278]
White	1,146	2 [2 to 2]	173 [167 to 180]	176 [169 to 183]

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.

[32] 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 yearly $PM_{2.5}$ exposure (yearly 24-hour average concentrations) in Northeast Puyallup, 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[33]	1,327	3 [3 to 3]	214 [208 to 219]
Deaths – Any cause	18 to 84	Pope et al., 2019[34]	7,460	3 [2 to 4]	43 [31 to 54]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023[35]	7,595	1 [0 to 2]	14 [5 to 22]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017[36]	5,683	1 [1 to 1]	16 [12 to 20]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009[37]	5,683	1 [1 to 2]	25 [20 to 29]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019[38]	5,683	1 [1 to 1]	15 [11 to 19]

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Deaths – Lung Cancer	30 to 99	Krewski, et al., 2009[39]	5,683	<1 [range <1]	3 [1 to 5]
Deaths – Lung Cancer	30 to 99	Turner et al., 2016[40]	5,683	<1 [range <1]	2 [1 to 4]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023[41]	7,595	1 [1 to 2]	16 [9 to 22]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016[42]	5,683	2 [1 to 3]	29 [9 to 46]

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 PM2.5 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.

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Table B4. Annual mortality and morbidity associated with daily $PM_{2.5}$ exposure (daily 24-hour average concentrations) in Northeast Puyallup, 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[43]	9,618	<1 [range <1]	1 [0 to 1]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014[44]	1,327	<1 [range <1]	19 [13 to 25]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022[45]	9,618	<1 [range <1]	1 [0 to 2]
Deaths – Respiratory	0 to 99	Liu et al., 2022[46]	9,618	<1 [range <1]	2 [0 to 4]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005[47]	7,595	<1 [0 to 1]	3 [-4 to 9]

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Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Zanobetti et al., 2009[48]	7,595	<1 [range <1]	3 [1 to 5]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009[49]	1,327	2 [1 to 2]	114 [65 to 162]
Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003[50]	8,291	1 [0 to 1]	10 [4 to 16]
ED Visits – Asthma	0 to 99	Mar et al., 2010[51]	9,618	5 [1 to 8]	51 [13 to 86]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005[52]	9,618	3 [-2 to 7]	27 [-23 to 73]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999[53]	2,023	3 [1 to 4]	133 [68 to 192]

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[53] 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.

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.

Table B5. Annual mortality and morbidity associated with seasonal and daily O_3 exposure (seasonal and daily 8-hour maximum concentrations) in Northeast Puyallup, 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[54]	1,327	1 [0 to 1]	39 [27 to 50]
Deaths – Any cause (Daily)	0 to 99	Zanobetti and Schwartz, 2008[55]	9,618	<1 [range <1]	1 [1 to 2]
ED Visits – Asthma (Daily)	0 to 99	Mar and Koenig, 2009[56]	9,618	3 [1 to 6]	36 [9 to 60]

[54] 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.
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[56] 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.

Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995[57]	1,327	2 [1 to 3]	133 [38 to 220]

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.

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