

Vulnerability Assessment Memo

Executive Summary

This Vulnerability Assessment Memo (VA) provides key findings from technical work and engagement efforts conducted in 2025 to recommend climate-related policy updates to the City of Yakima's Comprehensive Plan. Policy updates are needed to meet climate planning requirements in the Washington State Growth Management Act that were mandated in 2023 by House Bill 1181. The memo builds on earlier work to understand the impacts that extreme weather and climate-related hazards can have on the City of Yakima, to understand what people and infrastructure assets in the City are most vulnerable, and to review how the City's existing plans and policies address these hazards and vulnerabilities. It outlines how current and projected hazards affect public health, water systems, and transportation and utility infrastructure, and communicates vulnerabilities of these assets. The findings in this memo informed the development of the 2026 Comprehensive Plan and recommended policy updates to enhance the City of Yakima's resilience.

Climate Impacts

- **Extreme Heat:** The City of Yakima can expect to experience warmer year-round temperatures, including hotter maximum temperatures in the summer punctuated by more frequent and severe heat waves.
- **Drought and Snowpack:** Periods of drought will become more frequent and longer as a result of projected decreases in summertime precipitation and reduce soil moisture. Warmer temperatures will also lead to a reduced snowpack and earlier snowmelt, exacerbating water scarcity.
- **Wildfire and Smoke:** High fire danger conditions will become more frequent as a result of reduced soil moisture and high summer temperatures. Wildfires will be bigger and burn longer, leading to more days in which smoke causes unhealthy air quality.
- **Extreme Precipitation and Flooding:** Heavy storms will increase in intensity and frequency, which will likely cause more frequent flooding on the Yakima River and its tributaries in the city.

Key Findings

The VA evaluates climate risks to systems in the City of Yakima, using data and information from local, state, federal, and peer-reviewed sources. Vulnerability is assessed by hazard, organized by asset (or population), and summarized in the following table.

Hazard	Population/Asset	Vulnerability Score
Heat	Youth (under 18)	High
	Older Adults	Moderate
Drought	Well Protection Areas	Moderate
	Water Service Levels	Moderate-High
Wildfire and Smoke	Older adults	Moderate-High
	Youth	Moderate-High
	Electric Infrastructure	Moderate
	Drinking Water Supply	Low-Moderate
Extreme Precipitation and Flooding	Older Adults	Low
	Low-income residents and homes	Moderate-High
	Stormwater System	Low-Moderate

Introduction

Purpose of the assessment

The City of Yakima is incorporating climate resilience policies into its 2026 Comprehensive Plan update. These climate resilience policies will provide guidance on how to improve resilience to climate-driven environmental hazards and will build on strategies in the existing Comprehensive plan and other City plans. Climate change refers to the shifting of weather patterns and environmental conditions over a long period of time, consistent with guidance provided by the Washington State Department of Commerce (Commerce).¹ The City contracted with BERK Consulting (BERK) to lead its Comprehensive Plan Update, including the development of climate resilience policies. BERK worked with Cascadia Consulting Group (Cascadia) to identify hazards and assess their impacts on city assets and populations, and the vulnerability of those assets and populations.

Background/context

The Washington Growth Management Act (GMA) was amended in 2023 under Washington [House Bill \(HB\) 1181](#), requiring cities and counties to integrate climate policies into their comprehensive plan updates.² Jurisdictions must adopt climate policies through a framework consistent with Commerce's [Climate Element Planning Guidance](#) (Washington Department of Commerce, 2023). Commerce's framework offers a flexible approach for jurisdictions to incorporate the best available climate science, assess local impacts, and consider resilience policy options. This vulnerability assessment mirrors Commerce's "[Climate Element Workbook](#)" (Washington Department of Commerce, 2023). Step 3 Tasks 1.1, 1.2, and 1.3, with the goal of exploring how expected changes in the climate could exacerbate natural hazards (e.g., droughts, floods, etc.) and impact critical assets and sectors (e.g., water resources, infrastructure, public health, etc.).

OVERVIEW OF HAZARDS:

- **Extreme Heat:** Rising annual average temperatures, with especially high temperature increases during the summer months (up to an 11°F increase by the end of the century) (Raymond & Rogers, 2022).
- **Drought and Snowpack:** Declining summer precipitation and increased winter temperatures will reduce snowpack up to 66% measured April 1st by midcentury, leading to more frequent, longer, and severe regional droughts (Raymond & Rogers, 2022).
- **Wildfire, Smoke, and Air Quality:** Increasing wildfire activity and smoke-related air pollution, with up to 18 days of unhealthy air quality (AQI >100) projected annually by midcentury (First Street Foundation, 2025).

¹ Washington State Department of Commerce. Climate Element Planning Guidance. December 2023 – Intermediate Version. Page 136.

² The GMA requires climate resilience policies for all jurisdictions updating their comprehensive plans. GHG emissions reduction policies are only required for [11 of the fastest growing jurisdictions](#).

- **Extreme Precipitation and Flooding:** Greater flood risks due to rapid snowmelt and more frequent and intense extreme precipitation events, such as long-duration rain events (City of Yakima, 2007).

Methodology

Cascadia used established and peer-reviewed resources relevant to the City to identify observed and projected climate trends that currently affect the City or will in the future. Much of our weather data is at the county level due to the scale at which climate impacts are analyzed. When possible, we used city data to show how climate risks will manifest in the City of Yakima, such as Urban Heat Islands (UHI), the Wildland Urban Interface (WUI), and floodplains. We also used historical city data and plans to assess sensitivity and adaptive capacity; the plans most heavily drawn from are below.

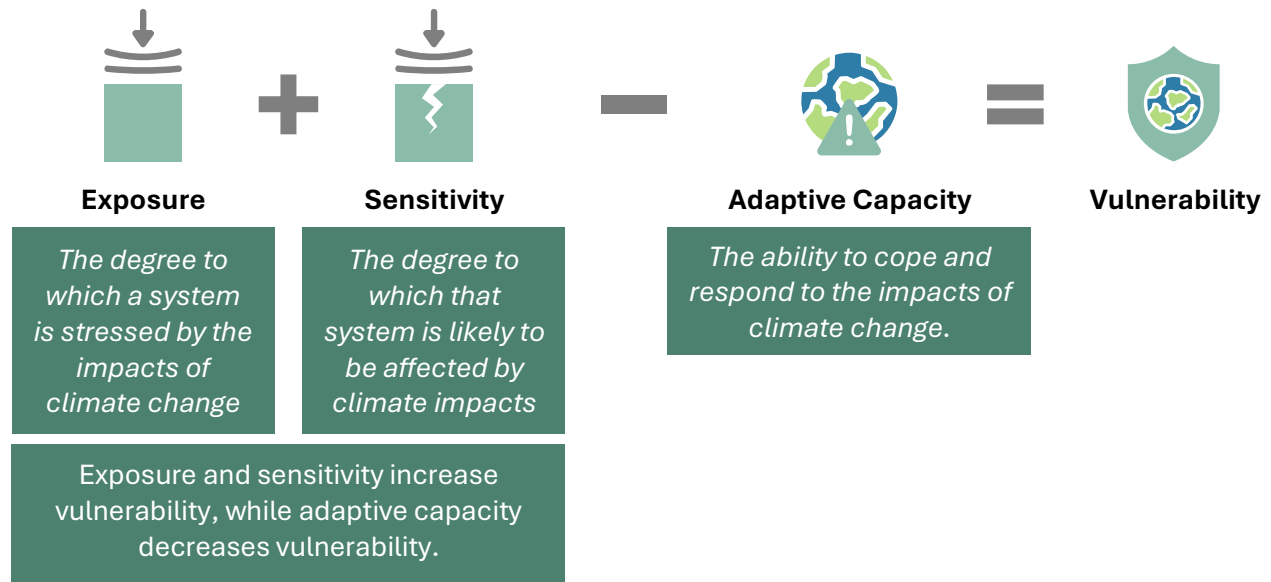
Table 1: Key Planning Documents

Planning Documents	Source
Comprehensive Plan (2018)	City of Yakima
Upper Yakima Valley Regional Wellhead Protection Plan (2000)	Yakima County
Yakima Community Wildfire Protection Plan (2023)	Yakima County
Yakima County Multi-Jurisdictional Hazard Mitigation Plan, City of Yakima Annex (2022)	Yakima Valley Office of Emergency Management
2022	
Shoreline Master Program (2013)	City of Yakima

Source: Cascadia, 2025

Figure 1: Vulnerability Framework

Climate risks refer to the range of potential impacts a system might face from climate change, influenced by the system's exposure to climate-related hazards, and its sensitivity to such changes. To characterize risks, we looked at:



Source: Cascadia, 2025

Hazard-Based Vulnerability Assessment

Extreme Heat

Overview

Extreme heat is one of Yakima’s most pressing hazards, with the community already experiencing longer and hotter summers (Raymond & Rogers, 2022). In June of 2021, the temperature in Yakima reached 113°F during the now-infamous heat dome that beat down on the whole Pacific Northwest, and in July and August 2022, Yakima experienced seven consecutive days over 100°F. (Loyd & Weiford, 2022). Urban Heat Island hotspots- or areas of the city that experience higher heat (Meade, et al., 2020) than other areas- tend to overlap with concentrations of sensitive populations, especially children and older adults. Southeast Yakima, Union Gap, and parts of northeast Yakima have over one-third of residents under 18, limited shade, and lower household incomes. Older adults (people aged 65 and over) in southeast and central neighborhoods face higher risks for heat-related illness and mortality due to underlying health conditions, medications, and limited ability to regulate body temperature (Meade, et al., 2020).

Cooling resources such as public libraries are often unevenly distributed and can be difficult to access for those with transportation or mobility barriers. Targeted investments in neighborhood shade, upgraded cooling infrastructure in schools and community facilities, and expanded mobile cooling services will be essential to protecting health and reducing heat-related impacts.

Population	Vulnerability Score
Youth (under 18)	High
Older Adults (65+)	Moderate

Source: Cascadia, 2025

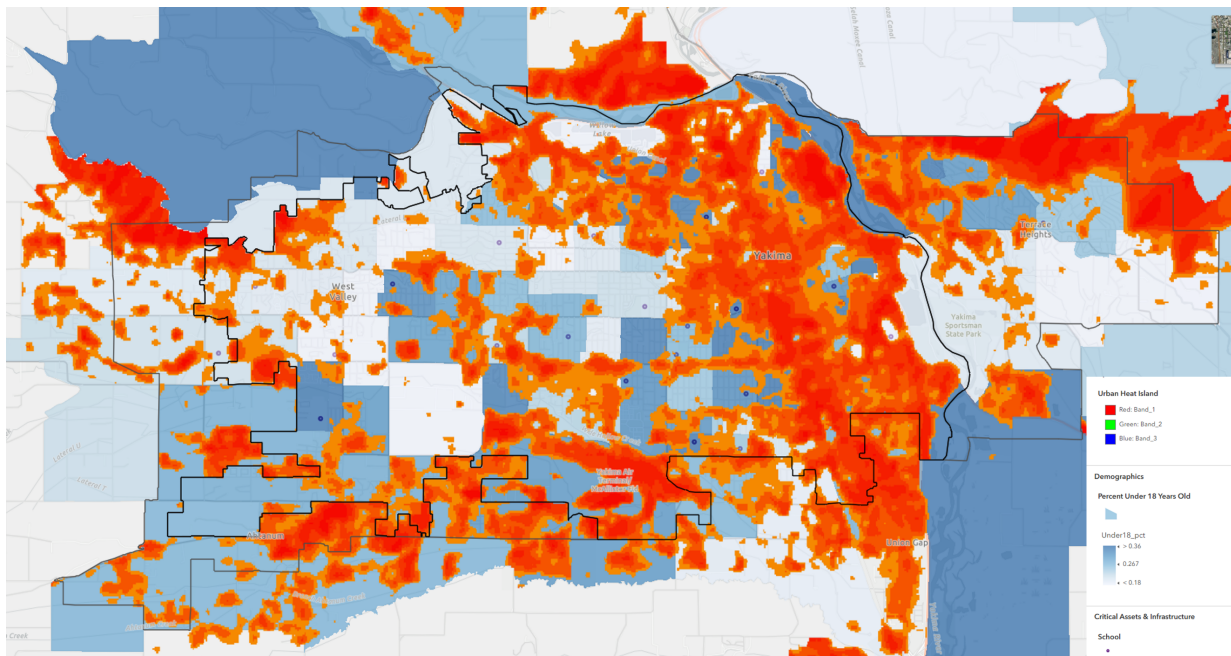
The following tables summarize hazard-related vulnerabilities for youth (under 18) and older adults (65+).

Table 2. Hazard-related vulnerability to youth under 18. (Chakraborty & Soroka, 2025)

Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Youth (under 18)	Exposure: High High overlap between Urban Heat Island (UHI) hotspots and neighborhoods with the highest concentrations of children (> 36 percent of the population under 18). Many of these hotspots coincide with the locations of schools and are situated in neighborhoods with predominately low-income households, suggesting that students experience disproportionate exposure to extreme heat both at home and during the school day (City of Yakima, 2025; Chakraborty & Soroka, 2025). Notable concentrations can be seen in southeast Yakima (near the airport), Union Gap, and parts of northeast Yakima (Figure 1). Sensitivity: High Children are more susceptible to heat-related illnesses and dehydration due to their developing bodies, especially when living in neighborhoods with limited green space, shaded areas, or access to home air conditioning (Environmental Protection Agency, 2023). Many also spend time outdoors during the hottest parts of the day, such as at school, walking, or playing, which increases their risk.	Adaptive Capacity: Low to Moderate Adaptive capacity varies significantly across Yakima. Key schools within high UHI and low tree canopy areas include Ridgeview, Roosevelt, McKinley, Garfield, Robertson, Barge-Lincoln, Hoover, Adams, and Washington Middle School (Figure 1). Many of these campuses lack shaded outdoor spaces, putting students at greater risk during recess and after-school activities. Schools without updated HVAC systems or air-conditioned classrooms may struggle to keep indoor spaces safe during heatwaves, particularly in older buildings. Community facilities like Franklin Pool and the Downtown Yakima YMCA/Aquatic Center offer opportunities for cooling and recreation, especially in areas near the most heat-exposed neighborhoods. However, these facilities may still be inaccessible to families without reliable transportation.

Source: Cascadia, 2025

Figure 2. Urban heat island and percentage of children (under 18).



Source: BERK, 2025

Table 3. Hazard related vulnerability for people 65 and older.

Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Older Adults (65+)	Exposure: Moderate-High Several neighborhoods in Yakima show overlapping concentrations of older adults ($\geq 27\%$ of residents) and high Urban Heat Island (UHI) intensity. These include areas along the south-central corridor near Union Gap, northeast of downtown Yakima, near Terrace Heights, and West Valley, where UHI exposure is highest and older adult populations are elevated. Sensitivity: Moderate Older adults are at higher risk for heat-related illness and mortality due to underlying health conditions, medications, and limited ability to regulate body temperature (Meade, et al., 2020). Those who live alone or lack access to cooling face increased vulnerability during prolonged heat events (Lim & Skidmore, 2020). Areas with high percentages of older adult populations and high UHI exposure overlap in southeast Yakima and central neighborhoods, where tree canopy is more limited. In these areas, mobility challenges, disabilities, health conditions, and lack of transportation can reduce the ability of older adults to access cooling centers or other resources, even when they are located nearby (Bedi, Adams, Hess, & Wellenius, 2022)	Adaptive Capacity: Low-Moderate Yakima has limited cooling resources available during extreme heat events. The three public library branches operate as cooling centers with air-conditioned space and water and a couple of churches, the Senior Center, and the Community Center have also been utilized (Ayer, 2024; Yakima Health District, 2021). Yakima Neighborhood Health Services also deploys a mobile hygiene trailer that provides air-conditioned showers, restrooms, and on-site medical staff on a rotating schedule (Ochoa, 2023). Most census tracts with the highest percentage of older adults ($\geq 27\%$) are located outside the most intense Urban Heat Island zones and often in areas with higher tree canopy coverage, which can provide localized passive cooling and shade (Figure 2).

Source: Cascadia, 2025

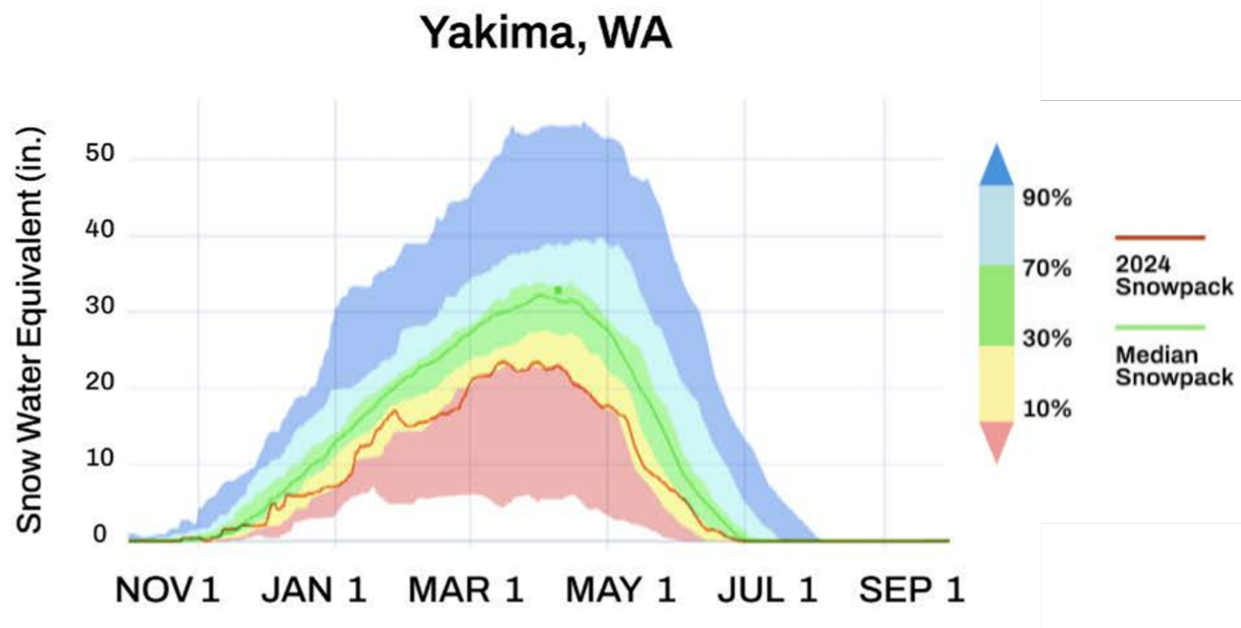
Drought

Overview

Much of Washington State, including Yakima County, has experienced seven years of drought conditions since 2014 (WA Department of Ecology, 2024). Spring of 2025 was the third year in a row that a drought was declared, a trend not seen since the 1990s (Inghram, 2025). The City provides domestic water service to more than 72,000 residents, along with commercial, industrial, and institutional customers. Its primary source is surface water from the Naches River, supplied through the City's Water Treatment Plant (WTP) under a combination of junior and senior water rights (WA Department of Ecology, 2025). When drought conditions trigger prorationing, junior water right holders, including the City, may receive a reduced allocation. In response, the city promotes water conservation. As of May 2025, the U.S. Bureau of Reclamation set prorationing at 43 percent, meaning junior rights holders can only draw 43 percent of their allotted supply (WA Department of Ecology, 2025).

The 2024 snowpack data for Yakima (Figure 4) shows below average snow water equivalent levels, which contribute to reduced spring runoff and limited reservoir recharge.

Figure 4. Water year 2024 snow water equivalent (red line).



Source: (Bumbako, Mauger, Colligan, O'Neill, & Hoekema, 2025)

The City supplements its surface water supply with four deep groundwater wells, which serve as a backup during prorationing or peak demand periods. However, prolonged drought can still strain existing municipal water systems. Given Yakima County's role as a major agricultural hub producing a large share of the nation's hops, apples, and cherries, water shortages can have significant economic consequences. City officials are encouraging residents to reduce outdoor

irrigation, fix leaks, and adopt other conservation measures to help protect limited water resources during extended dry periods (City of Yakima, n.d.).

Asset	Vulnerability Score
Well protection areas	Moderate
Water service levels	Moderate-High

Source: *Cascadia, 2025*

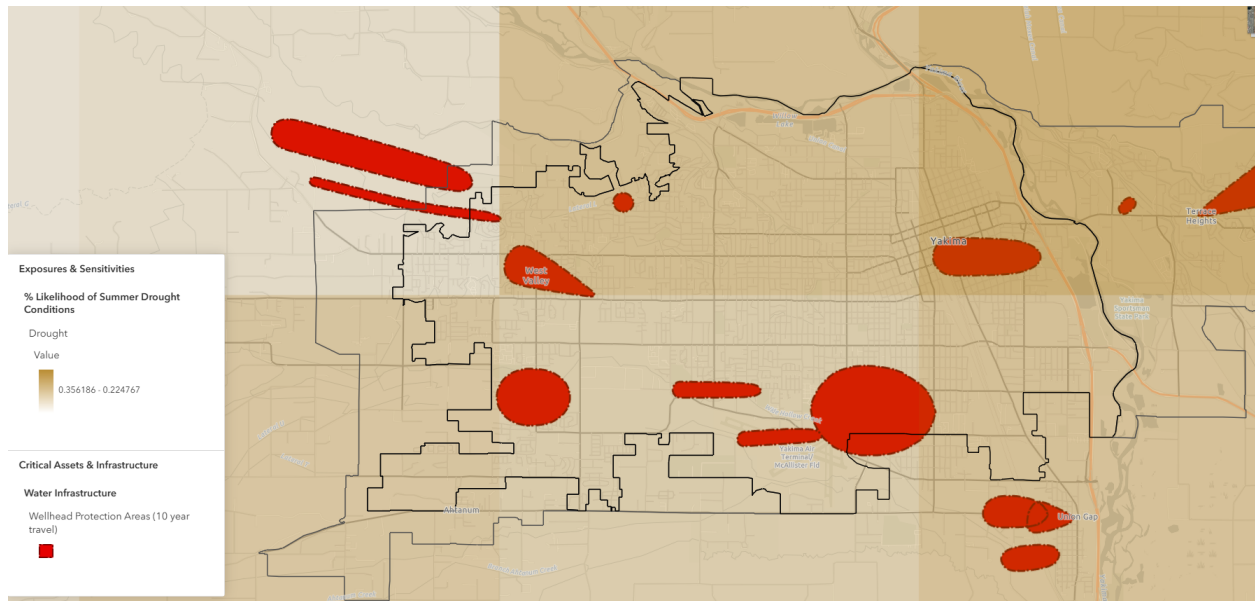
The following tables summarize hazard-related vulnerabilities for well protection areas and water service levels in the City of Yakima.

Table 4. Hazard-related vulnerability for well protection areas

Asset	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Well protection areas	Exposure: High Several wellhead protection areas within Yakima city limits overlap with zones of elevated summer drought likelihood (>30 percent). The largest clusters are concentrated in south Yakima near Union Gap and the northeastern part of the city (Figure 4). These overlaps indicate that key municipal and community water sources may face heightened risk of reduced recharge during drought years (Tasaka, 2025). Given that these wells serve as critical backup supplies for the City’s Water Treatment Plant and draw from the same aquifer that supports county-wide agricultural use, prolonged drought conditions could exacerbate competition for groundwater and increase pumping costs (ECONorthwest, 2017). Sensitivity: Moderate Communities relying solely on wells are more sensitive to drought impacts if well depth is shallow, aquifer recharge is slow, or infrastructure is aging. In addition, because these wells draw from the same aquifer used for agriculture in the county, municipal or domestic wells can be indirectly impacted by increased agricultural withdrawals during drought years, even when they are not directly tied to city limits (ECONorthwest, 2017).	Adaptive Capacity: Moderate Adaptive capacity depends on well depth, maintenance, and drought planning. The City’s WTP can supplement reduced surface water supply with four deep groundwater wells, which have enough capacity to meet the system’s average day demand. Restrictions may only be necessary during periods of peak seasonal use when demand exceeds this level. If the primary water supply source is unavailable due to extended drought, the City can activate its wells to augment or replace supply (City of Yakima, n.d.). However, activation of these wells may still require temporary rationing or restrictions. While this redundancy helps mitigate short-term drought impacts, many private wells remain outside coordinated drought planning, lack regular monitoring, and do not have backup supply options.

Source: Cascadia, 2025

Figure 5. Likelihood of summer drought conditions and well protection area



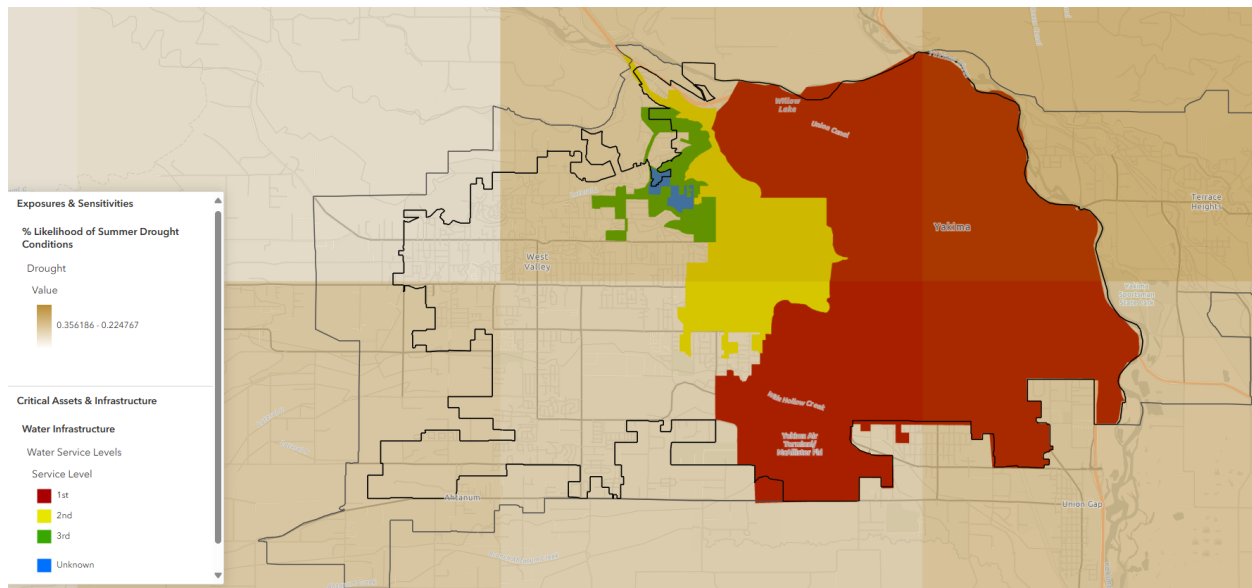
Source: BERK, 2025

Table 5. Hazard-related vulnerability for water service levels.

Asset	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Water service levels	Exposure: High Water service levels describe the reliability, quantity, and quality, of water provided by the City of Yakima to its residents. It is an indicator of the vulnerability of the city’s water supply. Water service levels 1, 2, and 3 overlap with areas that have more than a 30% likelihood of summer drought are at elevated risk of supply constraints (Figure 3). Service Level 1 areas are usually prioritized but may still experience strain during multi-year droughts. Levels 2 and 3, with lower delivery priority, are most vulnerable to reduced allocations and earlier restrictions, especially when combined with high drought likelihood and increased severity. Sensitivity: Moderate-High The Yakima Basin is entering its third consecutive year of drought with reservoir storage at only 38% of normal and pro-ratable water users—those with a May 10, 1905, water right priority date—projected to receive just 48% of their normal allocation (Tasaka, 2025). This shortage disproportionately affects junior water right holders, who face curtailments first, while also straining senior rights during prolonged low-supply years. The City of Yakima possesses certified water rights of 10,080 acre-feet for its emergency wells (City of Yakima, n.d.). Prolonged deficits in snowpack and soil moisture further stress the system, reducing water available for irrigation, municipal needs, and instream flows critical for fish habitat.	Adaptive Capacity: Moderate The City’s Water Treatment Plant can draw on senior water rights and four deep groundwater wells to supplement reduced surface water supply (Fannin, 2025). Conservation programs, public outreach, and infrastructure redundancy help reduce vulnerability, though extended multi-year droughts can overdraw aquifers, strain pumping infrastructure, and reduce reliability of both surface and groundwater supplies. As part of the Integrated Plan, the City of Yakima received a temporary permit from the Washington Department of Ecology that allows the city to begin storing water from the Naches River in underground aquifers. The city will eventually install recovery wells to access the stored aquifer water (ECONorthwest, 2017).

Source: Cascadia, 2025

Figure 6. Likelihood of summer drought conditions and water service levels.



Source: BERK, 2025

Note: Areas of the City of Yakima that are not served by the Yakima Water Department are served by the Nob Hill Water Association

Wildfire

Overview

In Yakima, warmer temperatures and drier summers combined with reduced snowpack stress vegetation and dry it out, turning into more fuel for fires when exposed to an ignition source, natural or manmade. These conditions result in longer fire seasons with more frequent and larger fires. By the end of the century, there is up to 65% likelihood that any given year will have climate and fuel conditions that are favorable for wildfires, compared to a maximum of 41% likelihood of high fire-risk conditions in 2020 (Raymond & Rogers, 2022).

At the same time, the wildland-urban interface (WUI), representing areas where wilderness and developed land overlap or are in close proximity, has expanded, putting more people and infrastructure at risk of direct harm from wildfire than in the past. Wildfires threaten infrastructure and buildings (and the people that live and work in them) in the WUI, and produce smoke that can impact health and wellbeing and can contaminate drinking water supply. Populations most at risk from wildfires and wildfire smoke center on older adults (65 and older) and children due to their higher likelihood of needing assistance to evacuate, and higher risk of health complications from wildfire smoke exposure (Environmental Protection Agency, 2023).

In 2020, the Evans Canyon Fire broke out north of Naches in Yakima County, burned nearly 70,000 acres, resulted in evacuations, and caused 10 days with an AQI over 100 (unhealthy for sensitive groups) in Yakima City. This was a glimpse of what will likely be common fire and smoke conditions later this century (Fire Engineering, 2020; KOMO News Staff, 2020).

Asset/Population	Vulnerability Score
Older Adults (65 and over)	Moderate-High
Youth (Under 18)	Moderate-High
Power Infrastructure	Moderate
Drinking Water Supply	Low-moderate

Source: Cascadia, 2025

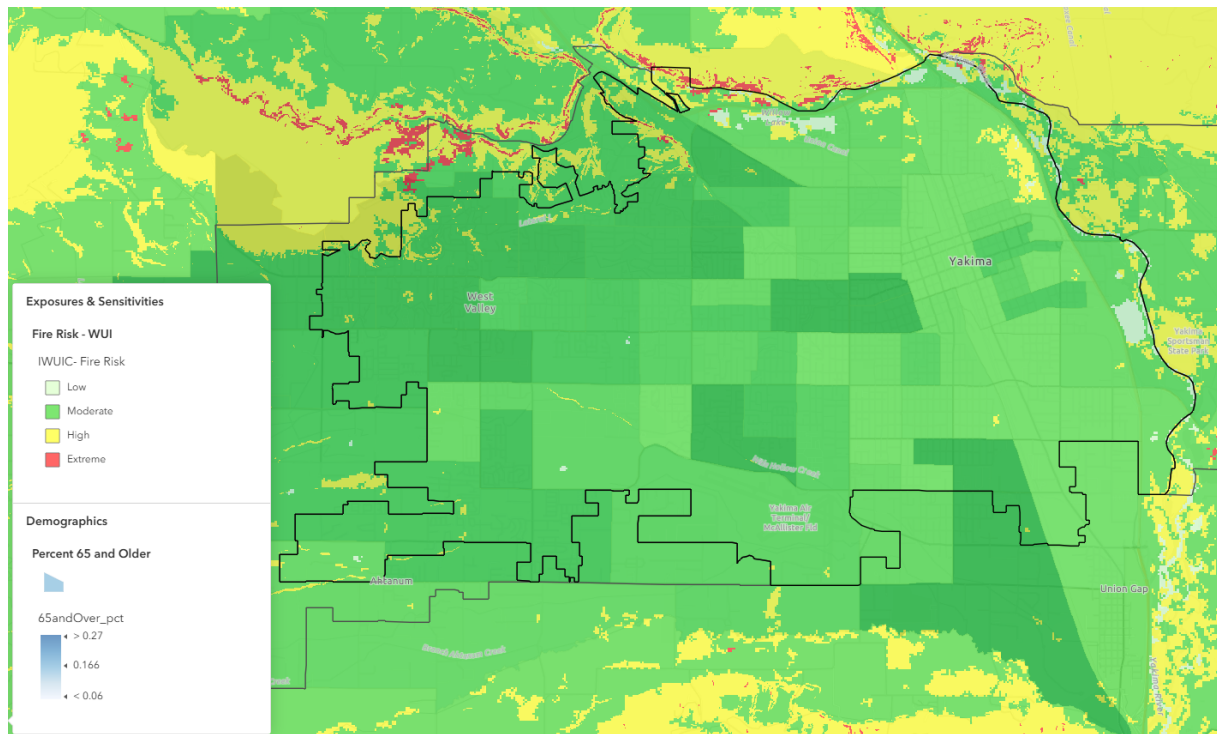
Table 6. Wildfire-related vulnerability to sensitive populations: people 65 and over and youth under 18.

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Sensitive Populations: Older Adults (65+)	Exposure: Moderate. The City of Yakima Fire Department district was one of three in Yakima county with an “extreme” hazard rating—the whole city has a minimum fire risk of moderate, while the risk is considered “high” around the northern city limits (Yakima County, 2023). Few census tracts have high fire risk and high percentages of older adults, and (Figure 6). Additionally, Yakima experiences poor air quality from fires burning outside the city. Between 2015 and 2024, there were an average of 9 days per year with an AQI over 100 (unhealthy for sensitive groups), with the range being 2 unhealthy air days in 2022 to 23 unhealthy air days in 2017 (Washington Department of Ecology, 2025) Sensitivity: High. Fewer than half of homes have defensible space and fewer than a 25% are adequately fire-hardened (Yakima County, 2023). People and structures in one-way in neighborhoods, and roads that the fire engines cannot access are especially vulnerable. Older adults tend to have reduced mobility, which may lead to evacuation barriers and makes them prone to social isolation during smoke events (Qin, et al., 2020). Wildfires smoke exposure	Adaptive Capacity: Moderate The City of Yakima, along with the County and region, has taken numerous measures to reduce the risk of fires starting or growing if they do ignite, including burn bans and restrictions, firebreaks and fuel reduction (Yakima Regional Clean Air Agency; CWPP, 2023). There are also multi-lingual wildfire preparedness programs, including a six-week-long “Ciclo Verde” wildfire preparedness workshop series for the Latin community. As part of the “Ciclo Verde” program, residents identified and prioritized actions to prepare, respond, and recover from a wildfire (Yakima Valley Community Foundation, 2023). During smoke events, the Health District issues air quality advisories and tips to reduce smoke exposure, and the Yakima Valley Libraries have served as cooling centers that also provide clean indoor air ((Metcalf, 2024).

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
	leads to worse physical and mental health outcomes for older adults, including dementia and reduced respiratory and immune system functioning. This makes them more likely to visit the emergency room, be hospitalized, or even die (Environmental Protection Agency, 2025).	
Youth (under 18)	Exposure: Moderate There are five census tracts with high percentages of children and high fire risk., mostly in the northeast quadrant of the city (Figure 7). However, all of the City of Yakima has at least moderate fire risk, and is exposed to unhealthy air when wildfires burn nearby (Metcalf, 2024; Sundeen, 2024). Sensitivity: High Children and youth are at higher risk of injury or death in the case of a wildfire in the WUI, due to their dependence on caregivers and limited mobility (US EPA, n.d.- climate change and human health: who is most at risk). Youth are also more sensitive to wildfire smoke because they breathe more air relative to their size and inhale more smoke proportionally. They also tend to spend more time outside and be more active than adults (Children’s Environmental Health Collaborative, 2024).	Adaptive Capacity: Moderate As stated above, the City and County of Yakima have taken significant steps to reduce the risk of fires starting and growing, including burn bans and defensible space requirements. To protect children from wildfire smoke, the Yakima School District uses the Washington Smoke Blog to monitor air quality, and using that information, the superintendent makes decisions about outdoor activities like recess, and the athletic directors decide if sports practices and events can go on. Schools also provide masks to students and staff who want to use them (Yakima School District, n.d.) In 2021, when there were over 20 days with air quality hazardous for sensitive groups, if the AQI got up to hazardous for all groups, everyone stayed inside (Lesseos, 2021).

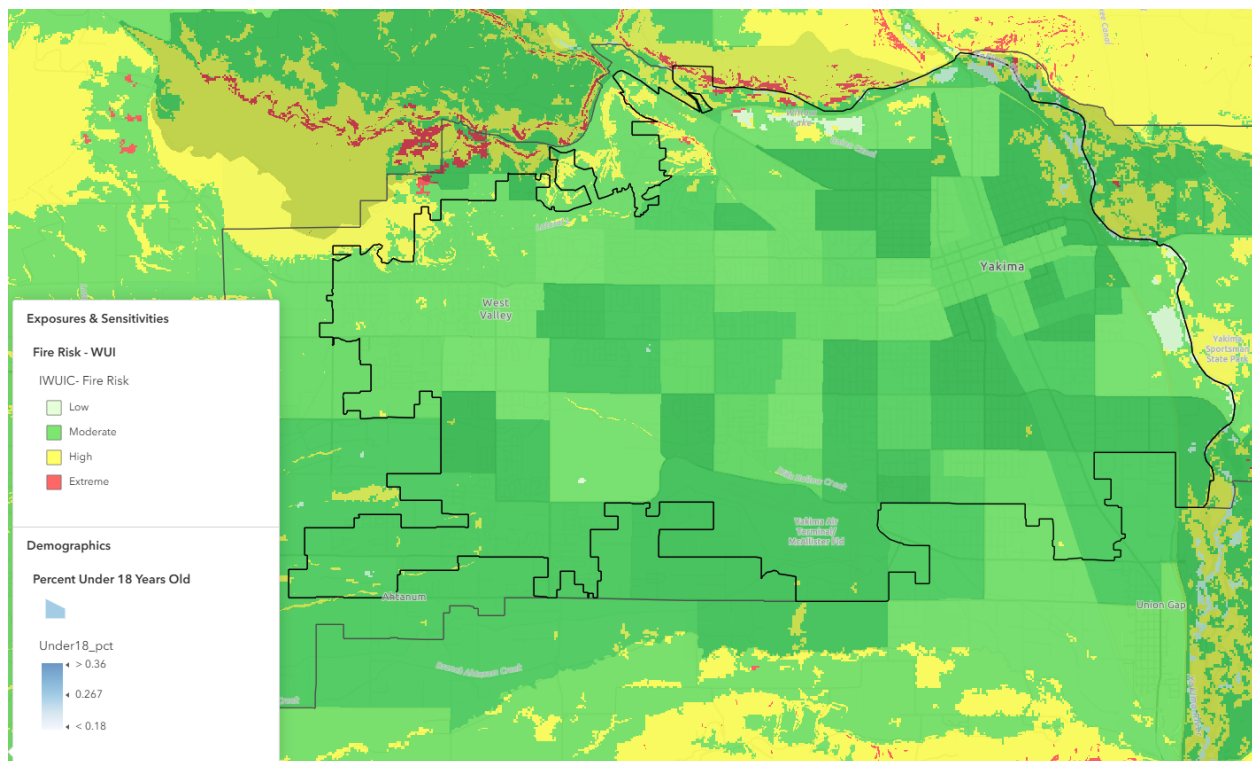
Source: Cascadia, 2025

Figure 7: WUI and percentage of people 65 and over.



Source: BERK, 2025

Figure 8: WUI and percentage of children (under 18)



Source: BERK, 2025

Table 7: Wildfire-related vulnerability of power infrastructure

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Power Infrastructure	Exposure: Moderate Fire risk to energy/power infrastructure in most of the City of Yakima and its surroundings is mostly moderate, and high in select areas around the perimeter of the city, mostly on the north and east borders. Key substations that provide power to Yakima are the Pomona Heights Substation and the Union Gap Substation are outside city limits, in moderate fire-risk territory, but near high fire-risk lands. Transmission lines also run through high fire-risk areas between Vantage and Pomona	Adaptive Capacity: Moderate Pacific Power is currently implementing its 2024 Washington Wildfire Mitigation Plan that recognizes the impact to customers of extended power outages (both as a result of active fires and for public safety during high fire-risk conditions) and provides a roadmap for responding to and recovering from high fire-risk weather conditions. Strategies listed in the plan

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
	Heights (City of Yakima, 2025). Transmission lines can also be an ignition source that catalyzes wildfires. Sensitivity: High Wildfire flames and heat can damage transformers, breakers, and other substation components, and also weaken or destroy metal conductors, wooden poles, and other power transmission infrastructure. This can lead to loss of power for large numbers of people in Yakima, even if they are not directly threatened by wildfire. Loss of power can also affect communications, which is essential in an emergency situation. Power outages also may require critical facilities to operate at reduced capacity and in emergency mode. Additionally, businesses lose revenue, and residents may lose cooling (A/C), air filtration, and refrigeration capabilities, which can have health impacts.	include FireSight Modeling³; weather monitoring, community outreach, communications with the public, Grid engineering (including Public Safety Power Shutoffs), and patrols to establish the soonest possible time to restore power (Pacific Power, 2024).

Source: Cascadia, 2025

³ The FireSight model inputs and outputs combines the utility asset information and Risk Associated with Value Exposure with public data regarding community characteristics, terrain, vegetation, and weather information to predict fire intensity and community impacts (Washington Wildfire Mitigation Plan, 2024).

Table 8: Wildfire-related vulnerability of drinking water supply

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Wellhead protection areas	Exposure: High Yakima’s local drinking water systems have already been impacted by wildfire (city of Yakima outtake on Naches river). Turbid water, as a result of burn scars, negatively affects water quality with potential bacteria, parasites, and viruses. These contaminants require additional filtration and processing of the water (Yakima County, 2023). The majority of Yakima’s wellhead protection areas are in moderate fire risk zones (as opposed to high risk zones) (City of Yakima, 2025). Sensitivity: Low The City of Yakima has wells as a backup to its water supply on the Naches River, which should provide drinking water if the primary source is compromised. The wellheads are above ground, capped and surrounded by wellhead protection areas to reduce probability of incidental contamination (City of Yakima, n.d.).	Adaptive Capacity: Moderate-High The City of Yakima has a Wellhead Protection Plan (City of Yakima, n.d.), which contains emergency response procedures for fires and water supply contamination. The City also has fuel reduction programs to reduce the risk of wildfire around wellhead protection areas.

Source: Cascadia, 2025

Table 9: Wildfire-related vulnerability of drinking transportation corridors

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Transportation	Exposure: Moderate-High. Parts of highway 82 and highway 12 (Figures 7.2 and 7.3, CWPP) are directly adjacent to high fire risk areas, and other parts run between high fire-risk areas. All of Yakima is in a moderate fire-risk zone and thus susceptible to fires that may have started outside the city entering the city limits, especially near high-risk zones (City of Yakima, 2025). Sensitivity: Low-Moderate Within the City of Yakima, there are multiple roads and existing freight corridors that are alternatives to the highways if they should become inaccessible. However, the City of Yakima has multiple neighborhoods with only one entrance and exit, and streets that are inaccessible to fire engines, making them indefensible and resulting in evacuation concerns (Yakima County, 2023).	Adaptive Capacity: Moderate. The City of Yakima coordinates with Yakima County on implementation of the Community Wildfire Protection Plan, but built environment adaptation for indefensible and difficult to evacuate areas is limited. Yakima County, including the city of Yakima, is part of the Fire Adapted Communities initiative, and the Yakima Valley Fire Adapted Communities Coalition, which aims to build neighborhood level resilience to wildfire and educate residents on how to protect themselves, their homes, and neighbors in case of fire (Yakima County, 2023).

Source: Cascadia, 2025

Extreme Precipitation and Flooding

Overview

The Yakima river has flooded over 30 times in the last century, with federal disasters declared eight times since 1970 (City of Yakima, 2007). Total annual precipitation in Yakima County is projected to increase by 9.7% by 2070, and 13.2% by the end of this century (City of Yakima, 2025). Extreme precipitation events are also expected to increase, which will increase the likelihood and frequency of flooding on the Yakima River and its tributaries. As a result, structures and people in the 100-year flood plain may experience the effects of flooding more frequently than in the past century, such as the Wide Hollow Creek overflow, which resulted in the closure of a substantial portion of Washington Avenue.

Flooding can have a significant impact on sensitive populations, including older adults and youth (who are more likely to need assistance evacuating) and low income residents, who have fewer resources to prepare and recover from flooding events. Floods can also threaten the water infrastructure in the floodplain, leading to flooding beyond floodplains if infrastructure is compromised.

Asset	Vulnerability Score
Older Adults	Low
Low-income Residents and homes	Moderate-High
Stormwater System	Low-Moderate

Source: Cascadia, 2025

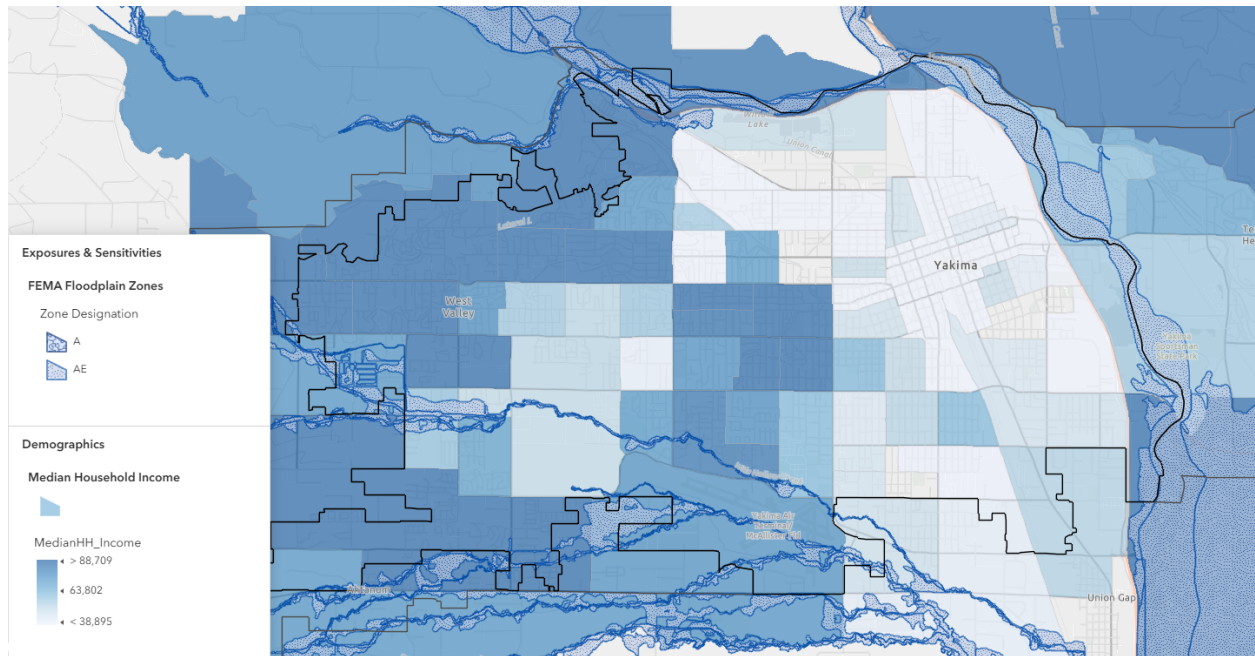
Table 10: Flood-related vulnerability of sensitive populations

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Older Adults (65 and over)	Exposure: Moderate Numerous census tracts along Yakima’s southern border, from the west valley to McAllister Field, have both high percentages of older adults (over 27% of the census tract) and overlap with a 100 year floodplain. Sensitivity: Moderate-High Older adults are more likely to have reduced mobility and cognitive abilities, which can make decision-making, preparing for a flood (for example, placing sandbags) and evacuating more difficult (Environmental Protection Agency, 2025; Saputra, Iswara, Fitri Md Nor, & Usman, 2025). They also may be more dependent on equipment powered by electricity or medications that require refrigeration, which can be compromised if floods cause power outages. Studies also show that flooding leads to increased hospitalization among older adults for a range of reasons tied to existing vulnerabilities, including weakened immune systems, lack of access to medications and healthcare, and chronic illness (Aggarwal, Hu, Sullivan, Parks, & Nethery, 2025).	Adaptive Capacity: Moderate The Yakima Fire department has produced communications materials advising residents on how to be aware of flood conditions, prepare for a flood, and steps for recovery for homes affected by flooding. The Yakima Police Department runs Project Guardian, which alerts Police that the individual enrolled has special needs in daily life or an emergency (Yakima Police, 2025). The Yakima County multi-jurisdictional Hazard Mitigation Plan also references city-wide public awareness and education campaign about existing mitigation programs targeted to personal preparedness measures for homeowners organized through the Yakima Valley of Emergency Management and administered by participating jurisdictions.

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Low-Income Residents	Exposure: Moderate There are several census tracts with median incomes under \$38,895 per year that are also adjacent to a 100 year floodplain, and thus likely to see more frequent flooding this century. These areas include northeast Yakima along the river, and the northern portion of Chesterley Park. There are also numerous census tracts along the Wide Hollow Creek floodplain that incomes below the median. Sensitivity: High Low-income households have fewer resources to prepare for flooding and also less capacity to respond and recover after a disaster (SAHMSA, 2017). Low-income people often rent, and buildings are less flood-hardened, and tenants often have less agency and money to make improvements (Swope & Hernandez, 2019). They are less likely to have flood insurance and financial reserves to facilitate evacuation, temporary housing, and repairs during and after a flood, which can lead to permanent displacement (Pecharroman & Hahn, 2024) Additionally, recovery programs may require transportation, internet access, or documentation that are more likely to be barriers to for low-income individuals (GAO, 2021)	Adaptive Capacity: Low-Moderate The City of Yakima does outreach campaigns in areas like Shaw Creek-Wide Hollow and provides general flood safety guidance, but these programs do not specifically target low-income families. There are a number of organizations operating in Yakima that offer social support, shelter coordinating, and financial assistance to flood survivors, but they are not affiliated with the City.

Source: Cascadia, 2025

Figure 9: 100-year floodplain and income. Lighter-colored census tracts are lower income than darker blue census tracts.



Source: BERK, 2025

Table 11: Flood related Vulnerability of stormwater system

Asset/Population	Hazard-Related Vulnerability (Exposure + Sensitivity)	Adaptive Capacity
Stormwater System	Exposure: Moderate The City of Yakima has stormwater infrastructure (including drains and pipes) both within and outside of the floodplains, which aims to mitigate flooding outside of the floodplain during extreme precipitation events (Resilient Yakima, 2025). However, as heavy precipitation becomes more frequent, it may overwhelm more of this infrastructure, and floodplains may expand beyond 100 year boundaries. For example, in March 2016, heavy precipitation closed Washington Ave from 16th St to 48th St. (Beehler, 2016). Sensitivity: Low-moderate Extreme precipitation and flooding can damage pump stations in the floodplains. The risk is especially high along the southwest city limits where it is closer to the Spring Creek floodplain, and along the Wide Hollow Creek floodplain (City of Yakima, 2025).	Adaptive Capacity: High The City of Yakima updated its Stormwater Management Plan (2024) The Upper Yakima River Comprehensive Flood Hazard Management Plan added a section after 2016 and 17 flooding to address flood mitigation and response along Cowiche Creek, which includes flood warning systems, and infrastructure upgrades. In 2019, the City of Yakima completed storm drain improvements to decrease flooding at eight targeted sites. Upgrades included modular detention takes, and swales. The Gap-to Gap project is a major ecosystem restoration project in progress along the Yakima River corridor. It involves removing levees, regrading floodplains, and reconnecting wetlands while reducing flood risk (Stormwater Solutions, 2023; Ferolito, 2023).

Source: Cascadia, 2025

Works Cited

- Aggarwal, S., Hu, J., Sullivan, J., Parks, R., & Nethery, R. (2025). Severe flooding and cause-specific hospitalisation among older adults in the USA: a retrospective matched cohort analysis. *The Lancet*.
- Ayer, T. (2024, July 9). Cooling stations available in the Yakima Valley as heat wave continues. *Yakima Herald-Republic*.
- Bedi, N. S., Adams, Q. H., Hess, J. J., & Wellenius, G. A. (2022). The Role of Cooling Centers in Protecting Vulnerable Individuals from Extreme Heat. *Epidemiology*.
- Beehler, R. (2016, March 6). *Flooding Forces Closure of Washington Avenue*. Retrieved from City of Yakima: <https://www.yakimawa.gov/media/news/flooding-forces-closure-washington-avenue/>
- Bumbako, K. A., Mauger, G. S., Colligan, L. K., O'Neill, L. W., & Hoekema, D. J. (2025). 2024 Pacific Northwest Water Year Impacts Assessment.
- Chakraborty, J., & Soroka, S. (2025). Social disparities in extreme heat days across U.S. public schools. *SSM Population Health*.
- City of Yakima. (2007). *Upper Yakima Comprehensive Flood Hazard Management Plan*.
- City of Yakima. (2025). *Climate Impacts Assessment Summary*.
- City of Yakima. (2025). *Resilient Yakima Interactive Webmap*. Retrieved from <https://berk.maps.arcgis.com/apps/instant/basic/index.html?appid=ed216ffcace7471a96389790f25b38cb>
- City of Yakima. (n.d.). *City of Yakima Wellhead Protection Plan*.
- City of Yakima. (n.d.). *Drought Conservation*. Retrieved from Yakima, WA.
- ECONorthwest. (2017). *Water Security for the Yakima River Basin's Economy, Communities, and Watersheds*.
- Environmental Protection Agency. (2023). *Climate Change and Children's Health and Wellbeing in the United States*.
- Environmental Protection Agency. (2025). *Climate Change and the Health of Older Adults*. Retrieved from United States Environmental Protection Agency: <https://www.epa.gov/climateimpacts/climate-change-and-health-older-adults?>
- Environmental Protection Agency. (2025). *Wildfire Smoke and Your Patients' Health*. Retrieved from United States Environmental Protection Agency.
- Fannin, J. (2025, June 5). City Encourages Water Conservation During Drought Conditions. Yakima, WA, USA.
- Ferolito, P. (2023, November 16). Latest levee project aimed at restoring Yakima River flows is underway. *Yakima Herald-Republic*.
- Fire Engineering. (2020). *Fast-Growing Wildfire Destroys Five Homes Near Yakima (WA)*.
- First Street Foundation. (2025). *Understanding Air Quality in Yakima*. Retrieved from Firststreet.org: https://firststreet.org/city/Yakima-Washington/5380010_fsid/air?from=riskfactor.com&utm_source=chatgpt.com
- GAO. (2021, October 27). *Disaster Recovery: Efforts to Assist and Address Barriers to Receiving Federal Recovery Assistance*. Retrieved from US Government Accountability Office: https://www.gao.gov/products/gao-22-105488?utm_
- Inghram, Q. (2025, April 9). Ecology declares third year of drought for Yakima Basin. *Washington State Standard*.

- KOMO News Staff. (2020, September 3). *Evans Canyon fire 10% contained; Burnout Operation Begins on Clemens Mountain*. Retrieved from KOMO News.
- Lesseos, S. (2021, August 24). *Smoke From The Fires May Affect Children Going Back To School*. Retrieved from Non Stop Local Tri-Cities Yakima.
- Lim, J., & Skidmore, M. (2020). Heat Vulnerability and Heat Island Mitigation in the United States. *Atmosphere*.
- Loyd, N., & Weiford, L. (2022, August 5). Was our recent heatwave the ghost of heatwave 2021? Yes and no. *The Spokesman-Review*.
- Loyd, N., & Weiford, L. (2022, June 30). Weathercatch: Why Washington's hottest temperature had to be verified (and, yes, it was right). *The Spokesman-Review*.
- Meade, R. D., Akerman, A. P., Notley, S. R., McGinn, R., Poirier, P., Gosselin, P., & Kenny, G. P. (2020, November). Physiological factors characterizing heat-vulnerable older adults: A narrative review. *Environment International*.
- Metcalf, T. (2024, July 26). *Yakima Health District shares tips on reducing exposure to wildfire smoke*. Retrieved from Non Stop Local Tri-Cities Yakima.
- Ochoa, S. (2023, August 18). Yakima Neighborhood Health offers free showers and water during record-breaking heat. *Yakima Herald-Republic*.
- Pacific Power. (2024). *Washington Wildfire Mitigation Plan 2024-27*.
- Pecharroman, L. C., & Hahn, C. (2024). Exposing disparities in flood adaptation for equitable future interventions in the USA. *Nature Communications*.
- Raymond, C., & Rogers, M. (2022). Climate Mapping for a Resilient Washington. Retrieved from <https://cig.uw.edu/resources/analysis-tools/climate-mapping-for-a-resilient-washington/>
- SAHMSA. (2017). *Greater Impact: How Disasters Affect People of Low Socioeconomic Status*.
- Saputra, H., Iswara, P., Fitri Md Nor, N., & Usman, F. (2025). Multidimensional factors shaping older persons' resilience to floods in Madura Island. *Journal of Disaster Risk Studies*.
- Snohomish County Public Works. (2006). *Intregated Stormwater Management Program - Public involmment and Edication Strategy - Public Opinion Research - Individual Homeowners / Upland Areas*.
- STORM. (2021). *GSI Guidebook DRAFT*.
- Stormwater Solutions. (2023, November 22). *USACE, Yakima County begin \$12M ecosystem restoration project*. Retrieved from Stormwater Solutions: <https://www.stormwater.com/green-infrastructure/low-impact-development/press-release/53078946/usace-yakima-county-begin-12m-ecosystem-restoration-project>
- Sundeen, J. (2024, July 27). Smoke still blowing into Yakima Valley from nearby wildfires, causing poor air quality. *Yakima Herald-Republic*.
- Swope, C. B., & Hernandez, D. (2019). Housing as a determinant of health equity: A conceptual model. *Social Science Medicine*.
- Tasaka, E. (2025, March 14). *Yakima Basin water supply update*. Retrieved from Washington Department of Ecology.
- WA Department of Ecology. (2024, September 30th). State lays out plan to tackle impacts of climate change in Washington. Olympia, WA, USA.
- WA Department of Ecology. (2025, April 8). Drought declared for Yakima region for third year in a row. Olympia, WA, USA.
- Washington Department of Commerce. (2023). *Climate Element Planning Guidance*. Retrieved from <https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx>

Washington Department of Ecology. (2025). *Washington's Air Monitoring Network- Annual AQI Summary Report*. Retrieved from Department of Ecology, State of Washington.

Yakima County. (2023). *Yakima County Community Wildfire Protection Plan*. Yakima, WA.

Yakima Health District. (2021, June 28). Cooling Centers for Individuals to Stay Cool in the Heat . Yakima, Washington.

Yakima Police. (2025). *Project Guardian*. Retrieved from Yakima Police:
<https://yakimapolice.org/project-guardian/>

Yakima School District. (n.d.). *Air Quality Guidelines*. Retrieved from Yakima School District.

Yakima Valley Community Foundation. (2023). *Nuestra Casa*. Retrieved from Yakima Valley Community Foundation: <https://yakimavalleycf.org/news/nuestra-casa>