City of Centralia
Climate Resiliency Plan

2025-2045

Adopted November 25, 2025

Table of Contents

INTRODUCTION

In May 2023, new legislation (HB 1181) added climate planning as a new goal of the Growth Management Act in Washington State. This required cities like Centralia to add a resiliency element under RCW 36.70A.040 to its 2025 Comprehensive Plan update.

HB 1181 requires Washington's cities and counties to use their principal planning document—the comprehensive plan—to build community resilience and reduce greenhouse gas emissions that contribute to global climate change. Eleven of Washington's largest and fastest-growing communities are required to include greenhouse gas reduction in their plans; Lewis County and Centralia are not included on this list.

Centralia has created a Climate Resilience Plan that will anticipate, prepare for, and adapt to changes in climate and minimize negative impacts on the city's natural systems, infrastructure, and community. The plan aims to build resilience by implementing a mix of preparedness, response, and recovery policies, including mitigating natural hazards, adapting to unavoidable impacts, and restoring natural areas that provide key ecosystem services.

This resilience sub-element aims to accomplish the following, consistent with state law:

- Equitably enhance the resilience of communities and ecological systems to climate change.
- Be consistent with the best available science and scientifically credible climate projections and impact scenarios.
- Prioritize and benefit overburdened communities that will suffer disproportionately from environmental impacts and climate-exacerbated natural hazards.

All goals and policies that pertain to climate change are reflected in the other chapters of the Comprehensive Plan and are summarized here. Additionally, the city's Hazard Mitigation Plan has been updated with actions that consider future conditions and climate change impacts.

FUNDED BY WASHINGTON'S CLIMATE COMMITMENT ACT

This effort is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

Acknowledgments

City Council

Kelly Smith Johnston
Mayor

Chris Brewer
Mayor Pro-Tem

Sarah Althauser
Councilmember

Norm Chapman
Councilmember

Adrianna Garibay
Councilmember

Max Vogt
Councilmember

Mark Westley
Councilmember

City Administration

Mike Thomas
City Manager

Core Project Team

Emil Pierson
Community Development

Andy Oien
Public Works

ML Norton
City Light

Patty Page
City Engineering

Andy Caldwell
Emergency Management

Climate Advisory Team

Max Vogt
City Council

Beth Sweeney
Planning Commission

Chuck Kifer
Planning Commission

Charlie Boyd
Community Member

Cindy Garibay
Community Member

Monica Brummer
Centralia College

Hillary Hoke
Planning

Mike Watilo
Buildings

Consulting Team

Christina Wollman
Perteet Inc.

Mandy Maxwell
EK Consulting

Jennifer Groos
Perteet Inc.

Key Definitions

Climate Terminology

Climate Resilience
Refers to the capacity of various systems—be it individuals, forests, cities, or economies—to adapt to change while maintaining functionality. Advocating for climate resilience acknowledges the inevitability of change; with appropriate planning and policy decisions in place, both built and natural systems have the potential to recover effectively when disruptions occur.

Climate Mitigation
This term encompasses the avoidance, reduction, and, whenever feasible, the complete elimination of heat-trapping emissions (greenhouse gases) traditionally linked to human activity.

Climate Adaptation
Climate adaptation involves modifying human behaviors and systems to lessen or prevent the impacts of climate change that are likely to persist, despite ongoing mitigation efforts.

Climate Vulnerability
Vulnerability is defined as a combination of exposure, sensitivity, and adaptive capacity. Assessments regarding vulnerability have been conducted across various sectors, including transportation, land use and agriculture, freshwater systems, and ecosystems and species, with further details in the Technical Appendix.

Climate Risk
Climate risk refers to the potential adverse effects of climate change on the environment, economy, and society. It encompasses both physical risks, such as extreme weather events, and transition risks, including changes in policy and regulations. Centralia's risk assessments are detailed in the Technical Appendix.

Sectors and Assets Evaluated for Climate Resilience

Agriculture & Food Systems	Agriculture-related business, public services
Buildings & Energy	Commercial, industrial, and residential buildings, power infrastructure, radio towers, cell towers, schools, low-income housing
Cultural Resources & Practices	Downtown historic district, historic buildings, archaeological sites, culturally significant fish and wildlife, Hub City, public art
Economic Development	Retail trade, health care and social assistance, accommodation and food services, Port of Centralia, Centralia College
Ecosystems	Chehalis and Skookumchuck Rivers and tributaries, wetlands, open spaces, trees
Emergency Management	Fire stations, police station, emergency response
Health & Wellbeing	Critical health and medical facilities, parks and recreation facilities, library, community centers, cold weather shelters, community organizations
Transportation	Bridges, roads, sidewalks, trails, railroad, railroad station, Amtrack, airport, public transit
Waste Management	Central Transfer Station, Lemay, Sutter Metals, wrecking yards
Water Resources	Water, wastewater, and stormwater infrastructure: reservoirs, wells, water treatment facility, pump stations, wastewater treatment facility, collection and distribution system
Zoning & Development	Centralia zoning map and codes, urban growth areas

CLIMATE CHANGE IN CENTRALIA

The changing climate presents a range of potential challenges for life in Centralia. With more frequent and severe weather events, Centralia's infrastructure, homes, and local ecosystems are at greater risk. This growing vulnerability can lead to notable economic and environmental changes within the city.

Water resources also face shifting dynamics. Changes in precipitation patterns can affect water availability, which is essential for ecosystems, industry, and everyday life. Fluctuations in availability and reliability can have important implications for residents and local businesses, necessitating careful management and planning.

The economic stability of Centralia and the surrounding region may also be affected, as local industries like retail and tourism may experience disruptions that could impact jobs and growth. This highlights the importance of developing resilience strategies to support economic stability and protect the livelihoods of community members.

Public health is another consideration, as altered climate conditions may lead to various health issues, including increased respiratory problems linked to air quality and a rise in waterborne diseases due to flooding. Proactively addressing public health concerns is essential for ensuring the well-being of the community.

Additionally, Centralia's diverse ecosystems contribute to the community's identity and quality of life. Protecting these natural resources is vital for both wildlife and recreational opportunities.

By recognizing the challenges posed by climate change, Centralia can take intentional steps toward a more sustainable future. Integrating climate resilience into urban planning and policies will enhance the city's ability to adapt and thrive in changing conditions, benefiting both community members and the environment they cherish.

Photo: Inundation at Borst Park during a flood event

Climate Trends

Hazard	Description	Timeframe 2020-2049; RCP 8.5
Drought 	Drought is a prolonged period of abnormally low rainfall that leads to a shortage of water, affecting ecosystems, agriculture, and water supply. Climate change can worsen drought conditions by altering weather patterns, increasing the frequency and intensity of heatwaves, and changing the timing and distribution of precipitation.	• More frequent and severe droughts • Up to 25% chance of a summer precipitation drought • Up to 9% decrease in streamflow during warm months • 1-2x more streamflow in winter due to mountain precipitation falling as rain
Extreme Temperatures 	Extreme temperatures include unusually high temperatures that are significantly above the typical averages for a given region and time of year, or short periods of freezing temperatures caused by seasonal atmospheric events like the polar vortex or an Arctic blast.	• Summer maximum temperature up to 4°F warmer • Up to 20 more days with a “feels like” temperature above 90°F • More days requiring air conditioning
Extreme Precipitation 	Climate change influences extreme precipitation by increasing the atmosphere's capacity to hold moisture as temperatures rise, leading to more intense and frequent episodes of heavy rainfall or snowfall. Warm winds and heavy rain events, like the Pineapple Express, may occur more frequently.	• 11% increase in average storm precipitation • More days with 1 inch of precipitation or more
Flooding 	Climate change can exacerbate flooding through a combination of rising sea levels, intensified storm surges, and more frequent and extreme precipitation events, all of which contribute to both coastal and inland flooding.	• Major floods occurring 2x as often • Typical peak streamflow increased by 4-6% • Chehalis River peak streamflow increased by 12%
Snowpack Decline 	Snowpack loss means there is less snow falling and accumulating in the mountains. Warmer temperatures bring winter rains instead of snow, causing the snowpack to melt more quickly. The loss of snowpack reduces the amount of water available for drinking, agriculture, and healthy river ecosystems.	• Centralia area watersheds (excluding Chehalis) face significant snowpack loss by mid-century • 68% loss of April 1st mountain snowpack • 5% decrease in late summer precipitation • Increase in the duration of low streamflow
Wildfire & Smoke 	Climate change contributes to wildfires by creating hotter, drier conditions, which are conducive to the ignition and rapid spread of fires, resulting in greater amounts of smoke that can be carried over long distances.	• Low chance of wildfire reaching the city – 3% wildfire likelihood in any year • Up to 5 more days of high fire danger • More poor air quality days (AQI over 100)

Source: UW Climate Impacts Group; 2020-2029; RCP 8.5

Increasing Climate Risk

Climate change and extreme weather events go hand in hand. Gradual climate change represents long-term shifts in temperature and precipitation patterns and increases the likelihood and intensity of extreme weather events like heat waves, floods, droughts, and wildfires.

Centralia currently faces a high risk of extreme precipitation and flooding, and these hazards are expected to worsen over time. Over the coming decades, the risk from drought, extreme heat, snowpack loss, and wildfire will increase as well. This climate resilience plan explores what that means for Centralia and its critical assets, including people, infrastructure, and natural resources.

The table below shows the progression of Centralia's climate risk over time:

		Current Risk	Mid-Century	Late-Century
Gradual Climate Change	**Drought**	●	●	●
	Extreme Temperatures	●	●	●
	Extreme Precipitation	●	●	●
	Flooding	●	●	●
	Snowpack Reduction	●	●	●
	Wildfire & Smoke	●	●	●

● Minimal or Isolated Risk ● Moderate or Amplified Risk ● Major and Amplified Risk

Source: UW Climate Impacts Group; 2020-2049, 2070-2099; RCP 8.5

Photo: Downed tree at Washington Park after a storm

Historic and Cultural Significance

Centralia is home to numerous historic and archaeological sites, including the Borst Blockhouse and the entire downtown historic district. It is also home to culturally significant ecosystems that support vital aquatic and terrestrial species. These natural and physical assets are included in the assessments conducted during this process, and in the development of Centralia's climate resilience focused goals and policies. In evaluating the community's ability to reduce risk from climate change, it is important to recognize the history and culture of the first people who inhabited this area and stewarded its natural environment and resources for millennia.

The Chehalis Tribe, known as the "People of the Sands," occupies a significant place in the history of the Centralia area, along the Chehalis and Skookumchuck rivers. The tribe, originally named for their sand-based dwellings near river mouths, consists of two bands - the Upper and Lower Chehalis. The Quiyaisk people, a branch of the Upper Chehalis, were the earliest documented inhabitants of the Centralia area, where they lived for thousands of years. They resided on the prairie known as "Tasunshun" or "resting place," at the convergence of two vital rivers. The Chehalis River, known as "Nisoolups" to the ancestors, was central to their way of life, though its name was changed by European settlers.

The Chehalis tribes have a rich cultural history rooted in the natural environment, particularly reflecting their reliance on rivers and the resources they provide. Known for using shallow shovel-nosed canoes, the waterways were their essential means of transportation. The Upper Chehalis were deeply involved in a river-based lifestyle, hunting and gathering across the mountains and trails as far as the regions now known as Grays Harbor and Lower Puget Sound. These waterways provided a crucial supply of salmon, steelhead, clams, and eels, forming the staple of their diet and cultural practices. Berries and sacred roots gathered from the land emphasized a harmonious relationship with nature.

European arrival in the late 18th century marked a turning point in Chehalis history, bringing trade opportunities but also devastating diseases, drastically reducing their population. Despite their initially large numbers, which ranged from an estimated 1,200 to 1,500, contact with European settlers reduced their population to 216. With the unfolding of treaties in 1854 proposed by Governor Isaac Stevens, the Chehalis tribes lost significant portions of their ancestral lands and began facing diminishing resources as non-native settlements increased.

Today, the Chehalis Tribe display resilience and adaptability. Although their numbers and territory have been reduced, the tribe's successful economic enterprises have been able to support preservation and restoration of their ancestral lands and self-sufficiency and quality of life for their people, while maintaining their cultural legacy and connection to the land.

References: https://www.chehalistribe.org/; History of Centralia by Curt Cunningham; Lewis County's First Culture: The Chehalis Tribe by Steven Abelson

Centralia's Vision for Climate Resilience

The city aims to foster a resilient community by taking actions to address climate change risk. We will create an adaptive environment that preserves natural resources, promotes sustainable growth, and protects the built environment and entire community—ensuring a secure and flourishing city for current and future generations.

What resilience looks like in Centralia:

Utilities are optimized to minimize outages and meet community needs during and after climate-driven events.

The **impacts of flooding on people and property are reduced**, and the ability to recover after flooding events is enhanced.

Connectivity is enhanced with alternative transportation options like the Hub City Greenways and West Side Connector.

Greenspaces and tree coverage are expanded and enhanced to protect natural ecosystems, improve air quality, be resilient to drought and wildfire, and provide natural cooling.

Infrastructure is resilient, protects natural resources like groundwater, and can adapt to the risks of climate change.

The **entire community is well-informed and engaged** in mitigating and adapting to the risks of climate change.

Safe spaces are available during extreme weather events, ensuring well-being through proactive preparation and communication.

Structures are sustainably retrofitted or designed to minimize environmental impacts, mitigate wildfire risk, and improve human health and safety.

CLIMATE CHANGE IMPACTS

The process for evaluating the impacts of climate change in Centralia involved assessing hazards against each category of community assets. The Climate Advisory Team and City Staff developed and approved the list of assets. It serves as the basis for all analysis across the planning process and development of supporting goals and policies. Full assessment results, including details on the methodologies and data used, can be found in the Technical Appendix of this plan.

Summary of climate risk in Centralia:

	Drought	Temps	Rain	Floods	Snowpack	Wildfire
All Buildings & Structures	●	●	●	●	●	●
Aquatic, Terrestrial, & Urban Habitat	●	●	●	●	●	●
City Parks & Recreation Facilities	●	●	●	●	●	●
Community Members & Visitors	●	●	●	●	●	●
Emergency Management & Response	●	●	●	●	●	●
Power Infrastructure & Transmission	●	●	●	●	●	●
Communications Infrastructure	●	●	●	●	●	●
Solid Waste	●	●	●	●	●	●
Stormwater Infrastructure	●	●	●	●	●	●
Transportation Infrastructure	●	●	●	●	●	●
Wastewater Infrastructure	●	●	●	●	●	●
Water Supply & Infrastructure	●	●	●	●	●	●

● Minimal or Isolated Risk ● Moderate or Amplified Risk ● Major and Amplified Risk

Source: UW Climate Impacts Group; 2020-2049; RCP 8.5

Drought

According to the Palmer Drought Severity Index, five of the last ten years have experienced severe or very severe summer drought conditions in Lewis County. Drought.gov shows exceptional drought (D4) conditions in Centralia every 20-25 years since 1950. The worst conditions historically occur in August and September.

Increased annual precipitation could enhance groundwater recharge, but changes in precipitation patterns, higher water demand, and evaporation may offset these gains. Water infrastructure that depends on groundwater recharge may be impacted.

Ecosystems in Centralia may be impacted in various ways, including a decrease in late summer precipitation, an increase in the duration of low streamflow, and a change in low streamflow. Areas that currently receive more summer precipitation will be more exposed to changes in the frequency of precipitation droughts.

Consequences of drought

- Reduced streamflow caused by drought conditions can affect water quality, leading to increased temperatures that can harm local ecosystems. As summer precipitation declines, drought stress increases, threatening the health and productivity of various plant species. Declining vegetation health can also exacerbate air quality issues, as dust and particulates become more prevalent during dry spells.
- Drought can also lead to water scarcity, complicating access to safe and reliable drinking water. Drought can diminish groundwater recharge, contributing to lower water quality due to reduced levels in lakes and streams.
- Drought conditions can also place immense pressure on Centralia's infrastructure. The process of soil depletion, driven by prolonged dryness, can lead to pavement cracks and subsidence, compromising roads, bridges, and railways. The support that soil provides is vital for heavy vehicles and freight transport, and its reduced load-bearing capacity can pose safety risks.
- When combined with high temperatures, drought can have a particularly destructive impact on structures, as excessively dry soil can contract and crack. This results in the potential for foundation shifts, increasing repair costs and risking the integrity of buildings.
- Increased wildfire risks during dry spells can directly threaten properties and energy infrastructure, resulting in power outages and substantial repair costs. Patterns of indoor air quality may decline with more dust and allergens in the environment, as well as shifts in humidity levels that complicate heating and cooling needs.

By 2050, Centralia may experience:

- More frequent and severe droughts
- Up to 25% chance of a summer precipitation drought
- Up to 9% decrease in streamflow during warm months
- 1-2x more streamflow in winter due to mountain precipitation falling as rain

Extreme Temperatures

Extreme heat days are increasing in Centralia. According to FirstStreet.org, the number of days over 90°F has doubled in the last thirty years—from three to six. The likelihood of a three-day (or longer) heatwave is expected to increase from 70% to 90% over the next thirty years.

In 2021, the Pacific Northwest experienced an unprecedented heat dome, caused by a high-pressure system trapping warm air and leading to record-breaking temperatures. Temperatures in Centralia reached 106°F, and the extreme heat strained infrastructure and power systems, caused road damage, and resulted in heat-related illnesses and fatalities, particularly affecting vulnerable populations without cooling options.

Conversely, a 2019 snowstorm brought the most snowfall to the Seattle area in 50 years. In early January 2025, a polar vortex-related Arctic blast brought freezing temperatures and lowland snow to the Pacific Northwest. The connection between climate change and the polar vortex is currently being researched, but there is believed to be a link with the warming of the Arctic[1].

Consequences of extreme temperatures

- Extreme heat or cold events can lead to higher healthcare costs, reduced productivity, and increased utility bills.
- Extreme heat or cold events can also strain public services and emergency response systems in their ability to prepare for and respond to human health impacts.
- Very hot days can damage road and bridge surfaces, resulting in higher maintenance and repair costs and more frequent traffic and service disruptions. On an 86-degree day, the temperature of asphalt in direct sunlight can be over 130 degrees, which is hot enough to soften the asphalt.
- Extreme heat may affect green infrastructure, like rain gardens. It dries out soils quickly and may kill plants that are not established or drought resistant.
- Elevated water temperatures can harm aquatic ecosystems and reduce water quality, stressing or killing aquatic species like fish.
- Extreme heat can be deadly to trees and established vegetation by causing water loss and burning the leaves. After the 2021 heat dome, the portions of trees and shrubs in direct sunlight were burned but recovered in the following years.

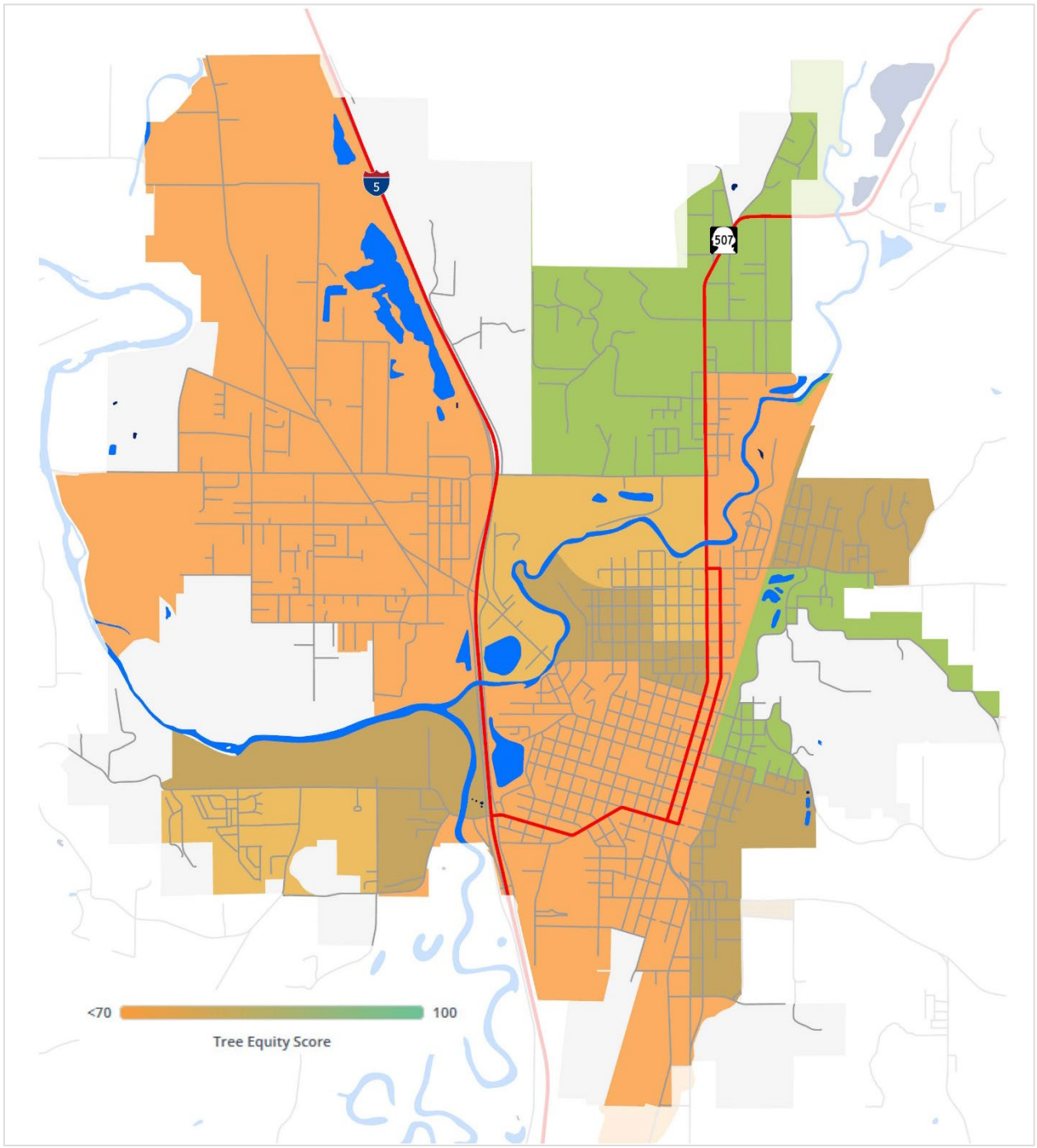
By 2050, Centralia may experience:

- Summer maximum temperature up to 4°F warmer
- Up to 20 more days with a “feels like” temperature above 90°F
- More days requiring air conditioning

[1] Judah Cohen *et al.* Linking Arctic variability and change with extreme winter weather in the United States.*Science***373**,1116-1121(2021).DOI:10.1126/science.abi9167

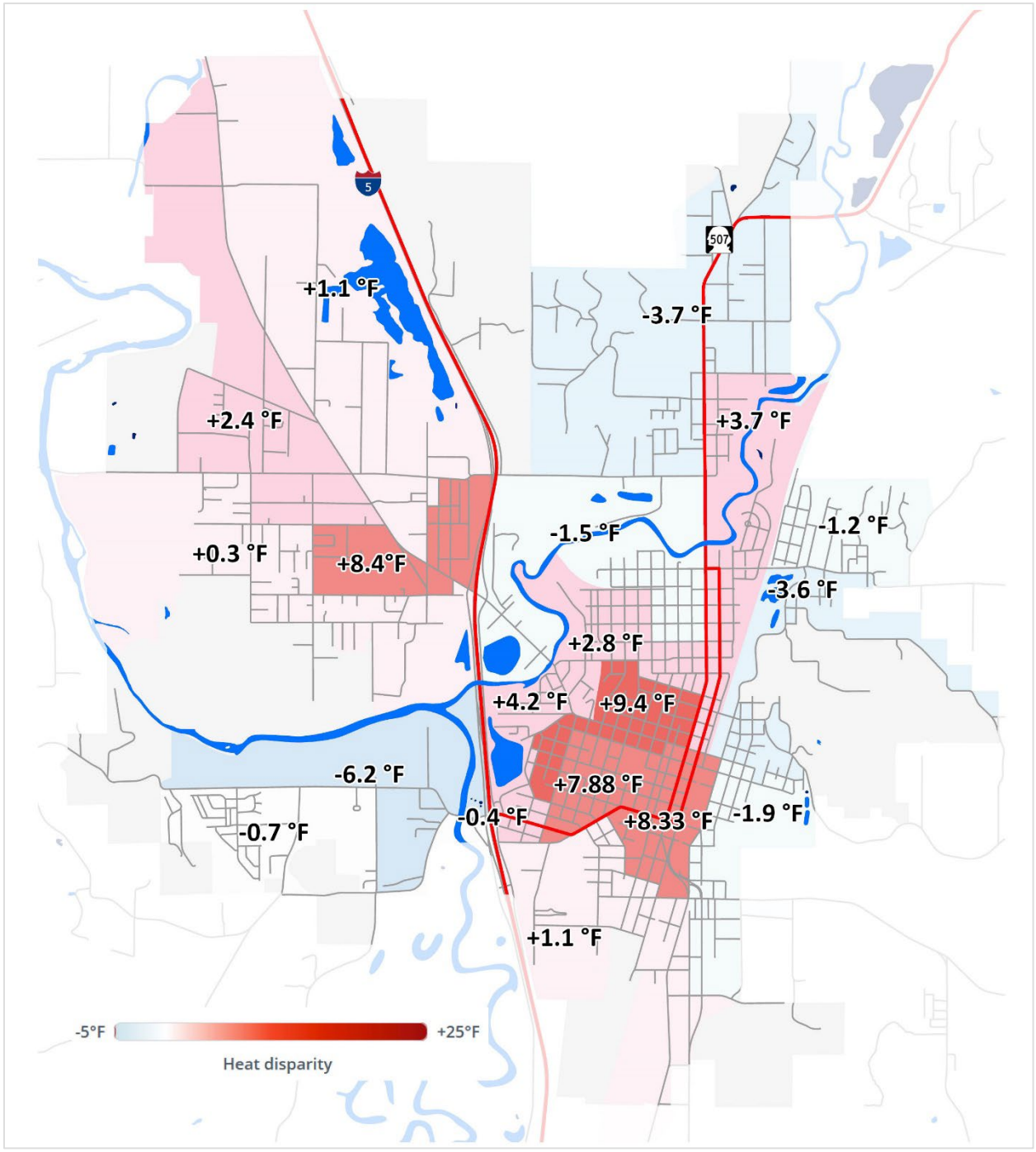
Centralia's Tree Equity Score – 72/100

Trees are critical urban infrastructure that are essential to public health and well-being. Trees provide shade and lower the surrounding temperatures. The Tree Equity Score was created to help address damaging environmental inequities by prioritizing human-centered investment in areas with the greatest need. Learn more about Centralia's Tree Equity Score here: https://www.treeequityscore.org/map#9/46.7248/-122.9679



Heat disparities in Centralia

The Tree Equity Score also highlights heat disparities by calculating summer surface temperatures. More urban density increases impervious surfaces and reduces the number of trees, which can increase the urban heat island effect. Source: 2022 USGS Earth Explorer



Extreme Precipitation

In Centralia, extreme precipitation and flooding often occur together. For example, flooding in 1996, 2007, and 2009 was caused by a Pineapple Express weather phenomenon. A Pineapple Express is a specific type of atmospheric river, a long, narrow band of water vapor that transports moisture from the tropics to higher latitudes. It brings extreme precipitation to cities like Centralia.

With climate change, the atmosphere can retain more moisture, potentially leading to more intense atmospheric river events that bring heavier rainfall and heighten the risk of flooding. Climate change could also alter the typical paths and timing of these atmospheric rivers, affecting when and where they occur. This shift can have significant implications for areas that depend on consistent weather patterns, particularly for water availability and flood management.

Consequences of extreme precipitation

- Excessive runoff can strain wastewater systems, causing backups and untreated sewage discharge into waterways. Infiltration through the joints of wastewater systems in wet weather is a significant concern for the city as it can cause surcharging and reduced capacity at the treatment plant.
- Stormwater systems in Centralia are designed to meet capacities based on historical rainfall quantities.
- Current design standards do not account for the predicted higher-intensity rain events. New and future stormwater systems built to current standards will be designed and constructed with insufficient storage, conveyance, and infiltration capacity, which is required to manage the new intense rainfall events. This will lead to overflow, urban flooding, and stream channel degradation, especially in areas near outfalls.
- In extreme precipitation events, stormwater may be full of sediment and contaminants, bypassing water quality facilities and flowing directly into streams and rivers.

By 2050, Centralia may experience:

- 11% increase in average storm precipitation
- More days with 1 inch of precipitation or more

Flooding

Flooding is Centralia's leading hazard, impacting infrastructure, people, and the natural environment. The earliest documented flood on the Chehalis River occurred in December 1825, and since then, there have been major floods every 7 years. Between 1956 and 2022, 17 Presidential Disaster Declarations for flooding in Lewis County were issued.

Centralia features the Chehalis and Skookumchuck Rivers and smaller tributaries, or streams, which are susceptible to annual flooding events that pose threats to life and safety and cause significant property damage. Streams include China Creek, Scammon Creek, Salzer Creek, and Coffee Creek.

The Office of the Chehalis Basin has studied the effects of climate change on the Chehalis River and developed a model and mapping showing the predicted 1% annual chance (100-yr) flood extents. Nearly all of Centralia's city limits are within the climate change 1% annual chance flood zone.

Consequences of flooding

- Flooding creates serious public health risks, triggering waterborne diseases while causing injuries and fatalities. Flooding often leads to the displacement of people and disrupts food supply and utilities. Damage to healthcare facilities and flooded roads further complicate emergency medical response, endangering community health.
- Infrastructure within flood-prone areas is particularly vulnerable. Roads and bridges may suffer erosion and structural damage, leading to higher maintenance costs and potential service interruptions for utility lines.

By 2050, Centralia may experience:

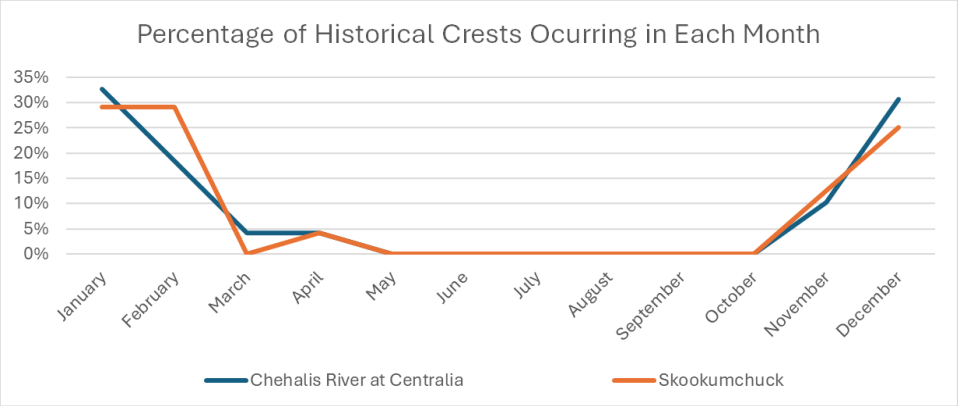
- Major floods occurring 2x as often
- Typical peak streamflow increased by 4-6%
- Chehalis River peak streamflow increased by 12%

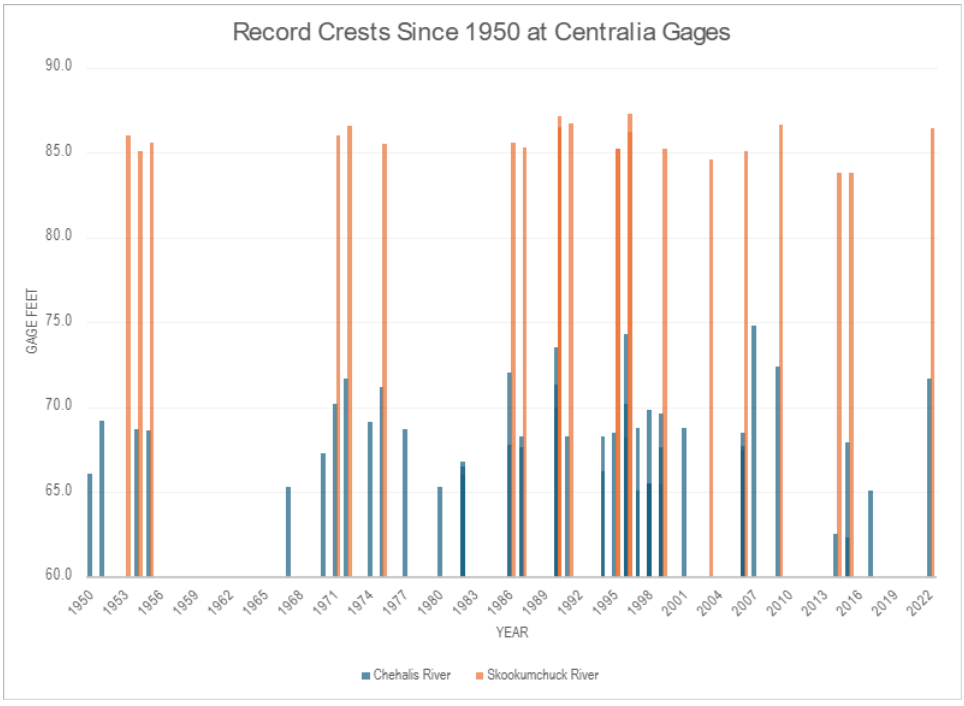
- Buildings can experience significant damage from flooding, such as compromised foundations, damage to machinery and contents, and mold growth, resulting in repair expenses and health hazards for property owners.
- Structures at the highest risk include those that were constructed with basements or prior to the enforcement of current flood hazard area regulations, before the first Flood Insurance Rate Maps (1982), and structures that were inundated in the 2007 flood.
- Structures built to protection levels based on the current FIRMs may not be protected in the long term. Effective FEMA floodplains are based on a discharge that is approx. 20,000 cfs below the flood of record.
- Flooding can lead to power outages by damaging critical infrastructure and submerging electrical equipment, causing short circuits. It disrupts energy production and grid reliability while causing spikes in energy demand and fuel supply disruptions, leading to shortages and increased prices.

Flood history

The 2024 City of Centralia annex to the Lewis County Multi-Jurisdictional Hazard Mitigation Plan identifies flooding as the city's highest risk hazard. The city's greatest flood risk is from the Chehalis and Skookumchuck Rivers, which can rise and inundate large areas of the city. The earliest recorded flooding is from 1825. Since then, there have been at least 65 flood events in Centralia, averaging about one flood event every three years, with major flooding occurring once every seven years. Most floods occur between November and February.

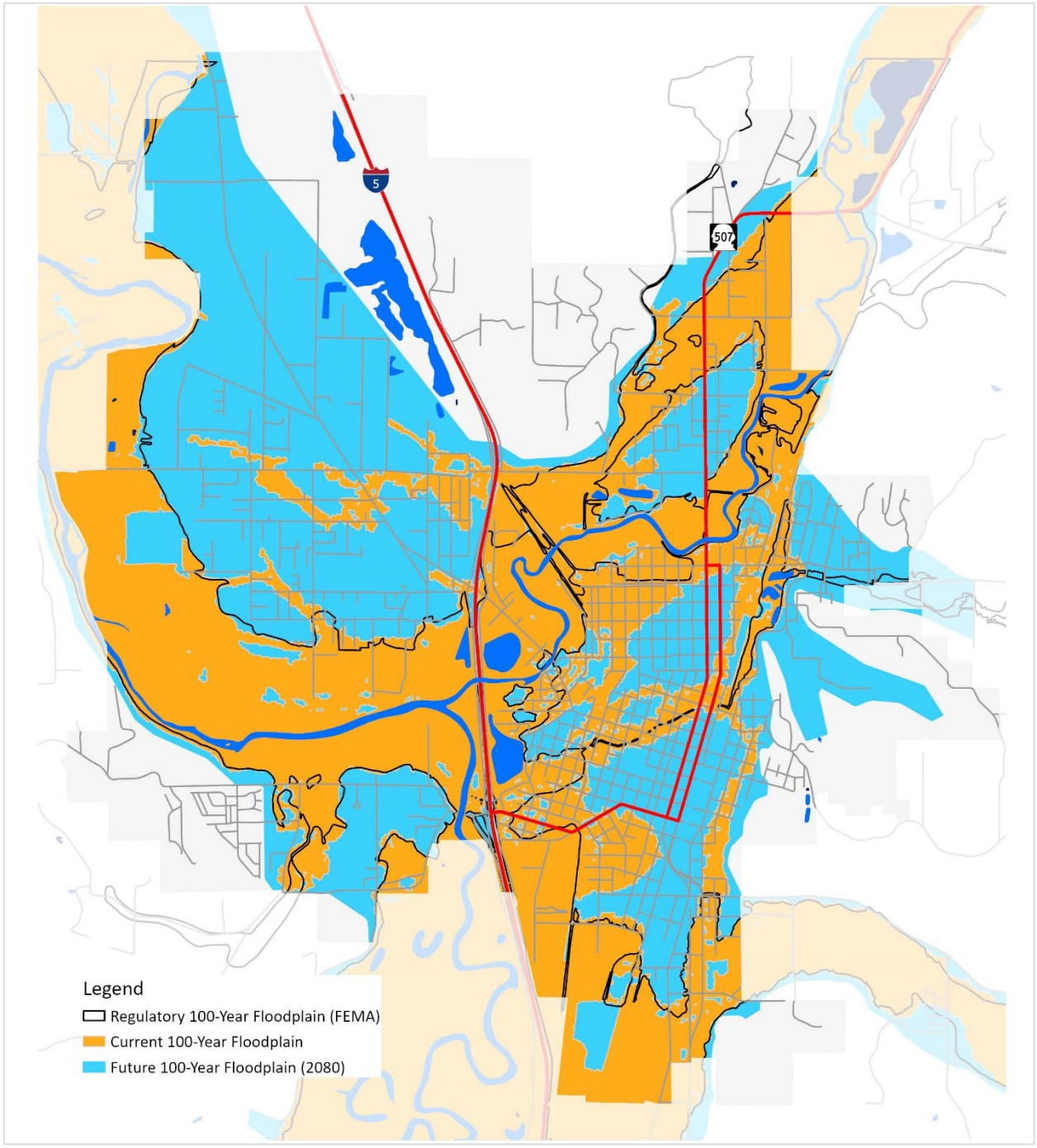
The severity of flooding has increased over time. The worst floods on record occurred in 1996 and 2007. 7 of the top 10 floods on the Chehalis at Mellon Street have occurred since 1990 (1990 (x2), 1996 (x2), 2007, 2015, 2022). A study by the Office of the Chehalis Basin of the effects of climate change predicts that by 2050, the frequency of major flooding will double to one major flood every 3-4 years. In addition to the increased frequency of flooding, the severity of flooding is also predicted to increase.





Centralia's 1% annual chance floodplain map under climate change conditions

This map shows the Centralia floodplain based on 2080 mid-range climate change projections. As shown here, nearly the entire city limits, and a sizable portion of the UGA, are within the flood risk area.



Snowpack Decline

Snowpack decline in the Cascades is expected to affect low-lying areas first, with snow levels retreating gradually to higher elevations. By the end of the century, only the highest elevations in the Cascades are expected to still receive an annual snowpack. The most notable change for Centralia will be precipitation falling as rain instead of snow and the changes to timing and volume of streamflow as a result.

The Chehalis River is largely fed by rain, but the Skookumchuck and Newaukum rivers start at the foothills of the Cascades and may be impacted by snowpack decline. Centralia currently sources all of its water from groundwater aquifers, making snowpack loss an issue that will require monitoring.

Consequences of snowpack decline

- The reduction in snowpack leads to decreased streamflow, adversely affecting water quality and temperature. This disruption can negatively impact local ecosystems and fisheries and threaten biodiversity.
- Diminished summer precipitation combined with snowpack loss may result in drought stress, hindering plant growth and decreasing overall productivity in the region.
- Earlier spring snowmelt and altered streamflow timing are likely to disrupt salmonid migration and survival rates, jeopardizing the health of aquatic populations that rely on stable water conditions.
- The combined effects of reduced streamflow and changing precipitation patterns may lead to a decline in greenspaces and recreational sites, adversely affecting community well-being and environmental quality.
- Reduced snowmelt and lower stream flows decrease groundwater recharge, resulting in lower water tables and diminished well yields. This often necessitates deeper wells, increasing energy costs and wear on equipment. The inconsistency of water availability places additional strain on pump stations, necessitating frequent operational adjustments and raising the risk of equipment failures. Loss of snowpack may also require more energy-intensive water transfers, leading to increased operational costs.

By 2050, Centralia may experience:

- Centralia area watersheds (excluding Chehalis) face significant snowpack loss by mid-century
- 68% loss of April 1st mountain snowpack
- 5% decrease in late summer precipitation
- Increase in the duration of low streamflow

Wildfire and Smoke

Centralia's current risk of wildfire is low compared to other communities in Washington or the US. Wildfirerisk.org ranks Centralia's wildfire risk as 'low' because of low probability and the low consequences. Wildfire smoke, however, poses a greater risk to the city. A poor air quality day in Centralia is considered to be any day with AQI over 100. While this can be caused by sources other than wildfire smoke, smoke is a significant factor.

Centralia is expected to experience eight days this year with an AQI of over 100, and the same in 30 years. Poorer air quality from wildfire smoke can result in serious respiratory health issues, particularly for vulnerable populations, including low-income and non-English speaking individuals, those with preexisting health conditions, and residents in substandard housing.

In Centralia, structures in the city center are less exposed to wildfires due to the presence of a lower tree canopy. However, buildings located in the Wildland-Urban Interface (WUI) and Urban Growth Area (UGA) face greater exposure, increasing their vulnerability to wildfire events.

Consequences of wildfire and smoke

- All structures in the area are affected by wildfire smoke. Older buildings are less likely to have adequate air purification systems, making the occupants more exposed to the harmful effects of smoke exposure.
- The increasing frequency of regional wildfire smoke events poses serious health risks to vulnerable populations and those with respiratory issues. Individuals living or working in buildings with low or no air filtration systems are at a higher risk, as are those who spend time outdoors during smoke events.

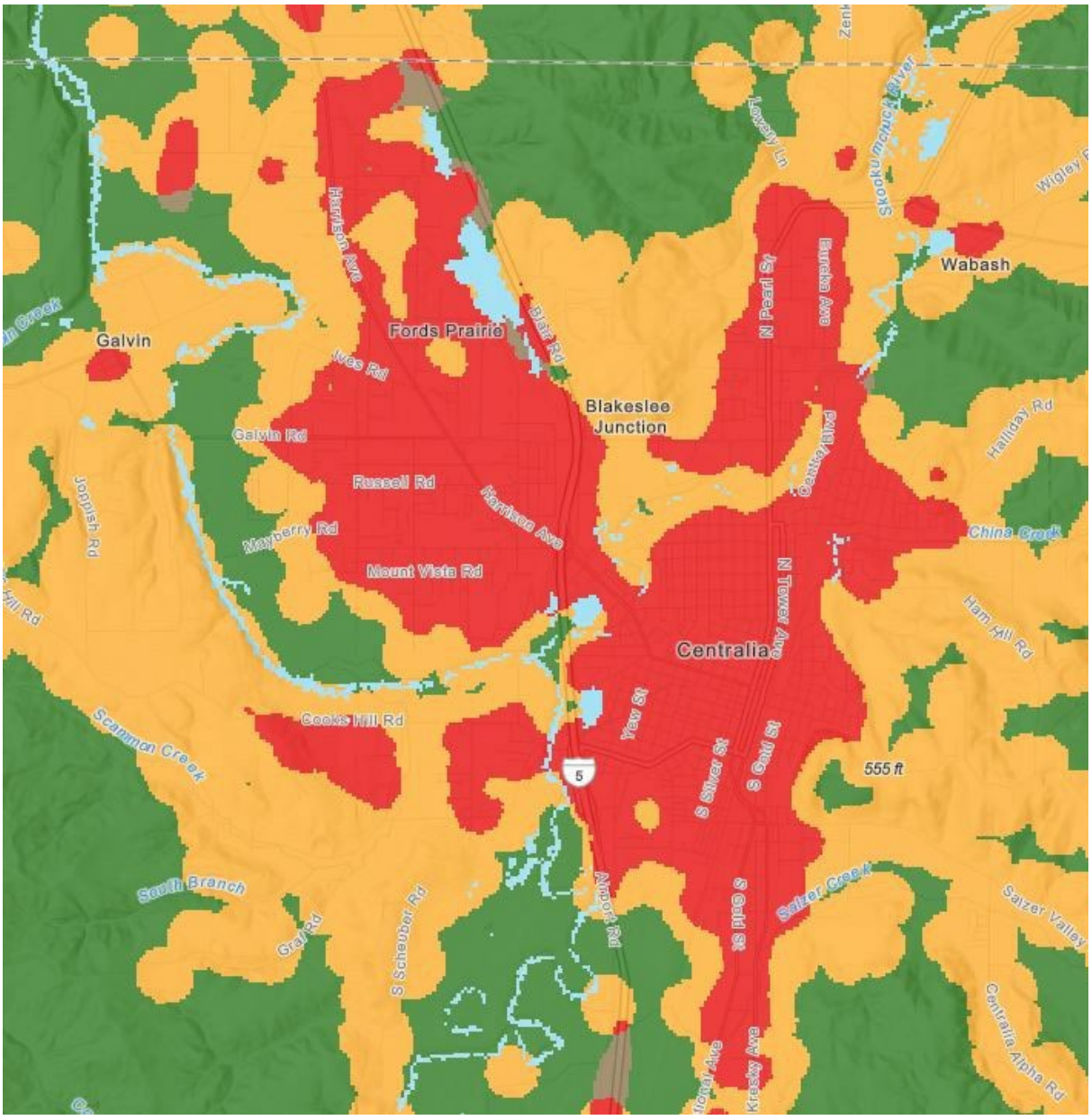
By 2050, Centralia may experience:

- Low chance of wildfire reaching the city – 3% wildfire likelihood in any year
- Up to 5 more days of high fire danger
- More poor air quality days (AQI over 100)

- Centralia's reliance on electricity sourced from the Columbia River dams further heightens this vulnerability; damage to transmission lines from wildfire can disrupt power supply, complicating response efforts.
- During periods of high fire weather, power transmission lines may be intentionally turned off to reduce the risk of igniting wildfire. This precautionary measure can have significant impacts on residents who rely on electricity for cooling, powering medical equipment, and other essential needs during heat waves.
- Dependence on evacuation routes designed for flooding could complicate emergency response strategies for wildfire events, which differ from the flooding scenarios the routes were designed for.

Centralia's wildland-urban interface (WUI)

The WUI is the zone of transition between unoccupied land and human development. Where structures and other development meet with undeveloped wildland or vegetative fuels.



CLIMATE RESILIENCE GOALS AND POLICIES

Many of the goals and policies within the previous comprehensive plan already addressed climate-exacerbated hazards. For this comprehensive plan, the Climate Advisory Team reviewed and suggested new goals and policies or modification to the proposed goals and policies to ensure future conditions and climate change are explicitly considered. Where goals and policies did not exist, new measures were identified using the Climate Policy Explorer. There are a few exceptions where new policies have been written.

In drafting or revising goals and policies to support climate resilience, there are three requirements of the Growth Management Act.

▶ Requirement 1
Address natural hazards created or aggravated by climate change and other effects of changes to temperature and precipitation patterns.

▶ Requirement 2
Identify, protect, and enhance natural areas to foster climate resilience, as well as areas of vital habitat for safe species migration.

▶ Requirement 3
Identify, protect, and enhance community resilience to climate impacts, and support adaptation to climate impacts consistent with environmental justice.

Summary of Climate Resilience Goals and Polices

Land Use

Proactive approach to guiding development and land use in a manner that minimizes risks from natural and climate-exacerbated hazards

CRP LU 1 Consider climate hazards and natural hazards when identifying areas where future development may occur
CRP LU 2 Prioritize the development of land with a lower risk of natural hazards
CRP LU 3 Consider how climate change impacts the safety, health, and wellbeing of community members
CRP LU 4 Encourage annexations of areas that will not require disproportionate response and recovery efforts
CRP LU 5 Ensure UGA development meets city standards

Housing

Encourage neighborhoods that are resilient to climate impacts and integrated into multi-functional urban landscapes.

- CRP Housing 1 Support programs that mitigate and protect existing homes from flooding, air pollution, and extreme temperatures
- CRP Housing 2 Expand bicycle and pedestrian routes through neighborhoods
- CRP Housing 3 Support innovative development that protects natural resources and open spaces
- CRP Housing 4 Maintain neighborhood character by enhancing and preserving existing housing
- CRP Housing 5 Promote higher-density and mixed-use housing near services, transit, and employment centers

Utilities

Maintain sustainable and resilient utility systems for future generations to benefit from.

- CRP Util 1 Consider future conditions when designing and planning for utilities
- CRP Util 2 Protect and preserve water quality and quantity from drought, extreme heat, and other climate hazards
- CRP Util 3 Encourage water conservation and discourage water waste
- CRP Util 4 Promote low impact development and green infrastructure
- CRP Util 5 Consider future conditions when planning and designing stormwater and flood control facilities
- CRP Util 6 Improve the safety and reliability of the city's power infrastructure
- CRP Util 7 Place all electrical and communication lines underground when possible
- CRP Util 8 PSE: Evaluate the potential to use renewable, recoverable, natural gas in existing systems.

Capital Facilities

Enhance urban greening and sustainability for equitable community spaces.

- CRP CF 1 Protect new public facilities from the 2080 climate change floodplain
- CRP CF 2 Continuing to provide firefighting staff with wildland fire training
- CRP CF 3 Consider developing a comprehensive tree plan that helps increase the city’s Tree Equity Score

Natural Hazards, Shoreline, and the Environment

Advance environmental stewardship and resilience for sustainable ecosystems.

- CRP NHSE 1 Protect natural areas that provide vital habitat for safe passage and species migration
- CRP NHSE 2 Limit development in areas where hazards may be exacerbated by climate change
- CRP NHSE 3 Protect the city's critical aquifer and prevent degradation of groundwater quality
- CRP NHSE 4 Protect and improve the water quality and biological health of lakes, wetlands, rivers, and streams
- CRP NHSE 5 Minimize public and private losses in frequently flooded areas
- CRP NHSE 6 Encourage the use of native and drought-resistant vegetation in landscaping
- CRP NHSE 7 Increase aquatic and terrestrial habitat resilience to climate impacts like drought and low streamflow
- CRP NHSE 8 Consider becoming a Smoke Ready Community

Economic Development

Foster a diversified and resilient economy for sustainable growth.

- CRP ED 1 Encourage diverse economic development with an emphasis on sustainable and resilient development

Parks and Recreation

Cultivate accessible, sustainable, and vibrant community spaces.

- CRP P 1 Partner to preserve land in the UGA that provides parks and open spaces, especially along the rivers
- CRP P 2 Apply sustainable standards and future considerations in park planning and upgrades
- CRP P 3 Help prepare for and adapt to extreme weather events that could affect the park system in the future
- CRP P 4 Ensure overburdened populations in the city have equitable access to parks and open spaces

Transportation

Incorporate climate change and resilience principles into guidelines and plans for transportation infrastructure and improvements.

CRP T 1 Develop emergency evacuation routes with resilient transportation infrastructure

CRP T 2 Regularly assess transportation systems for resilience in the context of climate or sudden impact events

CRP T 3 Regularly assess transportation infrastructure and systems to ensure that they follow sustainability principles in all aspects of their operation

Historic Preservation

Preserve the historic nature of the city by seeking creative solutions and using existing resources.

CRP HP 1 Incorporate resilient design into historic structures undergoing substantial improvements

TECHNICAL APPENDIX

This appendix includes information about Centralia's Climate Resilience Element planning process and the technical assessments conducted as part of that process. Vulnerability was assessed to determine if and how specific assets in Centralia are exposed and sensitive to climate-exacerbated hazards, including drought, extreme precipitation and flooding, extreme temperatures, snowpack decline, and wildfire and wildfire smoke. The level of risk to assets was then characterized by determining the probability of occurrence and the magnitude of impact. The following information outlines how these assessments were conducted, along with the results. Information about climate change impacts, community assets, and goals and policies for Centralia can be found in the companion document, the Centralia Climate Resilience Plan.

CLIMATE PLANNING PROCESS

Core Planning Team

The City of Centralia hired Perteet, Inc and EK Consulting to assist with developing the city's first Climate Resilience Sub-Element. A core planning team was formed to lead the planning effort, which included:

Emil Pierson – Community Development and Project Lead

Andy Oien – Public Works

Patty Page – City Engineering

ML Norton – City Light

Christina Wollman – Perteet

Mandy Maxwell – EK Consulting

Climate Advisory Team

At the beginning of the planning process, the core planning team identified a list of stakeholders to engage during the planning process that represented the various populations within Centralia, including vulnerable populations and tribes. All stakeholders were invited to participate as members of the Climate Advisory Team (CAT), along with city staff. The CAT membership is shown in Table 1. Invitations were also extended to Twin City Transit and the Chehalis Tribe, but those agencies were not able to participate.

Planning and Project Lead	→	Emil Pierson
Planning	→	Hillary Hoke
Building	→	Mike Watilo
Public Works	→	Andy Oien
City Light	→	ML Norton
City Engineering	→	Patty Page
Police/EM	→	Andy Caldwell
City Council / Business Community	→	Max Vogt
Planning Commission	→	Beth Sweeney
Planning Commission / Business Community	→	Chuck Kifer
Centralia College	→	Monica Brummer
Minority Community	→	Cindy Garibay
Senior Community	→	Charlie Boyd

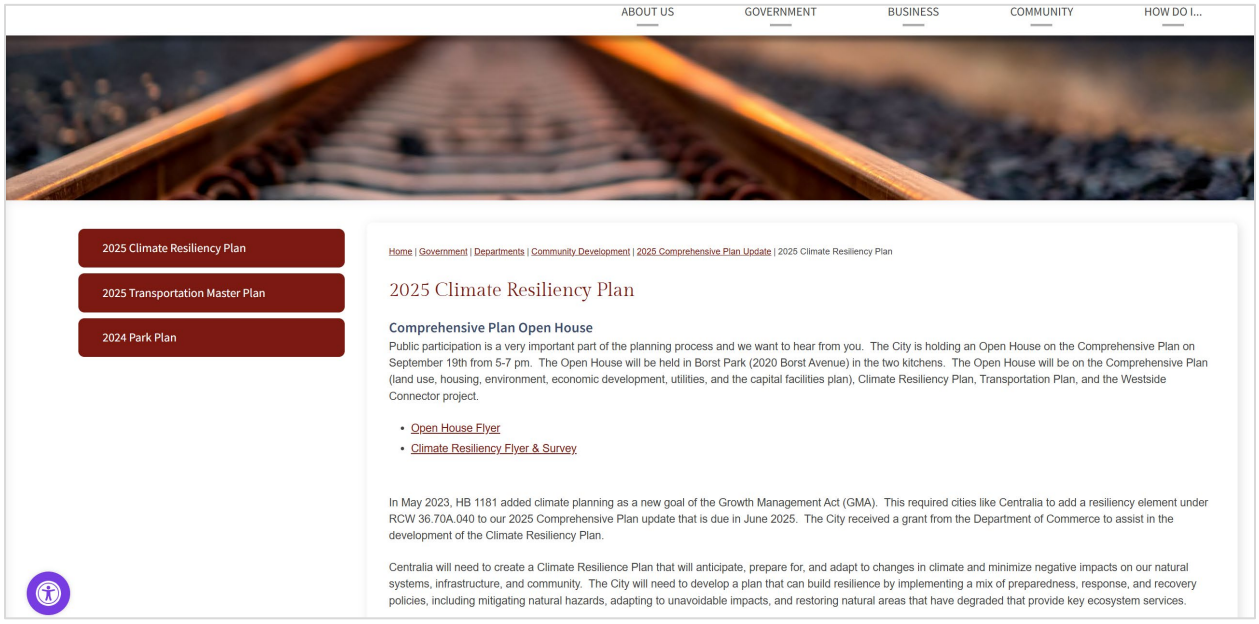
The CAT met six times throughout the planning process and supported the development of the climate resilience vision statement, the identification of assets, determining the path forward, and deciding the course of action.

Public Engagement

Broad public participation in the planning process helps ensure that diverse points of view about the city's needs are considered and addressed. The strategy for involving the public in this plan update emphasized the following elements:

- Website - Updated with meeting materials and resources
- Survey - Community input on climate concerns, impacts, and vision for resilience
- In-person engagement - Details listed in the Comprehensive Plan Public Participation Plan
- Climate advisory team - Provided input throughout the planning process

Website



METHODS AND EVALUATION CRITERIA

Assessment Methodology

Following the Washington State Department of Commerce's Intermediate Planning Guidance document, we used the Climate Element Workbook to document our assessment of climate impacts, vulnerabilities, and risks, and develop climate resilience goals and policies.

Climate change scenarios and data

The CAT supported the identification of assets to be evaluated in the assessment. The assets were evaluated against drought, extreme heat, extreme precipitation, flooding, reduced snowpack, and wildfire hazards.

We identified climate hazards, indicators, and impacts specific to Centralia and Lewis County using the Climate Mapping for a Resilient Washington ("CMRW") webtool. The CMRW tool provided a long list of climate indicators within various sectors including agriculture, buildings and energy, cultural resources and practices, economic development, ecosystems, emergency management, human health, transportation, waste management, water resources, and zoning and development. The assessment used the higher greenhouse gas scenario (RCP 8.5) as compared to the lower greenhouse gas scenario (RCP 4.5) as the scenarios do not differ significantly prior to 2050.

Vulnerability Assessment

To determine vulnerability, we evaluated asset-hazard pairs for sensitivity and adaptive capacity using a qualitative rating system. Flood hazards were not included in the vulnerability assessment because the vulnerability was already known to be high. The sensitivity and adaptive capacity ratings were determined using indicators such as age, asset condition, physical design, social assets, and economic costs. Based on these ratings, each asset-hazard pair was assigned a vulnerability risk rating of low, medium, or high.

Risk Assessment

All asset-hazard pairs that received a medium or high vulnerability rating were then analyzed for risk. We determined low, medium, or high risk based on the probability or frequency of hazard occurrence and the magnitude of potential losses and consequences. We determined probability using information from the Hazard Mitigation Plan and other sources. The magnitude was determined based on indicators such as potential losses, ability to recover, location, operations, and safety.

Based on the composite risk rating, the CAT made the decision to “Take Action” or “Acknowledge Risk” for each asset-hazard pair. Goals and policies were then recommended for each asset-hazard pair rated “Take Action.”

Existing plans, goals, and policies

Existing reports, documents, and the city’s website were used to gather relevant data pertaining to each hazard and community assets. A review of current plans used by the city concluded that future conditions and climate change are generally not addressed. However, there were existing goals and policies that can be modified to account for climate change. Plans reviewed include:

- 2018 Transportation Plan
- 2019 Sewer Facility Plan
- 2022 Water System Plan
- 2023 Stormwater Management Plan
- 2023 Housing Assessment and Action Plan
- 2024 Electricity Utility Plan
- 2024 Lewis County Multi-Jurisdictional Hazard Mitigation Plan
- 2024 Parks and Recreation Plan
- 2025-2045 Comprehensive Plan

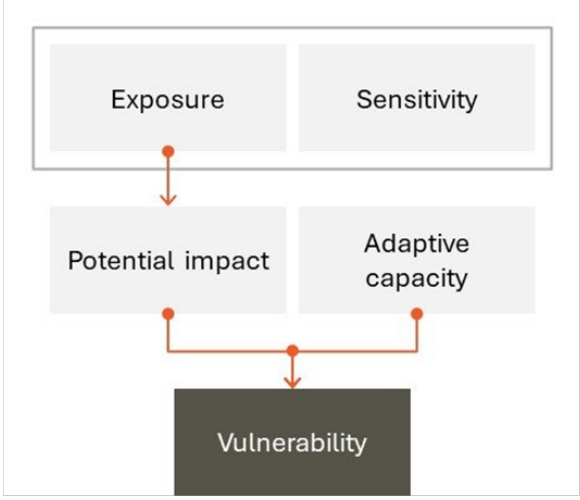
Primary information sources

- **UW Climate Mapping for a Resilient Washington:** A climate projections database used to build baseline awareness of how climate change is expected to affect Lewis County (water resources, transportation, etc.) and its social, economic, and environmental assets in coming decades. The Department of Commerce considers the CMRW webtool a source of best-available science and scientifically credible projections.
- **Washington Department of Health Environmental Health Disparities Map:** The Environmental Health Disparities map is a collage of lived experiences across Washington. It compares communities using census tracts to identify disparities. Using the EHD map can determine where more attention needs to be paid to address and reduce the specific pollution, societal, and health harms affecting Washington residents.
- **Lewis County Climate Element:** This process was informed by county-level climate impacts data and analysis of community assets including exposure, non-climate stressors and consequences. Vulnerability and risk assessments were also referenced in the development of Centralia's climate element.
- **NOAA National Centers for Environmental Information:** NOAA NCEI provides access to an extensive archive of environmental data through several platforms. It provides climate, coastal, oceanographic, and geophysical data in a variety of formats.
- **FEMA National Risk Index:** The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards. It was designed and built by FEMA in close collaboration with various stakeholders and partners in academia; local, state and federal government; and private industry.
- **Western Regional Climate Center:** The WRCC acts as a repository for high-quality historical climate data and information for the western U.S., a region covering the eleven westernmost states, including Alaska, Hawaii, and the U.S.
- **CDC Social Vulnerability Index:** The Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry Social Vulnerability Index is a place-based index, database, and mapping application designed to identify and quantify communities experiencing social vulnerability.

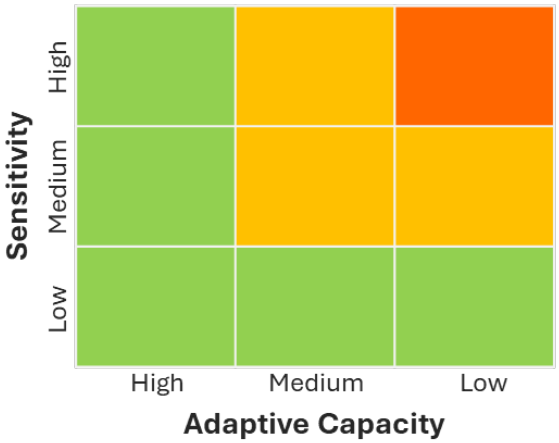
Vulnerability Criteria

The framework for determining climate change vulnerability consists of three key components: exposure, sensitivity, and adaptive capacity. Exposure assesses the degree to which a system is subject to climate-related hazards, such as rising temperatures or extreme weather events, highlighting areas that face the greatest risk. Sensitivity evaluates how inherently affected a system is by these climate impacts, considering characteristics that may heighten vulnerability, such as age and condition of infrastructure or socio-economic factors like poverty. Adaptive capacity measures a system's ability to adjust to climate change and minimize damage, influenced by governance, available resources, technologies, and social networks.

Elements of Climate Vulnerability



Vulnerability Rating Matrix



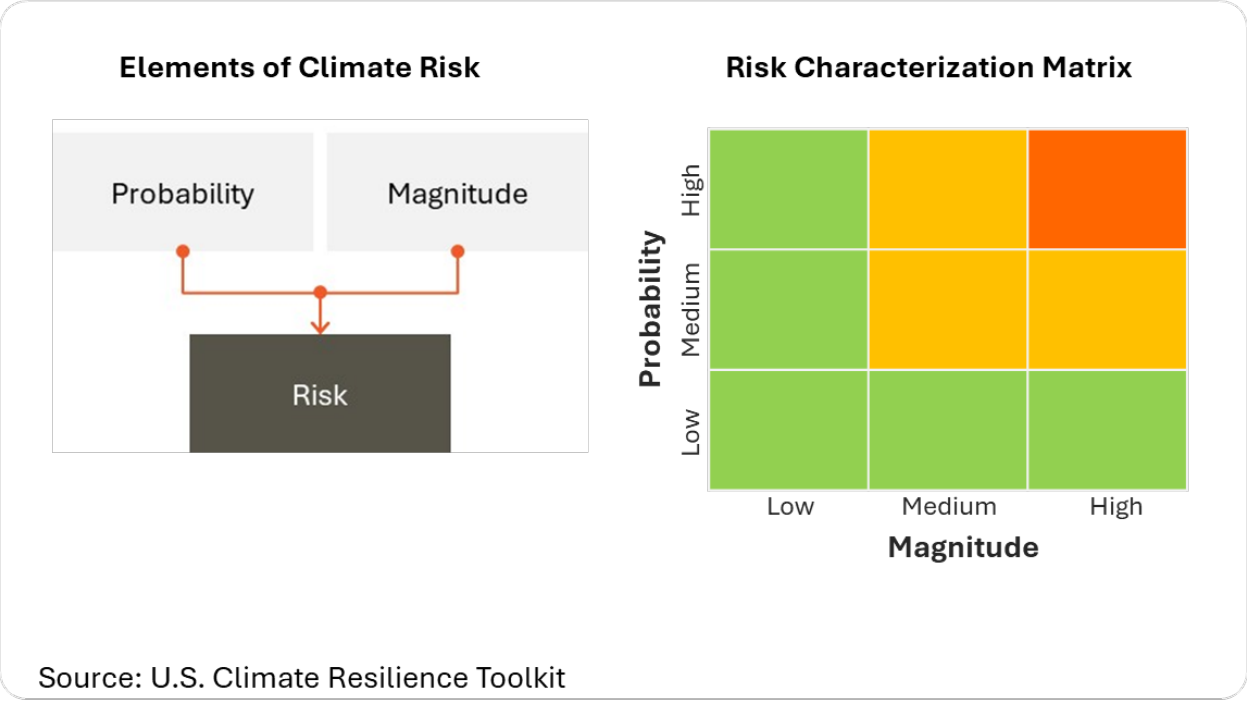
Source: U.S. Climate Resilience Toolkit

Table: Criteria used to determine the level of sensitivity and adaptive capacity.

	Sensitivity	Adaptive Capacity
Low	• Minor repairs and accommodation required. • Slight inconveniences and temporary loss of services. • Minor disruption to business continuity and minimal loss of revenue and wages. • Little to no increase in costs and demands to respond to emergency events.	• Adaptive solutions are innovative but costly. • Adaptive solutions may require coordination with multiple agencies to implement, leading to disruptions in service and longer implementation times. • Solutions require change in lifestyle or changes in political decisions. • The ability to avoid damage is limited.
Medium	• Temporary loss of food production, transportation, and distribution. Temporary loss of functionality and operations closure of emergency response services. • Moderate repairs and replacements required. • Moderate increase in costs and demands to respond to emergency events.	• Impacts can be reduced or mitigated to a certain extent; however, adaptive solutions are only feasible for limited assets. • Some assets may face difficulties in adapting in terms of cost and implementation. • Coordination with third party agencies may be necessary for adaptivity measures. • Solutions require some change in systematic operations but are somewhat executable.
High	• Significant impact requiring reconstruction of parts or an entirety of an asset. • Extensive rehabilitation of assets resulting in long-term or permanent loss of functionality or operations closure. • Significant impact to vulnerable populations due to flooding and extreme precipitation-related deaths and illnesses, population displacement, or migration. • Permanent loss of species is not able to adapt to weather events exacerbated by climate change.	• Assets can adapt with little to no difficulty. • Direct influence on the implementation of strategies or solutions for the asset is apparent. • Adaptive solutions are highly feasible for most, if not all assets with affordable costs. • Solutions are implemented immediately and face little to no resistance.

Risk Criteria

The framework for determining climate change risk involves assessing two key factors: probability and magnitude. Probability evaluates the likelihood of specific climate change impacts occurring in a given region or system, relying on historical climate data and climate models to estimate the frequency of events such as extreme heat, flooding, or drought in the future. Magnitude refers to the severity and scale of potential impacts associated with identified climate risks, examining the physical, economic, and social consequences of climate events. For example, the intensity of a flood can have varying effects on infrastructure, health, and local economies.



Source: U.S. Climate Resilience Toolkit

Probability Criteria:

- Likely to occur within 5 years = high probability
- Likely to occur once in 5 to 20 years = medium probability
- Likely to occur less than once in 20 years = low probability

Magnitude Criteria:

- Less costly and/or disruptive = low magnitude
- Moderately costly and/or disruptive = medium magnitude
- Very costly and/or disruptive = high magnitude

Prioritizing Goals and Policies

Centralia's climate element must focus on measures that align with the city's vision and goals, specifically prioritizing overburdened communities. These communities are particularly vulnerable to worsening environmental impacts and will be most affected by natural hazards associated with climate change. The following four criteria were used to prioritize the policies in this plan:

1. **Effectiveness:** Evaluates how well specific policies will achieve resilience against climate impacts. It determines whether the measures are suitable for addressing local needs.
2. **Co-benefits:** Assesses the additional benefits that a policy may provide beyond its primary goal, such as improving public health, enhancing community well-being, or promoting economic growth.
3. **Timeframe of benefit:** How quickly policies will deliver results. It distinguishes between short-term measures, which may need regular updates, and long-term measures that require more time and investment to implement and see full benefits.
4. **Equity:** Whether policies fairly benefit all community members, particularly those in overburdened or vulnerable populations. It emphasizes the importance of addressing potential disparities and involving affected communities in the decision-making process.

ASSESSMENT RESULTS

All Buildings & Structures

Among the range of climate threats, precipitation and urban flooding pose the greatest risks to the city's built environment. Centralia's stormwater systems, which were designed based on historical precipitation patterns, are regularly overwhelmed by intense rainfall events, leading to frequent instances of urban flooding. These flooding events often cause damage to structures, with older or poorly maintained buildings facing particular risk due to inadequate waterproofing and drainage. Recent risk analyses using updated flood models project that climate change will further intensify the threat: In the near term, more buildings are expected to be exposed to flooding, with damages to contents and structures projected to skyrocket from $110 million today to over $293 million (Hazus risk modeling using the 2019 1% annual chance flood model developed by the OCB). Notably, the percentage of properties vulnerable to flooding is expected to climb to 75.5% in the next thirty years, underscoring the city's significant exposure (FirstStreet.org).

Urban flooding is a more frequent hazard for Centralia than riverine flooding, as heavy precipitation events frequently outpace the ability of existing infrastructure to channel stormwater away from built areas. Furthermore, the public's reliance on outdated flood risk maps for real estate decisions can lead to underestimation of true hazards, placing both existing and future developments at heightened risk.

Wildfire and, more critically, wildfire smoke represent another growing climate-related challenge for Centralia's buildings. While direct wildfire is unlikely to reach the city's core, the increasing number of "smoke days"—when air quality deteriorates due to smoke from wildfires both near and far—presents health and operational risks to all occupied buildings. Many older structures lack

sophisticated air filtration or purification systems, exacerbating indoor air quality problems and threatening occupant health. Retrofitting such systems can be costly, especially for commercial, educational, or healthcare facilities. As wildfire seasons grow longer and more intense, improving air quality management in buildings becomes increasingly urgent.

Centralia's exposure to climate change is compounded by energy supply vulnerabilities. Hotter summers and more frequent heatwaves are driving up cooling needs—especially in areas afflicted by the urban heat island effect—but also pose strain on the regional electrical grid, especially if drought reduces the capacity of hydropower generation. The risk of power outages may indirectly affect buildings, as cooling and filtration systems may be rendered inoperable exactly when they are most needed. Though overall loss of function or productivity of buildings from higher temperatures and wildfire risk remains low at present, the cost of adaptation—updating construction codes, improving stormwater management, retrofitting for flood and smoke resilience—will remain significant.

All buildings & structures vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Low	Medium	Low	Low	Low	Low
Extreme Temperatures	Medium	Medium	Medium	High	Low	Medium
Extreme Precipitation	Medium	Medium	Medium	High	Medium	Medium
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Medium	Low	Medium	Medium	Medium	Medium

Aquatic, Terrestrial, & Urban Habitat

The city is home to a rich array of ecological areas—rivers, lakes, streams, wetlands, and forests—that not only offer valuable habitat for many species but also provide recreational opportunities for residents and visitors. The region's flora and fauna are generally less adapted to extreme weather, making them especially sensitive to the shifts expected with a changing climate.

In Centralia, the most pressing impacts from climate change are associated with increasingly frequent and severe precipitation events. While natural ecosystems may benefit from moderate flooding, extreme and repeated flood events risk overwhelming these environments, causing erosion, degrading water quality, and displacing wildlife. Over time, the cumulative effect may lead to loss of suitable habitat, longer recovery periods, and diminished biodiversity. The shrinking of suitable habitat patches, coupled with the direct displacement of animals and plants, could undermine the health and resilience of Centralia's ecosystems.

Drought conditions represent another risk, though in Centralia these are somewhat moderated by location. The city sits in a low-elevation watershed less dependent on mountain snowpack compared to other regions. According to UW Climate Impacts data, by the end of the century, no significant impact is projected for Centralia's ecosystems. However, the surrounding watersheds, excluding Chehalis, face a dramatic 68% decline in April 1st snowpack by mid-century, threatening tributary rivers like the Skookumchuck and Newaukum that originate in the Cascade foothills. Expected climate-driven decreases in late summer precipitation and changes in streamflow could contribute to higher plant mortality, reductions in urban tree canopy, and episodic water stress for both wildlife and vegetation. Fortunately, these impacts are expected to be manageable thanks to the city's relatively short-duration droughts and the potential to mitigate them through active greenspace management and increased irrigation.

Enhancing the resilience of Centralia's habitats and wildlife will require strategic, regional conservation efforts. Existing programs, such as the Aquatic Species Restoration Program (ASRP), funded by the Office of the Chehalis Basin, are already supporting these efforts. The ASRP is focused on improving and restoring aquatic habitat in the Chehalis Basin through a prioritized, science-based process. Priorities of the ASRP include increasing reliance to climate change, protecting and restoring native species, and increasing the quality and quantity of habitat, which will support sustained, long-term restoration of vital ecosystem functions. While projections suggest the overall risk to Centralia's ecosystems remains moderate in comparison to other regions, ongoing investment in habitat restoration and greenspace management will be critical. Such measures not only safeguard biodiversity but ensure that these natural spaces remain a treasured resource for the community in the future.

Aquatic, terrestrial, & urban habitat vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Medium	Medium	Medium	Medium	Medium	Medium
Extreme Temperatures	High	Low	High	High	Medium	High
Extreme Precipitation	Medium	Medium	Medium	High	Medium	Medium
Flooding	High	Low	High	High	High	High
Snowpack Decline	Medium	Medium	Medium	High	Medium	Medium
Wildfire & Smoke	Medium	Medium	Medium	Medium	Low	Low

City Parks & Recreation Facilities

Centralia's parks and recreation facilities play a vital role in community well-being, offering green refuge, social spaces, and opportunities for outdoor activity. Thanks to active and ongoing maintenance, such as managed irrigation and landscape care, these spaces are moderately insulated from some climate impacts. However, climate change still introduces heightened vulnerability and risk, challenging the city's ability to maintain these essential assets at their current standard.

Flooding remains one of the most significant risks, particularly for parks and recreation facilities located in the city's floodplain. While these facilities play an important role in preserving floodplain storage and habitat functions, as heavy rain events become more intense and more frequent due to climate change these areas are increasingly susceptible to flood damage. Moreover, climate-driven changes in temperature and precipitation may stress non-native plant species that make up a portion of the city's landscaped spaces. Over time, these plants may become less resilient to heat, drought, and heavy rainfall, requiring their replacement with more climate-adapted, drought-tolerant varieties.

Extremes of temperature—both hot and cold—pose other challenges for parks and recreation areas. While these effects are generally short-lived rather than persistent, they can impact the safe and comfortable use of facilities, making activities like fairs, outdoor sports, or trail use less appealing or even unsafe during heatwaves or cold spells. Ensuring that outdoor spaces can serve as reliable community resources may require strategic investments, such as providing shade, cooling centers, or adjusting schedules during extreme weather periods.

Drought, especially when coupled with extreme heat, becomes a concern when water for irrigation is insufficient and plant species are not drought resistant. Reduced water availability can hurt vegetation health; grassy fields, urban trees, and ornamental plantings may suffer declines,

impacting the quality and aesthetics of parks. However, as long as an adequate supply of irrigation water is available, drought impacts on the city's parks and recreation facilities are expected to be minimal.

Finally, although wildfire risk is low, parks are more vulnerable to wildfire due to abundant vegetation and public uses that may cause ignition. Wildfire smoke presents a growing but generally temporary risk, primarily resulting in decreased public use of outdoor facilities during smoke events. Overall, while Centralia's parks and recreation areas are no more physically vulnerable than other city structures, their value as community spaces relies heavily on proactive adaptation.

City parks & recreation vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Medium	High	Low	Medium	Low	Low
Extreme Temperatures	High	High	Low	High	Low	Low
Extreme Precipitation	Medium	Medium	Medium	High	Low	Low
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	High	Medium	Medium	Medium	Low	Low

Community Members & Visitors

Climate change is intensifying the vulnerability and risk faced by community members and visitors in Centralia in multiple interrelated ways. Chief among these are the urban heat island effect, increasing wildfire smoke events, and more frequent flooding—all of which can have direct impacts on residents' health and well-being.

Centralia is projected to experience a dramatic increase in the intensity, frequency, and duration of extreme heat events. Currently, the city already faces a significant urban heat island effect, where concrete, asphalt, and reduced tree canopy drive up temperatures in urbanized areas. Over the next thirty years, the likelihood of a three-day or longer heatwave will jump from 69% to 89%, and the city can expect about 14 days annually over 90 degrees (FirstStreet.org). This rising heat risk is particularly concerning given local demographic and housing factors. Over 40% of Centralia's housing is rental and may lack air, an issue compounded for lower-income residents and the elderly who may lack the financial means to invest in cooling or are especially susceptible to heat-related health impacts. As population growth leads to more urban development, reductions in tree canopy and expansion of heat-retaining surfaces will likely worsen these heat risks. Evaluating and expanding access to public cooling centers and ensuring residential facilities for vulnerable populations, like nursing homes or supportive housing, have adequate cooling and heating is critical.

Beyond heat, air quality in Centralia is increasingly compromised by drought and wildfire smoke, even if those fires originate outside the immediate region. Poor air quality days—defined as any day with an AQI over 100—are occurring more often due to wildfire smoke drifting into the area. Exposure to poor air quality and wildfire smoke is a significant health hazard, especially for children, the elderly, and those with preexisting respiratory conditions. Individuals who live or work in buildings with poor air filtration, or those who work outside, face heightened risk. The community's capacity to protect its population from the health effects of poor air quality and smoke will rely on both improving building air filtration and providing accessible, safe public spaces with clean air—particularly as smoke days become more frequent.

Flooding remains another major risk for Centralia residents. Increasingly intense rains and atmospheric rivers can cause rivers to overflow their banks and overwhelm stormwater systems, creating hazardous conditions for neighborhoods in low-lying areas. Major flood events, like those in 2007 and 1996, create risk to life and property. Flood events can dislocate families, disrupt daily life, and pose dangers to those with limited mobility or access to resources. Community members who live within flood hazard areas and do not carry a flood insurance policy are especially vulnerable to the economic devastation that flooding can cause. Continuing to provide outreach and education in these areas is key to reducing risk.

Compounding these risks, high fire-weather days may increasingly prompt public power shutoffs, which are intended to prevent wildfires caused by downed or sparking power lines, but such shutoffs can have unintended consequences for the community. During heatwaves or smoke events, power-dependent cooling and air filtration systems, refrigeration, and medical equipment may be inaccessible when they are most desperately needed, particularly for vulnerable populations.

Prioritizing cooling and air quality infrastructure, safeguarding and supporting vulnerable residents, expanding green spaces, and continuously providing outreach and education essential to protecting the health, safety, and quality of life for all who call Centralia home.

Community members & visitors' vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Low	Medium	Low	Low	Low	Low
Extreme Temperatures	High	Medium	Medium	High	High	High
Extreme Precipitation	N/A	N/A	N/A	N/A	N/A	N/A
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	High	Medium	Medium	Medium	High	Medium

Emergency Management & Response

Increased pressure on emergency management and Emergency Medical Services (EMS) due to climate-driven hazards is a primary concern for Centralia. While Centralia benefits from integration with Lewis County public safety communications, which provides some resilience and adaptive capacity, climate change introduces hazards and frequencies that could stress these systems.

Flooding poses high risk to emergency response capabilities in Centralia. Several public safety buildings are located within flood hazard areas. Inundation of these assets during heavy rainfall or flood events could disable critical facilities, delay response times, and even result in the loss of key resources or infrastructure. Such disruptions threaten not only the safety of emergency personnel but also the ability of the city to coordinate response and recovery during crises. Given that flood emergencies are likely to become more severe and frequent, it is crucial that emergency management be prepared for flood response and evacuations, displacement, and backup communication and power systems.

Extreme heatwaves will also increase demand for emergency services. As temperatures rise and prolonged heatwave events become more common, the emergency responders should be prepared for a surge in heat-related illnesses, particularly among those without access to air conditioning or adequate shelter. Heatwaves also pose indirect challenges for emergency management; for example, high temperatures can deform or buckle pavement, leading to transportation slowdowns or blockages that impede EMS travel and prolong response times. While extreme heat is unlikely to damage emergency facilities directly, it will stretch resources and

require new approaches to community outreach, cooling shelter operations, and public safety messaging.

Proactive adaptation is essential, including floodproofing critical facilities, strengthening backup power and communication systems, and developing robust contingency plans for wildfire smoke, power outages, and extreme heat. These steps will help ensure that emergency services remain resilient and capable of protecting the community under evolving climate threats.

Emergency management & response vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Low	High	Low	Low	Low	Low
Extreme Temperatures	Medium	High	Low	High	Low	Low
Extreme Precipitation	Medium	High	Low	High	Low	Low
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Medium	Medium	Medium	Medium	Low	Low

Power Infrastructure & Transmission

Extreme weather will continue to increase energy demand from buildings, especially during periods of extreme heat. As residents and businesses rely more heavily on air conditioning and cooling systems, the city's electrical transmission and distribution network will face greater stress. Fortunately for Centralia, the projected temperature increases by 2050 are small.

Centralia's dependence on electricity generated by Columbia River dams means the city's energy security is intrinsically linked to the reliability of the western hydropower system. Although the hydropower system has demonstrated impressive resilience during severe droughts, generating at least 80% of typical annual output[2], prolonged periods of dry conditions and loss of snowpack could eventually threaten hydropower capacity. Drought not only limits water available for electricity production but also increases wildfire risk, which can threaten the extensive transmission network that delivers power from distant sources to Centralia.

[2]Pacific Northwest National Laboratory, 2022

Wildfires present a distinct and growing threat to power infrastructure. Transmission and distribution lines are at continual risk of fire-related damage or destruction. Centralia and its utility providers have responded by assessing and upgrading transmission infrastructure to be fire-resistant and implementing wildfire risk mitigation plans. These efforts, along with ongoing monitoring and rapid response to wildfire incidents along transmission corridors, help reduce the likelihood of large-scale, fire-related outages. Centralia's six substations have also been evaluated and determined to be at low risk for wildfire along with underground portions of the distribution system, adding a measure of resilience.

Flooding, however, remains a persistent and high-impact risk. Most notably, substations and electrical infrastructure located within floodplains are susceptible to inundation during more frequent or severe storm events. Floods can submerge critical equipment, cause short circuits, damage transformers, down distribution poles, and disrupt transmission of electricity. These events not only create immediate outages but can also have cascading impacts—affecting water treatment, emergency response, communications, and community safety. Flooding's disruption of energy generation and supply is often accompanied by spikes in energy demand, further straining the grid and potentially causing shortages or increased energy costs.

As the city faces more intense and frequent weather extremes, deliberate investment in modernizing and protecting critical power infrastructure will be essential to ensuring continued power, public safety, and economic productivity.

Power infrastructure & transmission vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	High	Medium	Medium	Medium	Medium	Medium
Extreme Temperatures	Medium	High	Low	Low	Low	Low
Extreme Precipitation	Low	High	Low	High	Low	Low
Flooding	High	Medium	Medium	High	Medium	Medium
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Medium	High	Low	Medium	Low	Low

Communications Infrastructure

Much of Centralia's communications infrastructure, including emergency radio, relies heavily on a stable supply of electricity, which can be impacted by extreme weather and flooding. Should the power supply falter, key communications assets could experience outages, limiting the ability of emergency services and public agencies to coordinate effective disaster response and maintain routine operational communications.

Worsening wildfire conditions also pose a direct risk to physical communications infrastructure. Wildfires can damage or destroy radio towers, fiber optic lines, and other critical components, especially those in more remote or forested areas around Centralia. Even if wildfire does not reach the city itself, smoke and ash can cause intermittent disruptions or degrade signal quality. Fortunately, Centralia's emergency communications system is designed with redundancy in mind and alternate communication methods are likely available should a specific tower or part of the network be impacted. However, in a situation where wildfire, power outages, or severe weather events such as flooding occur concurrently, the overall resilience of the system could be tested, and maintaining reliable backups and rapid repair capabilities will be essential to ensuring uninterrupted communication during climate-driven emergencies.

Communications infrastructure vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Low	High	Low	Low	Low	Low
Extreme Temperatures	Medium	High	Low	High	Low	Low
Extreme Precipitation	N/A	N/A	N/A	N/A	N/A	N/A
Flooding	High	Medium	Medium	High	Low	Medium
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Medium	High	Low	Medium	Low	Low

Wastewater Infrastructure

Centralia's sewer system, which expands on a per-development basis, faces particular challenges related to stormwater infiltration and groundwater intrusion—risks that are predicted to intensify as the region experiences more frequent and severe precipitation events. The city's aging sewer lines, many of which were constructed with ungasketed joints, are especially vulnerable. During heavy rains or periods of high groundwater, water can infiltrate these older pipes through cracks and loose joints, leading to inflow and infiltration (I&I) issues. This not only reduces the effective capacity of the wastewater treatment plant but can also cause surcharging, backups, and maintenance challenges throughout the system.

The impact of past extreme weather on Centralia's sewer system provides a clear example of the risks ahead. During the 2007 flood, the wastewater infrastructure was inundated, with system manholes submerged under floodwaters. With no remaining overflow gates or controlled discharge points, features that were sealed in the early 1980s to comply with environmental standards, Centralia's wastewater system now has few options for safely managing large surges of wastewater. As a result, large rainfall events, which are expected to become more intense and frequent with climate change, already strain the capacity of the treatment plant and further stress aging infrastructure.

Adaptation to these increasing threats is complicated by both the age of the system and financial constraints. The replacement or comprehensive upgrade of wastewater collection systems poses a significant financial burden, especially given the scale of needed repairs. Capital improvement projects like ES-1 and ES-4 have been slated to address some of the worst problems by repairing and upgrading broken, cracked, or outdated joints, but these investments may not be sufficient if the frequency and intensity of extreme weather continue to climb. Ongoing issues with infiltration and inflow mean that Centralia's wastewater system is at high risk of further operational disruptions, environmental releases, and compliance challenges as climate change progresses.

Wastewater infrastructure vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Temperatures	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Precipitation	High	Low	High	High	High	High
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Low	Medium	Low	Low	Low	Low

Solid Waste

Centralia's local solid waste facilities and services consist of the transfer station, waste collection service, and recycling and wrecking yards. Climate-exacerbated hazards pose unique challenges for waste management, particularly in the context of flooding and heavy rainfall. These events can obstruct or damage important transportation routes, leading to delays in garbage collection services. Moreover, waste management facilities such as transfer stations and landfills may suffer physical damage during flooding events, further impeding waste disposal efforts. When garbage collection is interrupted, households and neighborhoods can experience a rapid accumulation of waste. This buildup not only creates unpleasant and unsanitary conditions but also fosters an environment conducive to pest infestations, posing additional public health risks.

The impact of wildfires and flooding can be severe. Flooding can generate an exceptional amount of debris and household waste, especially when homes and businesses are inundated with flood water. Wildfires also generate vast amounts of debris, including charred vegetation, damaged construction materials, and potentially hazardous household waste. However, Centralia is projected to have very low wildfire risk in the city and UGA. For both flooding and wildfire, the aftermath would require specialized cleanup and disposal operations which are. This strain on response and recovery can be reduced by preparing a disaster debris management plan.

The interconnected nature of waste accumulation and public health concerns underscores the necessity for resilient and adaptable waste management systems. As climate-related disruptions become more frequent and severe, implementing sustainable practices and investing in planning will be crucial in mitigating the impacts.

Solid waste vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Temperatures	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Precipitation	Medium	Medium	Medium	High	Medium	Medium
Flooding	High	Medium	Medium	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	High	Medium	Medium	Low	Medium	Medium

Stormwater Infrastructure

Recent data from NOAA shows 13 separate 24-hour rainfall events surpassing 1 inch each from 2014 to 2024, indicating a clear upward trend in the frequency and intensity of storms. Centralia's stormwater systems, like those in many communities, are designed using historical rainfall data and thus lack the capacity to handle the more extreme weather patterns anticipated with climate change.

The fundamental issue is that both older and newly constructed stormwater systems may have insufficient storage, conveyance, and infiltration capacity for today's more intense rainfalls. As design standards have not kept pace with the changing climate, future and existing infrastructure are increasingly at risk of being overwhelmed. When stormwater capacities are exceeded, the result is often urban flooding and overflow events. Such flooding not only damages property and disrupts daily life but also accelerates stream channel degradation, especially in areas downstream from stormwater outfalls. Complicating matters, stormwater during heavy events is frequently laden with sediment and contaminants. When infrastructure is overwhelmed, water quality facilities can be bypassed, allowing polluted runoff to flow directly into local streams and rivers, challenging Centralia's ability to meet National Pollutant Discharge Elimination System (NPDES) standards.

Flooding represents a particular threat to the continued function of stormwater infrastructure. During flood inundation, stormwater systems often cease to function altogether, as pipes and conveyance structures are submerged, blocked, or otherwise compromised. Major flood events introduce additional sediment and debris, which can clog pipes, swales, and retention ponds, further reducing their effectiveness and requiring labor-intensive maintenance and repair. This diminishes the ability of the system to manage future events effectively and can create a cycle of recurring damage and reduced capacity.

Green infrastructure, which is designed to naturally filter and absorb stormwater, is also sensitive to both overuse and the increased stress associated with more intense rainfall events. Excessively frequent or heavy rainfalls may damage vegetation, erode soil, and limit the ability of these systems to function as intended, further straining the city's traditional stormwater infrastructure.

Without substantial upgrades to both design standards and maintenance practices, the likelihood of system overflow, urban flooding, environmental degradation, and regulatory compliance issues will continue to rise.

Stormwater infrastructure vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	Medium	High	Medium	Low	Low	Low
Extreme Temperatures	Low	High	Low	Low	Low	Low
Extreme Precipitation	High	Low	High	High	High	High
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Low	Medium	Low	Low	Low	Low

Transportation Infrastructure

Currently, over 39% of Centralia's pavement is rated below "Good" condition, making it particularly susceptible to accelerated deterioration as climate extremes become more common. The freeze-thaw cycles expected in a changing climate can worsen existing cracks in pavement, leading to potholes and major surface failures. Meanwhile, hotter summers and more frequent heatwaves can cause asphalt to soften and deform, worsening ruts and making roads more hazardous for drivers. Using heat resistant paving material during scheduled maintenance and repairs can support a more resilient transportation system. Programs to increase shade over roadways, such as through the city's urban tree planting initiative, can also contribute to extending pavement life and reducing surface temperatures, further building transportation system resilience.

During heavy rains and floods, inundation and high-velocity water flows can wash away road surfaces, erode shoulders, and scour bridge abutments or piers which can compromise structural integrity. The risk is compounded by the fact that bridges often carry critical utility infrastructure such as water, electricity, and communications lines; thus, bridge damage can disrupt a range of essential services beyond just transportation. Floodwaters and heavy runoff frequently carry debris that may block culverts or become trapped against bridge piers, causing additional physical damage. The combined result is more frequent service delays, cancellations, reroutes, and a significant increase in operation and maintenance costs for the city.

Transportation infrastructure vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Temperatures	High	Medium	Medium	High	Medium	Medium
Extreme Precipitation	Medium	Medium	Medium	High	Medium	Medium
Flooding	High	Low	High	High	High	High
Snowpack Decline	N/A	N/A	N/A	N/A	N/A	N/A
Wildfire & Smoke	Medium	Low	Medium	Low	Low	Low

Water Supply & Infrastructure

The city relies heavily on surface water from streams and a critical aquifer beneath the city, both of which are highly sensitive to the effects of drought and shifting weather patterns. The statewide drought of 2015, driven by record-low snowpack, serves as a critical reminder of this vulnerability. With climate models projecting continued declines in snowpack and changes to the timing of spring and summer streamflows, Centralia faces a greater likelihood of experiencing similar drought conditions within the next 5 to 20 years.

The aquifer that provides much of the city's drinking water supply is very vulnerable to drought. Aquifers require adequate precipitation and streamflow to recharge, but with predicted decreases in summer rainfall and streamflow, their ability to sustain consistent water levels will be strained. Because the aquifer is associated with the Chehalis River, during periods of low river flow and reduced recharge, the city may see declining groundwater levels, potentially resulting in mandatory water conservation measures and water use restrictions for both residential and commercial/industrial users.

Another compounding factor is the changing pattern of water demand. As average temperatures rise and heatwaves become more frequent, the demand for water increases. This places additional strain on water sources already diminished by seasonal droughts. Decreased summer streamflow will also affect not just water supply for drinking, irrigation, and industry, but also hydropower generation and ecological health in local rivers and streams. The long-term sustainability of Centralia's water resources is under discussion, but comprehensive adaptation measures have yet to be implemented, leaving the system exposed should current trends continue or worsen.

While adaptation may be possible by reducing water leakage, seeking alternative sources, or increasing storage capacity, these solutions involve substantial investment and planning. Centralia

will need to prioritize long-term water management strategies, invest in infrastructure that supports water conservation and enhances aquifer recharge.

Water supply & infrastructure vulnerability and risk summary

Hazard	Sensitivity	Adaptive Capacity	Vulnerability	Probability	Magnitude	Risk
Drought	High	Low	High	Medium	Medium	Medium
Extreme Temperatures	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A	N/A	N/A
Flooding	High	Low	High	High	High	High
Snowpack Decline	Medium	Medium	Medium	High	Medium	Medium
Wildfire & Smoke	Medium	Medium	Medium	Low	Low	Low

INFORMATION AND NEXT STEPS

For more information about how Centralia is building climate resilience into its Comprehensive Plan and departments across the city, contact the Community Development Department at 360-330-7662 or visit the Community Development website.