Climate Resilience Sub-Element (Draft)

Mason County

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Mason County Climate Resilience Sub-Element

Project Information

Project:	Mason County Climate Action Plan
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Introduction

Mason County, located in the western part of Washington State, is known for its rich natural resources, scenic beauty, and strong maritime heritage. The county is bordered to the east by the Hood Canal and the southern end of the Puget Sound, and Olympic National Forest to the north and northwest. The county features an abundance of forestlands, lakes, rivers, and coastlines that support a diverse range of economic activities, including forestry, shellfish farming, and outdoor tourism and recreation. Its communities are a blend of small towns and rural areas, with Shelton serving as the county seat and primary urban center. Mason County plays a vital role in regional transportation and connectivity, linking coastal and inland areas through highways, marine routes, and rail services. Its unique geography and natural assets make it an important contributor to both economic development and quality of life in the broader Puget Sound region.

Like many parts of the Pacific Northwest, Mason County is experiencing the impacts of a changing climate. Shifts in seasonal rainfall patterns, increasing temperatures, and more frequent extreme weather events are beginning to affect the region's natural systems and infrastructure. These changes have implications for water resources, forest health, transportation resilience, and coastal ecosystems, particularly shellfish habitats that are sensitive to ocean acidification and temperature fluctuations. As the county plans for the future, understanding and adapting to these climate-related challenges will be essential to protecting its environmental and economic stability. This climate resilience plan will lay down the necessary steps to enhance readiness and resilience while protecting the important assets that shape Mason County's identity.

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The purpose of this plan is to:

- Serve as a building block upon which Maon County's Comprehensive Plan will continue integrating climate considerations into future growth and development strategies.
- Identify and rank the threats facing Mason County's infrastructure, economy, and population's health brought about by climate change, with emphasis placed on vulnerable populations and historically underserved communities.
- Fortify the County's capacity to respond to climatic threats such as extreme precipitation, intense heat waves, and frequent flooding by enhancing emergency response capacity and investing in resilience infrastructure.
- Foster green growth by conserving natural resources and balancing economic, social, and environmental goals.
- Strive to protect Mason County's vulnerable and elderly residents, low-income residents, and individuals with underlying health conditions from the negative impacts of climate change, such as extreme temperatures and degraded air quality.
- Develop methods to preserve Mason County's open space, coastal areas, and productive lands, and guide ecologically friendly land uses.
- Encourage local economies to prepare to face climatic disruption and adopt diversified methods to make them more resilient to environmental hazards.
- Engage residents, enterprises, and institutions through education, coordination, and access to information to empower them to adjust to and succeed in an evolving climate.

- Foster stable working relationships among local governments, private enterprises, and residents so that climate resilience practices are guided by community needs and values.
- Coordinate with agencies at the state and federal levels, tribal governments, and relevant organizations to optimize climate adaptation plans across all sectors.

Overview of State Requirements

Climate resilience in Washington State is coordinated by the Growth Management Act (GMA), where planning jurisdictions must prepare comprehensive plans addressing various aspects, including climate change. In 2023, the state legislature passed House Bill 1181, which identified a goal of addressing climate in the GMA and required a climate element to be included in the jurisdictions' comprehensive plans. This climate element can be included as its own chapter in the comprehensive plan or integrated into various elements such as land use, transportation, and housing.

In general, the climate element comprises two sub-elements:

1. **Greenhouse Gas Emissions Reduction Sub-Element**: Mandatory for the state's largest and fastest-growing counties and their cities with populations exceeding 6,000 as of April 1, 2021. This sub-element focuses on implementing measures to reduce greenhouse gas emissions and per capita vehicle miles traveled.
2. **Resilience Sub-Element**: Required for all jurisdictions fully planning under the GMA. This sub-element emphasizes strategies to enhance community resilience against climate impacts, including the integration of natural hazard mitigation plans that align with state guidance.

Mason County is not required to develop a Greenhouse Gas Emissions Reduction Sub-Element, and is, therefore, only developing the Resilience Sub-Element. This Climate Resilience Sub-Element is in accordance with HB 1181 and will be included in the county's comprehensive plan. This plan is funded through a grant from the Washington State Department of Commerce (Commerce).

This Climate Resilience Plan aims to prepare Mason County for climate-related challenges by:

- **Addressing Natural Hazards**: Identifying and planning for natural hazards intensified by climate change, such as landslides, droughts, extreme heat, poor air quality, and wildfires.
- **Enhancing Community Resilience**: Protecting and bolstering factors that contribute to the community's ability to adapt to climate impacts, with a focus on social, economic, and infrastructure components, while ensuring environmental justice.

WA Department of Commerce Guidance

Additional guidance developed by Commerce further facilitates the process of developing a Climate Resilience Sub-Element. The guide enables jurisdictions to prepare their climate elements more easily in accordance with statutory requirements by providing a clear methodology, separate sectors for grouping local assets, and a list of climate-exacerbated hazards relevant to WA State.

Commerce requires jurisdictions to address all 11 of its sectors through the final climate resilience sub-element goals and policies. These 11 sectors include Agriculture & Food Systems, Buildings & Energy,

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Cultural Resources & Practices, Zoning & Development, Economic Development, Emergency Management, Health & Well-being, Ecosystems, Transportation, Waste Management, and Water Resources. These sectors are intended to help ensure that the jurisdiction's set of measures addresses important areas that might not necessarily be included in the jurisdiction's hazard mitigation plan, such as local food security and green job creation.

Commerce highly recommends utilizing the *Climate Mapping for a Resilient Washington (CMRW)* web tool prepared by the University of Washington's College of the Environment in the development of the Climate Resilience Sub-Element. The CMRW tool offers valuable data, projections, and insights covering Commerce's 11 sectors and the seven common climate-exacerbated hazards. These insights supported the identification of priority areas for Mason County and helped integrate scientific backing into planning decisions. The tool was particularly useful for aligning resilience strategies with available data on vulnerability and risk exposure.

Alignment with Other Plans and Efforts

- **Hazard Mitigation Plan (2023)**
  This plan provided a foundational understanding of the hazards impacting Mason County, including floods, wildfires, sea-level rise, drought, and severe weather events. It helped identify high-risk areas and vulnerable populations, which directly informed the Climate Resilience Plan's risk assessment, prioritization of adaptation actions, and strategies to reduce long-term vulnerability across infrastructure, housing, and natural systems.
- **Mason County Comprehensive Plan (2016–2036)**
  As the county's primary long-range planning document, the Comprehensive Plan outlines goals and policies for land use, transportation, economic development, environmental stewardship, and more. The Climate Resilience Sub-Element will be part of the updated Comprehensive Plan, and it builds on the goals and policies provided in the 2016 plan by promoting climate-smart growth, infrastructure resilience, and community preparedness while ensuring that climate considerations are woven into future development and investment decisions.
- **Shoreline Master Program (2021)**
  This plan establishes policies and regulations to protect Mason County's shorelines. It emphasizes ecological conservation, public access, and responsible development. The Climate Resilience Plan aligns with these priorities by identifying strategies to protect shoreline habitats, manage flood-prone areas, and enhance the resilience of coastal infrastructure in the face of climate stressors such as sea level rise and ocean acidification.

Mason County's Assets

As communities across the country face increasing climate-related challenges, Mason County is proactively working to bolster its resilience. To do that effectively and holistically, the county assets were sorted within each of the 11 sectors identified by Commerce that are potentially impacted by climate change. This asset overview presents a summary of the county's vital resources, including their current condition, vulnerabilities, and contributions to sustaining community prosperity and well-being.

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By identifying and sorting these assets, specific actions can be taken to safeguard them against climate hazards like extreme weather, flooding, and increasing temperatures. This initial evaluation is an important step towards creating a complete climate resilience strategy, making Mason County a safe, sustainable, and resilient place for climate challenges to come. These assets are grouped below into the 11 sectors identified by Commerce.

Agriculture & Food Systems

Assets identified under this sector are aquaculture, poultry and products, agricultural croplands, livestock, and Forest products. Mason County agriculture consists of small farms, shellfish farms, and forestry that are all susceptible to the changing climate conditions. The rise in temperatures, more extreme storms, and ocean acidification pose risks to crop yields, livestock productivity, and the county's renowned shellfish economy. The improvement of the local food system and investment in sustainable agriculture are crucial to maintaining food security and economic stability.

Buildings & Energy

Assets identified under this sector are Public Utility District (PUD) facilities and structures, schools, grocery stores, county facilities, civic center, communication centers and towers, power lines, dams & power stations. The energy system within the county consists of hydroelectric power, natural gas, and renewable energy projects. Severe climatic events such as windstorms and excessive rain threaten the reliability of power distribution and expose old structures to vulnerability. Resilience to climate-related disruptions can be enhanced through improvements to energy infrastructure and sustainable construction.

Cultural Resources & Practices

Assets identified under this sector are salmon, shellfish, native tribes and reservations, historic buildings and sites, faith-based structures, and terrestrial harvesting sites such as mushroom and berries. Traditional cultural practices are well represented within the county, particularly through the Skokomish Indian Tribe and Squaxin Island Tribe. Activities such as salmon fishing and harvesting shellfish are vulnerable to climate change through diminished water quality and habitat loss. The protection of cultural sites, the support of tribal sovereignty within climate adaptation programs, and the preservation of historical practices are essential to the protection of the cultural heritage within the county.

Economic Development

Assets identified under this sector are local businesses, Mason County Conservation District, aquaculture and timber Industries, shellfish industry, tourism, industrial sector, Squaxin Island Tribe (the largest employer), Skokomish Indian Tribe, ports, Emerging industries, and Ridge Motorsports Park. The county's economy relies mostly on natural resource industries such as forestry, fishing, and aquaculture. Climate change, such as increased flooding and coastal erosion, will impact these industries, compromising livelihoods and enterprises. Establishing climate-resilience practices will be essential to maintain long-term economic sustainability for these important industries.

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Ecosystems

Assets identified under this sector are rivers and streams, wetlands, marine ecosystems, lakes, shellfish harvest areas, watersheds, riparian areas and shorelines, Olympic National Forest, state parks and lands, tree canopy, prairies, open space, and mature forests. Mason County's diverse ecosystems, from Puget Sound's estuaries to the Olympic National Forest, support natural resource industries, recreation, and biodiversity. Rising temperatures, changing rainfall patterns, and rising sea levels threaten essential aquatic and terrestrial habitats and species. Habitat restoration, forestry management, and conservation are crucial to maintain ecosystem resilience.

Emergency Management

Assets identified under this sector are Mason County Sheriff, Mason County Fire and EMS, shelters and evacuation centers (including for tsunami evacuees from other counties), roadways, community first-responder training programs, and state patrol training. The county is susceptible to wildfires, intense storms, and flooding; each is likely to be exacerbated with climate change. Increasing emergency response capability, investing in community preparedness programs, and making the built environment more resilient to extreme weather events will protect residents and vital services.

Health & Well-being

Assets identified under this sector are elderly care and rehabilitation centers, assisted living centers, medical centers, air quality, park systems, fishing and shellfish harvesting (for recreation), golf courses, and Mason Lake Recreation Area. Higher temperatures and smoke from wildfires produce health risks that are particularly dangerous to groups such as the elderly, young children, and people with medical conditions. Access to healthcare, emergency assistance, and public health initiatives will be crucial to addressing climate-related health outcomes. Enhancing mental healthcare, recreational outlets, and overall community well-being initiatives can also contribute to resilience.

Transportation

Assets identified under this sector are State highways, county roads, bridges, culverts, trails, airport, EV charging stations, Mason Transit Authority, and railroad lines. Mason County’s transportation network, including Highway 101 and county roadways, is vulnerable to landslides, flooding, and extreme weather events. Damage to roads and bridges can disrupt access to emergency services and economic hubs. Investment in climate-resilient infrastructure, alternative transportation routes, and adaptive planning measures are all necessary to maintain seamless access and mobility flow.

Waste Management

Assets identified under this sector are wastewater treatment facilities, stormwater management facilities, solid waste facilities, transfer stations, drop box stations, reclamation centers, recycling facilities, hazardous waste facilities, bio-solids treatment, septage stations, septic systems, and junk yards. Waste collection and recycling operations can be disrupted by extreme weather events that lead to higher risks of contamination. Rising temperatures accelerate

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landfill emissions that impact air and water quality. More programs to divert waste, expanding compost programs, and landfill optimization can enhance environmental and public health resilience.

Water Resources

Assets identified under this sector are snowpacks, reservoirs, groundwater, rivers and streams, water supply infrastructure, water reclamation facilities, individual wells, and community/HOA wells. Mason County's water supply depends on groundwater, rivers, and reservoirs, all of which are susceptible to drought, pollution, and saltwater intrusion. Conservation strategies, protecting watersheds, and stormwater management will be essential to maintaining a clean and continuous water supply for residents, agriculture, and industries.

Zoning & Development

Assets identified under this sector are residential, tourism, and commercial zoning, agricultural resource lands, and commercial forests. Land use policies must adapt to manage climate risks such as sea level rise, wildfires, and flooding. Smart growth principles, stronger building codes, and climate-adaptive zoning regulations can define sustainable growth and reduce climate-related exposure. This sector provides the framework for climate resilience planning within Mason County to enable measures that safeguard important assets and ensure long-term sustainability.

The table on the following page summarizes the assets in Mason County within each of Commerce's 11 sectors.

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Sectors	Assets
Agriculture & Food Systems	Aquaculture, agricultural croplands, livestock, poultry and products, Forest products
Buildings & Energy	Public Utility District (PUD) facilities and structures, Schools, Grocery Stores, County Facilities (gov bldgs., Court Rooms, Jail/Detention Center/prison), Civic Center, Communication centers and Towers, Power Lines, Dams & Power stations (Tacoma Power)
Cultural Resources & Practices	Salmon, Shellfish, Native Tribes and Reservations, Historic buildings and sites, Faith-based structures, Mushroom and Berry picking sites
Economic Development	Local Banks and Banking Resources, local businesses, Mason County Conservation District, Shellfish Industry, Tourism, Industrial sector, Squaxin Island Tribe (largest employer), Skokomish Tribe, Ports, Aquaculture & Timber Industries, Emerging industries, racetrack
Ecosystems	Rivers and streams, marine ecosystems, Lakes, shellfish harvest areas, watersheds, Riparian areas/shorelines, Native plants, Olympic National Forest, State parks, tree canopy, Prairies, Open Space, state lands, Old/mature forests, Wetlands
Emergency Management	Mason County Sheriff, Mason County Fire and EMS, Shelters and Evacuation Centers (including tsunami evacuees from other counties), Roadways, Community first-responder training, State patrol training
Health & Well-being	Air quality, Park systems, Fishing/shellfish Harvesting (recreation), golf courses, Mason Lake Recreation Area, Elderly Care and Rehabilitation centers, Assisted living facilities, Medical Centers
Transportation	State Highways, County Roads, Bridges, Trails, Airport, EV Charging Stations, Mason transit authority, waterways, railroad lines
Waste Management	Wastewater Treatment Facilities, Stormwater Management Facilities, Solid Waste Facilities, Transfer Stations, Drop Box Stations, Reclamation Centers, recycling facilities, hazardous waste facilities, bio-solids treatment, Septage Stations, Septic Systems, Junk Yards
Water Resources	Snowpack, Reservoirs, Groundwater, Rivers and Streams, Water Supply Infrastructure, Individual wells, Water Reclamation Facilities, Community/HOA Wells
Zoning & Development	Residential Zoning, Tourism Zoning, Commercial, Agriculture Resource lands, Commercial Forest

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Climate Impacts

Mason County's community, economy, and environment are at risk of rising climate change impacts. Rising temperatures, shifts in rain patterns, increased wildfire hazards, and coastal erosion are some of the factors impacting residents' livelihoods, local infrastructure, and terrestrial and marine ecosystems. Understanding the impact of climate change on Mason County is necessary to improve resilience and safeguard human and environmental systems. This chapter examines the climate-exacerbated impacts that are affecting Mason County based on scientific data, local observation, and historic trends. Examining the impacts guides the determination of vulnerability and risk and informs policies that increase county's resilience to adapt and prosper under a changing climate.

A set of priority hazards was identified for Mason County. Those priority hazards are:

1) Drought
2) Extreme Heat
3) Extreme Precipitation
4) Flooding
5) Sea Level Rise
6) Earthquakes

Additional hazards were considered relevant and impactful for the county. Ocean acidification negatively impacts aquaculture, natural aquatic resources, and other tribal cultural assets within the County. This would negatively impact economic activity and opportunities for outdoor and nature recreation. Pandemics, pests, and pathogens were also identified as important and relevant hazards within the County, considering the aging population and large areas of forest lands that play a significant role in both the Ecosystem and Economic Development sectors. These hazards will be addressed within the umbrella of the six priority hazards identified above.

This section summarizes the projected impacts of the six priority hazards relative to the 11 sectors discussed earlier in this element.

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Drought

Drought occurs when long durations of below-average precipitation cause water shortages. In Mason County, drought is of specific worry to rural residents, agriculture, and forest ecosystems. Reduced rainfall and snowpack in the Olympic Mountains can limit water supplies for residential drinking water, irrigation, and hydroelectric generation. Dry conditions also increase the risk of wildfires, which can devastate forests and endanger homes and businesses.

Historical Occurrences of Drought

Mason County has experienced numerous drought episodes as part of statewide events. In the 1970s, the Pacific Northwest's worst drought on record occurred from 1976 to 1977, with precipitation far below average levels. This affected crop yields and caused ski resorts to close due to a lack of snow. Washington subsequently endured other severe droughts, including a state-declared drought emergency in 2001 amid a prolonged dry spell. A notable recent event was 2015's "snowpack drought,"

when winter precipitation was near normal but fell as rain instead of snow. The low level of mountain snowpacks led to record-low summer streamflow and a traditional precipitation shortfall, harming crops and fish and prompting emergency measures. In 2019, Washington's governor declared drought emergencies in nearly half the State, including in Mason County, due to very dry conditions[1]. More recently, 2021 brought the second-driest spring on record, followed by an unprecedented late-June heatwave, which further exacerbated drought impacts. By July 2021, 96% of Washington was under an emergency drought declaration.

While Mason County has never received a federal disaster declaration for drought, it has been affected by these significant regional droughts. Below is a graph from the US Drought Monitor showing the trend in drought level for Mason County from 2015 to 2022, with 2015 having a period of extreme drought in Mason County.

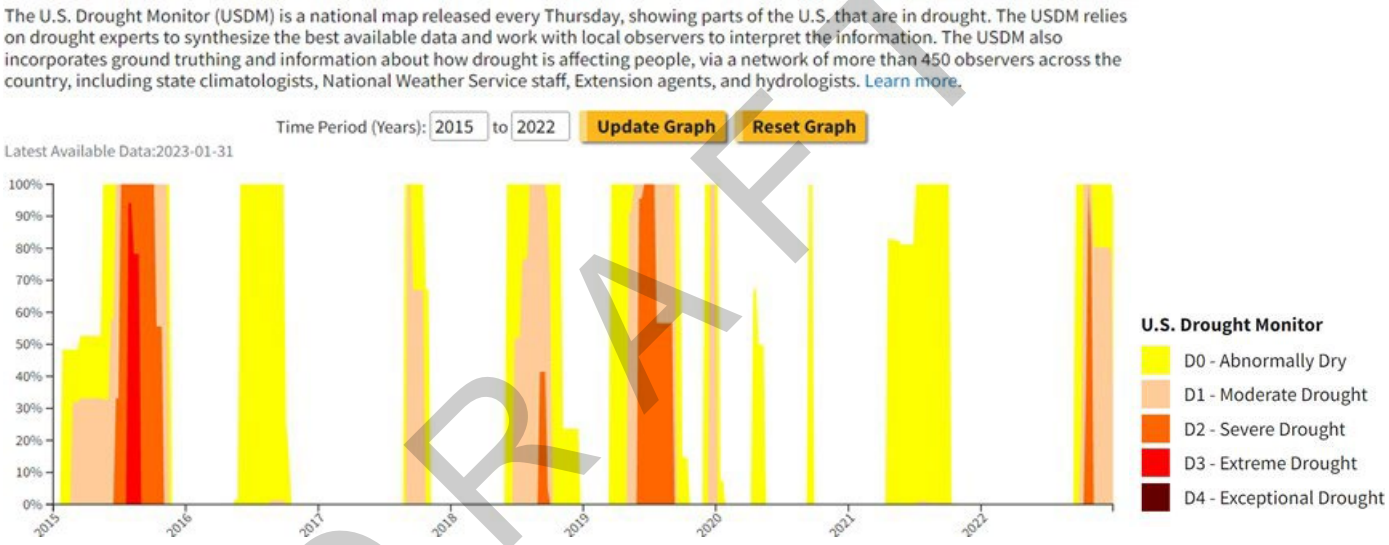

Figure 1: Historic Drought Conditions in Mason County from 2015 to 2022

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Future Drought Risk and Climate Outlook

Climate projections indicate increasing drought risk for Western Washington, including Mason County, as the environment warms. Summers are expected to become drier on average, with models projecting roughly a 14% decline in summer precipitation by the 2080s under moderate emissions scenarios. Warmer winter temperatures will mean more rain and less snow in the Cascades, reducing the natural storage of water as snowpack. Average spring snowpack in the region could decline by over 65% by mid-to-late century, even with low to moderate greenhouse gas emission projection scenarios. Less snowpack and earlier snowmelt lead to lower summer streamflow – a trend already observed, which in turn heightens summer water shortages. These changes are likely to increase the frequency and severity

[1] WA Department of Ecology <https://ecology.wa.gov/about-us/who-we-are/news/2019/may-20-inslee-expands-drought-emergency>

of droughts beyond historical ranges[2]. Mason County's Hazard Mitigation Plan acknowledges this outlook, concluding that some of the state's driest summers on record in recent years, coupled with rising temperatures, mean that "drought situations will only intensify" in the future.

Impacts on Agriculture, Water Supply, and Ecosystems

Droughts in Mason County can have wide-ranging impacts on agriculture, water resources, and local ecosystems. With insufficient rainfall, crop yields decline, and farmers may be unable to plant or harvest as usual, threatening the livelihood of farm owners, tenants, and laborers. Lack of soil moisture also increases vulnerability to pest infestations in crops and forests. Water supplies are strained during droughts, community water systems and wells face declining recharge, and irrigation for crops becomes limited.

In Mason County's watersheds, low summer flows and higher stream temperatures can be lethal to salmon and other wildlife, disrupting local ecosystems and fisheries. Streamflow drops to record lows, which is especially harmful to salmon and aquatic species that rely on cool water temperatures. Washington has seen fish runs suffer in drought years due to warming shallow streams.

Dry conditions also dramatically increase wildfire risk in the county's forests and rangelands. Vegetation becomes tinder-dry, leading to more frequent and intense wildfires, which is a dangerous compounding hazard during droughts. Additionally, Mason County's economy can be indirectly hit by drought: for example, hydroelectric power generation, which provides ~75% of Washington's electricity, is reduced when river levels fall, potentially raising electricity costs. Recreation and tourism may suffer as well with low lake levels, burn bans, etc., Prolonged drought can also lead to groundwater issues like land subsidence or saltwater intrusion in coastal wells as aquifer levels drop.

While droughts typically do not cause direct property damage or loss of life like a flood or storm would, their slow-onset, long-lasting nature means the economic and environmental toll can be very high, often accumulating silently over weeks and months. Below is a more detailed breakdown of all the sectors affected by drought and their impact or exposure in Mason County.

Sector	Drought Impacts/ Exposure
Agriculture & Food Systems	More frequent and severe droughts due to low summer precipitation will reduce the amount of water available for livestock and irrigation during the same time that warmer temperatures and longer growing seasons are expected to increase the demand for irrigation water.
Buildings & Energy	More frequent and severe droughts due to low summer precipitation will reduce the amount of hydro power generated.
Cultural Resources & Practices	Lower stream flows in summer are expected to reduce habitat quantity and quality for salmonids and other aquatic species that are culturally important to Northwest Tribes.

[2] Washington's Integrated Climate Strategy notes that climate change is pushing conditions "beyond their historical ranges," with drier summers and reduced snowpack emerging as clear trends consistent with more frequent drought conditions.

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Economic Development	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season, with adverse effects on the economy and character of some communities. Warm season outdoor recreation opportunities may increase, shifting tourism from one recreation sector to another and into different seasons.
Ecosystems	Less summer precipitation is expected to affect ecosystem types differently. In freshwater ecosystems, it will contribute to lower stream flows, reduced water quality, and increased water temperatures. In terrestrial ecosystems, it will contribute to drought stress and reduce the growth and productivity of some plants.
Emergency Management	More frequent and severe droughts due to low summer precipitation are expected to increase the need for emergency services to plan, prepare, and respond to water shortages.
Transportation	Reductions in snowpack have the potential to reduce snow-related road maintenance, road closures, and transportation delays. However, as more cold-season precipitation falls as rain rather than snow, transportation routes in mountainous areas may experience more damage from heavier winter rainfall and associated flooding, erosion, and washouts.
Water Resources	Less summer precipitation is expected to contribute to summer water shortages for commercial and residential uses. With less summer input and associated warmer water temperatures, water quality may also decrease. More frequent droughts caused by low snowpack are expected to reduce the water available in the warm season for commercial, residential, agricultural uses, and hydropower generation. Less streamflow in the warm season is expected to increase dependence on stored water and reduce water available for residential and commercial uses, as well as hydropower generation. During the same time period, warmer temperatures are expected to increase water demand and energy demand for cooling.
Zoning & Development	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season, which will have adverse effects on the economy and character of some communities. Warm-season outdoor recreation opportunities are expected to increase, shifting tourism revenue from one recreation sector to another.

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Extreme Heat

Extreme heat is defined as prolonged periods of unusually hot temperatures above historical averages. While the Pacific Northwest is renowned for its moderate climate, Mason County has experienced more frequent and intense heat waves in recent years. These events can be dangerous, particularly for the elderly, children, and individuals with pre-existing medical conditions. Extreme heat also strains local infrastructure, increasing energy demands for cooling and stressing water systems. Excessive heat can dehydrate plant life, too, making the area more susceptible to wildfire.

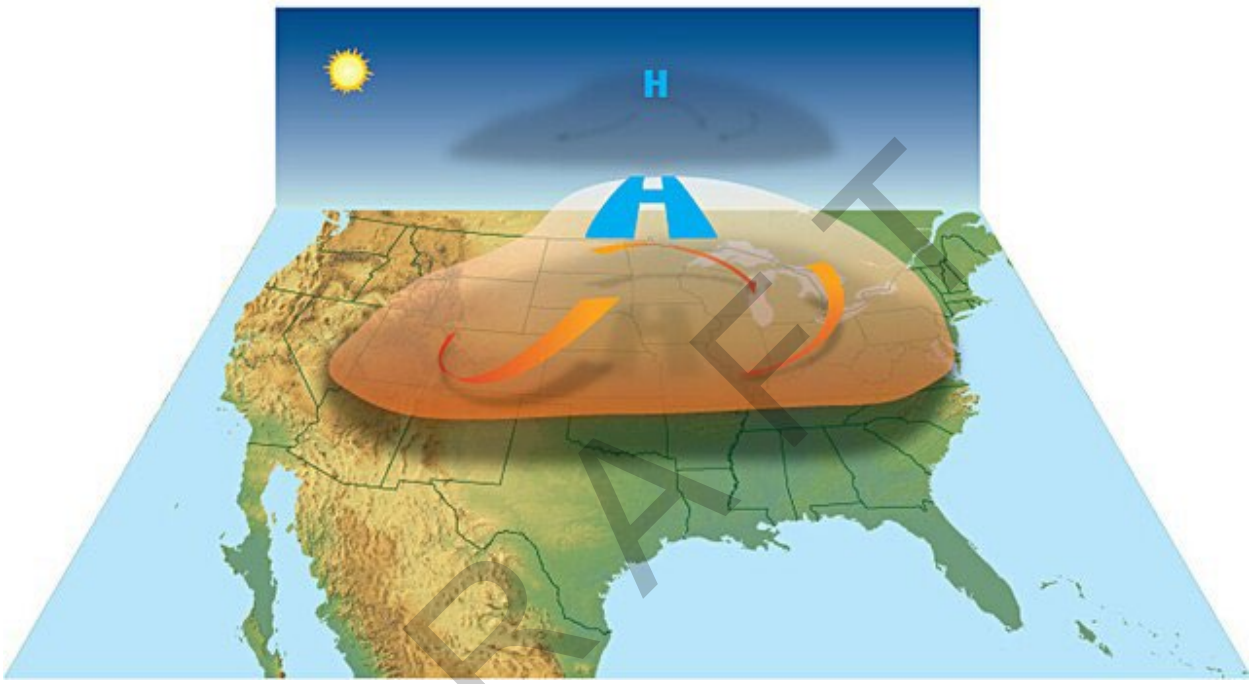

Figure 2: A high-pressure system in the upper atmosphere traps heat near the ground, forming a heat wave (This is an example of a heat wave in North America)

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Past Extreme Heat Events in Mason County

Historically, the Pacific Northwest's coastal climate has been mild, and extreme heat events were relatively infrequent in Mason County. However, recent years have seen record-breaking heat. The most dramatic was the late June 2021 heat wave, an unprecedented event that shattered all-time temperature records across Washington and Oregon. Over a four-day period (June 26–29, 2021), daytime highs soared well above 100°F – areas of western Washington that rarely exceed the low 90s saw readings up to 110°F. Mason County communities experienced similar extremes (many local thermometers registered highs in the 100–110°F range). This "heat dome" event had a devastating human impact, with about 140 heat-related deaths occurring in Washington State alone, with victims concentrated in the Puget Sound region. Most of those who died were elderly or lived in homes without air conditioning, illustrating the region's vulnerability when such anomalous heat events take place.

Prior to 2021, other notable heat waves did occur, albeit with less severity. For example, in July 2009 a heat wave pushed Seattle to 103°F (then, an all-time high for the city) and brought Mason County well into the 90s. Another hot spell in August 2016 saw several days of over 95°F in parts of western Washington. Yet those episodes pale in comparison to the magnitude and impacts of the 2021 heat wave, which has been described as a once-in-a-millennium event under past climate norms.

The 2021 event was so extreme that it exceeded the design limits of infrastructure (more on that below) and was one of the most intense heat waves ever recorded globally. It highlighted that even in a traditionally temperate region like Mason County, extreme heat can be a serious hazard. The figure below shows the annual average temperature in Mason County. The annual average temperature was the highest in 2020, and it is on a rising trajectory.

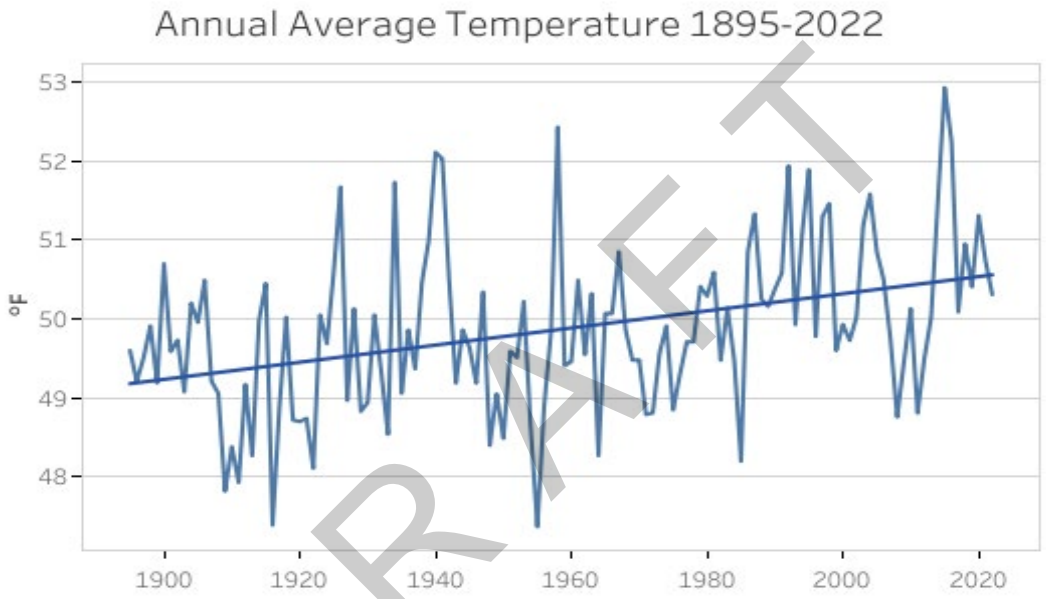

Figure 3: Annual Average Temperature Mason County, Office of the Washington State Climatologist, 2023

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Projected Changes Due to Climate Change

Climate change is expected to make extreme heat events more frequent and intense in the Pacific Northwest. All climate models for the region show a strong trend toward warmer temperatures in the coming decades, with more frequent extreme heat and far fewer extreme cold events. By the mid-21st century, what is considered a rare heat wave today may become relatively common. According to the University of Washington's Climate Impacts Group, average summer temperatures in Washington are projected to rise significantly, with overall warming of around 5°F by the 2050s under moderate to high emissions, and the hottest days will get hotter. This means Mason County will see a greater number of days above thresholds like 90°F or 100°F. The Washington Department of Health warns that without emissions reductions, by around 2050, an average year in Washington will be warmer than the hottest year observed in the 20th century.

Heat waves are also expected to last longer. What might have been a one- to two-day unusual hot spell in the past could persist for a week or more in the future, increasing health risks, especially for

vulnerable communities. Evenings and nights are also projected to be warmer, reducing the critical relief that cooler evenings typically provide during heat waves. Overall, Western Washington's climate is shifting, and extended periods of extreme heat are more likely.

Scientists project not only higher mean temperatures but also an uptick in the occurrence of high-impact heat waves – the kind that historically might occur once in several decades – happening much more often. For example, an analysis by the Climate Impacts Group found that in King County, the number of days per year above 90°F could double or triple by the 2050s, depending on the emissions scenario. Mason County, with slightly more inland geography in parts, could see similar increases in hot summer days.

It is important to note that baseline warming raises the floor for extreme heat: even without a specific heat wave, summers will generally be hotter. The state Health Department notes Washington summers are already getting longer and more dangerous, and the number of very hot days will rise statewide. Thus, Mason County should prepare for both more frequent heat waves and overall hotter summer conditions due to climate change.

Vulnerabilities in Population and Infrastructure

Health and Population Vulnerabilities

Extreme heat poses significant health risks, and certain groups in Mason County are especially vulnerable. These include older adults (seniors 65+), young children, people with chronic illnesses, and those who cannot easily escape the heat, such as outdoor workers and unhoused people. Mason County has a relatively high proportion of elderly residents, which elevates health concerns related to heat. Seniors are less able to regulate body temperature and often live alone, so they face a higher risk of heat stroke or dehydration. Low-income individuals and those experiencing homelessness are also at high risk, as they may lack access to air-conditioned spaces. Outdoor workers (loggers, construction crews, farm workers) are another vulnerable group; performing heavy labor in high heat can lead to heat exhaustion or worse, and statewide data have shown increased emergency calls for outdoor laborers during heat waves.

During the heatwave of 2021, many of the deceased were found in homes without air conditioning. Historically, Pacific Northwest homes did not need air conditioning, so the housing infrastructure is ill-equipped for such heat events. Mason County's Hazard Mitigation Plan notes that many older residential structures lack cooling or even modern ventilation systems. This lack of cooling infrastructure contributed to the high death toll in 2021.

During extreme heat, public health emergencies can occur which increases hospital admissions for heat-related illnesses, exacerbates heart and respiratory conditions, and even increases mortality. For example, a study in King County found that during extreme heat events, deaths increased by 10% compared to normal. Heat is the number one cause of weather-related deaths in the U.S. over the long term, surpassing floods, which underscores the need to take these vulnerabilities seriously[3].

[3] Adams-Fuller, Terri. "Extreme Heat Is Deadlier Than Hurricanes, Floods and Tornadoes Combined." Scientific American, July 1, 2023. <https://www.scientificamerican.com/article/extreme-heat-is-deadlier-than-hurricanes-floods-and-tornadoes-combined/>

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Infrastructure Vulnerabilities

Extreme heat also puts stress on infrastructure and utilities in Mason County. High temperatures can damage transportation infrastructure. Prolonged heat can soften roadways and buckle pavement. During the June 2021 heat wave, sections of Interstate 5 in WA buckled and had to be closed for repairs. Mason County's roads, like US Highway 101 or local asphalt county roads, are built for a temperate climate, and they may deteriorate faster with repeated 100°F days as asphalt and concrete expand. Additionally, road asphalt and roofing materials experience accelerated wear and tear in extreme heat, potentially shortening infrastructure lifespans.

Rail lines and bridges can also be affected during heatwaves. Steel rails can warp in extreme heat, and in the broader region, some rail services were suspended in 2021 to avoid accidents. Power and telecommunication infrastructure face overload and physical stress. Electrical demand spikes sharply as more people use air conditioning. This can strain the grid and lead to brownouts or failures if capacity is exceeded. Heat also reduces the efficiency of power transmission lines and transformers, which can overheat. In some cases, equipment can melt. For example, in Portland, OR, the extreme heat from the 2021 event melted streetcar power cables and warped utility lines, knocking out transit service. Similar effects could conceivably happen in Mason County's electrical distribution system during a severe heat wave, potentially causing power outages at the worst time when air conditioning is needed most.

The impact of a heatwave on water infrastructure is another concern. Drought and heat combined can warm the reservoir and distribution water, sometimes necessitating treatment adjustments. Higher temperatures can also increase demand for drinking water. Mason County's largely rural setting means many homes rely on wells and septic systems. Drought and heat can lower water tables and dry out soils, causing septic drain fields not to function optimally. Even the natural environment that provides services (like forests that normally keep watersheds cool) can suffer; extreme heat can raise river and lake temperatures, lowering dissolved oxygen and stressing fish populations. This can, in turn, impact fisheries and water quality for infrastructure that relies on cool water temperatures.

Below is a more detailed breakdown of all the sectors that are affected by extreme heat and the impact or exposure they experience in Mason County.

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Sector	Extreme Heat Impacts/ Exposure
Agriculture & Food Systems	Warmer summers are expected to increase the potential for heat stress on some crops and livestock and decrease crop yields. Some agricultural pests are expected to have greater survival rates and population size with warming. Warmer summer temperatures are expected to increase the demand for irrigation water.
Buildings & Energy	A decrease in heating degree days is expected to reduce energy demand for heating. This has the potential to reduce energy costs for businesses and residents, but it also decreases utility revenue to support infrastructure and operations.

Cultural Resources & Practices	Warmer stream temperatures are expected to reduce habitat quality for salmonids and other aquatic species that depend on cold water. This reduces the abundance of and access to these culturally important species for Northwest Tribes.
Economic Development	Warmer summer temperatures could decrease opportunities for warm-season recreation activities in some areas and increase them in others.
Ecosystems	Warmer summers are expected to reduce summer soil moisture and increase physiological stress for some plants and animals. Warmer summer temperatures are expected to reduce tree growth and forest productivity in some areas and increase growth and productivity in mild climates. Outbreaks of some forest pests, such as mountain pine beetles, are expected to increase.
Emergency Management	More frequent extreme daytime heat events are expected to increase the demand for emergency services to plan, prepare, and respond to human health impacts. Extreme heat may also impact emergency services due to transportation and travel disruptions, such as warped and buckling pavement on roads.
Health & Well-being	Warmer summers are expected to increase concentrations of air pollutants, such as ozone, and some vector-borne illnesses, such as West Nile virus.

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Extreme Precipitation

Extreme precipitation is unusually heavy rain or snowfall over a short period, which can overwhelm natural and human-made drainage systems. The climate of Mason County, because of its proximity to the Pacific Ocean and the Olympic Mountains, makes it susceptible to atmospheric rivers—weather systems that produce heavy rain. These events can lead to landslides, floods, erosion, and road washouts, which can cripple transportation and place residents at risk. Rural areas without stormwater management infrastructure are particularly at risk of localized flooding and property damage.

Historical Extreme Precipitation Events

Mason County is no stranger to extreme precipitation events. The county frequently receives heavy rainfall from Pacific storms, especially atmospheric rivers[4]. Several historical events stand out:

November 1990 Thanksgiving Floods: Over Thanksgiving weekend 1990, an atmospheric river brought 8 to 15 inches of rain in just a few days to Western Washington. Mason County was hit hard – the deluge caused severe flooding and road washouts. In the Skokomish Valley (a flood-prone area of Mason County), residents had to be evacuated as floodwater rose, numerous homes were inundated, and several others were left extensively damaged or uninhabitable. A bridge over Mission Creek was destroyed, and county road damage exceeded $250,000. This event was part of a federally declared disaster for severe storms and flooding, and it demonstrated how a multi-day rain event can overwhelm local rivers and drainage systems.

Winter 1996 – 1997 Floods: The winter of 1996-97 brought a notorious sequence of snow and rain. After heavy snowfall in December, a week of torrential rain in March 1997 led to flooding and numerous landslides in Mason County. Multiple roads were closed, and at least five homes had to be evacuated due to landslide threats on waterlogged slopes. Statewide, the damage was in the tens of millions of dollars. An earlier event in February 1996 had similarly caused widespread flooding in the region, though Mason County's worst impact came in 1997.

December 2007 "Great Coastal Gale": In early December 2007, a powerful storm slammed into the Washington coast with high winds and extreme rainfall. Mason County received torrential rains that led to the flooding of U.S. Highway 101 under four feet of water north of Shelton. This storm caused landslides and debris flows in the Hood Canal area. The Hoodsport to Lilliwaup stretch of Highway 101 saw hillsides give way, dumping mud and rocks on the road. The December 2007 event was so severe that parts of Mason and neighboring counties were isolated for days. This was a federally declared disaster (DR-1734) and highlighted the vulnerability of transportation routes to extreme rainfall.

December 2015 Rains: In early December 2015, an atmospheric river event caused widespread flooding across Western Washington, including Mason County. Roads and some homes flooded

[4] Atmospheric Rivers are long plumes of moisture that can dump enormous amounts of rain in a short time.

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(e.g., the Skokomish River overflowed its banks), and a federal disaster was declared in early 2016 for the storm damage.

January 2022 Rains: More recently, in January 2022, an atmospheric river following a snowstorm led to severe flooding in neighboring counties (such as the Thurston and Lewis counties). Mason County saw road flooding and some bridge damage, though it escaped the worst compared to counties to the south. Nonetheless, these events underscore a pattern: extreme precipitation tends to occur in Western Washington in the fall and winter, often causing flooding and landslides in Mason County. The county's hazard records show that large flood events with heavy rain have occurred roughly 10 times between 1956 and 2022, or about once every 6–7 years on average.

In summary, Mason County's history includes multiple occasions where extraordinary rainfall, sometimes several inches per day, led to significant natural disasters. The Skokomish River, the county's largest river, frequently floods when heavy rains fall on already-saturated ground or snow-laden mountains. Likewise, Mason's steep slopes and logged hillsides are susceptible to landslides when rainfall intensity and duration exceed certain thresholds[5]. The pattern of these past events shows the dual threats of flooding and landslides that come with extreme precipitation.

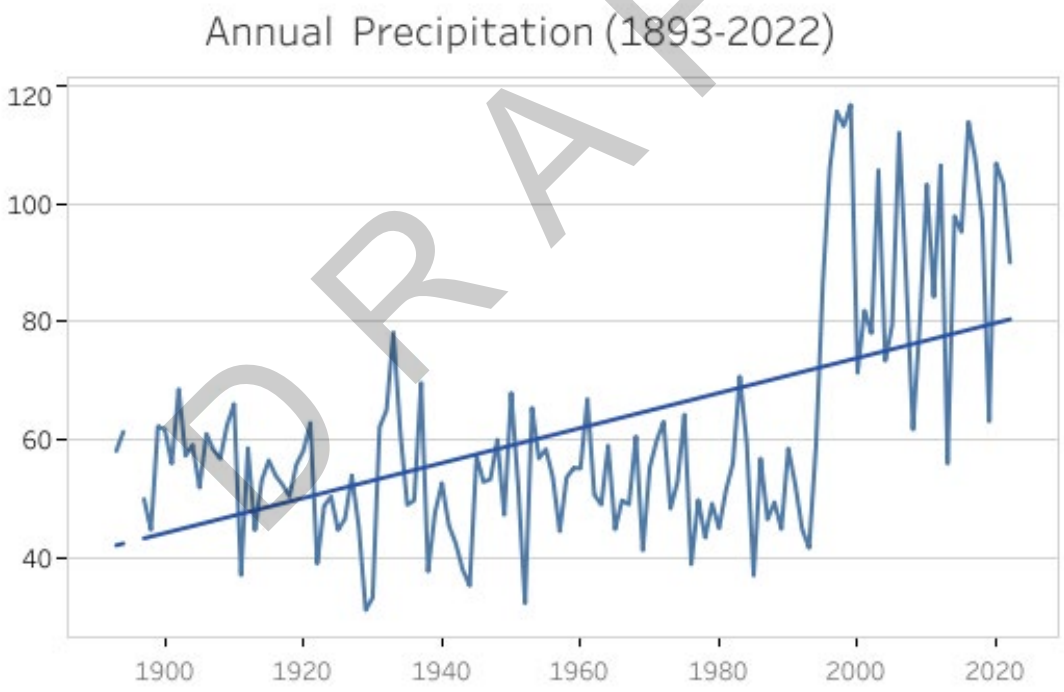

Figure 4: Annual Precipitation in Mason County, Office of the Washington State Climatologist, 2023

[5] For instance, a USGS study found that in the Puget Sound region, 3.5–5+ inches of rain in 3 days can trigger landslides in wet soil.

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Future Trends: Climate Change and Heavy Rainfall

As the climate warms, there is an expectation of more frequent and severe heavy precipitation events in our region. While total annual rainfall in the Pacific Northwest may not change dramatically, scientists project that rainfall will come in more intense bursts when it does occur. A warmer atmosphere holds more moisture; hence, storms can dump more rain. The University of Washington projects that heavy rainfall events are likely to become more intense in the coming decades. Even if the number of storm days doesn't increase greatly, the rainfall extremes (top 1% events) could carry substantially more water. Observations already suggest an uptick in the frequency of very heavy rain events in the Pacific Northwest over the past half-century.

For Mason County, this means future fall and winter storms could produce greater downpours than those in the past, increasing the risk of flash flooding. Climate models indicate that, especially under higher emissions scenarios, the most extreme 24-hour and multi-day rainfall events could intensify in the mid-to-late century. One study noted that by the late century, if global warming continues unabated,Western Washington might see atmospheric river storms with 20–40% more rainfall in them than today's storms. Additionally, because winters are projected to get warmer, more precipitation will fall as rain rather than snow, even in the mountains. This means that winter rain-on-snow flood events could become more frequent in transient basins.

The State's climate assessment found that flood risk is increasing in rain-dominated and rain/snow mix watersheds in western Washington. Warmer winters have already led to more winter flooding in those areas. As the climate continues to warm, flood frequency is projected to increase in January to March, when major rainstorms are likely to occur, and perhaps decrease in late spring (April and May) because the snowpack will have already melted by then.

Natural variability like El Niño or La Niña will still play a role, causing wetter or drier seasons in any given year. But the underlying trend is toward greater extremes. Mason County might not necessarily get more days of rain per year, but when it does rain, the volumes could be higher. The implication is that what is considered a "100-year storm" today might become more frequent by mid-century. This poses a challenge for infrastructure design, such as culverts, storm sewers, and bridges, which were built for past climate norms. The county's Hazard Mitigation Plan explicitly notes that while average precipitation changes are uncertain, the intensity of extreme rainstorms is expected to rise, necessitating updates in planning and engineering standards.

In summary, Mason County should prepare for a future where extreme precipitation events are a bigger risk; events such as heavy rainfalls that are more intense than historical records, more frequent flooding episodes in winter, and a higher occurrence of back-to-back storms that keep soils saturated – a prime condition for landslides. These projections underscore the importance of enhancing flood management and landslide mitigation efforts in a changing climate.

Impacts on Transportation, Infrastructure, and Landslide Risk

Extreme precipitation can have immediate and severe impacts on transportation and infrastructure in Mason County. As seen in past events, heavy rainfall leads to flooded roads, bridge failures, and landslides.

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Transportation Impacts

Many of Mason County's key transportation corridors run along rivers or near steep slopes (e.g., Highway 101 skirts along Hood Canal and the Skokomish Valley). In major rainstorms, these routes are prone to closure. Floodwater can inundate highways. For example, the December 2007 storm submerged Highway 101 under several feet of water, effectively cutting off the main north-south route on the Olympic Peninsula. Such closures not only isolate residents and disrupt travel, but they also hamper the delivery of emergency services.

Roadbed saturation can cause the pavement to crack or wash away. During extreme rain, culverts and storm drains may be overwhelmed by the volume of runoff and debris, leading to washouts. Mason County has experienced numerous instances of roads being undermined or covered by mud. For example, county roads in the Skokomish Valley and along Goldsborough Creek have washed out during heavy rains, requiring expensive repairs.

The 1990 flood damaged a bridge in Mason County, illustrating infrastructure vulnerability. Additionally, intense rain can cause urban flooding in areas like Shelton if stormwater systems back up. Intersections can turn into lakes, affecting homes and businesses. Power and communications infrastructure can be impacted as well. Flooded electrical substations or downed lines, from falling trees in storm-soaked ground, have caused power outages during past storms.

Increased Landslide Hazard

Perhaps the most acute hazard from extreme precipitation in Mason County is landslides. The county's terrain includes steep hills and bluffs, and many slopes consist of glacial soils that can become unstable when saturated. Heavy rainfall, especially if it falls on ground that is already wet from prior rain, greatly increases landslide risk. It is documented that Mason County sees some form of a landslide almost every year, often triggered by winter storms. In some major storm events, more than ten separate landslides have been recorded across the county. For instance, in the 1996-97 rainy period, multiple landslides shut down roads. In January 1997 alone, Mason County reported at least eight landslides that blocked highways or local roads, including along Highway 106 and 101.

The Hazard Mitigation Plan notes that 11 federal disaster declarations since 1956 have included landslides or mudslides in Mason County, invariably in conjunction with severe storms. Common problem areas are the bluffs along Hood Canal and steep valleys in the southern Olympics foothills. Landslides can range from shallow mudslides that cover roadways to deep-seated slope failures that can destroy homes. An example of the latter occurred in 1999 when a saturated hillside gave way near Hoodsport, destroying a section of the roadway. Landslides not only threaten life and property directly but can also have cascading effects, blocking streams (creating potential flood bursts if debris dams break) and increasing sediment in rivers, which can then worsen flooding by reducing channel capacity.

Infrastructure Strain

Extreme precipitation events test the limits of infrastructure like dams, levees, and drainage systems. Mason County isn't heavily dam-controlled, but nearby reservoirs, like Cushman Dam in Jefferson County to the north, must carefully manage releases during big rains to avoid exacerbating flooding downstream. Levees along the Skokomish River and other streams have at times been overtopped or damaged in heavy floods. Aging levee structures may not be adequate for future flood levels.

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Stormwater infrastructure in towns, such as drains and retention ponds, might prove undersized for future downpours, leading to more frequent flood incidents. There's also an impact on water quality: extreme runoff can overwhelm sewer systems and water treatment plants, causing contamination events. For example, Shelton's wastewater plant must occasionally bypass excess flows during huge storms to prevent sewage backups.

Below is a more detailed breakdown of all the sectors that are affected by extreme precipitation and the impact or exposure they experience in Mason County.

Sector	Extreme Precipitation Impacts/ Exposure
Agriculture & Food Systems	Heavier precipitation is expected to increase flooding and inundation of agricultural lands, which can delay spring planting, affect crop quality and quantity, increase erosion and runoff, and increase susceptibility to root diseases.
Economic Development	Heavier precipitation is expected to increase the extent of flooding in low-lying areas and flood zones. Businesses are expected to have more disruptions to operations and damage to infrastructure.
Emergency Management	Heavier precipitation has the potential to increase the demand for emergency response services by intensifying flood events and increasing other emergencies associated with heavy precipitation.
Transportation	Heavier precipitation events are expected to intensify flooding, landslides, and erosion, which can interrupt transportation routes, damage infrastructure, and increase maintenance and repair costs.
Waste Management	Heavier precipitation has the potential to increase storm damage to infrastructure and generate more waste and debris. More waste will strain municipal cleanup and refuse capacity.
Water Resources	Heavier precipitation events are expected to carry debris and pollutants into water streams, impacting water quality.
Zoning & Development	Heavier precipitation events are expected to intensify urban flooding and demands on stormwater systems, which can affect zoning restrictions on new buildings and require revised building codes for development in more frequently flooded areas.

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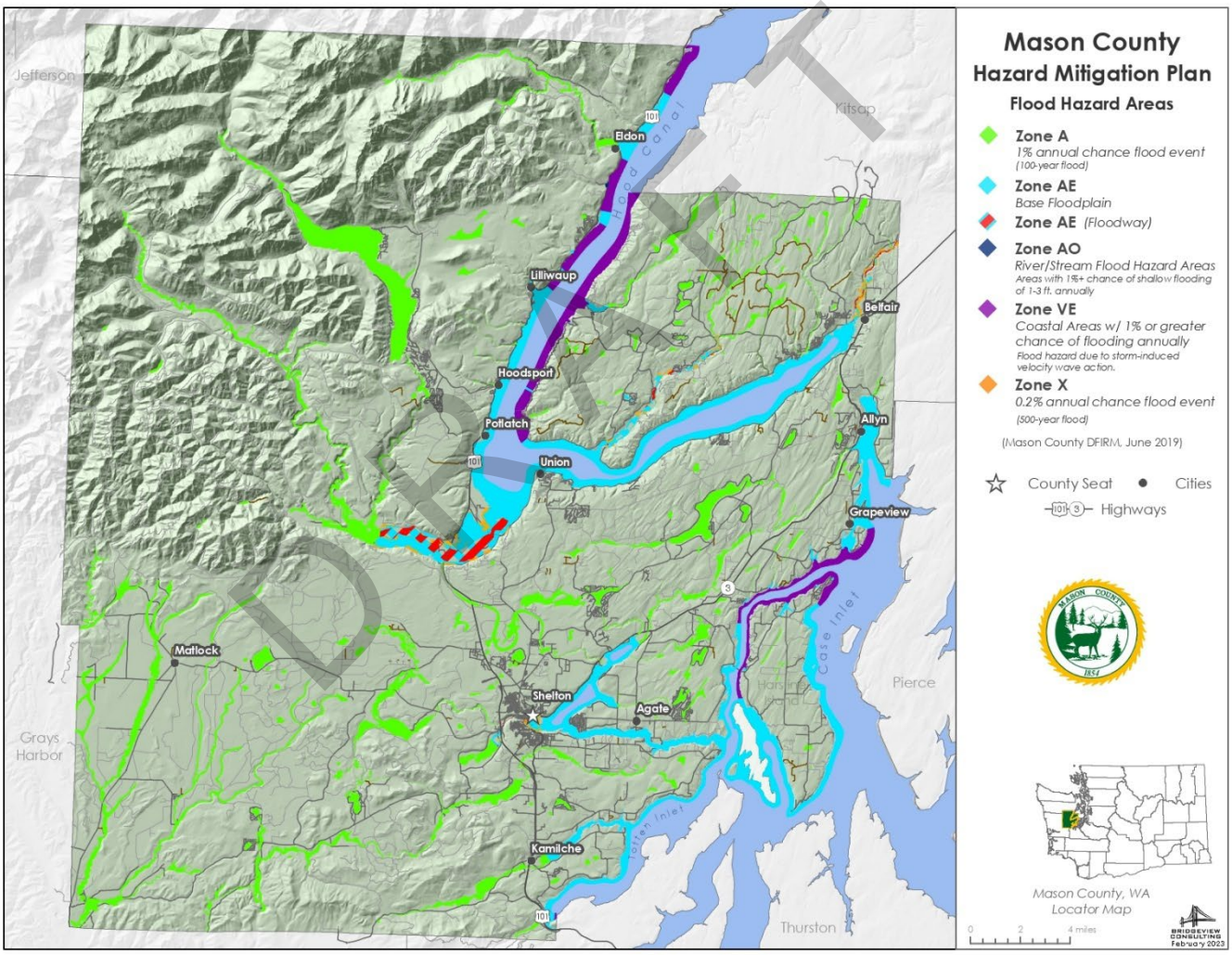
Flooding

Flooding is caused by rising water levels and overwhelming land that is usually dry. Mason County is vulnerable to numerous types of flooding, including riverine flooding from swollen streams and rivers, flash flooding from heavy rainfall, and coastal flooding from storm surges and high tides. The Skokomish River, one of the most flood-prone rivers in Washington State, routinely overflows its banks and affects nearby communities, agricultural lands, and roadways.

Flooding can be ruinous to homes, businesses, and public infrastructure while endangering human life. Enhanced floodplain management and emergency response planning are essential to reducing the impact of these events. Below is a map of the flood hazard areas in Mason County, with several areas situated in Zone A.



Flood Hazard Areas in Mason County (2023 Hazard Mitigation Plan)

Major Past Flooding Events in Mason County

Mason County experiences flooding regularly, with varying magnitudes from minor high-water events to major inundations. Several major floods in the past century have caused significant damage:

Skokomish River Floods: The Skokomish River basin, which drains a large portion of the southeast Olympics, is infamous as one of the most flood-prone rivers in Washington. It frequently overtops its banks during winter rains. Major Skokomish floods occurred in 1975, 1990, 1996-97, 2003, 2007, and other years. In the record 1975 event (Disaster 492), the Skokomish Valley saw numerous levee failures, many homes with water damage, and evacuations by boat. Total private and farm damage was estimated at $300,000 (in 1975 dollars). The November 1990 flood was also largely a Skokomish River event, where several homes in the valley were destroyed or made uninhabitable, and dozens of people were evacuated. Residents of the Skokomish Valley have come to expect almost annual flooding. The repetitive nature of the Skokomish floods has led to numerous mitigation projects.

Coastal Flooding Events: Mason County has a marine shoreline along Hood Canal and south Puget Sound, which makes it susceptible to coastal flooding under certain conditions. Coastal flooding in Mason County is typically caused by a combination of storm surges and high tides during winter storms. One notable event was in December 2012, when a strong windstorm coincided with a king tide, causing tidewater to flood in low-lying areas like Allyn and Shelton's Oakland Bay waterfront. Similarly, in January 2021, a storm pushed Hood Canal about one to two feet above normal high tide, flooding some yards and roads in Union and along Highway 106.

While Mason County's coastal floods tend to be localized in pockets of inundation rather than a countywide disaster, they can still impact homes, marinas, and infrastructure on the fringe of the sound. Coastal flooding is different from river flooding, and it is driven by ocean water levels rather than watershed runoff; however, Mason County faces both. Low-lying neighborhoods like Shelton's downtown and the Skokomish Reservation near the mouth of the Skokomish River are vulnerable to tidal backwater flooding. There have been few federally declared disasters solely for coastal flooding, but these events are expected to worsen with sea level rise.

Urban/Flash Flood Incidents: Mason County's smaller creeks and urban areas have seen flash floods during intense downpours. For instance, in October 2015, a thunderstorm dumped several inches of rain over Shelton in a short time, temporarily overwhelming street drains and flooding basements in some businesses. Similarly, the March 1997 rain event involved flooding not just the Skokomish River but also local streams with torrential rain, which led to road closures across the county. This indicates that multiple creeks jumped their banks or had culvert washouts. Urban flooding is often compounded when debris clogs storm drains, and Mason County has learned to clear debris from drainage systems when heavy rain is forecasted, but in extreme cases, the sheer volume of water can overwhelm the systems, flooding intersections and parking lots.

Overall, flooding in Mason County has multiple causes, and past events often saw a combination of types. For example, in December 2007, there was riverine flooding (Skokomish River), coastal flooding (Hood Canal storm surge), and extensive hillslope runoff causing flash floods. The largest flood events in

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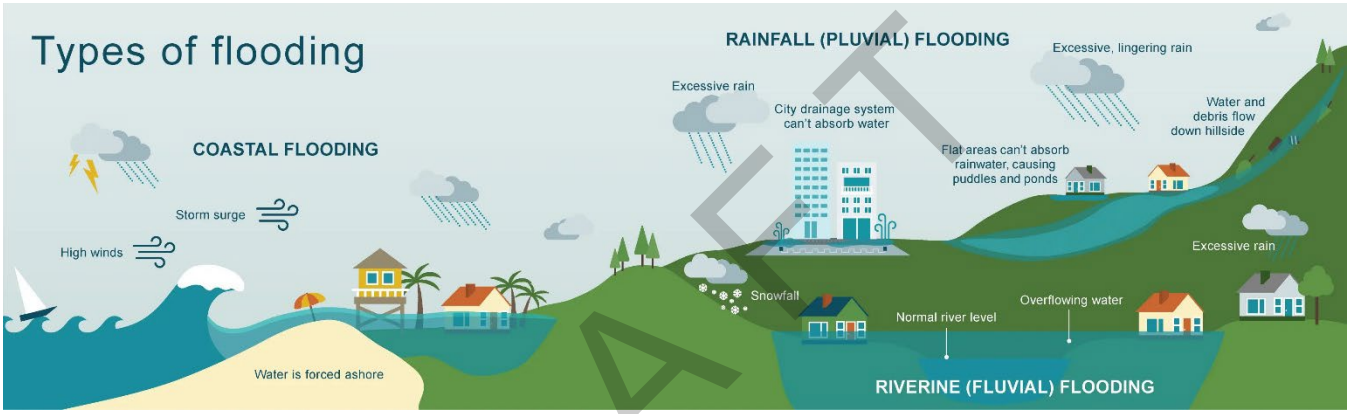
the county's history (like 1975, 1990, 1996, 2007) caused millions of dollars in damage, destroyed homes, and prompted federal disaster declarations. Statistically, from 1956 to 2022, there were about ten major flood events causing property damage in Mason County, which equates to roughly a 15% chance of a significant flood in any given year. This frequency underlines that flooding is not a rare or isolated hazard in Mason County; it poses a regular and serious threat.

Causes of Flooding: Riverine, Coastal, and Urban

The image below shows the different types of flooding. Mason County is primarily affected by two of these: coastal flooding and riverine flooding. To a lesser extent, the county is also affected by urban and small-stream flooding. Mason County faces several types of flooding, each with distinct causes.



Riverine Flooding

This is the most common and damaging form in Mason County, caused by rivers overflowing after heavy rain or snowmelt. The Skokomish River is a prime example. It drains steep, rain-soaked mountains, and its channel has been filled with sediment over time, reducing its flow capacity. When prolonged rain falls, the Skokomish swells and spills into the broad valley. Other rivers and streams in Mason County that flood include the Union River (affecting Belfair), Goldsborough Creek (through Shelton), and the Tahuya River.

Riverine floods typically occur in fall and winter when Pacific storms bring intense precipitation. They can last days up to a week as the water moves through the watershed. The 1996-97 floods were classic rain-on-snow riverine floods where a warm rain rapidly melted mountain snowpack, sending a torrent down the rivers. Riverine flooding in Mason County causes widespread inundation of lowlands, agricultural fields, and residential areas near rivers. Because of the accumulated sediment and gravel in some riverbeds (notably the Skokomish), even moderate rains can now cause flooding. The river has effectively lost some of its channel depth due to past logging and natural aggradation. This has increased the frequency of moderate floods in the county.

Coastal Flooding

Coastal flooding in Mason County occurs along Hood Canal and Puget Sound shorelines when high tides combine with storm effects. A storm surge is a rise in water level above the normal tide, driven by low atmospheric pressure and strong onshore winds. Hood Canal, being a long, narrow fjord, can experience

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oscillation that amplifies high tides during windstorms. In Mason County, places like Allyn, Shelton's Port area, and lower Union can experience saltwater flooding. Coastal floods often coincide with winter storms (November to January) when king tides occur. The impacts are typically short-term flooding of roads, yards, and sometimes structures located at the water's edge.

Coastal flooding doesn't usually extend far inland because Mason County's shores rise to bluffs and hills relatively quickly. However, in a King Tide event of January 2022, water encroached onto State Route 3 in Allyn and came within inches of entering some buildings. Coastal flooding also causes coastal erosion. Waves during high-water events can scour away at bluffs or beaches, undermining properties. It is important to note that with the expected sea level rise, these coastal flood events will become more frequent and severe (discussed more in the next section). For now, coastal flooding remains a periodic but significant hazard for Mason County's coastal communities.

Urban and Small Stream Flooding

Heavy localized rain can overwhelm urban drainage or cause small streams to flash flood. In Mason County, the urban footprint is small (Shelton and a few towns), but these areas have drainage systems that can back up. During extreme downpours, street flooding can occur when storm drains can't keep up. Also, small streams that aren't usually problematic – seasonal creeks or drainage ditches – can rapidly rise. This kind of flooding is typically flashy (fast onset, fast recession) and linked directly to short-duration cloudbursts or thunderstorms. For instance, a summer thunderstorm in July 2021 caused portions of US 101 to have standing water because the intense rain burst simply exceeded drainage capacity. The damage from urban flash floods is usually limited (a few flooded basements, stalled cars, etc.), but if the water concentrates, it can tear out sections of road or culvert. Mason County also has extensive logging roads and forest lands with heavy rain which can turn logging road culverts into blowouts, sending water and debris down onto public roads below. In recent hazard planning, the county considers "shallow flooding" as another category, which refers to inundation by direct rainfall or poor drainage rather than overflowing a river channel. Shallow urban flooding is an increasing concern as heavier downpours become more likely with climate change.

In many flood events, these causes overlap. For example, a strong storm can cause riverine flooding *and* coastal flooding simultaneously (high river flows meeting a high tide can back water up, worsening both). In 1990 and 1997, saturated ground led to both widespread river flooding and numerous landslides, so flooding and landslides were intertwined hazards. Mason County must approach flood preparedness by considering all sources: from the mountains to the sea to the storm drains on Main Street.

Future Flood Risk Projections

Looking ahead, flood risk is expected to evolve and, in some respects, worsen for Mason County. Climate projections, as discussed, indicate more intense winter rainfall and continuing sea level rise – both factors that heighten flood risk.

For riverine flooding, one key projection is that winter and early spring floods will become more frequent. As warmer temperatures cause more precipitation to fall as rain rather than snow, especially in mid-elevation basins, the classic scenario of heavy rain on snowpack, causing sudden melts, could become more common in December–February. The Climate Change Impacts Assessment for

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Washington projects that flood frequency could increase steadily from the 2020s through the 2080s in many western Washington watersheds. Specifically, model simulations suggest that what's currently considered a 100-year flood on some rivers might occur on the order of every 50 years or even more often by the late century, under high emission scenarios. Western Washington basins that are rain-dominated (like the Skokomish) or rain/snow mix (like the upper Skokomish, which historically had snow that's now turning to rain) are already seeing rising flood trends.

The WA Department of Ecology notes that flood risks are increasing primarily in warmer basins and less so in cold, snowpack-dominant basins. Mason County falls in the former category. So, it can be anticipated that a given storm in the future might produce a higher flood crest on the Skokomish than a similar storm would have 50 years ago, due to the baseline shifts (e.g., already higher winter streamflows, more saturated soils, etc.). The county's flood planners are therefore using climate-informed maps that look at how 2°C or 4°C of global warming could expand to local floodplain extents.

Coastal flood risk is unequivocally increasing because of sea level rise (SLR). Even in the absence of changes in storms, rising sea levels mean tides and storm surges will reach higher elevations. The Puget Sound has been rising at a rate of about one inch per decade at the Seattle tide gauge. Projections for the region suggest roughly a foot of sea level rise by 2050 and between two and five feet by 2100 (the range depends on emission scenarios and ice sheet behavior). Mason County's Hood Canal coast will likely mirror Seattle's rise, potentially slightly less if there's local land uplift, or slightly more if local subsidence occurs.

The Washington Coastal Resilience Project in 2018 provided localized SLR projections; for Shelton's Oakland Bay, the likely rise by 2100 is on the order of two feet (with a low-end of around one foot and a high-end of three feet for moderate emission scenarios). If polar ice loss accelerates, higher rises in sea level are possible. The implication for flooding is that coastal inundations that barely occur now will become a regular occurrence. For example, a present-day 100-year coastal flood might become an annual high tide event by 2100. In the nearer term, by the 2040s or 2050s, Mason County could start to see "sunny day" tidal flooding in low areas, where no storm is present, but an unusually high tide coupled with sea level rise causes water to encroach on streets or yards. Indeed, periodic floods are expected to pose a greater risk in the next few decades than permanent inundation, but eventually, permanent loss of some low-lying land is possible if sea levels continue to rise.

Overall, future flood scenarios for Mason County point toward: more frequent moderate floods, potentially more extreme floods, and new areas at risk, especially along the coast as sea level rises. Improved forecasting through weather and streamflow models will give better warnings, but the physical challenge remains. The county's flood mitigation planning incorporates these projections, using FEMA's climate-informed science to update flood insurance rate maps and consider higher freeboard requirements (extra margin in building elevation) for new construction in flood zones.

The recognition is clear: climate change is expected to increase Mason County's flood hazard over time, and proactive measures are needed to counteract that trend. The table below shows both the County's population and acres that are exposed within Flood Hazard Areas.

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Population Exposed within Flood Hazard Areas		
Jurisdiction	Population in the 1% annual chance event (100-year) Flood Boundary	Population in the 0.2% annual chance (500-year) Flood Boundary
Unincorporated Mason County	1,818	742
Shelton, City of	486	512
Allyn	0	0
Belfair	22	0
Total	2,326	1,254

Based on 2017 Assessor's data for residential structures within the 100-year and 500-year floodplains and an estimate of 2 persons per residential structure

Acres in 100 and 500-Year Flood Hazard Areas for Jurisdiction's Boundary					
Flood Zone	**Mason County, WA**	**Unincorporated Mason Co.**	**City of Shelton**	**Town of Allyn**	**Town of Belfair**
100 Year Flood Zone - *(Includes Zones A, AE, AH, AO, VE)*	37,458	*37,161.0*	*186.9*	*85.5*	*24.4*
500-Year Flood Zone	247	*223.6*	*22.0*	*0.0*	*1.2*

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Impacts on Homes, Businesses, and the Local Economy

Flooding in Mason County has repeatedly demonstrated its capacity to damage homes and businesses and disrupt the local economy.

Residential Impacts

In major floods, dozens of homes can be inundated. Floods damage not only structures (ruining foundations, walls, electrical systems, etc.) but also personal property and vehicles. For instance, the 1990 flood left several homes in the Skokomish Valley so badly damaged that they were declared uninhabitable. Families in those homes had to be relocated, some permanently. Even shallow flooding of a few inches can necessitate expensive repairs (drywall removal and mold remediation). In Mason County's flood-prone areas, many houses are now elevated on stilts or built on berms resulting from past inundations, and those that aren't elevated face repetitive losses. Beyond direct damage, there's the emotional toll of displacement. Flood evacuees may be out of their homes for weeks or months. Floods have also claimed lives in the broader region (two deaths statewide in the 1990 event, and one person drowned in a car during a 2003 Mason County flash flood). Thus, population safety is a prime concern for residents when flooding occurs.

Business and Economic Impacts

Mason County's economy can be affected by floods through several pathways. Businesses that get flooded suffer inventory and property losses and may have to shut down for repairs, losing revenue. Even if a business is not directly flooded, infrastructure outages can disrupt operations – e.g., if highways are closed, employees and customers cannot reach stores, or shipments of goods get delayed. Agriculture, while not the largest sector in Mason County, is impacted when fields flood – the Skokomish Valley's dairy farms have lost cattle and feed to deep floodwaters in past events, and saturated fields can't be planted for some time after. Forestry operations can also be impacted; after big floods and landslides, logging roads need repair, and timber harvest schedules get pushed back. Floods can also significantly impact coastal shellfish farms by carrying debris and contaminants into waterways. For the broader community, floods incur significant public costs: road and utility repairs can strain county budgets. For example, the late 1990s floods cost well over $1 million in road infrastructure repairs in the Mason County alone. These costs often have ripple effects on local government services and can lead to increased insurance premiums or taxes.

Critical Infrastructure and Services

Flooding can compromise critical facilities. Even though it's on elevated grounds, Mason County's General Hospital in Shelton might become isolated by flooded roads, as nearly happened in 1996 when both Highway 101 and Highway 3 had closures in various segments. Emergency services face challenges navigating flood-affected areas and roads, and ambulance response times increase if detours are needed. Schools have seen closures due to flood conditions, either because the buildings were threatened or because students and staff could not safely travel. Another concern is water supply contamination, where wells can be polluted by floodwater, and septic systems can overflow, leading to health risks. After the 2007 flood, Mason County Public Health had to issue boil-water advisories in some areas and assist residents with well testing and septic inspections.

Long-term Economic Effects

Repeated flooding can degrade the economic vitality of an area. If certain neighborhoods flood frequently, property values can drop, and some residents may relocate permanently, reducing the tax base. Businesses might be hesitant to invest in flood-prone zones. While flood recovery efforts can bring in some outside investment (FEMA aid, reconstruction jobs), that's often temporary. One specific long-term impact in Mason County has been on the Skokomish Indian Tribe with their reservation lands flooding so often that it has constrained development and impacted tribal fisheries and shellfish harvesting, as floods wash sediment and pollution into Hood Canal, leading to shellfish bed closures. This shows how floods can also intertwine with cultural and subsistence aspects of the local economy.

Below is a more detailed breakdown of all the sectors affected by flooding and the impact or exposure they experience in Mason County.

Sector	Flooding Impacts/ Exposure
Agriculture & Food Systems	More frequent high streamflows are expected to increase flooding and negatively impact agriculture in the Skokomish Valley and other areas (micro-farms, etc.). This will also impact Aquaculture with water runoff and pollution.

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Buildings & Energy	More frequent high streamflows are expected to increase flooding, which can cause damage to buildings. Increased landslides can also damage power lines and other infrastructure.
Cultural Resources & Practices	Higher streamflows are expected to directly affect salmonid populations and alter salmonid habitat, reducing the quantity of culturally important species for Northwest Tribes.
Economic Development	More frequent high streamflows are expected to increase the frequency of flooding, which impacts businesses and the economy by disrupting travel and shipping routes and damaging property. More frequent flooding has the potential to increase insurance premiums or make some properties more difficult to insure.
Ecosystems	Longer periods of low streamflow in summer are expected to prolong periods of poor habitat quality and change migration timing and success for salmonids and other aquatic species. Low streamflow also contributes to warmer stream temperatures, which create stress and thermal barriers for aquatic species that depend on cold water. Higher streamflows can scour the streambed and remove or crush salmon eggs, increasing mortality and reducing return rates. Higher streamflows reduce the availability of slow-water habitat and can increase sedimentation that affects habitat quality.
Emergency Management	More frequent high streamflows are expected to increase riverine flooding and the need for emergency services to plan, prepare, and respond to flood events.
Transportation	More frequent high streamflows are expected to increase the frequency of flood damage to roads, bridges, and railways, leading to higher operating and maintenance costs. Service delays, cancellations, and reroutes are also expected to become more common. Higher streamflows are expected to increase riverine flooding, which can damage roads, bridges, and railways and overwhelm drainage structures, such as culverts.
Waste Management	More frequent high streamflows are expected to increase flooding, which can generate more debris and waste. More waste will strain municipal cleanup and refuse capacity, and flooding of waste management facilities can release contaminants and hazardous materials.
Zoning & Development	More frequent high streamflows are expected to increase damage to assets and property located in flood zones. This could reduce the suitability of some areas for certain land uses and require relocation of some development.

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Sea Level Rise

As global temperatures rise, the melting of glaciers and thermal expansion of ocean water result in a rise in sea levels. Mason County, with its extensive Puget Sound shoreline, is facing a growing risk from sea level rise. Low-lying coastal areas, including harbors, marinas, and waterfront development, are vulnerable to erosion, saltwater intrusion, and frequent tidal flooding. A rise in sea level can also intensify the effect of storm surges, making coastal storm damage worse. Mason County policymakers and communities are crafting adaptation measures such as shoreline restoration and more robust coastal infrastructure to minimize the long-term effects of rising sea levels.

Risks Posed by Rising Sea Levels

Like drought, sea level rise (SLR) is a slow-moving but significant threat to Mason County's coastal areas. Though Mason County's coastline is mostly a higher bank, there are vital low-lying areas, including portions of Shelton, Belfair, Allyn, Union, and the Skokomish River delta, that could be increasingly affected by SLR. The primary risks posed by SLR are highlighted below.

Coastal Flooding and Inundation

As sea levels rise, high tides will reach further inland. Areas that once only flooded during rare storm surges may start flooding regularly during king tides. Over time, land that is currently just above the high tide line could be permanently submerged. In Mason County, this puts infrastructure like coastal roads (Highway 3 in Allyn, Highway 300 near Belfair State Park, and portions of Highway 106 along Hood Canal) at risk of chronic flooding. Neighborhoods built at sea level, such as parts of downtown Shelton by the Bayshore and some canal-side residential communities, could see frequent yards and street flooding.

The Department of Ecology warns that periodic coastal flooding will pose a greater and more near-term risk than permanent inundation in the next few decades. This means that Mason County might first experience more frequent extreme high-water events (during storms) that flood homes and businesses on the coast. But by the late century, with a higher baseline sea level, some low areas could be inundated even on calm days[6]. This magnitude of rise would dramatically redraw the shoreline. Mason County's 2018 Hazard Mitigation Plan (and other studies) mapped parcels that lie below threshold elevations for future sea levels. Many coastal wetlands and estuaries (like the Skokomish estuary) will be permanently underwater or drastically changed as saltwater pushes inland.

Coastal Erosion and Land Loss

SLR contributes to accelerated coastal erosion. Higher water levels allow waves and storm surges to strike higher parts of the shore that used to be dry. Bluffs and beaches in Mason County will likely erode faster. Bluff erosion already occurs in places like Union and along Pickering Passage, where some properties have lost several feet of shoreline in recent decades. As sea level rises, even without stronger

[6] The Puget Sound Regional Climate projections suggest that by 2100, a high tide in Hood Canal could be roughly 2–5 feet higher than today, depending on emission scenarios.

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storms, the base of bluffs stays saturated and undercut for more extended periods, making landslides more frequent (this is a secondary effect: as SLR can exacerbate coastal landslide hazards).

A study by the Washington State Coastal Resilience Project estimated that by mid-century, many stretches of Puget Sound could see significant beach loss unless the sediment supply keeps up with SLR. In Mason County, places like the tidal flats of Oakland Bay or the barrier spits near the mouths of rivers might be overtopped. Shoreline armoring can temporarily protect specific spots, but as water rises, those structures themselves can be compromised or can cause the beach in front of them to scour out. The risk is the gradual loss of coastal land, including private property and public beach access areas, as the line between ocean and land shifts.

Saltwater Intrusion into Aquifers

Mason County has many residents who rely on shallow coastal aquifers and wells for drinking water, especially in the less developed stretches of shoreline. As sea level rises, the interface between fresh groundwater and seawater moves upward and landward. This means a greater risk of saltwater intrusion in coastal wells. Already, some wells on Harstine Island and the Hood Canal coast show elevated salinity. SLR, by increasing the hydraulic pressure of seawater, can push salty water into aquifers that supply wells. Over time, some existing wells may become too saline to use, which would force communities to drill deeper or find alternate water sources. This is a gradual impact, but a serious one for the water supply in coastal zones.

Wetlands and Ecosystem Impacts

Mason County's coastal ecosystems such as the salt marshes, mudflats, and estuaries are particularly vulnerable to SLR. Tidal wetlands could be drowned or squeezed out if they cannot migrate inland. For instance, the extensive wetlands at the mouth of the Skokomish River provide critical habitat for salmon, waterfowl, and shellfish. With moderate SLR, these wetlands will either move upstream (if space is available and land gradients allow) or be lost under open water. The loss of wetlands means losing their natural flood protection benefits (wetlands absorb storm surges), their water filtration roles, and their habitat. Shellfish beds, which are a key part of Mason's economy and culture are also at risk. Many shellfish species rely on the intertidal zone and if water levels change, the optimal growing areas might shift. There's also concern about ocean acidification, which is related to climate change and CO2 absorption by oceans. The hazard plan notes that rising CO2 and higher temperatures can acidify marine waters, harming shellfish populations (this is an indirect impact tied to the same causes as SLR). Mason County's Hood Canal has already experienced low-oxygen and acidic conditions that cause shellfish die-offs, and climate change could worsen that.

Coastal Infrastructure

Infrastructure along the coast such as roads, ports, sewage treatment facilities, etc. faces escalating risk. For example, septic systems in low areas might fail more often as the groundwater becomes higher and saltwater intrudes. Marinas and docks will need to be modified to accommodate higher water (many docks could be overtopped at king tides in the future). The Port of Shelton's facilities in Oakland Bay might need additional elevation or floodproofing as the sea level goes up. Transportation routes like Highway 3 and the railroad near Shelton could see more frequent closures from high water if nothing is done. Notably, Interstate 5 in the Nisqually area (south of Mason) has already had issues with higher

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tides while Mason does not have an interstate, which shows that even critical regional infrastructure is vulnerable.

In summary, sea level rise introduces a host of gradually intensifying risks for Mason County: chronic coastal flooding, land erosion, saltwater intrusion, ecosystem loss, and infrastructure challenges. These impacts will unfold over decades, but some early signs are already observable (e.g., more frequent minor tidal flooding in recent years). Planning for these changes now is essential to reduce long-term harm.

Projections for Mason County

Current science provides detailed projections for sea level rise along Washington's coast, including specific estimates for Puget Sound. While Mason County itself wasn't a specific tide gauge site in global projections, we can infer from nearby locations:

The Seattle tide gauge (the longest record in Puget Sound) has measured about 8 inches of rise over the last century. For the future, the Seattle area is projected to see about 1 foot of SLR by 2050, around 2 feet by 2100 in a low-emissions scenario, and up to about 5 feet by 2100 in a high-emissions, high ice-melt scenario. Mason County's Hood Canal is likely to have similar numbers, though possibly slightly moderated by local geological uplift (the Olympic Peninsula is still rebounding slowly from past glaciation). In 2018, a report by UW and Ecology (Miller et al.) provided probabilistic SLR projections for nodes around Puget Sound. For Shelton, the likely range (66% probability) was roughly 0.5–0.8 feet by 2050, 1.5–2.3 feet by 2100 under a mid-range scenario. The extreme high-end (5% probability) for Shelton by 2100 was about 3.9 feet (this corresponds to an unlikely but possible scenario of rapid ice sheet loss).

The Washington Coastal Resilience Project created an interactive tool giving Mason County specific numbers. For example, at Union (Hood Canal), by 2100 there's roughly a 50% chance that SLR will exceed ~2 feet and a 5% chance it could exceed ~4 feet (under high emissions). These projections are continuously refined, but the key point is that some amount of sea level rise is virtually certain even in best-case scenarios, we're locked into at least ~1 foot by late-century due to global warming already in motion.

Local land movement: Mason County might experience a bit of uplift on the order of 1 mm/yr in some spots, which could slightly offset global SLR (e.g., the north end near Tahuya might be rising). Conversely, areas built on river deltas (Skokomish delta) could be subsiding as sediments compact, effectively adding to relative SLR. These local factors are considered in detailed studies but don't change the overall risk trajectory significantly and they might mean a difference of a few inches plus or minus.

In planning terms, Mason County is often using scenario-based projections like +1.5 feet by 2050 and +3 feet by 2100 for critical infrastructure planning, to be conservative. These numbers align with moderate-to-high emissions outcomes and provide a safety margin. It's also planning for worst-case contingency (like a rapid Antarctic melt scenario) in which 5+ feet by 2100 is possible, though not most likely.

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Risks to Coastal Infrastructure and Ecosystems

As sea levels rise, Mason County's coastal infrastructure and ecosystems face escalating risks:

Roads and Transportation

Many low-lying roads could be regularly affected. Highway 3 through Shelton and Belfair, which runs along creeks and shorelines, may need retrofitting. Sections of Highway 106 along Hood Canal are just barely above current high tide in coming decades, king tides could put those sections underwater. Neighborhood roads in Shorecrest, Union, and along Pickering Passage are also at risk. If nothing is done, these roads could face more frequent closures, washouts from undermining, or permanent submersion. This would isolate communities or force expensive emergency fixes. Bridge approaches at river mouths (like where highways cross the Skokomish and Skabob Creek) might flood more as backwater from high sea levels extends up into rivers. Washington DOT and the county road department have begun incorporating SLR into long-range transportation plans; options include *raising road elevations*, *rerouting roads inland*, or *building causeways*. Each has high costs and environmental considerations.

Sewage and Water Systems

In the Belfair and Allyn areas, Mason County operates sewer systems that have marine outfalls and low-elevation pump stations. Sea level rise can infiltrate these systems (through manholes or cracks), adding to the volume they must handle. Pump stations near the current water level might need to be elevated or sealed. Septic systems for waterfront homes are a big concern; many coastal homes use septic tanks and drain fields near the beach. With groundwater rising, these drain fields might saturate or see saltwater intrusion, causing failures and contamination of nearshore water. Health authorities may eventually require those areas to sewer if septic becomes untenable. Drinking water wells near the coast (like on Harstine Island or North Bay) could get salty, as mentioned before, which might force connecting those homes to public water systems or drilling deeper wells.

Buildings and Properties

Some structures are built extremely low – for example, boathouses, old cabins on the shoreline, and marinas. These structures will experience more frequent flooding. Private property damage from SLR will start as erosion (loss of yard, undermining of foundations) and progress to actual flooding of structures if adaptation measures aren't taken. In Mason County, several homes are only a few feet above high tide; over 100 homes statewide in WA are estimated to be at risk of tidal inundation by 2050 without adaptation, and Mason will contribute to that number. One analysis (Climate Central & Zillow 2018) put 14,000 homes in Washington, worth $8 billion, at risk of coastal flooding by 2050– Mason County's share might be small in that figure, but some of those are undoubtedly in Mason (especially if including the Skokomish Reservation and other tribal communities). Commercial facilities are fewer on Mason's coast, but the marinas in Shelton and Union, and tourism sites (resorts on Hood Canal), could suffer more frequent flood-related disruptions.

Ecosystems

Wetland migration is a critical issue. Ideally, as sea levels rise, wetlands would move upslope. But whether they can in Mason County depends on what's upslope and if it's steep terrain or developed

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land, the wetland gets pinched out. Estuaries like the Skokomish and Kennedy Creek are relatively natural and have room to migrate into undeveloped valleys, so they may transform but survive (albeit possibly changing from marsh to tidal flat). However, smaller pocket estuaries and salt marshes squeezed against bluffs (like those in Pickering Passage) could drown. The loss of these habitats would affect fish and bird species, especially those reliant on marsh nurseries (salmon fry, forage fish, etc.). Forested tidal swamp areas, such as those with Sitka spruce in the Skokomish delta, will die off as salinity increases, leading to "ghost forests" and standing dead trees in what becomes a salt marsh. Such transitions have already been observed on the Washington coast (e.g., in the Nisqually delta post-restoration combined with SLR). Additionally, rising sea and warmer water can exacerbate low dissolved oxygen events in Hood Canal, harming marine life. The hazard plan also mentions ocean acidification as an associated risk, which threatens Mason County's shellfish industry by making it harder for oysters and clams to form shells.

Cultural Resources

Rising seas threaten archaeological sites and cultural landmarks located near shore on the Skokomish Indian Reservation and other tribal usual and accustomed areas. Burial sites or artifacts could erode out of coastal bluffs. Tribes, including the Skokomish and Squaxin Island Tribes, are actively involved in SLR planning to protect these irreplaceable resources.

Below is a more detailed breakdown of all the sectors affected by sea level rise and the impact or exposure they experience in Mason County.

Sector	Sea Level Rise Impacts/ Exposure
Agriculture & Food Systems	Some farms are located close to sea level, making them vulnerable to sea level rise by impacting the freshwater input. Moderate sea level rise will increase the frequency and extent of coastal flooding, likely impacting aquaculture.
Buildings & Energy	Moderate sea level rise will increase the frequency and extent of coastal flooding. A rise in sea level is expected to impact coastal infrastructure and buildings.
Cultural Resources & Practices	Moderate sea level rise will increase the frequency and extent of coastal flooding, as well as beach and bluff erosion in some areas. Increasing coastal hazards have the potential to damage cultural and historical sites and buildings, reducing access to these areas.
Economic Development	Moderate sea level rise will intensify coastal flooding during storms or extreme weather events, which can disrupt business operations and damage property.
Ecosystems	Moderate sea level rise is expected to increase beach and bluff erosion and the frequency of flooding in coastal marshes and tidal flats. Changes in coastal ecosystems can reduce habitats for some aquatic, wildlife, and plant species.

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	High sea level rise in some coastal habitats, such as wetlands, beaches, marshes, and tidal habitats, may cause inland shifts or permanent losses of some habitats. This has the potential to reduce the abundance or shift the geographic distribution of some species dependent on specific coastal habitats.
Emergency Management	High sea level rise will inundate low-lying areas and intensify coastal flooding, making some locations much harder to reach for emergency response activities, especially when combined with high tides and storm surges.
Transportation	With moderate sea level rise, Washington's seaports and the connected distribution networks are expected to flood more often. Coastal transportation infrastructure may be subject to more frequent closures due to coastal flooding and erosion, and require more frequent maintenance and repairs.
Water Resources	Sea level rise is expected to increase salt water intrusion into groundwater and coastal aquifers, which could reduce water quality.
Zoning & Development	Moderate sea level rise is expected to inundate some coastal land and intensify coastal flooding of infrastructure. Sea level rise is expected to increase beach and bluff erosion in some areas. Increasing coastal hazards are expected to decrease the area of coastal land that is suitable for some types of development and increase the need for relocation.

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Earthquakes

Several faults run near or through Mason County, including the Saddle Mountain East Fault, Frigid Creek Fault, and Canyon Creek Fault, which are located north and west of Hoodsport near the Olympic National Forest.

Sectors like buildings and energy, health and well-being, emergency management, transportation, and housing may all be highly affected by future earthquake events. Developments within the county, including all capital facilities, transportation corridors, facilities holding hazardous materials, coastal areas, roadways, and especially old structures, are vulnerable to earthquakes.

The effects of a major earthquake in the Puget Sound basin area could be catastrophic, providing the worst-case disaster. Hundreds of residents could be killed, and a multitude of others could be left homeless. USGS estimates an 84-percent chance of a magnitude 6.5 or greater deep earthquake over the next 50 years. Dam failure warnings, evacuation plans, and procedures should be updated (and maintained) to reflect dam risk potential associated with earthquake activity.

Two of the most vulnerable populations to a disaster such as this are the young and the elderly. Mason County has a fairly high population of retirees and individuals with disabilities, both higher than the State averages. The need for increased rescue efforts and to provide assistance to such a large population base could tax the first-responder resources in the area during an event.

The number of people without power or water will be high, especially given the number of wells on which the County relies to supply water to individuals who most likely do not have generators to run pumps on the wells. This need will increase the number of individuals seeking shelter assistance.

Economic losses due to earthquake damage include damage to buildings, including the cost of structural and non-structural damage, damage to contents, loss of inventory, loss of wages, and loss of income.

Earthquake-induced landslides can significantly impact habitat. Streams can also be rerouted after an earthquake, changing water quality and possibly damaging habitat and feeding areas.

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Vulnerability Assessment

A vulnerability assessment is a systematic evaluation of the susceptibility of people, places, and systems to the impacts of climate-related hazards. As outlined in Commerce's Intermediate Climate Planning Guidance, this process helps identify which community assets, such as infrastructure, natural resources, and cultural systems, are most at risk due to climate change. The assessment examines two main components: the sensitivity of assets to specific hazards and their adaptive capacity, or ability, to adjust, cope, or recover. By evaluating these factors, communities can determine overall vulnerability levels for each asset-hazard pair (e.g., vulnerability of wastewater systems to flooding), laying the groundwork for effective resilience strategies.

Importance of Vulnerability Assessment

For Mason County, conducting a vulnerability assessment is fundamental in developing a Climate Resilience Plan that aligns with state guidance. Given the county's unique mix of rural communities, critical coastal and forest ecosystems, and aging infrastructure, it is essential to understand how climate hazards, such as sea level rise, wildfire smoke, extreme heat, and flooding, will impact local systems. This assessment provides a clear picture of where the county is most vulnerable, helping to prioritize adaptation actions that protect public health, maintain essential services, and safeguard natural resources. Ultimately, it supports long-term resilience planning that is equitable, data-informed, and locally relevant, as recommended by Commerce's guidance.

Some of the resources used in the vulnerability assessment are the 2023 Hazard Mitigation Plan, UG's CMRW web tool, WA Coastal Resilience, FEMA, WA State Climate Impacts Group, and NOAA.

Methodology

To systematically evaluate climate and hazard risks to community systems, we conducted a structured vulnerability assessment focused on determining the exposure and resilience of critical assets. This process involved three main steps: assessing sensitivity, rating adaptive capacity, and determining overall vulnerability.

Step A: Rating Asset Sensitivity

The first step in the process involved evaluating the sensitivity of each asset to specific hazards. Sensitivity was defined as the degree to which a hazard could negatively impact the asset. To assess this, we began by identifying how directly a given hazard affects the asset in question. We reviewed a series of indicators depending on the asset type. For physical assets such as buildings, roads, and infrastructure, we examined the asset's age relative to its expected design life, its current condition (e.g., poor, good, excellent), and whether its design includes features that protect against relevant hazards. For environmental assets like forests, wetlands, or shorelines, we considered factors such as fragmentation, climatic tolerance (e.g., temperature range), and vulnerability to pests or disease. For social assets, including community health and well-being, sensitivity was assessed through indicators like air and water quality (e.g., ozone or particulate matter concentrations) and key socioeconomic variables such as population age, income, race, and disability status.

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A simple ruleset was applied to rate sensitivity as low, medium, or high. For instance, a bridge that has exceeded its design life and lacks seismic retrofitting was rated as having "high" sensitivity to earthquakes. When multiple indicators were used, we assessed the collective implications of those factors. For example, if an asset had a high sensitivity rating for age but a low rating for design resilience, its overall sensitivity might be rated as "medium."

Step B: Rating Asset Adaptive Capacity

Next, we evaluated each asset's adaptive capacity, that is, its ability to adjust to changing conditions, withstand hazard impacts, or leverage opportunities to reduce risk. Key indicators used to measure adaptive capacity included design flexibility (e.g., modularity or retrofitting potential), availability of financial and technical resources, staffing capacity for emergency or adaptation planning, and the presence of back-up systems such as power generators. Assets with robust planning support, resource availability, or fail-safes were assessed as having high adaptive capacity, while those lacking redundancy or funding were rated lower.

Step C: Assessing Vulnerability

In the final step, we synthesized sensitivity and adaptive capacity ratings to characterize the overall vulnerability of each asset-hazard pair. Vulnerability was rated qualitatively as low, medium, or high based on a composite understanding of the previous steps. Assets with high sensitivity and low adaptive capacity were considered highly vulnerable, while those with low sensitivity and high adaptive capacity were deemed to have low vulnerability. This step enabled us to prioritize assets for adaptation action based on the degree of risk and resilience present.

This three-part approach provided a comprehensive understanding of how various community assets are affected by climate-related hazards and where strategic investments are most needed to reduce long-term vulnerability. The complete vulnerability assessment can be found in the Mason County Climate Element Workbook (in the Appendix).

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Risk Assessment

A risk assessment is a methodical process used to evaluate the likelihood and potential impact of climate-related hazards on community assets. According to the Intermediate Climate Planning Guidance from the Washington State Department of Commerce, risk assessment combines two key components: the probability of a hazard occurring (based on historical frequency and future projections) and the magnitude of its potential impacts (based on asset criticality, redundancy, and replacement cost). By plotting these factors on a risk matrix, communities can prioritize which hazards require immediate action and which can be monitored over time.

Importance of the Risk Assessment

Risk assessment is essential to Mason County's Climate Resilience Plan because it ensures that planning efforts focus on the most pressing climate threats. The county faces diverse hazards, including sea level rise, flooding, wildfires, and extreme heat, all of which vary in how often they occur and how severely they affect infrastructure, ecosystems, and people. By following Commerce's recommended approach, Mason County can identify high-risk hazard-asset combinations and develop policies and actions that protect vital systems and vulnerable populations. This data-driven approach strengthens the county's ability to adapt proactively and make informed investments in resilience.

Some of the resources used in the risk assessment are the 2023 Hazard Mitigation Plan, UG's CMRW web tool, WA Coastal Resilience, FEMA, WA State Climate Impacts Group, and NOAA.

Methodology

The risk assessment conducted as part of the Mason County Climate Resilience Plan followed the framework outlined in the Washington State Department of Commerce's *Intermediate Climate Planning Guidance*. This process involved evaluating the probability and magnitude of climate-related hazards and their impacts on community assets. The purpose of this analysis was to determine which hazard-asset combinations pose the most significant risks and to inform decision-making about whether to take proactive action or accept and monitor those risks.

Step A: Assessing Probability

The first component of the risk assessment focused on evaluating the probability of each hazard occurring. We began by reviewing the historical frequency of past events to understand how often each hazard has impacted the county. This included analyzing the recurrence of floods, wildfires, extreme heat events, sea level rise impacts, and other climate-related disruptions. Next, we assessed the likelihood of these hazards occurring in the future, based on available climate trend data, scientific projections, and expert judgment. Using these insights, we assigned each hazard a probability rating. Events projected to occur within the next five years were characterized as having *high* probability, those expected once in 5 to 20 years were rated *medium*, and those anticipated to occur less frequently than every 20 years were categorized as *low* probability.

Step B: Assessing Magnitude

Following the probability assessment, we evaluated the potential *magnitude* of impact for each hazard. This involved determining how disruptive or costly the hazard event would be to the

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asset or system in question. To do this, we considered several key indicators: the redundancy of the asset (i.e., whether alternate systems or routes are available if the asset fails), the estimated replacement cost (e.g., based on assessor's parcel value), and the criticality of the asset (e.g., whether it meets FEMA's definition of a critical facility). These factors helped us classify the anticipated impact as high, medium, or low.

Step C: Plotting the Risk Matrix
With probability and magnitude ratings in hand, we plotted each hazard-asset pair on a color-coded risk matrix. This tool visually represented the combined risk level, allowing us to identify which combinations fell into *high*, *medium*, or *low* risk zones. High-risk areas on the matrix indicated hazard-asset pairs with both high probability and high magnitude of impact, and these were prioritized for further action.

Step D: Deciding to Take Action or Accept Risk
The final step in the risk assessment involved making a strategic decision about how to respond to each risk. For hazard-asset pairs rated as high risk, the recommendation was to take immediate action—this could include developing comprehensive plan policies, or detailed strategies to reduce vulnerability. Conversely, for risks rated as low or moderate, the plan allows for *accepting the risk*, meaning that no immediate action is taken but the risk is monitored over time and reassessed during plan updates. This approach ensures that Mason County is allocating resources where they are most needed while maintaining flexibility to adjust as climate conditions evolve.

This structured process, rooted in Commerce's guidance, ensures that Mason County's climate resilience strategies are grounded in evidence-based risk analysis and tailored to the specific hazards, vulnerabilities, and priorities of the region. he complete risk assessment can be found in the Mason County Climate Element Workbook (in the Appendix)

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Climate Resilience Goals and Policies

The following goals and policies were developed following the extensive analysis of the assets in the 11 sectors identified by commerce, relative to the climate-exacerbated hazards facing Mason County. Some of the following policies will remain part of this climate element chapter, and some will be incorporated into the other elements of the comprehensive plan for a more cohesive and integrated approach.

Goal 1: Ensure the protection and restoration of streams, riparian zones, estuaries, wetlands, and floodplains to achieve healthy watersheds that are resilient to climate change.

C 1.1 – Implement actions identified in restoration and salmon recovery plans to improve the climate resilience of streams and watersheds.

C 1.2 – Protect and restore wetlands and corridors between wetlands to provide biological and hydrological connectivity that fosters resilience to climate impacts.

C 1.3 – Reduce the threat of aquatic invasive species (e.g., fish, plants, and invertebrates) to increase the climate resilience of native fish species and aquatic ecosystems.

C 1.4 – Protect and restore riparian vegetation to reduce erosion, provide shade, and support other functions that improve the climate resilience of streams.

C 1.5 – Increase aquatic habitat resilience to low summer flows by increasing water residence time, storing water on the landscape, conserving water, protecting groundwater, keeping waters cool, and protecting water quality.

C 1.6 – Implement and encourage measures to reduce sedimentation in streams resulting from wildfire damage and the associated impacts of landslides and flooding.

C 1.7 – Restore the structure and function of streams and floodplains to increase habitat climate resilience for cold-water fish.

Goal 2: Ensure the protection and restoration of terrestrial and coastal ecosystems to provide healthy habitats and increase the resilience of species in a changing climate.

C 2.1 – Restore and maintain critical areas and open space areas to maximize the climate resilience benefits they provide.

C 2.2 – Identify opportunities to expand habitat protection and improve habitat quality and connectivity to foster climate resilience using conservation area designations, buffers, and open space corridors.

C 2.3 – Ensure no net loss of ecosystem composition, structure, and functions, especially in Priority Habitats and Critical Areas, and strive for net ecological gain to enhance climate resilience.

C 2.4 – Consider climate stressors when determining allowed activities and uses within wetlands, Priority Habitats, and Fish and Wildlife Habitat Conservation Areas (FWHCAs), and ensure regulations maintain habitat integrity and function.

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C 2.5 – In restoration efforts, choose native drought—and pest-resistant trees, shrubs, and grasses to support climate resilience.

C 2.6 – Take early action to eliminate or control non-native invasive insect species that take advantage of climate change, especially where invasives threaten native species or ecosystem function.

C 2.7 – Consider sea-level rise in coastal and nearshore habitat restoration projects.

C 2.8 – Develop, implement, and periodically update a plan to mitigate and adapt to climate change impacts to the coastline.

Goal 3: Ensure that cultural resources and practices — including significant historic sites and culturally important traditional foods and practices — are resilient to the impacts of extreme weather and other natural hazards worsened by climate change.

C 3.1 – Protect, enhance, and restore ecosystems to meet tribal treaty rights and conserve culturally important consumptive and non-consumptive resources, including foods, medicinal plants, and materials that could be adversely impacted by climate change.

C 3.2 – Establish and maintain government-to-government relations with Native American tribes for the preservation of archaeological sites and traditional cultural properties that are vulnerable to climate impacts.

C 3.3 – Work with partners to establish and sustain a native plant nursery and seed bank to support long-term restoration and carbon sequestration efforts.

C 3.4 – Protect significant aquaculture and shellfish sites prone to flood runoff or other hazards worsened by climate change.

Goal 4: Protect and enhance the climate resilience of local forests by encouraging climate-smart forest management.

C 4.1 – Adopt a forest master plan and implementation ordinances to maintain and expand tree canopy cover, improve tree and watershed health, prioritize carbon sequestration, and build climate resilience.

C 4.2 – Ensure that tree species selection and planting guidance are updated to be resilient to climate change.

C 4.3 – Encourage participation in Washington's small forest landowner assistance cost-share and stewardship programs.

C 4.4 – Identify opportunities to expand incentives for forest landowners and reduce the loss of private forestland through forest stewardship education.

Goal 5: Protect and preserve water quality and quantity from drought, extreme heat, and other hazards exacerbated by climate change.

C 5.1 – Develop and implement a comprehensive drought resilience strategy that factors in projected climate impacts and sets action levels for different drought stages.

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C 5.2 – Identify and implement strategies to prepare for and mitigate the effects of saltwater intrusion into aquifers and drainage systems.

C 5.3 – Support pilot projects that foster collaboration for providing water for people, fish, and farms, such as water banks, irrigation modernization, and other mechanisms to ensure sufficient water supply for all needs in the county.

C 5.4 – Consider requiring the use of green infrastructure and low-impact development to address increased storm intensities and stormwater runoff.

C 5.5 – Evaluate the long-term adequacy of water delivery infrastructure to ensure that changes in hydrological patterns (e.g., increases in flooding frequency or reduction of late-summer water availability associated with climate change) can be anticipated and managed effectively.

C 5.6 – Develop and maintain a fund to build green infrastructure projects that help capture, filter, store, and reuse stormwater runoff.

C 5.7 – Ensure staff availability and capacity to monitor water quality and treatment systems, and define clear water quality regulations and enforcement measures.

C 5.8 – Explore deploying eco-friendly systems that enhance the resilience of rural communities in the event of water shortages, such as the use of greywater and compost toilets.

C 5.9 – Seek best practices for the disposal of biosolids and PFAS to limit the unknown impacts on groundwater quality.

C 5.10 – Utilize well permits to ensure that wells are constructed by licensed contractors and adhere to well standards, including proper casing, sealing, and backfill materials, to prevent contamination.

Goal 6: Ensure that the local timber, agriculture, aquaculture, and fisheries industries are resilient to the impacts of extreme weather and other natural hazards, and that adaptation resources are coordinated to support farmers and growers in making informed business decisions in a changing climate.

C 6.1 – Encourage the conservation of productive natural resources, and discourage incompatible uses by ensuring that adjacent land uses do not contribute to the demise of the long-term commercial forest, aquaculture, and agricultural lands and the resource-based industries associated with these areas.

Promote environmentally sustainable water-storage and farming practices that help aquaculture and agricultural producers adapt to changing conditions and reduce production losses while balancing ecosystem needs.

C 6.2 – Support conservation programs and resources that provide direct financial assistance to aquaculture farmers and forest owners to implement best management practices that address the impacts of climate change.

C 6.3 – Expand local food security and the food-related economy to address climate impacts and increase access to healthy, affordable, and climate-friendly foods.

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C 6.4 – Increase capacity for aquaculture and forest conservation technical assistance, especially related to climate-smart soil health or organic practices.

Goal 7: Ensure that the local economy is resilient to climate change-related disruption and fosters business opportunities associated with climate mitigation and adaptation.

C 7.1 – Ensure that Mason County's Emergency Management Plan responds to climate change impacts and identifies roles and responsibilities to support a sustainable economic recovery after a disaster.

C 7.2 – Support local businesses' efforts to bolster climate preparedness and continuity of operations.

C 7.3 – Support workers displaced from carbon-intensive industries.

C 7.4 – Ensure a level of environmental review and climate-resilience standards for all future development in Mason County.

C 7.5 – In environmentally sensitive areas, ensure that land use permit processes control activities that may have a detrimental effect on public health, safety, or the environment, and that they are consistent with state and federal requirements.

Goal 8: Promote community health and well-being by ensuring equitable access to clean air, open space, and outdoor recreation.

C 8.1 – Provide accessible public open space and protect environmentally important areas without compromising private property and treaty rights.

C 8.2 – Encourage increased access to publicly owned natural resource lands and protect existing public access to shorelines, water, and terrestrial recreation and harvesting areas.

C 8.3 – Encourage retention of open space and the development and maintenance of recreational opportunities like parks and public-use recreation areas appropriate for camping, hiking, horseback riding, and off-leash dog exercise.

C 8.4 – Identify and encourage the preservation of accessible open space areas, both urban and rural, which may be conserved through conservation easements, life estates, and/or conveyance to a land trust.

Goal 9: Protect the local population's health from the impacts of climate-exacerbated hazards, prioritizing overburdened communities and ensuring that the most vulnerable residents do not bear disproportionate health impacts.

C 9.1 – Protect the health and well-being of outdoor workers exposed to extreme heat and other climate-exacerbated hazards.

C 9.2 – Develop and maintain a program to distribute cooling units and install heat pumps, prioritizing households with residents most vulnerable to extreme temperature events (e.g., low-income seniors).

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C 9.3 – Address the social and mental health needs of displaced populations following natural disasters.

C 9.4 – Prioritize at-risk community members for actions that mitigate wildfire smoke, including providing personal protective equipment and filter fans or incentivizing infrastructure updates (e.g., HVAC updates and MERV 13 filters for air intake) for facilities that serve high-risk populations.

C 9.5 – Develop and implement multi-lingual notification alerts within the community to reduce the risk of exposure to wildfire smoke and particulate matter.

C 9.6 – Evaluate and implement habitat reduction and population control for disease vectors (e.g., mosquitoes and ticks) and zoonotic disease reservoirs (e.g., rodents) using integrated pest-management methods.

Goal 10: Ensure that the local transportation system is able to withstand and recover quickly from the impacts of extreme weather events and other hazards exacerbated by climate change.

C 10.1 – Design and site new and expanded roads and railroads to have the least possible adverse effect on the shoreline, account for sea-level rise projections, and cause no net loss of shoreline ecological functions.

C 10.2 – Design and site new and expanded roads and railroads to have the minimum adverse impact on existing or planned water-oriented uses, public access, and habitat restoration and enhancement projects.

C 10.3 – Promote interconnecting street networks that provide connectivity and redundancy to serve as potential evacuation routes.

C 10.4 – Incorporate hydrologic climate impacts into the design of water-crossing structures (e.g., climate-smart culverts and bridges) to improve fish passage and habitat quality without compromising the efficiency of the transportation network.

C 10.5 – Enhance the resilience of parks and recreational trails by assessing and addressing climate hazards and impacts.

C 10.6 – Site major public facilities that generate substantial travel demand along or near existing major transportation and public transit corridors.

C 10.7 – Encourage the sharing of corridors for major roads, utilities, trails, trucking routes, and other high-emission activities.

Goal 11: Ensure that energy and waste infrastructure is able to withstand and recover quickly from the impacts of extreme weather and other natural hazards worsened by climate change.

C 11.1 – Plan and build facilities, utilities, and infrastructure projects to avoid or withstand flooding from storms, rising sea levels, and associated climate impacts (e.g., changing floodplains).

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C 11.2 – Work with energy utilities to improve the safety and reliability of infrastructure vulnerable to climate change.

C 11.3 – Consider requiring new subdivisions to bury electricity transmission lines and associated infrastructure to reduce damage from storms and wildfire ignition risks.

C 11.4 – Advance waste reduction efforts through support of state and federal programs, public information and education programs, and other available and appropriate methods.

C 11.5 – Develop a countywide debris and waste management plan.

C 11.6 – Study and retrofit county-owned waste and energy facilities to better withstand damage from earthquakes, floods, and severe weather.

Goal 12: Enhance emergency preparedness, response, and recovery efforts to mitigate risks and impacts associated with extreme weather and other hazards worsened by climate change.

C 12.1 – Map transportation infrastructure that is vulnerable to repeated floods, landslides, and other natural hazards, and designate alternative travel routes for critical transportation corridors when roads must be closed.

C 12.2 – Incorporate sea-level rise information, along with tsunami hazard mapping, into critical area delineation for siting critical infrastructure, land-use planning, and emergency management.

C 12.3 – Support enhanced data collection for hazard events of all magnitudes to provide a fuller understanding of the community's hazard characteristics — including those affected by climate change.

C 12.4 – Factor climate impacts into the planning of operations and coordination of preparedness, response, and recovery activities among first-responders and partners, including public health, law enforcement, fire, school, and emergency medical services (EMS) personnel.

C 12.5 – Support the development of community wildfire protection plans.

C 12.6 – Incorporate post-flooding debris flow patterns into critical area delineation in flooding-prone communities.

C 12.7 – Develop community-serving resiliency hubs that are designed to support residents, coordinate communication, and distribute resources that enhance quality of life.

C 12.8 – Develop and implement a strategy to expedite management of debris (e.g., downed tree limbs and buildings blocking roads and streams) after a disaster incident to reduce the risks of subsequent fire, flood, injury, and disease vectors.

Goal 13: Ensure that buildings and development projects are designed and built sustainably to reduce environmental impacts and remain resilient to the impacts of climate change.

C 13.1 – Establish development regulations that incorporate best practices for reducing the risk of wildfire, extreme heat, flooding, and other climate-exacerbated hazards.

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C 13.2 – Review required buffers and setbacks for steep slopes and shorelines vulnerable to erosion, and establish new minimums, if necessary, so that improvements are not required to protect structures during their expected life.

C 13.3 – Facilitate and support long-term community visioning, including consideration of managed retreat, in areas with significant vulnerability to climate hazards.

C 13.4 – Consider future climate conditions, including changes to temperature, rainfall, and sea level, during the siting and design of capital facilities to help ensure they function as intended over their planned life cycle.

C 13.5 – Identify and plan for climate impacts to valued community assets such as parks and recreation facilities, including relocation or replacement.

C 13.6 – Establish and maintain a purchase and transfer of development rights program to allow transferring development rights from areas that provide conservation and climate resilience benefits, and promote denser development in suitable areas.

C 13.7 – Develop regulations for elevating or setting back new and substantially improved structures to reduce the risk of damage caused by sea level rise.

C 13.8 – Require that proposals for shoreline stabilization demonstrate a need, and require the use of soft shoreline stabilization methods to the extent practicable to protect sites from wave-driven erosion or flooding exacerbated by sea level rise.

C 13.9 – Consider requiring the design and construction of commercial and residential buildings and their surrounding sites to reduce and treat stormwater runoff and pollution.

C 13.10 – Adopt fire-resilience standards for new and redeveloped sites in high-risk wildfire areas.

C 13.11 – Develop or modify design standards to integrate building features that reduce the impacts of climate change and increase resilience.

C 13.12 – Establish Level of Service standards, timely development of essential infrastructure, and adherence to design standards for rural and urban areas.

Goal 14: Establish land use patterns that increase the resilience of the built environment and communities to climate change.

C 14.1 – Direct new development into areas where exposure to climate hazards, such as frequent flooding, is low.

C 14.2 – Encourage development in Urban Growth Areas where infrastructure exists or is planned.

C 14.3 – Identify and implement strategies to increase the resilience of the shoreline environment to sea-level rise and other climate hazards, while also protecting shoreline ecological functions, allowing water-dependent uses, and providing public access.

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C 14.4 – Identify and protect agricultural and forested lands that provide climate resilience benefits from conversion to more developed land use types.

Goal 15: Develop and maintain local government staff members' technical expertise and skills related to climate change and environmental justice to improve community-wide policy implementation, equity, and resilience.

C 15.1 – Create evacuation plans and outreach materials to help residents plan and practice actions that make evacuation quicker and safer.

C 15.2 – Develop a comprehensive, communitywide wildfire resilience strategy to improve emergency response capabilities, create fire-resilient landscapes, promote fire-adapted communities, protect the economy, and foster short- and long-term recovery.

C 15.3 – Provide private forestland owners and residents living in Wildland-Urban Interface (WUI) areas with information about fire prevention (e.g., Firewise) practices and support the application of such practices via building code provisions.

Goal 16: Ensure fair and equitable outreach by providing all residents with an opportunity to learn about climate impacts, influence policy decisions, and take actions to enhance community resilience.

C 16.1 – Create and implement culturally contextualized outreach and education initiatives and materials that will inform the community about near-term and longer-term climate change threats and build resilience.

C 16.2 – Build and support partnerships with community-based organizations that have the capacity and relationships to convene diverse coalitions of residents and educate and empower them to implement climate resilience actions.

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Appendix

Mason County Climate Element Workbook

See the following pages for the Mason County Climate Element Workbook.

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Task 2.1: Form project team			
Organization/ Department	**Name**	**Email**	**Notes**
Mason County	Marissa Watson	MWatson@masoncountywa.gov	Senior Planner (Long Range)
Mason County	Loretta Swanson	lorettas@masoncountywa.gov	Public Works Director
Mason County	Kell Rowen	KRowen@masoncountywa.gov	Community Development Director
SCJ Alliance	Kirsten Peterson	kirsten.peterson@scjalliance.com	Principal
SCJ Alliance	Shareefa Abdulsalam	shareefa.abdulsalam@scjalliance.com	Project Manager
SCJ Alliance	Christabel Agyei	christabel.agyei@scjalliance.com	Planning Technician
SCJ Alliance	Vaughan Cary	vaughan.cary@scjalliance.com	Planner

Task 2.2: Engage community members			
Organization/ Department	**Name**	**Email**	**Role**
Mason County/ Utilities & Waste Mgmt	Richard Dickinson	rdickinson@masoncountywa.gov	CPAT Member, Deputy Director of Utilities and Waste
Mason County/ Utilities & Waste Mgmt	Kevin Guijosa	KGuijosa@masoncountywa.gov	CPAT Member, Solid Waste Manager
Mason County/ Public Works	Dave N Smith	DNSmith@masoncountywa.gov	CPAT Member, Engineering & Construction Manager
Mason County/ Public Works	Mike Collins	MCollins@masoncountywa.gov	CPAT Member, County Engineer / Deputy Director
Mason County/ Fire Marshal	Randy Collins	RCollins@masoncountywa.gov	CPAT Member, Fire Marshal
Mason Conservation District	Evan Bauder	Evan@masoncd.org	CPAT Member, Executive Director
WSU Extension (AG & Food)	Dan Teuteberg	dan.teuteberg@wsu.edu	CPAT Member, Youth Development Regional Specialist
Mason Transit	Amy Asher	aasher@masontransit.org	CPAT Member, Mason Transit General Manager
Mason Transit	Jason Rowe	jrowe@masontransit.org	CPAT Member, Mason Transit Operations Manager
League of Womens Voters	Lynda Links	lyndalinks@msn.com	CPAT Member, Community advocate
League of Womens Voters	Peggy Morell	peggy.morell@gmail.com	CPAT Member, Community advocate
Squaxin Island Tribe	Erica Marbet	emarbet@squaxin.us	CPAT Member, Water Resources Biologist
Squaxin Island Tribe	Candace Penn	cpenn@squaxin.us	CPAT Member, Tribal Climate Change Scientist
Skokomish Indian Tribe	Kyle Grant	kgrant@skokomish.org	CPAT Member, Tribal Grant Writer
Mason County Climate Justice	Julianne Gale	masoncountyclimatejustice@gmail.com	CPAT Member, MCCJ Founder
Economic Development Council (EDC)	Karin Leaf	karin@choosemason.com	CPAT Member, EDC Business Development Manager
Economic Development Council (EDC)	Tiana Dunbar	tiana@choosemason.com	CPAT Member, EDC marketing & communications specialist
Washington Legacy Forest Defence Coalition	Joshua Wright	joshua@wlfdc.org	CPAT Member, Forest Campaigner at WLFDC

Task 1.1: Identify community assets	
Sectors	**Assets** *(examples below; revise list as desired)*
Agriculture & Food Systems	Aquaculture, agricultural croplands, livestock, poultry and products, Forest products
Buildings & Energy	Public Utility District (PUD) facilities and structures, Schools, Grocery Stores, County Facilities (gov bldgs., Court Rooms, Jail/Detention Center/prison), Civic Center, Communication centers and Towers, Power Lines, Dams & Power stations (Tacoma Power)
Cultural Resources & Practices	Salmon, Shellfish, Native Tribes and Reservations, Historic buildings and sites, Faith-based structures, Mushroom and berry picking sites, Hunting
Economic Development	Local Banks and Banking Resources, local businesses, Mason County Conservation District, Shellfish Industry, Tourism, Industrial sector, Squaxin Island Tribe (largest employer), Skokomish Indian Tribe, Ports, Aquaculture & Timber Industries, Emerging industries, race track
Ecosystems	Rivers and streams, marine ecosystems, Lakes, shellfish harvest areas, watersheds, Riparian areas/shorelines, Olympic National Forest, State parks, tree canopy, Prairies, State lands, old/mature forests, wetlands, Native plants, estuaries, pollinators, wildlife
Emergency Management	Mason County Sheriff, Mason County Fire and EMS, Shelters and Evacuation Centers (including tsunami evacuees from other counties), roadways, community first-responder training, state patrol training
Health & Well-being	Elderly Care/Rehabilitation centers, Assisted living, Medical Centers, Air quality, Park systems, Fishing/shellfish Harvesting, golf courses, Mason Lake Recreation Area
Transportation	State Highways, County Roads, Bridges, Trails, Airport, EV Charging Stations, Mason transit authority, waterways, railroad lines
Waste Management	Wastewater Treatment Facilities, Stormwater Management Facilities, Solid Waste Facilites, Transfer Stations, Drop Box Stations, Reclamation Centers, recycling facilities, hazardous waste facilities, bio-solids treatment, Septage Stations, Septic Systems, Junk Yards, waste transportation systems, decommissioned landfills, food waste
Water Resources	Hood Canal, Puget Sounds, Snowpack, Reservoirs, Groundwater, Rivers and Streams, Estuaries, Water Infrastructure, Individual wells, Water Reclamation Facilities, Community/HOA Wells
Zoning & Development	Residential zoning, Tourism Zoning, Commerical, Agriculture Resource lands, Commercial Forest

Task 1.2: Explore hazards and changes in the climate

Sector *(Use the CMRW webtool and other resources, as needed, to fill out this column.)*	**Climate Indicator** *(Use the CMRW webtool and other resources, as needed, to fill out this column.)*	**Hazard** *(Use the CMRW webtool and other resources, as needed, to fill out this column.)*	**Climate Impacts** *(Use the CMRW webtool's "Understanding the Importance" tab, Figure 5 of the climate element planning guidance, and other information sources to fill out this column.)*	**Notes** *(Note the emissions scenario(s) and time periods you explored. You may also wish to identify potential information gaps that might warrant further analysis.)*
Agriculture & Food Systems	Precipitation Drought	Drought	More frequent and severe droughts due to low summer precipitation will reduce the amount of water available for livestock and irrigation during the same time that warmer temperatures and longer growing seasons are expected to increase the demand for irrigation water.	High emissions future Greenhouse Gas Scenario. Increase in precipitation drought for early, mid, and late century.
Agriculture & Food Systems	Summer Maximum Temperature	Extreme Heat	Warmer summers are expected to increase the potential for heat stress on some crops and livestock and decrease crop yields. Some agricultural pests are expected to have greater survival rates and population size with warming. Warmer summer temperatures are expected to increase demand for irrigation water.	High emissions scenario. Increase in summer maximum temperature for early, mid, and late century.
Agriculture & Food Systems	Extreme Precipitation Magnitude	Extreme Precipitation	Heavier precipitation is expected to increase flooding and inundation of agricultural lands, which can delay spring planting, affect crop quality and quantity, increase erosion and runoff, and increase susceptibility to root diseases.	High emissions scenario. Increase in extreme precipitation for early, mid, and late century.
Agriculture & Food Systems	Frequency of Peak Streamflow	Flooding	More frequent high streamflows are expected to increase flooding and negatively impact agriculture in the Skokomish Valley and other areas (micro-farms, etc). This also impacts Aquaculture with water runoff and pollution.	Resources: Dept of Health, Federal EPA EJ Screen, Relevant Skokomish Studies
Agriculture & Food Systems	N/A	Reduced Snowpack	No Variable Results	N/A
Agriculture & Food Systems	Likely Sea Level Rise	Sea Level Rise	Some farms are located close to sea level, making them vulnerable to sea level rise by impacting the fresh water input; Moderate sea level rise will increase the frequency and extent of coastal flooding. Aquaculture will likely be impacted by sea level rise.	Based on feedback from the CPAT. Not captured in the CMRW webtool.
Agriculture & Food Systems	N/A	Wildfire	No Variable Results	N/A
Buildings & Energy	Reduced Precipitation	Drought	More frequent and severe droughts due to low summer precipitation will reduce the amount of generated hydro power.	Based on feedback from the CPAT. Not captured in the CMRW webtool.

Buildings & Energy	Heating Degree Days	Extreme Heat	A decrease in heating degree days is expected to reduce energy demand for heating.This has the potential to reduce energy costs for businesses and residents, but decrease utility revenue to support infrastructure and operations.	High emissions scenario. Decrease in heating degree days for early, mid, and late century.
Buildings & Energy	Cooling Degree Days	Extreme Heat	An increase in cooling degree days is expected to increase energy demand for air conditioning and industrial cooling systems in summer when regional hydropower supply is expected to decrease. Demand for air conditioning and infrastructure with cooling systems is also expected to increase where it does not already exist.	High emissions scenario. Increase in cooling degree days for early, mid, and late century.
Buildings & Energy	N/A	Extreme Precipitation	No Variable Results	N/A
Buildings & Energy	Frequency of Peak Streamflow	Flooding	More frequent high streamflows are expected to increase flooding. This can cause damage to buildings. Increased landslides can also impact powerlines and other infrastructure.	Resources: hazard mitigation plan (critical infrastructure)
Buildings & Energy	N/A	Reduced Snowpack	No Variable Results	N/A
Buildings & Energy	Likely Sea Level Rise	Sea Level Rise	Moderate sea level rise will increase the frequency and extent of coastal flooding. Sea level rise is expected to impact coastal infrastructure and buildings.	Resources: hazard mitigation plan (critical infrastructure)
Buildings & Energy	Wildfire Likelihood	Wildfire	More frequent wildfires have the potential to affect energy transmission by damaging infrastructure and interrupting transmission and distribution. More frequent wildfires are expected to cause property damage and loss. Poor air quality due to wildfire smoke could increase demand for air filtration systems in buildings.	High emissions scenario. Increased likelihood of climate and vegetation condition for wildfire for mid to late century.
Cultural Resources & Practices	Low Streamflow	Drought	Lower streamflows in summer are expected to reduce habitat quantity and quality for salmonids and other aquatic species that are culturally important to Northwest Tribes.	High emissions scenario. Reduction in streamflow for mid to late century.
Cultural Resources & Practices	August Stream Temperature	Extreme Heat	Warmer stream temperatures are expected to reduce habitat quality for salmonids and other aquatic species that depend on cold water. This reduces the abundance of and access to these culturally important species for Northwest Tribes.	Moderate emissions scenario. August stream temperature for late century.
Cultural Resources & Practices	N/A	Extreme Precipitation	No Variable Results	N/A
Cultural Resources & Practices	Peak Streamflow	Flooding	Higher streamflows are expected to directly affect salmonid populations and alter salmonid habitat, reducing the quantity of a culturally important species for Northwest Tribes.	High emissions scenario. Increase in annual maximum streamflow for early, mid, and late century.
Cultural Resources & Practices	N/A	Reduced Snowpack	No Variable Results	N/A

Cultural Resources & Practices	Likely Sea Level Rise	Sea Level Rise	Moderate sea level rise will increase the frequency and extent of coastal flooding. Sea level rise is expected to increase beach and bluff erosion in some areas. Increasing coastal hazards have the potential to damage cultural and historical sites and buildings, reducing access to these areas.	Low, moderate, and high emissions scenario. Sea level rise with 50% likelihood for early, mid, and late century.
Cultural Resources & Practices	Wildfire Likelihood	Wildfire	More frequent wildfires have the potential to damage cultural and historical sites, buildings, and cultural resources. More frequent wildfires can also reduce access to culturally important sites and resources for Northwest Tribes.	High emissions scenario. Increased likelihood of climate and vegetation condition for wildfire for mid to late century.
Economic Development	Snowpack	Drought	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season, with adverse effects on the economy and character of some communities. Warm season outdoor recreation opportunities may increase, shifting tourism from one recreation sector to another and into different seasons.	High emissions scenario. Decrease in April 1 snowpack for early century.
Economic Development	Summer Maximum Temperature	Extreme Heat	Warmer summer temperatures could decrease opportunities for warm season recreation activities in some areas and increase them in others.	High emissions scenario. Increase in summer maximum temperature for early, mid, and late century.
Economic Development	Extreme Precipitation Magnitude	Extreme Precipitation	Heavier precipitation is expected to increase the extent of flooding in low-lying areas and flood zones. Businesses are expected to have more disruptions to operations and damage to infrastructure.	High emissions scenario. Increase in extreme precipitation for early, mid, and late century.
Economic Development	Return Interval of 25-yr Peak Streamflow	Flooding	More frequent high streamflows are expected to increase the frequency of flooding impacts to businesses and the economy by disrupting travel and shipping routes and damaging property. More frequent flooding has the potential to increase insurance premiums or make some properties more difficult to insure.	High emissions scenario. Increase in frequency of peak streamflow for early, mid, and late century.
Economic Development	Snowpack	Reduced Snowpack	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season, with adverse effects on the economy and character of some communities. Warm season outdoor recreation opportunities may increase, shifting tourism from one recreation sector to another and into	Low emission scenario. Decrease in April 1 snowpack for early century.

Economic Development	Likely Sea Level Rise	Sea Level Rise	Moderate sea level rise will intensify coastal flooding during storms or extreme weather events, which can disrupt business operations and damage property.	Low, moderate, and high emissions scenario. Sea level rise with 50% likelihood for early, mid, and late century.
Economic Development	Wildfire Danger	Wildfire	More days with high wildfire danger are expected to affect businesses through more frequent closures of recreation areas and restrictions on outdoor activities during the wildfire season. More high fire danger days will interrupt timber operations and outdoor recreation.	Moderate, and high emissions scenario. Increase in high fire danger days for early and mid century.
Ecosystems	Late Summer Rain	Drought	Less summer precipitation is expected to affect ecosystem types differently. In freshwater ecosystems, less summer precipitation will contribute to lower streamflows, reduce water quality, and increase water temperatures. In terrestrial ecosystems, less summer precipitation will contribute to drought stress and reduce the growth and productivity of some plants.	High Scenario 2020-2049. Summer precipitation affects water availability for non-irrigated agriculture and fuel moisture during the height of the fire season.
Ecosystems	Summer Maximum Temperature	Extreme Heat	Warmer summers are expected to reduce summer soil moisture and increase physiological stress for some plants and animals. Warmer summer temperatures are expected to reduce tree growth and forest productivity in some areas and increase growth and productivity in mild climates. Outbreaks of some forest pests, such as mountain pine beetles, are expected to increase.	3 degree increase in maximum temperature is expected by 2049 and increase by 7 degrees by 2080. High Scenario
Ecosystems	N/A	Extreme Precipitation	No Variable Results	N/A
Ecosystems	Peak streamflow	Flooding	Longer periods of low streamflow in summer are expected to lengthen periods of poor habitat quality and change migration timing and success for salmonids and other aquatic species. Longer periods of low streamflow also contribute to warmer stream temperatures that create stress and thermal barriers for aquatic species that depend on cold water.	potential 5% increase in streamflow by 2080. High Scenario 2050-2079
Ecosystems	Peak Streamflow	Flooding	Higher streamflows can scour the streambed and remove or crush salmon eggs, increasing mortality and reducing return rates. Higher streamflows reduce the availability of slow-water habitat and can increase sedimentation that affects habitat quality.	moderate increae in annual maximum stream flow for 30 year period, Higher Scenario, 2020-2049
Ecosystems	Streamflow Timing	Reduced Snowpack	Earlier spring snowmelt and associated changes in streamflow timing are expected to alter migration timing and survival rates for salmonids.	High Scenario, Future time 2020-2049

Ecosystems	Increase in the amount of feet that sea level will rise with 50% probability	Sea Level Rise	Moderate sea level rise is expected to increase beach and bluff erosion and the frequency of flooding in coastal marshes and tidal flats. Changes in coastal ecosystems can reduce habitats for some aquatic, wildlife, and plant species.	High emissions scenario. Increase in sea level rise for early, mid, and late century.
Ecosystems	High Sea level Rise	Sea Level Rise	High sea level rise in some coastal habitats, such as wetlands, beaches, marshes, and tidal habitats, may cause inland shifts or permanent losses of some habitats. This has the potential to reduce the abundance or shift the geographic distribution of some species dependent on specific coastal habitats.	High Scenario, 2030 3 foot future rise expected
Ecosystems	N/A	Wildfire	No Variable Results	N/A
Emergency Management	Precipitation Drought	Drought	More frequent and severe droughts due to low summer precipitation are expected to increase the need for emergency services to plan, prepare, and respond to water shortages.	32% likelihood Summer precipitation below 75% of normal. High Scenario 2030-2050
Emergency Management	90 degree max hmidex days	Extreme Heat	More frequent extreme daytime heat events are expected to increase the demand for emergency services to plan, prepare, and respond to human health impacts. Extreme heat may also impact emergency services due to transportation and travel disruptions such as warped and buckling pavement on roads.	increase from 14 days per year over 90 degrees. Increasing to 29 days anually 2040-250
Emergency Management	Extreme Precipitation Magnitude	Extreme Precipitation	Heavier precipitation has the potential to increase the demand for emergency response services by intensifying flood events and increasing other emergencies associated with heavy precipitation.	High emissions scenario. Increase in extreme precipitation for early, mid, and late century.
Emergency Management	Return Interval of 25-yr Peak Streamflow	Flooding	More frequent high streamflows are expected to increase riverine flooding and the need for emergency services to plan, prepare, and respond to flood events.	Low Scenario, early century
Emergency Management	N/A	Reduced Snowpack	No Variable Results	N/A
Emergency Management	High Sea level Rise	Sea Level Rise	High sea level rise will inundate low-lying areas and intensify coastal flooding, making some locations much harder to reach for emergency response activities, especially when combined with high tides and storm surges.	.67 feet potential rise just under 1% or 1ft rise 2030. 1.25ft by 2050
Emergency Management	Wildfire Danger	Wildfire	More days with high fire danger will increase the need for fire bans and associated enforcement and capacity to respond to wildfires.	High emissions scenario. Increase in high fire danger days for mid century.
Health & Well-being	N/A	Drought	No Variable Results	N/A
Health & Well-being	Summer Maximum Temperature	Extreme Heat	Warmer summers are expected to increase concentrations of air pollutants, such as ozone and some vector-borne illnesses, such as West Nile virus.	Low and High emissions scenario. Increase in summer maximum temperature for early, mid, and late century.
Health & Well-being	N/A	Extreme Precipitation	No Variable Results	N/A
Health & Well-being	N/A	Flooding	No Variable Results	N/A

Health & Well-being	N/A	Reduced Snowpack	No Variable Results	N/A
Health & Well-being	N/A	Sea Level Rise	No Variable Results	N/A
Health & Well-being	N/A	Wildfire	No Variable Results	N/A
Transportation	Snowpack	Drought	Reductions in snowpack have the potential to reduce snow-related road maintenance, road closures, and transportation delays. However, as more cold-season precipitation falls as rain rather than snow, transportation routes in mountainours areas may experience more damage from heavier winter rainfall and associated flooding, erosion, and washouts.	Low and High emissions scenario. Reduction in snowpack for early, mid, and late century.
Transportation	N/A	Extreme Heat	No Variable Results	N/A
Transportation	Heavy Precipitation Magnitude	Extreme Precipitation	Heavier precipitation events are expected to intensify flooding, landslides, and erosion, which can interrupt transportation routes, damage infrastructure, and increase maintenance and repair costs.	High emissions scenario. Increase in heavy precipitation for early, mid, and late century.
Transportation	Return Interval of 25-yr Peak Streamflow	Flooding	More frequent high streamflows are expected to increase the frequency of flood damage to roads, bridges, and railways, leading to higher costs for operation and maintenance. Service delays, cancellations, and reroutes are expected to become more common.	
Transportation	Peak Streamflow	Flooding	Higher streamflows are expected to increase riverine flooding, which can damage roads, bridges, and railways and overwhelm drainage structures, such as culverts.	High Scenario 2020-2049, 12% to 20% increase means that the annual maximum streamflow 12% to 20% greater in this time period. An increase in the magnitude of peak streamflow is an indicator of the potential for flooding and more area inundated during peak flows.
Transportation	Snowpack	Reduced Snowpack	Reductions in snowpack have the potential to reduce snow-related road maintenance, road closures, and transportation delays. However, as more cold-season precipitation falls as rain rather than snow, transportation routes in mountainours areas may experience more damage from heavier winter rainfall and associated flooding, erosion, and washouts.	Low and High emissions scenario. Reduction in snowpack for early, mid, and late century.
Transportation	Likely Sea Level Rise	Sea Level Rise	With moderate sea level rise, Washington's seaports and the connected distribution networks are expected to flood more often. Coastal transportation infrastructure may be subject to more frequent closures due to coastal flooding and erosion, and require more frequent maintenance and repairs.	High emissions scenario. Relative sea level rise for late century.
Transportation	N/A	Wildfire	No Variable Results	N/A
Waste Management	N/A	Drought	No Variable Results	N/A
Waste Management	N/A	Extreme Heat	No Variable Results	N/A

Waste Management	Extreme Precipitation Magnitude	Extreme Precipitation	Heavier precipitation has the potential to increase storm damage to infrastructure and generate more waste and debris. More waste will strain municipal cleanup and refuse capacity.	High emissions scenario. Increase in extreme precipitation for early, mid, and late century.
Waste Management	Return Interval of 25-yr Peak Streamflow	Flooding	More frequent high streamflows are expected to increase flooding, which can generate more debris and waste. More waste will strain municipal cleanup and refuse capacity. Flooding of waste management facilities can release contaminants and hazardous materials.	Low and High scenario. Increased frequency of peak streamflow for early mid, and late century.
Waste Management	N/A	Reduced Snowpack	No Variable Results	N/A
Waste Management	N/A	Sea Level Rise	No Variable Results	N/A
Waste Management	Wildfire Likelihood	Wildfire	No Variable Results	N/A
Water Resources	Late Summer Precipitation	Drought	Less summer precipitation is expected to contribute to summer water shortages for commercial and residential uses. Water quality may also decrease with less summer input and associated warmer water temperatures.	High scenario. Decrease in summer precipitation for early, mid, and late century.
Water Resources	Snowpack Drought	Drought	More frequent droughts caused by low snowpack are expected to reduce the water available in the warm season for commercial, residential, agricultural uses and hydropower generation.	High emissions scenario. Decrease in April 1st snowpack for early, mid, and late century.
Water Resources	Warm Season Streamflow	Drought	Less streamflow in the warm season is expected to increase dependence on stored water and reduce water available for residential and commercial uses, as well as hydropower generation. During the same time period, warmer temperatures are expected to increase water demand and energy demand for cooling.	High emissions scenario. Decrease in warm season streamflow for mid and late century.
Water Resources	N/A	Extreme Heat	No Variable Results	N/A
Water Resources	N/A	Extreme Precipitation	Heavier precipitation events are expected to carry debris and pollutants into water streams, impacting water quality.	Based on feedback from the CPAT. Not captured in the CMRW webtool.
Water Resources	N/A	Flooding	No Variable Results	N/A
Water Resources	Decrease in April 1st snowpack	Reduced Snowpack	Reduced snowpack and more winter rain is expected to increase water availability in winter for multiple uses including drinking water and hydropower generation, and decrease water availability in late spring and summer when demand is also expected to increase.	High emissions scenario. Decrease in April 1st snowpack for early, mid, and late century.
Water Resources	Likely Sea Level Rise	Sea Level Rise	Sea level rise is expected to increase salt water intrusion into groundwater and coastal aquifers, which could reduce water quality.	High emissions scenario. Likely sea level rise for mid and late century.
Water Resources	Wildfire Likelihood	Wildfire	No Variable Results	N/A

Zoning & Development	Snowpack	Drought	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season with adverse effects on the economy and character of some communities. Warm season outdoor recreation opportunities are expected to increase, shifting tourism revenue from one recreation sector to another.	High emissions scenario. Decrease in April 1st snowpack for early, mid, and late century.
Zoning & Development	August Stream Temperature	Extreme Heat	No Variable Results	N/A
Zoning & Development	Heavy Precipitation Magnitude	Extreme Precipitation	Heavier precipitation events are expected to intensify urban flooding and demands on storm water systems, which can affect zoning restrictions on new buildings, and require revised building codes for development in more frequently flooded areas.	High emissions scenario. Increase in heavy precipitation for early, mid, and late century.
Zoning & Development	Return Interval of 25-yr Peak Streamflow	Flooding	More frequent high streamflows are expected to increase damage to assets and property located in flood zones. This could reduce the suitability of some areas for certain land uses and require relocation of some development.	Low and High scenario. Increased frequency of peak streamflow for early mid, and late century.
Zoning & Development	Snowpack	Reduced Snowpack	Reductions in snowpack are expected to decrease opportunities for winter outdoor recreation and shorten the winter recreation season with adverse effects on the economy and character of some communities. Warm season outdoor recreation opportunities are expected to increase, shifting tourism revenue from one recreation sector to another.	High emissions scenario. Decrease in April 1st snowpack for early, mid, and late century.
Zoning & Development	Likely Sea Level Rise	Sea Level Rise	Moderate sea level rise is expected to inundate some coastal land and intensify coastal flooding of infrastructure. Sea level rise is expected to increase beach and bluff erosion in some areas. Increasing coastal hazards are expected to decrease the area of coastal land that is suitable for some types of development and increase the need for relocation.	High emissions scenario. Increase in likely sea level rise for late century.
Water Resources	Wildfire Likelihood	Wildfire	No Variable Results	N/A

Task 1.3: Pair assets and hazards, and describe exposure and consequences						
Number	**Asset-Hazard Pair** *(Note applicable sector(s) in parenthesis.)*	**Climate Indicator** *(Use the CMRW webtool and other resources, as needed, to fill out this column.)*	**Climate Impacts** *(Use the CMRW webtool and other resources, as needed, to fill out this column.)*	**Exposure** *(Describe how each asset is exposed to the hazard, utilizing information from the CMRW webtool's "Understanding the Importance" tab, local knowledge, and other resources)*	**Non-Climate Stressors** *(Describe non-climate stessors that may exacerbate climate impacts.)*	**Consequences** *(Describe the consequences of the climate impacts, factoring in exposure, non-climate stressors, and your knowledge of how this hazard has impacted your community in the past. You may find it useful to divide consequences into past and future.)*
1	**Aquaculture, Shellfish, and Salmon Fishing** - Sea Level Rise, Extreme Heat, Drought (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	**Likely sea level rise/ August Stream Temperature**	Moderate sea level rise is expected to increase beach and bluff erosion and the frequency of flooding in coastal marshes and tidal flats which can disrupt business operations and damage property. Changes in coastal ecosystems can reduce habitats for some aquatic, wildlife, and plant species. Warmer stream temperatures are expected to reduce habitat quality for salmonids and other aquatic species that depend on cold water. This reduces the abundance of and access to these culturally important species for Northwest Tribes.	Mason County's economy relies heavily on aquaculture (2023 Hazard Mitigation Plan). While the extent of inundation, coastal flooding, and erosion will vary based on shoreline topography and characteristics, businesses located in low-lying areas and within waterways will be most exposed to projected increases in sea level rise. Aquaculture systems in shallow waters will be most impacted by increased stream temperatures.	Use of harmful chemicals and antibiotics. Competing habitats between salmon and shellfish, and areas needed for aquaculture and hatcheries. Shoreline development removing coastal trees that act as a filtration system for aquaculture and waterways. Dams, large and small Legal and illegal coastal development. Increased impervious surfaces driving more polluted runoff into water. Hatchery practices that impact the survival rates of wild populations and increase disease. Non-native salmon species. (shellfish does not use chemicals)	**Sea level rise will have an effect on the natural resources tribal members depend on. The Squaxin tribe estimates that a third of the shellfish habitat on the island is going to disappear.** **Sea-level rise can affect aquaculture and shellfish farming by increasing the risk of flooding coastal farming and harvesting infrastructure. Sea-level rise and more frequent king tide events can also increase water salinity levels in agricultural land and water resources, impacting the habitat needed for aquaculture and shellfish. Elevated stream temperatures, exposure to pollutants from nearby developments, and the loss of natural filtration systems can further erode habitat quality that is necessary for aquaculture and salmon populations. Aquaculture and salmon fishing are major economic drivers in Mason County, and the loss of adequate habitat will limit yields and harm local cultural resources and industries. Life cycles for fish spawning in the area would have environmental impacts years into the future.** **Warming climate increases invasive species, which can impact the habitat quality for local species. Salmon is already endangered which makes it even more vulnerable to these changes. Specific types of oysters may need to change based on the levels of ocean acidification**
2	**Forests, Timber Industries -** Drought, Extreme Heat, Pests & Pathogens (Cultural Resources and Practices, Ecosystems, Economic Development)	**Late Summer Precipitation/ Summer Maximum Temperature**	Warmer summers are expected to reduce summer soil moisture and increase physiological stress for some plants and animals. Warmer summer temperatures are expected to reduce tree growth and forest productivity in some areas and increase growth and productivity in mild climates. Less summer precipitation will contribute to drought stress and reduce the growth and productivity of some plants. Outbreaks of some forest pests, such as mountain pine beetles, are expected to increase.	Plants species growing at the lower end of their range for water availability will be more affected by decreases in summer precipitation. Some agricultural pests are expected to have greater survival rates and population size with warming. Warmer summer temperatures are expected to increase demand for irrigation.	Illegal and clearcut logging. Development and urbanization at timberland areas. Agricultural expansion Monoculture plantations - reducing biodiversity. Invasive plant and insect species. Removing protective designations e.g. National Forest. Fragmentation from roads and development, disrupting wildlife migration corridors. Speed of timber extracting and harvesting compared to growth cycle. Shorter rotations/time between logging cycles; need to incentivize longer rotation to better adapt to climate change. Industrial timber extraction practice e.g. spraying herbesides on crops which impacts soil quality. Removing biological materials from forests, Machinery killing microbiomes in the soil.	**Tree species currently affected by non-climatic stressors, such as invasive species, development, pests, and changes in land use, will be more sensitive to warming. Degraded landscape quality, including soil erosion due to drought, may lead to a more permanent loss of biological productivity. Younger trees will have a harder time establishing. This can reduce medicinal plant availability and brush for those who do brush picking. There will also be a loss of access to open space and nature, and a loss of habitat for animals and vulnerable plant communities. In addition, there can be a loss of carbon sequestration and transpiration, impacting the overall water cycle. Loss of soil fertility.** **Loss of tree cover will increase erosion and vulnerability to landslides. Loss of tree canopy may impact heat gain for water streams and other areas, further impacting other habitats. There can also be economic loss through impacts on nature tourism, the forestry industry, and aquaculture.** **Wildfires are often associated with drought. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Younger trees are more vulnerable to wildfire - quicker to ignite and faster to die. This increases the risk to the health and safety of the residents within the planning area, especially those in wildland-urban interface areas. Smoke and particles embedded within the smoke are of significant concern for the elderly and very young, especially those with breathing problems. (2023 HMP)**

3	**Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting** - Extreme Heat, Ocean Acidification, Sea level rise, Flooding, Extreme Precipitation (Ecosystems, Health and Wellbeing)	**Summer Maximum Temperature/ Ocean Acidification**	Warmer summers are expected to increase concentrations of air pollutants, ozone, and carbon dioxide (CO_2). They also foster some vector-borne illnesses, such as West Nile virus. These can drive increasd ocean acidification. Warmer summers are expected to reduce summer soil moisture and increase physiological stress for some plants and animals. They are expected to reduce tree growth and forest productivity in some areas. Outbreaks of some forest pests, such as mountain pine beetles, are expected to increase and thrive in warmer temperatures.	Exposure of people to warmer summers and associated pollutants, gases, and vector-borne illnessses will vary locally based on features that exacerbate or ameliorate these conditions. Areas with existing poor air or water quality will be more exposed. Exposure of ecosystems to extreme heat is expected to be greater in transitional zones between ecosystems and where plant and animal species are already living at temperature margins of suitable habitats. In Mason County, the exposure of ecosystems to increases in summer temperatures will depend on the presence of critical habitats or sensitive species, and the proximity to pollution sources. Flooding to park-related facilities causing damage and potential health hazards.	Shoreline development and related urban waste and runoff. Water pollution from flood and stormwater runoff bringing toxic sustances and pollution into soil and waterways. Release of carbon dioxide (CO_2) from human activities such as burning fossil fuels. Deforestation and removing tree canopy. Local natural processes driving ocean acidification in marine waters such as seasonal upwelling of Pacific Ocean water rich in carbon dioxide, deliveries of organic carbon from land, and absorption of other, non-carbon dioxide, acidifying gases from the atmosphere. (Dept of Ecology, WA) Lack of funding for park systems. Companies pulling out of recreation (Green Diamond) Sprawling development increases emissions and impacts air quality.	**The degree to which ecosystems and species are affected by warmer summers depends on the physiological tolerances of species to hot temperatures. Species living at the upper edge of their temperature ranges will be more sensitive to warmer summers. Species that are currently affected by non-climatic stressors, such as invasive species and habitat fragmentation, will be more affected by warming climate.** **Upwelled acidic water is more corrosive to calcifying organisms like oysters, clams, scallops, mussels, crabs, abalone, and pteropods than would be seen from natural conditions alone. It also means that this water will become increasingly corrosive in coming decades as water with higher and more recent human-generated carbon dioxide content upwells (Dept. of Ecology WA).** **Higher temperatures can increase the production of pollutants, such as ozone and particulate matter, and can speed up chemical reactions that create smog. Heat triggers more air conditioning power usage in buildings and cars, which emits more air pollution. Poor air quality especially impacts vulnerable groups such as the elderly, people with underlying health conditions, and unhoused populations. Hotter summers will limit the number of days suitable for outdoor labor and recreation, and increase the likelihood of experiencing heat-related health impacts. Storms can also limit the number of days people can recreate outdoors. Extreme weather events and the degradation of outdoor recreation areas can negatively impact mental health.**
4	**Roads and Bridges, Culverts, Non-motorized transportation -** Flooding, Sea Level Rise, Extreme Precipitation (Transportation, Emergency Management)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	Heavier precipitation events are expected to intensify flooding, landslides, and erosion, which can interrupt transportation routes, damage infrastructure, and increase maintenance and repair costs. More frequent high streamflows are expected to increase the frequency of flood damage to roads, bridges, and railways, leading to higher costs for operation and maintenance. Service delays, cancellations, and reroutes are expected to become more common. Heavy storms and flooding have the potential to increase the demand for emergency services to plan, prepare, and respond to such events.	100% of Mason County's infrastructure is exposed to severe storm threats. Mason County experiences some level of flooding on an annual basis. (2023 Hazard Mitigation Plan) Transportation routes and infrastructure located in low-lying areas, within or near current floodplains or regulatory flood zones, or adjacent to coasts and unstable slopes are expected to be more exposed to an increase in heavy precipitation and flooding. This would cause the failure, damage, disruption, and reduced capacity of transportation routes. Similarly, emergency services that serve people located in low-lying areas, within current floodplains or regulatory flood zones, or adjacent to unstable slopes are expected to be more exposed to the impacts of heavier precipitation events.	Population growth, along with more vehicle traffic and associated wear and tear on transportation infrastructure. Sprawling development increasing heavy vehicle loads on rural roads. Increased impervious surfaces. Non-paved roads in many areas. Lack of access redundancy for certain communities. Lack of infrastructure funding. Aging infrastructure (especially bridges and culverts) Out-of-county transportation systems management that can impact local Reduced access to timber roads and loss of redundancy due to gated roads.	**Flooding caused by sea level rise and extreme precipitation can inundate low-lying and coastal areas. Transportation routes in these areas are the most critical in emergency events, and their exposure to flooding would compromise their use in such situations. Damage to roads and transportation infrastructure may make it difficult to mobilize aid to those affected. This would further isolate flooded areas, trapping people and making it difficult to access emergency support. Squaxin Island is estimated to split in two by 2100, according to new sea level rise projections by the Squaxin Island Tribe, further isolating the island in emergency situations. Tidal changes from Hood Canal combined with increased runoff from the Olympics have also exacerbated the frequency of flooding in Mason County.** **Frequent severe storms and flooding increase the cost and frequency of maintaining roadways; Such events can also have financial impacts on communities missing work or school due to road flooding. Vulnerability of a household may increase based on the type of available vehicle.** **Island communities that rely on bridges and lack redundancies. People who have boats often aid in emergency evacuations, so such practices should be preserved.**

5	**Utility Lines and Structures** - Extreme Precipitation, Flooding, Sea Level Rise, High Winds (Buildings & Energy)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	More frequent high streamflows are expected to increase flooding. This can cause damage to all types of infrastructure in flood zones and could expand the flood zone in some areas, damaging infrastructure not currently in flood zones. Increased landslides due to extreme precipitation and flooding can also impact powerlines and other utility infrastructure.	100% of Mason County's infrastructure is exposed to severe storm threats (2023 Hazard Mitigation Plan). The City of Shelton and the Unincorporated Areas of Mason County have the largest percentage of buildings located in the Special Flood Hazard Area (SFHA). In addition, these two areas have the highest projected dollar loss, making them especially vulnerable to flooding.	Population growth stretches resources and overloads systems. Compounding impacts on power systems leading to blackouts and brownouts. Policy decisions around hydropower and breaching of dams - impacts to reliability on the power grid. Sprawling development increases the need for utility services. Lack of infrastructure funding. Aging infrastructure. Increased impervious surfaces exacerbate flooding. Disparity in quality of services provided depending on location and the company preferences. Inflation and economic stressors leading to vandalism and copper wire stealing.	**Floods frequently damage power transmission and sometimes power generation, which then has other effects caused by this loss of power. This includes loss of water treatment facilities which may result in loss of potable water or severe water contamination. Flooding and the loss of power may also cause the loss of sewage disposal facilities. Lack of clean water (May 2019 Mason County HIVA Page 46) combined with human sewage in flood waters raises the risk of waterborne diseases.** **Downed utility lines, due to severe flooding or wind events, take longer times to repair, delaying the restoration of power to certain areas. Remote and rural communities are most vulnerable. Loss of power leads to inability to refrigerate and safely store food during emergency events.** **Loss of power impacts traffic controls/traffic lights which can lead to accidents.** **Loss of electricity can cause loss of access to wells relying on electric pumps, therefore loss of water.**
6	**Residential and Commercial Zoning, Shelters & Evacuation Centers** - Extreme Precipitation, Flooding, Sea Level Rise (Zoning and Development, Emergency Management)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	Heavier precipitation events are expected to intensify urban flooding and demands on stormwater systems, which can affect zoning restrictions on new buildings and require revised building codes for development in more frequently flooded areas. Higher streamflows are expected to increase damage to all types of infrastructure in flood zones and could expand the flood zone in some areas, damaging development not currently in flood zones. High sea level rise will inundate low-lying areas and intensify coastal flooding, making some locations much harder to reach for emergency response activities, especially when combined with high tides and storm surges. More frequent flooding has the potential to increase insurance premiums or make some properties more difficult to insure.	100% of Mason County's parcels are exposed to severe storm threats, and most flooding in the county is due to river and urban flooding. (2023 Hazard Mitigation Plan) Certain land uses and development located in low-lying areas, within current floodplains or regulatory flood zones, or adjacent to unstable slopes are expected to be more exposed to an increase in flooding due to heavy precipitation and sea level rise. Development located in river valleys and in or near current and historical flood zones will be most exposed to projected increases in high streamflows that cause flooding. Emergency management serving low-lying coastal communities will be most exposed to the impacts of more coastal flooding.	encroachment/development on the floodplain by human-made structures. Increasing shoreline development. Population increase without proper accommodations for density can create sprawl and spread the impact on the environment. Zoning allowing development in flood zones. Limited capacity to adequately provide timely emergency services to growing populations - limited funding available. Lack of dedicated emergency shelters especially accommodating vulnerable populations. Lack/inefficiency of coordination during emergency events. Crashing housing affordability index/very low vacancy rates. High rates of mobile homes. Extremely limited permanent supportive housing options. Aging infrastructure for shelters. Funding consideration/limitations. Populations without phone/internet access (isolation) Poverty.	**Floods can damage homes, buildings, and infrastructure. Unhoused populations and communities with substandard housing are especially vulnerable.** **Communities may need to guide future development toward resilient growth and consider areas vulnerable to climate hazards such as sea level rise and flooding. This can drive special construction requirements in such areas, increasing the cost of building, and further reducing overall affordability.** **Development near waterways or in flood zones can create pollution, i.e., solid wastes and hazardous materials runoff during flood events. Construction and demolition practices in these areas can also release materials and pollute water systems.** **Impact on the economy related to a flood event in Mason County would include loss of property and associated tax revenue, as well as potential loss of businesses. Depending on the duration between onset of the event and recovery, businesses within the area may not be able to sustain the economic loss of their business being disrupted for an extended period of time. Historical data has demonstrated that those businesses impacted by a disaster are less likely to reopen after an event. (Mason County HAZARD IDENTIFICATION AND VULNERABILITY ANALYSIS).** **While structural damage may vary due to flood depths and existing floodplain management regulations, there is a fairly high rate of property ownership that does not have flood insurance.** **Exposure to flood hazards is not limited to those who reside in a defined hazard zone. Others at risk may be traveling in flooded areas or separated from access to emergency services during an event. The degree of that impact will vary and is difficult to measure.** **Need to focus on effective of emergency coomunication/notices.** **Long-term health impacts (e.g. populations with PTSD) and the impact of such**

7	**Storm & Wastewater Facilities, Waterways & Water Source**s - Extreme Precipitation, Flooding, Sea Level Rise (Waste Management, Water Resources)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	More frequent high streamflows and heavier precipitation are expected to increase flooding, which can generate more debris and waste. More waste will strain municipal cleanup and refuse capacity. Flooding of waste management facilities can release contaminants and hazardous materials. Heavier precipitation events are expected to carry debris and pollutants into water streams, impacting water quality. Sea level rise is expected to increase salt water intrusion into groundwater and coastal aquifers, which could reduce water quality.	100% of Mason County's infrastructure is exposed to severe storm threats (2023 Hazard Mitigation Plan). Waste management services that serve development located in low-lying areas and in current and historical flood zones will be most exposed to projected increases in the frequency of high streamflows that can cause flooding and generate more waste. Coastal areas are particularly vulnerable to flooding from storm surges, which can severely impact wastewater treatment plants located near the shoreline. Sea level rise is expected to increase saltwater intrusion into groundwater, water wells, and coastal aquifers, which could reduce water quality.	Population increase, urbanization, and land use changes challenge resource sustainability by decreasing water supply or increasing demand. Agricultural runoff and industrial pollution. Inadequate water management policies, including not informing the public of failure events at treatment plants/overflows. The finite amount of freshwater. Land management practices that impact the overall water cycle. Conflicts over water resources. Seasonal and vacation homes increase infrastructure costs for year-round residents. Within Shelton, lack of population growth meant fewer people bearing the burden of covering costs. Poor maintenance and misuse of septic capacity impacting water Poor maintenance impact on renders Lack of funding for infrastructure	**Floods significantly affect water quality by carrying pollutants like sediment, pesticides, bacteria, and industrial waste from land into water bodies. Shallow aquifers and wells located in low-lying coastal zones will be more exposed to saltwater intrusion due to sea level rise.** **When the water level rises in seas and rivers, water can start to flow backward in the sewer and stormwater systems. This might lead to the water level reaching the pump stations' emergency overflow. This potentially releases untreated sewage into the environment, leading to water contamination and creating public health risks, as well as negative impacts to ecosystems, habitats, and cultural resources, and local economy. This may cause the need to relocate certain wastewater treatment plants to areas less prone to flooding, which has significant cost impacts. Additional costs may be incurred through developing robust response plans to address potential flooding scenarios, including staff training and equipment maintenance.** **Other climate stressors, such as warmer water temperatures, lower stream flows, increasing storm frequency, and ocean acidification, all exacerbate the risks that affect water quality and the capacity of water treatment infrastructure.** **Overflow covering roads and manholes** **Need to plan for septic disposal facilities and appropriate locations and capacities.** **County reauthorizing the clean water district (which sunsets in 2027) to reduce over reliance on outside funding.**
8	**Solid Waste & Recycling Facilities, Hazardous Waste Facilities** - Extreme Precipitation, Flooding, Sea Level Rise (Waste Management)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	More frequent high streamflows and heavier precipitation are expected to increase flooding, which can generate more debris and waste. More waste will strain municipal cleanup and refuse capacity. Flooding of waste management facilities can release contaminants and hazardous materials.	100% of Mason County's infrastructure is exposed to severe storm threats (2023 Hazard Mitigation Plan). In Mason County, waste management services that serve development located in low-lying areas and in current and historical flood zones will be most exposed to projected increases in the frequency of high streamflows that can cause flooding and generate more waste.	Population increase, economic development, urbanization, and land use changes challenge resource sustainability by increasing demand for waste treatment facilities. Industrial waste management policies. Location of waste management facilities in areas prone to flooding. Workforce availability and stability (due to aging population and need fpr physical labor). Increased waste production and rising disposal costs.	**Flooding can significantly affect waste facilities by causing damage to infrastructure, leading to the potential release of hazardous materials, contaminating groundwater, and generating large amounts of debris that need to be managed, all while disrupting regular waste collection operations due to flooded roads and damaged equipment. Floodwaters can dislodge and displace waste within landfills, causing debris to spread and potentially exposing hazardous materials.**
9	**Shelton Port, Race Track (Ridge Motorsports Park), Golf Courses** - Extreme Precipitation, Flooding, Sea Level Rise (Economic Development)	**Heavy Precipitation Magnitude/ Peak Streamflow/ Return Interval of 25-yr Peak Streamflow**	Moderate sea level rise will increase the frequency and extent of coastal flooding. More frequent high streamflows are expected to increase the frequency of flooding impacts to businesses and the economy by disrupting travel and shipping routes and damaging property. More frequent flooding has the potential to increase insurance premiums or make some properties more difficult to insure.	100% of Mason County's infrastructure is exposed to severe storm threats (2023 Hazard Mitigation Plan). Exposure of cultural and historical resources to sea level rise will vary locally with differences in the rate of geologic uplift or subsidence. The extent of inundation, coastal flooding, and erosion will vary based on shoreline topography and characteristics. Indigenous people with many coastal-dependent cultural practices, resources, and sites will be more sensitive to sea level rise impacts. Businesses located in low-lying areas and in or near current and historical flood zones will be most exposed to projected increases in the frequency of high streamflows.	Isuues such as pollution and water quality, excessive sedimentation from runoff, harmful algal blooms (HABs), disease outbreaks, predation, improper stocking densities, fluctuations in salinity, and human activities like coastal development which can disrupt habitats and alter water flow patterns, all impacting shellfish growth and survival. Workforce availability and stability (due to needing specialized/skilled labor). Transportation challenges for commuters to the destinations.	**Flooding at the Shelton Port can significantly disrupt operations by damaging infrastructure, inundating storage areas, hindering access to the port due to flooded roads, and damaging goods. This can ultimately lead to delays in shipping, economic losses, and disruptions in trade flows.** **This may require costly retrofits such as elevating port facilities, building seawalls, and improving drainage systems to help protect against flooding.** **Other important economic resources, such as the Ridge Motorsports Park and certain golf courses, sometimes get inundated by extreme storms and floods, causing them to shut down and cancel events, incurring economic losses. They also require additional maintenance costs and efforts to protect against future flood events.**

10	**Roads and Bridges, Urban Development, Utility Infrastructure, Waste Facilities, Shelton Port** - Earthquake (Economic Development, Transportation, Emergency Management, Waste Management, Buildings & Energy, Ecosystems)	**N/A**	The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction or an increased propensity for slides during seismic activity due to the increased saturation.	All critical facilities in Mason County are exposed to the earthquake hazard. Seismic-related hazards in Mason County include ground motion from shallowor deep faults, liquefaction and differential settling of soil in areas with saturated sand, silt, or gravel, and tsunamis that result from seismic activities. High-magnitude earthquakes are possible in Mason County when the Juan de Fuca slips beneath the North American plates. Deep zone or Benioff zone quakes have occurred within the San De Fuca plate and can be expected in the future. (2023 Hazard Mitigation Plan)	Soil type. Building age and quality of construction. Proximity to fault locations. Population growth leading to greater demands on existing, aging infrastructure, as well as increasing demand for affordable rural housing options. Insufficient tax revenue to maintain the infrastructure.	**The effects of a major earthquake in the Puget Sound basin area could be catastrophic, providing the worst-case disaster. Hundreds of residents could be killed, and a multitude of others could be left homeless. USGS estimates an 84-percent chance of a magnitude 6.5 or greater deep earthquake over the next 50 years. Dam failure warnings, evacuation plans, and procedures should be updated (and maintained) to reflect dam risk potential associated with earthquake activity.** **Two of the most vulnerable populations to a disaster incident such as this are the young and the elderly. Mason County has a fairly high population of retirees and individuals with disabilities, both higher than the state averages. The need for increased rescue efforts and/or to provide assistance to such a large population base could tax the first-responder resources in the area during an event.** **The number of people without power or water will be high, especially given the number of wells on which the County relies to supply water to individuals who most likely do not have generators to run pumps on the wells. This need will increase the number of individuals seeking shelter assistance.** **Economic losses due to earthquake damage include damage to buildings, including the cost of structural and non-structural damage, damage to contents, loss of inventory, loss of wages, and loss of income.** **Earthquake-induced landslides can significantly impact habitat. It is also possible for streams to be rerouted after an earthquake. This can change water quality, possibly damaging habitat and feeding areas.** **(2023 Hazard Mitigation Plan)**

Task 1.4: Identify priority climate hazards		
Hazard	**Relevant to your jurisdiction?** *(Mark Yes or No.)*	**Notes** *(Explain why you determined this hazard is or is not relevant to your jurisdiction.)*
Drought	*Yes*	*Mason County's dependence on aqua- and agriculture means drought can cause a significant potential economic loss in the region, while also potentially impacting power supplies at the hydro-dams in the area. Less summer rain will impact all ecosystems and increase likelihood of wildfires. Drought impacts soil health, and can lead to increased pests and pathogens.*
Extreme heat	*Yes*	*Higher temperatures anticipated with climate change would increase water demand for agriculture. They will also increase the population's vulnerability due to excessive heat and potential increased concentrations of air pollutants. Outdoor workers and unhoused people are especially vulnerable to extreme heat, and outdoor jobs are at higher risk. There will be increased pests and pathogens with extreme heat, and higher stream temperatures will impact water habitats for salmonids and shellfish.*
Extreme precipitation	*Yes*	*Severe storms cause flood events and inundate agricultural lands and quality of crops. They can also create landslides and impact communities in sub-standard housing and unhoused populations.*
Flooding	*Yes*	*Flood events damage infrastructure, isolate areas, and block ingress and egress. They also impact agriculture in the Skokomish Valley and other areas, and impact aquaculture with water runoff and pollutants.*
Reduced snowpack	*Yes*	*Relevant but of lesser priority. Reduced snowpack impacts the timing and intensity of streamflows. Snow-related recreation is not a major economic source for Mason County. Not many watersheds in the county are snowpack-dependent.*
Sea level rise	*Yes*	*Sea level rise increases coastal flooding and impacts freshwater input for agriculture and aquaculture. It also isolates areas making them harder to access for emergency services.*
Wildfire	*Yes*	*Relevant but of lesser priority. The jurisdiction experiences some level of wildfire almost annually, but the acreage burned has been limited in nature.*
Ocean Acidification	*Yes*	*Impacts to aquaculture, natural aquatic resources, and other tribal cultural assets. This also impacts economic activity and opportunities for outdoor and nature recreation.*
Earthquake	*Yes*	*Several faultlines in the county. Could be highly destructive.*
Pandemics, Pests, and Pathogens	*Yes*	*Increased pandemics to both human and ecosystem health. Especially impactful on older populations, rural communities, and species that rely on delicate habitats.*

Task 2.1: Review existing plans for climate gaps and opportunities						
	Measure	**Document**	**Sector**	**Hazards**	**Gaps and Opportunities**	**Next Step**
	List existing measure (goal or policy) that implicitly or explicitly supports climate resilience.	*List the document where the measure is found (comprehensive plan, hazard mitigation plan, shoreline master program, stormwater management plan, etc.).*	*List the most appropriate sector(s) for the measure [select all that apply].) OPTIONS: Buildings & Energy, Cultural Resources & Practices; Economic Development; Emergency Management; Health & Well-being; Ecosystems; Transportation; Agriculture & Food Systems; Waste Management; Water Resources; Zoning & Development*	*List the climate-related hazard(s) that the measure addresses.*	*If applicable, note how the existing measure could be amended or supplemented by a new goal or policy to better address your local climate hazards and impact(s).*	*Note desired next step (e.g., amend an existing measure; consolidate with a similar measure; add a new measure; keep existing measure as-is in comprehensive plan).*
1	Urban Growth 1.3 - Encourage development in Urban Growth Areas where infrastructure exists or is planned.	Mason County Plan 2016-2036	Buildings & Energy, Emergency Management, Transportation, Waste Management, Zoning & Development	Extreme Precipitation, Flooding, Sea-level Rise	Encourage dev. Away from low-lying areas/flood hazard zone (identify rivers and streams specifically, sea level rise); creeks, King tides, storm surges	carry forward and add specificity
2	Reduce Sprawl 2.3 - Establish Level of Service Standards, timely development of essential infrastructure, and adherence to design standards for rural and urban areas.	Mason County Plan 2016-2036	Buildings & Energy, Emergency Management, Transportation, Waste Management, Zoning & Development	Extreme Precipitation, Flooding, Sea-level Rise	comp plan alts - Alt 1; focus on urban growth, strenghthen existing rural	carry forward and update
3	Transportation 3.5 - Promote interconnecting street networks which provide alternative routes.	Mason County Plan 2016-2036	Emergency Management, Transportation	Extreme Precipitation, Flooding, Sea-level Rise, Wildfire	sensitivity to roads impacting ecosystems/fragmenting	carry forward, and enhance
4	Economic Development 5.2 - Maintain and enhance natural resource-based industries including productive timber, agriculture, aquaculture, mining and fisheries industries. Encourage the conservation of productive natural resources, and discourage incompatible uses. Assure that adjacent land uses do not contribute to the demise of the long term commercial forest, aquaculture, and agricultural production lands and the resource based industries associated with these areas.	Mason County Plan 2016-2036	Agriculture & Food Systems, Cultural Resources & Practices, Economic Development, Ecosystems, Water Resources, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	add policy to encourage more climate-friendly practices; Check alt economies (economic element); climate resiliency of preserving mature forest; reword to cover protecting quality of resources from adverse impacts; Adress housing impact on shoreline/aqaculture	split up (Climate Element + Other elements)
5	Economic Development 5.6 - In environmentally sensitive areas, ensure land use permit processes control activities which may have a detrimental effect on public health, safety, or environment consistent with state and federal requirements.	Mason County Plan 2016-2036	Agriculture & Food Systems, Economic Development, Ecosystems, Health & Well-being, Water Resources, Zoning & Development	Extreme Precipitation, Flooding, Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	Ensure growth and economic activity is coordinated with Shelton; include some level of environmental review in ALL areas	carry forward and update

6	Open Space 9.1 - Designate and map open space areas in coordination with the incorporated and unincorporated areas designated as Urban Growth Areas. Criteria for designation shall include: provides multiple-use open space; environmentally unique and or fragile; separates incompatible land uses; consistency with the UGA's vision statement; traditional cultural places and landscapes.	Mason County Plan 2016-2036	Cultural Resources & Practices, Ecosystems, Health & Well-being, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	ensure beyond UGA shorelines/protecting cultural and tribal practices	carry forward and update
7	Open Space 9.2 - Provide accessible public open space and protect environmentally important areas without compromising private property rights.	Mason County Plan 2016-2036	Ecosystems, Health & Well-being, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	Add "and treaty rights" (global wherever we have "private property rights")	carry forward and update
8	Open Space 9.3 - Identify and prioritize open space areas, both urban and rural, which may be conserved through conservation easements, life estates, and/or conveyance to a land trust. Assure that private property rights are protected.	Mason County Plan 2016-2036	Cultural Resources & Practices, Ecosystems, Health & Well-being, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens		carry forward
9	Open Space 9.4 - Encourage increased access to publicly owned natural resource lands. Protect existing public access to shorelines and water. Encourage acquisition of lands to provide additional public shoreline and water access.	Mason County Plan 2016-2036	Agriculture & Food Systems, Cultural Resources & Practices, Ecosystems, Health & Well-being, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	expand acquisition beyond shorelines and water access to terrestrial	carry forward and update
10	Open Space 9.5 - Encourage retention of open space and the development of recreational opportunities like parks and public-use recreation areas appropriate for camping, hiking, horseback riding, and off-leash dog exercise.	Mason County Plan 2016-2036	Cultural Resources & Practices, Ecosystems, Health & Well-being, Zoning & Development	Drought, Extreme Heat, Ocean Acidification, Pests & Pathogens	add "maintain"	carry forward and update
11	Environment 10.1 - In order to protect public health and water quality, septic systems and/or appropriate alternative disposal systems will be installed where appropriate in rural areas, according to adopted County health codes. Alternative sewage collection and treatment systems should be considered as an option when public health is in jeopardy, and or to correct environmental damage and when consistent with land use designations in the Comprehensive Plan. Development permits and/or franchises for sewage treatment systems should be granted when consistent with the Comprehensive Plan.	Mason County Plan 2016-2036	Buildings & Energy, Emergency Management, Health & Well-being, Transportation, Waste Management, Water Resources, Zoning & Development	Extreme Precipitation, Flooding, Sea-level Rise	stricter regulations and enforcement re monitoring; add policy grey water and compost toilets in rural areas; identify funding sources for these services; county's staff capacity to monitor etc	carry forward
12	Environment 10.2 - Mason County and the cities therein shall protect drinking water supplies from contamination, ensure that water for development is both legally and physically available, and identify and reserve future supplies.	Mason County Plan 2016-2036	Health & Well-being, Water Resources, Zoning & Development	Extreme Precipitation, Flooding, Sea-level Rise	sea level rise impact with salt water intrusion - add specificity; policy re wells and well-permit distribution; seek best practices for disposal of bio-solids/PFAS needs more testing to limit unknown impacts on groundwater	carry forward and update

13	Environment 10.3 - In environmentally sensitive areas, ensure land use permit processes control activities which may have a detrimental effect on public health, safety, environment, and physical integrity of the area consistent with state and federal requirements.	Mason County Plan 2016-2036	Ecosystems, Health & Well-being, Zoning & Development	Ocean Acidification, Sea Level Rise, Extreme Heat	emphasize well permits and regulations	carry forward and update
14	Facilities/Services 12.3 - Major public facilities that generate substantial travel demand should be sited along or near major transportation and public transit corridors.	Mason County Plan 2016-2036	Buildings & Energy, Transportation, Zoning & Development	Extreme Heat, Extreme Precipitation		carry forward
15	Facilities/Services 12.4 - Sharing of corridors for major utilities, trails and other transportation rights of way is encouraged.	Mason County Plan 2016-2036	Buildings & Energy, Transportation, Waste Management	Extreme Heat, Extreme Precipitation	trucking waste and diesel emissions	carry forward and update
16	Facilities/Services 12.5 - Advance waste reduction efforts through support of state and federal programs, and through public information and education programs and other available, appropriate methods.	Mason County Plan 2016-2036	Waste Management	All	Overall gap: address vulnerable populations/ language accessibility (emergency notices in English, Spanish, Mam (oral), Q'anjob'al (oral)); should include more policies re waste management	carry forward and update
17	Park Benefits 3.3 - Natural Resource Areas: Actions to preserve natural areas, protect fish and wildlife habitat corridors, conserve land, provide appropriate public access and offer environmental education opportunities are promoted.	Mason County PROST Plan 2022-2027	Agriculture & Food Systems, Cultural Resources & Practices, Economic Development, Ecosystems, Water Resources, Zoning & Development	All	add preserving legacy forest/mature and biodiverse forests	carry forward and update
18	Park Benefits 3.5 - Cultural: Cultural and historic resources are preserved and promoted wherever they exist in parks and on trails throughout the County.	Mason County PROST Plan 2022-2027	Agriculture & Food Systems, Cultural Resources & Practices, Ecosystems, Zoning & Development	All	protect, promote, and preserve county-wide; co-manage designation with tribal leaders and local scientists	carry forward and update
19	CW-1 Continue data gathering for facility information to continue to improve the risk assessment and identification of infrastructure countywide.	Hazard Mitigation Plan 2023	Buildasgs & Energy, Emergency Management, Transportation, Waste Management	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
21	CW-3 Develop points of distribution in areas of potential isolation that may occur during a landslide or earthquake event, as well as for use during incidents like the COVID Pandemic for equipment, vaccinations, etc.	Hazard Mitigation Plan 2023	Emergency Management, Transportation	Earthquake, Pandemics Pests & Pathogens, Flooding, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

22	CW-4 Work with Public Health and Human Services to develop an information bank identifying individuals with access and functional needs. This will assist the County in determining shelter locations requiring specific resources to meet the needs of those individuals. NOTE: This is not an attempt to gather medical-related data, but rather to determine access and functional needs of citizens – e.g., citizens in wheel chairs need more space and shower/restroom facilities; hearing impaired need to have an area which allows them to be near to their signer, the use of oxygen tanks increases space requirements, etc.	Hazard Mitigation Plan 2023	Emergency Management, Health & Wellbeing	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
23	CW-8 Continue implementation of public education program within Mason County to educate citizens about the hazards faced and the appropriate preparedness and response measures, including, but not limited to, NFIP information and insurance.	Hazard Mitigation Plan 2023	Emergency Management, Health & Wellbeing, Zoning & Development	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
24	CW-9 Continue to expand CERT training, involving local teams in exercises and training with first responders.	Hazard Mitigation Plan 2023	Emergency Management, Health & Wellbeing,	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
25	CW-10 Develop and prepare a fueling plan, addressing both automotive and heating fuels, in case of prolonged interruption of normal distribution to Mason County locations.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
26	CW-11 Evaluate current coverage and equipment and provide a strategic emergency communications plan that provides better coverage to all areas of Mason County for first responders and emergency amateur radio communications. Continued training and recruitment will need to occur.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
27	CW-12 Review designated emergency shelter structural and utility readiness for occupancy after a significant incident. The County will attempt to gain Red Cross perspective with respect to the adequacy and functionality of shelters utilized.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
28	CW-13 Provide steep slope stability recommendations and education to owners of structures above steep bluffs or below steep bluffs. Increase monitoring of county bluffs involving beach communities or access to beach communities.	Hazard Mitigation Plan 2023	Ecosystems, Emergency Management, Zoning & Development	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
29	CW-15 Promote a “FireWise” program in County to increase fire safety zones around businesses and residences. Encourage owners to reduce woodland fuel loads on their property.	Hazard Mitigation Plan 2023	Economic Development, Emergency Management, Health & Well Being	Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

30	CW-16 Work with local jurisdiction and planning partners to develop various emergency planning efforts to help ensure continuity of business and resiliency.	Hazard Mitigation Plan 2023	Economic Development, Emergency Management	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
31	CW-17 Identify and establish redundant or back-up emergency operations center locations throughout the County in case of road closures which restrict access to areas of the County.	Hazard Mitigation Plan 2023	Emergency Management, Health & Well Being	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
32	CW-18 Partner with Washington State Department of Transportation to expand earthquake assessment, and to expand and implement training and exercises throughout the county which support transportation-related issues and potential isolation.	Hazard Mitigation Plan 2023	Emergency Management, Transportation	Earthquake	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
33	CW-19 Continue to promote and establish a countywide emergency management actions, projects, and programs, working with City of Shelton and special purpose districts, to enhance resiliency and maintain consistency in mitigation activities, emergency management programs, and capabilities. This includes seeking grant funding to support such initiatives.	Hazard Mitigation Plan 2023	Emergency Management	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
34	CW-20 Strive to capture time-sensitive, perishable data such as high-water marks, extent and location of hazard, and loss information following hazard events to support future updates to the risk assessment and in support of future grant applications to demonstrate impact.	Hazard Mitigation Plan 2023	Emergency Management	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
35	CW-25 Capture data concerning the number of portable generators at fueling stations and local grocery outlets to determine need to acquire generators to ensure fuel availability and food items during significant events which may impact transportation flows, reducing commodities in the planning area. If necessary, seek grant opportunities to purchase generators for use during such events.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Health & Well-being	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
36	CW-26 Capture information concerning the surplus supply maintained by local fueling stations and grocery outlets to determine quantities available should commodities be interrupted as a result of a significant incident.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Health & Well-being	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
37	CW-27 Develop countywide debris management plan.	Hazard Mitigation Plan 2023	Emergency Management, Waste Management	Earthquake, Flooding, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
38	CW-28 Work with various communications organizations within the area to identify location of cell towers and capacity to support area during disaster incidents.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management	Earthquake, Flooding, Extreme Heat, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

39	C-1 Study and retrofit county owned facilities to better withstand damage from earthquake, flood, severe weather.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation, Waste Management	Earthquake, Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
40	C-2 Evaluate and enhance the current capital improvements program for county roads, including the Skokomish Valley and Cloquallum Roads, as well as drainage projects to provide better flood control in known flood problem areas, including drainage system maintenance plans and sediment and debris clearance to ensure unobstructed flow of floodwaters.	Hazard Mitigation Plan 2023	Emergency Management, Transportation, Waste Management	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
41	C-3 Seek steep slope stability project funding or relocation funding for county roads with histories of instability.	Hazard Mitigation Plan 2023	Ecosystems, Emergency Management, Transportation	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
42	C-6. Work with WA DOT or seek grant funding for County roadways to address areas in high landslide areas. When funding received, complete project.	Hazard Mitigation Plan 2023	Emergency Management, Transportation	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
43	C-7 Continue participation in the NFIP; considering implementing various steps which will increase CRS scores to help lower insurance premiums.	Hazard Mitigation Plan 2023	Emergency Management, Health & Well-Being, Buildings & Energy	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
44	C-9 Continue to design and build facilities to meet or exceed seismic and code standards, including redundant essential equipment. Apply current seismic, wind and snow-load standards to all renovation or replacement of existing facilities, and/or equipment.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management	Earthquake	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
45	C-10 Conduct activities that support mitigation efforts to reduce the negative influence of natural hazards impacting Mason County, such as appropriate hazard identification, warning, dissemination of relevant information and data, and public outreach.	Hazard Mitigation Plan 2023	Emergency Management	Health & Well Being, Pandemic, Pests & Pathogens	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
46	C-12 Implement cost-effective measures to address vulnerability of facilities at risk to sea level rise, extreme high tides and storm surges as they relate to potential inflow of saltwater. This includes working with local private water purveyors.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation	Sea Level Rise, Flooding, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
47	C-14 Consider projects enhancing resistance of county structures to impact from hazards of concern, such as seismic bracing of equipment, piping and fixtures, removal of high hazard beams, access road reinforcement, or seismic upgrades of underwater interceptors.	Hazard Mitigation Plan 2023	Buildings & Energy, Emergency Management, Transportation	Earthquake	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

48	C-15 Implement a recovery system to ensure maximum FEMA reimbursement for disaster response, repair, mitigation and recovery, which will capture and track emergency activities, associated expenses (mileage, supplies, expendables, outside vendors, etc.), employee time and dedicated resources.	Hazard Mitigation Plan 2023	Emergency Management	Earthquake, Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
49	C-18 Assess the County's communications systems to determine its current vulnerability. This will include a review of the number of radios necessary to allow for adequate communications during emergency situations with field units, emergency response personnel, and emergency managers.	Hazard Mitigation Plan 2023	Emergency Management, Health & Well Being	Earthquake, Flooding, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
50	C-19 In accordance with OSHA/WISHA requirements for all employees performing emergency response activities (post-disaster), identify and train County staff and volunteers that will be utilized for these efforts. Training to be considered includes: ATC 20/45, Disaster Site Worker Training, and Emergency Response Training, Damage Assessment.	Hazard Mitigation Plan 2023	Emergency Management, Health & Well Being	Earthquake, Flooding, Extreme Precipitation, Wildfire	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
51	C-20 Develop (or update) plans to ensure response and recovery efforts. This includes working with the BOCC to develop appropriate committees, such as a continuity of operations team, which will develop a countywide continuity of operations plan, and an emergency communications team which will look at communications and interoperability issues.	Hazard Mitigation Plan 2023	Emergency Management	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
52	C-21 Develop public outreach which supports community participation in incentive-based programs, such as FireWise and StormReady. The County and its fire districts have applied for 2023 funding to develop a CWPP. If granted, such funds will be utilized for establishing the FireWise outreach necessary.	Hazard Mitigation Plan 2023	Emergency Management	Wildfire, Extreme Precipitation, Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
53	ECOLOGICAL PROTECTION, CRITICAL AREAS, NO NET LOSS - Requiring adverse impacts be mitigated in a manner that ensures no net loss of shoreline ecological functions necessary to sustain shoreline natural resources.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Water Resources	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
54	ECOLOGICAL PROTECTION, CRITICAL AREAS, NO NET LOSS - Including incentives to restore shoreline ecological functions where such functions have been degraded by past actions.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Water Resources	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
55	ECOLOGICAL PROTECTION, CRITICAL AREAS, NO NET LOSS - New uses and developments should be located and designed to preserve native shoreline vegetation to maintain shoreline ecological functions and prevent direct, indirect and cumulative impacts of shoreline development.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Zoning & Development	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

56	ECOLOGICAL PROTECTION, CRITICAL AREAS, NO NET LOSS - The County should implement vegetation conservation policies through a variety of means, including fish and wildlife habitat conservation area and wetland setback and buffer standards, conditional use requirements for specific uses or areas, mitigation requirements, incentives and non-regulatory programs.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Water Resources	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
57	ECOLOGICAL PROTECTION, CRITICAL AREAS, NO NET LOSS - The location, construction, operation, and maintenance of shoreline uses and developments should maintain or enhance the quantity and quality of surface and ground water over the long term.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Zoning & Development, Water Resources	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
58	ECONOMIC DEVELOPMENT - Ensure that water-oriented economic development is carried out in such a way that it has minimal adverse effects and that unavoidable adverse impacts are mitigated to achieve no net loss of shoreline ecological functions.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems, Water Resources, Economic Development	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
59	FLOOD HAZARD REDUCTION - Development in floodplains should not significantly or cumulatively increase flood hazard or be inconsistent with an adopted Comprehensive Flood Hazard Management Plan.	Shoreline Master Program 2021	Zoning & Development	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
60	FLOOD HAZARD REDUCTION - Development should be designed and located to preclude the need for flood control structures. New or expanded development or uses in the shoreline, including subdivision of land, that would likely require flood control structures within a stream, channel migration zone, or floodway should be prohibited.	Shoreline Master Program 2021	Zoning & Development, Water Resources	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
61	FLOOD HAZARD REDUCTION - Development should be discouraged in the channel migration zone areas and existing hazards or problem areas that would result in interference with the process of channel migration which may cause significant adverse impacts to property or public improvements and/or result in a net loss of ecological functions associated with the rivers and streams.	Shoreline Master Program 2021	Zoning & Development, Water Resources, eCosystems	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
62	VIEWS AND AESTHETICS - Clearing, thinning, and/or limbing for limited view corridors should only be allowed where it does not adversely impact ecological, aesthetic values or slope stability.	Shoreline Master Program 2021	Ecosystems	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
63	AGRICULTURE - New and expanded agricultural uses and development should be located and designed to assure no net loss of ecological functions and should avoid adverse impacts to shoreline resources.	Shoreline Master Program 2021	Agriculture & Food Systems, Cultural Resources & Practices, Ecosystems	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
64	AGRICULTURE - Agricultural uses and developments should follow best management practices to prevent erosion, runoff, and associated water quality impacts.	Shoreline Master Program 2021	Agriculture & Food Systems, Ecosystems, Water Resources	Flooding, Sea Level Rise, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

65	AGRICULTURE - Pasture siting practices that prevent contamination of watercourses and the destruction and erosion of vegetation and soil should be encouraged.	Shoreline Master Program 2021	Agriculture & Food Systems, Ecosystems, Water Resources	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
66	AGRICULTURE - Buffer zones of permanent vegetation should be encouraged between pastures and tilled areas and associated water bodies to retard surface runoff, reduce siltation, and promote quality habitats for fish and wildlife.	Shoreline Master Program 2021	Agriculture & Food Systems, Ecosystems, Water Resources	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
67	AGRICULTURE - Maintaining vegetative cover in areas subject to flooding should be encouraged.	Shoreline Master Program 2021	Agriculture & Food Systems, Ecosystems	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
68	AQUACULTURE - Shoreline and upland development in productive aquaculture areas or those areas with a high potential for aquaculture uses should be reviewed for detrimental impacts on aquaculture.	Shoreline Master Program 2021	Agriculture & Food Systems, Cultural Resources & Practices, Zoning & Development	Flooding, Sea Level Rise, Extreme Precipitation, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
69	COMMERCIAL - Multiple use concepts, which include open space and recreation, should be encouraged in commercial developments.	Shoreline Master Program 2021	Economic Development, Health & Well Being, Zoning & Development	Extreme Heat	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
70	COMMERCIAL - Commercial Developments should be located, designed and operated to avoid and minimize adverse impacts on shoreline ecological functions and processes.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
71	COMMERCIAL - New commercial development in shorelines should be encouraged to locate in those areas with existing commercial development that will minimize sprawl and the inefficient use of shoreline areas.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
72	COMMERCIAL - Restoration of impaired shoreline ecological functions and processes should be encouraged as part of commercial development.	Shoreline Master Program 2021	Ecosystems, Zoning & Development	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
73	INDUSTRIAL AND MARINE TERMINALS - Industrial and marine terminal development should be located, designed, and constructed in a manner that assures no net loss of shoreline ecological functions and such that it does not have significant adverse impacts to other shoreline resources and values.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
74	IN-STREAM STRUCTURES - Proposals for new in-stream structures should be evaluated for their potential adverse effects on the physical, hydrological, and biological characteristics as well as effects on species that inhabit the stream or riparian area.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
75	MARINAS - Where allowed, marinas should be located, designed, constructed and operated with appropriate mitigation to avoid adverse effects on shoreline ecological functions.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

76	MARINAS - Marinas should be constructed of materials that will not adversely affect water quality or aquatic plants and animals.	Shoreline Master Program 2021	Agriculture & Food Systems, Cultural Resources & Practices, Economic Development, Ecosystems	Flooding, Sea Level Rise, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
77	MARINAS - Use of marinas and public launches are preferred rather than the development of individual docks, piers, and boat launches for private, non-commercial pleasure craft.	Shoreline Master Program 2021	Economic Development, Ecosystems, Zoning & Development	Flooding, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
78	RECREATION - All proposed recreational developments should be designed, located and operated to protect the quality of scenic views and to avoid and minimize adverse impacts on the environment in order to achieve no net loss of ecological processes and functions. Favorable consideration should be given to those projects which complement their environment.	Shoreline Master Program 2021	Ecosystems, Health & Well-being, Zoning & Development	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
79	RECREATION - Publicly owned property which provides public access to a body of salt or fresh water should be retained for public use.	Shoreline Master Program 2021	Ecosystems, Health & Well-being, Zoning & Development	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
80	RECREATION - Trails and pathways on steep shoreline bluffs should be designed to protect bank stability and mitigate for impacts to shoreline ecological functions as to achieve no net loss.	Shoreline Master Program 2021	Ecosystems	Flooding, Extreme Precipitation	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
81	RESIDENTIAL - Residential development on shorelines should be planned, designed and located to avoid, minimize, and mitigate for unavoidable adverse impacts to shoreline ecological functions.	Shoreline Master Program 2021	Ecosystems, Zoning & Development	Flooding, Extreme Precipitation, Sea Level Rise, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
82	RESIDENTIAL - Residential development along shorelines should be designed and sited to make shoreline stabilization measures unnecessary within the foreseeable future.	Shoreline Master Program 2021	Ecosystems, Zoning & Development	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
83	RESIDENTIAL - New residential development should be encouraged to cluster dwelling units in order to preserve natural features, minimize physical and visual impacts and reduce utility and road costs.	Shoreline Master Program 2021	Buildings & Energy, Ecosystems, Transportation, Zoning & Development	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
84	RESTORATION AND ENHANCEMENT - Implement actions that restore shoreline ecological functions, values and processes as well as shoreline features, improve habitat for sensitive and/or locally important species, and are consistent with biological recovery goals for threatened salmon populations and other species and/or populations for which a recovery plan is available.	Shoreline Master Program 2021	Agriculture & Food Systems, Cultural Resources & Practices, Ecosystems	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

85	RESTORATION AND ENHANCEMENT - Integrate restoration efforts with other parallel natural resource management efforts including, but not limited to, water quality cleanup plans, TMDLs, integrated aquatic vegetation management plans for lakes, shellfish closure response plans, and other similar efforts.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
86	RESTORATION AND ENHANCEMENT - Protection of existing shoreline resources is the best way to ensure the long-term health and well-being of Mason County shorelines. Restoration should be used to complement the protection strategies required by this Program to achieve the greatest overall ecological benefit.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
87	RESTORATION AND ENHANCEMENT - When prioritizing restoration actions, the County should give highest priority to measures that have the greatest chance of reestablishing ecosystem processes and creating self-sustaining habitats.	Shoreline Master Program 2021	Cultural Resources & Practices, Ecosystems	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
88	TRANSPORTATION - New transportation facilities should be located on stable soils, back from a water channel using routes that avoid slumps, wetlands, and natural drainage areas. When this is not possible, corrective stabilization measures should be permitted.	Shoreline Master Program 2021	Transportation	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
89	TRANSPORTATION - Roads located in shorelands and wetlands should be designed and maintained to prevent erosion and to permit the natural movement of ground water.	Shoreline Master Program 2021	Transportation	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
90	TRANSPORTATION - All debris, overburden and other waste materials from construction should be disposed of in such a way as to prevent their entry by erosion from drainage, high water, or other means into any surface water body.	Shoreline Master Program 2021	Waste Management	Flooding, Extreme Precipitation, Sea Level Rise, Ocean Acidification	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
91	TRANSPORTATION - Waterway crossings should be designed and constructed to maintain normal geohydraulic processes, as well as to minimize interruption of flood water flow.	Shoreline Master Program 2021	Transportation, Water Resources	Flooding, Extreme Precipitation, Sea Level Rise	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
92	TRANSPORTATION - Trail and bicycle systems should be encouraged along shorelines to the maximum extent feasible.	Shoreline Master Program 2021	Transportation, Health & Well Being	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
93	TRANSPORTATION - Public transportation facilities should incorporate environmental education features, where practicable, and should employ pervious materials and other appropriate low impact development techniques where soils and geologic conditions are suitable and where such measures could measurably reduce stormwater runoff.	Shoreline Master Program 2021	Transportation, Health & Well Being	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
94	UTILITIES - New utilities should use existing transportation and utility sites, rights-of-way and corridors, rather than creating new corridors.	Shoreline Master Program 2021	Buildings & Energy, Ecosystems, Transportation	All	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

95	FLOOD CONTROL - Flood control planning should be comprehensive and long-term and focused on preventing flood damage, maintaining or restoring the natural hydraulic capacity of streams and floodplains, and conserving or restoring valuable resources such as fish, water, soil, and recreation and scenic areas.	Shoreline Master Program 2021	Buildings & Energy, Zoning & Development	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
96	FLOOD CONTROL - Non-structural flood control solutions should be used wherever possible, including prohibiting or limiting development in historically flood prone areas, regulating structural design and limiting increases in peak flow runoff from new upland development.	Shoreline Master Program 2021	Buildings & Energy, Zoning & Development	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy
97	FLOOD CONTROL - New development should be limited in flood-prone areas, and should be generally designed and located to preclude the need for flood control structures.	Shoreline Master Program 2021	Buildings & Energy, Zoning & Development	Flooding	This plan will remain as a complementary document to the Climate Element	Inform compatible Climate Element Policy

Task 2.2: Determine next step (Drought)

Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to help determine whether a more detailed vulnerability and risk assessment is warranted for your jurisdiction.*

Question	Answer	Discussion Notes
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The 2023 Hazard Mitigation Plan includes a chapter on Drought in the County.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	Densely wooded areas, especially those in parks and wildland-urban interfaces, are more vulnerable due to increased wildfire risk during drought. Areas dependent on aquifers are also at risk due to the potential for saltwater intrusion and limited water supply.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	Although overall regions like parks and woodlands are provided, the plan fails to map those regions at the level of detail required for particular policy-establishment purposes as well as targeted mitigation measures.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Natural resources such as aquifers, fish runs, watersheds, and forests are particularly vulnerable. The economic impact on aquaculture (Taylor Shellfish, for example) as well as agriculture, also exposes built and social assets to risk.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	The analysis provides descriptive impacts on particular sectors and environmental processes, but it does not include detailed spatial information sufficient for fine-grained policymaking or zoning.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Agriculture & Food Systems, Ecosystems, Buildings & Energy, Health & Well-being
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	The plan does describe sector-specific weaknesses, however, it does not give detailed spatial or economic information needed to completely underpin sector-specific policies or investments.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Vulnerable populations are the elderly, children, low-income residents, the disabled, unhoused people, and those with limited English language skills. These groups are at higher risk to both wildfires and water shortages related to drought.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan qualitatively identifies populations at risk, but it does not include detailed demographic mapping or neighborhood-level vulnerability measures that are required for local planning and outreach. There would be a need to consider the disparate impacts of each (potentially overlapping) population. Goals and policies would need to be based on these risks and formulated to ensure future development avoids exacerbating vulnerability and risk to these populations.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these questions, have you identified a need for a vulnerability and risk assessment for this hazard?	X Yes ☐ No	Sectoral and population-based risks are identified, but more nuanced spatial analysis and community-based assessments must be conducted to support actionable targets and policies. Not only do these questions lead staff to believe that a drought vulnerability assessment is necessary, but the City has already committed to conducting one as an action item in the Climate Resiliency Plan that will be adopted in 2025.

13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the 2023 Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for further prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Extreme Heat)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The Hazard Mitigation Plan includes a chapter on Severe Weather which addresses extreme temperatures.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	The region is prone to severe weather, including extreme heat. However, there are specific areas, like heavily forested or isolated rural areas, that are at higher risk because of the hazard of fires and restricted access to cooling or emergency services.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	While the plan mentions that extreme heat can affect the region as a whole and is focused on specifying individual weaknesses, it does not explicitly map or define those geographic locations at a fine enough level of scale to directly guide targeted objectives or policies.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	These include power systems as well as fish hatcheries, which are susceptible during heat events due to threats such as power outages, heat-induced wildfires, and higher temperatures in surrounding rivers, affecting aquatic animals.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of heat in specific terms.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Sectors such as health and well-being, buildings & energy, and ecosystems (e.g., forests and fisheries) are particularly at risk. Extreme heat increases energy demand, places additional burdens on healthcare, and poses the risk of fires in natural and built environments.
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan emphasizes sector-wide risk but is not specific enough. For example, it mentions broad effects on tourism and power infrastructure without detailing particular susceptibilities or response planning thresholds.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	At-risk groups are elderly citizens, children aged under 5, pregnant women, people with disabilities, low-income households, unhoused people, and linguisticly or culturally isolated groups. Such groups are at greater risk of heat stress as well as difficulty in accessing healthcare services.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	Though the plan does name these groups and list them as being included in assessments of hazards, it does not map where they are located or break them down in a manner useful for local policy or focused intervention.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these questions, have you identified a need for a vulnerability and risk assessment for this hazard?	X Yes ☐ No	There is an evident necessity for an enhanced vulnerability and risk analysis of heat extremes in particular mapping of at-risk groups, critical infrastructure, and sectoral thresholds in order to inform planning for things like targeted adaptation and mitigation.

13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for further prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Extreme Precipitation)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The 2023 Hazard Mitigation Plan includes a chapter on Severe Weather in the County, which addresses extreme temperatures.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	Low-lying areas, river valleys, and floodplains especially along the Skokomish River are repeatedly impacted by heavy precipitation events, which cause severe flooding and landslides.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	The plan includes detailed floodplain maps and identifies specific roadways, critical infrastructure, and neighborhoods prone to damage from excessive rainfall and runoff. These are used for policy and mitigation planning.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Repeated heavy rainfall affects transportation infrastructure, homes in flood zones, wastewater systems, and natural assets such as wetlands and riparian ecosystems. The Skokomish River basin is a prime example of a vulnerable natural-social system.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	Detailed analyses and mapping of flood-prone areas and infrastructure vulnerabilities are included. These data directly inform hazard mitigation initiatives and capital improvement planning. The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of heat in specific terms.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Sectors like health and well-being, buildings and energy, economic development, cultural resources and practices, transportation, and emergency management are disproportionately affected. Service interruptions, emergency response strain, and road closures are common during extreme rainfall.
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	Sector-specific mitigation goals and policies are outlined in the plan, including road elevation projects, stormwater upgrades, and emergency sheltering plans. However these can be updated to reflect current vulnerability to this hazard.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Populations in mobile homes, flood-prone neighborhoods, and those with limited resources or mobility face greater risk. The plan notes that these communities may lack insurance or the ability to evacuate quickly.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan identifies vulnerable groups but lacks neighborhood-scale mapping or highly targeted policy recommendations for outreach or relocation.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these questions, have you identified a need for a vulnerability and risk assessment for this hazard?	X Yes ☐ No	Sector-specific mitigation goals and policies are outlined in the plan, including road elevation projects, stormwater upgrades, and emergency sheltering plans. Not only do these questions lead staff to believe that an extreme precipitation vulnerability assessment is necessary, but the City has already committed to conducting one as an action item in the Climate Resiliency Plan that will be adopted in 2025.

13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for further prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Flooding)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The 2023 Hazard Mitigation Plan includes a chapter on Flooding in the County.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	X Yes ☐ No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	The 2023 Hazard Mitigation Plan identifies flood-prone areas, including those along the Skokomish River and low-lying coastal regions, as having a higher risk.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	Flood-prone areas are mapped using FEMA flood maps and local risk assessments and used in mitigation planning. However, these maps can be updated to show recent happenings.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Critical facilities, infrastructure (e.g., roads, utilities), and natural habitats are identified as being at higher risk in flood-prone zones.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	Specific assets at risk from flooding are listed in detail in the plan showing their spatial location and vulnerability. The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of heat in specific terms.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Sectors like health and well-being, buildings and energy, economic development, cultural resources and practices, transportation, and emergency management are highly affected during flooding events.
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	The plan includes sector-specific vulnerability analysis to support mitigation goals and targeted policies. However these can be updated to reflect current vulnerability to this hazard.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Populations with limited mobility, lower incomes, language barriers, and those living in rural and isolated areas are more vulnerable.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	Demographic data and mapping identify these populations with sufficient resolution for planning. The plan identifies vulnerable groups but lacks neighborhood-scale mapping or highly targeted policy recommendations for outreach or relocation.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these	X Yes	Despite the assessments, the plan recommends continued evaluation of vulnerabilities, especially with evolving flood risk and climate impacts. Sectoral and population-based risks are identified, but more nuanced spatial analysis and

questions, have you identified a need for a vulnerability and risk assessment for this hazard?	☐ No	risk and climate impacts. Sectoral and population-based risks are identified, but more nuanced spatial analysis and community-based assessments must be conducted to support actionable targets and policies. Not only do these questions lead staff to believe that an extreme precipitation vulnerability assessment is necessary, but the City has already committed to conducting one as an action item in the Climate Resiliency Plan that will be adopted in 2025.
13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for further prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Sea Level Rise)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The 2023 Hazard Mitigation Plan includes a chapter on Flooding in the Count, which includes flooding related to sea level rise.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	Low-lying coastal areas, especially along Hood Canal and near estuaries, are identified as more vulnerable to sea level rise impacts.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	Sea level rise exposure is discussed in the context of coastal flooding and climate change, with some mapping available.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Coastal infrastructure, ecosystems, and shoreline communities are acknowledged to be at increased risk from rising seas.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	While general risks are discussed, the plan lacks highly localized, asset-specific vulnerability modeling for sea level rise.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Sectors such as agriculture and food systems, buildings and energy, emergency management, economic development, and transportation are potentially at high risk.
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	Sector-level vulnerabilities are broadly discussed under climate impacts, but detailed sector-specific analysis is limited.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Populations in shoreline communities, especially those with mobility or income constraints, are more exposed to sea level rise.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	Social vulnerability mapping exists but does not isolate sea level rise impacts, limiting precise population-level planning.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these questions, have you identified a need for a	X Yes	There is a clear need for a more detailed and localized sea level rise risk and vulnerability assessment to inform future policy. Sectoral and population-based risks are identified, but more nuanced spatial analysis and community-based

questions, have you identified a need for a vulnerability and risk assessment for this hazard?	☐ No	assessments must be conducted to support actionable targets and policies. Not only do these questions lead staff to believe that a sea level rise vulnerability assessment is necessary, but the City has already committed to conducting one as an action item in the Climate Resiliency Plan that will be adopted in 2025.
13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for further prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Ocean Acidification)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	☐ Yes X No	Not a study specific to this hazard, but it is mentioned under the Drought and Sea Level Rise chapters of the 2023 Hazard Mitigation Plan.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Hazard Mitigation Plan is insufficient for localized policy development. There is no assessment of this hazard in the plan, but it is mentioned as relevant to drought and sea level rise.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	Waterways, shorelines, and water resources are the most impacted by ocean acidification.
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	These areas have not been identified at a scale that is relevant to setting goals and policies.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Natural aquatic resources and species, and all related aquaculture activities, are impacted by this hazard.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	There is no assessment of this hazard in the 2023 Mason County Hazard Mitigation Plan, but it is mentioned as relevant to drought and sea level rise.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Agriculture and food systems (specifically aquaculture and shellfish), cultural resources and practices, health & well-being (related to shellfish harvesting and fishing)
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	There is no assessment of this hazard in the 2023 Mason County Hazard Mitigation Plan, but it is mentioned as relevant to drought and sea level rise.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Populations who work in the aquaculture and shellfish industries, and populations who recreate in waterways, are specifically at risk.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	There is no assessment of this hazard in the 2023 Mason County Hazard Mitigation Plan, but it is mentioned as relevant to drought and sea level rise.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit it for FEMA approval?	X Yes ☐ No	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.

12. Based on the answers to these questions, have you identified a need for a vulnerability and risk assessment for this hazard?	X Yes ☐ No	Considering Mason County's high reliance on Aquaculture as a food system, economic resource, and recreational and cultural asset, the impacts of ocean acidification need to be accounted for.
13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, however, resources available for this hazard on a localized scale may be limited. The causes of ocean acidification impacting Mason County are well beyond the county's boundaries.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Task 2.2: Determine next step (Earthquakes)		
Instructions: *For each climate hazard (flooding, drought, etc.) that you identified in Step 1 as relevant to your jurisdiction make a copy of the table below and answer the questions to*		
Question	**Answer**	**Discussion Notes**
1. Has your jurisdiction already completed a localized study for this hazard and its impacts?	X Yes ☐ No	The 2023 Hazard Mitigation Plan includes a chapter on Earthquakes in the County.
2. If yes to Q1, does it provide enough information to address the hazard through goals and policies? If yes, move to Step 5 of this checklist.	☐ Yes X No ☐ Not sure ☐ N/A	The information provided in the 2023 Mason County Multi-Jurisdiction Hazard Mitigation Plan is insufficient for localized policy development, although it does provide a helpful overview of potential impacts that may be worth studying further.
3. Are certain geographic areas in your jurisdiction more vulnerable to this hazard than others?	X Yes ☐ No ☐ Not sure	There are several faults running near or through Mason County, including the Saddle Mountain East Fault, Frigid Creek Fault, and Canyon Creek Fault, which are located north and west of Hoodsport near the Olympic National Forest (USGS, 2015a).
4. If yes to Q3, have these areas already been identified at a scale that is relevant to setting goals and policies?	X Yes ☐ No ☐ N/A	The plan includes a Mason County Faults map that was obtained from the National Earthquake Hazard Reduction Program (NEHRP). Considering their number and locations, the entire county is within a risk area.
5. Are certain built, natural, or social assets in your jurisdiction more vulnerable to this hazard or more at risk from this hazard?	X Yes ☐ No ☐ Not sure	Buildings within the county especially old structures, all capital facilities, transportation corridors, facilities holding hazardrous materials, coastal areas, roadways are identified as more vulnerable to this hazard.
6. If yes to Q5, has the vulnerability and risk to these assets been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	There is an earthquake damage map, but it is not detailed. The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of earthquakes in specific terms.
7. Are certain sectors in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	Sectors like buildings and energy, health and well-being, emergency services, transportation, and housing are noted to be highly affected during earthquake events.
8. If yes to Q7, has the vulnerability and risk to these sectors been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of heat in specific terms.
9. Are certain populations in your jurisdiction more vulnerable to this hazard or more at-risk from this hazard?	X Yes ☐ No ☐ Not sure	The young population, Elderly population, persons living with disabilities, and persons with limited mobility or income constraints are more vulnerable to this hazard.
10. If yes to Q9, has the vulnerability and risk to these populations been identified at a scale that is relevant to setting goals and policies?	☐ Yes X No ☐ N/A	The plan recognizes overall risk to assets but does not include specific, site-by-site assessments of vulnerability that would inform goal-setting or action for mitigation of heat in specific terms.
11. Does your jurisdiction plan to update its local hazard mitigation plan and submit	X Yes	The 2023 plan is fairly recent and specifically addresses continued improvement, review, and coordination with FEMA hazard mitigation planning standards. Regular updates will be necessary as available information evolves. The updated

its local hazard mitigation plan and submit it for FEMA approval?	☐ No	HMP that is reviewed here is the FEMA-aligned version for Mason County in 2023 that has been fortified with new data and planning tactics.
12. Based on the answers to these questions, have you identified a need for a vulnerability and risk assessment for this hazard?	X Yes ☐ No	Sectoral and population-based risks are identified, but more nuanced spatial analysis and community-based assessments must be conducted to support actionable targets and policies. Not only do these questions lead staff to believe that an earthquake vulnerability assessment is necessary, but the City has already committed to conducting one as an action item in the Climate Resiliency Plan that will be adopted in 2025.
13. If yes to Q12, does your jurisdiction intend to conduct a vulnerability and risk assessment of this hazard -- or all applicable hazards -- at this time?	X Yes ☐ No	Yes, a vulnerability assessment will be conducted for all priority hazards. Conducting an assessment will help fulfill the action item mentioned in Q12 while providing useful information for the development of goals and policies in the Comprehensive Plan Update, thereby helping to integrate the two planning processes and provide a foundation for prevention and adaptation actions.
14. If yes to Q12, proceed to Step 3. If no to Q12, proceed to Step 4.		

Tasks 3.1-3.3: Assess sensitivity and adaptive capacity to characterize vulnerability							
Number	**Asset-Hazard Pair** *(from Column B of Task 1.3 tab)*	**Sensitivity — Task 3.1** *(Low, Medium, or High)*	**Adaptive Capacity — Task 3.2** *(Low, Medium, or High)*	**Vulnerability — Task 3.3** *(Low, Medium, or High)*	**Notes** (The CMRW tool used in Step 1 describes general factors that affect a given sector's sensitivity (susceptibility to change). To qualitatively rate the sensitivity and adaptive capacity of a specific local asset or a broader asset category, start with a core question and then select indicators and available information (e.g., online census data, local plans, and community knowledge) to answer the question. Use the sensitivity and adaptive capacity ratings -- and other information, as desired -- to characterize the asset's vulnerability.) **Indicators Discussion** (If desired, use this column to discuss your indicators and how they affected your ratings.)		
					Sensitivity Notes and Indicators	**Adaptive Capacity Notes and Indicators**	**Vulnerability Notes and Indicators**
1	**Aquaculture, Shellfish, and Salmon Fishing** Sea Level Rise (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	High	Medium	High	Step 1: Sea level rise directly threatens coastal aquaculture infrastructure, tidal shellfish beds, and salmon spawning areas. Step 2: Environmental asset indicators: - Fragmentation: High—habitats are already fragmented, limiting species movement. - Temperature range: Narrow—species like oysters and salmon are sensitive to salinity and temperature changes. - Exposure: High—tidal ecosystems are highly exposed to rising seas and salinity intrusion. Step 3: For example, intertidal shellfish beds are highly vulnerable due to permanent inundation or salinity shifts. Step 4: All indicators point toward high sensitivity.	Many operations lack physical barriers or elevation adjustments, but some mitigation strategies exist (e.g., selective breeding for resilient species, relocation of aquaculture sites). Financial and institutional resources are limited for small fishers, but tribal and state partnerships (e.g., shellfish recovery programs) enhance capacity. Based on these indicators, Mason County's Aquaculture, Shellfish, and Salmon Fishing have a medium adaptive capacity to sea level rise	With high sensitivity and medium adaptive capacity, this asset-hazard pair has high vulnerability. Coastal fisheries and aquaculture are physically exposed, ecologically fragile, and socially/economically significant, making them a priority for adaptation interventions.
2	**Aquaculture, Shellfish, and Salmon Fishing** Extreme Heat (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	High	Low	High	Step 1: Extreme heat stresses aquatic species, leading to mortality, disease outbreaks, and altered life cycles. Step 2: Environmental and social indicators: - Temperature range: Narrow—salmon and shellfish species are highly sensitive to temperature spikes. - Disease exposure: Elevated water temperatures increase susceptibility to pathogens and algal blooms (e.g., Vibrio outbreaks in shellfish). - Cultural impact: Heat-related declines in salmon directly affect tribal and cultural practices. Step 3: For example, juvenile salmon survival is greatly reduced at high stream temperatures. Step 4: With multiple temperature-related vulnerabilities, this asset has high sensitivity.	Mitigation is limited by the inability to control natural water temperatures in streams and coastal areas. Infrastructure like hatcheries may lack sufficient cooling systems. Mason County does not have a hatchery where cooling systems can be installed. Many operations are small-scale with limited financial or technical capacity for rapid adaptation, resulting in low adaptive capacity	High sensitivity and low adaptive capacity results in high vulnerability. Heat events directly endanger species survival, affect food security, and disrupt economic and cultural systems reliant on aquaculture and salmon harvest.
3	**Aquaculture, Shellfish, and Salmon Fishing** Drought (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	High	Medium	High	Step 1: Drought reduces streamflow, estuarine inflow, and salinity balance, severely impacting aquatic habitats. Step 2: Environmental indicators: - Streamflow dependency: High—salmon require adequate freshwater flows for migration and spawning. - Salinity fluctuation exposure: High—shellfish and aquaculture operations are sensitive to increased salinity due to reduced freshwater input. - Temperature rise from low water levels: Exacerbates stress on aquatic species. Step 3: For example, low river flows hinder salmon runs and increase disease risk. Step 4: Combined hydrological and biological stressors result in high sensitivity.	Some hatcheries and aquaculture facilities may implement water recycling, relocate operations, or use alternative water sources. However, wild salmon stocks and small operators lack strong drought contingency measures. Regional planning and tribal collaborations provide some support, but resources are unevenly distributed resulting in medium adaptive capacity	The combination of high sensitivity and medium adaptive capacity leads to high vulnerability. Drought threatens both ecological viability and economic livelihood, especially for vulnerable communities depending on fisheries.
4	**Forests, Timber Industries -** Drought (Cultural Resources and Practices, Ecosystems, Economic Development)	Medium (check w Joshua Wright)	High	Medium	Step 1: Drought reduces soil moisture, slows growth, and stresses trees. Step 2: • Fragmentation: Moderate – Mason County forests include some patchy, logged parcels but also large contiguous areas. • Moisture stress: Present, but not extreme – most species are moderately drought-tolerant. • Pest vulnerability: Elevated under drought but still monitored. Step 3: Drought impacts have been increasing, but large-scale die-off has not been observed. Step 4: With mixed conditions (moderate fragmentation + moderate stress), this results in medium sensitivity.	Step 1: The county has a strong ability to adjust and respond to drought. Step 2: • Design flexibility: Forestry operations can apply thinning, change species, or reduce density to conserve water. • Financial resources: Private companies and public programs (DNR, Forest Stewardship) provide resources. • Staff capacity: Experienced forestry professionals and extension staff support planning and response. The breadth of tools, support, and institutional capacity supports a high adaptive rating.	Step 1: Medium sensitivity + high adaptive capacity = medium vulnerability. Forests are affected by drought, but their health and the timber industry remain manageable due to strong adaptive measures.
5	**Forests, Timber Industries -** Extreme Heat (Cultural Resources and Practices, Ecosystems, Economic Development)	Medium	High	Medium	Step 1: Extreme heat increases evapotranspiration, raises wildfire risk, and stresses certain tree species. Step 2: • Temperature tolerance: Moderate – Some tree species are heat-sensitive (e.g., Douglas fir), but others are more resilient. • Moisture loss and fire risk: Elevated during heatwaves, especially in denser stands. • Pest susceptibility: Heat exacerbates bark beetle pressure. Step 3: Local forests have not experienced heat-related collapse but show early signs of stress. Step 4: Moderate conditions across indicators result in medium sensitivity.	Forest managers may use shade retention, selective thinning, and controlled burns to reduce heat-related stress. Larger timber operators have some flexibility to shift management practices, though heat-resistant replanting strategies are still emerging. Smaller private lands may lack resources resulting in High adaptive capacity	With high sensitivity and medium adaptive capacity, this pair is rated high vulnerability. Heat stress threatens forest ecosystems and timber revenues, and contributes to fire hazard buildup, with direct consequences for cultural and economic sectors.

6	**Forests, Timber Industries -** Pests & Pathogens (Cultural Resources and Practices, Ecosystems, Economic Development)	Medium	High	Medium	Step 1: Pests and pathogens weaken or kill trees, affecting both forest health and timber productivity. Step 2: • Species susceptibility: Medium – Douglas fir and other species are affected by bark beetles and root rot, but not uniformly. • Forest age and condition: Managed rotation forestry leads to younger, healthier stands. • Spread risk: Moderate – not heavily fragmented, but climate warming raises potential for future outbreaks. Step 3: Infestations are present but localized. Step 4: These conditions yield a medium sensitivity rating.	Step 1: Strong pest and forest health programs provide robust adaptive capability. Step 2: • Monitoring: WA DNR conducts regular pest surveys and forest health assessments. • Response tools: Landowners use targeted thinning, replanting, and integrated pest management. • Financial/technical assistance: Programs help small landowners respond to outbreaks. Comprehensive tools and agency support result in high adaptive capacity.	Step 1: Medium sensitivity + high capacity = medium vulnerability. Pest pressures are increasing, but Mason County has the infrastructure and practices in place to manage them effectively.
7	**Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting** - Extreme Heat (Ecosystems, Health and Wellbeing)	High	Medium	High	Step 1: Extreme heat affects both human and ecological systems connected to outdoor environments. Step 2: • Air Quality: Wildfire smoke and stagnant hot air increase ozone and PM2.5 levels, worsening asthma and cardiovascular conditions especially in children and older adults. • Parks & Recreation: Prolonged heat discourages outdoor recreation and increases risks of heat illness for workers and visitors. • Aquatic/Terrestrial Harvesting: Heat can reduce fish activity, change plant productivity, and increase harmful algal blooms, affecting cultural and subsistence harvesters. Step 3: Mason County has already experienced closures of shellfish beds due to heat-related toxin levels, and recreation programs face weather-related disruptions. Step 4: All these factors combine to a high sensitivity rating.	Step 1: Some strategies exist to adapt parks, protect health, and shift harvesting timing, but are inconsistently available. Step 2: • Parks Department Resources: Limited capacity to modify hours, provide shade, or monitor air quality in real time. • Public Health Infrastructure: Mason County Public Health provides heat warnings but lacks widespread cooling centers or transportation options. • Harvesting Practices: Indigenous knowledge systems adapt practices, but state regulations are often reactive rather than adaptive. Mixed resources across sectors lead to a medium adaptive capacity rating.	Step 1: With high sensitivity and medium adaptive capacity, this asset-hazard pair is highly vulnerable. Extreme heat disrupts daily life, cultural practices, and ecosystem services in ways that disproportionately affect low-income residents, outdoor workers, and tribal communities.
8	**Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting** - Ocean Acidification (OA) (Ecosystems, Health and Wellbeing)	High	Low	High	Step 1: Ocean acidification directly impacts shell-forming species and indirectly affects cultural harvesting and ecosystem health. Step 2: • Aquatic Harvesting: High sensitivity – Ocean Acidification affects shellfish and species that form the base of the food chain. • Terrestrial Harvesting: Less direct impact, but indirectly affected by declining marine food resources for tribal subsistence activities. • Parks & Recreation: Sensitive in coastal areas where Ocean Acidification affects marine education and ecotourism experiences. Step 3: In Mason County, Ocean Acidification has contributed to closures of shellfish harvesting and threatens culturally important practices like intertidal clam digging. Step 4: These factors together suggest high sensitivity.	Step 1: The capacity to adapt is limited since the causation is widespread and not locally controlled. Step 2: • Monitoring Systems: State partnerships with research institutions (e.g., NOAA, UW) track Ocean Acidification, improving scientific understanding, but limited ability to mitigate effects on-site. • Education & Interpretation: Some parks incorporate OA into programming, but limited ability to mitigate effects on-site. • Community Adaptation: Tribal and subsistence users have deep ecological knowledge but limited ability to counteract OA impacts directly. While awareness is available and growing, the limited ability to mitigate the impacts locally results in low adaptive capacity.	Step 1: With high sensitivity and low adaptive capacity, vulnerability is high. OA threatens both ecosystem services and culturally significant practices in Mason County, and while science and monitoring are improving, direct adaptation remains limited.
9	**Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting** - Sea level rise (Ecosystems, Health and Wellbeing)	High	Medium	High	Step 1: Sea level rise affects low-lying coastal and estuarine zones, threatening access, infrastructure, and ecosystem health. Step 2: • Parks & Recreation: Many parks and trails in Mason County are in shoreline areas (e.g., Oakland Bay, Potlatch State Park) and are susceptible to flooding, erosion, and saltwater intrusion. • Aquatic Harvesting: Intertidal shellfish beds are directly impacted by permanent inundation and shifting tidal zones. • Cultural Practices: Indigenous and subsistence harvesters rely on intertidal areas for clam and shellfish gathering. Step 3: Erosion, access restrictions, and water quality degradation have already been documented along parts of the county shoreline. Step 4: The combined ecological, recreational, and cultural impacts warrant a high sensitivity rating.	Step 1: The ability to adapt to sea level rise varies across asset types. Step 2: • Parks & Infrastructure: Limited funding for relocation or redesign of waterfront trails and amenities. • Harvesting Adaptation: Some adaptive capacity exists through tribal planning and NOAA-supported shellfish programs, but sediment and shoreline changes are hard to manage. • Air Quality and Ecosystems: Indirectly affected through increased salinity and degraded wetland buffers. Some tools exist, but they're unevenly applied and constrained by funding and jurisdictional complexity resulting in medium adaptive capacity.	Step 1: With high sensitivity and medium adaptive capacity, the overall vulnerability is high. Sea level rise poses a long-term threat to culturally significant harvesting areas, shoreline ecosystems, and recreational infrastructure in Mason County, with limited options for full mitigation.
10	**Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting** - Flooding, Extreme Precipitation (Ecosystems, Health and Wellbeing)	High	Medium	High	Step 1: Flooding and intense rain events damage public spaces, infrastructure, and ecosystem services. Step 2: • Parks & Recreation Areas: Many of Mason County's recreation areas (e.g., along the Skokomish River, Oakland Bay) are low-lying and prone to seasonal and flash flooding. Trails and access roads wash out, and facilities close. • Aquatic/Terrestrial Harvesting: Flooding affects intertidal areas and can degrade water quality and habitat conditions (e.g., shellfish contamination from runoff and sedimentation). • Air Quality: Heavy precipitation is often accompanied by damp indoor conditions, contributing to mold risk in homes and community centers—especially affecting vulnerable populations. Step 3: The Skokomish River has repeatedly overflowed its banks, prompting recreational closures and harvest restrictions. Step 4: Due to infrastructure exposure, ecological disruption, and public health concerns, sensitivity is rated high.	Step 1: There is some capacity to adapt through emergency planning, restoration efforts, and infrastructure adjustments. Step 2: • Parks/Trails: Mason County has started including climate-related risks in parks planning, but elevation and retrofitting options are limited. • Harvesting Systems: Some tribal and county entities monitor stormwater runoff and close harvesting when necessary, protecting public health but limiting flexibility. • Air Quality/Health Response: There are emergency alerts and shelter systems, but no robust wet-weather respiratory health programs. Tools exist but are reactive and unevenly distributed which leads to medium adaptive capacity.	Step 1: With high sensitivity and medium adaptive capacity, the overall vulnerability is high. Seasonal flooding and extreme rainfall already disrupt ecosystems, public access, harvesting, and health, and long-term resiliency efforts remain under-resourced.

11	**Roads and Bridges, Culverts, Non-motorized transportation -** Flooding, Extreme Precipitation (Transportation, Emergency Management)	High	Medium	High	Step 1: These assets are physically vulnerable to damage, blockage, and failure during high-flow events. Step 2: • Age & Condition: Many rural roads and culverts in Mason County are aging, undersized, or designed for outdated precipitation norms. • Physical Design: Some bridges and culverts (especially in the Skokomish Valley) frequently experience overtopping and road washouts. • Non-motorized Infrastructure: Trails and bike paths often lack drainage features and are susceptible to erosion or prolonged closure. Step 3: The Skokomish River is a well-documented flood hotspot, and county road closures due to washouts are common during heavy storms. Step 4: Given the exposure, physical limits, and maintenance gaps, this asset group rates high sensitivity.	Step 1: Mason County has some ability to plan for and mitigate impacts, but capacity is constrained. Step 2: • Planning/Upgrades: The County and WSDOT have begun incorporating climate projections into culvert replacement and floodplain restoration (e.g., fish passage projects). • Emergency Response: There are detour and closure systems, but smaller roads and rural routes often lack redundancy. • Funding: Federal and state grants exist (e.g., FEMA BRIC), but implementation is slow and unevenly distributed. These programs provide meaningful resilience, but do not yet reach all vulnerable areas—rating medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Transportation infrastructure remains at risk from repeat flood damage and is essential to emergency response, public safety, and economic access—particularly in rural Mason County.
12	**Roads and Bridges, Culverts, Non-motorized transportation -** Sea Level Rise (Transportation, Emergency Management)	Medium	Medium	Medium	step 1: Sea level rise threatens coastal infrastructure, especially low-lying roads and transportation corridors near bays and estuaries. Step 2: • Location & Design: In Mason County, some key roads and trails run near Oakland Bay, Pickering Passage, and along the Hood Canal shoreline areas that may see tidal flooding and saltwater intrusion. • Condition: Roads in low-lying areas (e.g., Old Belfair Highway) may not be elevated or armored, but many inland routes are not at direct risk. • Bridges and Culverts: These tend to be more vulnerable to riverine flooding than direct sea level rise. Step 3: While a few shoreline-adjacent assets are exposed, most of the system lies above sea level rise projections for 2050–2100. Step 4: Localized exposure with limited systemic impact results in medium sensitivity.	Step 1: Mason County has limited capacity for large-scale elevation or relocation of infrastructure. Step 2: • Planning Capacity: Sea level rise is being considered in shoreline and stormwater planning (e.g., Shoreline Master Program), but not consistently integrated into transportation engineering. • Financial Resources: Rural counties have limited funding for major elevation or relocation projects, and must rely on external grants (e.g., FEMA BRIC, FHWA resilience funds). • Engineering Flexibility: Culverts and coastal roads can be redesigned over time, but not retrofitted quickly. Planning awareness exists, but implementation capacity is uneven—medium adaptive capacity.	Step 1: Medium sensitivity + medium adaptive capacity = medium vulnerability. Sea level rise poses future risk to specific shoreline corridors and emergency routes, but most of the transportation network lies above projected inundation zones. Proactive planning will be key to maintaining this moderate vulnerability rating.
13	**Utility Lines and Structures** - Extreme Precipitation, Flooding (Buildings & Energy)	High	Medium	High	Step 1: Utilities are physically vulnerable to water intrusion, erosion, and damage from heavy rainfall and flooding. Step 2: • Age & Condition: Many utility structures in Mason County (e.g., power substations, sewer systems, storm drains) are decades old and not designed for today's extreme rainfall volumes. • Location Exposure: Substations and pump stations are often sited in low-lying or flood-prone areas (e.g., near streams or wetlands). • Vulnerability of Lines: Surface water and debris during flood events can damage overhead lines and overwhelm underground cable trenches. Step 3: Recent events (e.g., winter storms) have caused outages and local sewer overflows, especially in Shelton and Belfair. Step 4: Widespread exposure and systemic risk across energy and water infrastructure leads to high sensitivity.	Step 1: Utility providers have some capacity to respond, though proactive protection is limited. Step 2: • Redundancy and Emergency Response: Mason PUDs and regional utilities can reroute service in some areas; portable pumps and backup generators are available. • Infrastructure Upgrades: Stormwater improvements are underway in some jurisdictions, but larger system retrofits are expensive and long-term. • Planning Integration: Flood and precipitation risks are acknowledged in recent Capital Improvement Plans, but implementation is uneven and not countywide. These efforts provide a moderate degree of resilience medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Repeated exposure of critical infrastructure to precipitation extremes and flooding, combined with aging systems and partial upgrade implementation, creates persistent vulnerability particularly during high-intensity storm events.
14	**Utility Lines and Structures** - Sea Level Rise (Buildings & Energy)	Medium	Medium	Medium	Step 1: Sea level rise threatens coastal infrastructure, particularly where utilities intersect with marine environments. Step 2: • Location Exposure: In Mason County, some utility infrastructure, particularly near Oakland Bay, Hood Canal, and low-lying parts of Shelton, is within reach of long-term sea level rise projections (e.g., lift stations, coastal pump stations). • System Design: Many systems were not built with future sea level rise in mind, especially for drainage and pump systems. • Service Disruption Risk: Direct exposure is more localized compared to utilities impacted by precipitation or flooding events. Step 3: Utilities like stormwater and sewer systems in shoreline zones have potential for saltwater intrusion and rising groundwater impacts over time. Step 4: Due to localized exposure but not countywide impact, this results in medium sensitivity.	Step 1: Adaptation efforts exist in some jurisdictions, but proactive elevation or relocation of utilities is expensive and not widespread. Step 2: • Planning Response: Sea level rise is beginning to appear in long-term capital facility planning (e.g., sewer lift stations), but strategies are often reactive. • Funding & Coordination: Some grant-funded resilience projects are underway, but smaller jurisdictions face resource gaps. • Engineering Flexibility: Utilities can eventually be redesigned or elevated, but projects are incremental. Mixed capacity across jurisdictions and system types justifies a medium adaptive capacity rating.	Step 1: Medium sensitivity + medium adaptive capacity = medium vulnerability. Sea level rise affects a subset of utilities located in shoreline areas, especially wastewater and stormwater systems, and while not a system-wide threat now, vulnerability will increase without significant long-term investment.
15	**Utility Lines and Structures** - High Winds (Buildings & Energy)	High	Medium	High	Step 1: High winds directly impact above-ground utilities and structural components. Step 2: • Overhead Power Lines: Much of Mason County's electrical grid, especially in rural areas, consists of overhead distribution lines, which are highly susceptible to wind-blown debris and falling trees. • Utility Structures: Substations and poles are designed to resist typical wind loads, but intense windstorms (e.g., atmospheric rivers, coastal wind events) exceed those tolerances, especially where vegetation is unmanaged. • History of Damage: Past windstorms have caused prolonged power outages throughout Mason County. Step 3: Events like the 2018 and 2021 windstorms disrupted service countywide. Step 4: High exposure, frequent historical impacts, and reliance on above-ground infrastructure lead to high sensitivity.	Step 1: Utility providers have some adaptive systems in place but are constrained by geography and cost. Step 2: • Response Capacity: PUDs and regional energy utilities have robust emergency response protocols and mutual aid agreements. • Hardening Infrastructure: Some areas are moving to underground lines, but it remains cost-prohibitive for wide-scale rural deployment. • Vegetation Management: Utilities maintain clearing schedules, but windstorms frequently outpace preventative trimming efforts. Moderate preparedness with room for improvement = medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Mason County's reliance on overhead infrastructure, forested terrain, and frequent windstorm exposure makes utility systems vulnerable to outages and safety risks, particularly for medically dependent and isolated populations.

16	**Residential and Commercial Zoning, Shelters & Evacuation Centers** - Extreme Precipitation, Flooding (Zoning and Development, Emergency Management)	High	Medium	High	Step 1: Flooding and extreme rainfall directly impact built environments and essential services. Step 2: • Zoning Exposure: Some development has occurred in or near known floodplains (e.g., Skokomish Valley, downtown Shelton), increasing exposure. • Building Stock Condition: Older homes and mobile housing units, particularly in rural unincorporated areas, often lack flood resilience features. • Shelters & Evacuation Centers: Many community shelters are co-located with schools or churches that may not be elevated or floodproofed. Step 3: Mason County frequently experiences road closures, property damage, and shelter access issues during flood events, especially in low-income and tribal communities. Step 4: Due to physical exposure and critical social functions, sensitivity is rated high.	Step 1: The County has limited but growing capacity to reduce future flood risk through planning and infrastructure improvements. Step 2: • Development Controls: The County has adopted FEMA floodplain management regulations and requires elevation for new construction in designated areas, but enforcement and mapping updates are ongoing. • Shelter Planning: Emergency Management has basic shelter coordination plans but limited resources for physical retrofits or flood-proofing existing centers. • Housing Equity: There is minimal capacity to assist renters or vulnerable homeowners with retrofits or relocation. Institutional awareness exists but implementation and financial reach are limited which leads to medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Flooding and extreme rainfall threaten both residential stability and emergency response systems, particularly where vulnerable populations live in flood-prone zones or rely on shelters that may themselves be at risk.
17	**Residential and Commercial Zoning, Shelters & Evacuation Centers** - Sea Level Rise (Zoning and Development, Emergency Management)	Medium	Medium	Medium	Step 1: Sea level rise primarily threatens low-lying residential and commercial areas in coastal zones. Step 2: • Zoning Exposure: Most residential and commercial zones in Mason County are located inland, but some shoreline communities (e.g., Union, Allyn, parts of Shelton near Oakland Bay) are susceptible to rising seas, tidal flooding, and rising groundwater. • Building Stock Vulnerability: Buildings in flood hazard zones may not be elevated or designed for long-term tidal inundation. • Shelter Location Risk: Most evacuation centers are on higher ground (e.g., schools, churches inland), so direct exposure is limited. Step 3: Coastal parcel maps and shoreline planning documents indicate that only a small proportion of residential/commercial structures fall within long-term inundation zones. Step 4: The impact is highly localized rather than countywide, supporting a medium sensitivity rating.	Step 1: The County has some ability to plan around sea level rise but limited capacity for large-scale elevation or relocation. Step 2: • Planning & Zoning Tools: Shoreline Master Program updates account for sea level rise and critical areas protections, but zoning changes lag in implementation. • Shelter Siting: Most designated shelters are inland, providing redundancy. • Funding & Community Capacity: Elevation, retreat, and retrofits for existing homes and businesses are costly and may be unaffordable for low-income coastal residents. Institutional awareness exists, but financial and political barriers constrain implementation, resulting in medium adaptive capacity.	Step 1: Medium sensitivity + medium adaptive capacity = medium vulnerability. Sea level rise presents a growing but geographically limited threat to residential and commercial zones in coastal Mason County. Proactive planning is underway, but long-term risks will rise without stronger investment in housing adaptation and shoreline development restrictions.
18	**Storm & Wastewater Facilities, Waterways & Water Source**s - Extreme Precipitation, Flooding (Waste Management, Water Resources)	High	Medium	High	Step 1: Extreme rainfall overwhelms infrastructure and contaminates water sources. Step 2: • Age and Condition: Many of Mason County's stormwater and wastewater systems are dated, especially in Shelton and Belfair. Some rely on combined sewer-stormwater systems vulnerable to overflow. • Physical Design: Older pump stations, manholes, and treatment systems are not designed for today's high-intensity rainfall events. • Waterways and Water Sources: Flooding increases turbidity, pollution loads, and risk of source water contamination for wells and surface water intakes. Step 3: Flood-driven sewer overflows and runoff pollution have impacted shellfish beds and community health, especially during atmospheric river events. Step 4: Given the interconnected risks to both natural and built systems, this asset group is rated high sensitivity.	Step 1: There are some systems in place to manage stormwater and flooding, but full-scale upgrades are costly and incomplete. Step 2: • Mitigation Measures: Some areas have improved detention ponds, green infrastructure, and backflow prevention, but these are not yet widespread. • Emergency Protocols: Public Works and Emergency Management coordinate overflow response, but rural areas often lack backup systems. • Funding: Competitive grants (e.g., Ecology's Stormwater Financial Assistance Program) support retrofits, but coverage is limited. The capacity is improving but uneven across the county, which leads to medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Extreme precipitation and flooding frequently exceed the capacity of aging wastewater and stormwater infrastructure, threatening public health, ecosystems, and water supply in Mason County. Continued infrastructure investment is critical.
19	**Storm & Wastewater Facilities, Waterways & Water Source**s - Sea Level Rise (Waste Management, Water Resources)	High	Medium	High	Step 1: Sea level rise directly affects low-elevation infrastructure and adjacent freshwater systems. Step 2: • Facility Location: Several stormwater and wastewater facilities in Mason County are located near Oakland Bay, Hood Canal, and other tidal zones—making them susceptible to inundation, rising groundwater, and saltwater intrusion. • Waterways and Aquifers: Rising sea levels elevate groundwater tables, increasing the risk of septic system failure and brackish contamination of shallow wells and coastal aquifers. • Stormwater Backflow: Coastal outfalls can become overwhelmed during high tides or king tide events, especially during storm surges. Step 3: King tide impacts and outfall backups have been observed in downtown Shelton and shoreline neighborhoods. Step 4: These systemic, infrastructure-linked risks justify a high sensitivity rating.	Step 1: Some adaptation is underway, but significant physical upgrades are needed to keep pace with rising seas. Step 2: • Planning and Mapping: The County and Ecology have conducted sea level rise vulnerability mapping and have integrated coastal hazard planning into the Shoreline Master Program. • Retrofit Strategies: Some tide gates and backflow valves have been installed, but full facility redesigns are rare and expensive. • Water Source Monitoring: Some utilities monitor salinity intrusion, but alternative water sourcing or treatment capacity is limited in rural areas. These factors reflect partial resilience and proactive planning, resulting in medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Coastal wastewater and stormwater infrastructure in Mason County faces growing risks from sea level rise, including facility inundation, water contamination, and backflow events. Infrastructure upgrades and relocation planning will be critical to reduce long-term impacts.

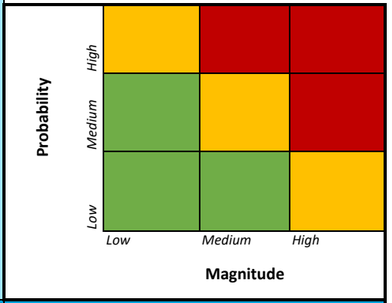
20	**Solid Waste & Recycling Facilities, Hazardous Waste Facilities** - Extreme Precipitation, Flooding (Waste Management)	High	Medium	High	Step 1: Extreme rainfall and flooding can damage containment structures, increase runoff of contaminants, and disrupt waste operations. Step 2: • Facility Location: Mason County's primary transfer stations and recycling centers (e.g., Eells Hill Transfer Station, Belfair Drop Box) are inland but near drainages that flood seasonally. • Design and Containment: Most facilities have stormwater control measures, but heavy rainfall can overwhelm containment systems and cause leachate or hazardous runoff—especially where hazardous waste (e.g., paints, chemicals) is temporarily stored. • Operational Disruption: Flooding can make access roads impassable and delay waste collection and transfer services. Step 3: Local records show weather-related disruptions to facility access and runoff concerns at waste handling sites during extreme events. Step 4: Due to pollutant risk and system disruption potential, this asset class has high sensitivity.	Step 1: Facilities have some ability to respond, though large-scale resilience retrofits are limited. Step 2: • Stormwater BMPs (Best Management Practices): Facilities have containment zones, storm drains, and diversion systems, but they may be insufficient for extreme precipitation. • Hazardous Waste Protocols: Collection events are seasonal, and storage is temporary and indoors, reducing long-term exposure risk. • Planning & Operations: Emergency shutdown procedures exist, and County Public Works coordinates closely with utilities and first responders. Moderate infrastructure readiness and operational planning suggest medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Flooding and heavy rain pose both contamination and access risks to Mason County's waste facilities, particularly regarding runoff, infrastructure damage, and hazardous material exposure. Ongoing investment in stormwater upgrades and climate-adapted design is essential.
21	**Solid Waste & Recycling Facilities, Hazardous Waste Facilities** - Sea Level Rise (Waste Management)	Medium	Medium	Medium	Step 1: Sea level rise may affect waste handling sites located near the coast or within tidally influenced zones. Step 2: • Facility Location: Most permanent solid and hazardous waste facilities in Mason County (e.g., Eells Hill Transfer Station, Shelton recycling) are located inland and elevated above current sea level projections. However, temporary or satellite collection points in coastal communities may face long-term risk (e.g., Union, Allyn). • Design: Waste facilities are generally buffered from surface water and follow regulatory design standards for stormwater and containment. • Hazard Potential: If inundation occurred, exposure of waste stockpiles or chemical storage to tidal waters would pose ecological and health risks. Step 3: While not immediately exposed, some facilities or service sites near coastal margins may become vulnerable over the long term. Step 4: Given the mostly inland siting and site-level containment, sensitivity is medium.	Step 1: Mason County has basic capacity to plan for sea level rise but limited funding for hardening or relocating facilities. Step 2: • Planning Awareness: Sea level rise is not yet consistently integrated into waste infrastructure planning, but coastal facility siting policies already limit hazardous uses in flood-prone areas. • Facility Control: The County directly operates most waste facilities, allowing for coordinated adaptation when risks arise. • Design Flexibility: Existing engineering controls (e.g., sealed containers, covered structures) reduce exposure risk. These factors support a medium adaptive capacity rating.	Step 1: Medium sensitivity + medium adaptive capacity = medium vulnerability. While most of Mason County's waste infrastructure is not directly threatened by current sea level projections, future siting and operations in low-lying coastal communities must consider saltwater intrusion, rising water tables, and long-term access risk.
22	**Shelton Port, Race Track (Ridge Motorsports Park), Golf Courses** - Extreme Precipitation, Flooding (Economic Development)	High	Medium	High	Step 1: These economic and recreational assets are physically and operationally affected by heavy rain and localized flooding. Step 2: • Port of Shelton: Includes industrial sites and airport facilities near Oakland Bay; susceptible to stormwater ponding and drainage overload. • Race Track (Ridge Motorsports): Located in a forested area with significant impervious surface; vulnerable to erosion and washout during extreme rainfall. • Golf Courses: Drainage systems can be overwhelmed by heavy rain, leading to flooding, closures, and turf damage, especially on low-lying fairways. Step 3: Local events and recreation-based tourism (e.g., golf and motorsports) are frequently disrupted during storm events. Stormwater overflows have also affected nearby industrial parks and roadways. Step 4: The combined impacts to infrastructure, operations, and revenue suggest high sensitivity.	Step 1: These facilities have moderate capacity to respond to precipitation and flooding impacts. Step 2: • Drainage Systems: Port facilities and golf courses maintain drainage and stormwater systems, though not always designed for current rainfall extremes. • Response & Coordination: Port of Shelton has emergency response protocols; private operators (race track and golf courses) typically close temporarily and conduct maintenance post-event. • Funding: Some public infrastructure (Port) may qualify for improvement grants, while private facilities may face greater financial limitations. There is some flexibility and response capability, but uneven resources across assets result in medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. Flooding and extreme precipitation increasingly threaten operations, access, and economic viability at key recreational and commercial sites in Mason County. Continued investment in drainage upgrades and resilient design is needed to support economic continuity.
23	**Shelton Port, Race Track (Ridge Motorsports Park), Golf Courses** - Sea Level Rise (Economic Development)	Medium	Medium	Medium	Step 1: Sea level rise primarily affects assets located in low-lying coastal or tidally influenced zones. Step 2: • Port of Shelton: Some areas of the airport and adjacent industrial lands are near Oakland Bay and could be affected by rising tides and groundwater over time. • Race Track (Ridge Motorsports): Located inland and at higher elevation, not directly at risk from sea level rise. • Golf Courses: Some courses near the shoreline or estuarine areas may experience groundwater rise or saltwater intrusion, but most are inland. Step 3: Sea level rise could affect long-term drainage, shoreline stabilization, or low-lying transportation routes leading to these assets. Step 4: Because only some parts of the port and a few shoreline-facing courses are exposed, this asset group has medium sensitivity.	Step 1: Capacity to respond varies across these assets depending on ownership and proximity to risk. Step 2: • Port Facilities: Managed by a public authority, with access to planning resources and funding for shoreline infrastructure adaptation. • Race Track & Golf Courses: Privately operated, may have less incentive or ability to invest in proactive adaptation unless directly impacted. • Long-term Planning: Sea level rise is not consistently factored into long-term economic development strategies. Varying ownership and resource availability across asset types result in medium adaptive capacity.	Step 1: Medium sensitivity + medium adaptive capacity = medium vulnerability. While the motorsports park and many golf courses are protected by elevation, the Port of Shelton and other economic shoreline areas may face future access, drainage, and land use limitations without proactive long-term planning.

24	**Roads and Bridges, Urban Development, Utility Infrastructure, Waste Facilities, Shelton Port** - Earthquake (Economic Development, Transportation, Emergency Management, Waste Management, Buildings & Energy, Ecosystems)	High	Medium	High	Step 1: Earthquakes cause widespread structural damage, service interruptions, and environmental hazards across multiple interconnected systems. Step 2: • Transportation & Roads: Mason County's roads and bridges include older structures not designed to current seismic standards. Some lie near unstable slopes and alluvial soils. • Urban Development: Many structures in Shelton and rural areas are wood-frame or older concrete/masonry buildings with limited retrofitting. • Utility Infrastructure: Overhead power lines, pump stations, and gas lines are at risk of disruption or rupture • Waste Facilities: Unsecured hazardous waste and landfill sites may rupture or leak. • Shelton Port: Industrial buildings and transportation linkages could suffer foundational damage. Step 3: Mason County is within the Cascadia Subduction Zone, where strong shaking, liquefaction, and ground failure are possible. Step 4: Broad multi-system exposure and physical fragility justify high sensitivity.	Step 1: Some preparedness measures are in place, but full resilience requires significant upgrades and investment. Step 2: • Seismic Retrofit Planning: Limited retrofits have occurred across public infrastructure; funding constraints delay widespread implementation. • Emergency Operations: The County has a hazard mitigation plan and continuity plans, but gaps remain in backup infrastructure. • Cross-Sector Coordination: Agencies have protocols but rely on post-event coordination more than pre-event structural resilience. Moderate emergency management and partial retrofitting lead to medium adaptive capacity.	Step 1: High sensitivity + medium adaptive capacity = high vulnerability. A major earthquake would have severe, cross-sector impacts in Mason County, especially in areas with aging infrastructure, low redundancy, and limited seismic engineering—posing long-term recovery challenges for essential services and economic assets.

Tasks 3.4-3.5: Characterize risk and decide course of action

In Column B [*below*], list the assets you identified in Task 3.3 as having *medium* or *high* vulnerability. In Column C, characterize the **Probability** of hazard occurrence for each asset as *low, medium, or high* . In Column E, characterize the **Magnitude** of the potential loss/consequences as *low, medium, or high.* Put each asset's number [*from Column A*] in the appropriate cell of the Risk Characterization Matrix [*right*], and note the composite risk rating in Column G. Based on the asset's risk characterization, note your decision [*Take Action of Accept Risk*] in Column H.

Risk Characterization Matrix



Number	Asset-Hazard Pair *(Note applicable sector(s) in parenthesis.)*	**Probability** (*Low, Medium, High*)	**Notes** *(Note the indicators, data, and ruleset used to characterize probability of loss.)*	**Magnitude** (*Low, Medium, High*)	**Notes** *(Note the indicators, data, and ruleset used to characterize magnitude of loss.)*	**Composite Risk Rating** (*Low = Green; Medium = Gold; Red = High)*	**Decision** (*Take Action* or *Accept Risk*)
1	Aquaculture, Shellfish, and Salmon Fishing - Sea Level Rise (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	High	Probability: Mason County's aquaculture zones, particularly around Oakland Bay and Totten Inlet, are already experiencing effects of tidal inundation and ocean acidification, both of which are exacerbated by sea level rise. Current exposure indicator: FEMA's National Risk Index (NRI) for Mason County shows elevated coastal flooding potential. Future likelihood indicator: WA Coastal Hazards Resilience Network (CHRN) modeling indicates 2.5 to 3.0 ft. sea level rise in Puget Sound by 2100 under high-emissions scenarios. With added storm surge of 3.1 ft., critical shellfish beds will experience regular inundation. Ruleset: High = actively exposed at present or exposed at 17% SLR probability with surge (2.5 ft. SLR + 3.1 ft. surge).	High	Mason County's economy and cultural identity are closely tied to shellfish harvesting and tribal fishing. This sector includes tribal treaty rights, commercial fisheries, and subsistence livelihoods. Indicators: **Criticality** = High (cultural and economic significance). **Redundancy** = Low (no inland alternatives for shellfish beds). **Expected Annual Loss** = High, due to projected declines in harvestable areas and income loss in shellfish sector. Ruleset: Assets with high dependence and no substitutes = high magnitude.	High	Take Action
2	Aquaculture, Shellfish, and Salmon Fishing - Extreme Heat (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	High	Probability: Regional climate data (NOAA, WA Integrated Climate Response Strategy) shows a sharp increase in the frequency and intensity of marine heatwaves and elevated stream temperatures. Marine heatwaves occurred in 2015, 2019, and 2021 causing substantial shellfish mortality and salmon migration delays. Projections indicate over 60% likelihood of summer temperature thresholds surpassing species tolerance levels annually by 2050.	High	Magnitude: Elevated temperatures reduce oxygen levels and increase harmful algal blooms, directly harming shellfish beds and salmon runs. Losses threaten local fisheries, tribal treaty rights, and the county's aquaculture-based economy. **Criticality** = High (cultural, economic, and food security importance). **Redundancy** = Low (few alternative species or economic substitutes). **Expected Annual Loss** = High due to recurring stock losses and harvest restrictions.	High	Take Action
3	Aquaculture, Shellfish, and Salmon Fishing - Drought (Agriculture & Food Systems, Cultural Resources and Practices, Economic Development)	Medium	Probability: WA State Climate Impact Group and UG CMRW Climate Tool indicate that summer drought frequency and severity are increasing across western Washington. Recent years (2015, 2021, 2023) have seen drought declarations affecting streamflows and estuarine conditions. Modeled projections suggest a 40–60% probability of streamflow deficits during key salmon spawning and migration periods by mid-century. Shellfish are less directly exposed but may experience habitat degradation through salinity shifts and water quality declines linked to drought.	Medium	Magnitude: Drought reduces freshwater inflows into estuaries, raising salinity levels and increasing temperatures, both harmful to juvenile salmon and shellfish habitat stability. **Criticality** = High (salmon runs and shellfish beds vital to local economy and cultural practices). **Redundancy** = Medium (some species/hatchery adjustments possible, but limited for wild stocks and shellfish). **Expected Annual Loss** = Moderate, primarily from reduced fishery yields and increased management costs.	Medium	Take Action
4	Forests, Timber Industries - Drought (Cultural Resources and Practices, Ecosystems, Economic Development)	Medium	Probability: WA State Department of Natural Resources (DNR) and UG CMRW Climate Tool indicate an increasing trend of summer droughts and reduced soil moisture across western Washington. Recent drought years (2015, 2021, 2023) have stressed forest ecosystems, with higher tree mortality rates observed. Future climate models project at least a 60–75% chance of recurrent drought stress affecting commercial and non-commercial forests by 2050.	Medium	Magnitude: Drought reduces tree growth, increases susceptibility to pests (e.g., bark beetles), and raises wildfire risk. Timber industries face both economic losses and supply chain disruptions. **Criticality** = High (forestry is a major sector for Mason County's economy and employment). **Redundancy** = Low (limited alternative industries and forest product substitutes). **Expected Annual Loss** = Moderate, factoring in reduced yields, increased fire suppression costs, and market impacts.	Medium	Take Action

5	Forests, Timber Industries - Extreme Heat (Cultural Resources and Practices, Ecosystems, Economic Development)	High	Probability: Climate modeling (WA State Climate Impacts Group, UG CMRW Climate Tool) shows a consistent trend toward hotter summers and more extreme heat events. The 2021 Pacific Northwest heat dome caused significant tree stress and mortality. By 2050, there is a 70–90% probability of seasonal temperature extremes surpassing physiological stress thresholds for common commercial species (e.g., Douglas-fir, western hemlock).	High	Magnitude: Extreme heat exacerbates drought stress, increases wildfire risk, and reduces growth rates. Impacts include direct tree mortality, greater susceptibility to pests, and declining timber yields. **Criticality** = High (key economic driver and cultural asset). **Redundancy** = Low (limited capacity to shift species or transition industries rapidly). **Expected Annual Loss** = High, considering both ecological impacts and long-term economic downturns for the timber sector.	High	Take Action	
6	Forests, Timber Industries - Pests & Pathogens (Cultural Resources and Practices, Ecosystems, Economic Development)	High	Probability: Warming temperatures and drought stress (WA DNR & US Forest Service data) have increased the frequency and spread of pest outbreaks (e.g., bark beetles, Swiss needle cast) and pathogens (e.g., root rots). Past outbreaks since 2000 have caused extensive mortality in Mason County's Douglas-fir and true fir stands. Models indicate a >70% probability of increased pest/pathogen activity due to climate stressors by 2050.	medium	Magnitude: Pest and pathogen outbreaks lead to tree mortality, reduced timber quality, and elevated wildfire risks. **Criticality** = High (forests support the economy, cultural traditions, and ecosystem services). **Redundancy** = Low (alternative forest products and species substitutions are limited). **Expected Annual Loss** = moderate, considering direct timber value loss, management costs, and ecological degradation.	High	Accept Risk	
7	Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting - Extreme Heat (Ecosystems, Health and Wellbeing)	High	Probability: Regional climate projections (WA Integrated Climate Response Strategy) show a sharp rise in summer heat events and extreme temperature days. Observed heat domes (2021) and projected >80% chance of record-breaking heat days by 2050 for western WA. Impacts to air quality from wildfire smoke and heat stress in recreation and harvesting areas are increasingly frequent.	High	Magnitude: Extreme heat degrades outdoor air quality (elevated ozone and PM2.5), creates health risks for outdoor workers and visitors, and reduces the availability of parks and harvesting areas during peak seasons. **Criticality** = High (direct health impacts, cultural and recreational value). **Redundancy** = Medium (some seasonal or indoor alternatives exist, but are limited for air quality and certain harvesting activities). **Expected Annual Loss** = High, factoring in public health costs, reduced recreation revenue, and harvesting interruptions.	High	Take Action	
8	Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting - Ocean Acidification (OA) (Ecosystems, Health and Wellbeing)	High	Probability: NOAA and WA Ocean Acidification Center data show continued decreases in pH levels in Puget Sound and Hood Canal, with Mason County's coastal waters particularly vulnerable due to upwelling and nutrient loading. Modeled probability of harmful acidification events >75% by 2050. Observed impacts already affecting shellfish larvae survival.	High	Magnitude: OA impairs shell formation in shellfish and some finfish, disrupting aquatic harvesting and reducing biodiversity. **Criticality** = High (major economic, ecological, and cultural importance of harvesting). **Redundancy** = Low (few species or ecological replacements available). **Expected Annual Loss** = High, with potential collapse of certain shellfish fisheries and reduced recreational harvesting opportunities.	High	Accept Risk	
9	Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting - Sea level rise (Ecosystems, Health and Wellbeing)	Medium	Probability: Sea level rise projections for Mason County (WA Coastal Resilience Project, FEMA) indicate 1.5–3.0 ft. rise by 2100, with a 17% probability of reaching the higher end under current emissions scenarios. Coastal parks, shellfish beds, and low-lying recreation areas face moderate to high exposure, especially when combined with storm surges.	High	Magnitude: Chronic inundation would degrade access to waterfront parks, impact aquatic harvesting areas, and damage recreational infrastructure. **Criticality** = High (significant community, cultural, and economic value). **Redundancy** = Medium (some opportunities to relocate or retrofit facilities, but limited options for natural harvesting grounds). **Expected Annual Loss** = High, due to infrastructure damage and long-term habitat change.	High	Take Action	
10	Air Quality, Parks & Recreation Areas, Aquatic and Terrestrial Harvesting - Flooding, Extreme Precipitation (Ecosystems, Health and Wellbeing)	High	Probability: WA State Climate Impacts Group and FEMA flood mapping indicate increasing frequency of heavy precipitation events and higher winter streamflows. Several Mason County parks and recreation areas lie in floodplains or near vulnerable streams and estuaries. Probability of damaging floods >70% in any given year by 2050.	High	Magnitude: Flooding can cause infrastructure loss, erosion, habitat degradation, and restrict both recreational and subsistence harvesting access. **Criticality** = High (vital spaces for public health, culture, and subsistence). **Redundancy** = Low to Medium (limited alternative sites and high cost of relocation or retrofitting). **Expected Annual Loss** = High, including repairs, habitat restoration, and lost access days.	High	Take Action	
11	Roads and Bridges, Culverts, Non-motorized transportation - Flooding, Extreme Precipitation (Transportation, Emergency Management)	High	Probability: FEMA flood maps, UG CMRW Climate Tool, and WA State Climate Impacts Group data indicate a rising frequency of heavy rainfall events and stream overflows. Several Mason County roads, culverts, and trails already experience periodic flooding. By 2050, there's a >70% probability of major flood events affecting critical infrastructure corridors.	High	Magnitude: Flooding can cause severe road washouts, culvert failures, bridge closures, and trail erosion. **Criticality** = High (transportation is essential for public safety, economic function, and emergency response). **Redundancy** = Medium to Low (some alternate routes exist, but are limited in rural areas). **Expected Annual Loss** = High, factoring in damage repair costs and potential isolation of communities.	High	Take Action	

12	Roads and Bridges, Culverts, Non-motorized transportation - Sea Level Rise (Transportation, Emergency Management)	Medium	Probability: WA Coastal Hazards Resilience Network and FEMA sea level rise projections indicate 1.5–3.0 ft. of rise possible by 2100. Several coastal and estuarine transportation routes are exposed to long-term inundation risk. The probability of significant exposure by 2100 is estimated at ~17–40%, depending on location and scenario.	High	Magnitude: Chronic inundation and erosion threaten roads, bridges, and non-motorized trails in low-lying zones. **Criticality** = High (these routes are vital for evacuation, commerce, and daily mobility). **Redundancy** = Medium to Low (limited alternatives in coastal or estuarine areas). **Expected Annual Loss** = High, particularly from infrastructure damage and increased maintenance costs.	High	Take Action
13	Utility Lines and Structures - Extreme Precipitation, Flooding (Buildings & Energy)	High	Probability: FEMA flood maps, UG CMRW Climate Tool, and WA State Climate Impacts Group indicate increasing heavy rainfall events and localized flooding. Utility infrastructure, particularly in low-lying or riparian areas, has a high likelihood of being impacted annually by 2050.	High	Magnitude: Flooding can cause substation damage, underground conduit failures, and pole base erosion. **Criticality** = High (essential services: power, communications, water systems). **Redundancy** = Medium (backup systems exist but with limits in rural areas). **Expected Annual Loss** = High, including repair costs, service interruptions, and public safety impacts.	High	Take Action
14	Utility Lines and Structures - Sea Level Rise (Buildings & Energy)	Medium	Probability: WA Coastal Resilience projections and FEMA sea level rise maps indicate 1.5–3.0 ft. rise by 2100. Several coastal substations and pole lines in estuarine areas face moderate exposure under higher-end scenarios. Probability of chronic inundation >17% by late-century.	High	Magnitude: Inundation could lead to utility service loss, corrosion of infrastructure, and increased maintenance needs. **Criticality** = High (critical services). **Redundancy** = Low to Medium (backup power is limited, and site relocation is expensive). **Expected Annual Loss** = High, considering infrastructure impacts and service disruptions.	High	Take Action
15	Utility Lines and Structures - High Winds (Buildings & Energy)	Low	Probability: Historical storm events (e.g., 2006, 2015, 2021 windstorms) have caused repeated utility failures in Mason County. Climate projections indicate the frequency and intensity of windstorms are likely to remain stable or increase slightly, maintaining a LOWprobability of impacts.	Medium	Magnitude: Wind can cause pole failures, downed lines, and widespread outages. **Criticality** = High (power and communications essential for safety and economy). **Redundancy** = Medium (backup power exists but is limited and expensive). **Expected Annual Loss** = medium, including emergency response costs and business interruption.	Low	Accept Risk
16	Residential and Commercial Zoning, Shelters & Evacuation Centers - Extreme Precipitation, Flooding (Zoning and Development, Emergency Management)	High	Probability: FEMA flood maps and WA State Climate Impacts Group projections show increasing frequency of high-intensity precipitation events causing flooding. Recent flood events have impacted residential zones and access to some shelters. By 2050, there's >70% probability of recurring flood exposure in flood-prone areas.	High	Magnitude: Flooding threatens homes, businesses, and critical emergency shelters. **Criticality** = High (direct public safety, housing security, and emergency response implications). **Redundancy** = Low to Medium (relocating shelters and emergency services is costly and complex). **Expected Annual Loss** = High, including property damage, displacement, and life-safety risks.	High	Take Action
17	Residential and Commercial Zoning, Shelters & Evacuation Centers - Sea Level Rise (Zoning and Development, Emergency Management)	Medium	Probability: FEMA and WA Coastal Resilience data indicate sea level rise of 1.5–3.0 ft. is likely by 2100. While many shelter locations are inland, some low-lying residential areas and commercial zones face moderate exposure, especially with storm surge interaction. Estimated 17–40% probability of chronic inundation by late century for exposed parcels.	High	Magnitude: Inundation could lead to long-term housing loss, displacement, commercial disinvestment, and compromised access to emergency shelters and evacuation routes. **Criticality** = High (housing stability and public safety core functions). **Redundancy** = Low (limited affordable relocation options and constrained emergency management budgets). **Expected Annual Loss** = High, especially for vulnerable populations and small businesses.	High	Take Action
18	Storm & Wastewater Facilities, Waterways & Water Sources - Extreme Precipitation, Flooding (Waste Management, Water Resources)	High	Probability: FEMA flood data, UG CMRW Climate Tool, and WA State Climate Impacts Group project an increase in extreme rainfall events, leading to both urban and riverine flooding. Stormwater and wastewater systems in low-lying or floodplain areas already experience periodic surcharging or overflows. By 2050, >70% probability of heavy precipitation events exceeding current design standards.	High	Magnitude: Flooding can overwhelm stormwater infrastructure, leading to backups, combined sewer overflows (CSOs), and untreated discharges. **Criticality** = High (essential for sanitation, water quality, and public health). **Redundancy** = Medium to Low (limited options for capacity upgrades and expensive retrofits). **Expected Annual Loss** = High, including infrastructure repairs, regulatory penalties, and public health impacts.	High	Take Action

19	Storm & Wastewater Facilities, Waterways & Water Sources - Sea Level Rise (Waste Management, Water Resources)	Medium	Probability: WA Coastal Resilience data and FEMA SLR models project 1.5–3.0 ft. of sea level rise by 2100. Several Mason County wastewater outfalls, pump stations, and drainage systems near tidal areas are exposed to potential backflow or chronic inundation. 17–40% probability of functional impacts by late century, depending on elevation and protective measures.	High	Magnitude: Inundation could lead to system failures, saltwater intrusion, and service outages. **Criticality** = High (essential public health and environmental infrastructure). **Redundancy** = Low (relocating facilities and constructing protective barriers is costly and complex). **Expected Annual Loss** = High, factoring in increased maintenance, compliance costs, and public safety concerns.	High	Take Action	
20	Solid Waste & Recycling Facilities, Hazardous Waste Facilities - Extreme Precipitation, Flooding (Waste Management)	High	Probability: FEMA flood maps, UG CMRW Climate Tool, and WA State Climate Impacts Group show a consistent increase in extreme rainfall events and localized flooding. Many waste management facilities are located in low-lying industrial zones prone to surface water accumulation or floodplain encroachment. By 2050, >70% probability of flood exposure during major precipitation events.	High	Magnitude: Flooding can damage waste handling infrastructure, lead to hazardous material leaks, and disrupt services. **Criticality** = High (public health and environmental safety risks). **Redundancy** = Low to Medium (limited spare capacity or alternate waste management sites in the county). **Expected Annual Loss** = High, including cleanup costs, regulatory penalties, and operational disruptions.	High	Take Action	
21	Solid Waste & Recycling Facilities, Hazardous Waste Facilities - Sea Level Rise (Waste Management)	Medium	Probability: WA Coastal Resilience data and FEMA SLR models indicate 1.5–3.0 ft. rise by 2100. Some waste management facilities near estuarine areas face moderate risk of inundation or service disruption. Probability of direct impacts estimated at 17–40% by late century depending on elevation and protective measures.	High	Magnitude: Inundation could result in facility damage, hazardous material exposure, and waste service disruptions. **Criticality** = High (waste management is essential for environmental and public health). **Redundancy** = Low (few relocation or retrofit options readily available). **Expected Annual Loss** = High, especially considering potential contamination incidents and costly facility adaptations.	High	Take Action	
22	Shelton Port, Race Track (Ridge Motorsports Park), Golf Courses - Extreme Precipitation, Flooding (Economic Development)	High	Probability: WA State Climate Impacts Group and FEMA floodplain data show increased frequency of heavy precipitation events. Low-lying areas at the Shelton Port and portions of golf courses are vulnerable to surface water flooding during intense storms. Probability of damaging flood events exceeds 70% by 2050, particularly during extreme rainfall seasons.	High	Magnitude: Flooding can cause business disruptions, infrastructure damage, erosion, and facility closures. **Criticality** = High (key recreational and economic assets for Mason County's tourism and commerce). **Redundancy** = Medium (limited alternate venues and high costs for temporary closures or repairs). **Expected Annual Loss** = High, including lost revenue and repair costs.	High	Take Action	
23	Shelton Port, Race Track (Ridge Motorsports Park), Golf Courses - Sea Level Rise (Economic Development)	Medium	Probability: WA Coastal Resilience data and FEMA projections indicate 1.5–3.0 ft. sea level rise by 2100. The Shelton Port and estuarine areas near some recreational facilities face moderate risk of tidal inundation or storm surge impacts. Probability of significant impacts estimated at 17–40% by late century.	High	Magnitude: Inundation could disrupt port operations, damage coastal infrastructure, and affect recreational facilities. **Criticality** = High (these facilities support local jobs, tourism, and business activities). **Redundancy** = Medium to Low (limited options for relocation or rapid adaptation). **Expected Annual Loss** = High, considering business interruptions and long-term repair or adaptation costs.	High	Take Action	
24	Roads and Bridges, Urban Development, Utility Infrastructure, Waste Facilities, Shelton Port - Earthquake (Economic Development, Transportation, Emergency Management, Waste Management, Buildings & Energy, Ecosystems)	Medium	Probability: Mason County lies within the Cascadia Subduction Zone's area of influence. USGS and WA Department of Natural Resources estimate a 10–15% chance of a major Cascadia event (M8–M9) within the next 50 years. Additionally, the county experiences low to moderate probability of shallow crustal earthquakes.	High	Magnitude: An earthquake of Cascadia scale would cause widespread infrastructure damage: • Roads and bridges could fail. • Utilities (power, water, communications) would likely be disrupted. • Waste facilities and Shelton Port could sustain severe structural damage. **Criticality** = High (multi-sector impact affecting emergency response, economy, and public health). **Redundancy** = Low (limited immediate alternatives, especially for transportation and port operations). **Expected Annual Loss** = High due to the scale of potential damage and long recovery time.	High	Take Action	