SNOHOMISH COUNTY HAZARD MITIGATION PLAN 2025 UPDATE VOLUME 1

Snohomish County
Emergency Management

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Placeholder for Adoption

Placeholder for formal adoption by the Snohomish County Council

Acknowledgements

Snohomish County Land Acknowledgement

On behalf of the Snohomish County Government, we honor descendants of all of the tribes and bands that have inhabited this land since time immemorial. We stand with these tribes, whose ancestors, by signing the Treaty of Point Elliott in Mukilteo in 1855, enabled our county, cities, and other communities to exist here. We honor these tribes as they continue to practice their culture and lifeways; including fishing, hunting and gathering and other cultural tradition. With this tribal acknowledgment, we open our time together by honoring the ancestors whose feet first knew these lands, and whose paddles still know the waters of what we now call Snohomish County.

Snohomish County Planning Partner Acknowledgement

The development of this plan would not have been possible without the dedication and commitment to this process by the Snohomish County Hazard Mitigation Plan Public Planning Committee, Steering Committee, other Planning Partners, and the people of Snohomish County. The dedication of time to this process is greatly appreciated. Also, all who participated in the public process are commended for their participation in this planning effort.

Hazard Mitigation Plan Sponsors

Snohomish County Executive Dave Somers

Snohomish County Department of Emergency Management – Lucia Schmit, Director

Snohomish County Council

District 1 – Nate Nehring

District 2 – Megan Dunn

District 3 – Strom Peterson

District 4 – Jared Mead

District 5 – Sam Low

Prepared By

Snohomish County Department of Emergency Management

Rebecca Carpenter, Project Manager, Resilience and Mitigation Analyst

Amy Lucas, Resilience and Mitigation Program Manager

Robert Thurston, Enhanced Emergency Services Communication System Manager

Drew Schwitters, Principal GIS Analyst

Scott North, Public Information Officer

Dara Salmon, Deputy Director

Record of Changes

The Record of Changes log will reflect administrative changes made to the Hazard Mitigation Plan outside of the official cycle of plan review, coordination, and update.

Change Number	Section	Date of Change	Individual Making Change	Description of Change

Executive Summary

First responders and emergency managers around the world share this truth: they know that disasters begin and end locally.

All bad things occur in someone's backyard. The people living nearby are the first to jump in to help. Major disasters can draw assistance from around the globe. At some point, though, those who make their homes in the disrupted community will be going it alone, engaging in the hard work of rebuilding their houses, schools, roads, businesses, lives.

The Snohomish County Hazard Mitigation Plan is a clear-eyed, data-driven assessment of what can go wrong here. For 20 years it has leveraged the best available information from experts and the community to identify options for reducing the harm from disasters to people, property and the environment.

Every five years since 2005, residents have gathered to catalog and rank the natural and human-caused hazards, and to reassess emergency management priorities. This is the plan's fifth edition. A team of representatives from 39 area agencies, including most cities and tribal governments in Snohomish County, has worked on this update, scheduled for adoption by late 2025.

As in years past, the plan's primary focus remains on minimizing damage and reducing harm from flooding, wildfires, severe weather, earthquakes, landslides and other challenges, including hazardous chemical spills and cybersecurity threats.

Snohomish County is a beautiful place, home to more than 840,000 people. Travel west from Puget Sound and within just a few dozen miles the terrain transitions from saltwater shorelines to urban streets, to farm-dotted floodplains, to dense forestlands and glaciers perched on mountainsides in the Cascade Range.

That dramatic landscape also hosts perils. The community's highest point, 10,541-foot Glacier Peak, is a slumbering stratovolcano with a history of explosive eruptions and mudflows. The forests can dry to become standing fuel for wildfires. The floodplains are testament that rivers have been spilling their banks here since time immemorial. The ground throughout the region is crisscrossed with earthquake faults, some known to have unleashed megaquakes and spawned tsunami waves.

Data and experience teach that living here means living with hazards.

Snohomish County encompasses roughly 1.35 million acres, about half of which are forestlands and mountains under federal jurisdiction. Of the remaining 687,000 acres,

about 44 percent are in areas susceptible to flooding or having soils prone to landslides, or at risk of liquefaction during earthquakes. Add to the mix the estimated 130,000 people who now make their homes in the wildland urban interface, where wildfire risk can be elevated and houses, farms and businesses stand amid or near trees.

In 2014, as work began on the third edition of this plan, the deadliest landslide in U.S. history crashed down on a riverside neighborhood between Oso and Darrington, killing 43 and temporarily burying Highway 530. Completing the 2020 update to this plan was complicated by the COVID-19 pandemic, which saw a Snohomish County man become the first confirmed case in North America. The local death toll topped 1,300.

Since this plan was last updated, not a year has gone by without a significant emergency. In 2021, lives were lost during a heat dome event that baked the community with triple-digit temperatures. In 2022, the Bolt Creek wildfire scorched nearly 15,000 acres across east Snohomish and King counties, sending up smoke that repeatedly degraded air quality to dangerous levels across most of the community. There was record flooding along the Stillaguamish River in 2023. A year later a bomb cyclone windstorm toppled trees into homes and caused widespread damage, including $18 million to publicly owned utilities and infrastructure.

The team working on this update built on past efforts while incorporating new data, particularly information about increased risk from wildfires and severe weather events, including deadly heat. They also weighted risks by factoring in the community's ability to cope with potential disruption from the emergencies, as well as the severity and likelihood of the hazard.

Earthquakes remain Snohomish County's top natural hazard, while wildfire, dam failure, volcanic eruption and mass earth movement (landslide) round out the top five. The hazard list now also includes extreme heat and drought. Tsunami is no longer a stand-alone hazard because the waves aren't self-generating, and almost always accompany an earthquake (see Figure 1).

2020 Hazards	Rank	2025 Hazards
Earthquake	1	Earthquake & Tsunami
Epidemic	2	Wildfire
Hazardous Materials	3	Dam Failure
Weather Events	4	Volcano
Flooding	5	Mass Earth Movement
Dam Failure	6	Disease Outbreak
Wildfire	7	Hazardous Materials
Cybersecurity Threats	8	Flood
Mass Earth Movement	9	Cybersecurity
Volcano	10	Severe Weather Events
Active Assailant	11	Aircraft Accident
Aircraft Accidents	12	Extreme Heat & Drought
Tsunami (unranked)	13	Active Assailant

Figure 1: 2020 Hazard Ranking vs. 2025 Hazard Ranking

This edition of the hazard mitigation plan reflects continuing collaboration by partner agencies to encourage approaches that mitigate risks, particularly in ways that save taxpayer resources. The team developed six overarching goals supported by 29 objectives.

Goal 1: Protect Life, Infrastructure, Property, and the Environment. The seven objectives incorporate multiple strategies, including discouraging buildings and infrastructure in areas with known high hazard risk while fostering, where possible, hazard mitigation efforts that restore flood plains and other natural systems.

Goal 2: Build Community Support and Sustain the Economy. The five objectives seek to reduce community vulnerability through resilience, including strengthening public-private partnerships around critical supply systems, promoting stronger social networks and using retrofits and relocations to help reduce risks to critical services, facilities, and infrastructure.

Goal 3: Increase Public Awareness and Engagement. The five objectives encourage broader access to hazard information that can encourage residents to take steps to minimize harm, including increasing their odds of getting life-safety updates on their mobile phones by signing up for SnoCoAlerts and creating a Smart911 profile.

Goal 4: Make Collaborative Decisions. The four objectives improve coordination on government-funded capital projects in risk areas, and encourage efforts that emphasize risk reduction, sustainable funding sources and multi-benefit outcomes.

Goal 5: Expand Understanding of Hazards. Each of the four objectives encourage building on what is known about the community's natural and human-caused hazards as well as the likely impacts of climate change. The objectives encourage continued data analysis and mapping, as well as training and exercises to test assumptions in response and recovery plans.

Goal 6: Implement Effective Mitigation Strategies. The four objectives prioritize acting on this plan, including identifying projects that address the greatest risks while making sure mitigation strategies are reflected in other plans focused on land use, capital improvements and transportation systems.

In addition to the goals set by the planning team, Snohomish County residents were surveyed about their hazard concerns and priorities. More than 100 submitted answers. Some insights:

- Earthquake is the top hazard concern for 39% of respondents. Wildfire and severe weather events rounded out the top three.

- If local government had $1 million to complete a mitigation project, 51% would direct the money toward improving critical infrastructure, such as elevating a pumping station or enhancing power poles to better stand up to windstorms or resist wildfire.
- Of those completing the survey, 59% reported that they are already signed up for SnoCoAlerts. There are more than 22,000 subscribers countywide.

This update to the hazard mitigation plan was completed without federal hazard mitigation funding that over the last two decades has helped support such planning. Regardless, people here decided that it was worth the effort.

Keeping the hazard mitigation plan updated not only supports community safety, it also makes good financial sense. Federal studies have shown that communities on average save $6 in response cost for every $1 directed toward mitigating hazards.

While there is uncertainty about how much federal money will remain available for hazard mitigation efforts, the importance of having an updated plan is undiminished. The plan enables Snohomish County and its planning partners to maintain eligibility for assistance under the federal Disaster Mitigation Act (2000). In addition, the plan helps meet requirements of the Federal

TAKE ACTION

Stay informed. Sign up for SnoCoAlerts **https://snocoalerts.snoco.org.** Bookmark the Snohomish County Public Safety Hub **https://snoco.org/safety** for real-time guidance during emergencies involving natural and human-caused hazards.

Know your area: Learn more about the hazards where you live and work, as well as along your commute. The Snohomish County Hazard Viewer makes that easy: **https://snoco.org/hazards**.

Have a plan: Where would you go if you had to evacuate from your home? How would you get there? Make sure your family knows. Learn more about work being done on evacuation planning in Snohomish County: **https://bit.ly/Sno_Co_Evacuation_Plan**

Get two weeks ready: A major earthquake could seriously damage the region's roads and bridges, limiting travel and making it difficult to access supplies **https://snoco.org/megaquake**. The best strategy is to gradually build up a two-week supply of food, water, and medication for you and your pets. If you have a vehicle, consider storing a blanket, flashlight, sturdy footwear, raingear and other parts of your disaster kit there so those items travel with you. By preparing for the worst, you are better positioned for lesser hazards.

Emergency Management Agency's Community Rating System. Under that program, flood insurance premium rates can be discounted to reward activities aimed at reducing flood damage and encouraging comprehensive floodplain management.

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Chapter 1 Introduction to Hazard Mitigation Planning

1.1 The Big Picture

Hazard mitigation is the effort to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. The responsibility for hazard mitigation lies with many, including private property owners, business and industry, and local, state, and federal government.

Mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage. Prior to 2000, federal disaster funding in the United States focused on relief and recovery, with limited funding for hazard mitigation planning. In 2000, the federal Disaster Mitigation Act required state and local governments to develop hazard mitigation plans (HMPs) as a condition for receiving disaster-related federal grant assistance (Public Law 106-390, approved by Congress on October 10, 2000). Commonly known as the DMA or the 2000 Stafford Act amendments, the act emphasizes the importance of community hazard mitigation planning before disasters occur.

The DMA encourages state and local authorities to work together on pre-disaster planning, and it promotes "sustainable hazard mitigation," which includes the management of natural resources, local economic and social resiliency, and the recognition that local hazards and mitigation strategies must be understood in the largest possible social and economic context. The enhanced planning network called for by the DMA helps local governments articulate precise needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

1.2 A Multi-jurisdictional Mitigation Strategy

This is the fifth edition of the Snohomish County Hazard Mitigation Plan. First adopted in 2005, the plan describes the natural and human-caused hazards that pose the greatest risk to people and the county's assets. If implemented, the plan's goals, objectives, and actions will minimize losses and protect assets from future disasters. This is a multi-jurisdictional hazard mitigation plan.

The residents and businesses of the entire Snohomish County planning area are the ultimate beneficiaries of this hazard mitigation plan. The plan strives to reduce risk for those who live in, work in, and visit Snohomish County. It provides a viable planning framework for all foreseeable natural hazards that may impact the county. Participation in

the development of the plan by key stakeholders in the county helps ensure mutually beneficial outcomes. The resources and background information in the plan are applicable countywide, and the plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

The plan's mitigation strategies include countywide actions to improve multi-agency coordination, build mitigation capabilities, and strengthen resiliency across Snohomish County. In addition, each eligible organization that participates in the Public Planning Committee, referred to throughout the document as "planning partners," can produce an annex that prioritizes actions to minimize losses within their jurisdiction.

1.3 How to Use This Plan

FEMA encourages multi-jurisdictional planning under its guidance for the DMA, and Title 44 of the Code of Federal Regulations (44 CFR) establishes criteria for multi-jurisdictional plans (Section 206.1). One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. This plan has been set up in two volumes so that elements that are jurisdiction-specific can easily be distinguished from those that apply to the whole planning area:

- Volume 1 includes all the required elements of 44 CFR Section 201.6 that apply to the entire planning area. This includes the description of the planning process, public involvement strategy, goals and objectives, countywide Hazard Identification and Risk Assessment (HIRA), countywide mitigation initiatives, and a plan maintenance strategy. Maps cited in each chapter are provided at the end of the chapter. The following appendices are provided at the end of Volume 1:
    - Appendix A – Acronyms and Definitions
    - Appendix B – Planning Process Documentation
    - Appendix C – Public Outreach Documentation
    - Appendix D – Mitigation Strategy Prioritization
    - Appendix E – Hazard Identification and Risk Assessment Methodology
    - Appendix F – Annual Report & CRS Compliance Template
    - Appendix G – Planning Mechanism Integration
    - Appendix H – Snohomish County Community Wildfire Protection Plan
- Volume 2 includes all jurisdiction and tribal-specific elements required by 44 CFR Section 201.6. The planning partnership includes cities, tribal nations, the county, and special purpose districts participating in this process and adopting this plan. To meet all required elements for plan approval, it is necessary for each planning

partner to adopt Volume 1 in its entirety, the overview chapter of Volume 2, and their own jurisdictional annex.

1.4 What is Different?

44 CFR stipulates that hazard mitigation plans must describe the method and schedule for monitoring, evaluating, and updating the plan. Prescribing an update schedule establishes an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. DMA compliance is contingent on meeting the plan update requirement. A jurisdiction covered by a plan that has expired is not able to pursue the elements of federal funding under the Robert T. Stafford Act which require a current hazard mitigation plan for eligibility.

During the course of this update the plan has been significantly enhanced using recently updated best available data and technology, especially in the risk assessment portion of this update. This plan update followed the basic planning process outlined in the 2025 update of the FEMA Local Mitigation Planning Policy and Handbook. Table 1 identifies where to find the required elements of the plan in this version, as well as the previous 2020 version.

Table 1: Plan Changes Crosswalk

44 CFR Requirement	2020 Plan	2025 Plan Update
44 CFR 201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in	Part 1, Sections 3.6 and 3.7 describe the public involvement process and the opportunities presented for comments on the plan during drafting stages and prior to plan approval. Part 1, Section 3.4 describes the opportunity for other communities and agencies to be involved in the plan update process. Part 1, Section 3.5 provides an overview of the review and incorporation of plans, studies, reports, and technical information.	Volume 1, Section 2.5 describes the public involvement process and the opportunities presented for comments of the plan during the draft stage and prior to plan approval. Appendix C contains all supporting documentation for the public outreach process. Volume 1, Section 2.2 describes the opportunity for other communities and agencies to be involved in the plan update process.

44 CFR Requirement	2020 Plan	2025 Plan Update
hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.		Volume 1, Section 2.6 provides an overview of the review and incorporation of plans, studies, reports, and technical information.
44 CFR 201.6(c)(2): A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	Part 2, Chapter 5 details the methodology and tools utilized in comprehensive risk assessment. The 13 hazards of concern looked at in the risk assessment were (1) active assailant, (2) aircraft accident, (3) earthquake, (4) epidemic, (5) hazardous materials, (6) weather events, (7) flooding, (8) dam failure, (9) wildfire, (10) cybersecurity threats, (11) mass earth movement, (12) volcano, and (13) tsunami. The latest data available in HAZUS-MH was used for dam failure, earthquake, flood, and tsunami.	Volume 1, Section 5.3 details the methodology and tools used in the comprehensive risk assessment. Appendix E contains all of the additional documentation for the risk assessment. The 13 hazards of concern looked at in the risk assessment were (1) active assailant, (2) aircraft accident, (3) cybersecurity, (4) dam failure, (5) disease outbreak, (6) earthquake & tsunami, (7) extreme heat & drought, (8) flood, (9) hazardous materials, (10) mass earth movement, (11) severe weather events, (12) volcano, and (13) wildfire. The latest data available in Hazus-MH was used for earthquake, flood, and tsunami.
44 CFR 201.6(c)(2)(i): [The risk assessment shall include] a description of the type, location, and	Part 2, Chapters 6–18 outline a comprehensive risk assessment for each hazard of concern, not just	Volume 1, Chapters 6 through 18 outline a comprehensive risk assessment for both

44 CFR Requirement	2020 Plan	2025 Plan Update
extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	natural hazards. The updated hazard profile includes a more general overview of the hazard and updated historical occurrences. Future probability was updated based on the latest data and studies. Scenarios were removed. Hazard maps were updated with the latest data and added to the end of the profiles.	natural and human-caused on it. The updated hazard profiles include a general description, the hazard ranking, location, extent, past events, probability of future occurrences, climate change considerations, and an impact and vulnerability assessment. Hazard maps were updated with the latest data and are within each profile.
44 CFR 201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.	Vulnerability was assessed for all hazards of concern. The HAZUS-MH computer model was used for the earthquake hazard and the flood hazard. These were Level 2 analyses using updated planning partner and county data. "User defined" analysis techniques were applied to the flood and earthquake hazards. Additionally, updated site-specific data on county identified critical facilities was entered into the HAZUS model. The vulnerability assessment for all other hazards determined the total assessed value of all buildings exposed to the hazard. The updated asset inventory was based on County Assessor's "user defined facilities" data. Best available data was used for all analyses.	Volume 1, Chapters 6 through 18 contains a countywide summary of each hazard and its impact on the county. Volume 2 contains an overall summary of each hazard and its impact on the community for each annex. Vulnerability was assessed for all hazards of concern. The Hazus-MH computer model was used for the earthquake hazard and the flood hazard. These were Level 2 analyses using planning partner and county data. "User defined" analysis techniques were applied to the flood and earthquake hazards. Additionally, updated site-specific data on county identified critical facilities was entered into the Hazus model.

44 CFR Requirement	2020 Plan	2025 Plan Update
44 CFR 201.6(c)(2)(ii): All plans approved after October 1, 2008, must also address [the National Flood Insurance Program] (NFIP) insured structures that have been repetitively damaged by floods.	The repetitive loss section meets DMA and CRS planning requirements. The update includes a comprehensive analysis of repetitive loss areas. Repetitive loss areas were delineated, and these areas were reflected on maps.	Volume 1, Section 2.6 includes information on the countywide participation in the NFIP. Volume 1, Section 13.4 includes an analysis of repetitive loss areas with updated mapping. In Volume 2, each annex contains a table detailing the community's participation in the NFIP including the number of NFIP structures that have been designated as repetitive loss structures.
44 CFR 201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern. This included County Assessor's "user defined facilities" data for existing buildings. Critical facilities were compiled using updated planning partner and county data. Each hazard profile includes a section on the updated future development trends in the county.	An updated building inventory was used for the Hazus-MH analysis. This included County Assessor's "user defined facilities" data for existing buildings. Volume 1, Section 2.4 describes how critical facilities were updated with planning partner and county data. Volume 1, Section 3.5 describes land use and future development trends in the county. In Volume 2, each annex describes their community's land use and future development trends.
44 CFR 201.6(c)(2)(ii)(B): The plan should describe an estimate of the	Loss estimations in terms of dollar losses were generated for all hazards of	In Volume 1, Chapters 6 through 18 contains loss estimations in the

44 CFR Requirement	2020 Plan	2025 Plan Update
potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.	concern except epidemic, cybersecurity incident, active assailant, and aircraft accident hazards. Loss estimates for Earthquake and Flood came directly from the HAZUS-MH model. The loss estimates for all other hazards was determined by the assessed value of all buildings exposed to the hazard. The asset inventory was the same for all hazards and based on County Assessor's "user defined facilities" data.	vulnerability and impact sections. Past event sections outline previous dollar losses for each hazard. Volume 1, Chapters 11 and 13, the loss estimates for Earthquake and Flood came directly from the Hazus-MH model. The full Hazus reports are located in Appendix E. Loss estimations in terms of dollar losses were not generated for disease outbreak, extreme heat & drought, cybersecurity, active assailant, and aircraft accident hazards.
44 CFR 201.6(c)(2)(ii)(C): The plan should provide a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	This update utilized the most current available analysis of Snohomish County buildable lands. The plan includes discussion on future development trends for each identified hazard of concern.	Volume 1, Section 3.5 describes land use and future development trends in the county. In Volume 2, each annex describes their community's land use and future development trends.
44 CFR 201.6(c)(3): The plan should include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	Countywide actions were removed. Each jurisdiction reviewed and provided the status of their 2015 strategies. Each jurisdiction then provided a new, prioritized list of updated and original strategies.	Volume 1, Section 4.6 describes the countywide mitigation actions that were developed by the Public Planning Committee and approved by the Steering Committee. In Volume 2, each jurisdiction reviewed and provided the status of their 2020 strategies. Each jurisdiction then provided a

44 CFR Requirement	2020 Plan	2025 Plan Update
		new, prioritized list of updated and original strategies.
44 CFR 201.6(c)(3)(i): [The mitigation strategy shall include] a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The Steering Committee adapted the 2015 countywide actions items and turned them into objectives assigned to the new goals of this plan.	Volume 1, Section 4.2, the Public Planning Committee reviewed the 2020 goals and updated them to reflect current countywide mitigation priorities. The Steering Committee reviewed and approved the updates.
44 CFR 201.6(c)(3)(ii): [The mitigation strategy shall include] a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	With the removal of the previous Countywide action items, each jurisdiction was given the opportunity to add and create new mitigation strategies to their 2020 strategy matrix. For each strategy identified for 2020, jurisdictions were asked to complete a prioritization workbook, stating which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority.	Volume 1, Section 4.6 describes the countywide mitigation actions that were developed by the Public Planning Committee and approved by the Steering Committee. The countywide mitigation actions include which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority. In Volume 2, each jurisdiction reviewed and provided the status of their 2020 strategies. Each jurisdiction then provided a new, prioritized list of updated and original strategies that include which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority.

44 CFR Requirement	2020 Plan	2025 Plan Update
44 CFR 201.6(c)(3)(ii): [The mitigation strategy shall] address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.	All jurisdiction annexes contain information about repetitive loss properties and NFIP policy numbers, dates, and claims. All annexes also state the municipal codes in place for municipalities to continue compliance with the NFIP requirements.	Volume 1, Section 2.6 includes information on the countywide participation in the NFIP. In Volume 2, each annex contains a table detailing the community's participation in the NFIP including the number of NFIP structures that have been designated as repetitive loss structures.
44 CFR 201.6(c)(3)(iii): [The mitigation strategy shall include] an action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	In Section 5 of every jurisdiction annex, planning partners reviewed mitigation initiatives for the 2020 plan. Included in the matrix are the goals supported, hazards addressed, lead entity, support entity, implementation timeline, cost, funding, and a STAPLEE and mitigation effectiveness score to assist the partners with prioritization.	Volume 1, Section 4.5 describes the process to develop mitigation actions including a brief overview of the Benefit-Cost Review criteria. Appendix D contains the full Benefit-Cost Review Matrix. Mitigation actions were prioritized based on cost, hazard risk addressed, supporting goals and objectives, life safety, benefit to underserved communities, account for changes in development, climate change, and geographic impact.
44 CFR 201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.	All countywide initiatives were removed in this plan update. All jurisdictions that participated in the update reviewed prior initiatives and adopted new ones for the 2020–2025 plan period.	Volume 1, Section 4.6 describes the countywide mitigation actions that were developed by the Public Planning Committee and approved by the Steering Committee. In Volume 2, each jurisdiction provided a new, prioritized list of updated

44 CFR Requirement	2020 Plan	2025 Plan Update
		and original strategies that include which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority.
44 CFR 201.6(c)(4)(i): [The plan maintenance process must include] a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	Part 3, Sections 22.3 through 22.7 describe a maintenance process that includes maintaining a planning committee, annual progress reports, supporting forms and their distribution, a five-year update cycle protocol with minimum elements to update, continuing public involvement, and methods for incorporation into other planning mechanisms in the planning area.	Volume 1, Sections 19.3 through 19.7 describe a maintenance process that includes maintaining the Public Planning Committee, annual progress reports, a five-year update cycle protocol with minimum elements to update, continuing public involvement, and methods for incorporation into other planning mechanisms in the planning area.
44 CFR 201.6(c)(4)(ii): [The plan maintenance process must include] a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	Part 3, Section 21.7 details different programs to integrate information from this plan: Land use planning, Critical areas regulation, Growth management, Capital improvements, Water Resource Inventory Area planning, Basin planning.	Volume 1, Section 19.7 details the different programs to integrate information from this plan: Land use planning, Critical areas regulation, Growth management, Capital improvements, Water Resource Inventory Area planning, Basin planning. Appendix G contains the full description for how the county will integrate mitigation planning into the development of Capital Improvement Plan projects. In Volume 2, each jurisdiction will detail how

44 CFR Requirement	2020 Plan	2025 Plan Update
		their organization will incorporate the requirements of the mitigation plan into their individual planning mechanisms.
44 CFR 201.6(c)(4)(iii): [The plan maintenance process must include] a discussion on how the community will continue public participation in the plan maintenance process.	Part 3, Section 22.6 details a strategy for continuing public involvement through the DEM Website, Annual Progress Reports distributed to stakeholders and media, Copies of plan in Sno-Isle Library System.	Volume 1, Section 19.6 details a strategy for continuing public involvement through the DEM Website, Annual Progress Reports distributed to stakeholders and media.
44 CFR 201.6(c)(5): Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.	All resolutions from adopting jurisdictions are included in Annex J.	In Volume 1, the formal adoption of the plan by the Snohomish County Council is included at the beginning of the plan. In Volume 2, all resolutions from adopting jurisdictions are included with their annex.

1.5 EMAP Standards

The Emergency Management Accreditation Program (EMAP) is a national, standards-based assessment and accreditation process for emergency management programs. In the context of hazard mitigation, EMAP ensures the HMP considers all the phases of emergency and disaster management: mitigation, protection, prevention, response, and recovery. These phases are addressed in the impact and vulnerability assessments, which are essential for evaluating hazards' risk to various community components.

Each identified hazard includes a detailed quantitative summary of its overall impact, vulnerability, and risk along with a qualitative summary provided at the end of the chapter. Table 2 identifies where to find each EMAP element within this plan.

Table 2: EMAP Standards Crosswalk

EMAP Standard	2022 Standard	Location in Plan
4.1	**Hazard Identification, Risk Assessment, and Consequence Analysis**	Volume 1, Chapters 5 through 18 The 13 hazards of concern looked at in the hazard identification and risk assessment were (1) active assailant, (2) aircraft accident, (3) cybersecurity, (4) dam failure, (5) disease outbreak, (6) earthquake & tsunami, (7) extreme heat & drought, (8) flood, (9) hazardous materials, (10) mass earth movement, (11) severe weather events, (12) volcano, and (13) wildfire.
4.1.1	The Emergency Management Program identifies the natural and human-caused hazards that potentially impact the jurisdiction using multiple sources. The Emergency Management Program assesses the risk and vulnerability of the following: (1) people; (2) property; (3) the environment; and (4) its own operations from these hazards.	Volume 1, Chapters 6 through 18, Section 8 assesses the risk and vulnerability of the planning area for each hazard.
4.1.2	The Emergency Management Program conducts a consequence analysis for the hazards identified in Standard 4.1.1 to consider the impact on the following: (1) public; (2) responders; (3) continuity of operations, including continued delivery of services;	Volume 1, Chapters 6 through 18, Section 8 assesses the risk and vulnerability of the planning area for each hazard.

EMAP Standard	2022 Standard	Location in Plan
	(4) property, facilities, and infrastructure; (5) environment; (6) the economic condition of the jurisdiction; and (7) public confidence in the jurisdiction's governance.	
4.1.3	The Emergency Management Program has a maintenance process for its Hazard Identification, and Risk Assessment (HIRA) identified in Standard 4.1.1, and the Consequence Analysis (CA) identified in Standard 4.1.2, including a method and schedule for evaluation and revision.	Volume 1, Sections 19.3 through 19.6 describe a maintenance process that includes maintaining the Public Planning Committee, annual progress reports, a five-year update cycle protocol with minimum elements to update and continuing public involvement.
4.2	**Hazard Mitigation**	Volume 1, Base Plan Volume 2, Unincorporated Annex
4.2.1	The Emergency Management Program has a plan to implement mitigation projects and sets priorities based upon loss reduction. The plan: (1) is based on the natural and human-caused hazards identified in Standard 4.1.1 and the risk and consequences of those hazards; (2) is developed through formal planning processes involving Emergency Management.	(1) Volume 1, Chapter 4 describes the process for developing the goals and objectives and mitigation strategy countywide. Section 4.2 contains the updated Goals and Objectives. Section 4.6 contains the countywide mitigation strategies that address all identified hazards. In Volume 2, the Unincorporated Annex contains Snohomish County's mitigation strategies that address all identified hazards. (2) Volume 1, Chapter 2 describes the formal planning process used for plan development. The planning process was developed using the Comprehensive Preparedness Guide 101 v2 and the Local Mitigation Planning Policy and Handbook (2025).
4.2.2	The Emergency Management Program documents project ranking based	Volume 1, Section 4.5 describes the process to develop mitigation

EMAP Standard	2022 Standard	Location in Plan
	upon the greatest opportunity for loss reduction and documents how specific mitigation actions contribute to overall risk reduction.	actions including a brief overview of the Benefit-Cost Review criteria. Appendix D contains the full Benefit-Cost Review Matrix. Mitigation actions were prioritized based on cost, hazard risk addressed, supporting goals and objectives, life safety, benefit to underserved communities, account for changes in development, climate change, and geographic impact. Volume 2, the Unincorporated Annex provides a new, prioritized list of updated and original strategies that include which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority.
4.2.3	The Emergency Management Program utilizes a process to monitor the overall progress of the mitigation activities and documents completed initiatives and their resulting reduction or limitation of hazard impact on the jurisdiction.	Volume 1, Sections 19.3 through 19.6 describe a maintenance process that includes maintaining the Public Planning Committee, annual progress reports, a five-year update cycle protocol with minimum elements to update, and continuing public involvement. The Annual Progress Report will include a review of successful mitigation strategies and review of incomplete ones, re-evaluation of action plans, recommendations for new projects, and changes in funding opportunities.
4.2.4	The Emergency Management Program, consistent with the scope of the mitigation program, does the following:	(1) Volume 1, Section 4.5 describes the process to develop mitigation actions. Volume 1, Section 19.4 describes the Annual Progress

EMAP Standard	2022 Standard	Location in Plan
	(1) identifies ongoing mitigation opportunities and tracks repetitive loss; (2) provides technical assistance in implementing mitigation codes and ordinances; and (3) participates in jurisdictional and multi-jurisdictional mitigation efforts.	report process that includes a review of successful mitigation strategies and review of incomplete ones, re-evaluation of action plans, recommendations for new projects, and changes in funding opportunities. Volume 2, the Unincorporated Annex provides a new, prioritized list of updated and original strategies that include which goals the strategy met, current status, hazards it addressed, primary and supporting agencies, cost, timeline, funding source, and priority. (2) Volume 1, Section 19.7 details the different programs to integrate information from this plan: Land use planning, Critical areas regulation, Growth management, Capital improvements, Water Resource Inventory Area planning, Basin planning. Appendix G contains the full description for how the county will integrate mitigation planning into the development of Capital Improvement Plan projects. (3) Volume 1, Chapter 5 describes the process for developing the goals and objectives and mitigation strategy countywide. Section 4.6 contains the countywide mitigation strategies that address all identified hazards that were developed by the multi-jurisdictional Public Planning Committee and approved by the multi-jurisdictional Steering Committee.

EMAP Standard	2022 Standard	Location in Plan
4.2.5	The Emergency Management Program has a maintenance process for the plan identified in Standard 4.2.1, including a method and schedule for evaluation and revision.	Volume 1, Sections 19.3 through 19.6 describe a maintenance process that includes maintaining the Public Planning Committee, annual progress reports, a five-year update cycle protocol with minimum elements to update and continuing public involvement.

Chapter 2 The Planning Process

The 2025 Snohomish County Hazard Mitigation Plan (HMP) follows the established planning guidelines of the Snohomish County Department of Emergency Management (DEM). This approach adheres to the standards of the Emergency Management Accreditation Program (EMAP) and FEMA's Comprehensive Preparedness Guide 101 (CPG 101). The planning process embraced a whole-community approach, collaborating with a multi-agency, multi-jurisdictional planning team and steering committee. In an effort to build a fully collaborative document, subject matter experts were consulted through the use of targeted focus groups and leveraging existing committees and planning efforts. Vulnerable communities were engaged through outreach opportunities to ensure comprehensive and inclusive input. Cities, tribes, special purpose districts, and school districts were invited to participate in this plan update. These jurisdictions and entities are critical to effective implementation of multi-jurisdictional mitigation projects.

2.1 The Previous Plans

In 2005, Snohomish County and a planning partnership of dozens of local agencies within the county embraced the concept of the DMA and prepared one of the largest multi-jurisdictional HMPs in the western U.S. The planning process took over 17 months and generated a plan that identified 261 initiatives to be implemented by 43 partners (13 municipalities and 30 special purpose districts).

In 2009, the County applied for and secured federal Pre-Disaster Mitigation Grant Program (PDM) funding to update the 2005 HMP. Due to the success of the initial plan, the same structure was used for the 2010 update. The 2010 HMP identified 330 mitigation initiatives and involved 35 partner organizations. The plan received formal approval by FEMA on September 14, 2010, for the updated HMP.

In 2013, Snohomish County was again awarded a PDM grant to prepare the 2015 update to the Snohomish County HMP. The County hired a consultant to prepare the plan with oversight from the Planning Committee. The committee acted as the principal vehicle for public involvement during the plan update process. The plan received formal approval by FEMA on September 8, 2015. The 2015 HMP included a single guiding principle, five goals, nine objectives, and 38 countywide mitigation strategies along with jurisdiction specific ones.

In 2019, the County started the update process again after being awarded a PDM grant for the 2020 update of the plan. The County hired a consultant to prepare the plan. The plan received formal approval by FEMA during the extended COVID-19 response on January 13,

2021. The 2020 HMP included four goals, 16 objectives, and 132 total mitigation strategies with 14 partner organizations completing annexes.

2.2 Partner Engagement

The Project Team

For this update, the Project Team is composed of staff from Snohomish County departments, including the Department of Emergency Management (DEM), the Department of Conservation and Natural Resources Surface Water Management (DCNR SWM), and the Department of Planning and Development Services (PDS). The team played a pivotal role in guiding both the internal county process and supporting the planning efforts of annex partners. Their responsibilities included coordinating outreach activities, developing plan drafts, creating the risk assessment, formulating mitigation goals and strategies, and overseeing the submission of the plan for local adoption. Table 3 shows the list of Project Team members.

Table 3: The Project Team Members

Name	Role	Organization
Lucia Schmit, Director	Project Sponsor	Snohomish County DEM
Rebecca Carpenter, Program Analyst	Project Manager	Snohomish County DEM
Amy Lucas, Program Manager	Project Oversight	Snohomish County DEM
Rob Thurston, Program Manager	GIS Oversight	Snohomish County DEM
Drew Schwitters, Principal GIS Analyst	GIS Analysis – Hazard mapping	Snohomish County DEM
Melody Ovard, Senior GIS Analyst	GIS Support – Hazard mapping	Snohomish County DEM
Gi-Choul Ahn, Principal GIS Analyst	GIS Analysis – Hazus	Snohomish County SWM
Eileen Canola, Senior Planner	Planning Support – Comprehensive Plan and Development Regulations	Snohomish County PDS
Matthew Siddons, Senior Planner	Planning Support – Capital Improvement Plan	Snohomish County PDS
Beth Liddell, Senior Environmental Planner, CFM	Community Rating System Support	Snohomish County PDS
Josh Monaghan, Floodplain Coordinator	Floodplain Management Support	Snohomish County SWM

Name	Role	Organization
Jessica Hamill, Project Specialist IV	Floodplain Management Support	Snohomish County SWM
Scott North, Public Information Officer	Executive Summary and Project Communications	Snohomish County DEM
Sammie Keller, Community Outreach Coordinator	Community Education and Graphics	Snohomish County DEM

The Public Planning Committee

The Public Planning Committee is composed of county department representatives, all partners who submitted a Letter of Intent to complete an annex to the plan, county and regional planning commission members, public and private dam owners, and community-based advocacy groups. Their responsibilities included advertising outreach activities, providing input on plan drafts, participating in the risk assessment, and providing input on mitigation goals and strategies.

Individual county departments developed their own strategies internally and then socialized the strategies with the other county participants.

Table 4 shows the participating jurisdictions who submitted a Letter of Intent.

Table 4: Participating Jurisdictions

County, Cities, and Towns	Special Districts
City of Arlington	Alderwood Water & Wastewater District
City of Brier	Community Transit
Town of Darrington	Cross Valley Water District
City of Edmonds	Diking District #1
City of Gold Bar	Diking District #2
City of Granite Falls	Drainage District #13
Town of Index	French Slough Flood Control District
City of Lake Stevens	Lake Stevens Sewer District
City of Lynnwood	Marshland Flood Control District
City of Mill Creek	Marysville Fire District
City of Monroe	Mukilteo Water & Wastewater District
City of Mountlake Terrace	Olympic View Water & Sewer District
City of Mukilteo	Port of Edmonds
City of Snohomish	Port of Everett
City of Stanwood	Snohomish County Fire District #5 – Sultan
City of Sultan	Snohomish County Fire District # 26 – Sky Valley Fire
Town of Woodway	Snohomish Regional Fire & Rescue

County, Cities, and Towns	Special Districts
Snohomish County	Silver Lake Water & Sewer District
Stillaguamish Tribe of Indians	Snohomish County Public Utility District No. 1
-	South Snohomish County Fire and Rescue

See Appendix B to see the full Public Planning Committee, participation tracking, and meetings agendas.

The Steering Committee

The Steering Committee is made up of Snohomish County department leadership and representatives from participating jurisdictions and special districts including community planners, emergency managers, and subject matter experts. This function was largely filled by the Snohomish County Tomorrow Steering Committee, due to the substantial overlap in both membership and mission. However, on occasion other standing committees filled Steering Committee roles, such as the Emergency Management Coordination Committee, when issues specific to county departments arose. Table 5 identifies the various committees consulted on a Steering Committee level. The committee supervised the writing of the plan and was consulted for final content approval and policy level decisions made by the Project Team.

The Steering Committee received briefings monthly to assess the progress of the Project Team and provide strategic guidance on critical decisions regarding the direction of the planning efforts. This planning process used already existing local and regional meetings with representatives from county department leadership and leadership from participating jurisdictions.

Table 5: Steering Committee Membership

Name	Description
Snohomish County Tomorrow Steering Committee	The Snohomish County Tomorrow Steering Committee is the policy advisory body of the Snohomish County Tomorrow planning process. The Steering Committee membership is comprised of one elected representative from each of the cities and towns in the county, the Tulalip Tribes, and three elected representatives from Snohomish County. The county representatives include the Snohomish County executive and two county council members.
Snohomish County Emergency Management Advisory Board	This board, identified in Snohomish County Code 2.36.100, assists the DEM Director in reviewing and recommending policies relating to emergency management. It serves as a conduit to cities, towns, and tribes that sign an interlocal

Name	Description
	agreement with DEM for emergency management services and is comprised of the highest elected official or their designee.
Emergency Management Coordinating Committee	This body, identified in Snohomish County Code 2.36.085, is the coordinating body for emergency management issues concerning Snohomish County government. It is comprised of departmental/office leadership or their designee. The committee acts in an advisory capacity to DEM to promote, advise, assist, and review emergency management issues and to enhance preparedness for employees, departments, and separately elected offices.
Climate Action Advisory Committee	Snohomish County's Ad Hoc Climate Action Advisory Committee (CAAC) provides recommendations that encourage the adoption of policies, programs, and practices in order to address climate change, protect public health, reduce greenhouse gas emissions (GHGs), and preserve the natural environment in Snohomish County. This committee includes representatives from local businesses, underserved communities, and academia.

See Appendix B to see all Steering Committee agendas and the timeline of their meetings.

Subject Matter Experts

Snohomish County has benefited through the years from partnerships and collaboration in all phases in emergency management (prevention, mitigation, preparedness, response, and recovery). The following discipline partners provided subject matter expertise throughout this mitigation planning effort:

- Snohomish County Department of Emergency Management
- Snohomish County Fire Chiefs Association
- Snohomish County Emergency Management Coordination Committee & subcommittees
- Public and private owners of High Hazard Potential Dams (HHPD)
- Snohomish County Local Emergency Management Planning Committee (LEPC)
- Snohomish County Departments (Airport, Department of Conservation and Natural Resources, Health Department, Human Services, Planning and Development Services, Public Works, Office of Energy and Sustainability)

- Snohomish County Transportation Partners (Community Transit, Sound Transit, The Snohomish County Transportation Coalition, The Regional Alliance for Resilient and Equitable Transportation)
- Washington State Departments (Emergency Management Division, Department of Natural Resources, Department of Ecology, Washington Geological Survey, Department of Transportation)
- Federal agencies (National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), United States Army Corp of Engineers, United States Forest Service)

All subject matter experts, partners, participating jurisdictions, and special districts were directly invited to participate in the planning process or had representatives on existing boards and committees included in the planning process.

Community Lifelines

Community Lifelines are the vital services in a community that enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security. When stabilized, they enable all other aspects of society to function. The organizations that make up our Community Lifelines are important stakeholders, represented in the Public Planning Committee, and participated in each step of the planning process. The Public Planning Committee and some boards and committees that make up the Advisory Committee include representatives from our utility owners, volunteer organizations responsible for sheltering, and major employers in the county such as Boeing, major healthcare facilities, and local, state, and federal government agencies. All of these representatives were either invited directly to participate in the planning process or had representatives on existing boards and committees included in the planning process.

Figure 2: Community Lifelines

Source: Federal Emergency Management Agency

2.3 Local Mitigation Planning Steps

The Federal Emergency Management Agency (FEMA) states that hazard mitigation planning reduces loss of life and property by minimizing the impact of disasters. It begins with

identifying natural disaster risks and vulnerabilities that are common in the planning area. After identifying these risks, the development of targeted mitigation strategies protects people and property from similar events. Mitigation plans are key to breaking the cycle of disaster damage and reconstruction.

FEMA breaks down the local mitigation planning process into four steps and nine tasks.

Figure 3: Local Mitigation Planning - Steps and Tasks

Source: Federal Emergency Management Agency

Step 1. Organize the Planning Process and Resources

The planning process begins with initial coordination and the establishment of a structured framework for development. This step involves gathering key stakeholders and creating a foundation for the plan's development.

- **Determine the Planning Area and Resources:** The planning area is Snohomish County. The City of Bothell, the City of Everett, the City of Marysville, the Sauk-Suiattle Tribe, and the Tulalip Tribes were consulted as stakeholders and subject matter experts but opted to complete their own HMPs and are not included in this update. In 2023, Snohomish County DEM secured a Building Resilient Infrastructure and Communities (BRIC) grant for the 2025 HMP update but the grant program was canceled, and the award was never received.
- **Build the Planning Team:** The Project Team organized the Public Planning Committee and Steering Committee to help establish goals and the planning

process. The Project Team outlines the steps, timelines, and resources necessary to complete the mitigation plan. The Public Planning Committee participated in the risk assessment and plan content development. The Steering Committee, consisting of representatives from key agencies and local officials, oversees and guides the planning process and provides policy level input.

- **Create an Outreach Strategy:** An outreach strategy was developed to engage the public and stakeholders through various channels. This included meetings, social media, newsletters, and more. This also included a public survey to gather feedback from residents about their perceptions of hazards, mitigation needs, and priorities. The plan is made available to the public for 30 days to review and provide further input or concerns before the final plan is approved.

Step 2. Assess Risks

Once the coordination step is complete, the next step is to assess the hazards and risks that the community faces. This step focuses on identifying and analyzing potential threats and their impacts.

- **Conduct a Risk Assessment:** The risk assessment identifies the natural and human-caused hazards that may affect Snohomish County. This includes developing criteria for evaluating the severity, likelihood, and potential impacts of each hazard and the vulnerabilities the county has. This process helps ensure that all risks are adequately considered and prioritized. See Chapter 5 and Appendix E for more information.

Step 3. Develop a Mitigation Strategy

This step focuses on developing strategies to reduce the identified risks. It is about determining actions that align with the established goals and establishing how the plan will be maintained.

- **Review Community Capabilities:** Evaluate the county's current capacity to respond to and manage the identified risks. This includes reviewing existing mitigation measures, resources, and expertise.
- **Develop a Mitigation Strategy:** Develop detailed mitigation strategies with the goal of reducing the impact of the identified hazards on people, property, and the environment.

Step 4. Adopt and Implement the Plan

The final phase of the hazard mitigation planning process involves reviewing and formalizing the plan, ensuring it meets regulatory requirements, and gaining official approval.

- **Review and Adopt the Plan:** All involved partners and stakeholders are provided with an opportunity to review and comment on this plan update. The draft plan is submitted to the Washington Emergency Management Department (EMD) for review. After state approval, the Federal Emergency Management Agency (FEMA) reviews the plan to ensure it meets federal standards and requirements for hazard mitigation planning. Finally, the plan is submitted to Snohomish County Council for final approval and adoption.
- **Keep the Plan Current:** Annually, the Public Planning Committee will convene to provide input for the Annual Hazard Mitigation Report. The report will assess progress on Mitigation Strategies. See Chapter 19 for more information.
- **Create a Safe and Resilient Community:** Celebrate the success of completing and adopting the HMP. Using the plan alignment mechanisms outlined in Chapter 19, mitigation planning will be incorporated into existing planning processes and programs. Multi-jurisdictional collaboration will continue through the development of jurisdictional annexes. See Volume 2 for more information.

2.4 Timeline

The following timeline outlines the key events and milestones for Snohomish County in the 2025 Hazard Mitigation Plan Update. The planning process officially began in December 2024 with the Project Team meeting to start the Hazard Identification and Risk Assessment (HIRA) development. The Public Planning Committee completed the HIRA survey before its kickoff meeting in April 2025. The Project Team successfully facilitated 13 Steering Committee meetings, 25 Public Planning Committee meetings, four mitigation strategy workshops, and engaged with subject matter experts to ensure a comprehensive and collaborative approach to the plan's development. Table 6 outlines the key events in the plan update timeline. Go to Appendix B to see the full list of Steering Committee and Public Planning Committee meetings.

Table 6: Plan Update Timeline Key Events

Date	Event	Summary	Attendees
1/21/2025	Emergency Management Working Group	Kick-off meeting for County departments who were briefed on the HMP document and the planning process and timeline.	Project Team, EMWG

Date	Event	Summary	Attendees
	(EMWG) Kick-Off Meeting		
02/25/2025	Snohomish County Tomorrow Steering Committee (SCT SC)	Kick-off for Steering Committee briefings. Gave SCT SC representatives an overview of the HMP and explain the update methodology and update timeline.	Project Team, SCT SC, Community Representatives
3/26/2025	HIRA Survey Kick-Off	Email was sent out with the full HIRA survey to all planning members with invites to eight office hour meetings with the Project Team for any questions.	All Public Planning Committee Members
4/10/2025	Annex Partner Planning Team	Kick-off meeting for annex planning partners. Gave planning partners an overview of the HMP planning process and explained the update methodology and update timeline. Reviewed their initial HIRA survey results.	Project Team, Annex Planning Partners
4/24/2025	Climate Action Advisory Committee (CAAC)	Reviewed the initial HIRA survey results and discussed climate change connections.	Project Team, CAAC, Community Representatives
5/8/2025	Annex Partner Planning Team	Discussed all Goals and Objectives and proposed updates.	Project Team, Annex Planning Partners
5/15/2025	Public Survey	Public Survey Launch.	Public Engagement
6/12/2025	Annex Partner Planning Team	Finalized suggested changes for the updated draft Goals and Objectives. Discussed the updated hazards and held a workshop to identify potential impacts and cascading impacts for each hazard.	Project Team, Annex Planning Partners
6/25/2025	High Hazard Potential Dam Workshop	Invited a combination of public dam owners, private dam owners, WA Dam Safety Office, and US Army Corp of Engineers to attend a hybrid workshop. The workshop included a discussion	Project Team, Dam Owners, Subject Matter Experts

Date	Event	Summary	Attendees
		of all dam risk, specific identified risks for each dam represented, potential funding sources in the future, and mitigation projects that could be included in the HMP.	
6/25/2025	SCT SC	Reviewed the HIRA survey results and changes to the identified hazards. Approved the suggested changes for the updated draft Goals and Objectives.	Project Team, SCT SC, Community Representatives
7/10/2025	Annex Partner Planning Team	Reviewed the methodology used to collect updated Critical Infrastructure and Key Resources data. Discussed how the County would be integrating hazard mitigation planning with the Capital Improvement Plan. Reviewed and approved the questions for the Public Survey.	Project Team, Annex Planning Partners
7/23/2025	SCT SC	Reviewed the methodology used to collect updated Critical Infrastructure and Key Resources data. Discussed how the County would be integrating hazard mitigation planning with the Capital Improvement Plan.	Project Team, SCT SC, Community Representatives
7/24/2025	CAAC	Discussed how the County would be integrating hazard mitigation planning with the Capital Improvement Plan.	Project Team, CAAC, Community Representatives
7/29/2025	County Department Mitigation Strategy Workshop - Infrastructure	Attendees were briefed on the proposed changes to the CIP process and given a chance to provide updates on the 2020 CIP oriented action items. Staff also reviewed the action item template and held discussions on new mitigation strategy action items.	Project Team, County Departments

Date	Event	Summary	Attendees
7/30/2025	County Department Mitigation Strategy Workshop – GIS/Technology	Attendees were given a chance to provide updates on the 2020 technology and data collection and analysis focused action items. Staff also reviewed the action item template and held discussions on new mitigation strategy action items.	Project Team, County Departments
7/30/2025	County Department Mitigation Strategy Workshop – Public Safety	Attendees were given a chance to provide updates on the 2020 public safety and facilities focused action items. Staff also reviewed the action item template and held discussions on new mitigation strategy action items.	Project Team, County Departments
7/31/2025	County Department Mitigation Strategy Workshop – Sheltering and Vulnerable Populations	Attendees were given a chance to provide updates on the 2020 sheltering and mass care focused action items. Staff also reviewed the action item template and held discussions on new mitigation strategy action items.	Project Team, County Departments
8/11/2025	Critical Infrastructure and Key Resources (CIKR) Update Tool Kick-Off Email	Email was sent out with the instructions for how to update CIKR information. Partners had two options: update the information manually using the tool (for partners without GIS capabilities) or submit the data to the Project Team.	Project Team, Annex Planning Partners
8/12/2025	SnoCo EM Advisory Board	Reviewed the mitigation planning work being completed by annex planning partners including the Critical Infrastructure and Key Resources data update, public outreach, and plan alignment.	Project Team, SnoCo EM Advisory Board
8/26/2025	EMCC	Discussed the methodology for developing the mitigation strategies for the county.	Project Team, EMCC

Date	Event	Summary	Attendees
		Reviewed the proposed countywide mitigation strategies.	
9/4/2025	SOAR4	Reviewed the progress on the HMP. Discussed the proposed Human Services mitigation strategies.	Project Team, SOAR4, Subject Matter Experts, Community Members
9/11/2025	Annex Partner Planning Team	Discussed countywide mitigation strategies and approved the strategies. Reviewed the timeline for completing the Base Plan.	Project Team, Annex Planning Partners
9/24/2025	SCT SC	Discussed the methodology for developing the mitigation strategies for the county. Reviewed the proposed countywide mitigation strategies.	Project Team, SCT SC, Community Representatives
9/30/2025	Public Survey	Public Survey ends.	Public Engagement
10/1/2025	Public Comment	Public Comment Period Begins. The plan will be available on the Snohomish County website for public comment.	Public Engagement
10/9/2025	Annex Partner Planning Team	Review and discuss any partner comments for the draft plan. Discuss the timeline and process for annex development.	Project Team, Annex Planning Partners
10/22/2025	SCT SC	Final briefing on the draft plan.	Project Team, SCT SC, Community Representatives
10/28/2025	Snohomish County Planning Commission	Final briefing on the draft plan.	Project Team, Planning Commissioners
10/31/2025	Public Comment	Public Comment period ends.	Public Engagement
11/13/2025	Annex Partner Planning Team	Review any public comments that were submitted during the public comment period and how they were integrated into the plan. Approve the final draft of the base plan.	Project Team, Annex Planning Partners

Date	Event	Summary	Attendees
11/21/2025	Submit for review	The Base Plan and Unincorporated Annex is submitted to WA Emergency Management Division and FEMA for review and approval.	Project Team, WA EMD, FEMA

2.5 Public Involvement

Broad public participation in the planning process ensures that community members' voices will be heard and addressed throughout the planning process, particularly concerning hazard risks, response capabilities, and mitigation actions. 44 CFR requires that the public have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (Section 201.6(b)(1)). While providing an opportunity for public comment on the draft plan is one way to engage with the public around hazard concerns, the Public Planning Committee also wanted to ensure the public had a meaningful way to participate in the process.

Public Survey

The online survey was run from May 2025 through September 2025. It was conducted on the platform "Survey123" and saw a total 133 participants from all over the county. The top hazards listed were Earthquake & Tsunami, Wildfire, and Severe Weather Events. The survey also captured the mitigation priorities for county residents. The survey was promoted through the Snohomish County Emergency Management Newsletter, the annual Snohomish County Preparedness Guide, and Snohomish County DEM social media pages. Electronic devices with the survey were available at tabling events and community meetings for residents to complete. The flyer and social media posts were shared with partners, jurisdictions, and entities involved in the planning process.

Figure 4: Public Survey Flyer

Full survey questions and result summary are located in Appendix C.

Outreach Events

Providing information to promote hazard awareness and increase risk reduction is a priority of the county's mitigation strategy. Education and outreach activities deliver hazard mitigation and disaster resilience information to organizations and community members. The Project Team tabled at community events hosted across the county in partnership with county departments, other county planning efforts, and with partnering jurisdictions. At the events, the public survey was available through scanning a QR code and on electronic devices brought by the team to assist community members in completing the survey. A new "Know Your Hazards" poster was developed and displayed at these events.

Figure 5: “Know Your Hazards” Poster

Residents were able to share their personal experiences from past hazard events during these outreach opportunities. For example, many Sky Valley residents expressed concern about wildfire evacuation and the potential of being cut off or remaining isolated with limited resources during a wildfire event.

The full list of outreach events is located in Appendix C.

Public Comment Period

Community members were provided with the draft HMP from October 1st to October 30th, 2025, on the county’s website (https://www.snohomishcountywa.gov/2429/Hazard-Mitigation-Plan) and informed of the availability of the plan through the DEM newsletter which will be sent out to over 14,000 subscribers and announcements on DEM’s social media accounts.

Figure 6: Public Comment Period Facebook Post

2.6 Review of Existing Programs

44 CFR states that hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (Section 201.6(b)(3)). An assessment of all planning partners' regulatory, technical, and financial capabilities to implement hazard mitigation initiatives is presented in the individual jurisdiction-specific annexes in Volume 2. Many of these relevant plans, studies, and regulations are cited in the capability assessment for each jurisdiction.

The following programs were considered in the development of this plan:

- Snohomish County Comprehensive Plan (2024)
    - Capital Facilities and Utilities Element (2024)

  - Natural Environment Element (2024)
  - Land Use Element (2024)
- Washington State Enhanced HMP (2023)
- Snohomish County Community Wildfire Protection Plan (2025)
- Snohomish County Shoreline Management Program (2019)
- Snohomish County Community Health Assessment (2022)
- Snohomish County Unified Development Code 30.62A Critical Area Regulation
- Stillaguamish River Comprehensive Flood HMP (2004)
- Snohomish River Comprehensive Flood Control Management Plan (1991)Sauk River Erosion/Flood HMP (2010)
- Snohomish River Basin Salmon Conservation Plan (2005)
- Stillaguamish Watershed Chinook Recovery Plan (2005)
- Sustainable Lands Strategy

National Flood Insurance Program Participation

The National Flood Insurance Program (NFIP) provides flood insurance to property owners, renters and businesses, and having this coverage helps them recover faster when floodwaters recede. The NFIP works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects. [1] The communities in Snohomish County that participate in the National Flood Program are[2]

- Snohomish County
- City of Arlington
- City of Bothell
- City of Brier
- Town of Darrington
- City of Edmonds
- City of Everett
- City of Gold Bar
- City of Granite Falls
- Town of Index
- City of Lake Stevens
- City of Lynnwood
- City of Marysville
- City of Mill Creek
- City of Monroe
- City of Mountlake Terrace
- City of Mukilteo
- City of Snohomish
- City of Stanwood
- City of Sultan

[1] Snohomish County Flood Insurance Rate Maps can be found at: FEMA Flood Map Service Center | Search By Address

[2] FEMA Community Status Book Report. Accessed April 2026. "Communities Participating in the National Flood Program – Washington."

Snohomish County also participates in the Community Rating System (CRS). [3] CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts that address the three goals of the program:

- Reduce and avoid flood damage to insurable property;
- Strengthen and support the insurance aspects of the National Flood Insurance Program; and
- Foster comprehensive floodplain management.

The communities in Snohomish County that participate in CRS are:

- Snohomish County
- Town of Index
- City of Monroe
- City of Sultan

In addition to the federally administered NFIP, the county's comprehensive flood hazard management planning program incorporates a selection of planning, engineering, and environmental protection measures. The county's floodplain management actions include:

- Participation in the NFIP;
- Adoption of floodplain development regulations that meet NFIP requirements;
- Participation in an NFIP Incentive Program and Community Rating System (CRS);
- Preparation of emergency preparedness plans;
- Creation of the Integrated Floodplain Management Program to oversee the maintenance of the comprehensive flood hazard management plans for the main rivers, which propose actions to minimize future flood damage;
- The Community Floodplains Solutions (CFS) Program, a partnership between Snohomish County and Sustainable Lands Strategy partners to develop reach scale (a defined section of a river) plans focused on identifying actions to advance farm, fish, and flood interests; and
- Maintaining and enforcing county flood hazard regulations, as described below.

Snohomish County's flood hazard regulations are found in the following sections of Title 30 (Unified Development Code) of the Snohomish County Code (SCC):

[3] Snohomish County Community Rating System

- SCC 30.65 - Flood Hazard Areas
- SCC 30.43C - Flood Hazard Permits
- SCC 30.91S.745 - Definition: Substantial Damage
- SCC 30.91S.750 - Definition: Substantial Improvement

Frequently flooded areas in unincorporated Snohomish County are regulated through County Code, Chapter 30 – Unified Development Code. The chapter states that the County implements the 2021 Washington State Building Codes which include the 2018 International Building Code, International Residential Code, and the International Existing Building Code.[4] Each of these codes contain provisions for construction in flood-prone areas. FEMA states that the floodplain provisions of the I-Codes (2012 edition and later) are consistent with the NFIP minimum requirements for buildings and structures in flood hazard areas.[5]

These county statutes/regulations establish policies, standards, and permitting requirements to guide, limit, and regulate new development within floodplains and floodways as required by the State Growth Management Act, State Shoreline Management Act, and NFIP.

More specifically, the Snohomish County Critical Areas Regulation (Chapter 30) identifies and protects critical areas, including wetlands and fish and wildlife conservation areas, geologically hazardous areas, aquifer recharge areas, and special flood hazard areas.

Goal NE 8 in the Natural Environment Element of the Snohomish County Comprehensive Plan (2024) further outlines the county's natural environment policies regarding flooding including:

- 8.A.2 The county should adopt an integrated floodplain management approach that considers diverse interests and aims to reduce flood risks to people and property while also protecting habitat, water quality, agricultural viability, and open space. An integrated floodplain management approach should include joint flood hazard planning and interlocal agreements to ensure consistent floodplain management where the county shares common floodplains with cities, tribes and state or federal agencies.
- 8.A.3 The county shall develop and update drainage basin plans that document urban flooding problems and potential solutions.

[4] Snohomish County Code (SCC). Accessed October 2025. "Chapter 30 - Unified Development Code."
[5] FEMA. National Flood Insurance Checklist. 2022. "Comparing National Flood Insurance Program Requirements to 2021 International Codes."

- 8.A.4 The county shall adopt and implement a Natural Hazards Mitigation Plan to reduce the vulnerability to natural hazards.
- 8.B.2 The county shall periodically analyze county-owned flood control structures for public benefit, consistency with adopted flood hazard management plans, and the potential for those structures to cause damage downstream, and modify, maintain or abandon the structures based on such analysis.
- 8.B.3 The county shall reduce the number of existing flood damage prone structures through acquisition, relocation, incentives, and regulation.
- 8.B.5 The county shall seek the most current research, data, modeling, and mapping on hazards including but not limited to channel migration, landslides, coastal erosion, earthquake faults and liquefaction zones, lahar routes, mine hazard areas, flood hazard areas, and areas potentially subject to tsunami in coordination with local city, county, state, federal, tribal agencies, and academic institutions. This information will be used for public education and to inform regulatory strategies.

Chapter 3 Snohomish County Profile

3.1 Historic Overview

Several native tribes, including the Snoqualmie, Skykomish, Sauk-Suiattle, Stillaguamish, and Snohomish, occupied the region that is currently recognized as Snohomish County. Both oral tradition and archaeological records indicate that these tribes consisted of hunters and gatherers, with a culture based in salmon fishing, whose vast territories covered the region's dense forests, mountains, prairies, and river systems.

The Snohomish Historical Society discussed the definition of the name Snohomish in their book River Reflections, stating:

"Indians named rivers and areas after their own tribes. The dominant tribe in this county was the Snohomish, the Indians spelling it 'Sdoh-doh-hohbsh.' Although many historians debate the meaning or claim it had none, Chief William Shelton, last of the hereditary Snohomish chiefs, said it meant lowland people. Other students of Indian lore say it might mean 'a style of union among them' of 'the braves'. Other sources claim the name means 'Sleeping Waters'. Still other spellings have given Sdohobich." (Snohomish Historical Society, 1975)

In 1792, Captain George Vancouver arrived to claim the Pacific Northwest for Great Britain. Captain Vancouver renamed much of the area and many of the names are still used now including Puget Sound, Port Gardner Bay in Everett, and Port Susan Bay in Stanwood. By the 1840s, Euro-Americans began migration into the Puget Sound region to claim homesteads. The arrival of these early white settlers greatly reduced the tribal populations through violent land disputes and the introduction of diseases and alcohol. In 1855, the Treaty of Point Elliott reserved the Tulalip Reservation for the use and benefit of the local tribes. It was created to provide a permanent home for the Snohomish, Snoqualmie, Skagit, Suiattle, Samish, and Stillaguamish Tribes and allied bands living in the region. [6]

Expansion of the Great Northern Railway down the Skykomish Valley into the City of Everett during the 1890s brought the industrial boom to Snohomish County. A nationwide depression in 1893 put a halt to much of the area's growth and prosperity and that period was followed with steadier growth based on timber and farming. After World War II, growth exploded in the southwestern part of the county, as the City of Seattle influenced the

[6] The Tulalip Tribes, Who We Are. https://www.tulaliptribes-nsn.gov/WhoWeAre/AboutUs

development of the suburban cities of Edmonds, Lynnwood, Brier, Mountlake Terrace, Mill Creek, and Woodway.

Snohomish County further grew in the late 1960s, following the construction of the Boeing 747 plant at Paine Field. Increased development of high-technology industries along the north Interstate-405 corridor and toward Lake Stevens and Marysville brought population increases in those areas too. During the last 30 years, the traditional economic mainstays of farming, logging, lumber, and paper production started to decline, affecting the economies and lifestyles of many of the county's natural resource-based communities. Over the last several decades the population in Snohomish County has grown faster than the average growth rate of counties in Washington state and the national average. The 2024 Snohomish County Tomorrow Growth Monitoring Report, estimates the population of Snohomish County at 867,100. [7]

3.2 Geography

Snohomish County is located on Puget Sound in western Washington and is the 13th largest county in Washington by total area, with a total area of 2,196 square miles (2,089 square miles of land and 107 square miles of water). It is located between Skagit County to the north and King County to the south and borders Chelan County to the east and Island County to the west with the water of Puget Sound.

The county's varied topography ranges from saltwater beaches, rolling hills, and rich river bottom farmlands in the west to dense forest and alpine wilderness in the mountainous east. The mountainous geography of the eastern portion of the county caused the bulk of Snohomish County's development and population growth to occur along the narrow, westernmost Puget Sound lowlands. More than half of the county is mountainous, with many peaks reaching elevations over 6,000 feet and supporting glaciers and perennial snowfields. Glacier Peak, at 10,541 feet, is the highest point in the county and one of the highest in the state.

Most of the county's communities are in the western lowlands near primary transportation corridors including Interstate-5, State Route-9, US Highway-2, and State Route-530. Snohomish County also hosts multiple railways connecting the communities to Puget Sound and Canada. Many sections of the historic railways have been converted to recreational trail systems, such as the Interurban Trail and Centennial Trail, while others are used for the Sound Transit commuter train and freight trains.

[7] Snohomish County Tomorrow. 2025. "2024 Growth Monitoring Report."

Washington State Department of Ecology identified that Snohomish County has five Water Resource Inventory Areas (WRIAs) and two major river basins that are identified in Table 7 [8]:

Table 7: Snohomish County Watershed Inventory Resource Areas and river basins

Name	Description
Watershed Resource Inventory Areas	Lower Skagit/Samish Upper Skagit Stillaguamish Snohomish Cedar/Sammamish
Snohomish River Basin	Covers approximately 1,856 square miles in King and Snohomish Counties and contains over 2,700 miles of streams, making it the second largest basin draining to Puget Sound. The Skykomish and Snoqualmie Rivers originate in the Cascade Mountains and flow west before meeting near the City of Monroe where they become the Snohomish River. The Snohomish River continues to the estuary near the City of Snohomish and reaches Puget Sound between the cities of Everett and Marysville.
Stillaguamish River Basin	Covers approximately 700 square miles in area, with about 3,100 miles in stream length. Located in the northern half of the county, the Stillaguamish River drains approximately one-half of the county's land area. With basin streams originating in Skagit and Snohomish County, the "Stilly" is the fifth largest tributary draining into Puget Sound.

3.3 Geology

Many of the geologic features of western Washington are shaped by plate tectonics. The Juan de Fuca Plate, a small, low- lying oceanic plate, is moving under the western edge of the North American Plate at the Cascadia Subduction Zone. This friction causes earthquakes of considerable magnitude, which may generate tsunamis. [9] As the dense oceanic crust is gravitationally pulled under the continental plate and deep into the mantle, parts of the crust turn into magma, resulting in the creation of volcanoes such as Glacier Peak. [10] Though modern-day seismic activity in Snohomish County has been

[8] WA State Department of Ecology. Accessed July 2025. "In your watershed."
[9] Pacific Northwest Seismic Network. Accessed July 2025. "Cascadia Subduction Zone."
[10] United States Geological Survey. Accessed July 2025. "Cascades Volcano Observatory Glacier Peak."

moderate to low, this active tectonic system has created a landscape of mountains, valleys and lowlands. [11]

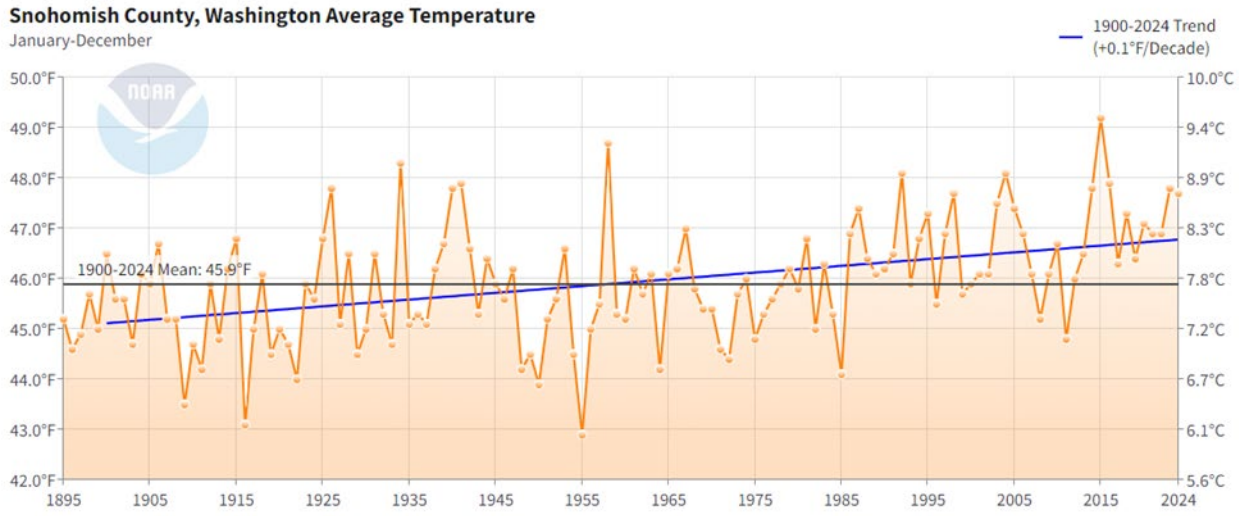
Over a few million years, at least four glacier periods carved and scoured the landscape of Snohomish County. Twenty thousand years ago, glaciers covered the land between the Olympics and the Cascade Mountains as far south as Olympia in several thousand feet of ice. When the ice finally retreated to the north about 13,000 years ago, it left behind deeply gouged channels, north-south oriented passages, and bays. Weather, waves, rivers, and gravity reworked the glacial sediment, molding landforms and shorelines into the beaches and bluffs that now edge the Puget Sound region. [12] The rivers cut through these valleys, transporting and re-distributing nutrient rich sediments throughout the productive floodplains.

3.4 Climate and Weather

As Snohomish County's landscape varies significantly between the valleys and the neighboring mountains, so does its climate. Locations along Puget Sound are generally characterized as a moderate year-round climate, with average temperatures ranging from about 75 degrees Fahrenheit in July to about degrees Fahrenheit in January. Since 1900, the average annual air temperature in the Puget Sound region has increased by 1.3 degrees Fahrenheit and is projected to be 5.5 degrees Fahrenheit warmer in the 2050s. Extreme heat events are forecast to worsen in Snohomish County. By mid-century the county is projected to experience between eight to 20 more days of extreme heat each year, which means drier forests and increased heat stress on native trees along with the human impacts of increased calls for emergency services, hospital visits, and increased energy usage. [13]

[11] Bourgeois, J. and Johnson. S. Geological Society of America Bulletin. 2001. "Geologic evidence of earthquakes at the Snohomish delta, Washington, in the past 1200 yr".
[12] WA State Department of Natural Resources. Accessed August 2025. "Puget Sound and Coastal Geology."
[13] Snover, A.K., C.L. Raymond, H.A. Roop, H. Morgan, 2019. "No Time to Waste".

Figure 7: Snohomish County Average Temperature 1900 – 2024 [14]



Source: National Oceanic and Atmospheric Administration

The Olympic Mountains to the west, across Puget Sound, shelter the area from excessive precipitation coming off the Pacific Ocean. Annual precipitation in the western part of the county is 35 inches but increases sharply as the elevation climbs into the Cascade Mountains (Index, 110" - 120"). This precipitation is concentrated between October and May, with June through August typically receiving less than 1.5 inches per month. The frequency of extreme precipitation events from atmospheric rivers is projected to increase across the Northwest and their impacts are projected to reach farther inland with increased intensity. [15] Snohomish County is dominated by a moist vegetation zone where most rainfall occurs in the winter and higher elevations receive a large snowpack that can persist until June and July. This provides an ideal environment for long term, large tree growth with a robust understory. The coastline of the county sometimes experiences fog or low clouds in the summer that can mitigate the effects of heat and drought. Strong wind driven storms typically occur in the winter during the higher precipitation season. However high heat events in the summer can trigger synoptic east wind events that can bring strong winds to the western slopes of the Cascades. [16]

[14] NOAA National Centers for Environmental information, Climate at a Glance: County Time Series. 2025, "Climate at a Glance County Time Series, Snohomish County."
[15] U.S. Global Change Research Program, 2023. "U.S. Global Change Research Program (USGCRP): Overview and Considerations for Congress."
[16] Reilly, Matthew J., et. al, 2021. "Cascadia Burning: The historic, but not historically unprecedented, 2020 wildfires in the Pacific Northwest."

3.5 Land Use and Development

Development in unincorporated Snohomish County is regulated by Snohomish County Code Title 30, the Unified Development Code (UDC). Incorporated cities and towns within the county implement their own development codes and regulations. Snohomish County follows the Growth Management Act of Washington (RCW 36.70A), which requires counties to direct the majority of development into urban areas where infrastructure exists. It also requires counties to limit growth in rural areas and protect critical areas and farmland. Growth in the county is monitored by Snohomish County Planning and Development Services (PDS) and published in regular Growth Monitoring Reports as required under the Countywide Planning Policies.

According to the 2024 Growth Monitoring Report, multi-family and townhouse housing represent the majority of residential units permitted countywide for five of the last six years, ranging from 53 percent in both 2019 and 2024 to 61 percent in 2021. Between 2020 and 2024, 34 percent of residential building permits have been issued in unincorporated Snohomish County and 66 percent have been issued within the incorporate cities.

Fifteen percent of the total housing units permitted since 1990 have been in the Rural/Resource areas. Parts of these areas experience flooding. They also encompass most of the Wildland Urban Interface (WUI) area, the places where houses, farms and businesses stand amid or adjacent to large tracts of trees. However, Planning and Development (PDS) has seen a decline in the percentage of housing units in the Rural/Resource areas; in the last six years it has remained below 10 percent consistently.

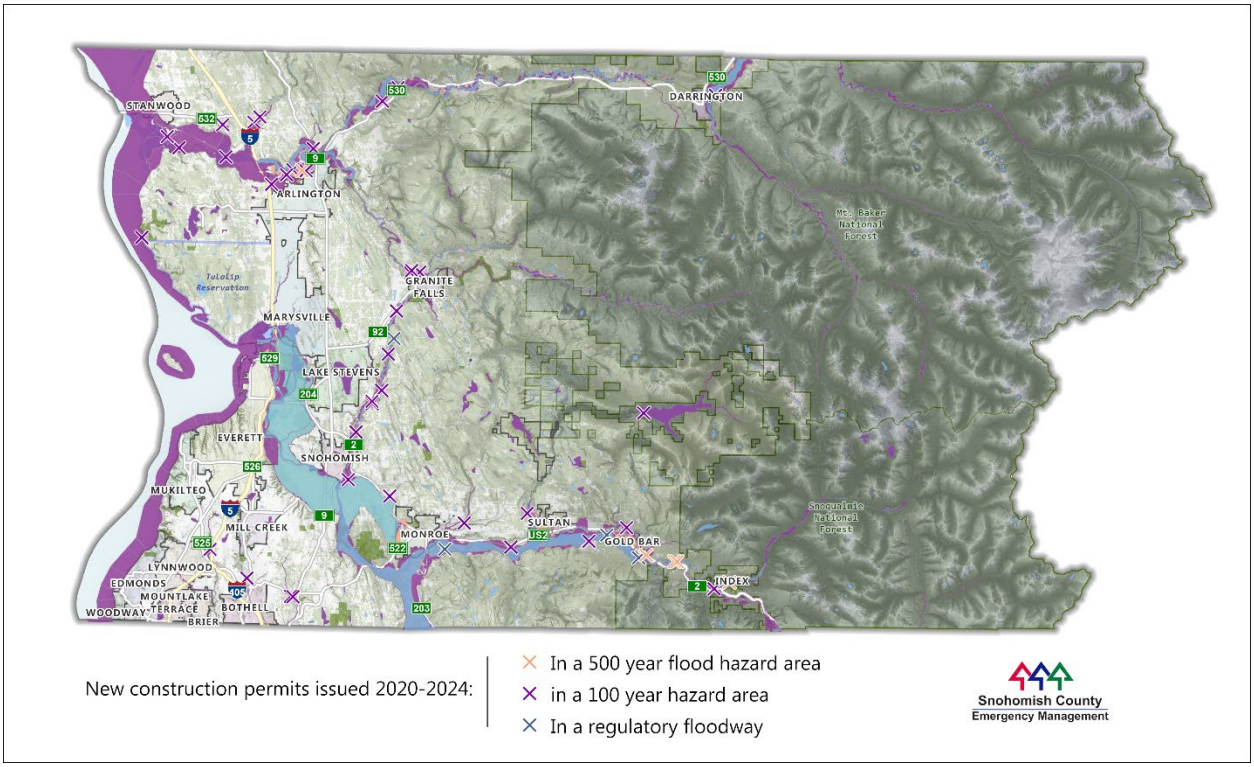
The Permitting Division within PDS is responsible for the review of permit applications to determine that the proposed construction occurring on a parcel that intersects with a hazard area meets the requirements set forth by county code. Permit applications are required to include detailed site plans and are reviewed under the process codified in Subtitle 30.7 in the Snohomish County Code (SCC). The Environmental Planning Group reviews permit applications for compliance with SCC 30.62A (Wetlands and Fish & Wildlife Habitat Conservation Areas), SCC 30.67 (Shoreline Management Program), and SCC 30.65 (Flood Hazard Areas), SCC 30.61 (SEPA Review), and SCC 30.43F (Forest Practices). Engineers in the Drainage group review applications for compliance with SCC 30.62B (Geologically Hazardous Areas) and also review the required zero-rise studies associated with flood hazard zone permit applications for proposed development in the regulatory floodway.

County code allows development activities in the floodway fringe, the density fringe, and in limited cases the floodway if the activities meet all regulatory requirements. County code

also allows development activities some distance from landslide hazard areas, with specific setbacks established according to recommendations in the required geotechnical report. County permitting data does not consistently track the exact coordinates of permitted work within a parcel resulting in an overcount of permits within hazard zones; if any part of the parcel intersects with at least one hazard area, the permit will be flagged as being in that hazard zone even if the exact coordinates of the permitted structure fall outside of the hazard area.

In the last five years the County has issued nearly 5,000 total building permits. The permits are mostly residential but also include non-residential permits for structures such as detached garages, warehouses, and shelters. A portion of those permits were issued on parcels that intersect with known hazard zones. The permit breakdown includes 47 in or near the 100-year flood zone, five in or near the 500-year flood zone, and two within the regulatory floodway. Additionally, 395 building permits were issued in or near potential landslide hazard areas, 162 issued on parcels that contain moderate to high liquefaction susceptibility, and 1,051 issued within the WUI areas.

Map 1: New construction permits issued 2020-2024, Snohomish County



An emerging trend is the recent increase in Rural Cluster subdivision applications. A Rural Cluster subdivision is an alternative to the lot subdivision process in the Rural/Resource areas where developers can group lots into compact clusters as long as they preserve

restricted open space within the development. Depending on how much open space the developer proposes to designate, they can receive between a 15 percent to 35 percent density bonus within the subdivision. For example, in certain areas of the Rural Residential 5 zone (meaning 1 home per 5 acres), a developer could purchase a 50-acre lot and subdivide it into six 5-acre lots under regular zoning regulations. Under the Rural Cluster Subdivision process, that developer could designate 45 percent of the total acreage as open space and qualify for a residential density of 1 lot per 200,000 square feet plus a 15 percent density bonus. This would allow the developer to fit an extra lot into the subdivision. Between 2008 and 2023, the county averaged 40 rural cluster lot applications per year. In 2024, that number spiked to 505 rural cluster lot applications, which was the largest annual total since 2007 according to PDS.

Land use, zoning and subdivision permits are regulated under the county code. Snohomish County also implements the Washington State Building Codes, which include the International Building Code, under Subtitle 30.50 SCC to regulate building permits and improvements, including seismic, snow and construction material requirements.

3.6 Demographics

Snohomish County is the third most populous county in Washington and makes up part of the Seattle metropolitan area with King and Pierce counties located to the south. Its major cities are Everett, Edmonds, Marysville, and Lynnwood. Other cities include Arlington, Bothell (partially in King County), Brier, Gold Bar, Granite Falls, Lake Stevens, Mill Creek, Monroe, Mountlake Terrace, Mukilteo, Snohomish, Stanwood, and Sultan. Snohomish County is also home to the incorporated towns of Darrington, Index, and Woodway, as well as the Tulalip, Stillaguamish, and Sauk-Suiattle Tribes.

The Tulalip Tribes are a federally recognized nation whose designated reservation encompasses 22,000 acres, over half of which is in federal trust land. The Stillaguamish people, a division of the Coastal Salish Tribe, were historically located on the Stillaguamish River. The Sauk-Suiattle tribe, whose ancestors originally inhabited the area now known as the Town of Darrington, maintains the 33.5-acre Sauk-Suiattle Reservation near the town. Although cultural traditions vary among the tribes, the native Lushootseed language is spoken by many Salishan groups.

Much of the population is located along the transportation corridors, which are also interspersed with commercial and industrial operations. [17]

[17] Boeing Company. Accessed July 2025. "Everett Production Facility."

Population

Since the 2020 Census, the Washington State Office of Financial Management (OFM) estimates that Snohomish County's population has grown by 3.8 percent to reach 859,800 total residents as of April 1, 2023 – a gain of 31,843 persons over three years, making it the third largest of Washington's 39 counties. The county's largest city is Everett, with the 2020 United States Census estimating a population of 110,629. Marysville is the second largest city, with over 70,000 residents, followed by Edmonds, Lake Stevens and Lynnwood with populations over 40,000.

Table 8: Populations of Cities and Unincorporated Snohomish County [18]

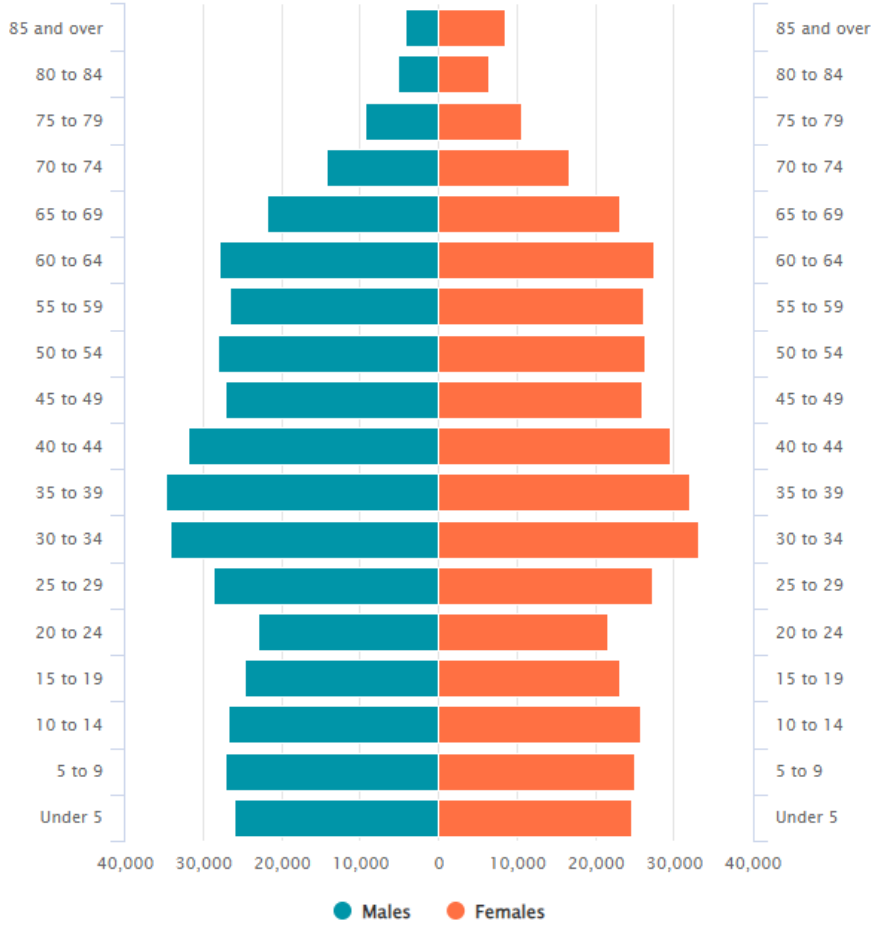
Area	2000	2010	2020	2023	2024
Arlington	11,927	17,926	19,868	21,740	22,980
Bothell (part)	13,965	16,415	19,205	20,270	20,380
Brier	6,383	6,087	6,560	6,610	6,600
Darrington	1,136	1,347	1,462	1,505	1,515
Edmonds	39,544	39,709	42,853	43,370	43,420
Everett	91,488	103,019	110,629	114,200	114,800
Gold Bar	2,014	2,075	2,403	2,305	2,310
Granite Falls	2,347	3,364	4,450	4,775	4,775
Index	157	178	155	155	160
Lake Stevens	6,361	28,069	35,630	41,260	41,540
Lynnwood	33,847	35,836	38,568	40,790	41,500
Marysville	25,315	60,020	70,714	73,780	74,390
Mill Creek	11,525	18,244	20,926	21,630	21,630
Monroe	13,795	17,304	19,699	20,590	20,830
Mountlake Terrace	20,362	19,909	21,286	23,810	24,260
Mukilteo	18,019	20,254	21,538	21,590	21,590
Snohomish	8,494	9,098	10,126	10,330	10,350
Stanwood	3,923	6,231	7,705	8,585	8,865
Sultan	3,344	4,651	5,146	6,730	7,160
Woodway	936	1,307	1,318	1,340	1,345
Incorporated Total	**314,882**	**411,043**	**460,241**	**485,365**	**490,400**
Unincorporated	291,142	302,292	367,716	374,435	376,700
Total	**606,024**	**713,335**	**827,957**	**859,800**	**867,100**

In the 2019-2023 American Community Survey, the median age of the County was 38.4 years. An estimated 22.4 percent of the population was under 18 years. In all, 37.5 percent were 18 to 44 years, 25.8 percent were 45 to 64 years, and 14.4 percent were 65 years and

[18] Snohomish County Tomorrow. 2025. "2024 Growth Monitoring Report."

older. [19] For people reporting one race alone, 66.4 percent were White; 3.6 percent were Black or African American; 1.0 percent were American Indian and Alaska Native; 12.8 percent were Asian; 0.5 percent were Native Hawaiian and Other Pacific Islander, and 4.9 percent were Some Other Race. An estimated 10.7 percent reported Two or More Races. An estimated 11.8 percent of the people in Snohomish County were Hispanic or Latino. An estimated 63.6 percent of the people were White alone, non-Hispanic. People of Hispanic origin may be of any race. [20]

Figure 8: Population by Age and Sex for Snohomish County, Washington in 2019-2023



Vulnerable Populations

People living near or below the poverty line, the elderly, the disabled, women, children, ethnic minorities, and renters tend to be more vulnerable to the effects from disaster and are considered "vulnerable populations." These populations may vary in living conditions,

[19]U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. S0101 | Age and Sex

[20]U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. DP05 | Selected Demographic Characteristics

access to information, capabilities during a disaster event, and access to resources for post-disaster recovery. The current Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) Social Vulnerability Index uses 16 U.S. Census variables from the 5-year American Community Survey (ACS) to identify communities that may need support before, during, or after disasters. [21]

In the United States and Snohomish County, individual households are expected to use private resources to prepare for, respond to, and recover from disasters to some extent. In 2019-2023, 7.9 percent of people living in Snohomish County were in poverty. An estimated 9.1 percent of children under 18 were below the poverty level, along with 8.9 percent of people 65 years old and over. An estimated 7.2 percent of people 18 to 64 years were below the poverty level. [22] 9.1 percent of households received SNAP (the Supplemental Nutrition Assistance Program) with an estimated 43.4 percent of households with children under 18, and 45.5 percent of households with one or more people 60 years and over. [23] These residents are less likely to have insurance to compensate for losses incurred from a disaster.

Households without internet, a computer, or those that speak a language other than English at home may be disadvantaged by delayed or inadequate access to important information. 97.3 percent of households in Snohomish County, Washington had a computer, but only 93.8 percent had a broadband internet subscription. [24] Foreign born persons make up 18.5 percent of the county. Among people at least five years old, 23.7 percent spoke a language other than English at home. Spanish was spoken by 7.4 percent of people at least five years old; 9.2 percent reported that they did not speak English "very well."

In Snohomish County, Washington in 2019-2023, 12.0 percent of the population reported a disability. The likelihood of having a disability varied by age, from 4.4 percent of people under 18 years old, to 10.0 percent of people 18 to 64 years old, and to 33 percent of those 65 and over. Elderly residents (65+) make up 14.4 percent of the population in Snohomish County and 33 percent of those over 65 have a disability. The vulnerability of elderly and disabled residents can vary significantly based on health, age, and economic security.

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[21] Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry. Accessed November 2025. "Social Vulnerability Index."
[22] U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. DP03 | Selected Economic Characteristics
[23] U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. S2201 | Food Stamps/Supplemental Nutrition Assistance Program (SNAP)
[24] U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. B28001 | Types of Computers in Household

Overall, the elderly and disabled are more likely to lack the physical and economic resources necessary for preparation, response, and recovery from a disaster, and are more likely to suffer health-related consequences. Evacuation from assisted-living facilities and private homes may be more difficult because of physical mobility, transportation, or economic resources. These vulnerable populations are more likely to need special medical attention, which may not be readily available during a disaster.

In contrast, children and persons under 18 are vulnerable to disaster events due to their young age and dependence on others for necessities. This vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards. In the county, 22.4 percent of the population is younger than 18. Very young children may be especially vulnerable to injury or sickness. [25]

3.7 Economy

Snohomish County's economy is strongly based in the biotech industry, clean technology, and aerospace engineering and production, and possesses many assets that contribute to the economic vitality of the region. The county is in the heart of the Puget Sound basin and is adjacent to the Seattle metropolitan area.

Employment Trends

Occupations for Snohomish County residents range from farming and ranching operations to high-tech manufacturing, military operations and medical field professions. Major private employers include Boeing (with an estimated 40,000 employees), Providence Medical Center, Premera-Blue Cross, and the Tulalip Tribes. Major public employers in Snohomish County include the U.S. Naval Station, the State of Washington, and Snohomish County.

Management and professional occupations, sales, and manufacturing are important base industries in the county. Snohomish County is the home of the Boeing Company's largest aerospace assembly plant, which is the largest manufacturing building in the world. [26]

Snohomish County experienced continuous job growth from 2010 through 2019. 2020 witnessed a decrease in employment due to the COVID-19 pandemic, which carried on through 2021. With total non-agricultural wage and salary employment in 2020 at 277,800 jobs, followed by 277,300 jobs in 2021, total non-agricultural employment finally began to rise again in Snohomish County in 2022 with 286,500 jobs recorded. The 2022 job total,

[25] U.S. Census Bureau; American Community Survey, 2023 American Community Survey 5-Year Estimates. S0101 | Age and Sex

[26] Boeing Company. Accessed July 2025. "Everett Production Facility."

however, was still 9,000 short of the county's record high non-agricultural job total of 295,500 observed in 2019.

Job growth from 2010 to 2022 was dominated by the service sectors, accounting for 30,700 (or 79 percent) of the total 38,900 non-agricultural job growth experienced by the county during this time. Job declines in the aerospace manufacturing sector were notable during COVID, with a loss of 8,600 wage and salary workers experienced from 2019 to 2022. No other employment sector in the county showed that large of a numerical decline during that period. However, aerospace ended the period growing by 3,500 jobs, an 11 percent increase, from 2023 to 2024. [27]

[27] Snohomish County Tomorrow. 2025. "2024 Growth Monitoring Report."

Chapter 4 Mitigation Strategy

4.1 Establishing Goals and Objectives

Title 44 of the Code of Federal Regulations (CFR) Section 201.6(c)(3)(i) states that hazard mitigation plans (HMPs) shall describe mitigation goals to reduce or avoid long-term vulnerabilities to identified hazards. The mitigation strategy is a call to action and outlines the countywide blueprint for reducing losses and impacts from the hazards identified in the plan's risk assessment. As this is a multi-jurisdictional plan, the goals and objectives are applicable to each plan participant and provide a countywide framework for local jurisdictions to work together with community members and stakeholders to increase local resilience to hazards.

The Public Planning Committee reviewed and updated the goals and objectives established in the 2020 plan update and established a set of six goals and 29 objectives for this plan based on data from the preliminary risk assessment and the results of public outreach. The proposed Goals and Objectives were reviewed by and approved by the Steering Committees for the plan update. The goals and objectives informed plan development, mitigation strategy identification, and prioritization.

4.2 Goals and Objectives – 2025 Update

The following tables list the goals and objectives that have been approved by the Steering Committee. Achievement of these goals defines the effectiveness of a mitigation strategy. The goals are used to help establish mitigation strategy priorities countywide. Each goal has a discrete set of objectives. Additionally, each objective will help measure the effectiveness of the mitigation initiatives and plan.

Goal 1: Protect Life, Infrastructure, Property, and the Environment

ITEM	OBJECTIVES
1.1	Develop, align, and implement policies that integrate hazard and risk information into local development regulations, and land use planning to promote resilient and safe development in high-risk areas and minimize the number of buildings and infrastructure in hazard prone locations (ex. Shoreline Master Program, Critical Areas Ordinance).
1.2	When possible, use avoidance, minimization, and mitigation strategies and actions that preserve and restore ecological functions of natural systems that provide protective benefits to the community.

ITEM	OBJECTIVES
1.3	Develop and maintain local continuity of operations plans to mitigate the impacts of hazards becoming disasters, and support disaster preparedness, response, and recovery.
1.4	Develop, implement, and sustain programs that promote reliable, redundant, and resilient community lifeline systems.
1.5	Maintain, upgrade, strengthen, retrofit or relocate critical facilities and critical infrastructure (e.g. transportation, utility systems, and public buildings) to withstand the effects of hazards without prolonged operational disruptions.
1.6	Address emergency evacuation needs, prioritizing higher risk areas of the community where mitigation strategies are less effective or cost prohibitive.
1.7	Safeguard objects or places that have cultural, environmental, or historic significance.

Goal 2: Build Community Support and Sustain the Economy

ITEM	OBJECTIVES
2.1	Provide framework and strategies, such as developing continuity plans, to support mitigation actions that reduce impacts on critical business operations including small businesses, community organizations and those located in higher risk areas.
2.2	Reduce exposure and vulnerability to all hazards by strengthening public-private partnerships to reinforce and establish redundancy for critical supply systems.
2.3	Promote the ability to increase the resilience of critical services, facilities, and infrastructure through applicable retrofits or relocation.
2.4	Promote stronger community social networks to enhance community resilience.
2.5	Coordinate and provide leadership in the hazard mitigation planning process among local, tribal, state, and federal government entities.

Goal 3: Increase Public Awareness and Engagement

ITEM	OBJECTIVES
3.1	Reduce the adverse impacts of disasters on the whole community by developing and sustaining communication campaigns with residents of Snohomish County about the known or anticipated risks from hazard events.

ITEM	OBJECTIVES
3.2	Create and enhance public information programs and access to hazard information that promotes actionable preparedness, mitigation measures and steps that community members or organizations can take to prevent or minimize losses.
3.3	Increase public input on local mitigation projects benefiting critical services, facilities, and infrastructure to the whole community with special emphasis on communities that are at higher risk of isolation.
3.4	Conduct broad outreach activities to engage all sectors of the community in the hazard mitigation planning process.
3.5	Encourage residents to sign up for Alert and Warning Systems (e.g. SnoCoAlerts and ShakeAlert) and develop Smart911 profiles.

Goal 4: Make Collaborative Decisions

ITEM	OBJECTIVES
4.1	Support the alignment and integration of the 2025 Hazard Mitigation Plan goals, objectives, and strategies with other local plans, policies, and processes.
4.2	Advance and expand a coordinated capital program (i.e. Community Floodplain Solutions) for eligible entities to adapt to risks through structural and nonstructural measures (e.g., easements, acquisition of properties located within high-risk hazard areas or levee setback projects that reduce flood risk by adding flood storage and conveyance).
4.3	Use the best available science and data when developing new or updating existing plans to prepare for and adapt to current and future natural and human-caused hazards and climate change (e.g., update conservation requirements to minimize impacts of drought).
4.4	Develop an integrated floodplain management strategy that leverages sustainable funding sources for flood risk reduction, multi-benefit outcomes, and identifies opportunities for interagency collaboration and coordination.

Goal 5: Expand Understanding of Hazards

ITEM	OBJECTIVES
5.1	Partner with state and federal agencies, colleges, universities, and non-governmental organizations to participate in modeling programs to map areas at risk from hazards to enhance the knowledge of natural and human-caused hazards and climate change.

ITEM	OBJECTIVES
5.2	Participate in regional or statewide disaster scenario exercises to assess mitigation, protection, preparedness, response, and recovery capacities, and apply lessons learned to mitigation activities.
5.3	Incorporate best available science and data into hazard mitigation planning, local plans, policies, and processes.
5.4	Support improved data collection, assessment, analysis, and implementation for all hazards.

Goal 6: Implement Effective Mitigation Strategies

ITEM	OBJECTIVES
6.1	Focus mitigation efforts on the county's greatest risks and vulnerabilities identified in the Hazard Identification and Risk Assessment.
6.2	Align and integrate applicable Mitigation Strategies into existing projects and plans (e.g. Comprehensive Plans, Capital Improvement Plans, and Transportation Improvement Plans).
6.3	Apply for mitigation assistance grants and leverage other funding sources to finance mitigation projects.
6.4	Monitor implementation of Mitigation Strategies through the Hazard Mitigation Plan Annual Report.

4.3 Alignment with Washington State Hazard Mitigation Goals

The Washington State Enhanced Hazard Mitigation Plan, last updated in 2023, establishes the statewide hazard mitigation strategy and provides guidance to local governments. Snohomish County's Hazard Mitigation Plan Goals and Objectives are unique and specific to the needs of our communities, but there is alignment between the goals of the state and Snohomish County.

Table 9: Washington State and Snohomish County Hazard Mitigation Planning Goals and Objectives Alignment

	Washington State Enhanced Hazard Mitigation Plan Goals	Snohomish County Hazard Mitigation Plan Goals and Objectives
1	Reduce the impacts of natural hazards on our community lifeline infrastructure and other critical assets.	1.3, 1.4, 1.5, 2.1, 2.2, 2.3,
2	Prioritize effective long-term partnerships across all levels of government.	2.5, 4.4, 5.2
3	Allow the risk and vulnerability assessments to drive the State's Mitigation Strategy and prioritization of mitigation actions.	6.1
4	Improve our understanding of multi-hazard environments.	5.1, 5.3, 5.4
5	Embed cultural understanding into our mitigation work.	1.7, 3.3
6	Ensure improved and equitable access to hazards information.	3.1, 3.2, 3.4, 3.5
7	Champion and prioritize people-centered mitigation actions in addition to property-centered ones.	1.6, 2.4
8	Emphasize the role of sustainable development and climate adaptation in hazard mitigation.	1.2, 4.3
9	Strategically reduce the number of repetitive loss and severe repetitive loss properties.	1.1, 4.2
10	Ensure all counties and sub-county jurisdictions in Washington understand their hazard risks and are eligible for mitigation funding opportunities.	4.1, 6.2, 6.3, 6.4

4.4 Mitigation Progress – Annual Progress Reports

There were no countywide mitigation strategies that were identified in the 2020 HMP so each jurisdiction has a summary of the progress made on their jurisdiction specific 2020 Mitigation Strategies in their jurisdictional annex.

The 2020 HMP identified a comprehensive plan maintenance strategy that involved the completion of an annual progress report. This report was prepared annually by the Department of Emergency Management with input from county departments and planning partners and submitted to the County Council for review. The primary purpose of the progress report is to provide an opportunity to identify mitigation progress and coordinate available grant funding opportunities, which is important for large multi-jurisdictional

efforts. Three progress reports were completed during the initial plan performance period. These reports were made available to the public on the Snohomish County website. They acted as the formal method for reporting progress on mitigation strategies, identifying enhancements to the plan and were the first documents reviewed during the plan update process. To illustrate the mitigation success stories within the planning area, the most recent progress report is attached to this plan update in Appendix F; all previous progress reports are available on the Snohomish County website (https://snohomishcountywa.gov/2429/Hazard-Mitigation-Plan).

4.5 Development of Mitigation Activities

The proposed projects, programs, and activities the plan participants will implement to provide long-term and sustained benefits that will reduce losses from the impacts of the hazards are at the center of hazard mitigation planning. The Public Planning Committee evaluated each action and scored it according to benefit-cost review criteria. These actions will require significant investments in planning, design, and construction or coordination, and may take years to complete or be sustained as ongoing activities.

The desired outcomes of this plan's mitigation strategy are that communities:

- Build the capacity needed to improve community knowledge of hazards and their risks;
- Identify and implement actions that will effectively reduce their jurisdiction's vulnerabilities to the hazard identified in the risk assessment; and
- Implement strategies that will fulfill the plan's goals and objectives.

The plan defines two sets of mitigation actions: the Countywide Mitigation Strategies and the Jurisdictional Mitigation Strategies.

- **Countywide Mitigation Strategies:** These are countywide actions identified by members of the Public Planning Committee and stakeholders and approved by the Advisory Committees. These actions, if implemented, will benefit multiple jurisdictions and improve interagency hazard mitigation planning capabilities. These mitigation actions will be overseen by the Public Planning Committee.
- **Jurisdictional Mitigation Strategies:** Each plan partner identifies actions that address specific vulnerabilities in their community. The plan partners are responsible for implementing their actions. Each plan partners' initiatives are presented in their respective annex.

Through the adoption of both the Countywide Mitigation Strategies from the base plan and the jurisdiction specific annex Mitigation Strategies, each community creates a comprehensive mitigation plan tailored to its specific needs.

Identifying Mitigation Actions

The Project Team worked with the Public Planning Committee to develop the Countywide Mitigation Strategies and provided guidance to the annex partners on creating their own Mitigation Strategy Workgroups for their jurisdictions. Planning partners were provided with numerous resources to assist in the development process of their Jurisdictional Mitigation Strategies, including:

- Updated Risk Assessment with hazard risk ratings
- Hazus model vulnerability analysis results
- Hazard maps/GIS map with hazard layers
- Map with updated critical facilities
- Updated Goals and Objectives
- A copy of previous annexes with Mitigation Strategies
- Capability assessment template
- An updated Mitigation Strategy template with instructions
- FEMA's "Local Mitigation Planning Handbook"
- FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards"
- Benefit-Cost Review Criteria
- Public survey results

Mitigation Strategy Workshops included staff and/or committees within each jurisdiction that are most familiar with their infrastructure, facilities, key assets, services, and their incorporated boundaries or service areas. Local planning partners referenced a variety of jurisdiction-specific resources such as their comprehensive plans, strategic plans, emergency management plans, capital improvement plans, other planning documents, and local knowledge to compile existing mitigation activities. Jurisdictions also considered strategies from the previous plan and identified new and original strategies to be included as part of this plan's update process.

Types of Mitigation Actions

There are seven types of mitigation activities that jurisdictions can perform to reduce or eliminate current and future vulnerabilities:

1. **Public Outreach and Information**: Information and outreach activities that improve the community's understanding of hazards, their impacts, and steps that people and organizations can take to reduce their risks.
2. **Plan Coordination and Implementation**: Developing emergency plans, coordinating their implementation across multiple agencies, training, and communications to improve community response and resiliency to hazards.
3. **Data Collection and Mapping**: Studies, data collection, monitoring programs, and mapping to improve a community's understanding of hazards to better inform decisions and investments to reduce risks.
4. **Development Regulations**: Developing or reviewing and updating strategic plans, codes, policies, and programs to incorporate best practices in hazard mitigation. Such activities influence the way land is developed, and buildings are constructed.
5. **Hazard Preparedness**: Investments in emergency warning and alert notification systems, specialized training to enhancing emergency response, and stockpiling emergency supplies and materials.
6. **Hazard Damage Reduction**: Acquisition, elevation, relocation, seismic retrofits, modernization, and other modifications to and/or surrounding existing buildings and structures to protect them from hazards.
7. **Critical Facilities Replacement/ Retrofit**: Hazard damage reduction activities for key lifeline facilities such as medical facilities, police and fire stations, water treatment systems, bridges, communications, and other critical community assets.

Benefit-Cost Review Criteria

A benefit-cost review is an assessment tool for weighing the various probable benefits that a mitigation action is expected to produce versus the cost to implement the action. This tool is useful for:

- Comparing a limited number of alternative actions to select a preferred action that will best serve the needs of a community to minimize or eliminate vulnerability.
- Ranking the order of a set of actions based on their scores to sort the actions' order of implementation (higher scoring actions result in a higher priority implementation status).

During the development of the mitigation action, each action was screened using eight point-based criteria. Five points were awarded for high benefit, three points for medium benefit, and one point for low benefit. The full Mitigation Action Benefit-Cost Review Matrix can be found in Appendix D.

4.6 Countywide Mitigation Strategies

The Public Planning Committee developed five multi-jurisdictional Mitigation Strategies that, if implemented, will improve the region's ability to coordinate hazard mitigation planning, assess risks, respond to natural hazards, and protect community assets.

Table 10: Countywide Mitigation Strategies Summary

Strategy	Description	Lead Agency	Priority
CW-1	HMP Implementation	Snohomish County Department of Emergency Management	High
CW-2	Alert and Warning	Snohomish County Department of Emergency Management	High
CW-3	CWPP Implementation	Snohomish County Department of Emergency Management	High
CW-4	CWPP Outreach	Snohomish County Department of Emergency Management	High
CW-5	Emergency Management Planning Coordination	Snohomish County Department of Emergency Management	Medium

CW-1 HMP Implementation

<table>
<tr>
<td>Lead Points of Contact

DEM (RAMP)</td>
<td>Partner Points of Contact

Annex Planning Partners</td>
<td>Hazards Mitigated
All Hazards

Goals and Objectives Supported
All Goals and Objectives</td>
<td>Funding Sources and Estimated Costs
General Fund
ILA Fees
HMA

Cost:
Annex Development - $300,000
Public Outreach/ Translation $50,000</td>
</tr>
<tr>
<td colspan="4">Strategy Vision/Objective
Work with planning partners to begin implementation of the 2025 Snohomish County Hazard Mitigation Plan to increase resiliency to hazards, promote countywide collaboration and leverage collaborative funding opportunities.</td>
</tr>
<tr>
<td colspan="4">Mitigation Strategy
Snohomish County DEM will lead the implementation of the 2025 Snohomish County Hazard Mitigation Plan with the following strategies:
• Planning Partner Annex Development
• Annual Progress Report Implementation – Community Rating System (CRS)
• Support individual outreach and mitigation strategies</td>
</tr>
<tr>
<td colspan="2">2-Year Objectives
• Have all HMP jurisdictional annexes approved and adopted by one year after base plan approval
• Complete a countywide annual progress report by October 1st each year to maintain CRS rating</td>
<td>5-Year Objectives
• Complete all countywide annual progress report by October 1st each year to maintain CRS rating</td>
<td>Long-Term Objectives
• Continued countywide partner participation in mitigation planning during the 2030 update
• Continue to seek funding opportunities for mitigation projects</td>
</tr>
<tr>
<td colspan="4">Implementation Plan/Actions
1) Complete planning partner jurisdictional annexes
a) Complete and distribute annex templates
b) Receive WA EMD/FEMA Approval for each annex within 365 days of base plan approval
c) Receive formal adoption for each annex within 365 days of base plan approval
2) Annual Progress Report Implementation
a) Annexes will complete a Mitigation Strategy Evaluation Form annually
b) DEM will host one meeting annually for annex partners to discuss successes and progress, will occur during summer months to facilitate the update</td>
</tr>
</table>

3) Support individual outreach and mitigation strategies a) Maintain outreach and mitigation strategy coordination through annual annex partner meeting b) Seek out multi-jurisdictional coordination and grant funding for mitigation strategies when possible c) Coordinate hazard related outreach programs to ensure consistent messaging
Performance Measures • Number of Annexes completed, approved, and adopted • Number of partners that participate in the annual progress report

CW-2 Alert and Warning

Lead Points of Contact DEM	**Partner Points of Contact** ILA Partners Sno911 NWS	**Hazards Mitigated** All Hazards **Goals and Objectives Supported** Goals: 1,2, 3, 5, 6 Objectives:1.4, 1.6, 2.4, 3.1, 3.2, 3.4, 3.5, 5.4, 6.2 6.4	**Funding Sources and Estimated Costs** General Fund HMA Cost: ~$100,000

Strategy Vision/Objective
Improve countywide readiness by increasing participation in alert and warning systems and programs.

Mitigation Strategy
Increase resident engagement in SnoCoAlerts through coordinated sign-up campaigns involving partners countywide and using multiple public information options.

Expand the Storm Ready Program in Snohomish County by maintaining the County's Storm Ready designation with the National Weather Service and assisting jurisdictions within the county in achieving Storm Ready designation.

2-Year Objectives	**5-Year Objectives**	**Long-Term Objectives**
• By Jan 30, 2026, have North Sound Media (KRKO/KXA) antenna up and tested at least three times, demonstrating remote radio broadcast capability from the County's Emergency Operations Center during disasters • By March 30, 2026, update annual contract with North Sound Media to comprehensively promote the radio stations as a piece of the community's disaster response capability, generating 10,000 social media impressions • By June 1, 2026, develop and circulate a multi-partner communications strategy to	• Support an additional five jurisdictions in become Storm Ready with NWS • By June 1, 2027, secure funding to encourage SnoCoAlerts signup via directed mailing campaigns to the County's unincorporated residents, adding 10,000 subscribers within 12 months	• Continuously work with NWS to maintain Storm Ready status and seek additional agencies to become certified

increase SnoCoAlerts signups by 10,000 subscribers over the next 12 months.		

Implementation Plan/Actions

1) SCDEM staff will work with NWS staff and local jurisdictions to ensure jurisdictions meet all necessary requirements set by NWS to become a Storm Ready community
2) SCDEM will regularly check in with all jurisdictions to ensure they remain Storm Ready and maintain all necessary equipment/processes to keep the certification.

Performance Measures

- Number of residents signed up for SnoCoAlerts
- Number of Storm Ready jurisdictions

CW-3 CWPP Implementation

<table>
<tr>
<td>Lead Points of Contact

DEM (RAMP and Readiness)</td>
<td>Partner Points of Contact

DCNR (Parks)
PDS (Fire Marshal’s Office)</td>
<td>Hazards Mitigated
Wildfire

Goals and Objectives Supported
Goals: 1, 2, 3, 4, 5, 6
Objectives:1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 2.1, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.4, 5.1, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4</td>
<td>Funding Sources and Estimated Costs
General Fund
CWDG
HMA

Cost:
CWPP Annexes and Stakeholder Outreach - $150,000
CWPP Implementation – $250,000</td>
</tr>
<tr>
<td colspan="4">Strategy Vision/Objective
Work with public and private planning partners to begin implementation of the Snohomish County Community Wildfire Protection Plan to increase community and individual resilience to wildfires and reduce fuel loads in WUI areas.</td>
</tr>
<tr>
<td colspan="4">Mitigation Strategy
Snohomish County DEM will begin the implementation of the new CWPP wildfire chapter with the following strategies:
• Complete CWPP local annexes for the five zones identified in the countywide CWPP.
• Develop and facilitate a Local Coordination Group of CWPP planning partners.
• Identify and host training for wildfire response and evacuation.
Support technology, modeling and data collection to increase knowledge of wildfire risk and forest health, and develop and maintain an enterprise level critical infrastructure inventory, monitor residential building permits in the WUI areas and support additional forest stand modeling.</td>
</tr>
<tr>
<td colspan="2">2-Year Objectives
• Complete local area CWPP annexes by October 2026
• Coordinate and facilitate first meeting of Local Coordination Group in 2026
• Establish smaller working groups out of the LCG and assist in planning working group meeting schedules for 2026</td>
<td>5-Year Objectives
• Host 1 meeting of Local Coordination Group annually
• Diversify LCG working groups into targeted geographic groups to complete progress on local CWPP annex mitigation strategies.
• Develop a tracking method for fuel reduction projects</td>
<td>Long-Term Objectives
• Local Coordination Group and working groups track mitigation strategy progress and use the information for the CWPP update in 2029
• Work with planning partners to help them identify and provide additional wildfire focused</td>
</tr>
</table>

• Identify training or classes focused on wildfire response and evacuation for public safety personnel • Identify funding sources for wildfire mitigation technology	including mapped locations • Host annual wildfire focused training • Host one workshop or tabletop focused on wildfire response and evacuation • Submit grant applications to obtain funding for AI fire monitoring equipment and back-up power sources for communications towers	training and classes for additional personnel and community members

Implementation Plan/Actions

1. Complete CWPP local annexes for the five zones identified in the countywide CWPP
    a. Hire a contractor to work with local planning partners on developing a zone annex template and completing content and maps for each zone
    b. Work with contractor and Human Services to identify potential evacuation sites and with Snohomish County Sheriff's Office and local fire districts to identify potential refuges of last resort along prioritized evacuation routes
    c. Use contractor team to design and launch an ESRI based CWPP hub to host easy to find information and maps from the base plan and local annexes
2. Develop and facilitate a Local Coordination Group of CWPP planning partners to collaborate smaller working groups that will scope out the tasks and perform the work to complete progress on the mitigation strategies
    a. Schedule a half day workshop once a year to go over roles and responsibilities of the mitigation strategies and have partners brief the full group on progress
    b. Ensure working groups are holding regular meetings at least quarterly.
    c. Provide grant application assistance to working groups for wildfire mitigation and fuel reduction projects when available
    d. Schedule a wildfire season wrap-up as part of the Fire Marshal's collaboration with local agencies
3. Identify and host training for wildfire response and evacuation
    a. DEM Readiness will work with planning partners to identify wildfire response and evacuation training
    b. DEM Readiness will actively recruit to host the class and promote attendance

c. DEM Readiness and RAMP will host and facilitate one wildfire response and evacuation workshop or tabletop within the 5 year implementation period of the CWPP prior to when the next update begins in 2029

4. Support technology, modeling and data collection to increase knowledge of wildfire risk and forest health, and develop and maintain an enterprise level critical infrastructure inventory, monitor residential building permits in the WUI areas and support additional forest stand modeling
    a. Continue to communicate the importance and find support for a full time GIS Analyst to develop and maintain a countywide critical infrastructure and facility inventory, monitor residential development in the WUI areas, identify best available data for climate change and forest health, and support forest health and wildfire modeling by tribes, county and local agencies
5. Seek funding to purchase Artificial Intelligence (AI) wildfire detecting equipment and solar powered backup equipment for communications towers

Performance Measures

- Completion of 5 CWPP annexes
- Annual meeting of Local Coordination Group
- Annual Summer Hazard workshop with wildfire focus
- Annual Fire Marshal hosted wildfire season wrap up workshop
- Host 1 wildfire focused training per year
- Host 1 wildfire and evacuation focused workshop or tabletop every 5 years
- Hire or contract a dedicated GIS analyst for wildfire and hazard analysis modeling
- Successful grant applications for funding to purchase AI wildfire detecting equipment and back-up power systems for communication towers

CW-4 CWPP Public Outreach

Lead Points of Contact DEM (Outreach and Education)	**Partner Points of Contact** DCNR (Parks), Tourism	**Hazards Mitigated** Wildfire **Goals and Objectives Supported** Goals: 1, 2, 3, 4, 5, 6 Objectives: 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 2.1, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.4, 5.1, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4	**Funding Sources and Estimated Costs** General Fund CWDG HMA Translation of current materials and development of new materials - $40,000

Strategy Vision/Objective

Develop and implement a public education and outreach campaign around wildfire safety, evacuation, defensible space and home hardening strategies based on the goals, objectives and strategies developed in the Snohomish County Community Wildfire Protection Program.

Mitigation Strategy

During the CWPP process, partners and stakeholders developed a mitigation strategy to explore options for collaboratively funding a full-time staff member to conduct public outreach and education around wildfire risk and to speak with homeowners to support outreach efforts including social media campaigns. CWPP planning partners identified several areas of public outreach and education they would like to see emphasized during CWPP implementation regardless of the status of a full-time staff member:

- Promotion of defensible space and home hardening strategies
- Promotion of the DNR small forest program and other landowner programs provided by the Snohomish Conservation District to assist with fuel management on individual properties
- Tourism and recreation focused outreach materials for burn bans, fire safety and evacuations
- Provide visual learning tools at forest health treatment sites explaining how the harvesting or understory treatment improves forest health
- Translation of evacuation education materials into multiple languages
- Share SnoPUD public education campaigns around Public Safety Power Shut-offs and encouraging residents to report issues around transmission lines.
- Promote the Public Safety Hub during wildfire season

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Translate all currently available wildfire and evacuation outreach material into Spanish • Promote evacuation education campaign annually • Develop defensible space and home hardening outreach materials with PDS, Fire Marshal, SCD, and Red Cross • Promote SCD and DNR fuel management programs for homeowners and small forest owners • Promote partner wildfire preparedness materials and social media posts • Work with DCNR and County Executive's Office to develop tourism-based materials focusing on burn bans and closures, fire safety and evacuations • Work with DCNR and Fire Marshal's Office to develop standardized messaging for forest/road closures and burn bans for tourists and other visitors to the County • Work with PDS and Fire Marshal's Office to develop Assistance Bulletins for permitting	• Continue to promote partner wildfire preparedness materials and social media posts • Continue to promote evacuation education campaign annually and encourage local fire agencies and jurisdictions to exercise evacuations within their communities • Find funding for a full time collaborative public outreach staff member dedicated to wildfire safety and preparedness • Work with local fire agencies and school districts for elementary school engagement around fire risks and safety and include Smokey Bear campaigns and materials • Work with DCNR to find funding for visual learning tools at forest health maintenance and harvesting sites • Create a Wildfire Safety Awareness Day • Provide a recap promotion of the wildfire tabletop exercise after it occurs	• Develop and share outreach materials for small communities and HOAs with guidance for maintaining fuel sources in rights-of-way and community forests • Continue to expand public outreach and education around wildfire preparedness, safety and evacuation • Disseminate wildfire preparedness, safety and resilience materials throughout the community via community meetings and events

and development recommending wildfire resilient materials, defensible space techniques and fire resilient landscaping • Develop and disseminate materials to help residents take steps at home to protect themselves from smoke		

Implementation Plan/Actions

1. Use money budgeted in the 2023 CWDG grant managed by DEM to translate existing Ready! Set! Go! materials and other pre-existing wildfire education materials
2. Use money budgeted in the 2023 CWDG grant to produce new outreach and education materials focused on home hardening and defensible space
3. Use funds budgeted in the 2023 CWDG grant to produce new materials promoting the Healthy Forests program and other DCNR fuel management treatments benefitting forest health and wildfire resilience
4. Use the current PIO network to promote partner wildfire awareness and education campaigns including the SnoPUD PSPS program, smoke safety, and fuels management for home and forestland owners
5. Work with PDS and the Fire Marshal's Office on the Assistance Bulletin process to develop educational materials for builders and developers to create more wildfire resilient homes and communities in and near WUI areas
6. Collaboratively seek funding through State, Federal or private party resources to train and hire a full-time staff member dedicated to wildfire safety, preparedness and evacuation outreach and education
   a. Working through the Local Coordination Group, identify possible funding sources and prepare standardized language for grant applications and presentations for funding requests
   b. Decide which agency will host the full-time staff member and create an Memorandum of Understanding with participating jurisdictions and agencies for how the funding should be spend and the scope of work for the staff member
   c. Staff member will work with LCG outreach working group to prepare new outreach and educational materials based on two- and five-year objectives

Performance Measures

- Translation of Ready! Set! Go! outreach materials into Spanish
- Translation of existing wildfire preparedness materials into Spanish (Public Safety Hub, SnoCoAlerts, etc.)

- New outreach materials recommending defensible space, home hardening and smoke safety strategies to increase wildfire resilience including Assistance Bulletins and brochures/hand-outs
- New outreach materials promoting DCNR fuel management and forest health programs and projects
- Cross-promotion of DEM, SnoPUD, SCD and other partners' wildfire preparedness and safety campaigns
- A full-time staff member dedicated to wildfire outreach and education and at minimum five community events per year (one in each zone)

CW-5 Emergency Management Planning Coordination

<table>
<tr>
<td>Lead Points of Contact

DEM</td>
<td>Partner Points of Contact

ILA Partners
Plan Stakeholders</td>
<td>Hazards Mitigated
All Hazards

Goals and Objectives Supported
Goals:1, 2, 3, 4, 5, 6
Objectives: 1.3, 1.4, 1.6, 2.1, 2.2, 2.4, 2.5, 3.1, 3.3, 4.1, 5.3, 5.4, 6.1, 6.2, 6.4</td>
<td>Funding Sources and Estimated Costs
General Fund
ILA Fees
HMA
~$600,000</td>
</tr>
<tr>
<td colspan="4">Strategy Vision/Objective
Support local, tribal, state, and federal preparedness efforts and ensure alignment with local and regional planning efforts to support a comprehensive and regional mitigation strategy.</td>
</tr>
<tr>
<td colspan="4">Mitigation Strategy
• Coordinate with county departments and ILA jurisdictions to update and maintain the CEMP, mitigation plan and local and functional annexes – including volcano and the CEMP earthquake annex with catastrophic elements
• Update the CEMP community lifelines plans to incorporate the Community Lifeline Status System (CLSS) allowing for real-time specific and actionable information sharing of community lifeline components and subcomponents
• Multi-jurisdictional ILA and regional planning, training, and exercise efforts between Snohomish County and local and regional partners
• Complete the update of the county COOP</td>
</tr>
<tr>
<td colspan="2">2-Year Objectives
• Engage ILA partners in developing a countywide earthquake response annex, which incorporates catastrophic elements
• Coordinate with Skagit and Whatcom County in update of USGS Glacier Peak/Mt. Baker Coordination Plan
• Initiate update of Regional Tactical Interoperable Communications Plan</td>
<td>5-Year Objectives
• Incorporate Glacier Peak/Mt. Baker Coordination Plan updates into county’s Comprehensive Emergency Management Plan
• Incorporate ILA community lifelines planning into CLSS.
• Conduct test of concept exercise of catastrophic earthquake communications
• Complete update of Regional Tactical</td>
<td>Long-Term Objectives
• Countywide Functional Exercise
• Regularly maintain the TICP with regional partners (ensuring it is not out of date)</td>
</tr>
</table>

	Interoperable Communications Plan	

Implementation Plan/Actions

1. Monitoring Station Installation
2. Coordinate with USGS staff to identify actions that the County can take
3. Review community lifelines with ILA partners over the next five years, with the goal of including all relevant components and subcomponents into the CLSS system

Performance Measures

- Monitoring Station Installation
- Number of trainings and planned exercises
- Completion of CEMP annexes

Chapter 5 Hazard Identification and Risk Assessment

5.1 Overview

Hazard Identification and Risk Assessment (HIRA) is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards through an analysis of quantitative and qualitative information. It allows personnel to establish mitigation and response priorities through identification of potential hazards and vulnerable assets.

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards. It allows emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- **Hazard Identification** – Use all available information to determine what types of hazards may affect a jurisdiction, how often they can occur, and their potential severity.
- **Exposure identification** – Estimate the total number of people and properties in the jurisdiction that are likely to experience a hazard event.
- **Vulnerability identification and cost evaluation** – Assess the impact of hazards on the people, property, environment, economy, and lands of the region, with estimates of the cost of potential damage and losses, or cost that can be avoided by mitigation.

44 CFR Section 201.6(c)(2) requires a risk assessment that provides factual basis for activities proposed in the strategy to reduce losses from identified hazards. To protect privacy and security, information on properties assessed is presented in aggregate, without details about specific properties.

This risk assessment provides information relating to the full planning area. Jurisdiction specific information is available in each jurisdictional annex located in Volume 2.

5.2 Identified Hazards of Concern

The 2025 Snohomish County Hazard Mitigation Plan identifies 13 hazards, including seven natural hazards and six human-caused threats.

The list of hazards was developed through an examination of the 2020 HMP and annual progress reports, other local hazard mitigation plans, the Washington State Enhanced Hazard Mitigation Plan, and hazard events that occurred in the last five years. The list was

cross referenced with FEMA's National Risk Index (NRI), a tool that assesses natural hazards and community risk factors. Based on the review, Table 11 lists the hazards of concern this plan update addresses:

Table 11: List of Hazards Identified for the 2025 Snohomish County HMP

Natural Hazard	Human Caused Hazards
Earthquake & Tsunami	Active Assailant
Extreme Heat & Drought	Aircraft Accident
Flood	Cybersecurity
Mass Earth Movement	Dam Failure
Severe Weather Events	Disease Outbreak
Volcano	Hazardous Materials
Wildfire	-

5.3 Methodology

The purpose of this risk assessment is to identify which hazards pose the greatest risk and which areas and assets are most vulnerable. The Project Team used multiple risk assessment tools to determine overall risk for each identified hazard for the full planning area.

GIS Mapping

Geographic Information System (GIS) is a computer system that analyzes and displays geographically referenced information. It uses data that is attached to a unique location. National, state, county, and city databases were reviewed to locate spatially based data, and maps were produced using GIS to show the spatial extent and location of hazards when such datasets were available. Data used for this plan update represents the best science currently available. GIS data was taken from a variety of Snohomish County, State of Washington, and federal sources. The data was sourced via Snohomish County GIS, including layers owned by both GIS and by other entities. The resulting maps are included in the Hazard Profile component of this plan.

Hazus-MH

Hazus-MH is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facilities, transportation, and utility lifelines. This data can be used in multiple models to estimate potential losses from natural disasters.

In December 2024, the Project Team conducted Hazus analyses on six earthquake scenarios and two flood scenarios.

The summary risk reports for the two most damaging earthquakes and the two flood scenarios are located in Appendix E:

- Earthquake: Southern Whidbey Island Fault Magnitude 7.4
- Earthquake: Cascadia Subduction Zone Magnitude 9.0
- Flood: 100-year
- Flood: 500-year

Hazard Probability and Impact Matrix

The Project Team developed a risk matrix to assess hazards, their impacts on county assets, and the vulnerabilities of these assets. The matrix incorporates Emergency Management Accreditation Program (EMAP) standards to quantify the hazard impacts on county assets and assess their vulnerability. The matrix was distributed to Snohomish County department representatives, the Public Planning Committee, and subject matter experts in the county to complete. Their rankings were averaged to determine the overall risk of each hazard and calculate the hazard rankings.

The matrix is separated into three categories that determine the total risk; the potential severity of the hazard, exposure of county resources to the hazard, and the overall vulnerability of the exposed population. Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The following tables give a summary of the criteria for each category. To view the full matrix with definitions, see Appendix E.

Table 12: Hazard Occurrence (Severity Factor) Criteria

Frequency	Duration	Speed of Onset	Magnitude
1 - Unlikely 2 - Possible 3 - Likely 4 - Highly Likely	1 - Minimal 2 - Short 3 - Medium 4 - Long 5 - Excessive	1 - Extended 2 - Medium 3 - Short 4 - Short-None	1 - Localized 2 - Limited 3 - Critical 4 - Catastrophic

Table 13: Vulnerability Impact Criteria

Impact on Business	Impact on Humans	Impact on Property	Impact on Environment
1 - Minimum 2 - Low 3 - Medium 4 - High	1 - Minimum 2 - Low 3 - Medium 4 - High	1 - Minimum 2 - Low 3 - Medium 4 - High	1 - Minimum 2 - Low 3 - Medium 4 - High

Table 14: Resource Impact Criteria

Public	First Responders	Continuity of Operations	Facilities and Infrastructure	Economy	Environment	Public Confidence
1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High

When calculating risk, the Project team accounted for the county's current capabilities and regulations. The overall risk ranking of each hazard was determined by using the overall severity of each hazard as a multiplier for the potential impact of the hazard on the jurisdiction.

1. **Severity Factor** = Sum of Hazard Occurrence Probability/1.7
2. **Risk Score** = Severity Factor x (Sum of Vulnerability Impact + Sum of Resource Impact)
3. The **Risk Score** for each hazard is used to determine the final ranking of the hazard.

5.4 Risk Assessment Results

Figure 9 shows the average results of all participating planning partners and stakeholders who completed the survey for all of the hazard-related factors.

Figure 9: Snohomish County Risk Assessment Results and Hazard Ranking

	Earthquake & Tsunami	Wildfire	Dam Failure	Volcano	Mass Earth Movement	Disease Outbreak	Hazardous Materials	Flood	Cybersecurity	Severe Weather Events	Aircraft Accident	Extreme Heat & Drought	Active Assailant
Frequency	3	3	2	2	2	3	3	3	3	3	2	3	3
Duration	4	4	4	4	3	5	3	3	3	3	2	3	2
Speed of Onset	4	3	3	3	4	2	4	2	4	2	4	1	4
Magnitude	4	2	3	3	2	4	2	2	3	3	1	3	1
Impact on Business	3	2	3	2	2	2	2	2	2	2	1	1	1
Impact on Humans	4	3	3	3	3	4	3	3	2	2	3	3	3
Impact on Property	3	2	2	3	2	1	2	2	1	2	1	1	1
Impact on Environment	3	3	3	3	3	1	3	3	1	2	2	2	1
Public	3	2	3	3	2	3	2	2	1	2	2	2	2
First Responders	3	3	2	3	2	2	2	2	1	2	2	1	2
Continuity of Operations	3	2	2	2	2	2	2	2	2	2	2	1	1
Facilities and Infrastructure	3	2	2	2	2	1	1	2	1	1	1	1	1
Economy	3	2	2	2	2	2	2	2	2	2	1	2	1
Environment	2	2	2	3	2	1	2	2	1	2	2	2	1
Public Confidence	3	2	2	2	2	3	2	2	2	1	2	1	2
Overall Risk	Very High	High	High	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Low	Low
Rank	1	2	3	4	5	6	7	8	9	10	11	12	13

5.5 Hazard Profiles

Chapters 6 through Chapter 18 describe the risks associated with each hazard of concern identified for Snohomish County. Each chapter elaborates on the hazard, the planning area's vulnerabilities, and probable event scenarios. The following steps were used to define the risk of each hazard:

- **General Description:** This section provides clear, concise information of the specific hazard being assessed. It includes scientific and technical terms related to the hazard and its characteristics, ensuring a shared understanding for all stakeholders involved.
- **Hazard Ranking:** This section shows the averaged results for the probability ranking and summarizes the information.
- **Location:** This section identifies and outlines geographical regions that are particularly vulnerable to the hazard. It highlights areas that are more likely to experience higher levels of risk based on historical data, topography, weather patterns, and other relevant factors.
- **Extent:** This defines the scale of the hazard's potential effects.
- **Past Events:** This section provides a historical record of previous occurrences of the hazard in the area offering valuable insights into the frequency and extent of the hazard, as well as the impacts on people, property, and infrastructure.
- **Probability of Future Occurrences:** This section forecasts the likelihood of the hazard occurring in the future.
- **Climate Change Considerations:** This section examines how climate change might influence the frequency, intensity, or characteristics of the hazard.
- **Impact and Vulnerability Assessment:** This section evaluates the potential consequences and identified vulnerabilities of the hazard on various sectors, using a structured table format.

Chapter 6 Active Assailant

6.1 Hazard Description

Active assailant incidents can be well-planned, coordinated attacks with multiple suspects, or the result of a lone individual on a rampage. [28] Most incidents have occurred in places of commerce, educational institutions, open space, and government properties. [29] Active shooters violently targeted members of the public across the United States at a rate that was 89 percent higher from 2019 to 2023 than in the previous five-year period. [30]

Active assailant attacks can also come in the form of a car, knives, or explosives. In 2014, a 16-year-old student with two knives went on a rampage at a Pennsylvania high school, stabbing 21 students and a security guard. On May 22, 2017, a suicide bomber entered a concert in Manchester, England, killing 22 people and injuring over 50. [31] On January 1, 2025, a man planted two improvised explosive devices (IED) on Bourbon Street in New Orleans before driving his truck into the crowd of people celebrating the New Year killing 14 people and injuring at least 57. [32]

The most immediate damage from active assailants is the loss of human life and the wounding of people. Although sometimes there is a particular victim in mind, most people involved in an incident are innocent bystanders. After the incident, fear can be present not only in the community but in similar locations across the nation. Lasting trauma can affect individuals and their families involved in the attacks.

6.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Active Assailant are summarized in Table 15.

[28] Federal Bureau of Investigations (FBI). Accessed August 2025. "FBI Active Shooter Safety Resources."
[29] FBI. 2019. "Quick Look: 277 Active Shooter Incidents in the United States From 2000 to 2018."
[30] FBI. 2024. "Active Shooter Incidents in the United States in 2023."
[31] Gibson, T. Rave Mobile Safety. 2019. "Understanding the Difference: Active Shooter vs. Active Assailant in K-12 Schools."
[32] FBI. 2025. "FBI Releases Investigative Update in Bourbon Street Attack."

Table 15: Active Assailant Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	2	4	1	1.56	Low	13

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event is short and will last between 12 to 24 hours.
- There will be minimal to no warning for the onset of the event.
- Magnitude of the event is localized, likely impacting only one jurisdiction.
- The overall impact to the full county will be low.
- Active Assailant has a low overall risk.

6.3 Location

An active assailant incident can occur throughout the entire county. The locations of active assailant incidents are generally unknown to those impacted until the event occurs, but locations are not typically random for the assailant. A high percentage of school shootings are carried out by current or former students, and many shootings at businesses are carried out by current or former employees, or by persons with a known grievance. In instances with no direct connection to the location, places with a high-pedestrian presence are typically chosen (i.e., special events, large gatherings).

6.4 Extent

The Federal Bureau of Investigations (FBI) defines an "active shooter" as one or more individuals actively engaged in killing or attempting to kill people in a populated area. [33]

Casualties in active assailant incidents can range from no deaths and very few injuries, to potentially dozens of individuals killed and even more wounded. Incidents involving cars or explosives can be over in seconds or last minutes while active shooter situations are often over within 10 to 15 minutes, but the damage from this time can vary greatly. Some of the most severe aftereffects are the trauma to victims and families, as well as the fear that is instilled in the public.

[33]FBI. Accessed August 2025. "Active Shooter Safety Resources."

In the weeks and months before an attack, many active assailants engage in behaviors that may signal impending violence. Some of these behaviors are intentionally concealed, but others are observable and reportable.

6.5 Past Events

Between 2000 and 2024, there were two Active Assailant events in Snohomish County:

- On October 24, 2014, a 15-year-old armed with a handgun began shooting in the cafeteria of Marysville-Pilchuck High School; four students were killed, three wounded; and
- On July 20, 2016, a 19-year-old armed with a rifle, began shooting people attending a house party in Mukilteo; three people were killed, one wounded.

Additionally, multiple potential mass shooting/active assailant attacks were investigated and foiled by law enforcement before they occurred. In February of 2018, a Snohomish County grandmother reported her 18-year-old grandson to the police after finding a journal with threats to shoot students. After investigation, the threats were considered credible, and the man was arrested. [34]

6.6 Probability of Future Events

The threat from an active assailant is becoming more common in the United States. From 2020 to 2024, the FBI designated 223 active shooter incidents, which represents a 70 percent increase in active shooter incidents from the previous five-year period (2015 to 2019). [35] Of the 48 active shooter incidents that occurred nationally in 2023, four occurred in Washington state, putting Washington in the top three states that experienced active assailant incidents. [36] In 2024, there were a total of 24 incidents that occurred in the United States with one occurring in Washington state. [37]

Once an incident has started, when the active assailant arrives on scene and begins the act of violence, there is virtually no warning time. Those further away from the assailant have more time to implement action-based response options to increase survivability and save lives.

[34] Bernhard, J. ABC 10. 2018. "Grandmother foils alleged mass shooting plot at Washington school."
[35] FBI. 2025. "Active Shooter Incidents in the United States in 2024."
[36] FBI. 2024. "Active Shooter Incidents in the United States in 2023."
[37] FBI. 2025. "Active Shooter Incidents in the United States in 2024."

6.7 Climate Change Considerations

There is no direct relationship between Active Assailant events and climate change.

6.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Active Assailant are summarized in Table 16.

Table 16: Active Assailant Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Public gatherings such as marathons, protests, or festivals, as well as everyday locations like schools and workplaces, are potential sites of attack, exposing residents across the county to direct harm. Additionally, the emotional and psychological toll of an active assailant attacks will affect not only those directly targeted but also the wider community, potentially altering everyday behaviors and impacting mental health.
First Responders	Moderate	First responders, including law enforcement, firefighters, and emergency medical services (EMS), face immediate risks when responding to active assailant events, especially when dealing with hazardous materials, active shooter situations, or explosive devices. The physical danger posed by these incidents places responders at risk of injury or death. Mass shootings have the potential to serve as a catalyst for anti-gun demonstrations, putting additional strain on local law enforcement.
Continuity of Operations	Low	Disruptions can range from temporary shutdowns to long-term closures, requiring significant recovery efforts. Essential services such as public health, social services, and law enforcement could be delayed or interrupted, affecting the county's ability to serve its residents effectively.
Facilities and Infrastructure	Low	If facilities are targeted, the immediate impact is often physical destruction or damage to the structure, systems, and equipment within. Employees and existing patients could become

		injured or killed. Inundation of hospitals and medical centers after mass violence can result in shortages in blood and supplies, potentially putting other victims more at risk. Physical infrastructure could sustain physical damage from the weapon (e.g., gun, vehicle, fire, or explosives).
Economy	Low	An Active Assailant incident can include loss of business and revenue or loss of labor hours.
Environment	Low	An Active Assailant incident likely will have a minimum impact on the environment.
Public Confidence	Moderate	In most Active Assailant incidents, impact to the public confidence will be moderate, especially in cases where government fails to quickly reassure impacted communities, provide them with community support and make security resources available. Failure to protect the public from an Active Assailant event or appropriately respond to the event can, in extreme cases, cause a total failure of public confidence in public safety organizations.
Vulnerable Populations	High	Certain groups, particularly those from protected classes, are particularly vulnerable to attacks. These individuals or communities may be specifically targeted due to their age, race, religion, ethnicity, gender identity, sexual orientation, or other protected characteristics. Vulnerability arises because these groups are often seen as symbols of the values or causes that extremists oppose, making them more likely to be victims of violence.
Property	Low	There could be physical damage from the weapon (e.g., gun, vehicle, fire, or explosives), resulting in property damage.

Chapter 7 Aircraft Accident

7.1 Hazard Description

Aircraft accidents occur every year in the United States. Accidents occur from either mechanical failure or human error. The five most common reasons for airliner disasters are pilot error, contributing to around 50 percent of accidents; mechanical failure; bad weather; intentional crashes; or other forms of human error. According to a study conducted by the Massachusetts Institute of Technology in 2024, the overall risk of a fatality from commercial air travel is low, approximately one per every 13.7 million passenger boardings globally between 2018 and 2022. [38]

The two main ways an aircraft accident could cause damage are directly by the impact, or indirectly via explosion, fire, and vibration. Aircraft landings in residential areas have the potential to damage property and injure people. Some aircraft have skidded off runways, hitting cars in streets. The most potential for loss of human life comes from a high-impact crash in which the impact forces are beyond human tolerance and all onboard are killed instantly. [39]

7.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for commercial Aircraft Accident are summarized in Table 17.

Table 17: Aircraft Accident Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
2	2	4	1	1.77	Low	11

Probability and Ranking Summary

- Frequency of the event is possible, with between one percent to 10 percent probability in the next year, or at least one chance in the next 100 years.
- The duration of the event is short and will last between 12 to 24 hours.

[38] Dizikes, P. MIT News. 2024. "Study: Flying keeps getting safer."
[39] Ekman, S. and Debacker, M. Safety Science. 2018. "Survivability of occupants in commercial passenger aircraft accidents."

- There will be minimal to no warning for the onset of the event.
- Magnitude of the event is localized, likely impacting only one jurisdiction.
- The overall impact to the full county will be low.
- Aircraft Accident has a low overall risk.

7.3 Location

Snohomish County is home to six public and 24 private airports, the largest being Paine Field in Everett, Washington. [40] The County is also within the flight pattern of multiple flights flying to and from Seattle-Tacoma International Airport. Paine Field commercial air service was launched in March of 2019. The terminal accommodates approximately 24 departures per day and supports approximately 10,000 to 15,000 travelers per week. [41]

Although aircraft accidents can happen anywhere in the county, the most likely locations are those close to the 30 airports and along the more populated western portion of the county. Historically, most crashes have happened near Paine Field, Snohomish, and Arlington Municipal Airports.

7.4 Extent

According 49 CFR 830.2, an aircraft accident means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. [42]

All aircraft accidents should be considered severe. Severity can vary depending on where the aircraft landed or crashed (e.g., population, property), how fast it was going, how heavy it was, and how much fuel was on board. In almost all cases, there is little to no warning time for aircraft accidents for people on the ground.

7.5 Past Events

Aircraft accidents tend to happen annually in Snohomish County, with the majority being non-fatal.

[40] Snohomish County Public and Private Airports, Washington. Snohomish County tollfreeairline.com.
[41] Paine Field Snohomish County Airport. 2019. "Questions, Answers About Commercial Air Service at Paine Field."
[42] US Code of Federal Regulation. Accessed August 2025. Title 49 § 830.2 Definitions.

- In 2019, a single engine plane crashed into a rural Marysville field, resulting in one fatality. [43]
- In 2022 a single engine plane crashed into a field east of Harvey Field in Snohomish, resulting in four fatalities. [44]

7.6 Probability of Future Events

It can be reasonably expected that one or more aircraft accidents will occur each year somewhere in Snohomish County. However, future regulations and safety standards may reduce the amount of aircraft accidents.

7.7 Climate Change Considerations

There is no direct link between climate change and aircraft accidents. While severe weather plays a role in some accidents, technology and government agencies can typically compensate for and forecast potentially dangerous conditions.

7.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Aircraft Accident are summarized in Table 18.

Table 18: Aircraft Accident Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Potential impacts to the public from an aircraft accident can vary widely based on the severity of the incident. There could be significant casualties as a result of the event that could include both individuals on the aircraft and those involved in the aircraft collision on the ground. Temporary or even permanent displacement through evacuation from an unsafe area can result in relocation/displacement of populations.
First Responders	Moderate	First responders, including law enforcement, firefighters, and emergency medical services (EMS), face immediate risks when responding to an

[43] Fox 13 Seattle. 2019. "1 dead after small plane crashes into Marysville field."
[44] Roberts, P, and Groover, H. Seattle Times. 2022. "Plane that Crashed in Snohomish County was on a test flight."

		aircraft accident event, especially when dealing with hazardous materials. A large-scale event would divert significant resources and limit the ability of first responders to respond to other emergencies.
Continuity of Operations	Moderate	Disruptions can range from temporary shutdowns to long-term closures, requiring significant recovery efforts. Depending on the size of the response, essential services such as public health, social services, and law enforcement could be delayed or interrupted, affecting the county's ability to serve its residents effectively.
Facilities and Infrastructure	Low	Spills of hazardous materials can result in extensive and costly cleanup efforts. Until a site is cleaned up to those standards, residential or business occupancy can be denied under the Health Code. Patient inundation of hospitals and medical centers after a mass fatality crash can result in shortages in blood and supplies, potentially putting other victims more at risk. Physical infrastructure could sustain physical damage if involved in the event.
Economy	Low	After an aircraft accident, areas around the crash are typically closed off and unusable until after an investigation has been completed. This can lead to negative financial impacts for affected businesses, such as airlines or the airport.
Environment	Moderate	There may be a direct impact to the environment based on the location of the aircraft accident. The incident could result in physical damage to the environment or a fire. If the aircraft accident involves a chemical spill, it may further impact the natural environment. Wetlands, streams and rivers, lakes, and reservoirs may all be damaged from chemical spills. In some cases, these damages may injure the plant and animal life irreparably.
Public Confidence	Moderate	Fear stemming from the accident can have a negative financial impact on airlines if people

		choose a different method of transportation or not to travel at all.
Vulnerable Populations	Low	Vulnerable populations often live in closer proximity to airports which could increase their chance of being impacted by an aircraft accident.
Property	Low	Property could sustain physical damage if involved in the event.

Chapter 8 Cybersecurity

8.1 Hazard Description

Cybersecurity threats are becoming more common, more dangerous, and more sophisticated as people become increasingly dependent upon the internet. Threats are evolving as nation-states, terrorists, individual criminals, transnational criminal organizations, and other malicious actors move their activities to the digital realm. Motivations include espionage, political and ideological interests, and financial gain. The broad availability, relatively low cost, and increasing capabilities of cyber tools affect trends and threats; examples include malware and phishing.

Cybersecurity threats can affect institutions such as banking, medical, education, military, commerce, and communications and infrastructure systems. Cyberattacks are malicious attempts to access or damage a computer system using computers, mobile phones, gaming systems, and other devices to steal identities; block access or delete documents and pictures; target children; or cause problems with business services, transportation and power. Common types of cyberattacks include denial of service, botnets, distributed denial of service, exploit tools, logic bombs, phishing, sniffers, Trojan horses, viruses, war dialing, war driving, and worms.

Cyberattacks can not only damage governments, companies, and individuals economically, but can also lead to embarrassment, reputation loss, and a loss of public trust. Attacks are also a risk to critical infrastructure, potentially affecting power grids, utilities and transportation systems, and healthcare sectors.

Cyber incidents due to human errors and system glitches can occur because of negligence, lack of implemented policies and/or processes, unclear roles and responsibilities, insufficient training, misconfigurations etc. Such incidents are often identified and contained faster than disruptions caused by malicious actors. Human errors and system glitches can expose confidential data, decrease availability and put data integrity at risk.

8.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Cybersecurity are summarized in Table 19.

Table 19: Cybersecurity Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	3	4	3	1.56	Moderate	9

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event will be medium and will last between one to seven days.
- There will be minimal to no warning for the onset of the event.
- Magnitude of the event is critical, likely to impact the full county.
- The overall impact to the full county will be moderate.
- Cybersecurity has a moderate overall risk.

8.3 Location

Cyberattacks can occur locally from sources anywhere on the globe. Attackers may be local, wishing harm on county governments, officials, or individuals. People in the county can also be affected by mass breaches elsewhere in the United States or the world, such as a breach at a bank or credit card institution. Usually, the source and location of the cyberattack are unknown.

8.4 Extent

Major internet service providers report seeing 80 billion malicious scans a day, showing automated efforts by cybercriminals to identify vulnerable targets. Many researchers track the quantity of new malware released, estimating a range from 300,000 to a million viruses or other malicious software products being created every day. [45]

Cyber incidents put both financial resources and sensitive information at risk. The financial impact includes costs related to: downtime, remediation efforts to repair damaged systems, expert consultations, and potential ransom payments. Data loss or compromise also poses a significant threat, particularly for entities handling sensitive information such as Personally Identifiable Information (PII) or Personal Health Information (PHI). Snohomish County manages a wide range of public, sensitive, and confidential data, some of which is regulated by federal law, the Revised Code of Washington, and global compliance standards. Unauthorized, unintentional, or unanticipated disclosure of

[45] Department of Homeland Security (DHS). 2018. "Cybersecurity Strategy."

confidential data could lead to identity theft, financial loss for individuals, operational disruptions for businesses, legal action, and reputational damage for the County.

The potential high risk of impacts from cyberattacks on critical infrastructure systems at a national or local level are only being understood and managed, including the cascading impacts that this risk poses. The interconnectedness of major economic systems, utility systems (i.e., smart grids), food and health systems, and transportation systems indicates that these risks are vast and significant. [46]

8.5 Past Events

In May 2016, the Northshore School District servers were hacked and 9,000 out of 21,000 Gmail accounts were compromised. Thousands of students received spam emails containing inappropriate messages and links to pornography. [47] On Friday, September 20, 2019, the Northshore School District's servers suffered another significant cyberattack, rendering many of the systems inoperable. [48]

In 2016, the Snohomish County Public Utility District enlisted the help of the Washington Air National Guard to identify vulnerabilities in their cybersecurity system, asking them to hack into the system; they were successful. The goal was to identify vulnerabilities before suffering an actual attack to enhance the security of their system to protect customers and employees. [49]

In December 2018, a failure in CenturyLink's fiber optic network caused widespread outages affecting Washington's 911 system, severely disrupting emergency communications on and off for more than 49 hours. At least 10,752 calls were blocked from reaching a 911 dispatcher during the outage. [50]

In February 2021, Automatic Funds Transfer Services (AFTS) were attacked by ransomware. AFTS provides payment processing, billing, mailing, and other services for local governments and municipal utilities. The ransomware attack affected the data from Snohomish County governments that included the cities of Lynnwood and Monroe, as well as the Port of Everett and the Alderwood Water & Wastewater District. Compromised

[46] Toregas, C. and Santos M. United Nations Office for Disaster Risk Reduction. 2019. "Cybersecurity and its cascading effect on societal systems."
[47] KOMO News. 2016. "Thousands of Northshore School District Students Gmail Accounts Spammed."
[48] Hozan, E. 2019. "Washington Stat's Northshore School District Cyber Attack."
[49] Farley, G. King5 News. 2016. "Why Snohomish Co. Utility Had Itself Hacked."
[50] Washington State Office of the Attorney General. 2021. "AG Ferguson: CenturyLink responsible for widespread 911 outage."

information potentially included images of customers' checks that include banking and routing information. [51]

8.6 Probability of Future Events

On a daily basis people, governments, and companies are targeted and may be vulnerable to cyberattacks. The frequency of these attempted attacks and incidents will continue to increase, especially as the county population increases.

Attacks are instantaneous; there is virtually no warning time for cybersecurity threats once they occur. Once intrusions into systems are recognized, steps can be taken to mitigate the severity of consequences, but this is after a problem has already been identified or made present. Identifying vulnerabilities in systems and increasing cybersecurity are ways to prevent attacks.

8.7 Climate Change Considerations

Cyberattacks may impact the functionality of smart technology that could disrupt the availability of water or energy during heat waves or droughts, which are occurring with greater frequency due to climate change, negatively impacting public health or destroying an entire season's crop. [52]

As natural disasters, storms, and hazards increase in frequency, vulnerabilities in critical infrastructure exposed to these hazards also increase, as do cybersecurity threats during these events. [53]

8.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Cybersecurity are summarized in Table 20.

[51] Roberts, P. Seattle Times. 2021. "Hack of Seattle payments processing firm puts local governments on alert."
[52] Toregas, C. and Santos M. United Nations Office for Disaster Risk Reduction. 2019. "Cybersecurity and its cascading effect on societal systems."
[53] Cybersecurity & Infrastructure Security Agency. 2023. "CISA Warns of Hurricane-Related Scams."

Table 20: Cybersecurity Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Low	Anyone in Snohomish County during a cyber related incident can be impacted. Impact on residents may include delayed services such as transportation, impaired or cancelled healthcare services, decreased or no availability of public services, information, and financial loss and exposed or lost information.
First Responders	Low	First responders may not be able to access their systems and databases resulting in delays and increased risk from the loss of situational awareness. If data integrity is lost it may put patients and first responders at risk.
Continuity of Operations	Moderate	Minor cyber incidents which are identified early and are recoverable may have some impact on daily operations before being fully contained but won't lead to significant loss of operations. A significant incident impacting one or more functions and businesses can severely affect the county's capability to perform critical operations.
Facilities and Infrastructure	Low	Cyberattacks can cause physical damage if facilities, devices, or infrastructure are impacted by the disruption. An incident including utilities, life support devices, transportation or telecommunications may lead to extensive property damages. A hazard impacting the power system can lead to a cyber incident due to loss of power to devices rendering systems and data unavailable, loss of power to cooling systems which can cause overheating and fires in server rooms and data centers. If critical healthcare related systems and devices can't be accessed or data integrity can't be guaranteed, patient safety will be at risk.
Economy	Moderate	The financial impact of a cyber-incident ranges from little or minimal to significant depending upon duration, scale, affected systems, devices and users. A significant, extended cyber incident affecting most or all of the county's operations

		would likely impact the local and possibly regional economy for some time.
Environment	Low	A cyberattack targeting water/wastewater or hazardous materials facilities could potentially impact the environment in the region if it causes the release of hazardous materials or improper disposal of wastewater.
Public Confidence	Moderate	Largescale disruptions can generate national media interest and jeopardize the public perceptions of effective operations. Long term loss of service or having protected personal data compromised could create distrust in the ability of government to maintain essential services and protect data.
Vulnerable Populations	Moderate	Individuals who live with health and safety challenges are vulnerable to cyber incidents impacting their needed services along with any individuals who are dependent on critical public services.
Property	Low	Property with control systems or that contain vital cybersecurity infrastructure are more vulnerable to cybersecurity incidents. Impacts to physical property will likely be minimal during a cybersecurity incident.

Chapter 9 Dam Failure

9.1 Hazard Description

A dam failure is an uncontrolled release of water from a reservoir as a result of structural failures in a dam. Dam failures can range from minor to catastrophic and can result in deaths, injuries, and damage to property in areas downstream from the reservoir. Natural hazard events like floods, earthquakes, and landslides can cause dam failures, and the same is true for human activities like deficiencies in maintenance, poor operation, criminal acts, or terrorism.

Dam failures in the United States often occur as the result of other hazards, such as earthquakes, landslides, storms, snowmelt or sabotage. Human error, such as poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for. These threats are under continuous review by public safety agencies.

Two federal agencies play significant roles in ensuring the safe operation and maintenance of dams identified under the National Dam Safety Program: the U.S. Army Corps of Engineers and the Federal Energy Regulatory Commission (FERC).

The Washington State Department of Ecology Dam Safety Office (DSO) is the regulating body over non-federal dams that impound at least 10-acre feet of water in Washington state. The DSO permits all new dam construction, inspects all high and significant hazard dams every five years, and requires that all deficiencies be remedied.

There are three types of dam risk:

- **Incremental Risk:** The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or mis-operation, where the consequences are greater than those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences upstream of the dam as well.
- **Non-Breach Risk:** The risk in the reservoir pool area and affected downstream floodplain due to ‘normal’ dam operation of the dam (e.g. large spillway flows that are within the design capacity but exceed channel capacity) or ‘overtopping of the dam without breaching’ scenarios.

- **Residual Risk:** The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time". It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

Dams fail for a variety of reasons, but the four most common are [54]:

- Overtopping, 34 percent - caused by the reservoir reaching capacity and water spilling over the top of a dam.
- Foundation defects, 30 percent - caused by settlement and slope instability.
- Piping and seepage, 20 percent - when water travels through the dam and causes internal erosion.
- Conduits and valves, 10 percent - Piping of embankment material into the conduit through joints or cracks.

A dam failure has the potential to cause damage similar to a flash flood. Downstream communities can be devastated in the event of a large dam failure, which can result in damage or destruction of buildings and infrastructure, particularly bridges, culverts, and other infrastructure within the floodplain. Large dam failures can also result in injuries and deaths and damage to agriculture and natural ecosystems.

9.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Dam Failure are summarized in Table 21.

Table 21: Dam Failure Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
2	4	3	3	2.52	High	3

[54] Washington State Department of Ecology. Water Resource Program. Dam Safety Office. Accessed August 2025. "Incidents & failures - Washington State Department of Ecology".

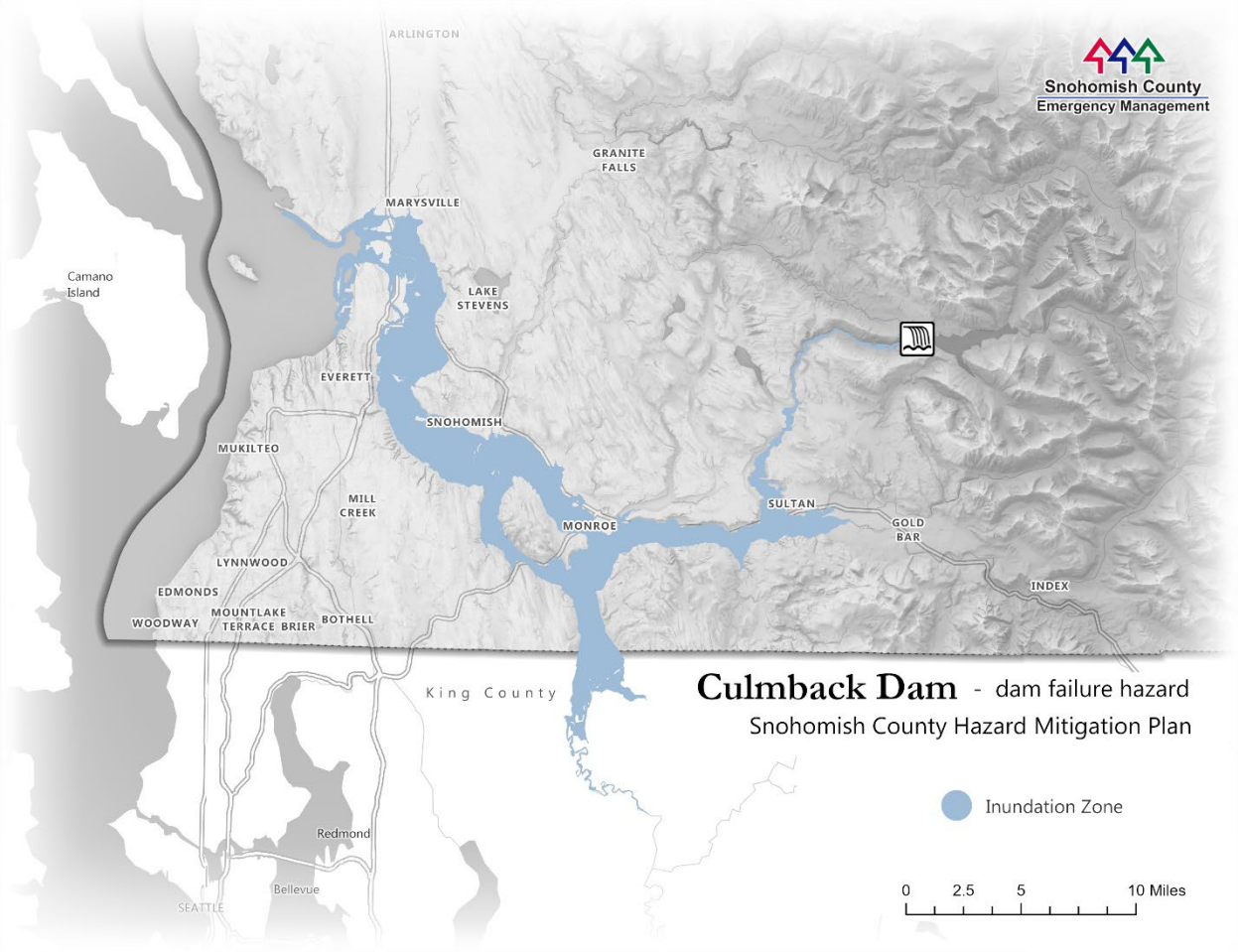
Probability and Ranking Summary

- Frequency of the event is possible, with between one percent to 10 percent probability in the next year, or at least one chance in the next 100 years.
- The duration of the event will be long and will last between seven to 30 days.
- There will be six to 12 hours warning for the onset of the event.
- Magnitude of the event is critical, likely to impact the full county.
- The overall impact to the full county will be moderate.
- Dam Failure has a high overall risk.

9.3 Location

There are 65 dams in Snohomish County, with 23 classified as a threat to human life if they fail. The dams with the highest potential impact are the Culmback Dam and the South Fork Tolt Dam. The latter is located in King County, but a failure would impact Snohomish County.

Map 2: Culmback Dam Inundation Zone



Culmback Dam

The Culmback Dam is owned and operated by Snohomish County Public Utility District Number One. Culmback offers hydroelectric power generation, flood control, drinking water, and recreational benefits to the region.

Culmback Dam's morning glory spillway is designed to maintain a margin of safety (freeboard) even during maximum probable flood events. Changes in a dam's watershed or extreme precipitation events affect the amount of water a dam needs to release downstream to keep it from failing. Culmback Dam's watershed lies within a densely forested area that slows the speed in which water enters the reservoir, prevents sediment from entering the reservoir, and prevents debris flows. A wildfire around the dam would increase the hydrologic strain on the dam. An increased flow can be compensated for with larger releases from the dam which could result in flooding that impacts the City of Sultan. If a controlled release does not occur, enough water could create a potentially dangerous overtopping incident at the dam.

South Fork Tolt Dam

Located in King County, but inundating the Snohomish River Basin, the South Fork Tolt Dam is owned and operated by the City of Seattle. It is a hydroelectric dam that also provides drinking water for 30 percent of 1.3 million people across the greater Seattle area. South Fork Tolt Dam is a large embankment type dam, equipped with a morning glory spillway. The Tolt dam has known landslide hazards below the dam and above the reservoir. If a slide were to occur in the reservoir, an overtopping wave may be generated that could cause the dam to fail or send a flood wave downstream.

9.4 Extent

Dam failure can be catastrophic to all life and property downstream. Past dam failure events in Snohomish County and Washington state have led to significant economic and environmental impacts. Dam hazard classifications rate dams by the extent or severity of a potential dam failure.

Table 22: U.S. Army Corp of Engineers Dam Hazard Classification [55]

Hazard Category	Direct Loss of Life	Lifeline Losses	Property Losses	Environmental Losses
Low	None (rural location, no permanent	No disruption of services (cosmetic or	Private agricultural lands,	Minimal incremental damage

[55] US Army Corp of Engineers. 2014. "SAFETY OF DAMS – POLICY AND PROCEDURES."

Hazard Category	Direct Loss of Life	Lifeline Losses	Property Losses	Environmental Losses
	structures for human habitation)	rapidly repairable damage)	equipment, and isolated buildings	
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

The impact of a dam failure depends on factors such as the size of the impoundment (i.e. how much water it is holding at the time of failure), the steepness of the terrain, downstream land use, and the speed of failure. For larger dams, failure typically results in a fast-moving flood wave with high velocities. In contrast, smaller dams may only cause a gradual rise in water levels. The consequences of dam failure can include loss of life, property damage, destruction of infrastructure, public health risks, contamination of drinking water, and environmental harm within the inundation zone. Additionally, there may be secondary effects on communities and ecosystems outside the flooded area.

Table 23: WA Department of Ecology Dam Hazard Classification in Snohomish County [56]

Hazard Class	Number
1A = High – Greater than 300 lives at risk	2
1B = High – 31 to 300 lives at risk	7
1C = High – 7 to 30 lives at risk	7
2* = Significant – 1 to 6 lives at risk	0
2D = Significant – 1 to 6 lives at risk	7
2E = Significant – Environmental or economic impact	5
3 = Low – No lives at risk	37

The US Army Corp of Engineers National Inventory of Dams includes 43 dams in Snohomish County with 22 dams receiving the High Hazard designation. The State

[56]Washington State Department of Ecology Dam Safety Office. 2025. " Inventory of Dams Report."

Department of Ecology's Inventory of Dams includes 65 dams in Snohomish County, with 23 being in a hazard class that threatens human life, as depicted in Table 23.

9.5 Past Events

The Washington Department of Ecology Dam Safety Office maintains records of dam accidents in Washington [57]. Between 1918 and January 2019, 22 notable dam failures and incidents occurred in Washington state. Two of these events occurred in Snohomish County.

- In December 1967, the 40-foot-high North Star Sand & Gravel Dam was washed out by overtopping due to the lack of a spillway. A 25-foot-high dam was rebuilt but also failed and washed out the Great Northern railroad tracks near Everett, derailing a passing train. There were no lives lost in this incident.
- In April 2010, the French Slough Bartelheimer Dairy Waste Pond breached and emptied around 27 million gallons onto adjacent farmland and into French Slough. The cause of the breach was internal erosion through the embankment foundation due to the failure to remove the cedar drain field beneath the pond during construction. There were no lives lost in this incident.

9.6 Probability of Future Events

The likelihood of a dam failure in Snohomish County is very low. While the county's location near multiple fault lines does lead to more frequent earthquakes than other parts of the United States, the risk of dam failure from seismic activity is still minimal. All large, high hazard dams in the area are closely regulated by FERC and other agencies. These organizations ensure that dams are properly maintained and that operators are prepared for potential emergencies, such as flooding.

9.7 Climate Change Considerations

Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hydrograph changes, it is conceivable that the dam could lose some, or all, of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle to maintain the required margins of safety. These earlier releases of increased volumes of water can increase flood potential downstream. Heavy rainfall events can lead to erosion and scouring near dams, exacerbating runoff and increasing

[57] Washington Department of Ecology. 2019. "Washington State Notable Dam Failures and Incidents."

water pressure, while rising temperatures lead to faster evaporation, which may weaken dam structures over time. Both extreme heat and cold can further damage the structural integrity of dams. Spillway overflow events, often referred to as "design failures," may increase. This would result in increased discharges downstream and flooding potential. Climate change would also increase the occurrence of floodwaters exceeding capacity and increase the risk of structural failure.

9.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Dam Failure are summarized in Table 24.

Table 24: Dam Failure Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	High	All populations within dam failure inundation zones would be exposed to the effects of a dam failure. The potential for loss of life is affected by the capacity of the dam, the number of evacuation routes available to populations living in areas of potential inundation, and warning time. For example, the population within the dam failure inundation areas of the Culmback and Tolt River dams is approximately 2 percent of the total county population.
First Responders	Moderate	Dam failure would impact multiple fire agency and law enforcement facilities within the inundation zone. First responders would also lose the ability to use major transportation routes with few to no alternate routes.
Continuity of Operations	Moderate	Multiple cities are located within the inundation zone. If city buildings are directly impacted, there may be impact on daily operations. A catastrophic dam failure impacting one or more functions and businesses can severely affect the county's capability to perform critical operations.
Facilities and Infrastructure	Moderate	All critical facilities within dam inundation areas are vulnerable to the dam failure hazard. Transportation routes, including all roads, railroads, and bridges in the path of a dam

		inundation, are vulnerable and could be wiped out, creating isolation issues. Critical facilities most vulnerable are those already in poor condition and thus not able to withstand a large water surge. Utilities such as overhead power lines, cable, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues within the inundation areas.
Economy	Moderate	Flood damage from the failure of the Culmback Dam would devastate the region. With multiple municipalities, acres of farmland, and major interstates in the inundation zone, a dam failure would leave the local economy crippled. Commutes, roadways, and rail lines would all be impacted by a high release from the Culmback Dam. Unemployment may follow in areas that experience a dam failure.
Environment	Moderate	The environment would be exposed to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways, possibly destroying downstream habitat and exerting detrimental effects on many species of animals. Any facilities that contain hazardous materials within the inundation zone may also threaten the environment. The extent of vulnerability of the environment is the same as the extent of exposure.
Public Confidence	Moderate	A dam failure may cause the public to lose confidence in dam owners, both public and private, to manage local dams. Depending on the success of the response, the public may also lose confidence in first responders.
Vulnerable Populations	High	Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the economically disadvantaged, elderly and young, those who may be unable to get themselves out of the inundation area, and those who may not have adequate warning. A lack of public knowledge about dams, their presence in the community, and their failure

		potential creates an added challenge in creating a resilient community.
Property	Moderate	Vulnerable properties are those closest to the dam inundation area. These properties would undergo the largest, most destructive surge of water. Low-lying areas are also vulnerable because dam waters would collect there. Based on the 2020 Hazus-MH model estimated that there are 7,315 structures within the combined inundation areas of the Culmback and Tolt River Dams. The value of exposed buildings in the planning area was generated using Hazus-MH. This methodology estimated $2.54 billion worth of building-and-contents exposure to dam failure inundation in these areas, representing five percent of the total assessed value of the planning area.

Chapter 10 Disease Outbreak

10.1 Hazard Description

A disease outbreak refers to the widespread occurrence of an infectious disease within a community or region over a specific period, also known as an epidemic. Disease outbreaks can overwhelm healthcare systems, disrupt daily life, and require coordinated public health responses to control and mitigate their spread.

Communicable diseases are vector-borne illnesses that people spread to one another through contact with contaminated surfaces, bodily fluids, blood products, insect bites, or through the air. Examples include influenza, norovirus, and hepatitis A.

Agricultural diseases encompass a variety of animal and crop diseases, pest infestation, and food safety outbreaks. Examples include highly pathogenic avian influenza (HPAI), Chronic Wasting Disease and e. coli.

An outbreak can be characterized by the extent of spread of the disease:

- **Endemic**, seen in more common diseases, are the baseline levels within a community. Animal and crop diseases are endemic in many parts of the world.
- **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
- **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Modern travel and globalization mean disease can spread more widely and quickly than before, potentially affecting ever-greater numbers of people, having a significant impact on the economy of the affected community and spilling over into the global economy, disrupting travel, trade, and livelihoods. Local outbreaks can overwhelm medical facilities, and a pandemic could jeopardize essential community services by causing critical positions to go unfilled. Basic public services such as health care, law enforcement, fire and emergency response, communications, transportation, and utilities could be disrupted or severely reduced. An extended epidemic or pandemic would stress societal systems, including local and outside resources.

10.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and

rank, enabling the prioritization of hazards by type. The results for Disease Outbreak are summarized in Table 25.

Table 25: Disease Outbreak Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	5	2	4	2.11	Moderate	6

Probability and Ranking Summary

- Frequency of the event is possible, with between one percent to 10 percent probability in the next year, or at least one chance in the next 100 years.
- The duration of the event will be long and will last between seven to 30 days.
- There will be six to 12 hours warning for the onset of the event.
- Magnitude of the event is critical, likely to impact the full county.
- The overall impact to the full county will be moderate.
- Disease Outbreak has a moderate overall risk.

10.3 Location

All of Snohomish County is susceptible to human health hazards and disease outbreak. Communicable diseases can cause exposure to the county from outside the local region. Local residents who travel or commute can be exposed and bring diseases back into the county. It is difficult to map the extent of an outbreak or epidemic.

10.4 Extent

The Centers for Disease Control and Prevention (CDC) Pandemic Intervals Framework (PIF) delineates the progression of an influenza pandemic through six distinct intervals. This widely recognized framework not only visualizes fluctuations in disease activity but also provides a standardized method for describing pandemic phases and guiding public health responses. [58]

In general, severity depends on the pathology of the disease, the health of the individual, vaccinations, and the availability of treatments for symptoms or curing the disease. The severity of a disease varies from individual to individual. Typically, vulnerable populations (specifically young children and elderly adults) are more susceptible to acquiring communicable diseases due to immune system challenges and capabilities.

[58] Center for Disease Control. Pandemic Flu. 2024. "Pandemic Intervals Framework (PIF)."

Due to increased air travel, commuters, and population growth, the probability of an outbreak occurring continues to grow. The frequency of outbreaks is difficult to establish, depending largely on unique circumstances surrounding the outbreak and expansion into epidemics and eventually pandemics. Warning time for public health risks varies from a few hours or days to a few months, depending on the illness and outbreak.

Some of the larger impacts of an outbreak would be economic. The reduction in workforce and labor hours would cause businesses and agencies to be greatly impacted. With a reduced workforce, there may be transportation route closures or supply chain disruptions, resulting in a lack of food, water, or medical resources. Another large and costly secondary impact would be fear or stigmatization, which may result in isolation or social unrest. Hospitals and public health facilities may be inundated with individuals, including those with the disease, and those concerned about having contracted it. Finally, the disease may mutate, rendering cures and research unusable and contributing to the previously identified secondary impacts.

10.5 Past Events

The highly contagious measles virus, which was declared eliminated in 2000, has re-emerged throughout the United States with cases confirmed in 31 states, including Washington state. In January through August 2025, there were a total of 11 cases in Washington across four counties, including Snohomish County. [59]

- In 2009, Snohomish County residents were exposed to the H1N1 virus, known as “swine flu,” which resulted in more than 1,650 hospitalizations and deaths across Washington state. H1N1 was the first influenza pandemic of the 21st century.
- In 2020, Snohomish County had the first confirmed case of COVID-19 in the United States. From the beginning of the COVID-19 outbreak in February 2020 to the end of the state of emergency in Washington on October 31, 2022, there were around 1,330 deaths in Snohomish County along with severe impacts to the healthcare system and the local economy. This led to a disaster declaration. [60]

For a full list of historical disaster declarations in Snohomish County, see Appendix E.

10.6 Probability of Future Events

While it is impossible to predict the timing or nature of the next outbreak, they are not uncommon and can have lasting devastating impacts on communities. Advancements in medicine over the past century have enhanced our ability to combat diseases. At the same

[59] Washington State Department of Health. Accessed July 2025. “Measles.”
[60] Washington State Department of Health. Accessed June 2025. "Respiratory Illness Data Dashboard."

time, several factors, including rapid population growth in our city centers, increasing number of individuals without adequate healthcare, the evolution of antibiotic-resistant bacteria, globalization, and societal upheaval, contribute to the rapid spread and increased severity of outbreaks.

Emerging variants of COVID-19, novel strains of influenza, and severe acute respiratory syndrome (SARS) all pose risks with the potential to trigger outbreaks. These diseases and variants can also have limited or no medical countermeasures (therapeutic treatment or vaccine), posing as a high risk/low frequency event that have the potential to broadly impact health and medical capacity as well as disrupt critical resources and support infrastructure.

With extensive global travel networks and increasing urbanization, novel pathogens can quickly spread far beyond their origins. This rapid transmission poses a particular threat to vulnerable populations as well as individuals on the front lines of exposure, especially those with fewer resources.

10.7 Climate Change Considerations

Climate change and globalization have significantly heightened the reach of invasive species, pathogens, and diseases affecting people, agriculture, and the environment. Ecological concerns include the introduction of diseases and parasites to wild species, competition between wild and farm-raised species, threats from invasive species, and the negative effects of pollution and fish farming on shellfish beds, among others. These climate-driven changes in ecosystems further exacerbate the risk of emerging infectious diseases by altering the interactions between humans, pathogens, and animals. [61]

10.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Disease Outbreak are summarized in Table 26.

Table 26: Disease Outbreak Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	High	All residents and visitors in the county could be susceptible to the effects and exposed to

[61] KC Ernest, et al. U.S. Global Change Research Program. 2023. "Fifth National Climate Assessment (NCA5)."

		infectious disease. A large outbreak or epidemic could have devastating effects on the population.
First Responders	Moderate	Emergency services would be severely impacted during a serious outbreak because they are likely to be exposed early due to public contact. As responders become sick, response times and capabilities would be severely limited.
Continuity of Operations	Moderate	Many government operations may reduce normal operations during the most severe outbreaks. Agencies may have to adopt work from home policies and take other steps to protect employees. Due to employee illness, many non-essential functions may have to be curtailed.
Facilities and Infrastructure	Low	Health care facilities may reach capacity and become inundated with people. Early identification of shelters, alternate treatment facilities, isolation capacity, and methods to expand resources can help health care facilities and governments cope with an epidemic. However, epidemics and diseases would not have significant measurable impact on the critical facilities or infrastructure of the county.
Economy	Moderate	The economy may come to a virtual standstill for weeks on end during severe outbreaks as people avoid public places. Many small businesses may lose too much revenue and be forced to close. During an outbreak of infectious disease in livestock, large-scale depopulation of livestock may be necessary to curb further spread of the pathogen and prevent associated welfare problems arising. This puts large financial constraints on farmers.
Environment	Low	Disease outbreak would not have a significant measurable impact on the environment in the county.
Public Confidence	High	A disease outbreak can have devastating impacts to public confidence from the distribution of misinformation, disinformation, and malinformation.
Vulnerable Populations	High	Those with compromised immune systems, children, individuals that are socioeconomic or health disadvantaged, and individuals with access

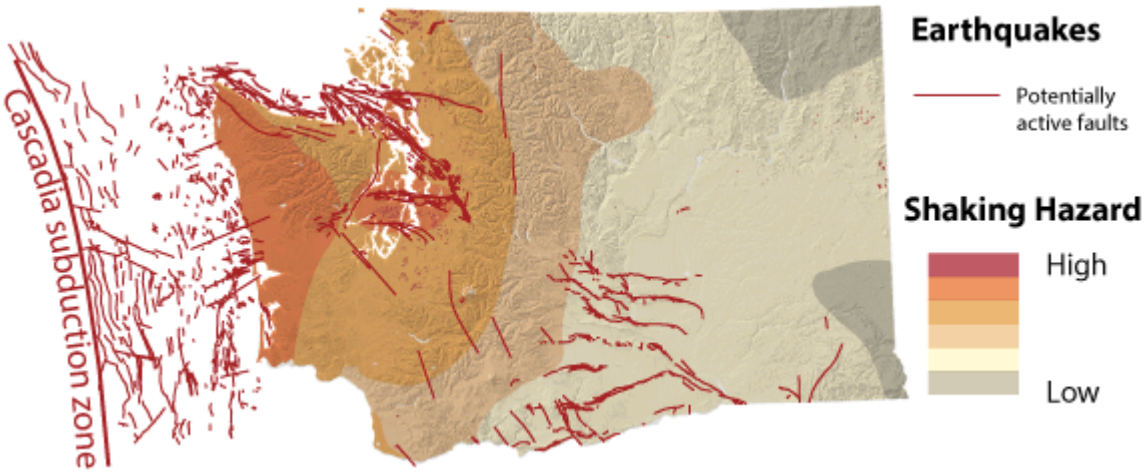
		and functional needs are considered some of the most vulnerable to diseases.
Property	Low	Property is not vulnerable to an infectious disease outbreak.

Chapter 11 Earthquake & Tsunami

11.1 Hazard Description

An earthquake is the ground shaking and seismic energy from sudden stress changes in the earth due to the slip of a fault or volcanic activity. Earthquakes can last from a few seconds to over five minutes; they may also occur as a series of tremors over a period of several days. While most seismic hazards occur or are projected to occur on well-known active faults, determining if a fault is active or potentially active depends on geologic evidence that may not be available. Although there may be some unrecognized active faults, known active faults represent the highest hazard. Earthquakes are more likely to occur on a fault if they have more rapid rates of movement, have had recent earthquakes, experience greater total displacements, or are aligned so that movement relieves accumulating tectonic stresses.

Figure 10: Earthquake Faults in Western Washington



Source: Washington State Department of Natural Resources

The Puget Sound region is seismically active, with hundreds of earthquakes occurring each year. Most are so small that only sensitive instruments can detect them. While many of these events register a magnitude of 3 or lower on the Richter scale, earthquakes measuring up to 7.1 magnitude have been recorded. Recent studies suggest that earthquakes of a magnitude 8 or greater have occurred in the region and that similar seismic events are possible in the future. [62]

[62] Washington State Department of Natural Resources (DNR). Accessed July 2025. "Earthquakes and Faults."

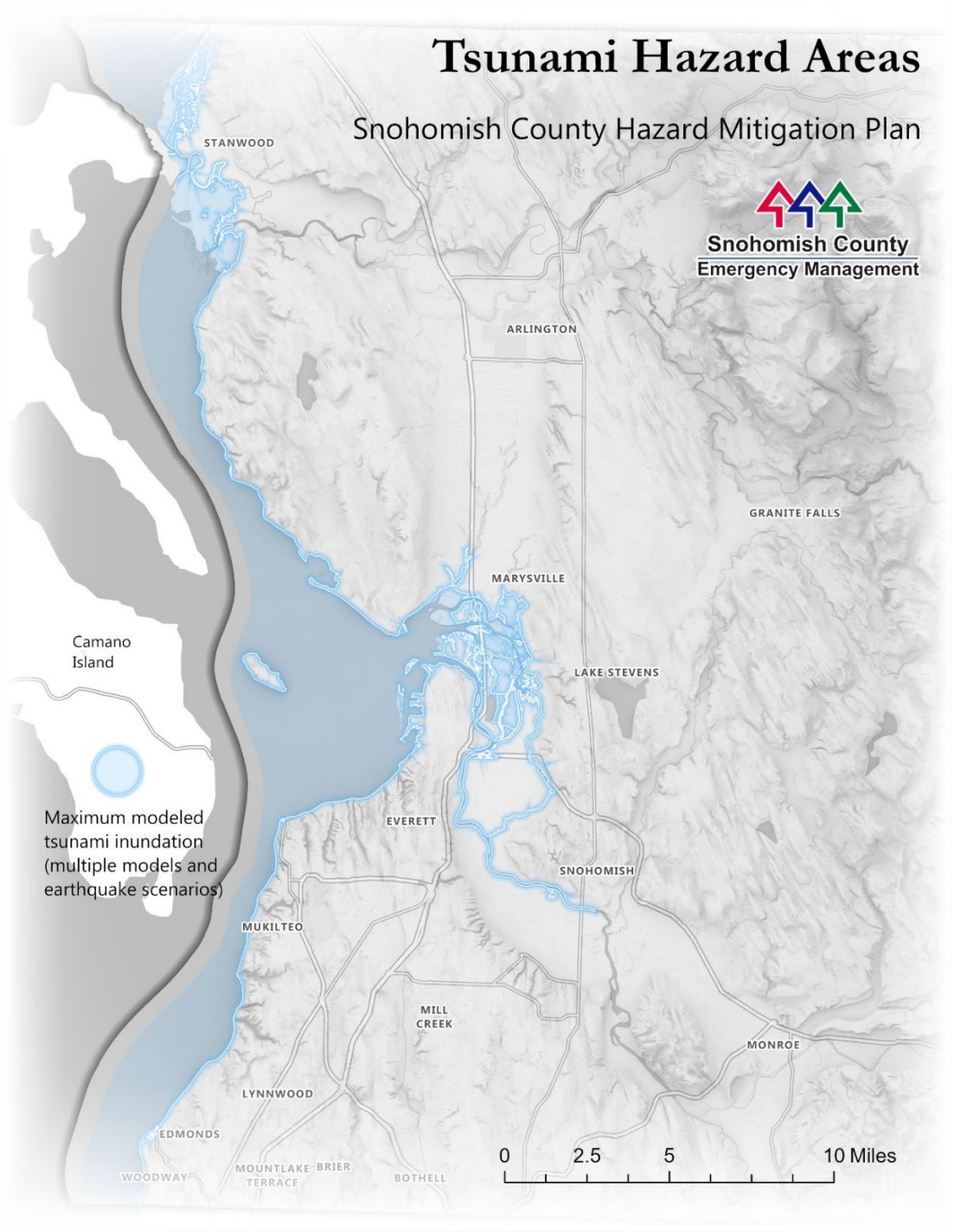
Table 27: Earthquake Secondary Hazards

Secondary Hazards	Description
Dam failure	Earthquakes can cause significant shaking that may compromise the structural integrity of dams. If a dam is already weakened by age, poor maintenance, or underlying geological issues, the seismic forces can cause cracks, ruptures, or even complete failure of the dam structure. This would result in the flooding of inundation zones.
Ground shaking	The most immediate and widespread consequence of an earthquake. Ground shaking can also happen from foreshocks or aftershocks that can persist for days to even decades, worsening damage and injuries. While the shaking itself rarely causes fatalities, the resulting destruction, such as collapsing buildings and falling debris, is a major contributor to casualties.
Hazardous material release	Earthquakes can trigger hazmat releases from a pipeline rupture, underground fuel storage tank failure, oil train derailment, or damage to port facilities.
Liquefaction	Soft, water-saturated soils lose their strength during an earthquake and behave like a liquid. This phenomenon can severely damage buildings and infrastructure that rely on solid ground for support, particularly in areas with loose sedimentary soils.
Mass Earth Movement	Earthquakes can cause large and sometimes disastrous landslides and mudslides. Soil liquefaction occurs when water-saturated sands, silts, or gravelly soils are shaken so violently that the individual grains lose contact with one another and "float" freely in the water, turning the ground into a pudding-like liquid. [63] Depending on where the landslide occurs, this event can lead to additional cascading effects. For instance, in 1820 a landslide occurred from Camano Head that generated a tsunami.
Tsunami	Previous editions of this plan included tsunami as a stand-alone hazard due to its destructive potential in the coastal portions of the county. Snohomish County's coastal geography, particularly in relation to Whidbey Island, mean that the county is protected from the worst impacts of distant source tsunamis, and that the most severe tsunami threat comes from local or near local earthquakes. For this reason, tsunamis are included as a secondary effect of earthquake in this version of the plan and discussed at length within this chapter.

[63] Oregon State University. 2013. "Earthquake Hazard Maps & Liquefaction."

Tsunami

Map 3: Tsunami Hazard Areas



Tsunamis are waves caused by earthquakes, volcanic eruptions, or landslides under the sea. As waves travel inland, they build to higher heights as the depth of the ocean decreases. Waves can reach heights of over 100 feet and can travel at speeds over 500

miles per hour, the equivalent speed of a commercial jet plane. Tsunamis are among the most infrequent of Earth's natural hazards. Each year, there are approximately two tsunamis that cause damage near their source. Tsunamis that cause damage or deaths on distant shores (more than 1,000 kilometers, 620 miles, away) occur about twice per decade. [64]The time before a tsunami reaches the coast can vary from minutes to hours; individuals near the coast should seek higher ground immediately. Natural warning signs for tsunamis include severe ground shaking from local earthquakes, water receding from the coast and exposing the ocean floor and abnormal ocean activity creating a loud roaring sound similar to that of a train or jet aircraft. A tsunami's height and impacts are influenced by local bathymetry and topography and the direction from which the tsunami arrives. [65]

11.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Earthquake & Tsunami are summarized in Table 28.

Table 28: Earthquake & Tsunami Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	4	4	4	2.91	Very High	1

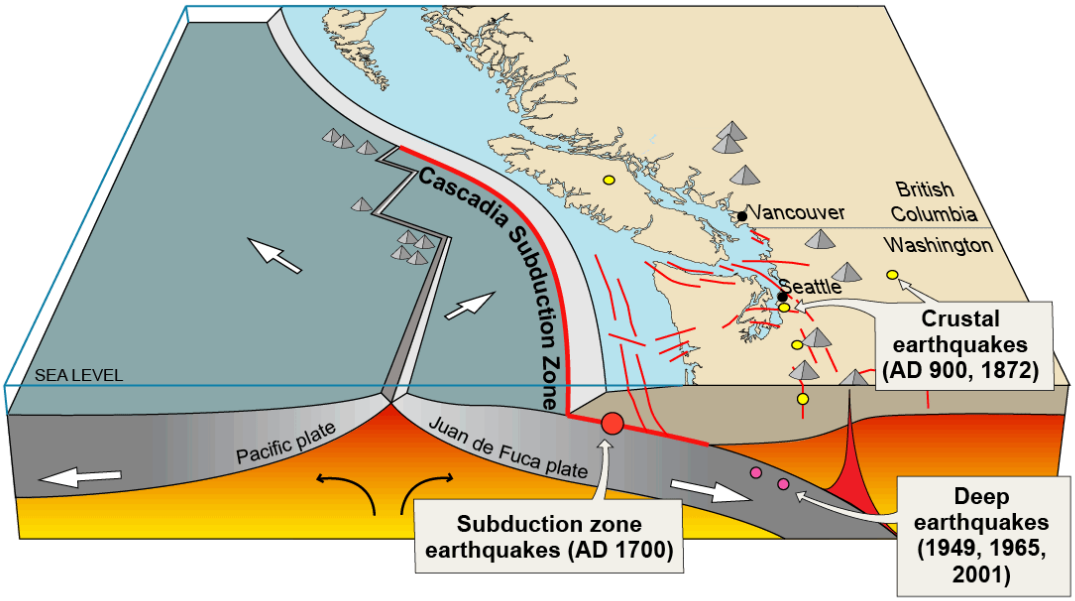
Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event will be long and will last between seven to 30 days.
- There will be minimal to no warning for the onset of the event.
- The magnitude of the event is catastrophic, likely to impact the full region.
- The overall impact to the full county will be high.
- Earthquake and Tsunami have a very high overall risk.

[64] National Oceanic and Atmospheric Administration (NOAA). Accessed July 2025. "About Tsunamis."
[65] National Oceanic and Atmospheric Administration (NOAA). Accessed July 2025. "Tsunami Frequently Asked Questions."

11.3 Location

Figure 11: Earthquake Types in Washington



Source	Max. Size	Recurrence
Subduction zone	M 9+	200–600 years
Deep Juan de Fuca plate	M 7+	30–50 years
Crustal faults	M 7+	Hundreds of years?

Volcano

Active crustal fault

Active plate boundary fault

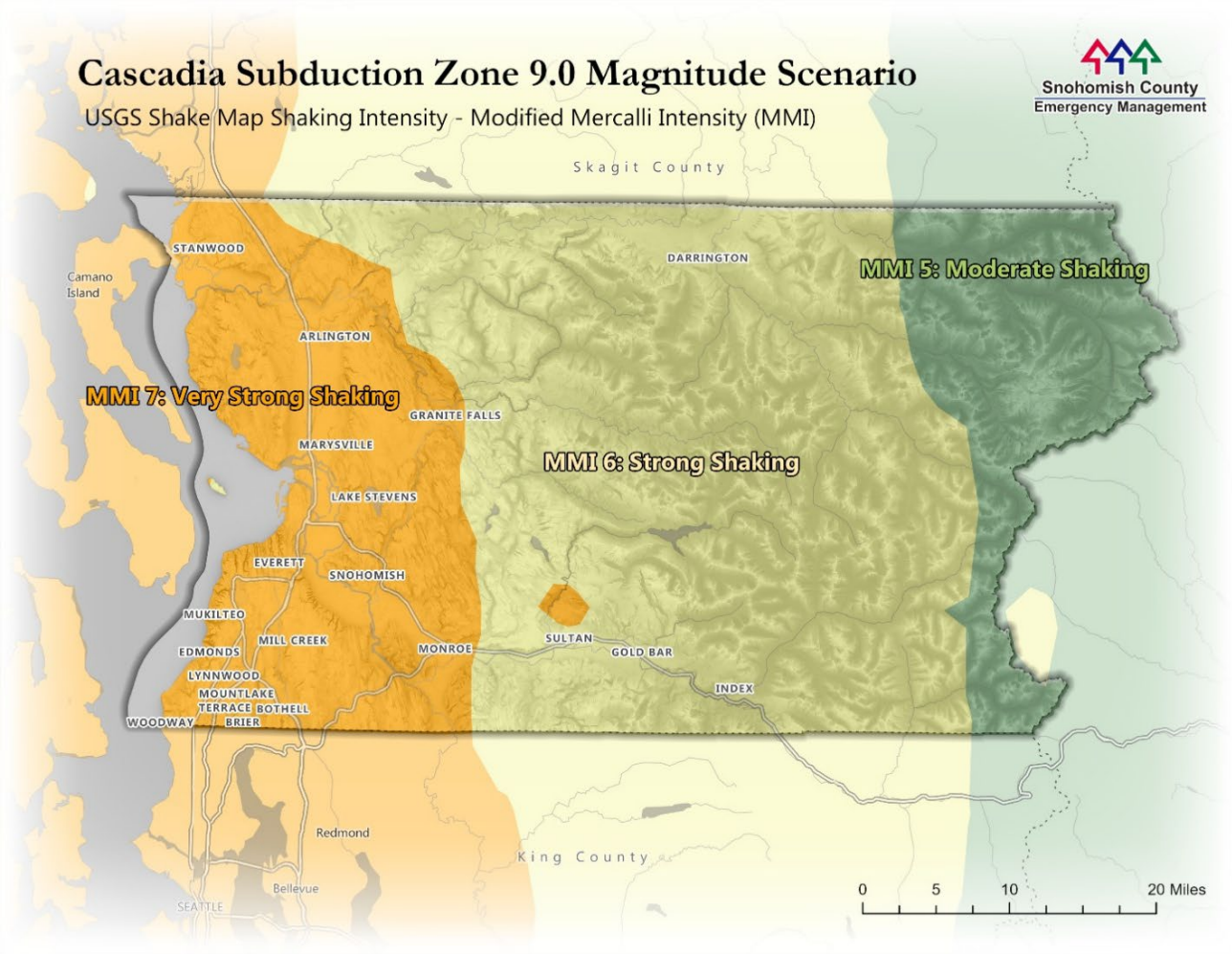
*figure modified from USGS Cascadia earthquake graphics at http://geomaps.wr.usgs.gov/pacnw/pacnweq/index.html

There are several major faults in the Puget Sound region. Geologists generally agree that three source zones exist for Puget Sound quakes: a shallow (crustal) zone; the Cascadia Subduction Zone (CSZ); and a deep, intra-plate Benioff Zone. [66] More than 90 percent of Pacific Northwest earthquakes occur along the boundary between the Juan de Fuca plate and the North American plate.

[66] Pacific Northwest Seismic Network (PNSN). 2019. "PNW Earthquake Sources Overview."

Cascadia Subduction Zone

Map 4: Cascadia Subduction Zone 9.0 Magnitude Scenario



The Cascadia Subduction Zone (CSZ) is a 700-mile subduction zone that generally runs north/south off of the North American West Coast from Cape Mendocino, CA to Brooks Peninsula, B.C., where the Juan de Fuca and Gorda oceanic plates converge with the North America continental plate at an approximate 20-mile depth. A rupture of this fault could create a significant seismic event, historically between 8.0 - 9.0 magnitude on the seismic scale. The last rupture of the CSZ occurred in the year 1700 and was estimated by geologists to have been between a magnitude 8.7 and 9.0 in scale, along 620 miles of the fault line. The average upward thrust of that event was 66 feet, which created a major seismic disturbance across the region, including tsunamis linked to the event on the Washington coast and in Japan.

The entire fault could rupture as one large event, or rupture section by section over a period of years. Coastline displacement of up to 6.6 feet in elevation could occur, possibly

triggering tsunamis in multiple locations along the Pacific Ocean coastlines. Additional damage could occur based on the shaking intensity, especially in areas with soils prone to liquefaction or landslides. [67]

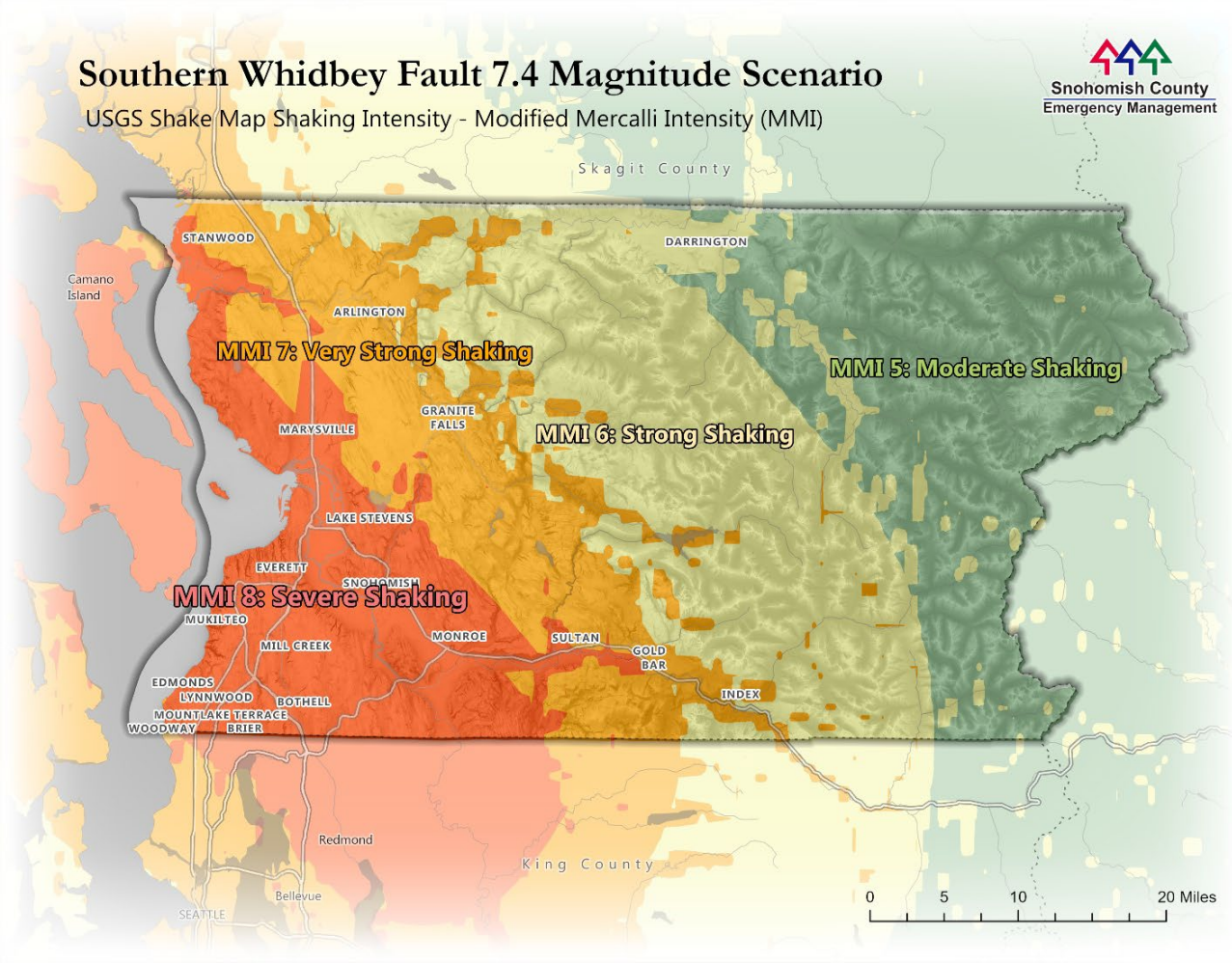
Intense shaking at this magnitude is expected to cause major infrastructure damage to buildings, highways, railways, and bridges, which could create “Population Islands" where mobility outside of the immediate area may be significantly limited, or impossible, delaying or inhibiting a return trip for many people to their homes and reunification with loved ones. It is projected that Snohomish County could fracture into almost 60 different islands.[68]

The Juan De Fuca plate moves northeast with respect to the North American plate at a rate of about an inch and a half per year. As it collides with the North American plate, the Juan De Fuca plate slides beneath the continent and sinks into the earth’s mantle. The sliding of one plate below another is called “subduction.”

Earthquakes at subduction zone boundaries produce the world’s greatest earthquakes. A subduction earthquake off the coast of Washington or Oregon where the plates converge would typically have a minute or more of strong shaking at magnitude 8 to 9.5 on the moment magnitude scale. The shaking from a CSZ earthquake would cause major impacts in Snohomish County, however a tsunami originating from that earthquake would only pose moderate risk.

[67] Washington State DNR. Accessed July 2025. “Earthquakes and Faults.”
[68] Snohomish County Emergency Management. 2023. “Megaquake Population Islands in Snohomish County.”

Map 5: Southern Whidbey Fault 7.4 Magnitude Scenario



Wadati-Benioff Zone (Deep Earthquakes)

Western Washington can experience deep earthquakes of magnitude 6.0 to 7.4. This is a type of subduction zone earthquake that occurs within the Juan de Fuca plate at depths of about 30 to 40 miles. As the Juan de Fuca plate moves beneath North America, it becomes denser than the surrounding mantle rocks and breaks apart, causing Wadati-Benioff zone earthquakes, also called Benioff zone or deep earthquakes Benioff zone earthquakes develop beneath volcanic island arcs and continental margins above active subduction zones. The largest Benioff zone earthquakes occur where the Juan de Fuca plate begins to bend even more steeply downward, forming a knee. Because of their depth, intra-plate

earthquakes are least likely to produce significant aftershocks. The 2001 Nisqually Earthquake occurred in the Benioff zone.[69]

Crustal Zone (Shallow Earthquakes)

The third source zone is the crust of the North American plate, which are known as shallow earthquakes. Shallow earthquakes with a magnitude of 7.0 or more can happen anywhere in the Puget Sound region, such as the Southern Whidbey Island fault, part of which runs under southwest Snohomish County. Such earthquakes have the potential to cause greater loss of life and property than any other kind of disaster but may occur no more than once every 1,000 years. The SWIF, first mapped by geologists in 1985, was assessed as capable of generating the largest crustal earthquake in Puget Sound. [70] Based on radiocarbon and stratigraphic data, researchers concluded that the SWIF can produce a magnitude 6.5 to 7.5 earthquake. [71] How many other crustal faults pose significant earthquake hazards to the Puget Sound region is not yet known.

Earthquakes along the Southern Whidbey Island fault (SWIF), or on the Seattle fault could produce tsunamis with the ability to reach shores in minutes, giving emergency management officials little time to warn and evacuate people. [72] The Tacoma fault also has the potential to produce tsunamis that impact Snohomish County. These would likely pose a lower risk than either CSZ or Seattle fault tsunamis but would also have an arrival time of tens of minutes.

11.4 Extent

Earthquake Magnitude

In earthquake science, there are two kinds of magnitude; the Earthquake Intensity Scale (or Modified Mercalli Intensity MMI) that is based on impacts to people, property, and operations and the Moment Magnitude Scale (MW) that measures amount of energy released when an earthquake happens.

- **Earthquake Intensity Scale:** Earthquake intensity, or ground shaking, is measured by the Modified Mercalli Scale. Its intensity depends on the original moment magnitude, the distance from where the earthquake started to where the impacts

[69] University of Washington. Nisqually Earthquake Clearinghouse Group. March 2001. "Preliminary Reconnaissance Report."
[70] Liberty, L. and Pape, K. Center for Geophysical Investigation of the Shallow Subsurface. 2006. "Seismic Characterization of the Seattle and Southern Whidbey Island Fault Zones in the Snoqualmie River Valley, Washington."
[71] WA Emergency Management Division. Understanding Earthquake Hazards in Washington state. 2012. "Modeling a Magnitude 7.4 Earthquake on the Southern Whidbey Island Fault Zone."
[72] WA State DNR. 2022. **"**Tsunami wave simulation for central Puget Sound, Wash."

are being assessed, and the soil type and material near the surface at the area being shaken. A shallowly sourced earthquake that has relatively small magnitude but is nearer to populated areas is potentially more damaging than a much larger magnitude earthquake that is farther away from populated areas. Even when an earthquake source is distant, unconsolidated soils, such as uncompacted sands, or gravels, found in many floodplains or river valleys, amplify shaking, leading to more potential damage.

- **Moment Magnitude Scale:** The Moment Magnitude Scale (M) measures the total amount of seismic energy (known as "moment" to engineers and seismologists) released by an earthquake. The moment magnitude scale is a type of logarithmic scale, where each increase of 1 means ~32 times more energy is released. An increase of 2 means that ~1,000 times more energy is released. For example, a M7 earthquake releases 32 times more energy than a M6 earthquake, and 1,000 times more than a M5 earthquake. The moment magnitude scale replaced the Richter scale as the USGS's primary earthquake magnitude metric in the late 1970s. [73]

Liquefaction Magnitude

The National Earthquake Hazard Reduction Program (NEHRP) identifies soil types that help predict locations that likely will be significantly impacted during an earthquake. NEHRP B and C soils typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP D, E, and F soils. In general areas with NEHRP D, E, and F soils are also susceptible to liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. If there is a dry soil crust, excess water will sometimes come to the surface through cracks in the confining layer, bringing liquefied sand with it, creating sand boils, colloquially called "sand volcanoes." Soil liquefaction maps are useful tools to assess potential damage from earthquakes.

Table 29: NEHRP Soil Classification System

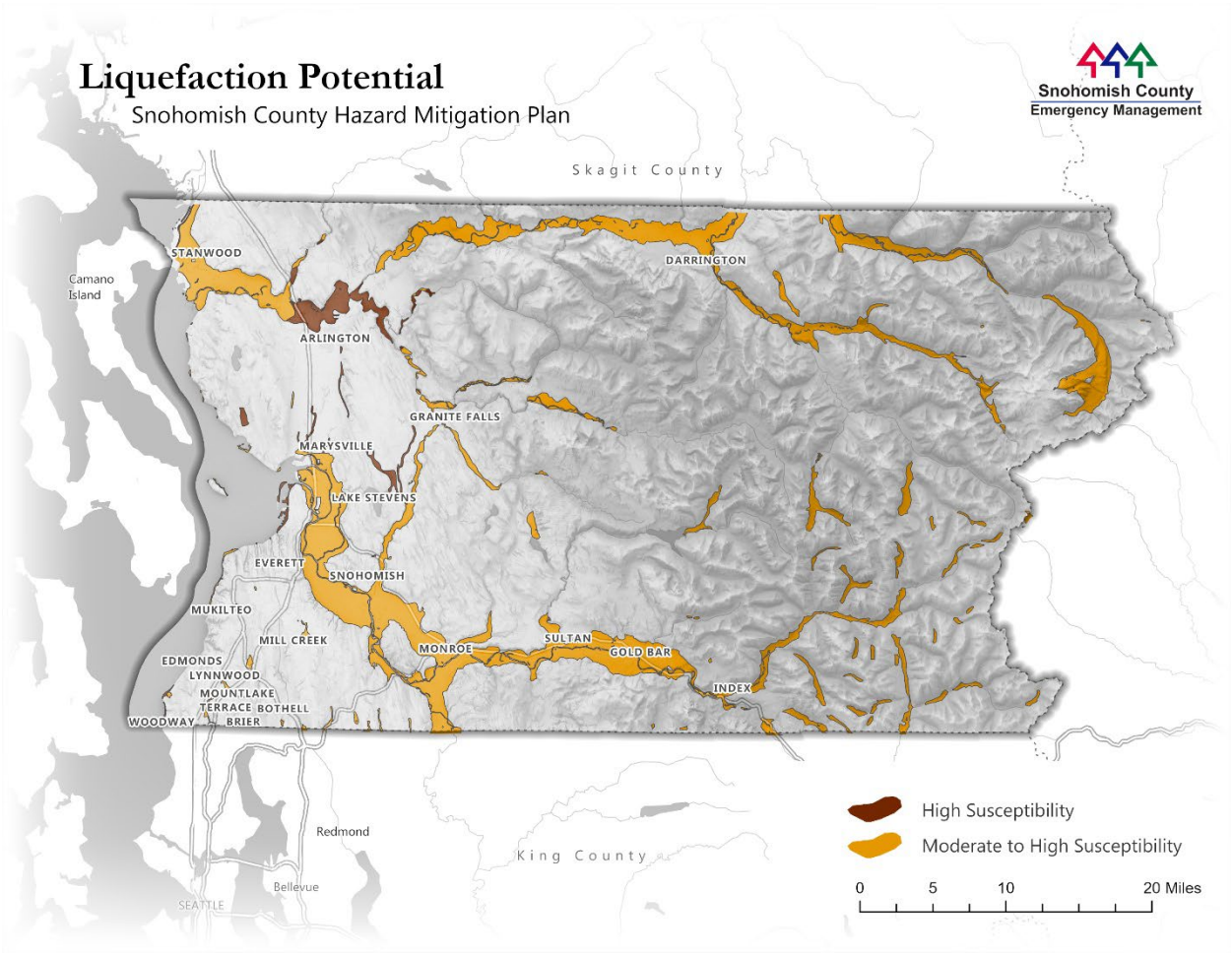
NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	<180

[73] Washington State DNR. Accessed July 2025. "Earthquakes and Faults."

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

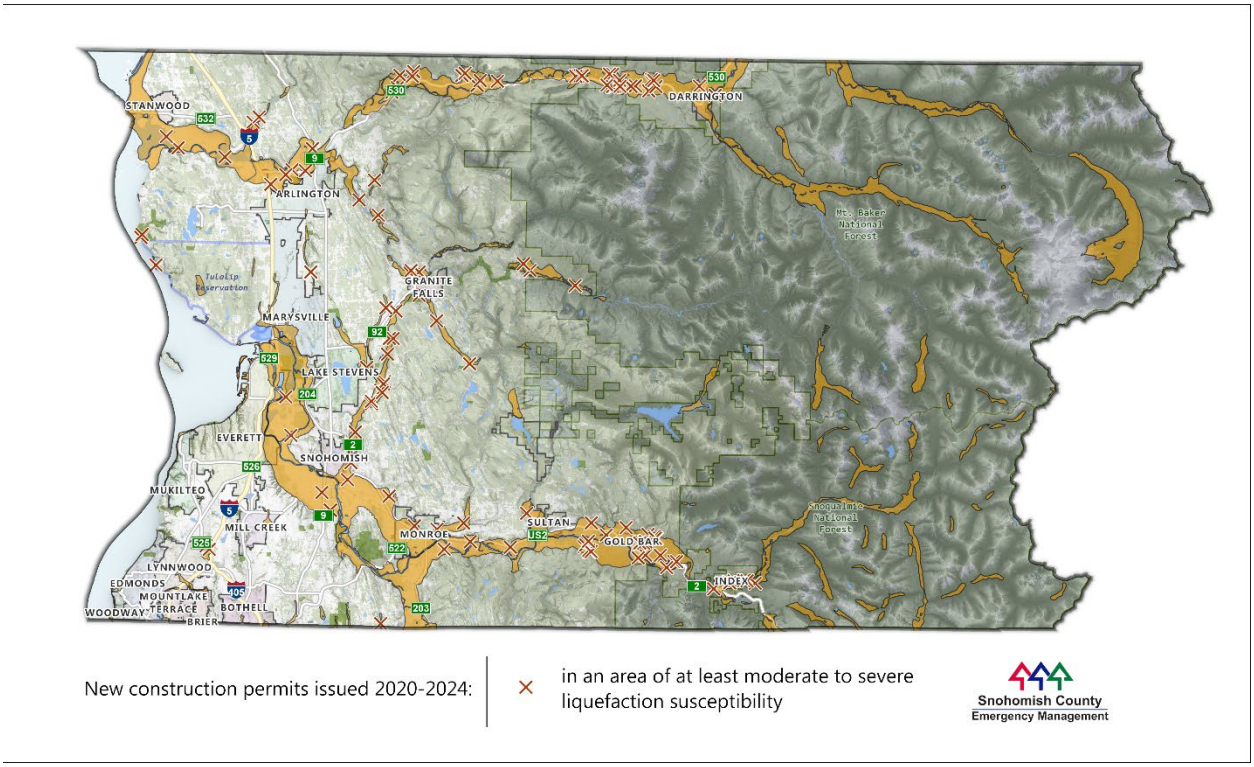
Map 6 shows the liquefaction potential in Snohomish Couty. Liquefaction susceptibility is determined by NEHRP site classes and based on other published geologic correlations and quantitative susceptibility analyses by the Washington State DNR.

Map 6: Liquefaction Potential



In the last five years the County has issued nearly 5,000 total building permits, including 162 issued on parcels with moderate to high liquefaction susceptibility. See Chapter 3 for more information on Land Use and Development. [74]

Map 7: Liquefaction Hazard – New construction permits issued 2020-2024



Tsunami Magnitude

Tsunamis that could impact Snohomish County vary significantly in strength, depending on their origin and the type of event triggering them. The speed of a tsunami depends on the depth of the water it is traveling through. The deeper the water, the faster the tsunami. In the deep ocean, tsunamis are barely noticeable, but they can move as fast as a jet plane, more than 500 mph. As they enter shallow water near land, they slow to approximately 20 or 30 mph, which is still faster than a person can run. [75]

Distant earthquakes, like in Alaska and elsewhere along the Pacific Rim, can create tsunamis that take hours to reach the region and often lose much of their destructive power by the time they reach the shallow waters of Puget Sound. For example, the 2025 magnitude 8.8 earthquake in Russia generated tsunami warnings for Snohomish County.

[74] County permitting data does not consistently track accurate permitted building locations within the parcel. Chapter 3 describes the process the County follows to minimize the exposure of new construction on parcels which overlap with known liquefaction zones.
[75] Washington State DNR. Accessed July 2025. "Tsunamis."

While these distant tsunamis pose little immediate threat, studies show that tsunami inundation from large distant earthquakes can still affect inland waters. In contrast, tsunamis generated by localized earthquakes, such as those occurring on faults located within and around the Puget Sound, would reach the county within minutes, causing more immediate danger. The CSZ is capable of producing significant tsunamis, with waves potentially reaching the region in tens of minutes. A tsunami generated by such an earthquake would bring faster and more intense wave energy, making it a higher-risk scenario. Similarly, landslides occurring within or near the Puget Sound region could also generate tsunamis, with these events typically causing waves to strike within minutes, depending on the location of the slide. The value and density of property along the waterfront suggests potential for moderate impacts from such an event.

11.5 Past Events

Although scientific recognition of the earthquake hazards is relatively recent, Native Americans have lived on the Cascadia coast for thousands of years, transferring knowledge from generation to generation through storytelling. [76] Combining these oral accounts from indigenous Native American and First Nation tribes living on the coast with modern day paleoseismology (the exploration of evidence of ancient quakes from rocks), determined that the last known Cascadian Subduction Zone megathrust earthquake (estimated magnitude 9.0) in the region was in January of 1700. [77]. In 1820, a large landslide from Camano Head created a tsunami that hit Hat Island, drowning an indigenous village. [78]

Since 1870, at least 20 damaging earthquakes have occurred in western Washington, with at least seven deep earthquakes having an estimated magnitude of 6.0 or larger. The epicenters of all these events have occurred between Olympia and just north of Tacoma, within about 50 miles of each other. [79]

Between January 2000 and July 2024, Snohomish County experienced 20 earthquakes of a 3.0 magnitude or greater, with the strongest having a 4.6 magnitude. [80] Only two earthquakes, in 1965 and 2001, have resulted in a disaster declaration for Snohomish County.

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[76] Ludwin et al. Seismological Research Letters. 2005. "Dating the 1700 Cascadia Earthquake: Great Coastal Earthquakes in Native Stories."
[77] Penn State University. Not Dated. "The 1700 Cascadia Megathrust Earthquake and the Future of Cascadia Margin."
[78] Shipman, H. Washington State Department of Ecology. TsuInfo Alert. 2001. "The Fall of Camano Head."
[79] Washington State Military Department. Not Dated. "Significant Earthquakes Experienced in Washington Since 1872."
[80] Pacific Northwest Seismic Network (PNSN). Accessed July 2025. "PNSN Recent Events."

- On April 29, 1965, a 6.7 magnitude earthquake struck 12 miles north of Tacoma, killing 7 people and causing about $12.5 million in damage (in 1965 dollars). [81] Minor damage was widespread through Seattle to Everett in the north and to Olympia in the south and extended from a few miles east of Renton to almost as far west as the Hood Canal.
- On February 28, 2001, the Nisqually Earthquake, a 6.8 magnitude quake occurred with shaking that lasted from 30 seconds to greater than two minutes. About 400 people were injured and with property damage estimated as high as $4 billion dollars for the region.

For a full list of historical disaster declarations in Snohomish County, see Appendix E.

11.6 Probability of Future Events

The likelihood of future earthquakes in Snohomish County is inevitable, with a 100 percent certainty that one will occur eventually. However, predicting the magnitude and exact location is not possible. Earthquakes occur at unpredictable intervals, and there are few scientifically verified early warning signs to indicate when one might strike. The United States Geological Survey (USGS) estimated that a CSZ earthquake has a 10 to 15 percent probability of occurrence in 50 years. [82] It is estimated that earthquakes on the SWIF and Seattle fault have a 2 percent probability of occurrence in 50 years. A Benioff zone earthquake has an 85 percent probability of occurrence in 50 years, making it the most likely of the three types and a crustal zone earthquake has a recurrence interval of 500 to 600 years. [83]

There is not yet enough information on the Devil's Mountain fault-North Whidbey fault complex to determine the probability of occurrence of an event on this complex. [84]

Despite advanced analytical methods, earthquakes continue to defy reliable prediction. Research is being done with warning systems that use the low-energy waves that precede major earthquakes. These low-energy waves arrive at seismic detection stations before destructive energy waves, and the stations transmit data to the Pacific Northwest Seismic Network (PNSN). The PNSN can then issue an earthquake early warning (EEW), warning persons in the area of approaching strong tremors. These potential warning systems give approximately 40 seconds notice that a major earthquake is about to occur. The warning

[81] US Geological Survey. Accessed July 2025. "M 6.7 - 3 km ESE of Browns Point, Washington."
[82] Goldfinger, C. et al. U.S. Geological Survey Professional Paper 1661–F. 2012. "Turbidite event history."
[83] The Geological Society of America. 2017. "Is the coast toast? Exploring Cascadia earthquake probabilities."
[84] Washington State DNR. Accessed July 2025. "Earthquakes and Faults."

time is short, but it could allow someone to get under a desk, step away from a hazardous material, or shut down a computer system.

11.7 Climate Change Considerations

The impacts of global climate change on earthquake probability are unknown; however, the secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could fail during seismic activity due to the increased saturation. Steep slope failure may increase where changes in river hydrology or sea-level weakens slope stability. Dams storing increased volumes of water due to increased river levels could fail during seismic events. There are currently no models available to estimate these impacts.

11.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Earthquake & Tsunami are summarized in Table 30.

Table 30: Earthquake & Tsunami Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	High	The entire population of Snohomish County is potentially exposed to earthquakes. Cities are more at risk than rural areas due to higher density. The county's towns are also more vulnerable because they are typically located in small valleys alongside streams, which typically have softer soils. Population islands are areas that will possibly become isolated after an earthquake. After a large earthquake, hazards such as liquefaction, fallen bridges, roadway debris, and abandoned vehicles may cause barriers to travel that may make it impossible to cross the boundaries of these islands by road. See Map 8. Impacts to the population are not restricted to displacement and sheltering. People may be injured or lose their jobs. Schools may be closed. Government services may be interrupted. Health facilities and care may also be interrupted or completely unavailable. Family members may be

		separated, including children, necessitating reunification efforts. Elderly in care facilities, may be moved to alternate facilities – and unaccounted for. Deaths of unclaimed and unidentified people may require burial before family can claim their remains. According to the Hazus analysis, the highest estimated displacement potential to residents in Snohomish County is from a 7.4 magnitude quake on the SWIF that is estimated to affect 21,777 households with over 10,000 residents requiring short-term shelter. [85] While the Hazus analysis for a 9.0 CSZ earthquake shows that fewer residents of Snohomish County will be displaced or will seek temporary shelter, there is a high likelihood that residents from areas with greater impact will be displaced and evacuate to Snohomish County to seek temporary shelter. [86]
First Responders	High	First responders experience personal and professional impacts from an earthquake. Since responders are also local residents, they will be personally impacted by the disaster. Professionally, emergency services will be called upon to help with life safety operations while also seeking to restore day-today services.
Continuity of Operations	High	Any damaging earthquake has the potential to impact delivery of essential government services in the days, weeks, months, and even years following the earthquake. The damages to infrastructure and residential or business locations may curtail or even prevent government employees from reaching their work locations or may prevent services from reaching populations in need scattered around the county. See Map 8 to view the projected population islands that will occur after a CSZ earthquake.
Facilities and Infrastructure	High	Health system impacts from a major disaster include disruptions to emergency services,

[85] See Appendix E to view the full Snohomish County 7.4 magnitude SWIF Hazus Summary Report
[86] See Appendix E to view the full Snohomish County 9.0 magnitude CSZ Hazus Summary Report

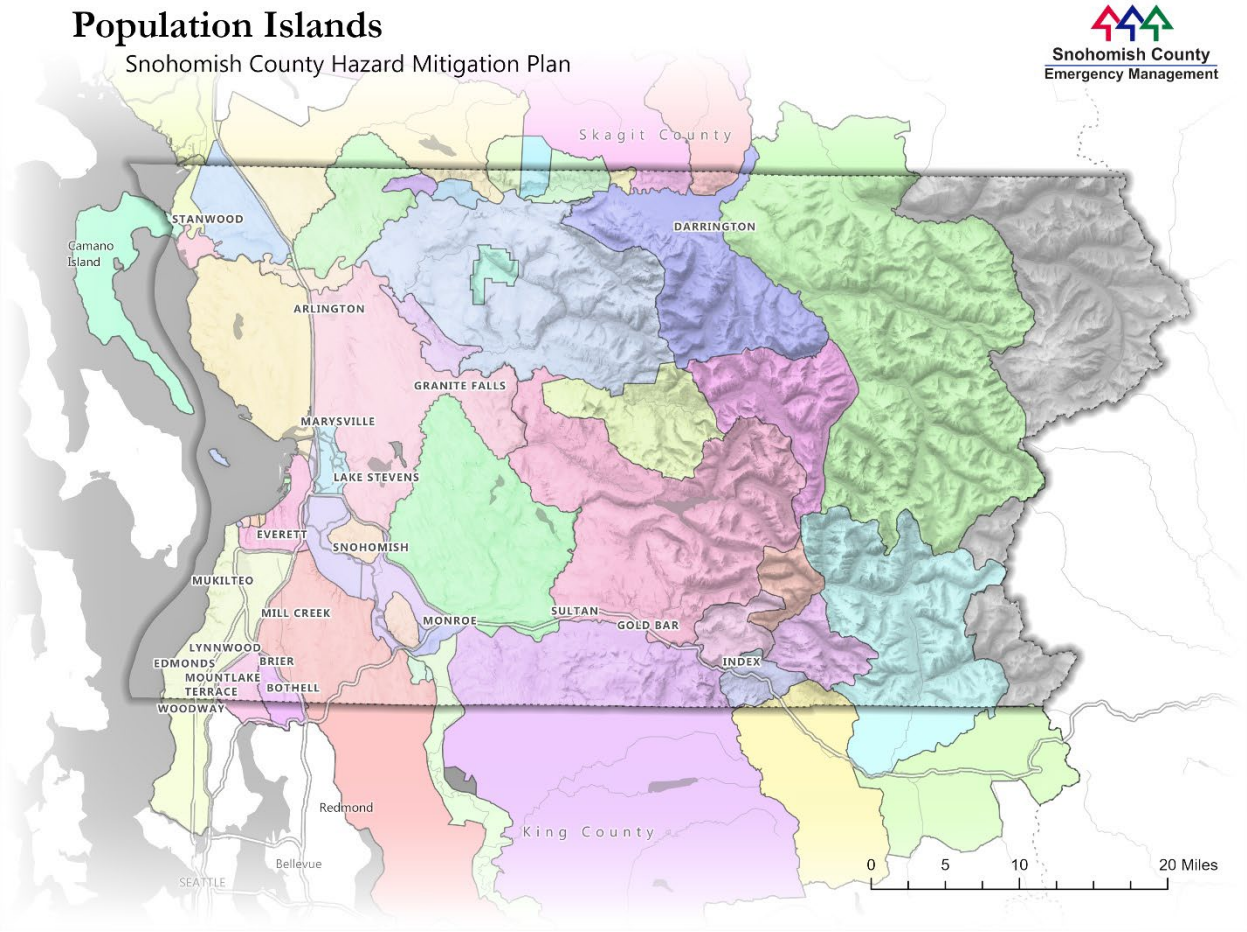
		community health clinics, pharmacies, and hospitals. To function, hospitals require significant infrastructure inputs, including power and water that are likely to be disrupted after an earthquake. Backup services are available; however, they may be insufficient to meet the need if infrastructure recovery takes too long. While the state and the county have been completing seismic retrofits on bridges in Snohomish County, impacts to bridges and other transportation infrastructure can result in population islanding. See Map 8. In the event of a catastrophic earthquake, the energy infrastructure could be impacted for months surpassing the generators capacity. While the public sector maintains critical radio communications networks, the cellular networks on which most residents depend is privately owned. While cell towers are equipped with backup generators, these generators may only have enough fuel for a few days of continuous operation.
Economy	High	The immediate impacts to the economy include the destruction of facilities and inventory, as well as the loss of employees and customers. A total loss of critical lifeline infrastructure, such as port facilities, communication hubs, and major highway corridors, could be devastating, particularly if these links are not restored.
Environment	Moderate	The greatest potential for environmental damage is from hazardous materials releases as fuel and waste pipelines rupture and underground fuel storage tanks fail. Trains, including oil trains, may derail. Port facilities may be damaged by any tsunami or seiche. Other chemicals, including household items, likely will be spilled. There will also be a significant amount of debris generated from the damage. Competing demands for first responder attention may also lead to delays in hazardous material response, increasing the long-term environmental impact.

Public Confidence	High	Disasters of the magnitude we can expect from a damaging earthquake have the potential to lower public confidence in the government's ability to maintain law and order, provide essential services, repair or replace needed infrastructure for employment, process building permits and inspections, clear debris, and other needs. There will be significant challenges with long-term sheltering of displaced people and restoration efforts may take longer than the public is willing to accept. Severe damage to roads and bridges will limit travel and access to services. Amendments to zoning and building standards may not be embraced by those seeking to rebuild.
Vulnerable Populations	High	Vulnerable populations are more likely to suffer losses during an earthquake and are likely to take longer to recover after. Factors influencing likelihood of damage include living in higher hazard areas, living in older buildings, being less likely to have emergency supplies, and having a higher rate of persons with disabilities. **Linguistically Isolated Populations:** They are particularly vulnerable during earthquake events because of communication issues with the predominantly English-speaking media and government. A difficulty arises when there is an urgent need to inform non-English speaking residents of an earthquake event or response. Special care will need to be taken to ensure that non-English speakers have access to relief supplies from established points of distribution. **Population below poverty level:** Persons below the poverty level are more vulnerable because they may not have the financial ability to secure or improve their homes to prevent or mitigate earthquake damage or have extra supplies on hand such as flashlights, batteries, non-perishable foods and extra water supply. Additionally, they are also less likely to have insurance to compensate for losses in earthquakes. According to the Office of the Insurance Commissioner, which conducted a major earthquake insurance study in 2017,

		residential earthquake coverage in western Washington is 13.8 percent. Commercial coverage rates are much higher than residential, with 43.2 percent of insurance policies having some earthquake coverage. The uninsured have the most to lose during an event and are the least prepared to deal with losses. **Population without the means to care for themselves over multiple weeks, especially those with Access and Functional Needs:** The response and initial recovery following a catastrophic earthquake will take weeks. This population group is more vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. This population will also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations. Homebound populations, those requiring medications, the chronically ill, or others with access and functional needs may need to sustain themselves for an estimated two weeks in some places.
Property	High	The highest estimated damage potential to structures in Snohomish County is from a 7.4 magnitude quake on the SWIF is $20.67 billion. Many communities in Snohomish County have buildings that were built during the beginning of the twentieth century and were not subject to the building codes implemented over the last 30 years, which require that structures be able to better withstand earthquakes. The Nisqually Earthquake of 2001 caused extensive damage to such structures. Buildings constructed from unreinforced masonry buildings or non-ductile concrete, as well those with soft stories, irregular shapes, or poorly attached to their foundations are particularly vulnerable during an earthquake. Washington Emergency Management Division conducted a Hazus loss estimate for a CSZ earthquake and tsunami scenario. In this scenario the building loss estimate ranged from $56-$88

		million in Snohomish County with an estimated 125-211 buildings. [87]

Map 8: Population Islands



[87] WA Emergency Management Division. 2025. "CSZ Tsunami Loss Estimate Snohomish County."

Chapter 12 Extreme Heat & Drought

12.1 Hazard Description

There are several ways to define extreme heat, and generally relative measures are more useful for both environmental and human health purposes. It is frequently based on how unusually hot and humid it is for a specific area. While summertime temperatures of 100-degree Fahrenheit might be normal for Phoenix, Arizona, they would be considered extreme for Everett, Washington. As average temperatures rise due to climate change, the risk of extreme temperatures, heat waves, and record-breaking temperatures increases. [88]

The heating and cooling of the Earth is a natural process that has been occurring for billions of years. [89] As the earth heats and cools, the species on it have adapted and evolved or gone extinct. Impacts to species can be significant if the pace of the heating or cooling occurs at a faster rate than the ability of the species to adapt and evolve. This has contributed to previous mass extinctions including the Cambrian-Ordovician and Triassic-Jurassic extinctions.

Humans began burning large amounts of fossil fuels during the Industrial Revolution in the mid-18thcentury with the invention of the steam engine and have continued to increase the rate of fossil fuel emissions over the last 250 years. [90] This has caused an increase of the natural warming process of the earth to a rate where some delicate and vulnerable species are going extinct. Others cannot keep the pace of adaptation with the increase in CO2 levels and overall temperatures.

Even hardier species are showing strain from the rapidly changing climate. Forests across the Pacific Northwest showed signs of stress after the June 2021 Heat Dome, and heat waves can be particularly deadly to vulnerable humans. [91] Nationally, extreme heat is responsible for the highest number of annual deaths among all weather-related hazards. [92]

12.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of

[88] US Environmental Protection Agency. Accessed August 2025. "Extreme Heat."
[89] Herring, D. and Lindsey, R. NOAA Climate. 2020. "Hasn't Earth warmed and cooled naturally throughout history?."
[90] MIT Climate Portal Writing Team. MIT Climate Portal. 2024. "Is today's climate change similar to the natural warming between ice ages?."
[91] Heeter, K et al. NPJ Climate and Atmospheric Science. 2023. "Unprecedented 21st century heat across the Pacific Northwest of North America."
[92] U.S. Department of Homeland Security. Ready.gov. Accessed August 2025. "Heat."

the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Extreme Heat & Drought are summarized in Table 31.

Table 31: Extreme Heat & Drought Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	3	1	3	1.70	Low	12

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event is medium and will last between one to seven days.
- There will be more than 24 hours warning for the onset of the event.
- Magnitude of the event is critical, likely impacting the full county.
- The overall impact to the full county will be low.
- Extreme Heat & Drought has a low overall risk.

12.3 Location

Snohomish County's geographic location, bordered by Puget Sound with the Pacific Ocean farther to the west and the Cascade Range to the east, plays a key role in shaping its climate. Daytime and nighttime surface air temperatures are generally mild throughout the year in the Pacific Northwest.

All Snohomish County communities are affected by extreme heat events. These events will worsen in Snohomish County as climate change continues. By mid-century the county is projected to experience between eight to 20 more days of extreme heat each year, which means increased calls for emergency services, hospital visits, and increased energy usage. [93] Most homes in western Washington lack air conditioning and the population is not accustomed to hot summer temperatures. Temperatures can vary geographically, and more research is necessary to map areas that are most prone to heat island effects. [94]

[93] Snover, A.K., C.L. Raymond, H.A. Roop, H. Morgan. University of Washing Climate Impacts Group. 2019. "No Time to Waste."
[94] Phillips, J., Tinsley, C. Prepared by Parametrix and Berk Consulting for Snohomish County, 2023. "Snohomish County Climate Change Vulnerability and Risk Report."

12.4 Extent

Drought

The Washington State Department of Ecology approaches drought emergencies from the perspective of water supply, which can affect the entire county. This includes residents and businesses who depend on local water resources as well as farmers and landowners who use water resources for irrigation. A key factor contributing to drought in this region is the reduced snowpack in the Cascades. The snowpack acts as a critical source of runoff that feeds watersheds and replenishes reservoirs. While there is a slight projected increase in winter precipitation, the main driver of declining snowpack is that more of this precipitation is falling as rain rather than snow due to rising temperatures. This shift, combined with hotter, drier summers, reduces the amount of snowmelt available in spring and summer, ultimately exacerbating drought risk.

A drought declaration from the State serves as a statement on water supply. State law has two conditions that guide a drought declaration: (1) water supply below 75% of normal (average of the last 30-year period), statewide or in specific geographic areas, and (2) the water shortage will likely create undue hardship for water users or the environment. In the water supply and drought context, "normal" refers to average water supply from the 1991-2020 period, for this day in history. This baseline is adjusted every decade.[95]

Extreme Heat

Extreme heat is the number one cause of weather-related fatalities nationally. Current annual losses in Washington state due to heat-related illness and heat-associated traumatic injury, death, and productivity losses are calculated to be between $111 million to $153 million annually. [96] A major factor that contributes to heat-related impacts is the lack of efficient cooling systems in many homes and businesses.

The National Weather Service (NWS) developed a heat service framework called HeatRisk to more clearly communicate the potential for heat-related impacts during extreme heat events. [97] The "Red" category shows temperatures that could affect local residents without effective cooling and/or adequate hydration and would likely impact some health systems and infrastructure. [98] The threshold temperatures for "Red" Heat Risk vary by

[95] WA State Department of Ecology. Accessed April 2026. "Drought Response."
[96] Vogel, J et al. University of Washington Climate Impacts Group. 2023. "In the Hot Seat: Saving Lives From Extreme Heat in Washington state."
[97] NOAA National Weather Service. Accessed August 2025. "NWS HeatRisk."
[98] National Weather Service and Center for Disease Control. 2024. "NWS-CDC Joint Webinar on Experimental NWS HeatRisk."

location and are generally above the 95th percentile. Additionally, the increase of warmer overnight low temperatures impedes the body's ability to adequately cool itself after a daytime period of extreme heat.

Figure 12: National Weather Service HeatRisk Scale

NWS HeatRisk

Category	Risk of Heat-Related Impacts
Green 0	Little to no risk from expected heat.
Yellow 1	Minor - This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
Orange 2	Moderate - This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration. Impacts possible in some health systems and in heat-sensitive industries.
Red 3	Major - This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries and infrastructure.
Magenta 4	Extreme - This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.

Source: National Weather Service

12.5 Past Events

On Earth, the 10 warmest years since 1850 have all occurred since 2013. [99] In 2023, the average annual temperature for the contiguous U.S. was 54.4°F, 2.4°F above the 20th-century average, which made 2023 the fifth warmest year in the 129-year record for the country as a whole. [100] In Washington, the extreme heat event in 2021 caused sections of Interstate-5 and State Route 162 to buckle, causing some lanes to be closed. As a part of that event, on June 29, 2021, the Town of Darrington reported a record temperature of 113 F. [101] During the summer of 2021, the record-breaking heat wave killed 156 people across Washington, with 15 heat related deaths in Snohomish County. [102]

Snohomish County has been included in eight drought declarations since 2001. [103]

- 2001 – Statewide declaration
- 2005 – Statewide declaration
- 2015 – Statewide declaration
- 2019 – 27 Watersheds
- 2021 – Statewide declaration
- 2022 – Extension of 2021 statewide declaration
- 2023 – 12 watersheds/12 counties in the emergency drought declaration with a statewide advisory
- 2024 - Statewide declaration
- 2025 – 19 watersheds/12 counties in the emergency drought declaration

In 2023, the Washington State Department of Ecology declared drought conditions and water restrictions in portions of Snohomish County within the Skagit watershed. The full county has been included in a Drought Advisory in both 2024 and 2025 [104] The snowpack in the Cascade Mountains trended below the median in 2025, with the Central Puget Sound Region at only 50 percent to60 percent of the median snowpack . [105] This led to a Moderate Drought declaration by the US Drought Monitor for most of Snohomish County as of April

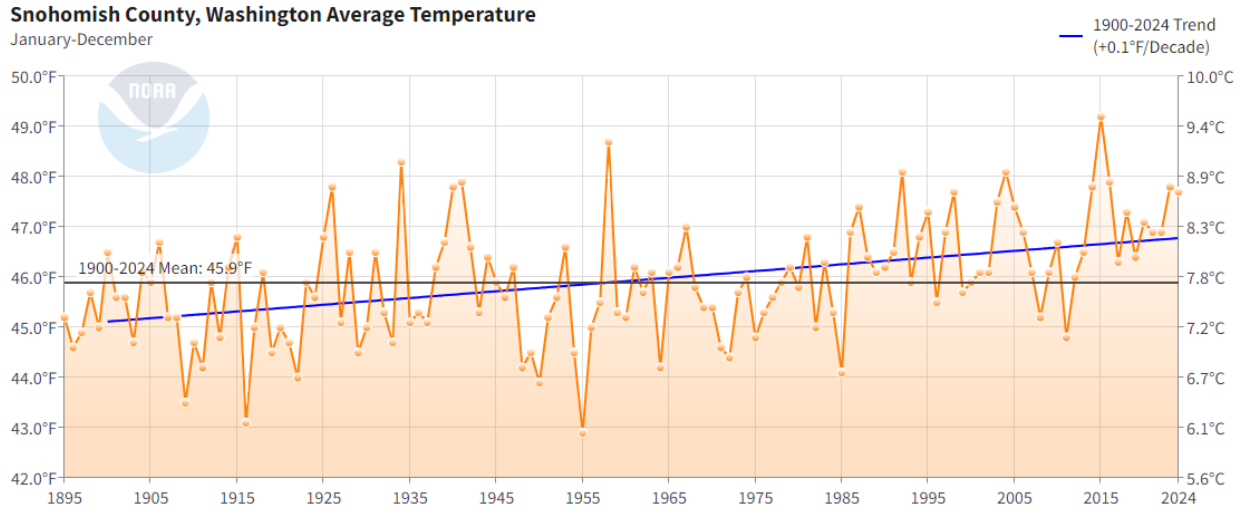
[99] Lindsey, R. and Dahlman, L. NOAA Climate. 2025. "Climate change: global temperature."
[100] Cybersecurity and Infrastructure Security Agency. Accessed August 2025. "Extreme Heat".
[101] Sistek, S. Fox 13 Seattle. 2021. "118?!?! Here is how hot it got around Western Washington during historic heat wave."
[102] Washington State Department of Health. Accessed August 2025. "Heat Wave 2021."
[103] Washington State Department of Ecology. Accessed August 2025. "Drought Response."
[104] Washington State Department of Ecology. Accessed August 2025. "Drought Response."
[105] Genuise, J. Washington State Climate Office April 2024 Newsletter. 2025. "March 2025 Snowpack and Drought Summary."

2025 . [106] As of May 25, 2025 the snowpack level at the two monitoring stations in Snohomish County were less than 50 percent of the 1991-2020 median. [107]

12.6 Probability of Future Events

All climate scenarios predict hotter summers in the region. By the 2080s, the average maximum summer temperature is expected to increase by 10.5°F (with a range of 7.4°F to 13.0°F). The number of days above 90°F will also rise substantially, with projections indicating a median of 41 days per summer by the 2080s. Additionally, nighttime temperatures are expected to increase, which is concerning from a public health perspective. Nights with a humidex above 65°F are projected to occur 45 more nights (with a range of 18-71 days), which can exacerbate heat-related health risks. [108]

Figure 13: Snohomish County, Average Temperature Trend 1900-2024



Source: National Oceanic and Atmospheric Administration

Researchers estimate an event with similar temperatures to the June 2021 Heat Dome event has a 0.1 percent chance of recurring this year. Although this was a rare event, some climatologists believe it would have been virtually impossible without climate change. [109]

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[106] NWS Seattle. 2025. "Drought Information Statement for Western Washington."
[107] US Department of Agriculture National Water and Climate Center (NWCC). Accessed September 2025. "NWCC Interactive Map."
[108] KC Ernest, et al. U.S. Global Change Research Program. 2023. "Fifth National Climate Assessment (NCA5)."
[109] Fountain, H, The New York Times. 2021. "Climate Change Drove Western Heat Wave's Extreme Records, Analysis Finds."

12.7 Climate Change Considerations

Climate change is a significant concern as it is expected to alter the frequency, intensity, and severity of extreme weather events in the region. These changes are projected to result in hotter, drier summers and an increase in heavy rainfall events, which could lead to a range of hazardous consequences, including floods, landslides, avalanches, droughts, and wildfires.

12.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Extreme Heat & Drought are summarized in Table 32.

Table 32: Extreme Heat & Drought Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Heat is already the leading weather-related cause of death in the United States. People involved in outdoor activities including athletes, first responders, outdoor workers, and others who may not have access to air conditioning are prone to heat-related illness and injury.
First Responders	Moderate	People involved in outdoor activities including first responders are prone to heat-related illness and injury. Extreme heat events can increase call loads from heat related illness and incidents related to water activities.
Continuity of Operations	Low	Extreme heat could cause damage to roads and infrastructure and create unsafe work environments for those working outside. Excessive heat that extends over days or weeks may result in the need for cooling shelters.
Facilities and Infrastructure	Low	Rising temperatures and extreme heat can damage energy infrastructure and transportation systems, causing safety hazards, increased need for road maintenance, and airport and train delays. Extreme heat can cause powerlines to sag. This reduces the efficiency of the grid during a time when demand may already be high due to

		increased use of cooling systems. Infrastructure can be damaged during extreme heat events by stressing materials, leading to expansion and contraction that results in cracks in pavement and bridges.
Economy	Moderate	People who work outdoors are more exposed to extreme heat. This can include agriculture, fishing, construction, transportation, utility, or delivery workers. Farmworkers are more at risk of heat stress and death than other U.S. workers. The number of unsafe working days for farm workers due to heat is projected to double by the middle of the century. [110] Drought and changes to the natural timing of seasonal plant growth lead to decreased crop yields. Warming temperatures can increase the range of pests and non-native species that can harm crops and livestock.
Environment	Moderate	Hot and dry conditions can result in an increase in the threat of wildfires by drying out vegetation and making forests more flammable. Drought can cause impacts to the environment including plants, wildlife, and fish that require minimum stream flows to support their annual spawning migrations. Dry conditions also contribute to higher water temperatures, which causes increased salmon mortality.
Public Confidence	Low	Access to cooling shelters and free bus transportation to access cooling shelters can increase public confidence during extreme heat events.
Vulnerable Populations	High	Excessive heat that extends over days or weeks may result in the need for cooling shelters. Older adults, children and people with certain illnesses and conditions, including pregnancy, are susceptible to illness from extreme heat. Heat waves disproportionately impact communities and people who have been marginalized, including outdoor workers, people of color and low-income individuals with less access

[110] KC Ernest, et al. U.S. Global Change Research Program. 2023. "Fifth National Climate Assessment (NCA5)."

		to cooling resources and fewer strategies to reduce heat, such as green space and urban trees.
Property	Low	Property can be damaged during extreme heat events by stressing materials, leading to expansion and contraction that results in cracks in foundations, walls, and roofs. It also dries out soil, causing the foundation to shift and crack.

Chapter 13 Flood

13.1 Hazard Description

Floods are one of the most common hazards in the United States. They can develop over a period of days or occur rapidly without warning. The effects of floods can be local (impacting a neighborhood or community) to regional (impacting counties or states). A floodplain is defined as the land adjoining a channel of a river, stream, ocean, lake, or other watercourse or waterbody that becomes inundated with water during a flood. The extent to which a floodplain becomes inundated during a flood depends partly on the magnitude of the flood and partly on the surrounding landscape. [111]

The relationships between a water source and its floodplain are most apparent during and after major flood events. Floodplains and their associated wetlands form complex physical and biological systems that not only support a variety of natural resources but also provide natural flood and erosion control. When a river is separated from its floodplain by levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced. [112] In these areas, floodplains are often narrow or absent.

Snohomish County is susceptible to various types of flooding. The most common types observed in the county are:

- **Riverine flooding**: a river or stream overflows its banks and spills into nearby low-lying areas due to excess water flow.
- **Tributary flooding**: a smaller stream or river overflows its banks and spills into nearby low-lying areas due to excess water flow.
- **Coastal flooding**: when high tides and storm surges inundate or cause damaging erosion to normally dry areas along the marine shoreline.
- **Urban flooding**: caused by stormwater runoff or overwhelmed urban storm sewer systems, leading to localized flooding in developed areas.

Several weather conditions can cause flooding, from too much rainfall in a river's watershed to sustained offshore wind driving a high tide inland. Flooding can also be caused by non-weather scenarios, such as liquefaction and failure of levees during an earthquake, causing the release of water the levees hold back.

[111] Federal Emergency Management Agency (FEMA). 2006. "NFIP Floodplain Management Requirements."
[112] FEMA. Accessed August 2025. "Benefits of Natural Floodplains."

13.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Flood are summarized in Table 33.

Table 33: Flood Probability Ranking Average Results

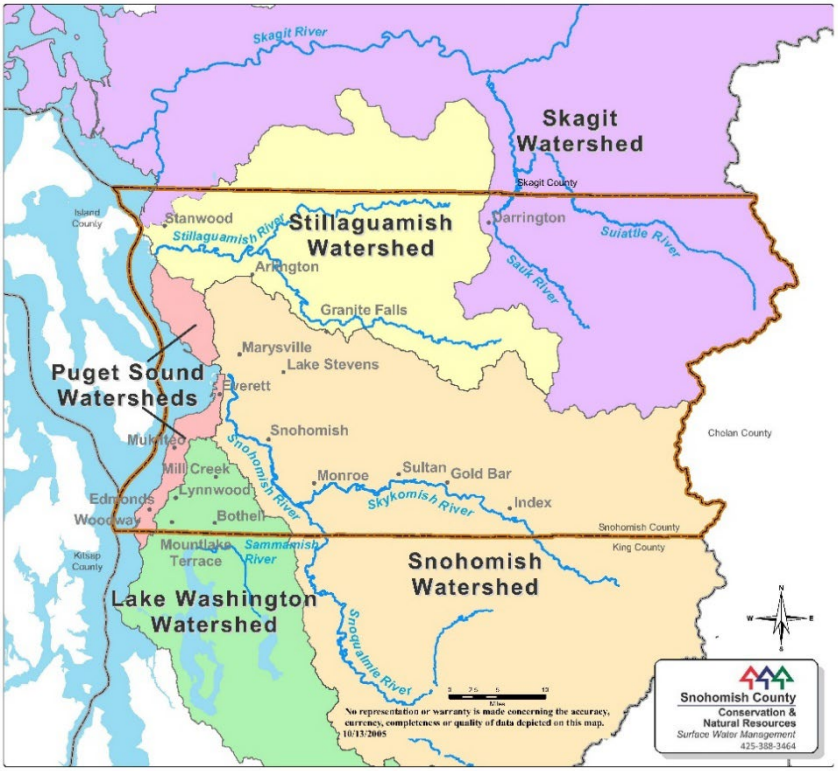
Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	3	2	2	2.05	Moderate	8

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event will be medium and will last between one to seven days.
- There will be six to 12 hours warning for the onset of the event.
- Magnitude of the event is limited, likely to impact multiple county jurisdictions.
- The overall impact to the full county will be moderate.
- Flood has a moderate overall risk.

13.3 Location

Figure 14: Snohomish County Watersheds



Source: Snohomish County Department of Conservation & Natural Resources

Snohomish County contains five watersheds (Skagit, Stillaguamish, Puget Sound, Lake Washington, and Snohomish) with five significant rivers (Sauk River, Stillaguamish River including North and South Forks, Snohomish River, Skykomish River including North Fork, and the Snoqualmie River). Additionally, the county has other smaller tributaries and streams.

The combination of hydrology and hydraulics plays a critical role in shaping the behavior of rivers in the county and directly contributes to the significant flood risks the county faces. Several rivers in Snohomish County face significant flood risks, each presenting unique challenges. The most flood-prone areas include:

- **Sauk River**: Located in the Skagit Watershed near Darrington, it can cause extensive inundation downstream of the town, experience large-scale channel migration, and can flood State Route 530 at the Suiattle River.
- **Stillaguamish River**: Located in the Stillaguamish Watershed, the Stillaguamish River is divided into three parts: Main Stem, North Fork, and South Fork. All sections

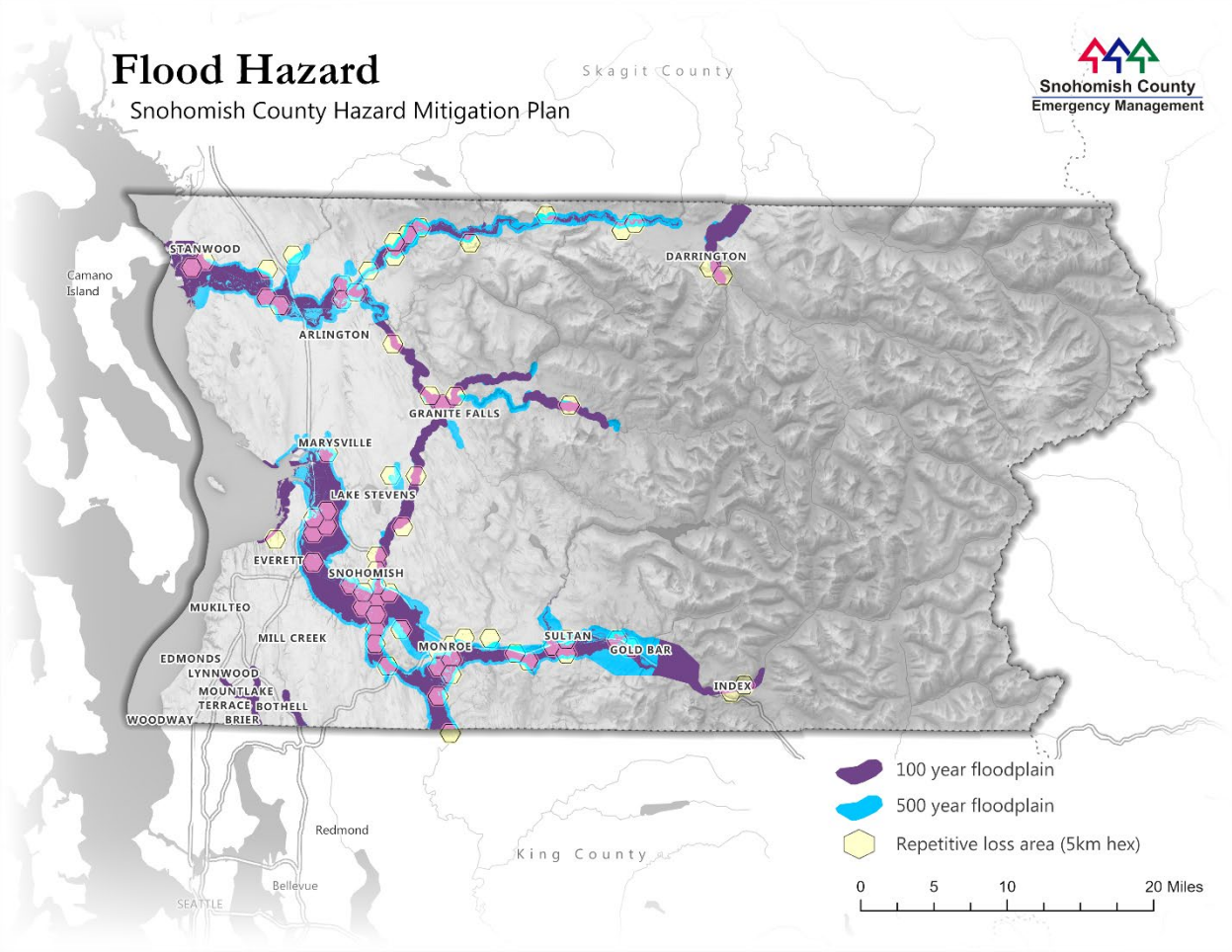
are prone to flooding events. On the Main Stem, major flooding throughout the floodplain is possible with overtopping of dikes and banks, making sections of State Route-530 impassible and cutting off the community of Silvana. Flooding near Stanwood can be made worse during high tide events, known as "compound flooding." Flood events at the North Fork can result in extensive inundation throughout the valley and water over State Route-530 in multiple places. South Fork flooding can impact roadways around the Granite Falls area and close Mountain Loop Highway.

- **Snohomish River**: Flooding of the Snohomish River can have severe impacts on the low-lying pasturelands and agricultural areas and damage the flood control infrastructure protecting those lands. The leveed areas of the Snohomish River could experience a breach which would result in closures of valley roads and highways.
- **Skykomish River**: Located in the Snohomish Watershed, the Skykomish River is capable of causing severe flooding in the City of Sultan and farms and homes near Monroe.
- **Pilchuck River**: Located in the Snohomish Watershed, the Pilchuck River can It inundate residences and roads along the river.

Coastal flood hazard areas also pose potential risks to Snohomish County. The county experiences periods of coastal flooding during high tide, or King tide, events. King tide is a colloquial term used to describe an extremely high tide. These high tides combined with rising sea levels contribute to coastal flooding along the Puget Sound region that can result in minor to moderate coastal flooding. [xxi]

13.4 Extent

Map 9: Flood Hazard



FEMA identifies Special Flood Hazard Areas (SFHAs) or floodplains as areas at risk for flooding, mudflow, or flood-related erosion. These areas are classified based on their annual probability of occurrence, with larger flood events generally associated with a lower likelihood of occurrence. It is important to note that SFHAs are named according to historic probabilities of flooding, so the names do not reflect evolving flood risk due to climate change.

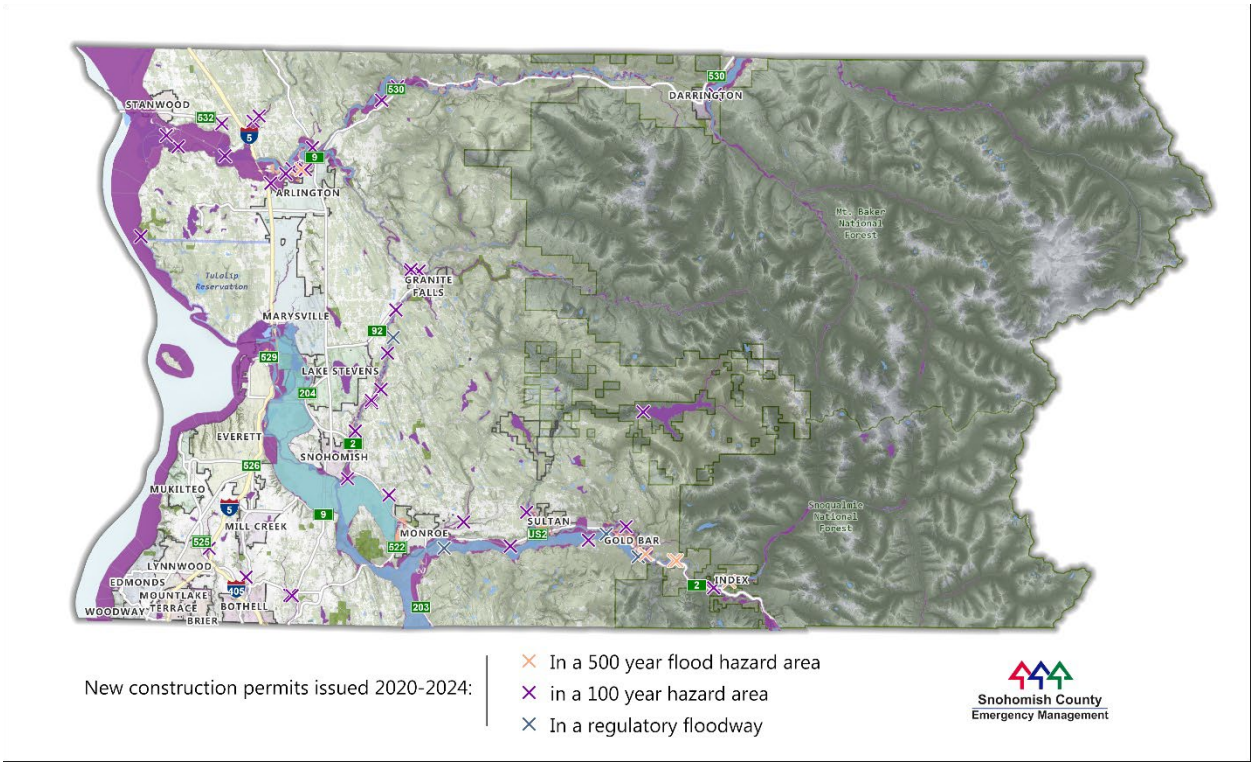
Snohomish County's floodplain risk is broken up into the following flood zones:

- **100-Year Floodplain:** areas that historically had a one percent annual chance of flooding. FEMA floodplain regulations and federal flood insurance are based on this flood event forms the basis for community regulations for participating communities in the National Flood Insurance Program.

- **500-Year Floodplain**: areas that historically had a 0.2 percent (or one in 500 chance) annual chance of flooding.
- **Floodway**: The space along a river or water course that must remain unobstructed to allow floodwaters to pass through without causing significant increases in water surface elevation.

A Repetitive Loss Property is a building that has received two or more flood insurance claims of over $1,000 within any rolling 10-year period under the National Flood Insurance Program (NFIP) since 1978. A Repetitive Loss Area is a portion (or portions) of a community that includes buildings on FEMA's list of repetitive losses and also any nearby properties that are subject to the same or similar flooding conditions. [113] Map 10 shows the areas located within the floodplain that are designated as a Repetitive Loss Area.

Map 10: Flood Hazard - New construction permits issued 2020-2024



In the last five years the County has issued nearly 5,000 total building permits, including 47 on parcels which include the 100-year flood zone, five on parcels which include the 500-

[113] FEMA National Flood Insurance/Community Rating System. 2015. "Mapping Repetitive Loss Areas for CRS."

year flood zone, and four on parcels which include the regulatory floodway. [114] See Chapter 3 for more information on Land Use and Development.

Snohomish County's flood warning program warns of impending flooding on major rivers so that residents and agencies can prepare before serious flooding occurs. In most locations, the warning system provides at least two hours of lead time before floodwaters reach damaging levels. The system is a phased program with response protocols for four phases of observed stream flow conditions:

- **Phase 0**: Normal water levels.
- **Phase 1:** Actual flooding is rare. County staff and Emergency Management Duty Officer monitor weather forecasts. County Emergency Operations Center is in standby.
- **Phase 2:** Minor flooding and some road closures may occur. Preparations are made to open the County's Emergency Operations Center, if warranted. County staff begins monitoring river gauges and flood conditions around the clock. Flood information lines are periodically updated with current river gauge/river level information.
- **Phase 3:** Moderate to severe flooding, with numerous road closures and some levee overtopping expected. Investigational crews are sent out to monitor flood control facilities such as levees. County Emergency Operations Center opens.
- **Phase 4:** All agencies respond in anticipation of major flooding and widespread damage.

13.5 Past Events

Flooding in Snohomish County has been documented by gauge records, high water marks, damage surveys, and personal accounts. Typically, the county experiences major flooding every three to five years. Since 1962, there have been 18 floods severe enough to receive disaster declarations. For a full list of historical disaster declarations in Snohomish County, see Appendix E.

In December 1975, a combination of rain and melting snow in the mountains caused several Snohomish County rivers to flood for six days, with the worst flooding along the Snohomish River. The Snohomish River reached a record depth of 33.16 feet at

[114] County permitting data does not consistently track accurate permitted building locations within the parcel. Chapter 3 describes the process the County follows to minimize the exposure of new construction on parcels which overlap with known flood zones.

Snohomish, and the Snohomish River Valley filled with a 50,000-acre "lake" forming in the valley between Everett and Monroe. [115]

In recent years there have been multiple record-breaking countywide flood events. In December 2023, heavy rains and melting snow brought moderate-to-major flooding to Snohomish County rivers and streams; the Stillaguamish River reached a record 21.34 feet at Arlington, more than seven feet above flood stage. In December 2025, heavy rains brought major flooding with the Snohomish River reaching a record 34.15 feet, resulting in more than $18 million in damages. Both events received a federal major disaster declaration.

13.6 Probability of Future Events

Snohomish County is inherently vulnerable to flooding due to its distinctive geography and heavy precipitation patterns. It experiences episodes of river flooding nearly every winter. Large, damaging floods have typically occurred every two to 10 years and projections indicate that both the frequency and severity of these events will likely increase due to the broader impacts of climate change. Urban portions of the county annually experience localized flooding related to drainage issues. King tides can impact coastal communities with both flooding and coastal erosion. Flooded roadways from king tides can cause corrosion to vehicles and other equipment not coated to resist salt water. Additionally, king tides during high water or flood events on the rivers can compound flood waters upstream from the coast as occurred on December 22, 2022.

13.7 Climate Change Considerations

According to the 2023 Fifth National Climate Assessment, the northwest region in the United States is projected to see an increase in frequency and intensity of extreme precipitation events. [116] While results will vary by location and flood interval, river flooding is expected to increase due to the combined effects of wetter winters, more intense heavy rain events, and more winter precipitation falling as rain rather than snow in mountain watersheds.

Sea level rise will also increase the frequency and extent of coastal flooding. By 2100, sea level in Snohomish County is on average projected to rise approximately 1.5 feet to 2.5 feet. [117] Portions of the Snohomish Valley between Everett and Lake Stevens are predicted

[115] Herald Staff. The Everett Herald. 2020. "Looking back: Floodwaters spill into the Snohomish River Valley."
[116] KC Ernest, et al. U.S. Global Change Research Program. 2023. "Fifth National Climate Assessment (NCA5)."
[117]. WA State Department of Ecology. 2024. "Washington State Climate Resilience Strategy."

to be most impacted by sea level rise. [118] This expected increase may also exacerbate compound flooding in coastal drainages, which could impact public health, life, and safety.

13.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Flood are summarized in Table 34.

Table 34: Flood Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Flooding can impact anyone who lives, works, or travels in or near floodplains. For those situated within the 100-year floodplain, there is a 26 percent likelihood of experiencing flooding over a 30-year period, the length of a typical mortgage. Hazus analysis determined that in a 500-year flood scenario impacting all river systems in the county there could be 25,987 households displaced with around 3,230 individuals requiring short-term shelter. In a 100-year flood scenario impacting all river systems in the county, there could be 10,995 households displaced with around 1,851 individuals requiring short-term shelter. [119] Flooding also affects those who work in flood-prone areas or commute through them. In a flood event, most deaths occur from people driving through floodwaters and being swept away in their cars. [120]
First Responders	Moderate	Police, firefighters, and paramedics play key roles in the response to flooding. Police officers often help shut roads down to prevent people from driving through floodwaters; firefighters often rescue people trapped by flooding; and

[118] NOAA. Accessed September 2025. "Sea Level Rise Viewer."
[119] See Appendix E to view the full Snohomish County 100-year Hazus Summary Report and 500-year Hazus Summary Report
[120] National Weather Service. Accessed September 2025. "Turn Around Don't Drown."

		paramedics transport people hurt by flooding, often from hypothermia or other causes. Additionally, neighborhoods with roads that are inaccessible during flooding pose challenges to first responders. They may not be able to drive to homes and may require helicopters or boats to access.
Continuity of Operations	Moderate	There are few government facilities located within flood prone areas in Snohomish County. Hazus analysis indicates that in the worst-case scenario of a 500-year flood impacting all river systems in the county, three fire stations and two police stations could suffer a total loss of use. Thus, flooding does not pose a substantial risk to the continuity of government operations. Although the facilities themselves are relatively safe, government employees may still need to travel through flood-prone areas to reach their workplaces. This may necessitate the development of alternative work sites to ensure continuity of operations during flood events.
Facilities and Infrastructure	Moderate	Flooding regularly causes impacts to our roadways and bridges, which can cause very extensive and expensive repairs. Roads through the lower Snohomish River Valley are particularly susceptible to flooding and close regularly during high water events. State Route 530 regularly floods, isolating communities. Wastewater treatment facilities along rivers are prone to impacts from flooding and have sustained damage during previous flood events.
Economy	Moderate	Flooding can significantly impact industries that rely on floodplain locations such as agriculture. Flooding can negatively impact these operations, particularly if it occurs before harvest or late into the spring planting season. Farmers cannot sell food products from flood-damaged fields. Flooding has the potential to impact livestock as well, with an estimated 3,500 head of cattle and other livestock lost during the 1975 flood event. Flooding, however, also provides nutrients to the soil that supports productive agriculture. For

		business owners, flood damage may mean lost economic output from shutdowns, destroyed inventory, and inability to pay employees. Hazus analysis determined in a 500-year flood scenario impacting all river systems in the county. There could be an estimated total economic loss of $3.3 billion. In a 100-year flood scenario impacting all river systems in the county, the economic loss is estimated to be $1.1 billion.
Environment	Moderate	Flooding is a natural process and supports unique ecosystems and habitats. Many riparian and aquatic ecosystems depend upon some amount of regular flooding or high-water events. Various salmonid species use high water events to seek refuge as juveniles or access more favorable habitats, which makes flooding an important part of recovery for the endangered salmon species in Puget Sound. Natural floodplain functions typically result in slower-moving floodwaters with less intense flood height peaks. When upland forest areas are logged or burned, rain and snowmelt reach streams faster, which can cause flooding to be more intense and push water through the floodplain more quickly. Hazus analysis determined that in a 500-year flood scenario impacting all river systems in the county, a total of 44,862 tons of debris could be generated. In a 100-year flood scenario impacting all river systems in the county, 20,902 tons of debris could be generated.
Public Confidence	Moderate	Flooding occurs frequently enough in Snohomish County that residents often turn to the Surface Water Management Division of the Department of Conservation and Natural Resources and the Department of Emergency Management for help and information during flooding events.
Vulnerable Populations	Moderate	Vulnerable populations that are particularly susceptible to the long-term impacts of flooding include low-income individuals, renters, and people with limited English proficiency.

		Renters are far less likely to have a flood insurance policy and may not even be aware of their flood risk. Those who do not speak English may not have easy access to government resources. Most flood warning systems are in English and much of the flood insurance, floodplain regulations, and any mitigation programs are made up of materials in English. Flooding is a complicated hazard to understand and accessing flood warnings, flood insurance, and other information often requires command of English, understanding of government bureaucracy, and access to financial resources.
Property	Moderate	Flooding and channel migration pose a risk to commercial and residential areas across Snohomish County. Hazus analysis determined that in a 500-year flood scenario impacting all river systems in the county 2,769 buildings in the flood hazard area could be at least moderately damaged, and 781 buildings could be destroyed. In a 100-year flood scenario impacting all river systems in the county, 1,381 buildings in the flood hazard area could be at least moderately damaged, and 313 buildings could be destroyed. A building is considered "destroyed" if the probability of it sustaining complete damage (the cost to repair a building is 50 percent or more of its pre-disaster market value) exceeds 50 percent.

Chapter 14 Hazardous Materials

14.1 Hazard Description

Hazardous materials (hazmat) releases are among the most common types of emergency incidents. A hazardous material may cause damage to people, property, or the environment when released to soil, water, or air. Hazardous materials are substances or materials that pose and unreasonable risk to health, safety, and property, and include hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, and others.

Small releases can have the potential to endanger public health and contaminate groundwater, surface water, and soils. Environmental damage from such releases depends on the material spilled and the extent of contamination. Many releases are of small quantities that are contained and cleaned up quickly with little damage to the environment. Even small releases can cause thousands of dollars of cleanup costs and damages. Large releases can cost communities and companies millions of dollars.

Starting in 1986, the Emergency Planning and Community Right-to-Know Act required certain industries to report to government officials the locations and quantities of chemicals stored on-site. The Snohomish County Local Emergency Planning Committee (SC-LEPC) is the coordination and planning body for hazardous materials located in the county.

14.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Hazardous Materials are summarized in Table 35.

Table 35: Hazardous Materials Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	3	4	2	2.02	Moderate	7

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.

- The duration of the event will be medium and will last between one to seven days.
- There will be minimal to no warning for the onset of the event.
- Magnitude of the event is limited, likely to impact multiple county jurisdictions.
- The overall impact to the full county will be moderate.
- Hazardous Materials has a moderate overall risk.

14.3 Location

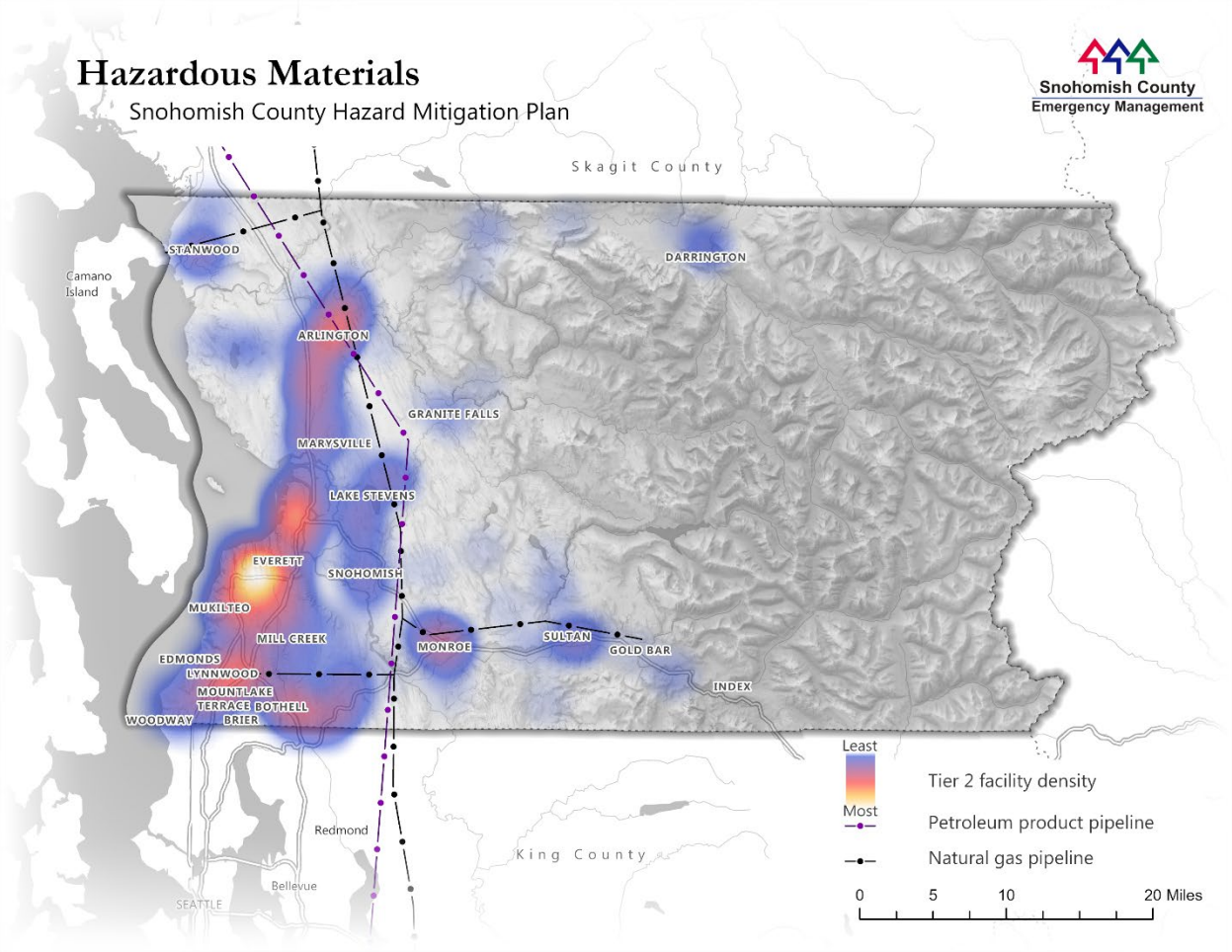
Hazardous material releases are more likely to occur in areas surrounding fixed site facilities, major pipelines, and along major transportation routes in the county but can be present in a variety of locations, ranging from residential homes and workplaces to medical facilities and industrial sites. These materials can include cleaning products, engine fuels, chemicals, and everything in between.

Certain areas are more prone to hosting or interacting with hazardous substances, such as distribution centers, ports, industrial zones, Tier II facilities, and transportation networks (including highways, rail lines, and pipelines). Snohomish County has multiple major transportation routes including I-5, I-405, and Highway 2. BNSF railroad also runs along the west coast and southern portion of the county. There are 302 reported Tier II facilities in Snohomish County. These facilities are required to report annually how much of each chemical is recycled, combusted for energy recovery, treated for destruction, and disposed of or otherwise released on and off site.

Superfund is a US Environmental Protection Agency (EPA) program that cleans up severely contaminated sites that have significant risk to the environment and public health. There are two EPA-designated Superfund Sites in Snohomish County: the Boeing Company Tulalip Test Site [121] and the Tulalip Landfill. [122]

[121] US Environmental Protection Agency. EPA Superfund Site. Accessed August 2025. "Boeing Company Tulalip Test Site".
[122] US Environmental Protection Agency. EPA Superfund Site. Accessed August 2025. "Tulalip Landfill."

Map 11: Hazardous Materials in Snohomish County



14.4 Extent

Several factors are used to evaluate the release of hazardous materials or areas that formerly acted as hazmat storage. These factors are based on contamination levels, risk to human health, environmental damage (for soil and water), and local impact.

Hazardous material incidents usually offer little to no warning time before the incident occurs. People in the immediate vicinity have the least amount of warning and response time. Surrounding community members will usually have more time to shelter-in-place or evacuate the area. The initial identification of specific hazardous materials types can increase response capabilities.

Severity regarding a hazardous material release varies greatly depending on the material and the amount released. The extent of a hazardous substance release depends on whether the substance is released from a fixed or mobile source, the size of the impacted area, the toxicity and properties of the substance, the duration of the release, and

environmental conditions. Air, water, and soils can become contaminated resulting in injuries or death. Exacerbating conditions magnifying effects of a release include weather conditions, micro-meteorological effects of buildings and terrain, and maintenance failures. Other factors that determine the severity of a potential incident include quick and solid decision-making by emergency officials, evacuation and shelter-in-place needs and communication, public health concerns, and relevant economic considerations.

Although the likelihood of large numbers of fatalities from a single materials release is low, the effects can be devastating to impacted communities, the economy and the environment. In this way, the hazardous materials incident hazard is one of the most complex. This hazard category includes frequent spills and releases from day-to-day human activities, the threat of a major release from a massive spill or accident, and the threat of an intentional release from an attack. The impacts from hazardous materials are also complex, including slow-acting releases that kill people and the environment over years and catastrophes that kill thousands. While most incidents are generally brief, the resulting recovery and cleanup may take time and money.

In Washington, the State Department of Ecology is the lead agency for addressing risks from hazardous materials and responding to hazardous material related events. Local response is led by fire services.

14.5 Past Events

A review of the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration Hazmat Incident Database showed the hazardous materials incidents along transportation corridors from 2020-2025. Snohomish County experienced 46 incidents. [123]

The Washington Department of Ecology reports five notable hazmat incidents in Snohomish County: [124]

- In 2006, The Department of Ecology and U.S. Coast Guard responded to an oil spill in the Puget Sound that occurred early morning about one-quarter mile west of the Edmonds Ferry Terminal in Snohomish County, at its peak the spill covered about 140 acres of water.

[123] US Department of Transportation. Pipeline and Hazardous Materials Safety Administration. Accessed August 2025. "Hazmat Incident Database."
[124] Washington State Department of Ecology. Accessed August 2025. "Spill Incidents."

- In 2011, there was an ammonia release from a tank on a marine beach on the Tulalip Indian Reservation. The origin of the tank and amount of the spill was unknown, but the tank had capacity of up to 470 gallons of ammonia.
- In 2011, the state Department of Ecology and Global Diving, a private contractor, responded to a sunken 93-foot pleasure craft in Steamboat Slough near Everett. The vessel was boomed with hard boom lined with adsorbent boom before the vessel was towed and boarded. Crews found approximately 250 gallons of fuel and other sources of hazmat.
- In 2013, the Everett Parks Department and Department of Ecology responded to reports of a vessel aground and leaking fuel between Langus Park and Dagmar's Marina. A dive team hired by the Department of Ecology used inflatable bags to re-float the partially sunken vessel. The team towed the vessel to a nearby marina and removed fuel and other hazardous materials.
- In 2014, the Department of Ecology spills program responded to the SR 530 Slide to manage hazardous containers and materials found throughout the slide area, that posed a risk to search teams. In total, they collected over 400 items of hazards material during their deployment.

14.6 Probability of Future Events

Given the widespread use and distribution of hazardous materials across the county, including in residential homes, medical facilities, and industrial sites, the risk of a hazmat release within the next year is inevitable. Certain areas are more vulnerable to these incidents, such as the 302 reported Tier II facilities and transportation networks including rails, pipelines and interstates, and Superfund sites.

14.7 Climate Change Considerations

Human-caused incidents such as hazardous substance releases are not typically considered vulnerable to climate change. However, climate change and its impact on hazardous material sites, particularly waste sites, is a growing concern. Hazardous waste sites near rivers and marine waters are tentatively at highest risk because extreme storms and higher water levels could release pollution into the environment. Many of these sites were built in locations believed to be removed from potential contamination or exposure increasing factors. However, development, floodplain boundary change, and an increase in extreme weather events from climate change are increasing the possibility that water may reach hazardous material and waste sites.

14.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Hazardous Materials are summarized in Table 36.

Table 36: Hazardous Materials Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Potential impacts to the public from a hazardous materials spill can vary widely. Temporary or even permanent displacement through evacuation from an unsafe area can result in relocation/displacement of populations. Employment disruption, school closure, impacts to private and community wellheads and other impacts can change whole communities.
First Responders	Moderate	Hazardous materials make response and recovery activities in all disasters a threat to the health and safety of responders. During local events, such as house fires, stores of chemicals can catch fire and explode, injuring responders. During larger events such as earthquakes, large-scale releases can surprise and overwhelm responders without proper equipment.
Continuity of Operations	Moderate	The county has solid waste (garbage) transfer stations and while the acceptance of contaminants is avoided, some material may make its way into the ground water table. Drinking water facilities including private and community well heads and reservoirs may also be vulnerable to introduction of chemical or biological contaminants. Any chemical spill that impacts a major roadway or rail line may impact public transit routes in the county.
Facilities and Infrastructure	Low	Spills of hazardous materials to soil or buildings can result in extensive and costly cleanup efforts. Cleanup standards are established by federal (U.S. EPA), state (Washington State Department of Ecology), and local standards (fire agencies and environmental agencies). Hospitals can be overwhelmed by major releases of hazardous

		materials as populations, both those exposed and those who feel they may have been, check in at emergency rooms. With hazardous materials being everywhere in our modern community, it is possible to impact almost any critical facility in the county. Any roadway or rail line is vulnerable to the many chemicals transported over them daily. Spills to soils and surface water sources can impact drinking water and the environment.
Economy	Moderate	Small spills can close businesses and have a rather large impact on employment and land use. This includes impacts on the properties of neighbors not responsible for the chemical release.
Environment	Moderate	Any chemical spill on or along rails, roads, pipelines, fixed industrial facilities or illegal drug labs/dumping may impact the natural environment. Wetlands, streams and rivers, lakes, and reservoirs may all be damaged from chemical spills. In some cases, these damages may injure the plant and animal life irreparably. Birds, reptiles, amphibians, fish, and mammals may all be impacted. Air pollutants may impact human inhabitants as well as the natural environment.
Public Confidence	Moderate	The Community Right to Know Act, and other related legislation, resulted from serious breaches in public confidence following massive releases, explosions, or other failures in hazardous materials systems. Any major incident in and of itself seems to offer proof to the public of a regulatory failure. Maintaining Local Emergency Planning Committees and a regular structure to report and analyze hazardous materials releases is critical to maintaining public confidence.
Vulnerable Populations	Moderate	Vulnerable populations often live in closer proximity to facilities with elevated risk of hazardous materials release. Populations with respiratory issues are also at a heightened risk of impacts due to an airborne release of chemicals.
Property	Low	Properties vulnerable to hazardous material release typically include former industrial sites, dry cleaning facilities, gas stations with underground storage tanks, landfills, and vehicle maintenance

		or repair shops. Contamination can drastically reduce the value of the property.

Chapter 15 Mass Earth Movement

15.1 Hazard Description

Mass earth movement includes debris flows, mudslides, rock falls, sinkholes, and landslides. The term "landslide" encompasses a variety of geomorphic processes in which masses of soil, rock, and debris (a mixture of soil and rock) become detached and move downslope. Typically, this mass is wet, saturated, or suspended in water. Mass earth movements denote any down-slope movement of soil, rock, or debris under the direct influence of gravity. There are five modes of slope movement: falls, topples, slides, spreads, and flows. Slope movement occurs when forces acting down-slope exceed the strength of the earth materials that compose the slope.

Landslides are generally considered secondary hazards, triggered by precipitation, earthquakes, wildfires, and human activities. Smaller, shallower landslides often occur in response to short-term storm events lasting hours or days, while larger, deep-seated slides may be initiated by prolonged wet conditions persisting for months. Historical records and geological evidence indicate that significant earthquakes, though infrequent, can also serve as powerful landslide triggers. Areas affected by wildfires are particularly susceptible, as burn scars can lead to debris flows. [125] Human activities such as improper clearing, grading, or stormwater discharge can also contribute to landslide occurrences. Additionally, landslides tend to occur in areas where there is a history of previous occurrences. Modern technology like LiDAR (light detection and ranging) can be used to identify these historic landslide zones and help land use and emergency planners better understand where they have occurred. [126]

- **Deep-seated landslides:** Deep-seated landslides are those that fall below the rooting depth of trees and vegetation. They are often slow moving but can also move rapidly. Deep-seated landslides can cover large areas and devastate infrastructure and housing developments. These landslides usually occur as translational slides, rotational slides, or large block slides. Deep-seated landslides are typically much larger than shallow landslides, in terms of both surface area and volume. A deep-seated landslide may appear stable for years, decades, or even centuries. These long-lived features can be partially or entirely reactivated for a variety of reasons.

[125] Washington State Department of Natural Resources. Accessed August 2025. "Wildfire-Associated Debris Flows."
[126] US Geological Survey. Accessed August 2025. "What is Lidar data and where can I download it?."

- **Shallow debris slides:** Known as shallow landslides, infinite slope failures, and colluvial slides are a common style of slope movement both in the Puget Lowland and Cascade Mountains. Shallow landslides are rooted in the soil layer and often form slumps along roadways or release fast-moving debris flows down valleys. These types of landslides are often called mudslides. Shallow landslides also occur as flows, slides, or rockfalls and topples. Shallow landslides typically occur during the winter months in western Washington.
- **Debris flows**: Debris flows and debris floods usually occur in steep gullies, move very rapidly, and can travel for many miles. Debris flows and floods deposit material on alluvial or depositional fans (a fan-shaped deposit of sediment formed by a fast-moving stream carrying debris flows). They may contain more coarse material than a mudflow when channelized. Slopes where vegetation has been removed by fire (also known as burn scars) or humans are at greater risk for debris flows and many other types of landslides.

The most common slide in Snohomish County is the shallow debris slide, occurring particularly in response to intense, short duration storms. Less common is the largest and most destructive type of slide, the deep-seated slides. The county's shoreline contains many large, deep-seated dormant landslides. Most landslides occur in January after the water table has risen during the wet months of November and December. In addition to the coastal bluffs, landslides are most prevalent around the slopes of the county's steep, linear hills. Water is involved in nearly all cases, and human influence has been identified in more than 80 percent of reported slides.

15.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Mass Earth Movement are summarized in Table 37.

Table 37: Mass Earth Movement Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
2	3	4	2	2.34	High	5

Probability and Ranking Summary

- Frequency of the event is possible, with between one percent to 10 percent probability in the next year, or at least one chance in the next 100 years.
- The duration of the event will be medium and will last between one to seven days.
- There will be minimal to no warning for the onset of the event.
- The magnitude of the event is limited, likely to impact multiple county jurisdictions.
- The overall impact to the full county will be high.
- Mass Earth Movement has a high overall risk.

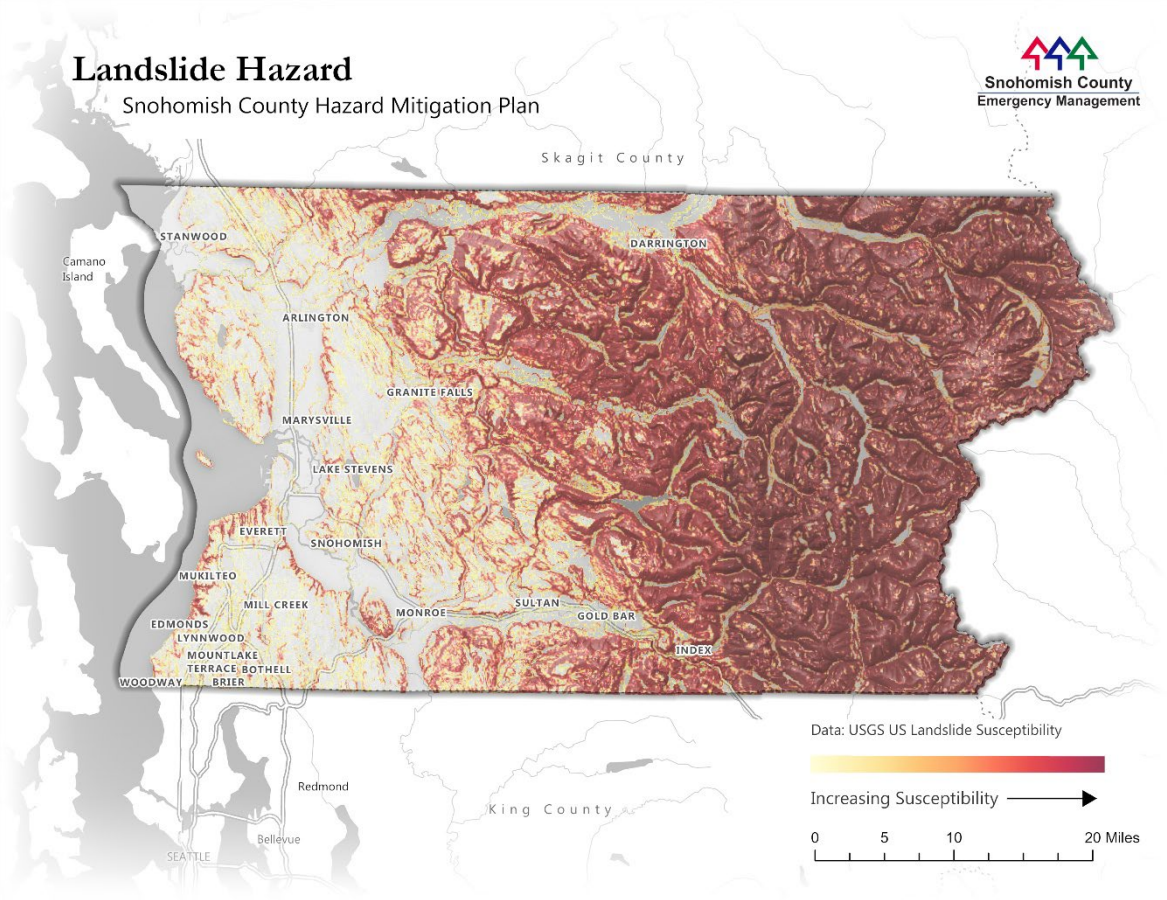
15.3 Location

Snohomish County was shaped by multiple glacial advances over the past two million years, the most recent occurring around 14,000 years ago. Landslides are most prevalent in areas where post-glacial erosion has created steep slopes in glacial deposits. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as: [127]

- A slope greater than 33 percent (i.e. a slope that is as steep or steeper than a standard staircase);
- A history of landslide activity or movement in the past 10,000 years;
- Stream or wave activity which has caused erosion, undercut a bank, or cut into a bank to cause the surrounding land to be unstable;
- The presence of an alluvial fan; and
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils, such as sand and gravel.

[127] US Geological Survey. Accessed August 2025. "What is a landslide and what causes one?."

Map 12: Landslide Hazard



The recognition of ancient dormant mass earth movement sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

15.4 Extent

Mass earth movements in Snohomish County are most commonly of small magnitude, but they have the potential to become large and highly destructive, especially when triggered by significant weather events, human activities, or disturbances like major wildfires.

Mass earth movements can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on height, slope angle, material, and water content. Some monitoring methods can provide an idea of the type of movement and the amount of time prior to failure. Currently, there is no practical

warning system for individual landslides. The standard operating procedure is to monitor situations on a case-by-case basis.

Generally accepted warning signs for Mass earth movement activity include [128]:

- Cracks growing in the ground;
- Movement of rock, soil, or vegetation;
- Sounds of cracking wood, knocking boulders, groaning of the ground, or other unusual sounds, especially if the sound increases;
- Changes in surface or sub-surface runoff patterns;
- Sudden changes in water levels in rivers and streams, sometimes with increased sediment, especially during or after large storms. This indicates a debris flow may be about to descend the river or stream channel; and
- Earthquakes.

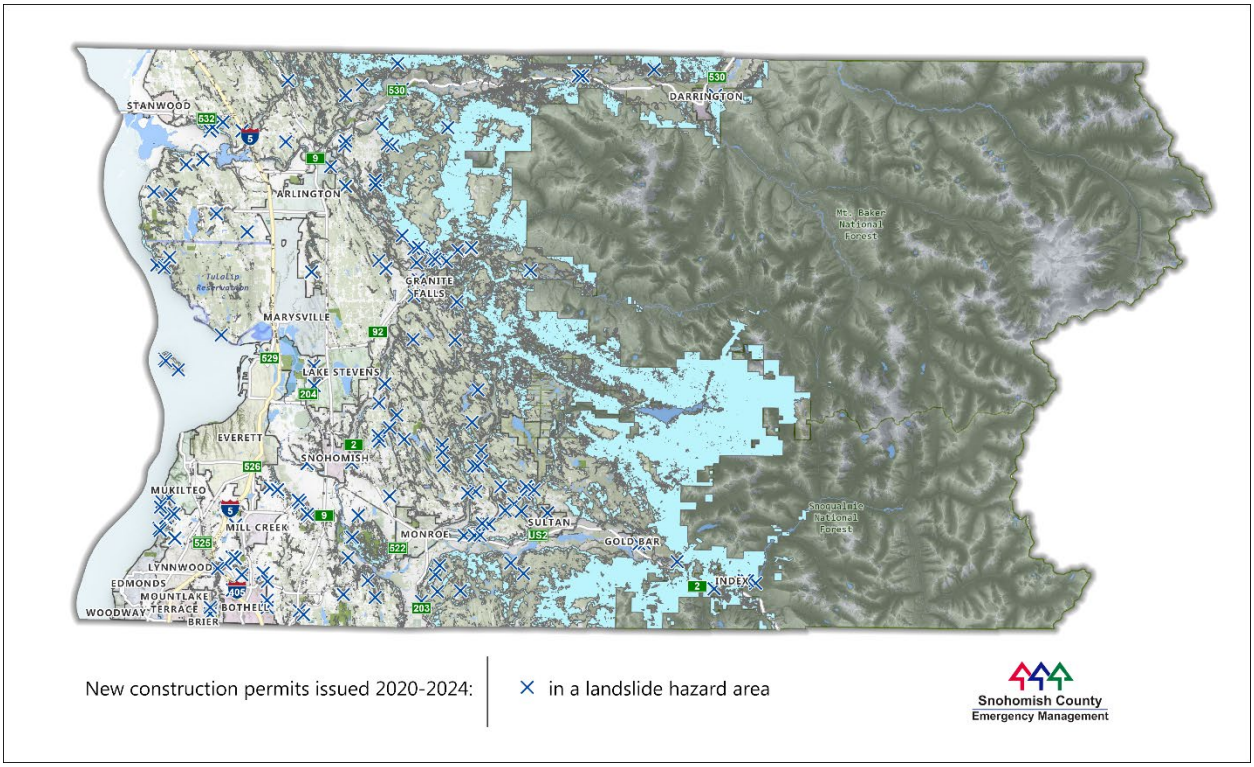
Landslide Magnitude

Snohomish County's geography makes certain areas particularly susceptible to landslides. The most vulnerable areas include:

- **Puget Sound Shoreline**: Consisting of permeable sand and gravel deposits over less permeable silts and clays, the County's shorelines contain ideal conditions for landslides. When sand and water accumulate on top of the clay layer, it can increase pore water pressure, destabilize the slope and cause it to fail.
- **Steep Bluffs Along Incised Rivers**: The steep, unstable bluffs along rivers in the county are particularly vulnerable to landslides due to erosion and the shifting of materials over time.
- **Eastern Cascade Foothills**: These areas often experience landslides after heavy rainfall or during seismic activity.
- **Fire Burn Scars**: Areas that have been affected by wildfires are more prone to landslides due to the loss of vegetation and soil stability. Without the root systems to anchor the soil, heavy rains can quickly trigger landslides in these fire-impacted zones.
- **Previous Landslide Zones**: Areas that have experienced landslides in the past are more likely to experience them again.

[128] Washington State Department of Natural Resources. Accessed August 2025. "Landslides."

Map 13: Landslide Risk – New construction permits issued 2020-2024



In the last five years the County has issued nearly 5,000 total building permits, including 162 issued on parcels with moderate to high liquefaction susceptibility. See Chapter 3 for more information on Land Use and Development. [129]

Liquefaction Magnitude

Mass earth movements are often triggered by other natural hazards, such as earthquakes. A landslide can also be large enough to register seismic signals (ground vibrations) without an earthquake. [130] The National Earthquake Hazard Reduction Program (NEHRP) soil types define the locations that will be significantly impacted by an earthquake. NEHRP B and C soils typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP D, E, and F soils.

In general areas with NEHRP D, E, and F soils are also susceptible to liquefaction, an event when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking. If there is a dry soil crust, excess water will

[129] County permitting data does not consistently track accurate permitted building locations within the parcel. Chapter 3 describes the process the County follows to minimize the exposure of new construction on parcels which overlap with known liquefaction zones.
[130] Allstadt, K. Pacific Northwest Seismic Network. 2014. "Seismic signals generated by the March 22nd Oso Landslide."

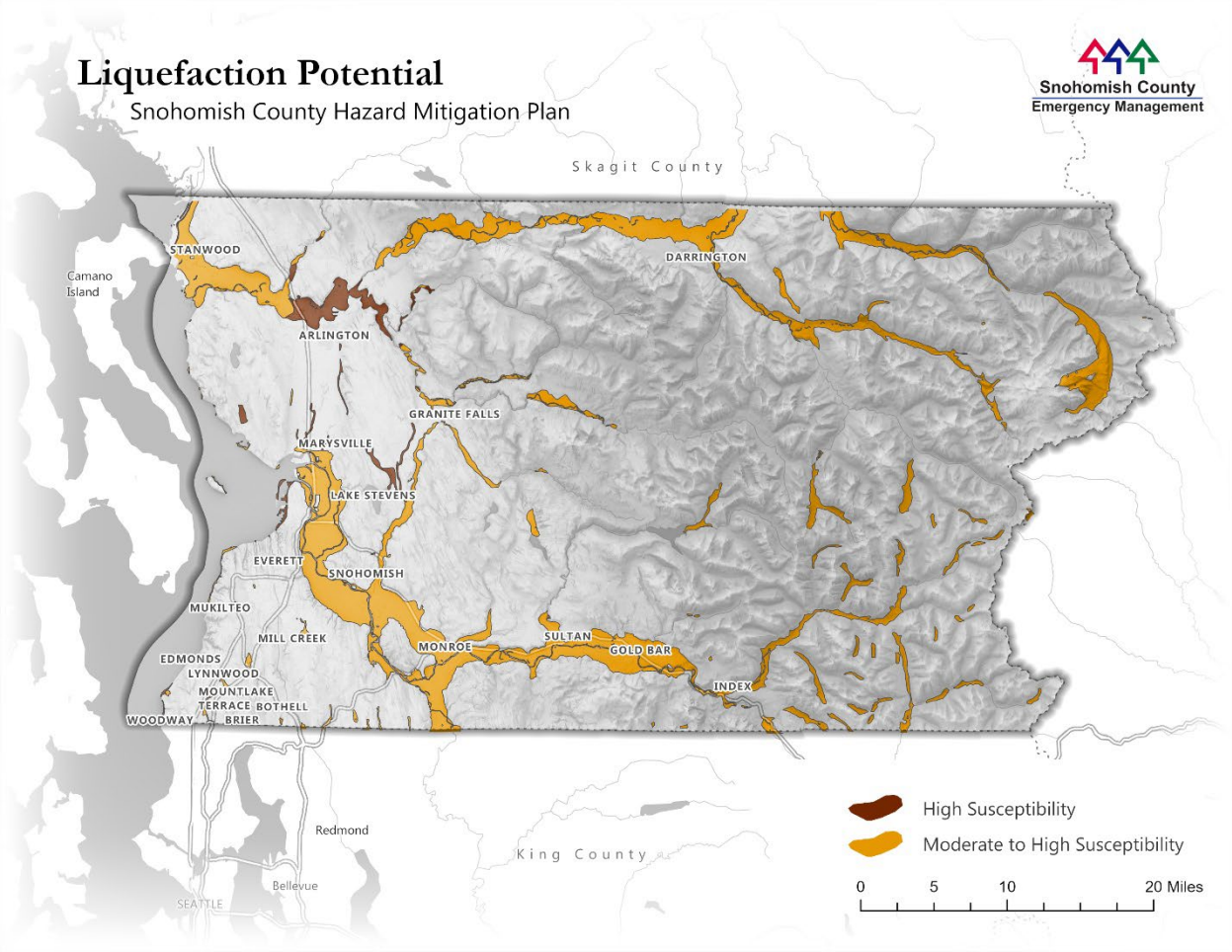
sometimes come to the surface through cracks in the confining layer, bringing liquefied sand with it, creating sand boils, colloquially called "sand volcanoes." After the 2014 SR-530 slide, geologists identified hundreds of transient sand boils suggesting that the rapid movement of a landslide mass over a base of liquefied soil (known as basal liquefaction) contributed to the landslide's high mobility. [131]

Table 38: NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	<180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

[131] Collins, B., Reid, M. Geology, Minerals, Energy, and Geophysics Science Center. 2019. "Enhanced landslide mobility by basal liquefaction: the 2014 SR530 (Oso), Washington landslide."

Map 14: Liquefaction Potential



In the last five years the County has issued nearly 5,000 total building permits, including 162 issued on lots with moderate to high liquefaction susceptibility. See Chapter 3 for more information on Land Use and Development.

15.5 Past Events

There are two federal disaster declarations for landslides/mudslides in Snohomish County. For a full list of historical disaster declarations in Snohomish County, see Appendix E.

- In 1997, a large slide occurred in Woodway, just north of the Richmond Beach neighborhood. It cut 50 feet into the property above, passed over the railroad tracks and knocked a freight train into the Puget Sound. Initial estimates placed the volume of the slide at 200,000 to 260,000 cubic yards, but later estimates based on additional data ranged from 100,000 to 200,000 cubic yards.

- In 2014, the SR-530 slide occurred, engulfing 49 homes and other structures in an unincorporated neighborhood known as Steelhead Haven on the south side of the North Fork Stillaguamish River resulting in 43 fatalities. The mud, soil and rock debris left from the mudslide covered an area 1,500 ft long, 4,400 ft wide (118 football fields) and deposited debris up to 70 ft deep. The overall size of the landslide debris was approximately 270 million cubic feet. Two years after the mudslide, about 11,000 tons of wreckage, including homes and vehicles, had been removed from the slide area. This remains the deadliest landslide in U.S. history.

15.6 Probability of Future Events

Due to the region's topography and geological conditions, the probability of landslides in Snohomish County will continue to be moderate to high in specific areas, especially following heavy rainfall, snowmelt, or other destabilizing events. As the climate warms, the frequency of heavy rainfall events and extreme weather may increase, leading to more frequent landslides, particularly in fire impacted and urbanized areas.

15.7 Climate Change Considerations

Future climate conditions may increase the risk of landslides in Snohomish County due to a combination of wetter winters, drier summers, and increased severe weather events. Projections indicate that more intense and frequent rainstorms will saturate soils, making them more susceptible to movement, especially along coastal bluffs and river corridors. As winter rains intensify, the saturation of soil increases the likelihood of landslides, particularly in steep, unstable slopes common in the region.

Rising summer temperatures and drought conditions can contribute to an increase in wildfires, which further destabilize the landscape. After wildfires, areas with exposed land are highly vulnerable to erosion, especially those with glacial soils. The loss of vegetation results in denuded ground, depleting topsoil and exacerbating the risk of post-fire debris flows. [132]The loss of vegetation along with the increase of severe precipitation events creates a higher risk of a post-fire debris flow. [133]

Moreover, larger and more frequent storm events are expected to lead to increased flooding in Pacific Northwest rivers, which may cause significant channel migration and bank erosion. These changes can further destabilize steep slopes in river valleys,

[132] KC Ernest, et al. U.S. Global Change Research Program. 2023. “Fifth National Climate Assessment (NCA5).”
[133] National Weather Service Seattle. Accessed August 2025. ”Burn Scars Have an Increased Risk of Flash Flooding and Debris Flows.”

heightening the risk of landslides. Sea level rise will accelerate erosion at the base of coastal bluffs, especially during high tides and storm surge.

15.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Mass Earth Movement are summarized in Table 39.

Table 39: Mass Earth Movement Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	While the total number of people exposed to landslides is relatively small, and the risk of a rapid slope failure is typically low, many homeowners do not carry insurance to cover losses from landslide hazards. Due to the county's increasing population density and structures built on property atop bluffs, below bluffs, and on steep slopes subject to mass movement, vulnerability has increased.
First Responders	Moderate	Most commonly, homes are isolated and ready access to communities by first responders is impeded by slide activity. Access to schools, businesses, and public services may be impeded by road blockages from slide activity.
Continuity of Operations	Moderate	Most impacts of the delivery of essential services are indirect. For a large-scale incident, government would need to divert resources. Closed roadways may impede the work force from reaching work locations.
Facilities and Infrastructure	Moderate	Highly susceptible areas of the county include the mountain and coastal roads and transportation infrastructure. Roads can become blocked or destroyed, isolating residents, communities, and businesses and delaying commercial, public, and private transportation. Poles can be knocked over resulting in loss of power and communication.
Economy	Moderate	The SR 530 landslide caused a complete reroute of the main highway between Everett and Darrington for an extended period, devastating the local economy and forcing residents to commute several hours longer to work each day.

Environment	Moderate	Environmental problems as a result of mass earth movements can be numerous. Simply, earth movements alter the landscape. Landslides can impact the topography/morphology of both subaerial and submarine surfaces, rivers, streams, forests, and grasslands, and the habitats of native fauna, both on land and in water. Earth movements can also block waterways, resulting in flooding, reduced water quality, and potential harm to fisheries and spawning habitat.
Public Confidence	Moderate	The 2014 SR-530 landslide impacted public confidence in government during the response and led to multiple lawsuits and changes to local and state building and development regulations and state logging rules in landslide prone areas. In 2024, the SR-530 Slide Memorial formally opened at the site of the disaster.
Vulnerable Populations	High	People who live or travel through landslide-prone areas are at significant risk, especially those who engage in outdoor recreation and may be unaware of risk in areas they don't visit often. The vulnerability of recreational areas depends on the history of the trail, its maintenance, and recent weather events that could trigger instability.
Property	Moderate	The effects of slide and flow activity seen during the SR-530 slide of 2014 and winter storms of 1996–97 suggest a significant vulnerability as countywide tens of millions of dollars in damage attributable to mass movement affected private property and public infrastructure and facilities. Based on the analysis completed in 2020, Snohomish County Assessor Data, approximately 12,000 buildings worth an assessed value of approximately $32.3 billion are exposed to landslides. There is also a risk of destabilizing the foundations of structures, resulting in property and monetary losses for businesses and homeowners.

Chapter 16 Severe Weather Events

16.1 Hazard Description

Severe weather can be defined as dangerous meteorological or hydro-meteorological phenomena, of varying duration, with risk of causing major damage, serious social disruption and loss of human life, and requiring measures for minimizing loss, mitigation, and avoidance. [134] Severe weather can include winter storms damaging winds, severe thunderstorms, flash floods, large hail, and tornados. [135]

Severe weather can be classified into two categories:

- **General severe weather**: weather systems that form over large geographic areas, impacting wide regions.
- **Localized severe weather**: weather phenomena with a more limited geographic effect, often associated with a specific storm.

Severe weather events can lead to secondary hazards and cascading impacts. For instance, heavy precipitation can cause flooding and landslides, resulting in road closures and property damage. In rural or suburban areas, high winds can knock down trees and powerlines, leading to extended power outages and road blockages. In urban areas, extreme cold may disproportionately affect the unsheltered population and families with limited resources, particularly those without access to heating systems.

16.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Severe Weather Events are summarized in Table 40.

Table 40: Severe Weather Events Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	3	2	3	1.75	Moderate	10

[134] World Meteorological Organization. Accessed August 2025. "Extreme Weather."
[135] US Department of Homeland Security. Ready.gov. Accessed August 2025. "Severe Weather."

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event will be medium and will last between one to seven days.
- There will be 12 to 24-hour warning for the onset of the event.
- Magnitude of the event is critical, likely to impact the full county.
- The overall impact to the full county will be moderate.
- Severe weather events have a moderate overall risk.

16.3 Location

Severe weather events have the potential to happen anywhere in Snohomish County. Communities in low-lying areas next to streams, lakes, or shorelines are more susceptible to flooding.

The north Puget Sound region, particularly areas along the Strait of Juan de Fuca, regularly experiences high winds during the winter. In certain conditions, the Strait acts as a wind funnel, accelerating winds as they move eastward toward the interior of the region. Areas closer to the water, such as Edmonds, Mukilteo, and Everett, are often more affected by these powerful gusts. Wind events are most damaging to areas that are heavily wooded.

16.4 Extent

Severe weather events in Snohomish County have the potential to cause significant disruptions, posing both immediate and long-term risks to infrastructure, the economy, and public safety.

Liquid precipitation is traditionally measured using various types of rain gauges or through the use of radar.[136] Snohomish County maintains a series of precipitation and water level gauges that constantly monitor rainfall totals, river levels and flood status within the county and surrounding areas.[137] Intense precipitation is the primary cause of both river and urban flooding in Snohomish County. Areas such as Sultan, Monroe, Snohomish, and Stanwood are particularly vulnerable to flooding following rain events. Larger, more destructive floods are often driven by atmospheric rivers (narrow bands of concentrated water vapor in the atmosphere that can bring significant rainfall and snow). The Pineapple Express, a type of atmospheric river, is a common source of severe weather, where moisture picked up from warm areas of the Pacific Ocean near Hawaii is carried by the jet stream and released as intense precipitation when it rises over the Olympic and Cascade

[136] National Weather Service. Accessed May 2026. "Precipitation Measurements."
[137] Snohomish County Surface Water Management. Accessed May 2026. "Information & Outreach."

Mountains. Pineapple Express events during winter often result in rapid snowmelt, which can exacerbate the resulting riverine flooding. Heavy rainstorms also lead to urban flooding, stressing the stormwater infrastructure and affecting ground-floor structures and basements. This can cause widespread damage and pose a risk to public safety. Annual precipitation in the western part of the county is 35 inches but increases sharply as the elevation climbs into the Cascade Mountains (Index, 110" - 120"). This precipitation is concentrated between October and May, with June through August typically receiving less than 1.5 inches per month. The frequency of extreme precipitation events from atmospheric rivers is projected to increase across the Northwest and their impacts are projected to reach farther inland with increased intensity. [138]

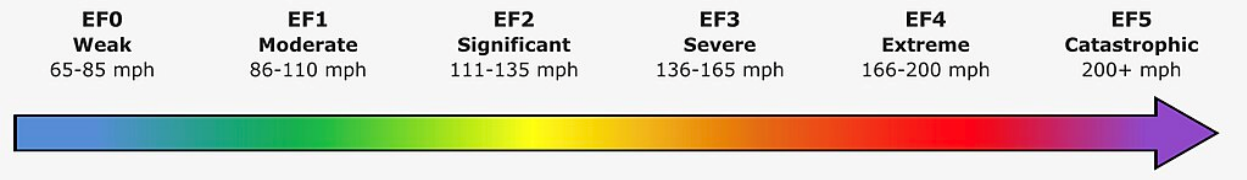
An ice storm is a storm which results in the accumulation of at least .25" of ice on exposed surfaces and a winter storm is a combination of heavy snow, blowing snow and/or dangerous wind chills; both can be life-threatening.[139] Snohomish County is also vulnerable to extreme winter conditions, with heavy snowfalls and ice storms disrupting transportation, power, and emergency services. While the region typically receives moderate snow, events like the 2008 winter storm or the 2022 ice storm can paralyze the area for extended periods. When major incidents occur, vehicles and drivers can be stranded almost anywhere in the county. Transportation impacts to buses, trains, roads, bridges include snow routes, shelter needs, and power outages. Multiple consecutive freezing days can threaten the lives of unsheltered and lower-income individuals requiring the opening of warming shelters.

High wind events are common in Snohomish County, especially during winter, with gusts often reaching 40-45 mph and severe winds surpassing 90 mph. For the north Puget Sound region during the winter season, the Strait of Juan de Fuca can also act as a wind funnel in the right conditions. These intense wind events often lead to widespread power outages, road and bridge closures, tree damage, airport disruptions, and risks such as carbon monoxide poisoning and injuries to utility workers, first responders, and the public. Wind events can be exceptionally damaging when winds blow from an atypical direction, such as what happened in the November 2024 wind storm when pressure dropped 27 millibars in six hours, about four times faster than the rate meteorologists use to label storms as bomb cyclones.[140]

[138] U.S. Global Change Research Program, 2023. "U.S. Global Change Research Program (USGCRP): Overview and Considerations for Congress."
[139] NOAA National Severe Storms Laboratory. Accessed May 2026. "Severe Weather 101 - Winter Weather."
[140] Swanson, C and Gaitan, C. Seattle Times. November 2024. "How a powerful bomb cyclone ravaged the Northwest."

Tornado activity is relatively rare in the Pacific Northwest with less than 10 confirmed tornados in Snohomish County as reported by the NOAA Storm Event Database [141]. Tornados are currently measured using the Enhanced Fujita Scale.

Figure 15: Enhanced Fujita Scale



Source: National Weather Service

Meteorologists can often predict the likelihood of a severe storm. This can give several days of warning time. However, the exact time of onset and severity are not easily predicted. Some storms may come on more quickly and more severely than initially estimated, only giving a few hours of warning time.

16.5 Past Events

Twenty-six of the 39 disaster declarations in Snohomish County are from severe weather events. Most historic declarations in the County have included a combination of winter storms, mudslides, heavy rains, and/or straight-line winds. The primary impacts and costs triggering these declarations include emergency protective measures for, and damage to, utilities, roads, and bridges, and for costs associated with debris removal. For a full list of historical disaster declarations in Snohomish County, see Appendix E.

On November 19, 2024, the Puget Sound region was struck by an unprecedented severe windstorm, referred to as the "Bomb Cyclone." This event was the result of a rapidly intensifying storm that experienced a dramatic drop in atmospheric pressure. This storm generated powerful east to southeast winds, with wind gusts of 49 mph at Arlington Airport and 48 mph at Paine Field. This intense storm caused widespread destruction; uprooting trees, downing powerlines, and leaving approximately 135,000 Snohomish County Public Utilities District customers without power. In Snohomish County, the windstorm caused one fatality, more than $18 million in damage to publicly owned infrastructure including powerlines and roads, and an estimated $5.5 million damage to homes and other private property. This event did not receive a presidential disaster declaration.

[141] NOAA. Accessed September 2025. "Storm Events Database."

For a full list of severe weather events in Snohomish County that resulted in deaths/injuries or property damage, see Appendix E.

16.6 Probability of Future Events

The frequency of extreme weather events has increased steadily over the last century. A disaster related to a weather, climate, or water hazard occurred every day on average over the past 50 years – killing 115 people and causing US $202 million in losses daily. [142] Historical data show that the probability for severe weather events increases in a warmer climate. In the Pacific Northwest, heavy precipitation events are expected to become more intense, with a projected 14 percent increase in intensity by the 2050s and up to 30 percent by the 2080s. [143]

16.7 Climate Change Considerations

Future climate conditions present a significant challenge for risk management associated with extreme weather. Climate change can affect the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air, and warmer air can hold more moisture. When more moisture-laden air moves over land or converges into a storm system, it can produce more intense precipitation, for example, heavier rain and snowstorms. [144]

16.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Severe Weather Events are summarized in Table 41.

Table 41: Severe Weather Events Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	The entire county is exposed to some extent to severe weather events and anyone in Snohomish County at the time of the weather event is subject to potential impacts. Certain areas are more

[142] World Meteorological Organization. 2021. "WMO Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)."
[143] U.S. Environmental Protection Agency. Accessed September 2025. "Extreme Precipitation."
[144] KC Ernest, et al. U.S. Global Change Research Program. 2023. "Fifth National Climate Assessment (NCA5)."

		exposed due to geographic location and localized weather patterns. Populations living in heavily wooded areas may be more susceptible to wind damage and utility loss, while populations living in low-lying areas are at an increased risk for flooding. Impacts to residents may include personal property damage, interruption of sports and recreation, extension of the daily business commute, impacts to daycare and school closures, injuries, and sheltering needs from power outages.
First Responders	Moderate	Portions of the population may be stranded or isolated from the results of severe weather, like roads blocked by trees and power lines, snow- and ice-covered roads, water or debris slides over roadways. Closure of the mountain passes for heavy snow conditions or avalanche control is a fairly common occurrence.
Continuity of Operations	Moderate	Public services can be impacted by absenteeism, access restrictions to critical facilities, and damage to vehicles like buses, police cruisers, and aid units, power outages, and other service outages.
Facilities and Infrastructure	Low	All structures in the county are subject to the direct impacts of severe weather incidents. These same structures are subject to flood impacts if they are in the flood plain. Local urban flooding also results when debris clogs storm drains, or they are overwhelmed by runoff. High winds, snow, and icy conditions can close airports or cause flight delays and rerouting. Mountain pass conditions may be so severe that they are closed to all traffic for days at a time. Impacts to emergency medical services from impacts to the roadways of the county can delay response times, restrict emergency room staff and supplies, and result in under staffing EMS and hospitals during severe weather emergencies. Downed trees caused by high winds and rain saturated soils can damage transmission lines and cause power outages in local areas for hours to

		days when multiple occurrences are experienced. Water and wastewater systems are vulnerable to a multi-day loss of power as well as to serious flooding. Storms may cause downed trees and snow or ice that temporarily blocks roadways or can cause large floods that can wash out or undermine roads and bridges. Systems can be knocked out by high winds or loss of power transmission. While the move to cell phones has reduced the vulnerability of telephone lines to outage caused by trees, a multi-day loss of power can still shut down a cell transmission site.
Economy	Moderate	Businesses can be severely impacted when weather events impede mobility during high seasons, such as around the holidays. The most serious and longest-lasting impacts may be to low-income individuals and families who may lose jobs or days of wages due to snow or other weather-related closures.
Environment	Moderate	Severe weather can have impacts to the environment through flooding and floodplain damages to salmon and steelhead habitat, wetland impacts to amphibians and reptiles, and bird sanctuaries. Hillside destabilization can occur where soil geology and saturation of soils occur.
Public Confidence	Low	The County and local utility services maintain websites and mapping to keep residents informed about local response for storm impacts. Having these tools lets residents monitor when any disrupted services could be restored, when roads have been made safer through plowing and de-icing efforts, and all warming sheltering locations available.
Vulnerable Populations	Moderate	Vulnerable populations include the elderly, low-income, or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life-threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of

		the hazard. Populations needing shelter are especially exposed and cold events may require opening additional shelter spaces and canvassing areas to offer shelter services.
Property	Moderate	Structures in poor condition or in particularly vulnerable locations (such as near Puget Sound) may risk the most damage. The frequency and degree of damage will depend on specific locations. Landslides are a major secondary hazard of severe precipitation events. Buildings on or near slopes of greater than 40 percent grade are most at-risk.

Chapter 17 Volcano

17.1 Hazard Description

A volcano is a vent in the earth's crust through which magma, rock fragments, gases, or ash are ejected from earth's interior. Volcanoes may lie dormant for centuries between eruptions; therefore, the risk posed by volcanic activity is not always apparent. The hazards related to volcanoes and volcanic eruptions are distinguished by the different ways in which volcanic materials and other debris flow from the volcano. Washington state has five active volcanoes. Glacier Peak, located in Snohomish County, is classified by U.S. Geological Survey (USGS) as a "very high" threat. Mount Baker, Mount Rainier, and Mount St. Helens are also classified as "very high", and Mount Adams is classified as "high". [145]

The different types of eruptive events include pyroclastic explosions, hot ash releases, lava flows, and gas emissions. Secondary hazards include flooding and lahars (i.e., mudflows), due to the melting of ice/snow and rainfall; ashfall; and wildfires due to pyroclastic flows.

- **Lahars**: also called volcanic mudflows or debris flows, can have the consistency of wet cement and are historically one of the most damaging elements of an eruption. Mudflows can travel more than 50 miles from the volcano, and commonly at speeds of 40 miles per hour. [146] These flows pick up debris like trees and boulders, and if sufficiently large and powerful, also houses, cars and anything else in their paths. They slow down once they reach flatter gradients typical of distant river channels but are still an unstoppable mass of mud and debris, often pushing a flow of water ahead of them. The only personal protective action available to avoid a lahar is evacuation to higher ground.
- **Ashfall:** made up of tiny particles of broken rock, glass, and minerals, may travel hundreds of miles or more downwind. Even in tiny quantities, volcanic ash can be very disruptive, as it lowers air quality, poses potential health hazards if ingested or inhaled, especially to those with pulmonary conditions, makes roads slippery to drive on, is abrasive, poses risks to aircraft, motor vehicles and electronics, and is extremely difficult to clean up.

[145] Washington Emergency Management Division (EMD). Washington State Enhanced Hazard Mitigation Plan. 2023. "Volcano."
[146] Washington State Department of Natural Resources. Not dated. "Volcanic Hazards in Washington State."

17.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Volcano are summarized in Table 42.

Table 42: Volcano Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
2	4	3	3	2.53	High	4

Probability and Ranking Summary

- Frequency of the event is possible, with between one percent to 10 percent probability in the next year, or at least one chance in the next 100 years.
- The duration of the event will be long and will last between seven to 30 days.
- There will be six to 12 hours warning for the onset of the event.
- Magnitude of the event is critical, likely to impact the whole county.
- The overall impact to the full county will be high.
- Volcano has a high overall risk.

17.3 Location

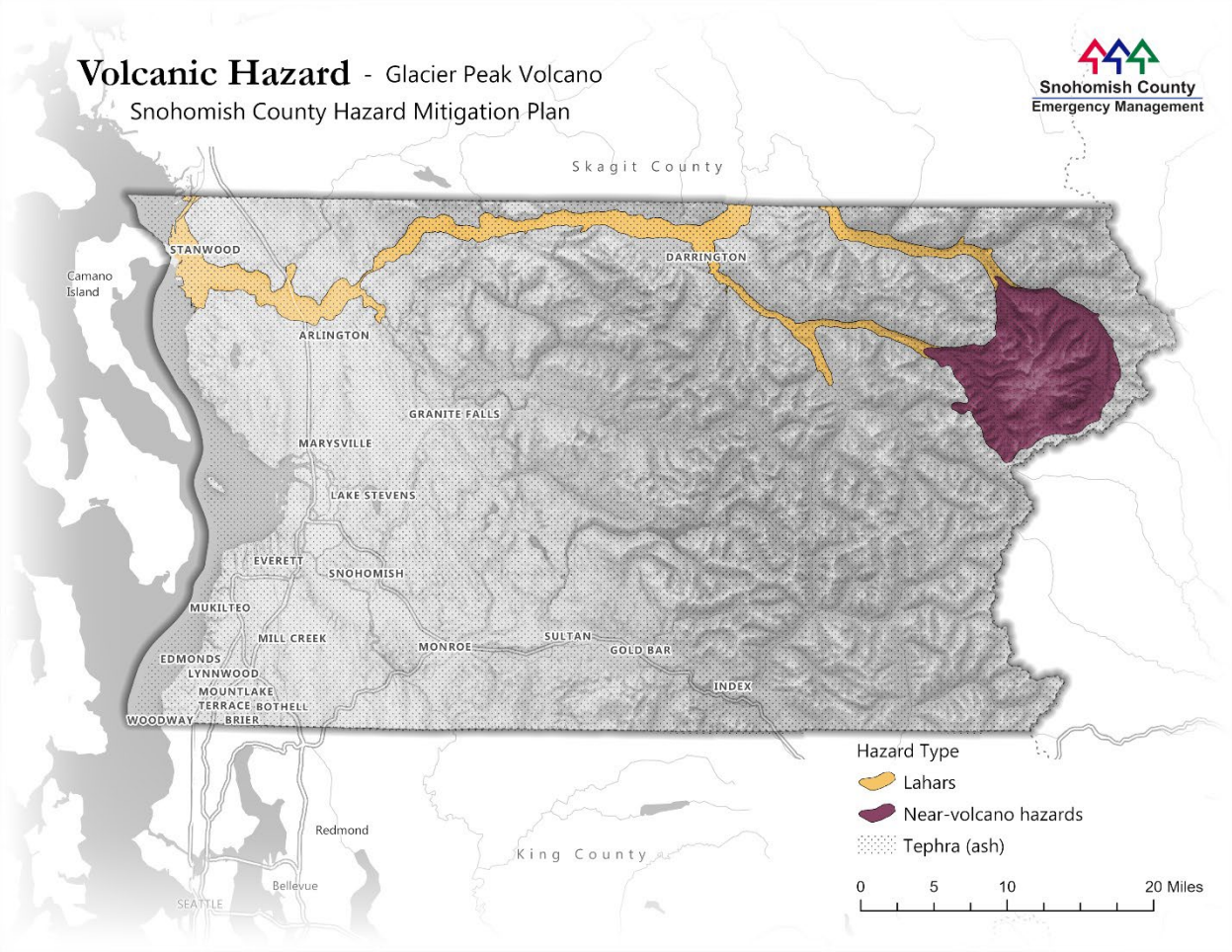
Washington's five volcanoes are scattered along the Cascade Range. Mount Baker and Glacier Peak are located in the north of the state, Mount St. Helens and Mount Adams are located in the south, and Mount Rainier is central.

Glacier Peak, located in eastern Snohomish County, is a major Cascade stratovolcano thought to have erupted as recently as the 18th century. With the exception of Mount St. Helens, Glacier Peak has produced larger and more explosive eruptions than any other Washington volcano. [147] Glacier Peak is the only volcano capable of producing a lahar within the county.

The entire county is at risk of volcanic ash impacts from a Glacier Peak event and could be impacted by ashfall from other Washington state volcanoes.

[147] Mastin, L. and Waitt, R. US Geological Survey. Fact Sheet 058-00. 2000. "Glacier Peak — History and Hazards of a Cascade Volcano."

Map 15: Volcano Hazard

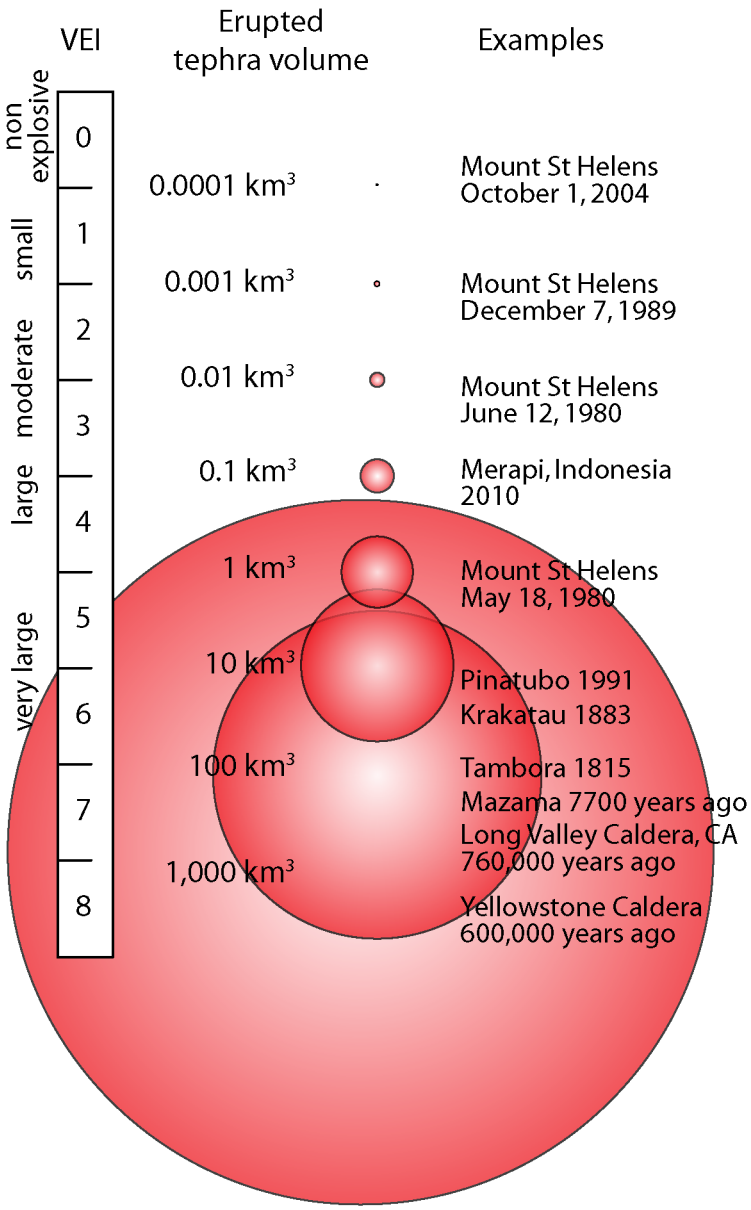


17.4 Extent

The Volcanic Explosivity Index (VEI) is a scale used to measure the size of explosive volcanic eruptions. [148] Ranging from 0 to 8, the VEI is a logarithmic scale, comparable to the way earthquake magnitude is measured. Each increment on the VEI represents a ten-fold increase in eruption size. The scale considers factors such as the volume of magma erupted and the height of the eruption column. The 1980 eruption of Mount St. Helens, for instance, produced an eruption column that reached approximately 15 miles in height.

[148] Yellowstone Volcano Observations. US Geological Survey. 2022 "The Volcanic Explosivity Index: A tool for comparing the sizes of explosive volcanic eruptions."

Figure 16: Volcanic Explosivity Index



Source: U.S. Geological Survey

Constant monitoring of the Cascades volcanoes by the USGS Cascades Volcano Observatory and the Pacific Northwest Seismic Network (PNSN) means that scientists are monitoring the background level of activity to identify warning signs of an impending eruption. Typically, stratovolcanoes in the Cascades undergo weeks to months of unrest before eruption. An important consideration for Glacier Peak is its location in a remote and protected wilderness area. There is only a single seismometer on the volcano, despite its

ranking among the highest-threat volcanoes in the country. [149] By comparison, Mount St. Helens has around 21 seismometers. The USGS is currently in the process of improving the monitoring network for Glacier Peak, but in the present situation, scientists have somewhat reduced ability to detect seismic unrest.

A lahar is a type of mass earth movement capable of widespread destruction. Lahars from the 1980 eruption of Mt. St. Helens destroyed 27 bridges, over 200 homes, and more than 85 miles of roads. In addition to this immediate damage, lahars residue caused increased sediment deposits in nearby rivers for years after the eruption. The lower Columbia River required dredging multiple times, and the Army Corps of Engineers spent more than $1 million building a sediment retention structure. [150]

A one-inch deep layer of ash weighs an average of 10 pounds per square foot, increasing the risk of structural collapse due to excessive weight. Ash may also carry a high static charge for up to two days after being ejected from a volcano. When an ash cloud combines with rain, sulfur dioxide in the cloud mixes with the rainwater to form diluted sulfuric acid that may cause minor, but painful burns to the skin, eyes, nose, and throat. Ash in the atmosphere can also interfere with communications and transportation. [151]

17.5 Past Events

Glacier Peak unleashed a powerful sequence of explosive eruptions about 13,600 years ago, which generated voluminous pyroclastic flows and tephra that traveled as far away as Wyoming. Between 5,000 and 7,000 years ago, the volcano developed domes that eventually collapsed to form numerous pyroclastic flows and sent fine ash far downwind. Smaller dome forming eruptions have occurred at least six times in the past 4,000 years. The last of these, 300 to 500 years ago, produced thin ashfalls but no pyroclastic flows. [152]

USGS scientists have found evidence of large prehistoric lahars from Glacier Peak for most of these eruptive episodes. During the eruptions of 13,600 and 5,000 to 7,000 years ago, lahars and post-eruption sedimentation filled the Sauk Valley at Darrington, switching the Sauk River's course down the North Fork Stillaguamish River to its current path flowing north into the Skagit River [153]

[149] Glacier Peak. USGS. 2023. "Earthquake Monitoring at Glacier Peak."
[150] Mount St. Helens. USGS. 2023. "Lahar Hazards at Mount St. Helens".
[151] WA Emergency Management Division. 1999. "Volcanic Ashfall: How to Prepare for an Ashfall."
[152] Glacier Peak. USGS. 2023. "Eruption History of Glacier Peak."
[153] Mastin, L. and Waitt, R. US Geological Survey. Fact Sheet 058-00. 2000. "Glacier Peak — History and Hazards of a Cascade Volcano."

The 1980 eruption of Mount St. Helens buried 23 square miles of the North Fork Toutle River and generated a pyroclastic flow that covered 230 square miles north of the volcano, causing 57 fatalities and receiving a federal disaster declaration. [154]

For a full list of historical disaster declarations in Snohomish County, see Appendix E.

17.6 Probability of Future Events

Volcanoes have been erupting in the Cascade Range for over 500,000 years with an average rate of one to two per century during the last 4,000 years [155]. Future eruptions are certain, and it is anticipated that these active volcanoes will continue to erupt at a similar rate over the next several centuries. The USGS classifies Glacier Peak, Mount Adams, Mount Baker, Mount Hood, Mount St. Helens, and Mount Rainier as potentially active volcanoes that would impact the county. According to the Washington State Enhanced Hazard Mitigation Plan, there is a 2.5 percent chance each year that a volcanic disaster could lead to a formal disaster declaration. [156]

17.7 Climate Change Considerations

Future climate conditions are not expected to impact the hazard from volcanic eruptions, but volcanic eruptions can influence climate, primarily through the release of gases, aerosols, and ash into the atmosphere. While volcanic ash, which is injected into the stratosphere during major explosive eruptions, typically falls back to Earth within days or weeks and has little lasting impact on climate, the gases released can have significant effects. [157]

17.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Volcano are summarized in Table 43.

[154] Mount St. Helens. USGS. 2023. "1980 Cataclysmic Eruption."
[155] Meyers, B. and Driedger, C. USGS. 2008. "Eruptions in the Cascade Range During the Past 4,000 Years."
[156] Washington Emergency Management Division (EMD). Washington State Enhanced Hazard Mitigation Plan. 2023. "Volcano."
[157] Volcano Hazards Program. USGS. Accessed August 2025. "Volcanoes Can Affect Climate."

Table 43: Volcano Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	High	The Town of Darrington and residents along SR 530 are directly in the lahar flow hazard zone for a Glacier Peak eruption with limited routes to evacuate the area. Fine ash may cause regional health impacts – especially respiratory for the duration of ash fall or during any ash resuspension by strong winds.
First Responders	High	First responders would be directly impacted through their response in evacuating the residents from the lahar zone, health impacts from ashfall, high volume of calls for service during the event, and slick and dangerous roads due to ash.
Continuity of Operations	Moderate	Potential impacts could include damages to infrastructure, equipment including machinery and vehicles, inaccessibility to service areas, obstruction of transportation routes and health impacts to residents and the workforce. Services provided by other government agencies and basic service providers might include interruption of: power, phone and cell phone service, emergency medical service, fire and law enforcement, water systems, and health/medical facilities.
Facilities and Infrastructure	Moderate	Health systems would be impacted by an expected dramatic rise in demand for services from ash-related respiratory distress and lahar-related injuries. Ash can short out electrical systems and cause widespread power failure. Water systems, including reservoirs, could quickly clog with ash, potentially polluting water supply. Electrical and communication systems can be severely impacted during ashfall.
Economy	Moderate	Aviation interruption would likely occur from airborne ash. Ash would affect all internal combustion engines or vehicles, clogging filters. This would impact the workforce and movement of food, supplies and repair crews. Volcanic ash can also have major impacts on agriculture if feed and water sources are not protected.
Environment	High	Any significant volcanic activity at Glacier Peak would have an impact on the environment. Ashfall, pyroclastic flows, large landslides, and lahar

		activity would directly impact birds, fish, mammals, reptiles, amphibians, trees, and vegetation. Sediment deposition would impact rivers that support salmon and steelhead spawning. Large landslides and lahars may change the course of rivers entirely. Lahars may cause incidental hazardous material releases that harm birds, fish and other wildlife. Recreational use of ski areas and hiking trails would also be impacted.
Public Confidence	Moderate	Since the 1980 Mount St. Helens eruption, investments in research, volcano monitoring, and public outreach have increased the ability of the USGS to detect early signs of unrest and coordinate with local officials to communicate factual, reliable, and actionable information to government authorities and the public. Currently, there is concern about the lack of monitoring on Glacier Peak after installation of additional monitoring stations was delayed. [158]
Vulnerable Populations	High	Communities in the lahar hazard zone of Glacier Peak are most vulnerable to a large lahar generated by an eruption. Communities further down valley are vulnerable to excessive river sedimentation in the aftermath of an eruption and lahar. Populations vulnerable to respiratory distress brought on by ash can experience the disruption of daily life, with ash being a major threat to people with medical vulnerabilities. Populations that recreate in the Glacier Peak wilderness or work in the area are most susceptible to near-volcano hazards that can affect the immediate surroundings within minutes.
Property	High	Property damage from lahars can include complete inundation and destruction of any property in the lahar's path. Furthermore, property damage that can occur from ash fall include obstructed filters in HVAC systems, clogged drainage systems in gutters, and corrosion on metal roofs.

[158] Donovan, L. FOX 13 Seattle. 2024. "Glacier Peak's critical monitoring delayed. What this means for WA residents."

Chapter 18 Wildfire

18.1 Hazard Description

A wildfire is an unplanned, unwanted fire burning in a natural area such as a forest, grassland, or prairie. Wildfire is a historically natural phenomenon that has played a role in reshaping and regenerating our ecosystems. However, the dangers wildfires can pose are significant. Wildfires can damage natural resources, destroy homes and structures, and threaten the safety of the public and first responders. While Snohomish County and all of western Washington have historically been viewed as having a relatively low fire risk, the dense vegetation in our forests can serve as an abundant source of wildfire fuel if conditions are right. In the last decade, the region has been experiencing drier summers and longer fire seasons, with approximately 30 percent to 40 percent of wildfire starts in Washington occurring on the west side of the Cascade Crest. [159] Meanwhile, more and more people are moving into the wooded areas of Snohomish County with a higher likelihood of exposure to fire.

How a fire behaves depends on the following:

- **Fuel:** Fuel Load and fuel type (e.g., vegetative underbrush under the canopy) both impact fire behavior. Lighter fuels such as grasses, leaves, and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs, and trunks take longer to warm and ignite. Dead, dying, and diseased trees present a higher hazard.
- **Weather:** Strong, dry winds and low relative humidity play large roles in determining extreme fire conditions.
- **Terrain:** The topography of a region influences the amount and moisture in fuel, the impact of weather conditions (such as temperature and wind), potential barriers to fire spread (such as highways and lakes), and elevation and slope of landforms (uphill vs. downhill). South facing slopes, box canyons, and saddles can intensify fire spread.

To address concerns related to wildfire, Snohomish County and partners in 2025 collaborated on drafting a countywide Community Wildfire Protection Plan (CWPP) that expands upon items listed in this chapter and describes concerns, risk factors, and effective wildfire mitigation actions. Once adopted, actions or mitigation plans listed in the

[159] Flatt, C. Oregon Public Broadcasting. 2022. "Washington's 2022 fire season has been the mildest in a decade."

Snohomish County CWPP will be considered a part of the Snohomish County Hazard Mitigation Plan. You can find the full Snohomish County CWPP in Appendix H.

18.2 Hazard Ranking

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate a total average score and rank, enabling the prioritization of hazards by type. The results for Wildfire are summarized in Table 44.

Table 44: Wildfire Probability Ranking Average Results

Frequency	Duration	Onset	Magnitude	Impact Average	Overall Risk	Rank
3	4	3	2	2.35	High	2

Probability and Ranking Summary

- Frequency of the event is likely, with between 10 percent to 100 percent probability in the next year, or at least one chance in the next 10 years.
- The duration of the event will be long and will last between seven to 30 days.
- There will be six to 12 hours warning for the onset of the event.
- Magnitude of the event is limited, likely to impact multiple jurisdictions.
- The overall impact to the full county will be moderate.
- Wildfire has a high overall risk.

18.3 Location

There are almost 1 million acres of forestland within Snohomish County. The majority of our forest acreage is managed by the US Mount Baker-Snoqualmie Forest, in addition to Washington State Department of Natural Resources, Tribal ownership, Snohomish County Department of Conservation and Natural Resources, collaborative timber investments, and private timber stands. Table 45 shows the ownership of forestland in Snohomish County. Forestlands dominate the east side of the County in the mountains and foothills, and some communities are intermixed with second-growth forest in the lowlands, especially in the north county. Most of the forests outside of the wilderness areas have been previously harvested and contain second-growth conditions where tree stands are more dense than historic, old growth forests.

Table 45: Estimated Forestland by Ownership in Snohomish County 2025 [160]

Ownership/Management Type	Acreage
Federal	591,884
State	170,775
County	4,584
Private	211,353
Tribal	15,671
Total	**994,267**

The Federal Register defines the Wildland Urban Interface (WUI) as "a community [that] exists where humans and their development meet or intermix with wildland fuel."

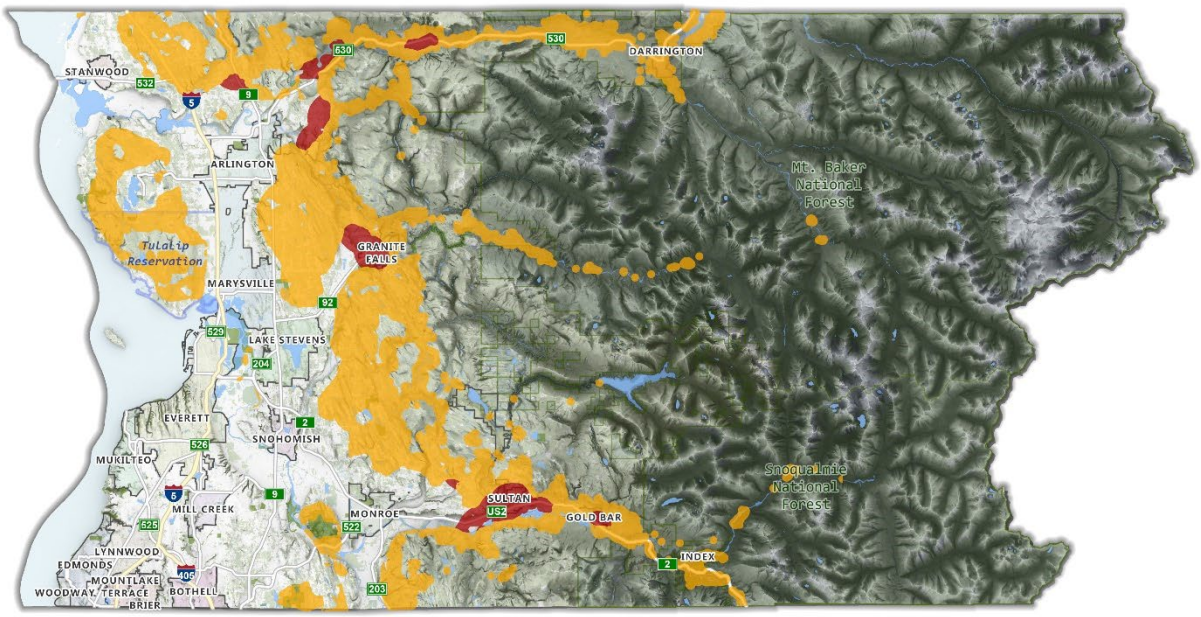
It is characterized into three categories Intermix, Interface, and Occluded communities and defined as:

- **Interface Community**: According to the Federal Register, the Interface Community exists where structures directly abut wildland fuels. In an interface community there is a clear line between the wildland fire fuel sources and the developed community. Densities within these communities average three structures per acre or alternatively can be defined as a community with 250 people or more per square mile.
- **Intermix Community**: The Intermix Community exists where structures are scattered throughout a wildland area. There are no clear lines of development between the vegetation and built structures in these areas, and densities can range from a few structures close together to one structure per 40 acres, or alternatively as 28-250 people per square mile.
- **Occluded Community:** The Occluded Community generally exists in a location, often within a city, where structures abut an island of wildland fuels (e.g., park or open space). Development densities are similar to Interface Communities, but the occluded area is typically smaller, less than 1,000 acres in size, and is present within or around the development of the community.

[160] The "Forest Ownership CONUS" data product from the US Forest Service provided the basis for these estimations. Per USFS, "this data product contains raster data depicting the spatial distribution of forest ownership types in the conterminous United States circa 2020. The data are a modeled representation of forest land by ownership type, and include three types of public ownership: federal, state, and local, as well as three types of private: family (includes individuals and families), corporate, and other private (includes conservation and natural resource organizations, unincorporated partnerships and associations, and Native American tribal lands)".

Roughly 130,000 people live within WUI areas of Snohomish County, including parts of the following communities: Arlington, Darrington, Gold Bar, Granite Falls, Index, Monroe, Snohomish, Stanwood, and Sultan.

Map 16: Snohomish County WUI [161]



18.4 Extent

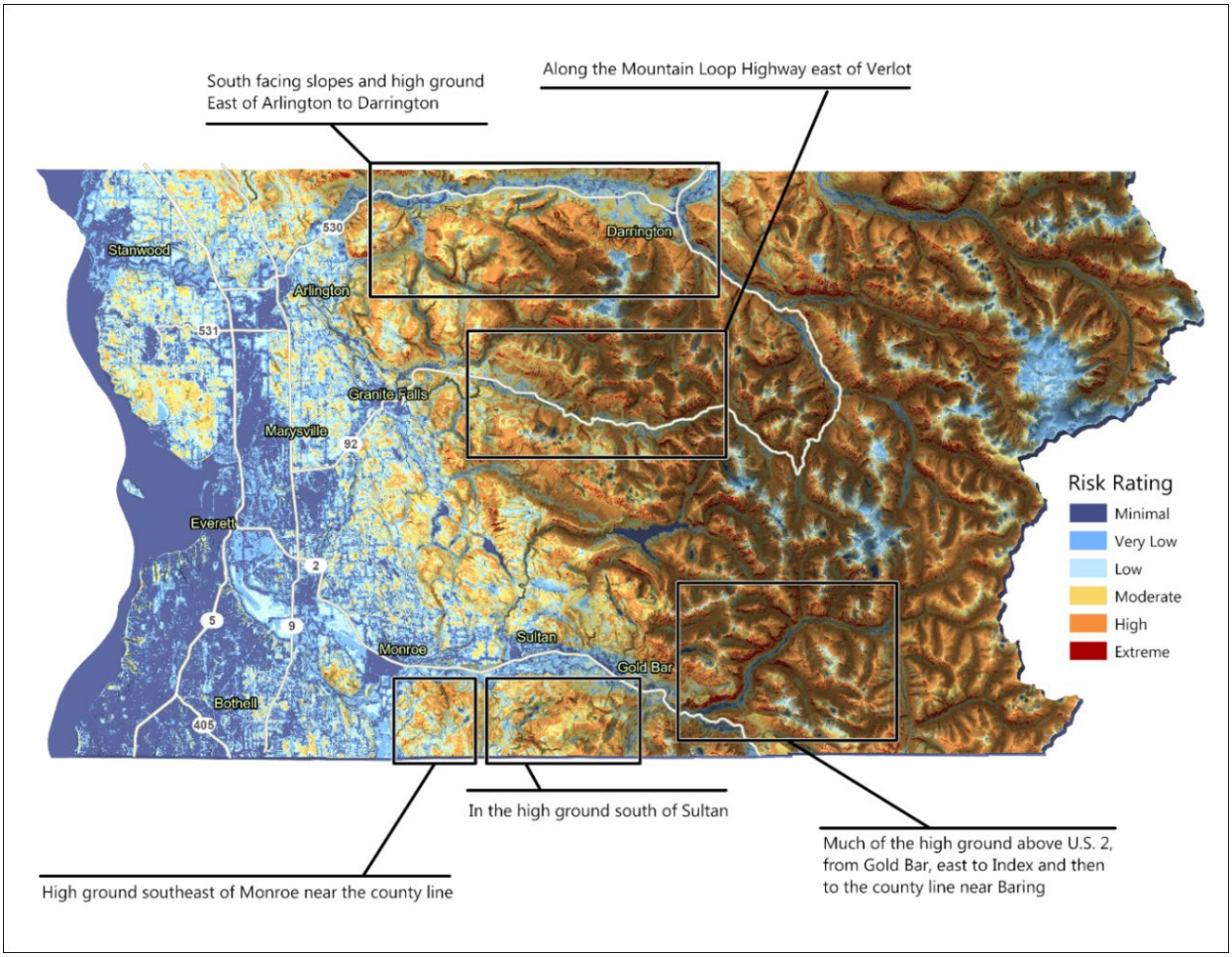
Wildfire

Many factors contribute to wildfire risk, and there are no definitive methods for predicting when, where, or how intense a wildfire will be. By borrowing from existing standards and models used by the National Fire Protection Agency and the National Park Service for determining the amount of wildfire risk a particular structure is exposed to, a similar method was used to estimate the relative risk faced by structures in Snohomish County. These models rely on combining factors that contribute to wildfire risk in a given area, such as the amount and type of vegetation, the slope and aspect of the terrain, the presence of nearby water, the number of roads nearby, the presence of barriers to firefighting

[161] The Washington State Legislature is working with the Washington Department of Natural Resources (DNR) to develop a WUI map that will designate where WUI related State building code will be enforced. Until the WA-WUI map is available for use, Snohomish Cunty DEM has used best available science and data to develop the Snohomish County WUI Planning and Prevention Map to use for planning purposes only. For more information please go to Wildland-Urban Interface in Snohomish County.

apparatus, and more. GIS analyses were used to identify areas of the county most at risk, which generally include heavily vegetated slopes in rural areas with southern exposure. [162]

Map 17: Wildfire Risk in Snohomish County



While a fire is actively burning, its impact can be measured several ways. The size of a fire is often typically communicated to the public by the number of acres burned. Within the first responder community, wildfires are categorized by the complexity of a response using Incident Command System (ICS) typing.

Table 46: Incident Command System (ICS) for wildfire response

Type	Description
Type 1	• Multi-agency and national resources • Large number of personnel and equipment are assigned to the incident • It is a large, complex incident
Type 2	• Large number of resources utilized

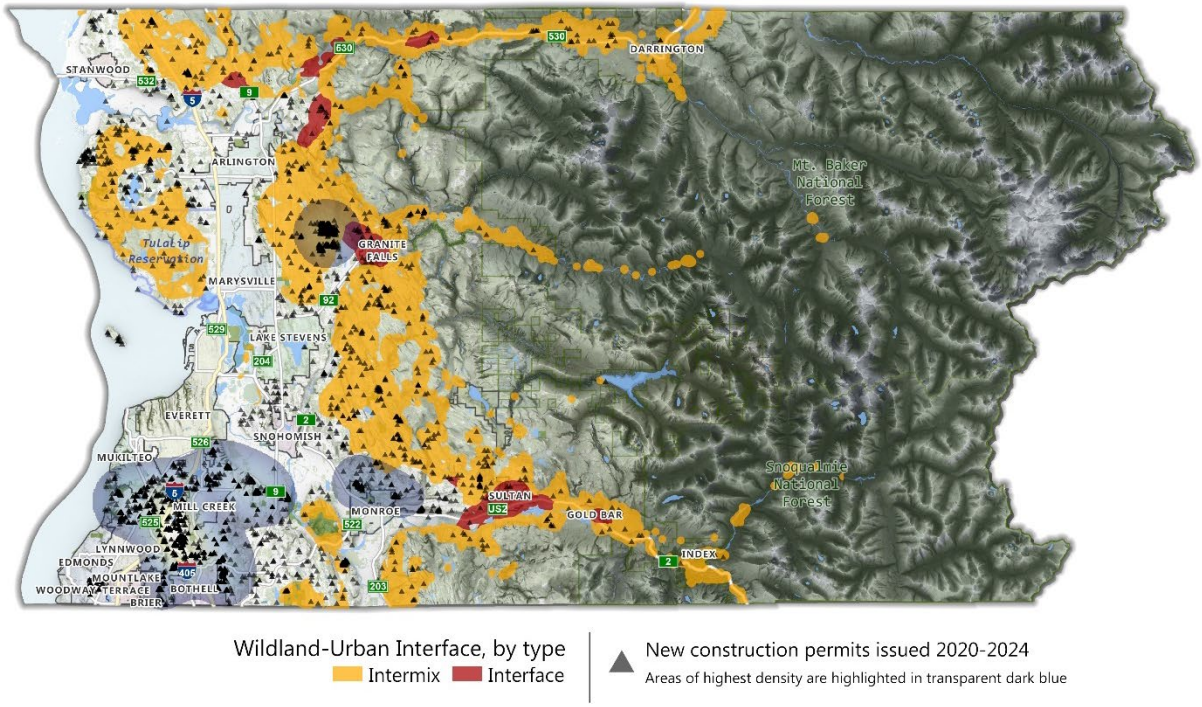
[162] Snohomish County Department of Emergency Management. 2023. "Wildfire Risk Analysis."

Type	Description
	• Incident extends into multiple operational periods • Significant logistical support is required
Type 3	• Extended initial attack on wildland fires • Resources may vary from several single resources to several task forces or strike teams • May extend into another operational period (12 hours), and require an Incident Action Plan (IAP)
Type 4	• Initial attack or first response to an incident • Few resources are used (several individuals or a single strike team) • Normally limited to one operational period
Type 5	• Very small wildland fire only • Short duration • Few resources assigned (generally less than 6 people) • Little complexity

In the last five years the County has issued nearly 5,000 total building permits**,** including 1,051 permits within the WUI areas. Of those, 52 were issued within the Interface area and 999 within the Intermix area. The following map shows a breakdown of permits issued in the WUI planning layers. [163]

[163] County permitting data does not consistently track accurate permitted building locations within the parcel. Chapter 3 describes the process the County follows to minimize the exposure of new construction on parcels which overlap with known WUI areas.

Map 18: Wildfire Hazard – New construction permits issued 2020-2024



Smoke

Wildfire smoke contains a mixture of very small particles and gases. The composition of wildfire smoke is related to the fire conditions and materials burned, which varies between fire events. Some fires predominantly burn vegetation, while others that enter WUI areas can also burn vehicles, structures, or other materials that may cause more severely degraded air quality.

Particulate matter is the principal public health threat from exposure to wildfire smoke. Particulate matter is a general term for particles suspended in air, usually a mixture of solid and liquid droplets. The size of the particles impacts their potential health effects. Particles larger than 10 micrometers in diameter do not typically reach the lungs. Particles with diameters less than 10 micrometers (PM10) can be inhaled into the lungs and affect the lungs, heart, and blood vessels. PM2.5 (also known as fine particulate matter) is especially concerning and refers to particles 2.5 micrometers or smaller. While the size of particles from wildfire smoke varies, approximately 90 percent of total particle mass emitted from wildfires is PM2.5 or smaller. [164]

[164] Office of Air Quality Planning and Standards. 2019. "Wildfire Smoke A Guide for Public Health Officials Revised."

The EPA uses the Air Quality Index (AQI) to communicate air quality conditions to the public. The AQI converts pollutant concentrations (including PM) to a numeric scale from 0 to 500. Higher AQI values correspond to greater levels of air pollution and health concerns. AQI values are reported in six color-coded categories ranging from good to hazardous. For example, AQI values ranging from 101 to 150 are considered unhealthy for sensitive groups.

Table 47: Air Quality Index Levels of Concern [165]

Levels of Concern	Values of Index	Description of Air Quality
Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The public is less likely to be affected.
Unhealthy	151 to 200	Some members of the public may experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

18.5 Past Events

According to the Washington State DNR Large Fire Dataset (1973 – 2023) there have been 12 large wildfire events in Snohomish County. The four largest fires, Bolt Creek, Suiattle River, Downy Creek and Dome Peak have occurred in the last five years. [166] Prior to 2003, there were no recorded large wildfires within Snohomish County. However, historic records have shown that wildfires have raged through the Snoqualmie and Skykomish valleys in the past. This notably includes a series of fires that burned in 1893 between Skykomish and Wellington along what is currently Stevens Pass, that spread from a large fire burning along what is now Snoqualmie Pass. [167]

[165] US Environmental Protection Agency (EPA). Accessed August 2025. AirNow.gov
[166] Washington State Department of Natural Resources. Accessed August 2025. "Washington Large Fires 1973-2023."
[167] Snoqualmie Valley Historical Society Board. 2022. "Honoring Our Valley History: Past Fires of the Snoqualmie Valley."

Between 2020 and 2024, people in Snohomish County experienced 21 days of air quality index numbers that were unhealthy for sensitive groups, 14 days of unhealthy air quality for everyone, four days of very unhealthy air quality and one day of hazardous air quality. [168]

Table 48: Historical Air Quality in Snohomish County, 2014-2024

Year	# Days Good	# Days Moderate	# Days Unhealthy for Sensitive Groups	# Days Unhealthy	# Days Very Unhealthy	# Days Hazardous
2024	262	104	0	0	0	0
2023	246	116	2	1	0	0
2022	210	129	13	6	3	1
2021	248	114	3	0	0	0
2020	234	122	3	3	4	0
2019	227	136	1	0	0	0
2018	260	96	5	4	0	0
2017	244	105	13	3	0	0
2016	278	85	3	0	0	0
2015	238	112	10	2	0	0
2014	241	120	4	0	0	0

18.6 Probability of Future Events

As the climate changes, there is a greater likelihood that high temperature and dry conditions will be present along with the already-existing topographic, wind, and fuel conditions necessary to support a large fire. The trend of development continuing to densify in the wildland-urban interface isn't expected to change and many communities have limited ingress and egress routes.

18.7 Climate Change Considerations

Fire in western ecosystems is determined by climate variability, local topography, and human intervention. As the climate changes, it is expected to lengthen the fire season and increase the likelihood of more wildfire in western Washington. Prolonged summer heat, combined with high density forests and areas of poor forest health, is increasing fire risk. Future climate conditions have the potential to affect multiple elements of the wildland fire system: fire behavior, ignitions, fire management, and vegetation fuels. Hotter and drier

[168] Puget Soung Clean Air Agency. 2025. "Air Quality Data Summary."

conditions are two of the three factors that influence fire behavior and make a wildfire significantly more likely to occur.

18.8 Impact and Vulnerability Assessment

Planning partners and stakeholders completed a hazard ranking survey for a range of hazard-related factors. The full ranking matrix can be found in Appendix E. The results of the survey were averaged together for each factor to generate the average impact. This list is not all inclusive and there may be other impacts and vulnerabilities not noted. The results for Wildfire are summarized in Table 49.

Table 49: Wildfire Impact and Vulnerability Ranking

Category	Impact	Discussion
Public	Moderate	Smaller communities in the foothills are located along major state or U.S. highways without alternative routes in or out. Foothill communities depend on goods and services in the lowlands, and long-term highway closures can be a major disruption to business and life. Air quality issues will impact the public across the full county.
First Responders	High	The growing number of wildfires will increase risk to firefighters. With an increase in WUI fires, firefighting becomes more complex and dangerous. Also, communities without proper ingress/egress routes exacerbate risk to firefighters who may be called upon to attempt evacuations in such communities. As climate change helps fuel wildfires across the United States, increasing frequency and severity of fires and extending wildfire season, it increases the strain on firefighting resources.
Continuity of Operations	Moderate	Most government operations and facilities are in the more urban areas of the county and unlikely to be directly impacted by wildfires but rural communities in the WUI areas are more likely to be directly threatened by wildfire or face evacuations. A major wildfire might occupy most of the county's first responder capabilities, pulling resources from other sectors and parts of the county through mutual aid. Smoke can cause an increase in employee absenteeism.
Facilities and Infrastructure	Moderate	Critical infrastructure could be at risk as well, including the Everett, Darrington, and Index water

		systems which are located adjacent to and within forested lands. Potential fire risks for these utilities include damaged transmission lines, poles, transformers, substations. For water utilities, wildfires can affect more than just infrastructure. Both fire debris and fire retardants can impact water quality in reservoirs, as can debris flows post-fire. Long term power outages due to wildfire damage or response could trigger widespread impacts to customers including lost food, wi-fi and communication outages, cell tower outages, cooling and heating issues and medical device charging.
Economy	Moderate	The biggest impact of wildfire on the logging industry is the economic loss of timber from wildfire damage. Some forest stands are on long harvest rotations and can take many decades to return to their pre-fire timber value. Loss of timber stands from wildfire also impacts logging, milling, trucking and shipping jobs, and, according to the USFS. can have emotional impacts to foresters and ecologists who may have spent years preparing for a timber harvest, only to lose it to wildfire. A high-severity wildfire impacting structures could cause significant economic impact to an affected community for years. Disaster recovery is a lengthy process, and a wildfire would likely result in displacement of residents and impact local housing stock and prices.
Environment	Moderate	While wildfires can be beneficial to the landscape, a major wildfire can be damaging in the near term. Fires can pollute water systems and destroy old growth habitat. They can burn over springs and increase evaporation. Following extreme fires, hydrophobic soils make it difficult for plants to regrow and the runoff over these soils increases the turbidity of local streams, endangering fish and other water animal populations.
Public Confidence	Moderate	Wildfire hazards have gained renewed importance in recent years. WUI wildfires are particularly destructive and deadly, and several recent such fires resulted in mistrust for responding

		institutions. Government will need to be proactive in managing this hazard, communicating clearly throughout a response, and commit to recovery in order to maintain public confidence, which is difficult to earn and easy to lose.
Vulnerable Populations	High	Exposure to wildfire smoke can cause serious health effects, and everyone should take steps to reduce their smoke exposure during wildfire smoke events. Some individuals are especially sensitive to smoke exposure, including people with asthma or other respiratory diseases, cardiovascular disease, children, pregnant people, older adults, low-income households, unsheltered individuals, and outdoor workers. Power shut offs for fire response or ignition prevention, whether planned or not can also have major impacts on individuals in the community. A long-term outage could spoil fresh foods, and prevent people from acquiring critical goods such as gas and food. Individuals who are dependent on medical equipment may have issues keeping their equipment running during a long-term power outage.
Property	Moderate	There are several factors that put a structure at higher risk of damage from a wildfire. Buildings in the WUI that do not have sufficient defensible space surrounding them are likely to be damaged if directly exposed to wildfire. This includes homes with flammable roofs, proximity to dense brush or timber, or tightly packed neighborhoods with space between buildings. Structures built in interface or intermix areas are more likely to be exposed to fires, including from spotting and embers ahead of a fire.

Chapter 19 Plan Adoption and Maintenance

19.1 Overview

44 CFR requires hazard mitigation plans to outline a plan adoption process (Section 201.6.c.5) and a plan maintenance process that includes the following (Section 201.6.c.4):

- The method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle;
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate; and
- A discussion of how the community will continue public participation in the plan maintenance process.

This chapter details the formal process that will ensure that the Snohomish County Hazard Mitigation Plan will meet these requirements and remain an active and relevant document.

19.2 Plan Adoption

Section 201.6(c)(5) of 44 CFR requires documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval must document that it has been formally adopted. This plan will be submitted for a pre-adoption review to both WA EMD and FEMA prior to adoption. Once pre-adoption approval has been provided by WA EMD and FEMA, all planning partners will formally adopt the plan update. All planning partners understand that Disaster Mitigation Act of 2000 compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners are on file with Snohomish County Department of Emergency Management and are included in their annexes located in Volume 2.

19.3 Plan Implementation and Maintenance

The effectiveness of the hazard mitigation plan depends on the implementation of the plan and incorporation of the outlined action items into existing partnership plans, policies, and programs. The updated plan includes a range of action items that, if implemented, would reduce losses from hazard events in the Snohomish County planning area. Together, the action items in the plan update provide the framework for activities that the partnership can choose to complete over the next five years. Every five years the entire plan will be reevaluated and revised. The Core Planning Team and Planning Committee have

established goals and objectives and have prioritized identified mitigation actions that will be implemented through existing plans, policies, and programs.

Snohomish County DEM will assume lead responsibility for planning and facilitating implementation and maintenance coordination. DEM will act as the county's point of contact for this plan and linkage procedures as outlined in Volume 2. Although DEM will have primary responsibility for coordination, plan implementation and evaluation will be a shared responsibility among all planning partners and agencies identified as lead agencies in the mitigation action plans.

19.4 Annual Progress Report

Resilience and risk reduction are ongoing commitments. The mitigation plan is a long-term strategy to reduce disaster losses. The Annual Progress Report is the opportunity for planning partners to own their mitigation efforts, keep track of actions as they go forward over time, document any changes, and highlight mitigation successes over time.

Public Planning Committee

The Public Planning Committee is made up of volunteers and paid staff who contributed greatly to the development of the updated plan and will remain as a viable body involved in key elements of the plan maintenance strategy. The Public Planning Committee should include representatives of the planning partner organizations that submit an annex, the residents of Snohomish County, and other stakeholders. They will convene annually to provide input on the Annual Progress Report. Organizations who completed annexes will submit updates on the progress to their mitigation strategies. All other members will review the content and provide input and feedback for future plan updates. The make-up of this committee can be dynamic, which will allow differing views and for participants to have a say in the implementation of the plan. DEM will strive for true "stakeholder" representation on this committee. Individuals involved in this plan update process will be contacted and given the option to remain involved in the process.

Annual Progress Report Methodology

For continuity, a mitigation strategy evaluation form based on the Community Rating System (CRS) evaluation form will be used by each organization with a completed annex to submit progress updates on their mitigation strategies. The evaluation will include:

- A review of successful mitigation strategies identified in the plan;
- A brief discussion about why targeted strategies were not completed;

- Re-evaluation of the action plans to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term project because of funding availability);
- Recommendations for new projects; and
- Changes in or potential for new funding options (grant opportunities).

The Mitigation Action Evaluation forms are provided in Appendix F.

DEM will present the completed Annual Progress Report to Snohomish County Tomorrow, a cooperative and collaborative public inter-jurisdictional forum consisting of representatives from the County and 19 of the cities as well as the Tulalip Tribes. The final report will be submitted to the County Council

The CRS program requires a recertification submitted by October 1 of every calendar year for which the community has not received a formal audit. To meet this recertification timeline, DEM will strive to complete this progress report process between June and September each year.

Table 50: Annual Progress Report Roles and Responsibilities

Role	Responsibilities
DEM	• Kick-off the Annual Progress Report Progress; • Provide the Mitigation Strategy Evaluation Form to planning partners; • Compile information and complete the report; • Post on the website page dedicated to the Snohomish County HMP; • Present in the form of a council/board report to all participating jurisdictional governing bodies; and • Provide as part of the Community Rating System annual re-certification package.
Public Planning Committee	• Complete the mitigation strategy evaluation form for their organization; • Provide input on countywide mitigation strategies; • Review completed report and provide input.

19.5 Plan Updates

44 CFR requires that local HMPs be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the Disaster Mitigation Act of 2000 (Section 201.6(d)(3)). The planning partnership intends to update the plan on a five-year cycle from the date of initial plan adoption. Future updates will build on the contents of the

current plan. Based on needs identified by the planning partners, this update will, at a minimum, include the elements below:

- The update process will be initiated by DEM and use representatives from the existing Public Planning Committee;
- The hazard identification and risk assessment will be reviewed and, if necessary, updated using best available information and technologies;
- The mitigation action plans will be reviewed and revised to account for any strategies completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms, as appropriate (such as the general plan);
- The draft update will be sent to appropriate agencies and organizations for comment;
- The public will be given an opportunity to comment on the update prior to adoption; and
- The governing bodies of partners completing a jurisdictional annex will adopt their respective portions of the updated plan.

19.6 Continuing Public Involvement

The public will be regularly updated on the status of hazard mitigation actions through the Snohomish County website, and county-operated social media platform, when appropriate. Annual updates will not only highlight the progress of specific mitigation actions but also offer concise summaries of completed and ongoing efforts. Copies of the HMP Annual Progress Reports will be distributed to stakeholders and the media and will be viewable online through the county website. The county also maintains an interactive Hazard Viewer (i.e., digital map) to engage the public and help them better understand and manage natural hazard risks. [169]

Whenever updates or addendums are introduced to the HMP, the county will actively open channels for public input. This ensures that the community remains a vital and engaged participant in the planning process. Residents, local stakeholders, and other interested parties will be encouraged to provide comments, voice concerns, and offer valuable feedback on proposed changes to the plan.

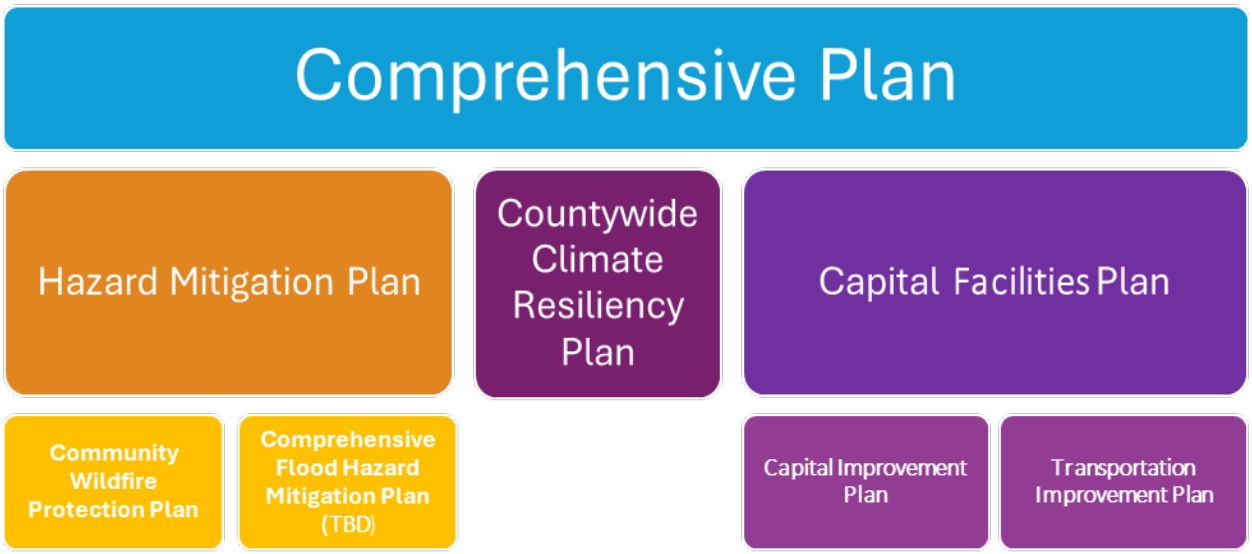
[169] Snohomish County Department of Emergency Management. Accessed September 2025. "Snohomish County Hazard Viewer."

19.7 Incorporation into Other Planning Mechanisms

The information on hazard, risk, vulnerability, and mitigation contained in this plan update is based on the best science and technology currently available. This information is invaluable for making decisions required in other planning efforts, such as critical areas planning, growth management planning, and capital facilities planning. All partners will use information from this updated plan as the best available science and data on natural hazards impacting Snohomish County and climate change resiliency. Data in the revised plan can also be a tool for other programs, such as the following:

- Land use planning
- Critical areas regulation
- Growth management
- Capital improvements
- Water Resource Inventory Area planning
- Basin planning

Figure 17: Snohomish County Plan Alignment



The HMP 2025 Update was developed in alignment with the Snohomish County Comprehensive Plan 2024 update. The DEM HMP team worked with staff from Snohomish County Planning and Development Services (PDS) during the Comprehensive Plan update to help develop and refine language in both the Natural Environment and Climate Change and Resiliency elements. The Natural Environment element of the Comprehensive Plan includes goals and policies to designate and protect both frequently flooded areas and geological hazard areas. Goal NE 8 and Objective NE 8.A state, "*Protect the health, safety, welfare, and the economy of the community by minimizing the risks associated with*

natural hazards" and directs the County to adopt and implement a Natural Hazards Plan and consider natural hazards in all land use planning.

Policy NE 8.A.2 recommends that the County adopt an integrated flood management approach that includes joint flood hazard planning and interlocal agreements with cities, tribes, and state and federal agencies for consistent floodplain management. Objective NE 8.B contains the policies to review and analyze flood structure integrity and downstream impacts, reducing the number of flood damage prone structures through mitigation and regulation, using best available science and data for hazard analysis, and prioritizing mitigation strategy actions that increase public safety and reduce national flood protection insurance rates for county residents.

DEM also provided new wildfire goals and objectives in the Climate Change and Resiliency element, specifically CRE Policy 3.B.2 *"The County shall coordinate with jurisdictions and fire protection agencies to prepare for and mitigate the effects from wildfires and smoke by developing a Community Wildfire Protection Plan and coordinating fuel reduction in wildland urban interface (WUI) areas."* Public comments about wildfire risk and response received during the Comprehensive Plan Update process were also reviewed and considered during the 2025 Hazard Mitigation Plan Update.

The State of Washington recently updated the Growth Management Act to require a new Climate Change and Resiliency element to local jurisdiction Comprehensive Plans. The state allows for a Hazard Mitigation Plan to be substituted for the resiliency piece of the element, but the HMP must be developed per the guidelines found under RCW 36.70A.020(14). The HMP Update planning team consulted with planners from PDS, Public Works, and Conservation and Natural Resources (DCNR) to find existing tools and committees to better align the Hazard Mitigation Plan land use and infrastructure planning requirements with the County's recently updated Comprehensive Plan.

DEM worked with staff from PDS, DCNR, and Public Works to create the Interdepartmental Climate Resiliency Committee. This completed action item 5 under the 2020 HMP strategy SnoCo-13, *"Establish a collaborative workgroup of County Departments, municipal governments in the county, and organizations that provide public services to focus on implementation of strategies to reduce greenhouse gas emissions and adapt to changing climate"*. The ICRC has been used as a platform to align the Comprehensive Plan Update with the Hazard Mitigation Plan mitigation strategies and develop the County's vision and goals for assessing and mitigating the impacts of Climate Change.

Since the 2020 HMP update DEM has been partnering with Snohomish County Human Services and the stakeholder group Snohomish County Organizations Advancing

Readiness, Response, Recovery and Resiliency (SOAR4) to better understand the needs of people with access and functional needs and at-risk communities during disaster responses and recovery. Human Services helped develop mitigation strategies for the 2025 HMP update that address the impacts of extreme heat and periods of unhealthy air quality. The County's Surface Water Management Division (SWM) has been coordinating with DEM staff on developing projects and grant applications for nature-based solutions under their Community Floodplain Solutions program and assisted in developing the new Integrated Flood Management program that will be working to update basin-wide flood mitigation plans.

Additionally, DEM has been working with PDS and members of the County's Emergency Management Working Group to develop a process to document a natural hazard screening assessment during the biennial Capital Improvement Plan (CIP) budget process. The CIP is updated every two years and adopts the Transportation Improvement Plan inclusively. Documenting a hazard analysis during the CIP process will ensure that the impacts of natural hazards and climate change to facilities and infrastructure are included in the planning and design phases of capital projects. Since the 2025 HMP update and the CIP budget process are not on the same update schedule, project managers and planners responsible for developing the County's 2025 – 2029 CIP plan were invited to a CIP mitigation strategy workshop and asked to review their projects listed in the plan to capture any mitigation strategies included in the project design or mitigation strategies that may need additional budget or grant funding to complete. The full draft process for Snohomish County's CIP and HMP integration can be found in Appendix G.

The 2020 HMP also supported emergency planning efforts for the County and all planning partners. The Hazard Identification and Risk Assessment (HIRA) formed the basis for identifying capability goals and gaps in an emergency response, which drove planning, training, exercising, and funding decisions for the five-year period of 2021 to 2025. The updated 2025 HIRA also identified the hazards considered and prioritized in the Comprehensive Emergency Management Plan update (including the jurisdictional annexes, Emergency Support Function annexes, incident annexes, functional and operational annexes and appendices), the Snohomish County Recovery Framework, and continuity of operations plans. Future planning efforts and updates of these documents will benefit from the refined 2025 Risk Assessment conducted during the 2025 HMP update process. These HMP revisions provide the ability to assess and align specific target capabilities for preparedness, mitigation, response, and recovery efforts.

The update process accounts for incorporating new information that can enhance this plan as that information becomes available from other planning mechanisms.