FRANKLIN COUNTY

WASHINGTON

MULTI - HAZARD MITIGATION PLAN

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Part I: Planning Process

CHAPTER 1: INTRODUCTION

1.1 Introduction

Franklin County, Washington and the incorporated communities that lie within the county boundaries are vulnerable to natural, technological, and manmade hazards that have the possibility of causing serious threats to the health, welfare, and security of its residents. The cost of response to and recovery from the potential disasters, in terms of potential loss of life or property, can be lessened when attention is turned to mitigating their impacts and effects before they occur or reoccur.

This Multi-Jurisdictional All Hazard Mitigation Plan seeks to identify the county's and individual communities' hazards and understand their impact on vulnerable populations and infrastructure. With that understanding, the plan sets forth solutions that, if implemented, have the potential to significantly reduce threat to life and property. The plan is based on the premise that hazard mitigation works. With increased attention to managing natural, technological, and manmade hazards, communities can reduce the threats to citizens and through proper land use and emergency planning can avoid creating new problems in the future. Many solutions can be implemented at minimal cost and social impact.

This is not an emergency response or management plan. Certainly, the plan can be used to identify weaknesses and refocus emergency response planning. Enhanced emergency response planning is an important mitigation strategy. However, the focus of this plan is to support better decision-making directed toward avoidance of future risk and the implementation of activities or projects that will eliminate or reduce the risk for those that may already have exposure to a hazard threat.
The Franklin County Multi-Jurisdictional All Hazard Mitigation Plan was created with the goal of substantially and permanently reducing the county's vulnerability to hazards through sound public policy. By increasing public awareness of potential harm, documenting resources for risk reduction and loss prevention, and identifying activities to guide the development of the creation of less vulnerable and more sustainable communities, this plan aims to protect citizens, critical facilities, infrastructure, private property, and the natural environment.

1.2 Plan Organization

Part I of the plan provides a general overview of the plan and its planning process and identifies who was involved in revisions of the plan and the process used to develop this particular revision.
Part II contains a community profile of the county.
Part III provides a brief definition for each natural and manmade hazard. All hazards identified as affecting the county are analyzed at the county and incorporated county levels and then summarized in a hazard profile.
Part IV outlines the Mitigation Strategy and identifies the goals, objectives, and mitigation projects.
Part V details the plan maintenance process and provides a tentative timeline for updating the plan in the future.

The **Appendix** contains contact information for the planning team, meeting minutes, meeting invites, worksheets, agendas, public participation social media advertisements, website screenshots, disadvantaged community tables, plan adoption and endorsement forms, and references.

1.3 Purpose

This plan exists to identify natural and manmade hazard threats to the community, prepare mitigation management strategies to address those threats, develop short-term and long-term goals and objectives for mitigation planning, and to fulfill federal, state, and local hazard mitigation planning obligations. This plan does not address technological hazards. The intention of this plan is to enhance awareness of and provide mitigation strategies for elected officials, staff, agencies, and the public and develop actions which will minimize negative outcomes to Franklin County's citizens, the economy, and the environment due to potential natural and manmade hazard threats. The well-being of the county and local communities rests on reducing risks to life and property from a hazard, emergency or disaster.

1.4 Hazard Mitigation and Hazards

Hazard mitigation is defined as cost-effective actions that have the effect of reducing, limiting, or preventing the vulnerability of people, culture, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life, culture, and property, fall into three categories:

1. Those that keep the hazard away from people, property, and structures;
2. Those that keep people, property, or structures away from the hazard; and
3. Those that reduce the impact of the hazard on people, property, and structures.

Actions, such as mitigation measures, taken to limit the vulnerability of people, property and structures are most effective when they are practical, cost effective, and culturally, environmentally, and politically acceptable.

Hazard mitigation planning must be based on vulnerabilities and its primary focus must be on the point where capital investment and land use decisions are made. The placement of capital investments, whether for homes, roads, public utilities, pipelines, or public works, determine to a large extent the nature and degree of a community's hazard vulnerability. Once a capital facility is in place, there is little opportunity to reduce hazard vulnerability through correction of errors in location or construction. It is for this reason that often the most effective mitigation tools are zoning and other ordinances that manage development in low, moderate and high vulnerability areas and building codes that ensure new buildings are constructed to withstand the damaging forces of anticipated hazards.

Because disaster events are generally infrequent, the nature and magnitude of the threat is often ignored or poorly understood. Thus, the priority to implement mitigation measures is low and implementation is slowed. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management.

The hazards analyzed in this plan include the following:

Natural and Geological Hazards

- Drought
- Earthquake
- Flood
    - Riverine Flooding
    - Flash/Urban Flooding
- High-Hazard Dams & Levees
- Landslide
- Severe Summer Weather
    - Air Quality Incidents
    - Dust Storm
    - Extreme Heat
    - Strong Wind
- Severe Winter Weather
    - Blizzard
    - Ice Storm
    - Extreme Cold
    - Heavy Snow
- Space Weather
- Tornado
- Volcano
- Wildfire

Other Hazards of Concern

Although non-natural hazards are not required by FEMA for inclusion in a hazard mitigation plan, Franklin County wishes to rank and mitigate against a comprehensive list of hazard events that could impact the county. Due to both the nature of non-natural hazards and the discretionary status regarding their inclusion, the following hazards of interest have been briefly and qualitatively assessed for the sake of public education and informing their inclusion within the hazard ranking and mitigation process.

Natural Hazards

- Invasive Species

Technological (Manmade) Hazards

- Air Quality Incidents
- Structural Fire

Biological Hazards

- *Public Health Emergency*
- Per FEMA’s mandate to address all natural hazards, the following natural hazards were not included because these hazards do not directly impact Franklin County or the City of Pasco due to geographic location:
- Avalanche
- Hurricane

- Sea Level Rise
- Storm Surge
- Tsunami
- Volcanic Eruption

1.5 Scope

The plan provides comprehensive hazard identification, risk assessment, vulnerability and impact analyses, mitigation actions, and an implementation schedule.

1.6 Plan Goals and Objectives

The goals of the Franklin County Multi-Hazard Mitigation Plan include coordinating with local governments to develop Franklin County's plans and processes that meet the planning components identified in the FEMA Region X Crosswalk document, as well as Washington Emergency Management Division planning expectations and public input from the local community. The overall objective is risk reduction from natural hazards in the state of Washington through implementing and updating county, regional, and the state of Washington mitigation plans.

1.7 Authorities

1.7.1 Federal

Public Law 93-288, as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires—as prerequisite for state receipt of future disaster assistance outlays—the identification, evaluation, and mitigation of hazards. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government.

Several additional provisions were also included when PL 93-288 was amended by the Stafford Act that provide for the availability of significant mitigation measures in the aftermath of a presidentially declared disaster. Civil Preparedness Guide 1-3, Chapter 6—Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

The Disaster Mitigation Act of 2000 (DMA 2000) was signed into Law on October 30, 2000, by President Bill Clinton. Section 322 defines mitigation planning requirements for state, local, and tribal governments. Under Section 322, if states submit a mitigation plan (a summary of local/regional mitigation plans) identifying natural hazards, risks, vulnerabilities, and proposed actions to reduce those risks and vulnerabilities, the state is eligible for an increase in the federal share of hazard mitigation.

1.7.2 State

The Governor's Emergency Operation Directive, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended, Title 44, CFR, Federal Emergency Management Agency Regulations, as amended, State Emergency Management Act of 1981, Washington State Code 38.52 RCW, Disaster Response Recovery Act, 63-5A, Executive Order of the Governor, Executive Order 11, Emergency Interim Succession Act, 63-5B.

1.7.3 Local

Effective natural hazard mitigation is dependent upon local governments assuming a vital role. As such, each local government will review all present or potential damages, losses, and related impacts associated with natural hazards to determine what is required for mitigation action and planning. It is critical that local governments be prepared to participate in the post-disaster Hazard Mitigation Team process, as well as the pre-mitigation planning outlined in the Multi- Hazard Mitigation Plan.

CHAPTER 2: PLANNING PROCESS

2.1 PLANNING PROCESS

The 2025 Franklin County Multi-Hazard Mitigation Plan was completed through the collaborative efforts of the Washington Emergency Management Division, Franklin County Emergency Management Director, Fire Departments, Sheriff's Office, Police Department, Washington State Fire Marshal Office, Franklin County EMS, Public Works Department, Planning and Zoning Commission, Building Department, Assessor's Offices, City, County, and State GIS Departments, Elected Officials, Public Employees, National Weather Service - Pendleton, Washington Division of Forestry, Fire and State Lands, Bureau of Land Management, Washington Department of Ecology, and citizens within Franklin County. Feedback was solicited through the Franklin County Local Emergency Planning Committee (LEPC). During the plan development, the draft plan was posted on Franklin County's website on the Office of Emergency Management page for public comments. Public participation was encouraged through public meetings and review of the 2024 plan on the Franklin County website. All comments, questions, and discussions resulting from these activities were given thoughtful consideration as the plan was developed.

2.2 PLANNING AREA

This plan covers Franklin County, Washington including the cities of Pasco, Connell, Mesa and Kahlotus.

2.3 FRANKLIN COUNTY LOCAL HAZARD MITIGATION PLANNING TEAM

The planning team consisted of a core Steering Committee of key county and city representatives, supported by a broad network of stakeholders from various sectors. Descriptions of the planning meetings follow in the next section below as well as with the meeting minutes in Appendix B.

Table 2.1 Participating Jurisdictions Involvement

Jurisdiction	Attended at Least One Meeting	Represented at Mitigation Workshop	Met with Core Planning Team	Submitted New Mitigation Action	Reviewed Past Mitigation Actions
Franklin County	Yes	Yes	Yes		
City of Pasco	Yes	Yes	Yes		
City of Connell	Yes	Yes	Yes		
City of Mesa	Yes	Yes	Yes		
City of Kahlotus	Yes	Yes	Yes		

2.4 LOCAL HAZARD MITIGATION PLANNING SCHEDULE, MEETINGS, AND MITIGATION WORKSHOPS

The mitigation plan update process commenced on May 1, 2024. The Risk Assessment section was updated during the months of June, July, and August. The Mitigation Strategy section was updated during the months of February, March and April. The plan was completed and submitted to the Washington Division of Emergency Management on Month Date, 2025. The Steering Committee guided the process through hazard identification, strategy development, and feedback integration[1], detailed in 2.4.1.

2.4.1 Meeting Details & Minutes

Franklin County Hazard Mitigation Plan Update Kickoff Meeting—07/11/2024

1011 E. Ainsworth St., Pasco, 11:00 AM–1:00 PM (hybrid)[2].
- Key Components: FEMA requirements review, goal finalization, committee role discussion, public involvement planning[2].
- Public Engagement: Survey on FCEM website, Franklin County Graphic ads, October 1–2 meetings[11].

Meeting #2: Workshop – 08/22/2024
11:00 AM–1:00 PM[3].
- Key Activities: Risk assessment review, initial risk validation, local expertise integration, hazard ranking[3].
- Preliminary Assessment: Wildfire, flooding, air quality prioritized (survey: 35.6%, 22.8%, 10.9%)[4].

Meeting #3: Workshop – 10/30/2024
- Focus: Feedback integration, action development (e.g., preparedness education)[4].

Meeting #4: Workshop – 12/1/2024 – 01/15/2025
- Purpose: Virtual/asynchronous, finalize actions[5].

Meeting #5: Workshop – 01/15/2025 – 03/30/2025
- Review: Draft feedback, jurisdictional review, April 2025 approval[6].

2.5 PUBLIC & STAKEHOLDER INVOLVEMENT

The general public must be allowed to be involved in the planning process. As such, several public outreach activities were organized to ensure public participation and input was obtained. Additionally, a draft of the 2024 Franklin County Multi-Hazard Mitigation Plan was made available to the public and linked on the Franklin County website on the Office of Emergency Management page beginning on [INSERT]. The link was updated with the completed version of the plan in [INSERT] 2025 and is still available for review. This allowed the public the opportunity to comment or provide feedback on the updated plan before completion. A screenshot of the link is provided in Appendix XX.

2.5.1 Public Meetings

Two meetings that took place on October 1-2, 2024and [INSERT] at [INSERT] were advertised publicly and open to public participation. Advertisements/invites are available in Appendix E.

Minor editing comments were received and incorporated within the plan document. During the [INSERT] public meeting, the survey results were discussed to demonstrate that all public feedback was integrated into the draft plan. The meetings resulted in adjustments to the draft plan, specifically to the hazard ranking and validation of new and ongoing actions.

2.5.2 Public Survey

The County of Franklin conducted a comprehensive community survey as part of the Hazard Mitigation Planning process to gather public input on hazard concerns, priorities, and mitigation preferences. The survey was designed to identify which hazards residents consider most threatening to their community and to understand their personal level of preparedness and interest in participating in future mitigation efforts.

Survey Distribution and Outreach: The County implemented an extensive outreach campaign to ensure broad community participation. The survey was:

- Featured prominently on the County of Franklin's official website
- Promoted through all county social media channels
- Published in local newspapers
- Distributed to key stakeholders with requests to share with their constituents
- Made available to all attendees at public meetings, with staff assistance provided for completion

This multi-faceted approach ensured the survey reached a diverse cross-section of the community, including residents, business owners, community organizations, and other stakeholders with interests in Franklin County's resilience and safety.

2.5.3 Stakeholder Participation

In addition to the Steering Committee, the plan was guided by a wide range of subject matter experts and key stakeholders representing all the participating jurisdictions.

Table 2.3 Local Hazard Mitigation Stakeholders

Representative	Agency	Position
Alexis Spencer	Benton & Franklin Conservation Districts	Research & Monitoring Program Coordinator
Boys and Girls Club of Benton and Franklin Counties		
Brian Terbush	WA EMD	Earthquake/Volcano Program Coordinator
Bryan Thornhill	Franklin County Fire District #5	Fire Chief
Chris Lee	City of Connell	Police Chief
Chris Mortensen	City of Pasco	Fire Deputy Chief
Craig Erdman	Franklin County Public Works Department	Director

Representative	**Agency**	**Position**
Craig Raymond	City of Pasco	Community & Economic Development Deputy Director
Elizabeth Garcia	Benton Franklin Council of Governments	Assistant Regional Planner
Eric Mauseth	Franklin County Fire District #1	Fire Chief
Erin Braich	Benton Franklin Council of Governments	Deputy Director
Erin Coyle	Washington State Department of Agriculture	Emergency Manager
Franklin County Local Emergency Planning Committee		
Hallie Tuck	City of Connell	Public Works Director
Jason Langston	Franklin County Fire District #3	Captain
Jim House	WA Department of Social and Health Services	Disability/AFN Integration Manager on Inclusive Emergency Planning
John Christensen	Franklin County Public Works Department	Surveyor
John Rosenau	Franklin County Assessor’s Office	County Assessor
Kara Kaelber	Franklin County Conservation District	District Manager
Kathleen Neuman	Franklin County Public Works	Engineer
Katy Branham	National Weather Service – Pendleton	Warning Coordination Meteorologist
Kent McCue	City of Pasco	Public Works Operations Manager
Lee Barrow	City of Connell	Mayor
Lucas Van Holenbeke	Franklin County Fire Protection District #2	Fire Chief
Maria Serra	City of Pasco	Public Works Director
Matt Truman	Housing Authority of the City of Pasco and Franklin County	Executive Director
Michael Morgan	Franklin County	Geographic Information Systems Manager
Michelle Callighan	Housing Authority of the City of Pasco and Franklin County	Finance Director
Michelle Holt	Benton Franklin Council of Governments	Director
Mike Harris	Franklin County Fire District #3	Fire Chief
Mike Troidl	Franklin County	Building Official
Sierra Knutson	Northwest Healthcare Response Network	Eastside District Coordinator
Steve Cooper	Franklin County Fire Protection District #4	Fire Chief

Representative	**Agency**	**Position**
Suzanne Henderson	Bureau of Reclamation	Regional Emergency Management Program Coordinator
Tim Harkins	City of Pasco	Deputy Fire Chief
Tim Waters	Washington State University	Professor – Agriculture and Natural Resources Unit
Tricia Sears	Washington Department of Natural Resources	Geologic Planning Liaison
Wesley McCart	Franklin County Planning and Building	Director
Zach Ratkai	Benton Franklin Council of Governments	Locla Government Programs Director
Erin Hockaday	Benton Franklin Health District	Senior Manager of Surveillance & Investigation

2.5.3 Overview of Stakeholder Participation

- *Emergency Services and Law Enforcement* (3): FCEM, Law Enforcement, Washington EMD, fire districts, provided response expertise[3].
- *Healthcare and Social Services* (1): Benton-Franklin Health District focused on health impacts[7].
- *Education and Youth Services* (1): WSU Extension connected rural communities[4], Boys and Girls Club of Benton and Franklin Counties.
- *Utilities and Infrastructure* (1): Public Works addressed infrastructure resilience[2].
- *Community Organizations* (2): Conservation District and Housing Authority enhanced local perspectives[4].
- *Regional Partners* (5): Adjacent counties (Benton, Walla Walla, etc.) ensured coordination[3].

2.5.4 Stakeholder Engagement Process

Stakeholders were engaged throughout[1]:

- Invited to meetings and phases[3].
- Provided surveys and draft reviews[2].
- Shared data (e.g., DNR hazard maps, health district vulnerability assessments) [8].
- Contributed to mitigation strategies (e.g., evacuation protocols, infrastructure upgrades) [5].

2.6 Equity Considerations for Underserved Communities and Socially Vulnerable Populations

Some disasters occur on larger scales, are more impacted by built environments, and are most likely to continually impact those at risk because of existing health conditions, lack of resources, being underserved by past mitigation planning work, facing historical disinvestment in their communities, or other factors. In this case, people in widely different locations can be harmed most by repeating disaster cycles. Therefore, mitigation strategies should be crafted to break cycles of loss caused by social and economic disparities. Hazard mitigation strategies can reduce existing risk by, for example, relocating a building out of an area that frequently floods. In each case, an attempt has been made to lessen the harm of a future flood before the event happens. Strategies may also seek to make future development less vulnerable to hazards at the time it is built. Examples would be requiring new structures to be elevated above predicted flood levels or building structures to withstand future hazards better. Hazard mitigation plans are designed to involve the input of stakeholders from different perspectives to ensure plans use the best available data, are aligned with the needs of the entire community, and align with other plans, such as comprehensive plans, capital improvement plans, and climate action plans.

This Franklin County Multi-Hazard Mitigation Plan recognizes that not all community members are impacted similarly by natural disasters. Some are at more risk. A mitigation strategy that uses a “one size fits all” approach and does not recognize different levels of risk will not adequately or efficiently support historically underserved populations and can worsen inequalities after a disaster.

Equitable mitigation success should be measured by assessing who was most impacted by loss of life or financial harm by past and future disasters, quantifiable reductions of vulnerability to those most at risk, and increasing engagement with historically underserved populations and community organizations to better understand how plans and processes and natural hazard events are affecting different communities.

The county and participating jurisdictions are responsible for ensuring equitable outcomes in implementing this plan and taking action to reduce vulnerabilities to disasters experienced disproportionately by marginalized populations.

The Climate & Economic Screening Tool, provided by the U.S. Council on Environmental Quality, analyzes the QUANTITY 2010 census tracts in Franklin County for disadvantaged communities. Appendix C identifies and describes the burdens experienced in each census tract.

Franklin County also invited and coordinated with stakeholders representing several local organizations serving disadvantaged populations, including the following organizations:

- Boys and Girls Club of Benton and Franklin Counties
- Washington State Department of Health and Social Services
- Benton Franklin Health District
- Washington State Emergency Management Division – Access and Functional Needs Program Manager

Additionally, the public survey specifically included questions to determine how the county could better support the functional and access needs of populations and underserved groups. Questions include but are not limited to: During times of emergency, information is provided in a format I can understand; I can quickly obtain emergency information in times of crisis; Please indicate how Franklin County can better assist you in preparing for emergencies and disasters; What might prevent you from leaving your place of residence if there was an evacuation order?
The results of the sruvey are included in Appendix C.

2.7 Existing Plans, Studies, and Reports Reviewed for the Development of the Plan

Chapter 5: Capabilities Assessment reviews critical studies, plans, laws, and ordinances in effect within the planning area that can affect hazard mitigation actions. All these documents were reviewed and incorporated into this plan as part of the update process.

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[1] FEMA. (2024). Hazard Mitigation Planning Guidelines. https://www.fema.gov/hazard-mitigation-planning
[2] Franklin County Emergency Management (FCEM). (2023). Hazard Mitigation Plan. https://www.co.franklin.wa.us/emergency_management
[3] Washington State EMD. (2024). HMP Review Process. https://mil.wa.gov/emergency-management-division
[4] Franklin County. (2024). Public Survey Results. https://www.co.franklin.wa.us/surveys
[5] Washington DNR. (2024e). CWPP Guidelines. https://www.dnr.wa.gov/cwpp
[6] Tri-City Herald. (2024). Public Meeting Notices. https://www.tri-cityherald.com
[7] Benton-Franklin Health District. (2024). Community Health Assessment. https://www.bfhd.wa.gov
[8] Washington DNR. (2024a). Fire Districts Map. https://www.dnr.wa.gov/wildfire-maps

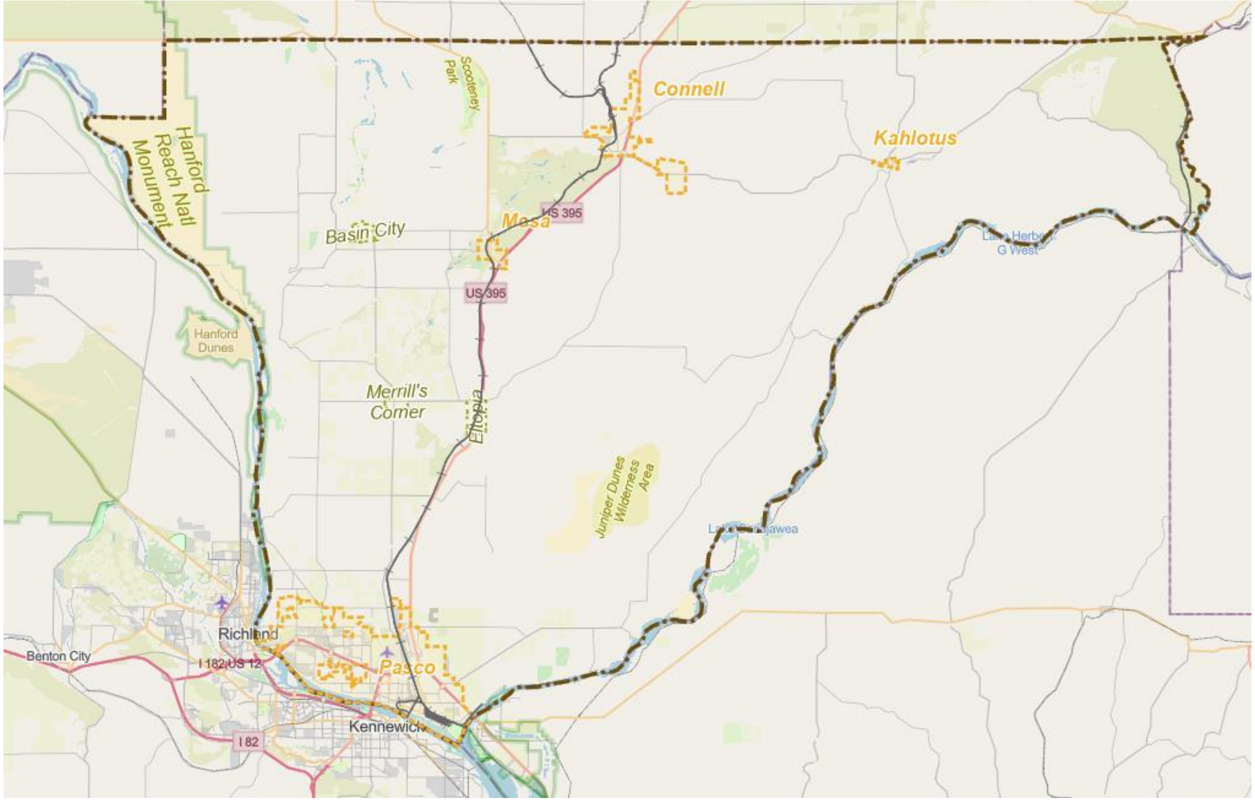
Part II: Community Profile

CHAPTER 3 COMMUNITY PROFILE

3.1 Location and Setting

Franklin County is located in south-central Washington State, within the Columbia Basin, between the Snake and Columbia Rivers[1]. It spans 1,242.4 square miles, ranking 27th in size among Washington's 39 counties[1]. The county is bordered by Benton County to the southwest, Grant and Adams counties to the north, Whitman and Columbia counties to the east, and Walla Walla County to the southeast, with the Columbia River marking its western and southwestern edge and the Snake River its southeastern boundary[1]. Key drainages, like Esquatzel Coulee and smaller canyons, intersect the landscape[1]. Elevations range from 423 feet at the lowest point to 1,824 feet on the North Columbia Plateau[1].

Figure 3.1 Franklin County, Washington



Incorporated cities and towns include Pasco (the county seat), Connell, Kahlotus, and Mesa, while unincorporated communities, like Eltopia, Harder, Basin City, and West Pasco, dot the rural, agriculture-dominated landscape[2]. Pasco, near the confluence of the Columbia and Snake Rivers, forms part of the Tri-Cities with Richland and Kennewick in Benton County[2]. Mesa and Connell lie along U.S. Route 395, Kahlotus along State Route 260, Basin City along Road 170, and West Pasco is enveloped by Pasco's urban sprawl[2].

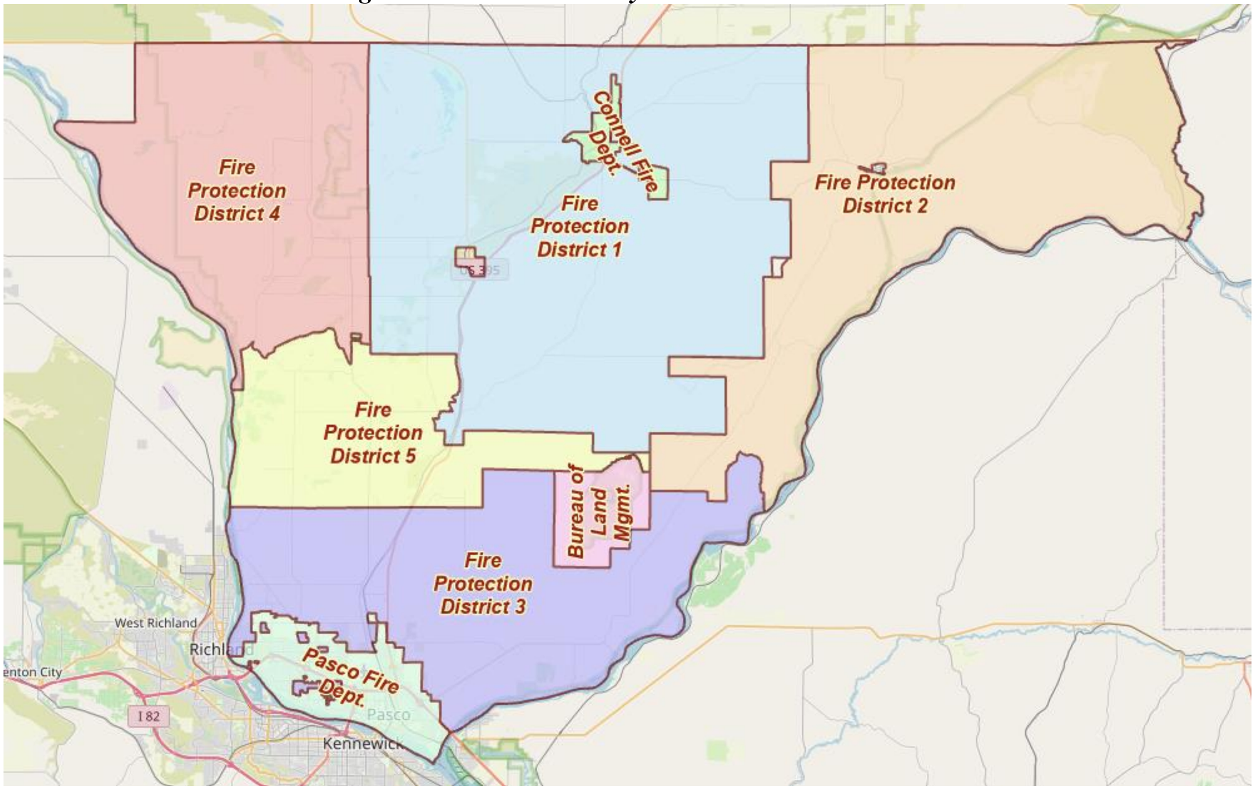
Historically, the Columbia River supported Native American tribes, such as the Umatilla, Wanapum, and Yakama, who used its lowlands as wintering grounds[3]. Settlement surged in the 1890s with irrigation infrastructure, transforming arid shrub-steppe into farmland[3]. The Dalles-

Celilo Canal (1915), Hanford Nuclear Site (1940s), and the Columbia Basin Irrigation Project (1950s) cemented Franklin County's agricultural and economic significance[3].

The proximity of the Hanford Nuclear Site, which was a key facility for the development of nuclear weapons during World War II, and the construction of three Washington Public Power Supply System (WWPPSS) nuclear plants at Hanford in the 1970s also had significant impacts on the economic development of the region. In the 1950s, two major developments fueled regional growth—the Columbia Basin Irrigation Project and McNary Dam. These developments underscored the rich agricultural potential of the region. With the advent of irrigation not only did agricultural production both boom and diversify, but the related food processing industry also flourished. The area has become one of the nation's leading agricultural production regions.

For wildfire planning, Franklin County falls within the Southeast Washington Fire Region, managed by the Washington DNR[4]. It includes five fire districts: Franklin County Fire District #1 (Connell), #2 (Kahlotus), #3 (Pasco), #4 (Mesa), and #5 (Basin City), covering both urban and rural wildland-urban interface (WUI) areas[4].

Figure 3.2 Franklin County Fire District Boundaries



Source: Franklin County Emergency Management

3.2 Topography

Franklin County's topography, within the Columbia Basin and Columbia Plateau, features flat to gently rolling terrain, with elevations from 300 to 800 feet above sea level[5]. Fertile loess-covered Palouse Hills in the east support agriculture, while the arid west hosts sagebrush steppe—a prime wildfire fuel[6]. The Columbia and Snake Rivers carve valleys, creating varied landscapes prone to seasonal flooding and fire spread in dry months[7].

The topographic relief in the county is relatively low, with the most prominent features being river valleys and gently sloping hills. The geological composition includes basalt from ancient lava flows, sedimentary deposits from ancient lakes and rivers, and loess, a fine silt deposited by wind.

3.3 Geology and Soils

Franklin County lies in the Columbia Basin Province, shaped by volcanism and flooding[7]. Key formations include Grande Ronde Basalt (15.6–17 million years old), Wanapum Basalt (13.5–14 million years old), and Saddle Mountain Basalt (6–13 million years old), with sedimentary interbeds from the Ellensburg and Ringold Formations[7]. Pleistocene floods from Lake Missoula sculpted the Channeled Scablands north of the county, leaving sandy loam and loess soils—highly flammable when dry[7]. Juniper Dunes, northeast of Pasco, exemplify wind-deposited sands, a wildfire hotspot[8].

3.4 Natural Resources

Franklin County's resources fuel its economy and wildfire risks[9]. The following table highlights key natural resources:

Table 3.3 Franklin County Natural Resources:

Resource Type	Details
Agricultural Crops	Potatoes, wheat, apples thrive on irrigated lands from the Columbia Basin Project; dryland farming dominates the east[9]
Water Resources	Columbia and Snake Rivers, plus groundwater, support irrigation but face nitrate contamination[10]
Vegetation/Fuels	Shrub-steppe (sagebrush, bunchgrass) and dry forests increase wildfire risk, especially near WUI zones[11]

Franklin County has identified and designated critical areas as required under the Growth Management Act.

3.5 Climate

This portion of Washington State is part of the large inland basin between the Cascade and Rocky Mountain ranges. East of the Cascades, summers are warmer, winters are colder, and precipitation is less than in western Washington.

Franklin County's semi-arid climate, with 7–15 inches of annual precipitation, features hot, dry summers (90s°F) and cold winters (15–40°F), ideal for wildfire ignition[12]. July–August dryness, paired with 50–85% sunshine and southwest winds (4–24 mph, gusts to 80 mph), amplifies fire spread[13].

Central Basin Climate

To describe the climate in more detail, Eastern Washington has been divided into five sections, one of which is the Central Basin, in which Franklin County lies. Figure 3.4 shows average monthly precipitation for Franklin County from 2000 to 2025 while Figure 3.6 shows the graphed drought levels for Franklin County from 2000 to 2025.

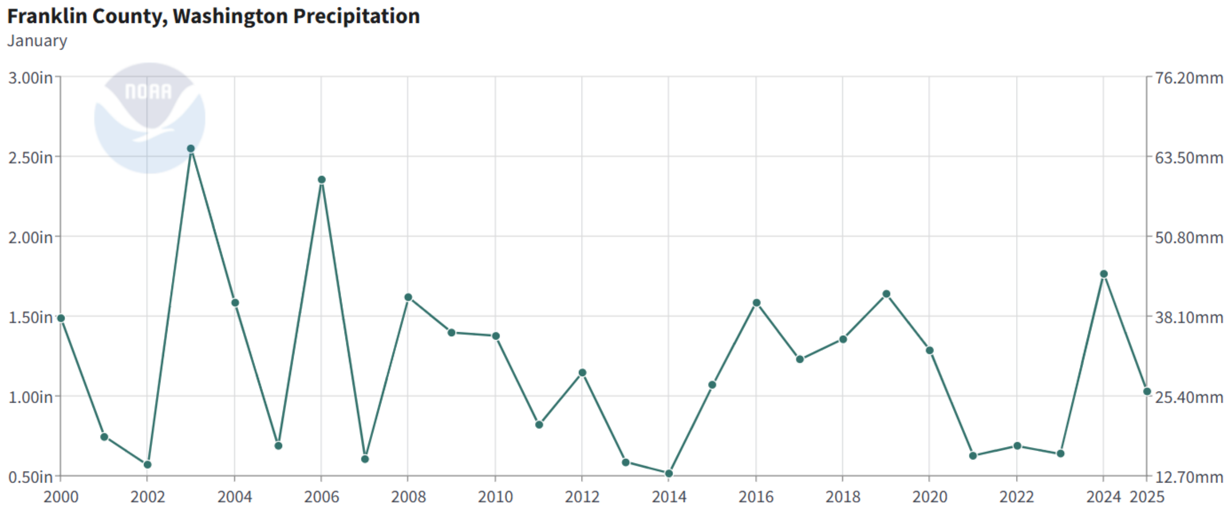
The Central Basin includes the Ellensburg valley, the central plains area in the Columbia basin south from the Waterville Plateau to the Oregon border and east to near the Palouse River. This is the lowest and driest section in eastern Washington. Annual precipitation ranges from seven inches in the drier localities along the southern slopes of the Saddle Mountains, Frenchman Hills and east of Rattlesnake Mountains, to 15 inches near the Blue Mountains. Summer precipitation is usually associated with thunderstorms. During July and August, it is not unusual for four to six weeks to pass without measurable rainfall.

Snow can be expected after the first of December and to remain on the ground for periods varying from a few days to two months between mid-December and the last of February. Other than in the Ellensburg valley, snow depths seldom exceed eight to 15 inches. The Central Basin is subject to "chinook" winds which produce a rapid rise in temperature. A few damaging hailstorms are reported in the agricultural areas each summer.

The average January maximum temperature is near 30° F in the colder localities in the Columbia Basin and 40° F in the lower Yakima valley, and minimum temperatures are between 15° to 25° F. Minimum temperatures between 0° to -10° F are recorded almost every winter and temperatures from -15° F to -30° F have been recorded.

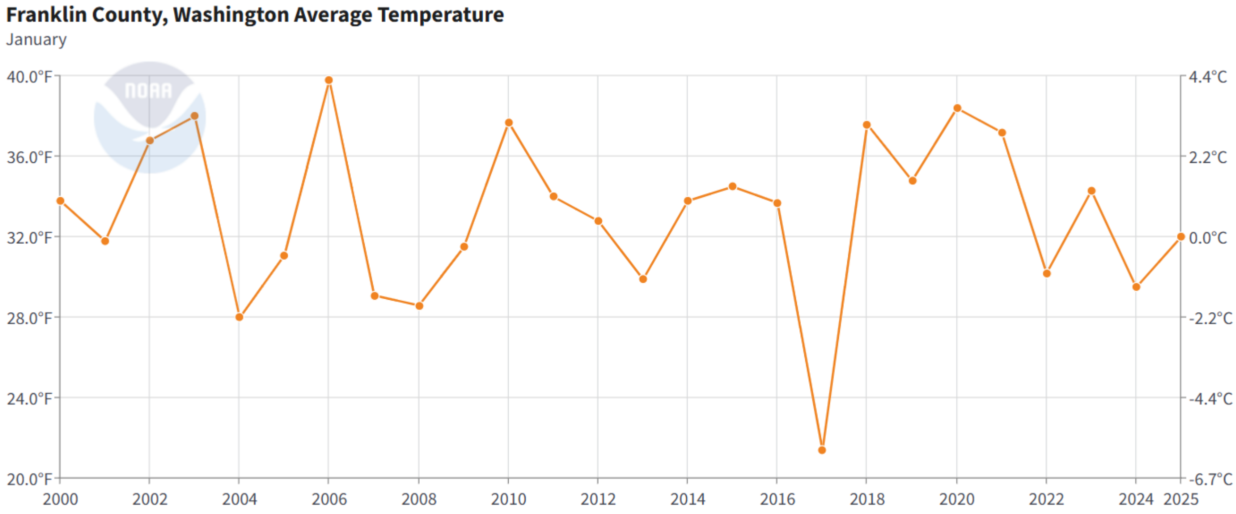
In summer, maximum temperatures reach 100° to 105° on a few afternoons of the season.. The first freezing temperature in the fall is usually recorded between mid-September and mid-October.

Figure 3.4 Average Precipitation for Franklin County, WA from 2000-2025:



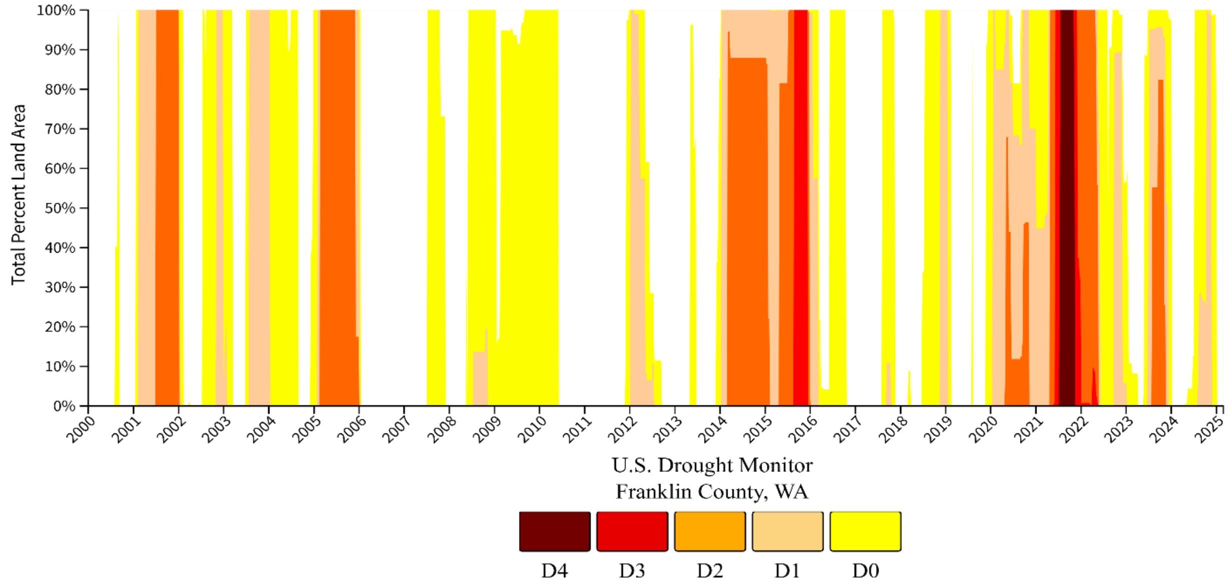
Source: NOAA Centers for Environmental Information

Figure 3.5 Average Temperature in Franklin County, Washington from 2000-2025:



Source: NOAA Centers for Environmental Information

Figure 3.6 U.S. Drought Monitor for Franklin County, Washington from 2000-2025:

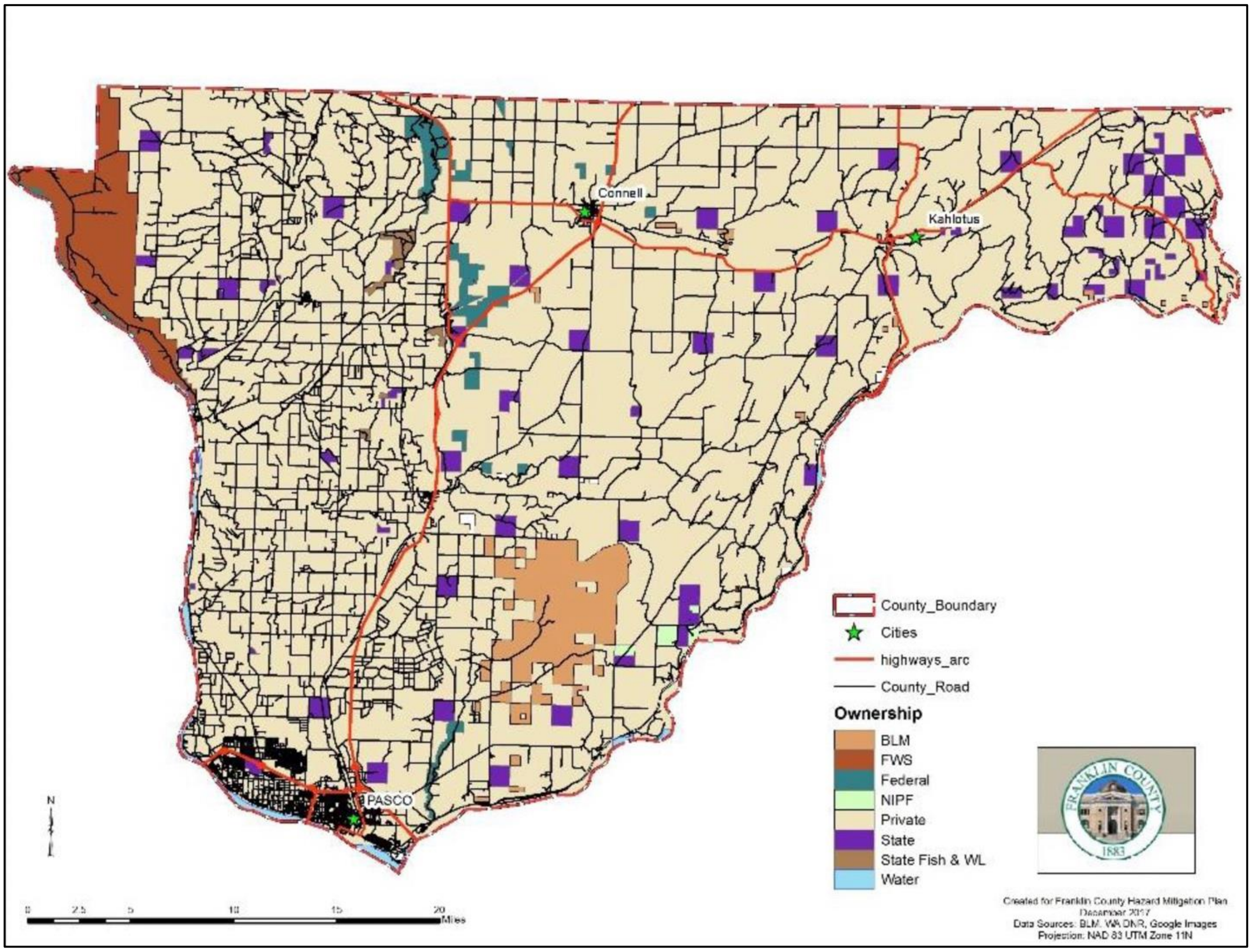


Source: NOAA National Integrated Drought Information System

3.6 Land Ownership, Land Cover, Land Use and Management

Franklin County is in the southeastern part of Washington. It consists of privately owned land; land that is managed by the U.S. Department of the Interior, Bureau of Reclamation, Washington State Department of Fish and Wildlife and Bureau of Land Management; and land that is managed by the Office of Legacy Management for the U.S. Department of Energy (Figure 2). The county is about1,242 square miles, or about 809,600 acres. Of Franklin County's 809,600 acres, 230,000 are irrigated cropland, 220,000 non-irrigated cropland, 195,000 rangeland, and 165,000 urban or other uses[9]. Federal agencies (Bureau of Land Management, Bureau of Reclamation), state (Washington DNR and WDFW) and private owners dominate[14]. Rangeland and shrub-steppe are wildfire-prone, especially near Pasco and Basin City[14].

Figure 3.6 Land ownership map of Franklin County, WA



Source: Franklin County, Washington

3.7 History

Franklin County, established in 1883, grew with the Northern Pacific Railway and irrigation, evolving into an agricultural hub[3]. The Hanford Site (1940s) and Columbia Basin Project (1950s) spurred growth[3]. Wildfire history includes the 2017 Juniper Dunes Fire, burning 5,000 acres[15].

Pasco, the county seat, emerged as a significant railway hub in the late 19th century. Its strategic location at the confluence of the Snake and Columbia Rivers further bolstered its status as a key transportation and trade center. Over the years, the county has diversified its economy, incorporating sectors such as food processing, manufacturing, and logistics, while agriculture remains a cornerstone.

Franklin County's history is marked by its role in supporting World War II efforts through the Hanford Site, part of the Manhattan Project, located nearby. This period brought an influx of workers and led to substantial population growth and infrastructural development. Today, Franklin County continues to evolve, balancing its agricultural heritage with modern advancements and economic diversification

3.8 Development Trends

Agriculture drives 70% of the land use, but residential and commercial growth is rising (22% population increase, 2011–2021)[2]. The Franklin County Comprehensive Plan (2018–2038) guides sustainable development, emphasizing Wildland-Urban Interface (WUI) fire safety[2].

One of the other development trends in Franklin County is the expansion of residential housing to accommodate the growing population. This trend is supported by ongoing residential developments and infrastructure improvements.

Economic development is another trend, with efforts on diversifying beyond the county's traditional agricultural base. Franklin County is seeing growth in sectors such as food processing, manufacturing, and logistics, which are attracting new businesses and creating job opportunities.

The Franklin County Comprehensive Plan (2018-2038) and other long-range planning initiatives are guiding these developments to ensure sustainable growth and balanced land use.

The Franklin County Comprehensive Plan (2018-2038) is intended to manage urban development across the county in an efficient and sustainable manner. The following General County Goals are identified within the plan:

- Goal 1. Urban Growth: Encourage development in urban areas where adequate public facilities exist or can be provided in a cost-efficient manner.
- Goal 2. Avoid Sprawl: The inappropriate conversion of undeveloped land must be avoided. Urban development will be confined to appropriate areas within urban growth boundaries.
- Goal 3. Property Rights: Private property rights will not be taken for public use without just compensation having been made. The property rights of landowners will be protected from arbitrary and discriminatory actions.
- Goal 4. Natural Resource Industries: Maintain and enhance natural resource-based industries including productive agriculture (cultivation and grazing), fisheries, and mineral industries. Encourage the improvement of productive agricultural lands and discourage incompatible uses.

The plan also identifies areas allocated for urban development across the county. These Urban Growth Areas (UGA) include the incorporated cities and towns and most of the population in Franklin County. Each municipality has a designated Urban Growth Area. Growth in these areas consists of commercial and industrial activity and a wide range of residential densities.

Each UGA also includes unincorporated areas characterized by urban growth and/or adjacent areas within which urban infrastructure and services are provided or planned to be provided during the 20-year planning period covered in the Franklin County Comprehensive Plan. UGAs are currently designated for the cities of Pasco, Connell, Mesa, and Kahlotus.

3.9 Future Development

Based on recent development trends and annexations in and around Pasco, future development in Franklin County is anticipated to primarily concentrate within and adjacent to the city of Pasco. Infill development for residential purposes is expected to continue within Pasco's existing boundaries, with potential for higher-density housing like duplexes and apartments in some areas.

The urban growth area surrounding Pasco remains susceptible to future annexation and subsequent residential and commercial development, exemplified by the ongoing Columbia Shores townhouse project and the extensive Broadmoor Development Area. Residential expansion is also projected to continue north and west of Burns and Dent Roads. The significant 2022 annexation north of Pasco, with initial development focused on a new school, suggests substantial future residential growth in this area. Furthermore, annexations in the north Pasco industrial area to accommodate food processing facilities indicate continued industrial expansion. While the majority of development is focused around Pasco, the gradual addition of new homes in Connell represents the limited development activity in other parts of Franklin County. This pattern of concentrated growth around Pasco should be a key consideration in future emergency planning for the county.

3.10 Population, Education, and Demographics

The following table summarizes population, education, and demographic data:

Table 3.7 Franklin County Population, Education, and Demographics:

Category	Details
Population Growth	23.78% increase (78,163 to 96,749) from 2010–2020[16]
High School Graduates	75.8% of persons aged 25+[16]
Bachelor’s Degrees	20% of persons aged 25+[16]
Hispanic/Latino	55.6% of population[17]

Table 3.1 Franklin County Demographics 2023

3.11 Housing

The following table outlines housing data:

Table 3.2 Franklin County Housing Statistics:

Category	Details
Housing Units (2023)	31,903[16]
Owner-Occupied Rate	69.9%[16]
Median Value	$308,700[16]
Building Permits (2023)	923[16]

3.12 Economy

The following table outlines economic data:

Table 3.9 Franklin County Economy:

Category	Details
Top Employment Sector	Agriculture (6,083 jobs)[18]
Second Sector	Healthcare[18]
Third Sector	Retail[18]
Wildfire Impact	Could disrupt economic base[8]

3.13 Transportation

Franklin County is served by various air, highway, and rail infrastructure including the following major thoroughfares:

- **US Route 395**: This highway runs north-south through Franklin County, providing a critical connection between the Tri-Cities area and Spokane, WA. It is a vital route for both commercial and passenger traffic.
- **State Route 17**: Serving as an important north-south route, SR 17 connects U.S. Route 395 near Mesa to U.S. Route 97 near Brewster. It plays a significant role in agricultural transportation.
- **State Route 260**: This east-west route connects the towns of Connell and Kahlotus, linking to State Route 17, State Route 26 and U.S. Route 395, facilitating local travel and commerce.
- **BNSF Railway**: The Burlington Northern Santa Fe Railway operates freight services through Franklin County, supporting the transportation of agricultural products, industrial goods, and other commodities.
- **Port of Pasco**: The Port of Pasco is a major transportation and logistics hub in Franklin County, featuring facilities for rail, truck, and barge traffic. It includes the Big Pasco Industrial Center and the Tri-Cities Airport, supporting regional and international trade.
- **Tri-Cities Airport (PSC)**: Located in Pasco, this airport offers commercial flights and is a key asset for passenger travel and cargo transport in the region.

U.S. Route 395, State Routes 17 and 260, BNSF Railway, Port of Pasco, and Tri-Cities Airport (PSC) support connectivity[19]. Evacuation routes are critical for wildfire response[19] and evacuations.

3.14 Water Resources

Franklin County's water resources are critical for its agriculture, industry, and residential needs. The Columbia River, one of North America's largest rivers, forms the western boundary of the county and serves as a primary water source for irrigation, recreation, and hydroelectric power generation. The Snake River, another major waterway, converges with the Columbia River near the Tri-Cities area, providing additional water for irrigation and supporting local ecosystems. Numerous irrigation canals and ditches crisscross the county, distributing water from these rivers to vast agricultural lands, enabling the cultivation of various crops. Groundwater resources, accessed through wells, also play an essential role in supplying water for agricultural, industrial, and residential use.

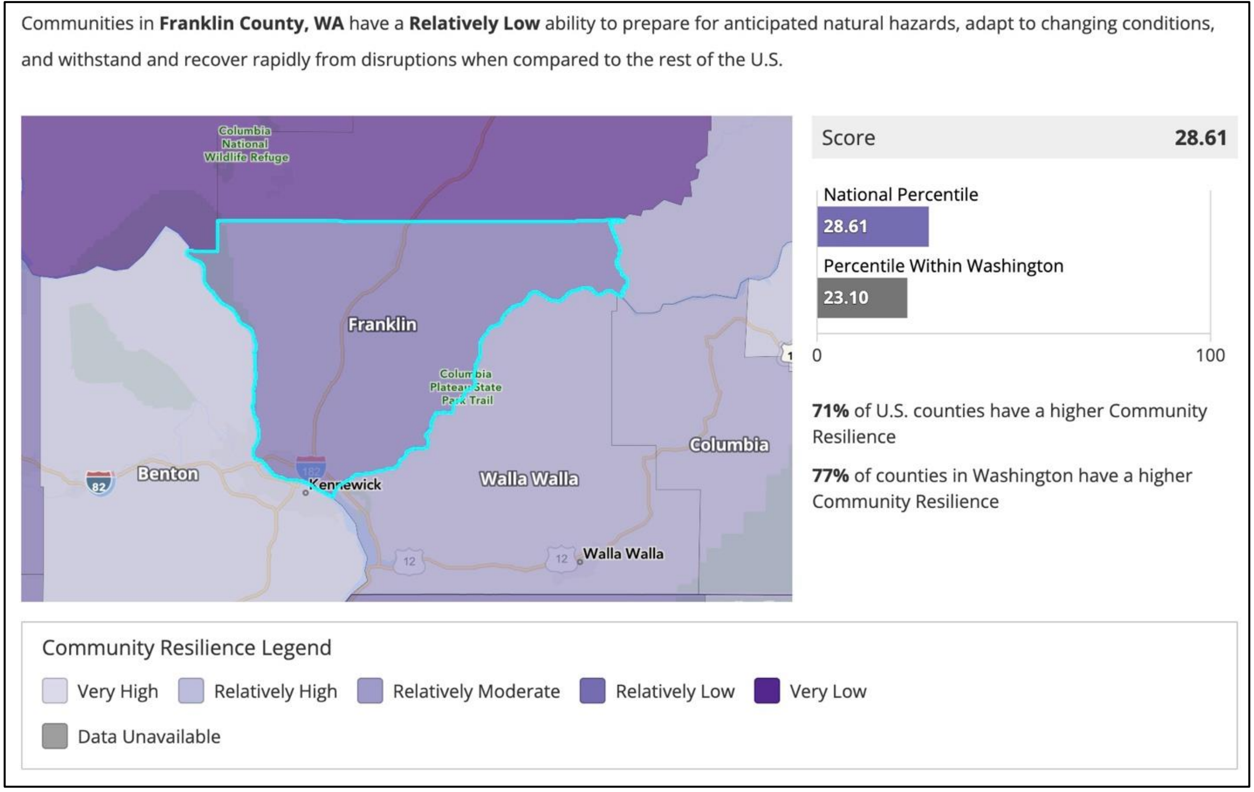
3.15 Critical Wildlife and Habitat Types

Franklin County has a variety of critical wildlife and habitat types that are essential for conservation efforts and face threat from natural hazards, especially wildfire. The county includes significant areas of shrub-steppe habitat, which is crucial for species such as the sagebrush sparrow, ferruginous hawk, and sage thrasher. The shrub-steppe ecosystem is characterized by sagebrush and native grasses, providing habitat for numerous bird species and other wildlife.

Additionally, the Columbia River and Snake River corridors within Franklin County are vital habitats for several fish species, including the threatened bull trout and various salmonids. These waterways support aquatic ecosystems and provide critical spawning and rearing grounds for fish populations. Wetlands and riparian zones along these rivers also offer essential habitats for amphibians, birds, and other wildlife.

3.16 FEMA Community Risk Index

Figure 3.9 Franklin County FEMA Community Resilience Score



Communities in **Franklin County, WA** have a **Relatively Low** ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions when compared to the rest of the U.S.

Score **28.61**

National Percentile 28.61

Percentile Within Washington 23.10

71% of U.S. counties have a higher Community Resilience

77% of counties in Washington have a higher Community Resilience

Community Resilience Legend

Very High, Relatively High, Relatively Moderate, Relatively Low, Very Low, Data Unavailable

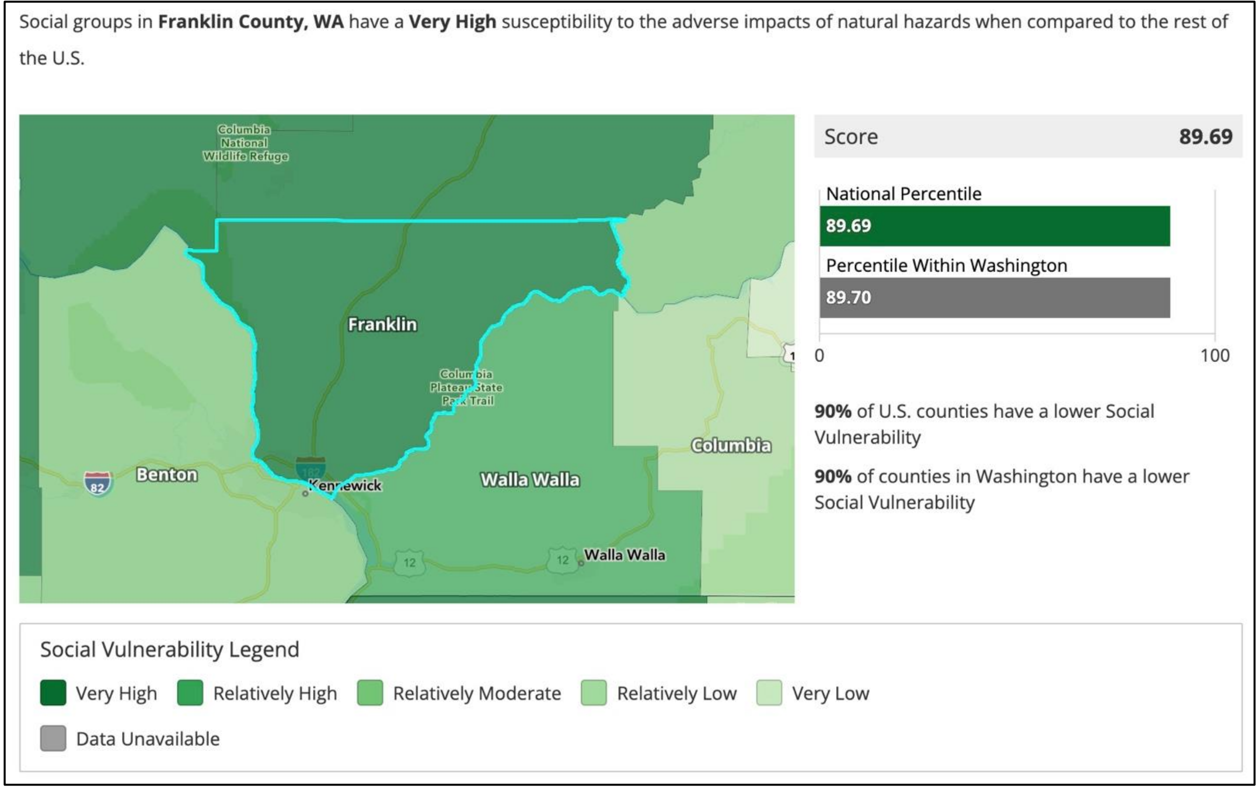
3.17 Social Vulnerability and Underserved Communities

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.

The "Social Vulnerability Score" and "Rating" represent the relative level of a community's social vulnerability compared to all other communities at the same level. A community's Social Vulnerability Score is also proportional to a community's risk. A higher Social Vulnerability Score results in a higher Risk Index Score.

Social vulnerability is also one of five components included in the formulation of the "National Risk Index Score" in addition to Community Resilience, Estimated Annual Loss (EAL) based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors.

Figure 3.2 Franklin County FEMA Social Vulnerability Score



Social groups in **Franklin County, WA** have a **Very High** susceptibility to the adverse impacts of natural hazards when compared to the rest of the U.S.

Score **89.69**

National Percentile **89.69**

Percentile Within Washington **89.70**

90% of U.S. counties have a lower Social Vulnerability

90% of counties in Washington have a lower Social Vulnerability

Social Vulnerability Legend

🟩 Very High 🟩 Relatively High 🟩 Relatively Moderate 🟩 Relatively Low 🟩 Very Low

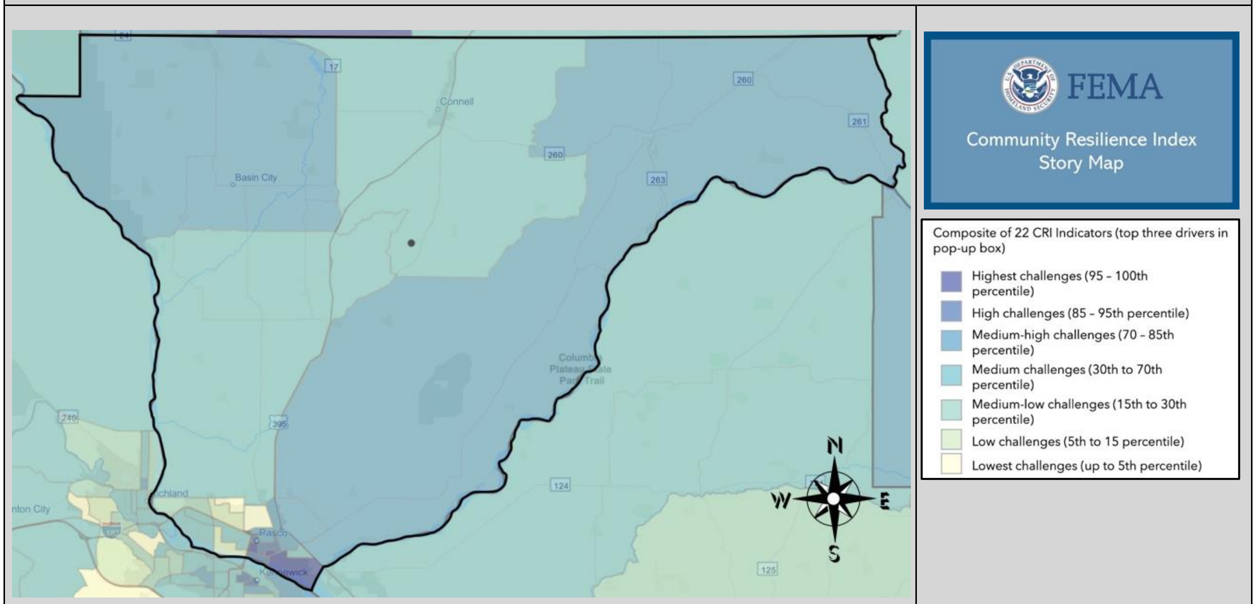
⬜ Data Unavailable

The figure below illustrates the Franklin County Community Resilience Index Story Map. This map utilizes density mapping to illustrate community areas that can be overburdened by 22 challenges identified by the FEMA Community Resilience Challenges Index.

Figure 3.3 Franklin County - FEMA Community Resilience Index Story Map

FRANKLIN COUNTY, WA

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



22 CHALLENGE VARIABLES

Population, Household, Housing Characteristics	Economic	Healthcare	Connection to Community
Population without a High School Diploma Population 65 and Older Population with a Disability Households without a Vehicle Households with Limited English Single-parent Households Households without a Smartphone Mobile Homes as Percentage of Housing Owner-Occupied Housing	Population Below Poverty Level Median Household Income Unemployed Labor Force Unemployed Women Labor Force Income Inequality Workforce in Predominant Sector	Number of Hospitals Medical Professional Capacity Population without Health Insurance	Presence of Civic and Social Organizations Population without Religious Affiliation Percent of Inactive Voters Population Change

Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2024

3.18 Critical Infrastructure and Key Resources

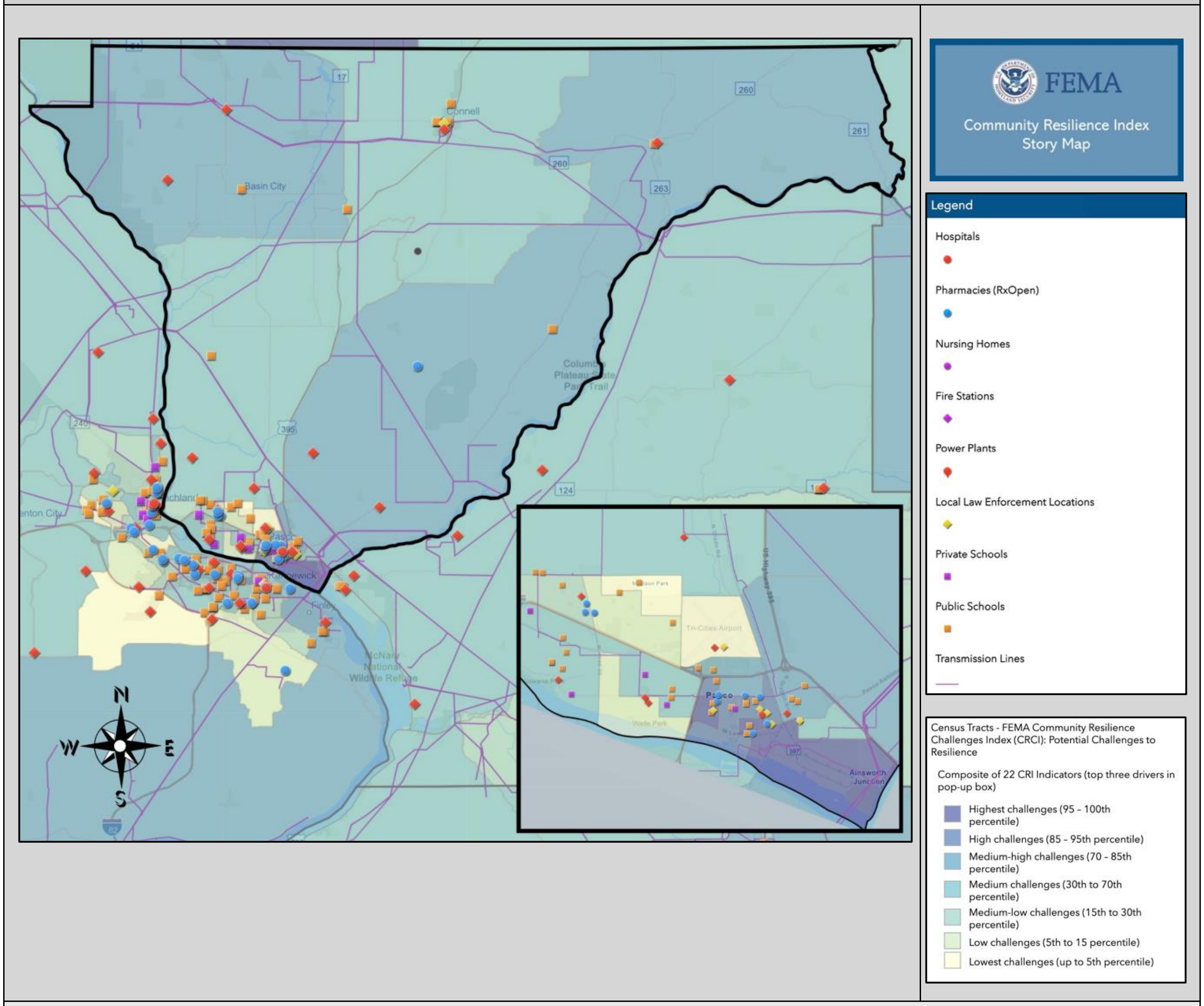
Critical facilities are commonly considered to be police stations, fire and rescue facilities, hospitals, shelters, schools, nursing homes, water supply and waste treatment facilities, and other structures the community identifies as essential to the health and welfare of the population and that are especially important following a disaster.

The following figure illustrates the locations of critical facilities within Franklin County.

Figure 3.4 Franklin County - FEMA Critical Infrastructure Map

FRANKLIN COUNTY CRITICAL INFRASTRUCTURE AND KEY RESOURCES

FEMA CRITICAL INFRASTRUCTURE MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2024

3.19 Hazard Mitigation-related Laws, Ordinances, Programs, Studies, and Plans

3.19.1 Local Historical Records and Relevant Technical Studies

- Quad Cities Agal Bloom Management Plan
- Franklin County Strategic Plan
- Franklin County Capital Improvement Plan
- Franklin County 4 Year CIP Budget
- Franklin County Community Plans - Land Use
- Franklin County Community Wildfire Protection Plan

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Part III: Risk Assessment

CHAPTER 4 HAZARD RISK SUMMARY

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural 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 disasters may affect a jurisdiction, how often they can occur, and their potential severity.
- Vulnerability identification—Determine the impact of natural hazard events on the people, property, environment, economy, and lands of the region.
- Cost evaluation—Estimate the cost of potential damage and expenses. tMitigation can help costs be minimized or avoided.

The risk assessment for this hazard mitigation plan update evaluates the risk of natural hazards prevalent in the planning area and meets the requirements of the DMA (44 CFR, Section 201.6(c)(2)).

4.1 Identified Hazards

There are countless hazards that pose a threat to human life, health, and well-being~~, and no attempt is made here to compile an exhaustive list~~. Those that are addressed in disaster planning are generally categorized as "natural" or "technological" (sometimes "manmade"). As of April 24, 2025, the FEMA website contains a thorough discussion and list of hazards in the "National Risk Index for Natural Hazards" section. Some hazards threaten all geographic areas, while other hazards are more limited in their extent, such as flooding. Studies were conducted to determine which hazards are of concern in Franklin County or the City of Pasco.

The Franklin County hazards were identified, and their frequency of occurrence was evaluated using several resources, including:

- 2023 Washington State Hazard Mitigation Plan
- 2018 Franklin County Hazard Mitigation Plan
- Hazard planning documents developed by state, federal, and private agencies
- NOAA weather data from the past 72 years
- Data from the United States Geological Survey (USGS)

Hazards identified as significant in this county and that will be considered in this plan are listed below.

Natural and Geological Hazards

- Drought
- Earthquake
- Flood
    - River Flooding
    - Flash/Urban Flooding
- High-Hazard Dams & Levees
- Landslide
- Severe Summer Weather
    - Dust Storm
    - Extreme Heat

    - Straight-line Wind
- Severe Winter Weather
    - Blizzard
    - Heavy Snow
    - Extreme Cold
- Space Weather
- Tornado
- Volcano
- Wildfire
-

Other Hazards of Concern

Natural Hazards
- Invasive Species

Technological (Manmade) Hazards
- Air Quality Incidents
- Structural Fire

Biological Hazards
- *Public Health Emergency*

Per FEMA's mandate to address all natural hazards, the following natural hazards **were not included** because these hazards do not directly impact Franklin County due to geographic location:

- Hurricane
- Sea Level Rise
- Storm Surge
- Tsunami
- Volcanic Eruption

4.2 Hazard Profile

The risk assessments in the following chapters describe the risks associated with each identified hazard of concern. The following sections were used to describe each hazard and communicate each respective level of risk:

- **Hazard Description**—Each hazard profile contains a description of the general definition and causes of the hazard. It may also include background information for understanding the context of the hazard within Franklin County.
- **Location**—The location or region in Franklin County where each hazard may occur is described.
- **Historical Frequency & Probability of Future Occurrence**—This section identifies past hazard events of note that have occurred in the Franklin County. It also includes the likelihood of each hazard occurring again if available.
- **Extent**—The strength or magnitude of each hazard is defined, usually through a form of measurement, such as a formula, scale, chart, or graph.
- **Impacts & Loss Estimates**—The potential impacts of each hazard on the county are discussed. This section also outlines the potential economic/monetary loss from a hazard/event and the loss of property, structures, facilities, systems, livestock, and life.

- **FEMA NRI Score**—The hazard-specific FEMA National Risk Index scores for each natural hazard are included.
- **Related Hazards**—The hazard profiles that fall under a greater hazard category can be found within this section.

4.3 Risk Assessment Methodology

Each hazard included in this plan was assessed and ranked based on a pre-defined hazard risk methodology consistent with FEMA's mitigation plan requirements. Information from the hazard profiles and input from subject matter experts were used to inform the hazard risk assessment process. The following is a description of the key factors.

4.3.1 Probability/Likelihood of Occurrence

The probability of occurrence of a hazard is indicated by a probability factor based on the likelihood of annual occurrence:

- **High**—Significant hazard event is likely to occur annually (Probability Factor = 3)
- **Medium**—Significant hazard event is likely to occur within 25 years (Probability Factor = 2)
- **Low**—Significant hazard event is likely to occur within 100 years (Probability Factor = 1)
- **Unlikely**—There is little to no probability of significant occurrence, or the recurrence interval is greater than every 100 years (Probability Factor = 0)

The assessment of hazard frequency is generally based on past hazard events in the area. The past hazard events are events that are documented through data sources like state and federal disaster declarations, personal stories, city and county public works road and infrastructure repair data, and other sources that provide insight on the varied hazard history of Franklin County.

4.3.2 Extent

Extent was assessed in two categories: extent/intensity and catastrophic potential of the hazard. Numerical impact factors were assigned as follows:

Extent/Intensity—Extent is defined as the range of anticipated intensities of the identified hazards. Extent is most commonly expressed using ~~various~~ scientific scales, such as the Enhanced Fujita scale.

- **High**—Historical and/or probabilistic models/studies for this hazard indicate the possibility of a high-intensity incident (Extent Factor = 3).
- **Medium**—Historical and/or probabilistic models/studies for this hazard indicate the possibility of a medium-intensity incident (Extent Factor = 2)
- **Low**—Historical and/or probabilistic models/studies for this hazard indicate the possibility of a low-intensity incident (Extent Factor = 1)
- **Unlikely**—Historical and/or probabilistic models/studies for this hazard indicate the possibility of little to no intensity (Extent Factor = 0)

Catastrophic—The potential that an occurrence of this hazard could be disastrous.

- **High**—High potential that this hazard could be catastrophic (Extent Factor = 3)
- **Medium**—Medium potential that this hazard could be catastrophic (Extent Factor = 2)
- **Low**—Low potential that this hazard could be catastrophic (Extent Factor = 1)
- **Unlikely**—Virtually no potential that this hazard could be catastrophic (Extent Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *Extent/Intensity* and its potential to be *Catastrophic*.

4.3.3 Vulnerability

Vulnerabilities were assessed in three categories: population exposure, property exposure, and exposure based on changes in development. Numerical impact factors were assigned as follows:

People—Values were assigned based on the percentage of the total population exposed to the hazard event.

- **High**—30% or more of the population is exposed to this hazard (Vulnerability Factor = 3)
- **Medium**—15% to 29% of the population is exposed to this hazard (Vulnerability Factor = 2)
- **Low**—14% or less of the population is exposed to this hazard (Vulnerability Factor = 1)
- **No Vulnerability**—None of the population is exposed to this hazard (Vulnerability Factor = 0)

Property Exposed—Values were assigned based on the percentage of the total property value exposed to the hazard event.

- **High**—25% or more of the total assessed property value is exposed to the hazard (Vulnerability Factor = 3)
- **Medium**—10% to 24% of the total assessed property value is exposed to the hazard (Vulnerability Factor = 2)
- **Low**—9% or less of the total assessed property value is exposed to the hazard (Vulnerability Factor = 1)
- **No Vulnerability**—None of the total assessed property value is exposed to the hazard (Vulnerability Factor = 0)

Changes in Development—Changes in development since the previous plan was approved have increased or decreased the community's vulnerability/exposure to this hazard.

- **High**—Changes in development have significantly increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 3)
- **Medium**—Changes in development have increased the vulnerability/exposure of the community to this hazard, but not significantly (Vulnerability Factor = 2)
- **Low**—Changes in development have minimally increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 1)
- **No Vulnerability**—Changes in development have had no effect and/or have decreased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *People*, and a weighting factor of 1 was assigned for *Property Exposed* and *Changes in Development*.

4.3.4 Impact

Hazard impacts were assessed in eight categories: population and life/safety, underserved/equity, property damages, economic, environmental, essential operations, future development, and climate change. Numerical impact factors were assigned as follows:

Population and Life/Safety: Values were assigned based on (1) best available historical and probabilistic data for individuals who are vulnerable to the hazard event and (2) the likelihood to experience adverse impacts in the event of its occurrence.

- **High**: Populations exposed to this hazard are likely to experience significant adverse impacts (Impact Factor = 3)
- **Medium**: Populations exposed to this hazard are likely to experience some adverse impacts (Impact Factor = 2)
- **Low**: Populations exposed to this hazard are likely to experience minimal adverse impacts (Impact Factor = 1)
- **No impact**: Populations exposed to this hazard are not likely to experience significant adverse impacts (Impact Factor = 0)

Underserved/Equity—Values were (1) assigned based on the best available data for underserved populations vulnerable to the hazard event and (2) are likely to experience adverse/disproportionate impacts from the hazard incident, resulting in greater disparity in equity.

- **High**—Underserved populations exposed to this hazard are likely to experience significant adverse/disproportionate impacts (Impact Factor = 3)
- **Medium**—Underserved populations exposed to this hazard are likely to experience some adverse/disproportionate impacts (Impact Factor = 2)
- **Low**—Underserved populations exposed to this hazard are likely to experience minimal adverse/disproportionate impacts (Impact Factor = 1)
- **No impact**—Underserved populations exposed to this hazard are not likely to experience significant adverse/disproportionate impacts (Impact Factor = 0)

Property Damages—Values were assigned based on the expected total property damages incurred from a hazard incident. It is important to note that values represent estimates of the loss from a major incident based on historical data or probabilistic models/studies.

- **High**—More than $5,000,000 in property damages is expected from a single major hazard event, or damages are expected to occur to 15% or more of the property value within the jurisdiction (Impact Factor = 3)
- **Medium**—More than $500,000 but less than $5,000,000 in property damages is expected from a single major hazard event, or expected damages are expected to be more than 5% but less than 15% of the property value within the jurisdiction (Impact Factor = 2)
- **Low**—Less than $500,000 in property damages is expected from a single major hazard event, or less than 5% of the property value within the jurisdiction (Impact Factor = 1)
- **No impact**—Little to no property damage is expected from a single major hazard event (Impact Factor = 0)

Economic—An estimation of the impact, expressed in dollars, on the local economy is based on a loss of business revenue, crops, worker wages, and local tax revenues or the impact on the local gross domestic product (GDP).

- **High**—Total economic impact is likely to be greater than $10,000,000 (Impact Factor = 3)

- **Medium**—Total economic impact is likely to be greater than $100,000 but less than or equal to $10,000,000 (Impact Factor = 2)
- **Low**—Total economic impact is not likely to be greater than $100,000 (Impact Factor = 1)
- **No Impact**—Virtually no significant economic impact (Impact Factor = 0)

Environmental Factor: Environmental impact from a major hazard event requiring outside resources and support and/or repair, clean-up, restoration, and/or preservation work.

- **High**: Environmental impact from a single major hazard event is likely to be significant, requiring extensive outside resources and support and/or repair, clean-up, restoration, and/or preservation work (Impact Factor = 3)
- **Medium**: Environmental impact from a single major hazard event is likely to be localized, requiring some outside resources and support and/or repair, clean-up, restoration, or preservation work (Impact Factor = 2)
- **Low**: Environmental impact from a single major hazard event is likely to be minimal, requiring little to no outside resources and support, and/or minimal repair, clean-up, restoration, or preservation work (Impact Factor = 1)
- **No impact**: No environmental impacts from a single major hazard event is likely (Impact Factor = 0)

Essential Operations Factor: Impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.

- **High**: Significant impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 3)
- **Medium**: Some impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 2)
- **Low**: Minimal impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 1)
- **No Impact**: No impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 0)

Future Development—The potential that future development will have on increasing or decreasing the impact/consequence of this hazard.

- **High**—Future development trends will significantly increase the impact/consequence of this hazard (Impact Factor = 3)
- **Medium**—Future development trends will increase the impact/consequence of this hazard, but not significantly (Impact Factor = 2)
- **Low**—Future development trends will minimally increase the impact/consequence of this hazard (Impact Factor = 1)
- **No Impact**—Future development trends will not increase the impact/consequence of this hazard and/or may even decrease the impact/consequence of this hazard (Impact Factor = 0)

Climate Change—The potential that climate change will increase the risk of this hazard (e.g., type, location, and range of anticipated intensities of the identified hazard and impacts).

- **High**—Climate change trends will significantly increase the risk of this hazard and its impacts (Impact Factor = 3)
- **Medium**—Climate change trends will increase the risk of this hazard and its impacts, but not significantly (Impact Factor = 2)
- **Low**—Climate change trends will minimally increase the risk of this hazard and its impacts (Impact Factor = 1)
- **No Impact**—Climate change trends will not increase the risk of this hazard and its impacts (Impact Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *Population and Life Safety* and *Underserved/Equity*, and a weighting factor of 2 was assigned for *Property Damages.* In addition, a weighting factor of 1 was assigned for *Economic*, *Environmental, Essential Operations*, *Future Development,* and *Climate Change*.

4.4 FEMA NRI Risk Scores

The National Risk Index (NRI) is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather. Because not all hazards apply to Franklin County, only those with a defined risk to the county are included.

The National Risk Index leverages available source data for Expected Annual Loss due to these 18 hazard types, Social Vulnerability and Community Resilience, to develop a baseline relative risk measurement for each United States county and census tract. These measurements are calculated using average past conditions but cannot be used to predict future outcomes for a community. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision-makers as they develop risk reduction strategies.

4.4.1 Social Vulnerability

Social Vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.

Table 4.3 Franklin County – FEMA NRI Social Vulnerability Score and Rating

FEMA NRI Score	FEMA NRI Rating
89.69	Very High
Social Vulnerability is measured using the Social Vulnerability Index (SoVI) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI). Source: National Risk Index, 2023e; 2023f	

4.4.2 Community Resilience

Community Resilience measures a community's ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Table 4.4 Franklin County – FEMA NRI Community Resilience Score and Rating

FEMA NRI Score	FEMA NRI Rating
28.61	Relatively Low
Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI). Source: National Risk Index, 2023b; 2023e	

4.4.3 Expected Annual Loss

The table below shows the overall expected annual loss score for the entire county based on all natural hazards. Hazard-specific scores are included in each hazard chapter under Impacts & Loss Estimates.

Table 4.5 Franklin County – FEMA NRI Expected Annual Loss Score and Rating

FEMA NRI Score	FEMA NRI Rating
62.06	Relatively Low
Expected Annual Loss scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: National Risk Index, 2023d; 2023e	

4.4.4 Overall NRI Score

The table below shows the overall FEMA National Risk Index Score for the entire county based on all natural hazards. Hazard-specific scores are included in each hazard chapter under the FEMA NRI Score.

Table 4.6 Franklin County – FEMA Overall NRI Score and Rating

FEMA Overall NRI Score	Expected Annual Loss Rating
68.47	Relatively Low
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index). Source: National Risk Index, 2023c; 2023e	

4.5 Overall Risk Scores

The following table represents the new overall risk scores for Franklin County based on the described methodology. Following a data-driven quantitative assessment, the planning team utilized subject matter knowledge and expertise and further refined the scores.

4.5.1 Franklin County

Table 4-7. Hazard Risk Scores for Franklin County

Hazard Event	Probability	Consequence				Total Risk Score (Probability x Consequence)
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	
Drought	3	12	9	21	42	126
Flooding: Riverine	1	18	13	33	64	64
Flooding: Flash/Urban	1	18	13	33	64	64
High-Hazard Dams & Levees	1	18	11	30	59	59
Severe Summer Storms: Dust Storms	3	9	7	23	39	117
Severe Summer Storms: Extreme Heat	3	18	12	30	60	180
Severe Summer Storms: Strong Wind	2	12	13	30	55	110
Severe Winter Weather: Blizzard	2	12	9	24	45	90
Severe Winter Weather: Extreme Cold	1	12	9	24	45	45
Severe Winter Weather: Heavy Snow	1	12	9	24	45	45
Tornado	1	18	11	35	64	64
Volcano	1	3	5	8	8	8
Wildfire	3	18	13	34	65	195
Earthquake	1	18	13	33	64	64
Landslide	1	15	11	30	56	56
Invasive Species	2	12	9	24	45	90
Structural Fire	2	18	15	33	66	132
Air Quality Incidents	2	18	14	32	64	128
Public Health Emergency	1	12	14	26	52	52

4.6 Drought

4.6.1 Hazard Description

Drought is a natural part of the climate in nearly every region, including Washington. While there are formal definitions, most experts agree that pinpointing exactly when a drought begins and ends is difficult due to the many contributing factors and their gradual impact. The National Drought Mitigation Center defines drought as a prolonged lack of precipitation, usually lasting a season or more, that leads to water shortages for various activities, groups, or the environment. Essentially, a "drought" in any location means there's a significant drop in the usual water supply for that area.

4.6.1.1 Drought Types

- Meteorological Drought – Defined as below-normal precipitation over a set period. Often, this type of drought is region-specific based on regional climatology. This drought type is often what is thought of as ‘drought’.
- Agricultural Drought – This type of drought occurs when a reduction in soil moisture results in unmet demand for crops. This drought type is region-, crop-, and time-specific and usually occurs after meteorological droughts. Agricultural drought can cause significant crop losses and economic disruption for agriculture-dependent communities.
- Hydrological Drought – This type of drought is driven by a deficiency of surface and subsurface water resources, often indicated by reduced streamflow, lake or reservoir water levels, and groundwater table heights. Due to the complex hydrological network that feeds surface and subsurface water resources, hydrological drought occurs after meteorological drought.
- Socioeconomic Drought – This type of drought occurs when physical water shortages impact individuals or communities. Socioeconomic drought impacts can vary according to an individual’s or community’s ability to adapt or mitigate.

4.6.2 Hazard Location

Drought could occur anywhere in Franklin County, likely affecting the entire county.

4.6.3 Hazard Extent/Intensity

The figure below displays the precipitation conditions for the United States using the Palmer Drought Severity Index (PDSI), taken from the National Weather Service (NWS). The PDSI quantifies drought in terms of prolonged and abnormal moisture deficiency or excess. This index indicates general conditions and not local variations caused by isolated rain. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. In addition, it can help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires (NCAR, 2024).

The PDSI compares moisture deficiency and excess on a numerical scale that usually ranges from positive five to negative five. Positive values reflect excess moisture supplies, while negative values indicate moisture demands in excess of supplies.

Figure 4.1 Palmer Drought Severity Index (PDSI)

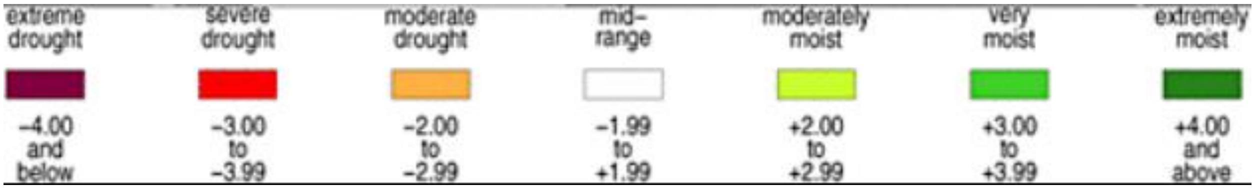
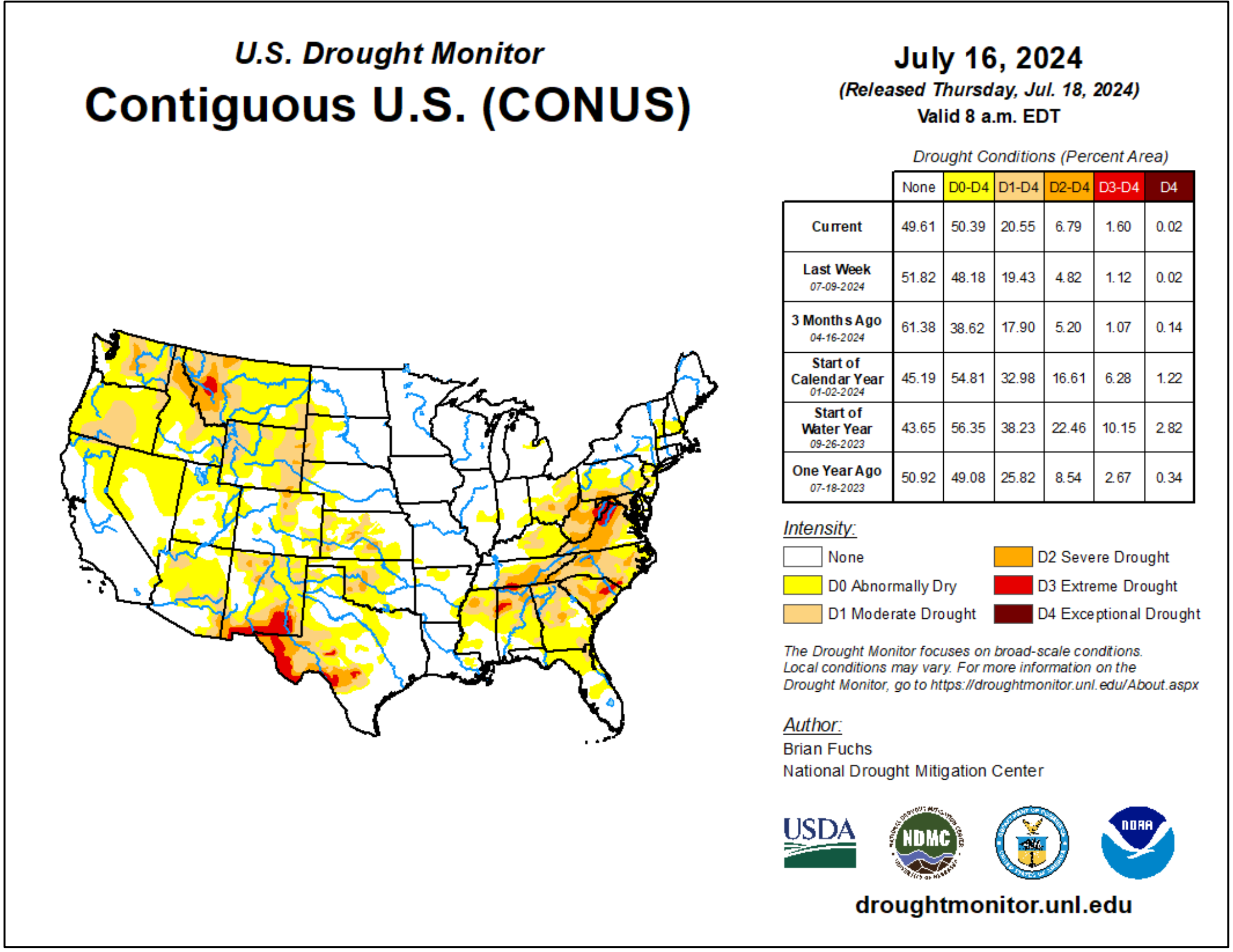


Figure 4.2 U.S. Drought Monitor



U.S. Drought Monitor

Contiguous U.S. (CONUS)

July 16, 2024

(Released Thursday, Jul. 18, 2024)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	49.61	50.39	20.55	6.79	1.60	0.02
Last Week 07-09-2024	51.82	48.18	19.43	4.82	1.12	0.02
3 Months Ago 04-16-2024	61.38	38.62	17.90	5.20	1.07	0.14
Start of Calendar Year 01-02-2024	45.19	54.81	32.98	16.61	6.28	1.22
Start of Water Year 09-26-2023	43.65	56.35	38.23	22.46	10.15	2.82
One Year Ago 07-18-2023	50.92	49.08	25.82	8.54	2.67	0.34

Intensity:

☐ None
🟨 D0 Abnormally Dry
🟧 D1 Moderate Drought
🟧 D2 Severe Drought
🟥 D3 Extreme Drought
🟫 D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brian Fuchs
National Drought Mitigation Center

droughtmonitor.unl.edu

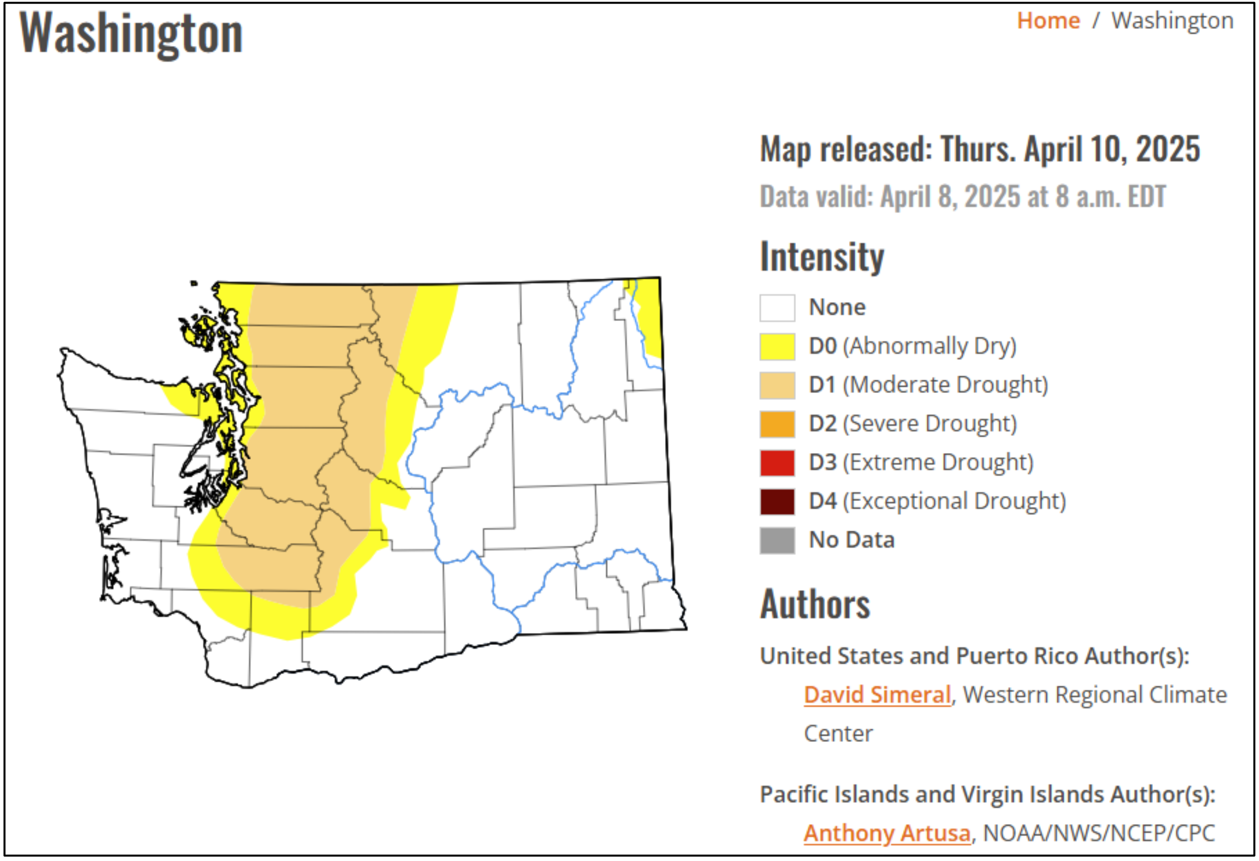
4.6.4 Probability and Frequency

According to NOAA, the probability of drought is determined using precipitation, temperature, soil moisture, and streamflow data, among others. Key methods and tools used to assess and predict drought conditions include:

1. **Palmer Drought Severity Index (PDSI)**: This index assesses the severity of a drought based on precipitation, temperature, and soil moisture. It helps identify the onset and end of drought conditions.
2. **Standardized Precipitation Index (SPI)**: This index measures the amount of precipitation over various timescales and is used to monitor both short-term and long-term drought conditions.
3. **Soil Moisture Analysis**: Soil moisture data, particularly from NASA's GRACE satellite, provides insights into the wetness or dryness of soil at various depths, indicating drought conditions.

4. **U.S. Drought Monitor**: This tool integrates data from multiple indicators to provide a weekly map that shows the location and intensity of droughts across the U.S.

Figure 4.3 US Drought Monitor – Washington April 2025



Washington

Home / Washington

Map released: Thurs. April 10, 2025

Data valid: April 8, 2025 at 8 a.m. EDT

Intensity

⬜ **None**

🟨 **D0** (Abnormally Dry)

🟧 **D1** (Moderate Drought)

🟧 **D2** (Severe Drought)

🟥 **D3** (Extreme Drought)

🟫 **D4** (Exceptional Drought)

▨ **No Data**

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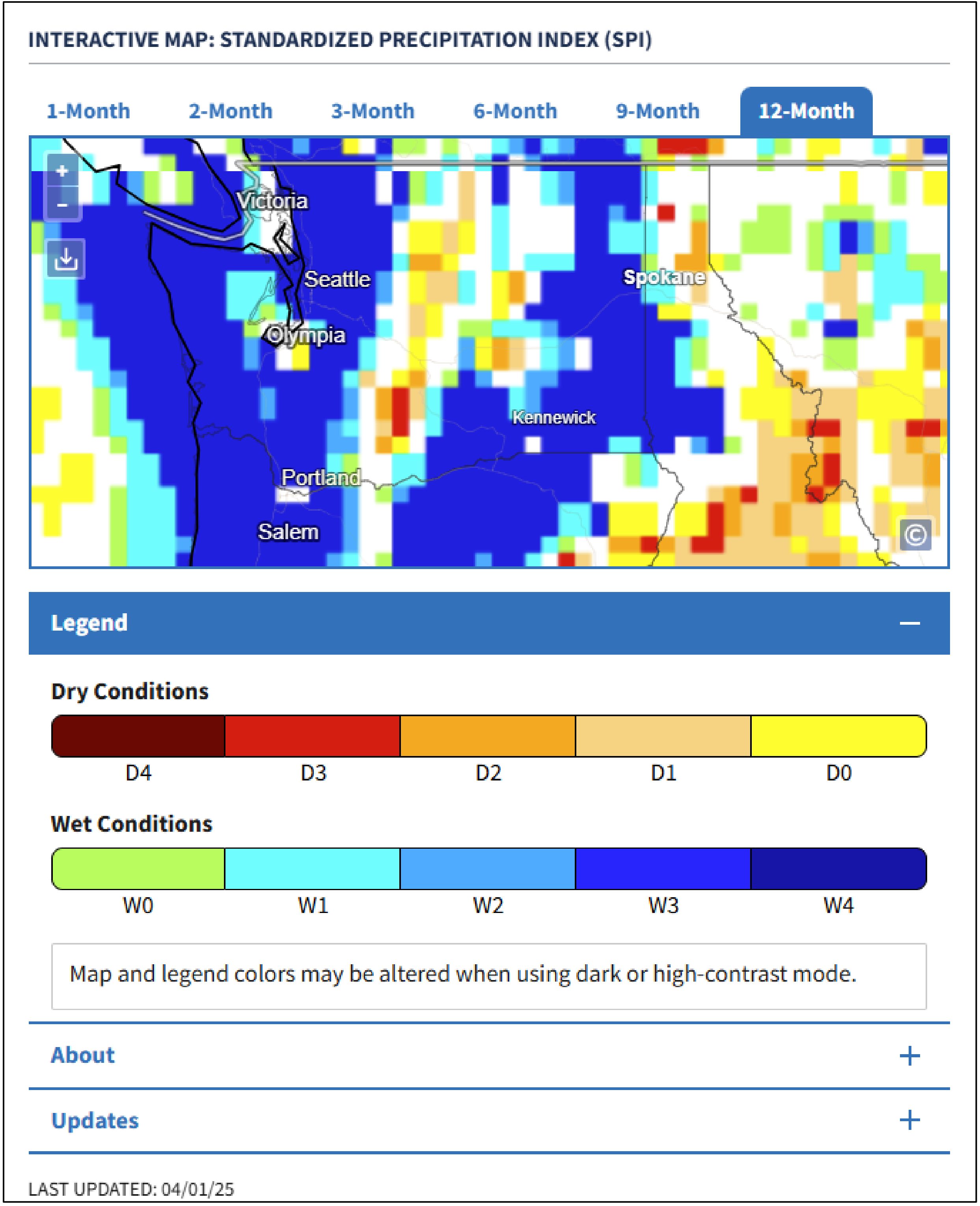


Figure 4.4 12-Month CMORPH Global SPI – Washington April 2025

INTERACTIVE MAP: STANDARDIZED PRECIPITATION INDEX (SPI)

Dry Conditions

D4	D3	D2	D1	D0

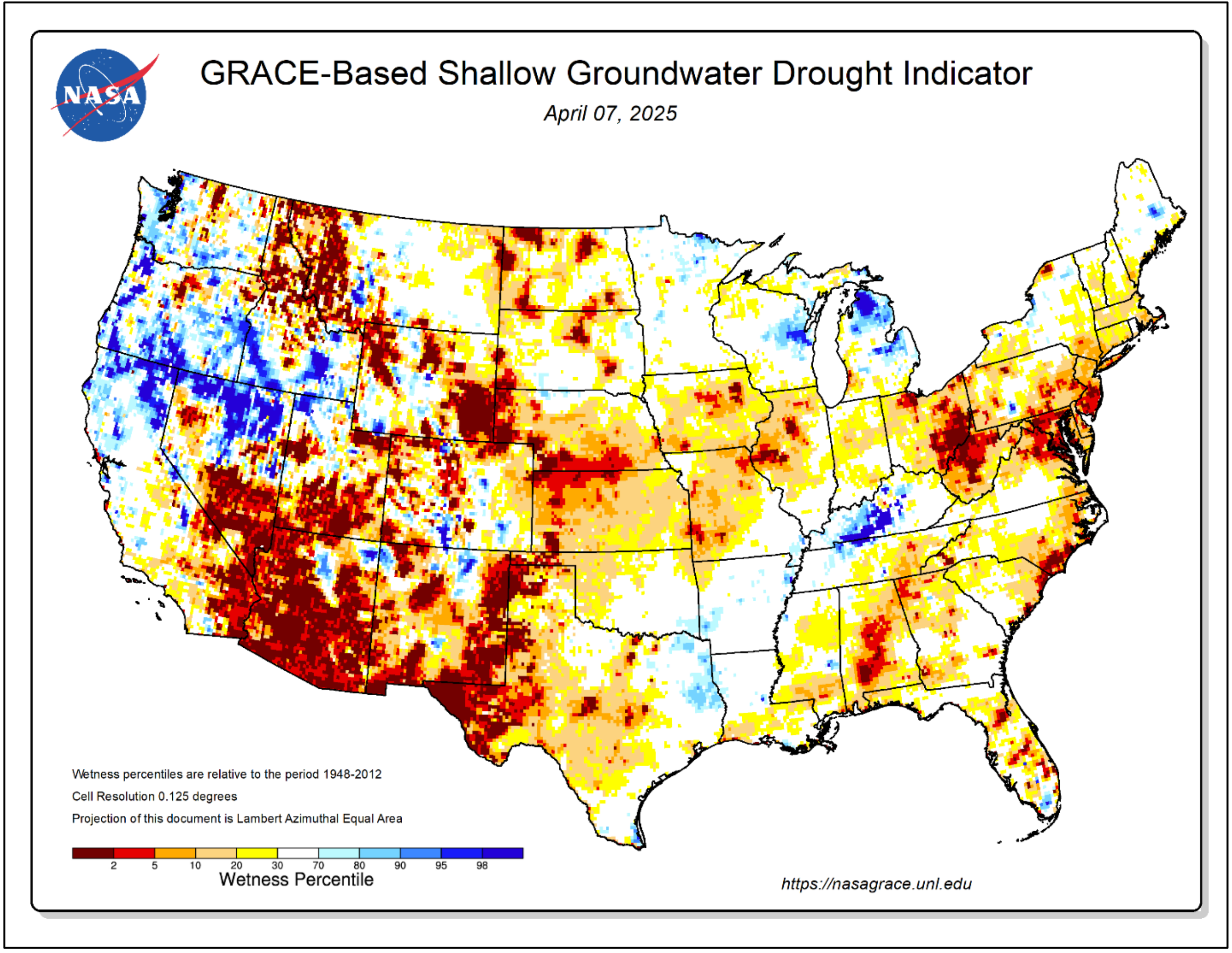
Wet Conditions

W0	W1	W2	W3	W4

Map and legend colors may be altered when using dark or high-contrast mode.

LAST UPDATED: 04/01/25

Figure 4.5 NASA GRACE Surface Soil Moisture Percentile



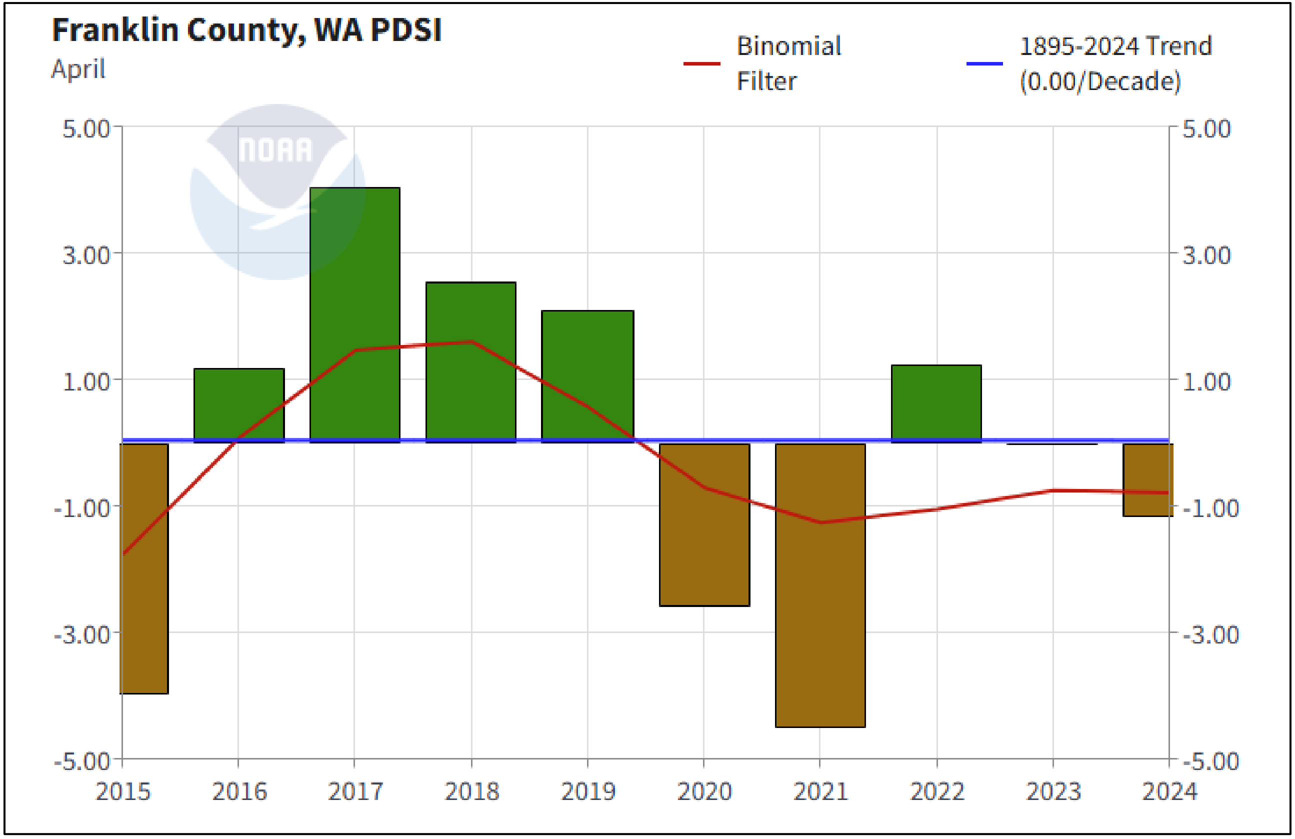
4.6.5 Past Events

According to NOAA, between 01/01/19 and 12/31/24 there have been no documented drought events in Franklin County.

The United States Department of Agriculture's Farm Service Agency has listed Franklin County as a primary county with Disaster Designations affected by drought 4 times between 01/01/19 and 12/31/24.

The figure below represents the PDSI for Franklin County between 2014 and 2023.

Figure 4.6 Franklin County Palmer Drought Severity Index (2015-2025)



4.6.6 Vulnerability and Impacts

Life Safety and Health: Droughts affect life safety and public health in several ways. Health problems can arise from poor water quality, poor food quality, and increased dust in the air. In addition, droughts make fires more likely, spread more quickly, and make them more challenging. In addition, poor air quality and a lack of water may reduce residents' engagement in recreational activities, reducing overall mental and physical well-being.

Property Damage and Critical Infrastructure: Drought has a negligible impact on buildings. Possible losses/impacts to critical facilities include the loss of essential functions due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be involved, the losses could total millions if outside water is shipped. Possible losses to infrastructure include the loss of potable water.

Economy: Although no data demonstrates the economic impact of past drought events on Franklin County, the most significant financial effect of drought is on agriculture.

Changes in Development and Impact of Future Development: No data exists demonstrating the impact of drought on future development in Franklin County. However, excessive drought can result in water shortages and increased competition for limited water resources, which can limit the ability of developers to expand projects within the city.

Effects of Climate Change on Severity of Impacts: According to the University Corporation for Atmospheric Research (UCAR), climate change is causing more extreme weather events, including severe drought. UCAR explains that warmer temperatures cause more evaporation, turning water into vapor in the air and causing drought in some areas of the world. Places prone to drought are expected to become even drier over the following century.

Providing projections of future climate change for a specific region is challenging. Shorter-term projections are more closely tied to existing trends, making longer-term projections even more challenging. The further a prediction reaches, the more subject it becomes to changing dynamics. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water's future
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management, and ecosystem functions
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness, and emergency response

Climate Change Impact on Drought: According to NOAA, climate change can lead to increased frequency and severity of drought. Warmer temperatures accelerate evaporation rates and reduce soil moisture, intensifying drought conditions. This is particularly problematic for regions already prone to droughts, which are now experiencing longer and more intense drought periods. Drought can also impact riparian shrubsteppe vegetation and habitat restoration. Climate change also heightens the likelihood of compound extreme events, such as concurrent heatwaves and droughts. These combined events can overwhelm adaptive capacities and significantly increase damage to ecosystems, agriculture, and infrastructure.

Furthermore, climate change contributes to increased water stress by altering precipitation patterns and elevating temperatures, which affect both water availability and quality. This stress impacts agriculture, energy production, and urban water supplies. Ecologically, intensified droughts pose significant threats to ecosystems and wildlife. For example, reduced stream-flows and higher water temperatures can negatively affect fish populations and other aquatic life. Economically, droughts exacerbated by climate change lead to substantial costs, including losses in crop yields, increased wildfire risks, and strains on municipal and industrial water supplies. Drought can also impact riparian and shrubsteppe vegetation and habitat restoration.

Table 4-8. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.

Source: Neighborhoods at Risk (2024)

Table 4-9. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	**Higher Emissions**	**Lower Emissions**	**Higher Emissions**	**Lower Emissions**	**Higher Emissions**
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation							
Average Annual Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Days Per Year With No Precipitation	**257 days**	**257 days**	**257 days**	**258 days**	**257 days**	**258 days**	**259 days**
	254-261	249-264	245-263	249-263	238-267	251-267	247-269
Maximum Number Of Consecutive Dry Days	**38 day**	**40 days**	**40 days**	**41 days**	**42 days**	**43 days**	**46 days**
	31-47	30-55	29-55	30-59	31-64	31-61	32-61
Temperature Thresholds							
Annual days with Maximum temperature > 90°	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual days with Maximum temperature > 100°	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.6.8 FEMA NRI Expected Annual Loss Estimates

Table 4-10. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, WA FEMA NRI EXPECTED ANNUAL LOSS TABLE - DROUGHT							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
14.6 events per year	N/A	N/A	N/A	$89,729	$89,729	66.9	Relatively Low
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2024)							

4.6.9 FEMA Hazard-Specific Risk Index Table

Table 4-11. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS - DROUGHT		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
69.6	Very High	Relatively Low

Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*

Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*

Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2024)

4.6.10 FEMA NRI Exposure Value Table

Table 4-12. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA FEMA EXPOSURE VALUE TABLE - DROUGHT					
Hazard Type	**Total Value**	**Building Value**	**Population Equivalence**	**Population**	**Agriculture Value**
Drought	$505,719,223	N/A	N/A	N/A	$505,719,223

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*

Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 million of economic loss (2022 dollars).*

Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

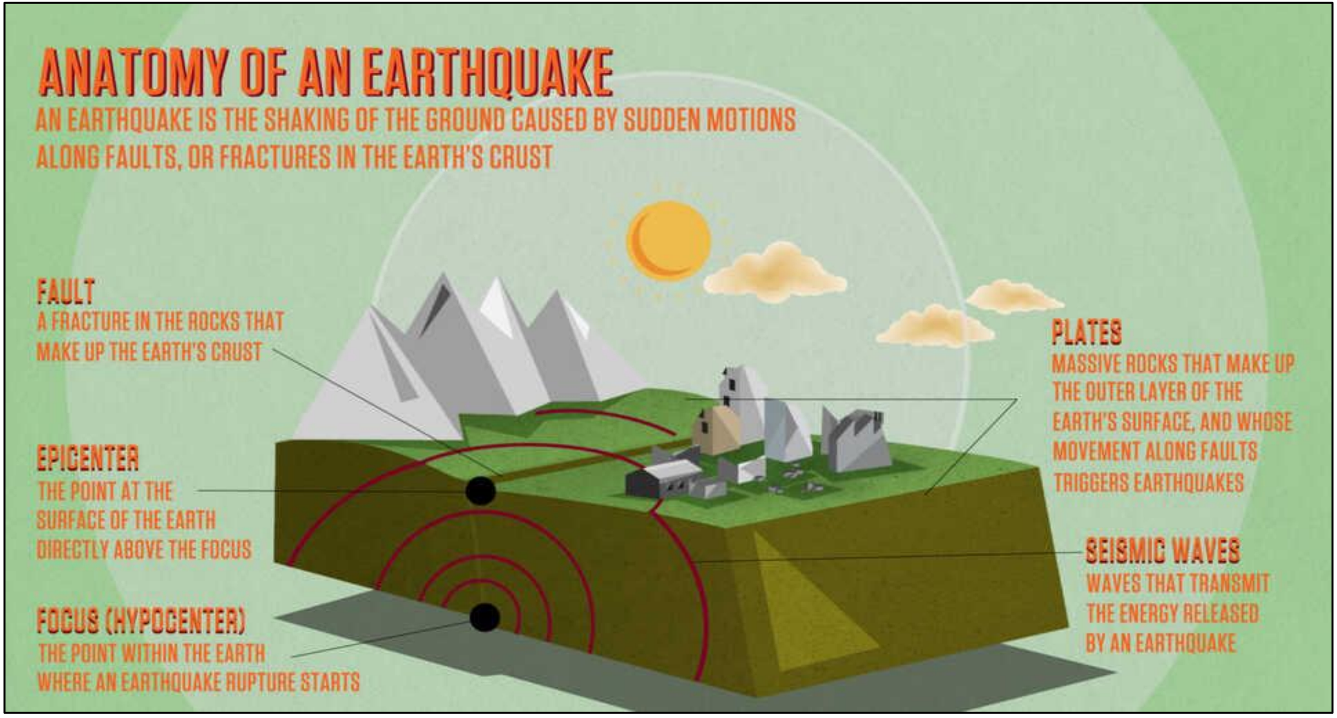
Source: FEMA National Risk Index (2024)

4.7 Earthquake

4.7.1 Hazard Description

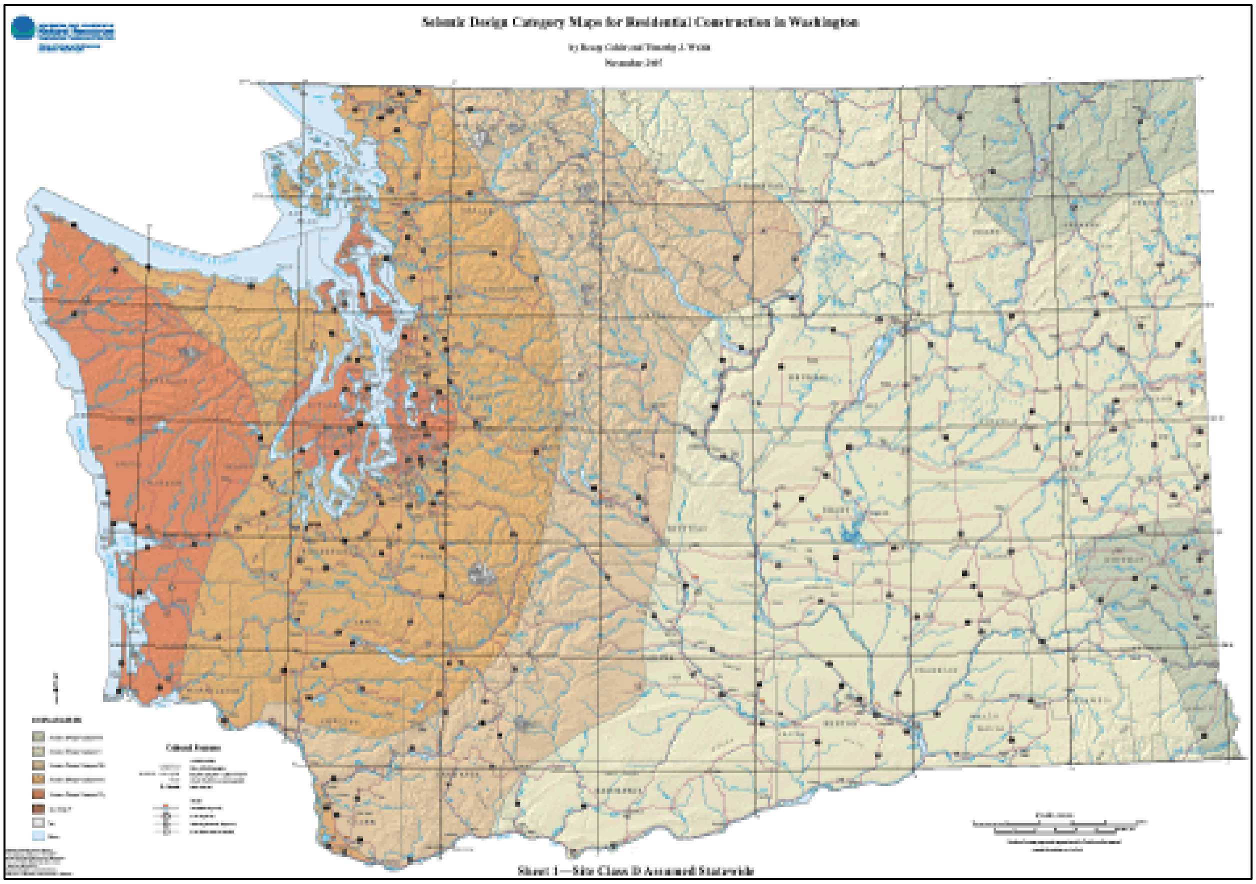
An earthquake is the shaking through the ground, caused when two parts of Earth's crust suddenly slip past each other along a surface called a "fault." Earth's crust is under pressure from the forces of tectonic plates slowly moving around on the surface. While it seems solid, this crust has broken numerous times throughout the planet's history, along surfaces called faults. Faults spend most of their time held together by the force of friction. However, pressure builds up over time, and when it becomes strong enough to overcome the force of friction, the fault slips. The Magnitude, or size, or the earthquake is related to how far the fault moves at one time. The series of waves, or reverberations through the ground of this slip are called an earthquake, and are stronger with higher magnitudes. Earthquakes may also have aftershocks, or additional, earthquakes along the fault as the ground adjusts to its new location. Note

Figure 4.7. California Academy of Sciences Anatomy of an Earthquake



4.7.2 Hazard Location

Figure 4.8. Seismic Map of the State of Washington



4.7.3 Hazard Extent/Intensity

The severity of an earthquake can be expressed in terms of both *intensity* and *magnitude*. However, the two terms are quite different, and they are often confused. Each Earthquake has one Magnitude, but many intensities, depending on location. Intensity is expressed using the Modified Mercalli Intensity Scale, and describes the observed effects of ground shaking on people, buildings, and natural features. It varies from place to place within the disturbed region depending on the location of the observer with respect to the earthquake epicenter, the type of soil beneath them, and expresses how different building types may be impacted. Intensity can also be expressed as "peak ground acceleration," which is measured by instruments on the ground. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake.

Earthquake strength is measured using a Moment Magnitude, which is a number that describes the amount of energy released by the earthquake. Each earthquake has one Magnitude, which is calculated based on how large of an area of the fault ruptured to cause the ground shaking. Each whole-number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value. It is important to note that Magnitude is not used to express damage – damage should be expressed through intensity.

Table 4-13. The Richter Scale

THE RICHTER SCALE	
Magnitude	**Description**
< 2.0	Micro earthquakes, not felt.
2.0 - 2.9	Minor earthquakes, generally not felt, but are recorded.
3.0 - 3.9	Minor earthquakes, often felt, but rarely causes damage.
4.0 - 4.9	Light earthquakes, noticeable shaking of indoor items, rattling noises, and significant damage is unlikely.
5.0 - 5.9	Moderate earthquakes, can cause major damage to poorly constructed buildings over small regions, and possible slight damage to well-designed buildings.
6.0 - 6.9	Strong earthquakes, can be destructive in areas up to about 99 miles across in populated regions.
7.0 - 7.9	Major earthquakes, can cause serious damage over larger regions.
8.0 - 8.9	Great earthquakes, can cause serious damage in regions several hundred miles across.
9.0 - 9.9	Great earthquakes, devastating in areas several thousands of miles across.
10 <	Massive earthquakes, never recorded, widespread devastation across vast regions.

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. The Modified Mercalli (MM) Intensity Scale is the common intensity scale used in the United States. This scale is composed of 10 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction. It does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects. The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the non-scientist than the magnitude because intensity refers to the effects actually experienced at that place.

The table below illustrates abbreviated descriptions of the =10 levels of Modified Mercalli Intensity Scale.

Table 4-14. Modified Mercalli Intensity Scale

MODIFIED MERCALLI INTENSITY SCALE	
Level of Intensity	**Observed Earthquake Effects**
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Earthquakes can trigger other types of ground failures which could contribute to the damage. These include landslides, dam failures, and liquefaction. In the last situation, shaking can mix groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is a special problem in floodplains where the water table is relatively high, and the soils are more susceptible to liquefaction.

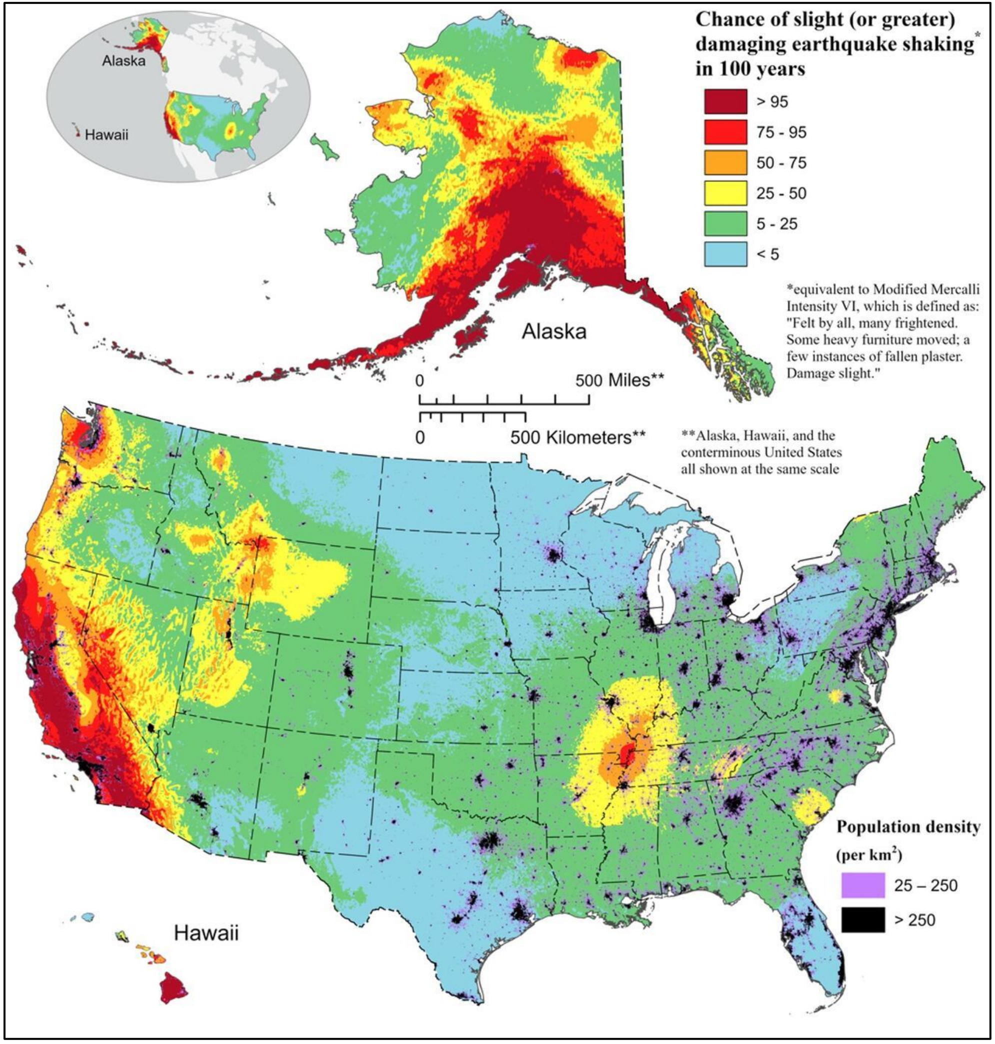
4.7.4 Probability and Frequency

Probability: The United States Geological Survey (USGS) determines the probability of earthquake events through a combination of historical earthquake data, geological and seismological research, and advanced modeling techniques. This process involves analyzing past earthquakes to understand patterns of occurrence, fault line activities, and the distribution of seismic activity across different regions. By studying the behavior of tectonic plates, including their movement and the stress accumulation along faults, scientists can assess where earthquakes are more likely to occur. The USGS also utilizes seismic hazard maps that depict the likelihood of various levels of earthquake shaking in different areas over specific time frames. These maps are based on models that incorporate the rates at which earthquakes occur in different areas and the expected ground shaking from those earthquakes.

In addition, the USGS employs probabilistic seismic hazard analysis (PSHA), a method that quantifies the likelihood of exceeding various levels of earthquake shaking in a given time period, considering the uncertainties inherent in forecasting earthquake behavior. PSHA takes into account the location, rate, and magnitude of potential earthquakes, as well as how seismic waves will propagate through the Earth to affect particular locations. The analysis also incorporates the potential for soil amplification and other local effects that can influence ground shaking intensity.

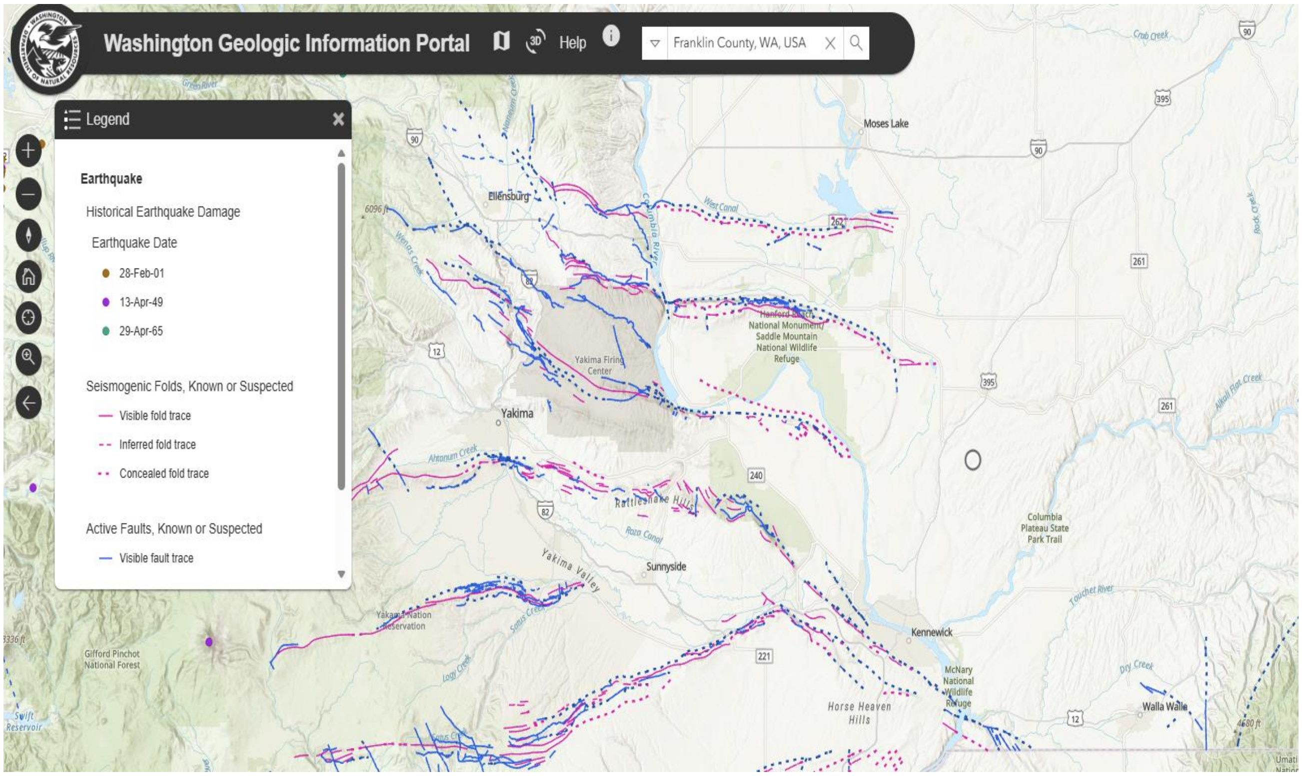
The figure below illustrates peak ground accelerations having a 2% probability of being exceeded in 50 years, for a firm rock site. The long-term national seismic hazard map is based on the most recent USGS models for the conterminous U.S. (2023), Hawaii (2023), and Alaska (2023). These models are based on seismicity and fault-slip rates and consider the frequency of earthquakes of various magnitudes. In California, the hazard may be greater than shown, because site geology may amplify ground motions.

Figure 4.9. Long-term National Seismic Hazard Map



4.7.5 Past Events

Figure 4.11. Washington Geologic Information Portal – Historic Earthquake Damage & Known Fault Lines



4.7.6 Vulnerability and Impacts

Public Health and Life Safety: According to FEMA, earthquakes can impact life safety and public health in different ways. Some of the most common impacts are as follows:

- Injuries and Loss of Life: The violent shaking and structural damage caused by earthquakes can result in injuries and, in severe cases, loss of life. Falling debris, structural collapses, and ground ruptures can pose immediate risks to individuals in affected areas.
- Structural Damage: Earthquakes can cause extensive damage to buildings, homes, and infrastructure, making them unsafe for occupancy. This can lead to injuries, homelessness, critical infrastructure outages, and the need for temporary shelter.
- Displacement: Earthquake-affected individuals may be forced to evacuate their homes due to damage or the threat of aftershocks. This displacement can lead to overcrowding in emergency shelters and increased stress for affected individuals and families.
- Mental Health Impact: Earthquakes and their aftershocks can have long-lasting psychological effects, including trauma, anxiety, and post-traumatic stress disorder (PTSD), which may require mental health support and counseling.
- Strain on Healthcare Systems: Earthquakes can overwhelm healthcare systems with an influx of injured individuals in need of medical attention, in addition to damage to healthcare facilities or their infrastructure. Hospitals and medical facilities may face challenges in providing care and resources.
- Infrastructure Disruption: Critical infrastructure, including roads, bridges, utilities, and communication networks, can be damaged, affecting emergency response capabilities and access to essential services.
- Water Supply Contamination: Ground shaking can damage water supply systems, leading to contamination of drinking water sources. This poses health risks and requires water treatment and distribution efforts.

- Fire Hazards: Earthquakes can cause gas leaks and damage to electrical systems, increasing the risk of fires. Fire outbreaks can lead to additional injuries, property damage, and air quality issues.
- Aftershocks: Aftershocks following the initial earthquake can further damage weakened structures, hinder response efforts, and prolong the risks to life safety and public health.

Property Damage and Critical Infrastructure: Generally, wood frame buildings and structures on solid ground fare best during an earthquake. Wood frame buildings are flexible enough to withstand ground shaking and swaying. Evaluations of recent earthquakes found that damage was primarily caused to:

- Unreinforced masonry structures.
- Older buildings with some degree of deterioration.
- Buildings without foundation ties.
- Multi-story structures with open or “soft” first floors.

Most building codes have standards related to the first three concerns. This means that the most threatened buildings are older ones (built before current codes), masonry ones, and taller ones with open first floors.

In addition to the building type, damage is related to the underlying soils. Buildings on solid ground fare better, while those on loose or sandy soils will suffer more from shaking. These can be found in floodplains. If there is enough water present, the shaking can liquefy the underlying soils, which removes the support under the foundation.

Figure 3-8 in the Community Profile illustrates the locations of critical facilities within Franklin County.

A HAZUS analysis was conducted to examine the life safety and health impact to people during an earthquake incident. In this analysis, HAZUS estimates the number of people that could be injured or killed by an earthquake in Franklin County.

The casualties are broken down into four (4) severity levels that describe the extent of the injuries and are described as follows:

- Severity Level 1: Injuries will require medical attention, but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

The following table provides a summary of the casualties estimated by HAZUS for an earthquake.

Table 4-15. HAZUS Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.01	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	0.81	0.07	0.00	0.00
	Single Family	0.20	0.01	0.00	0.00
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	0.82	0.08	0.00	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.48	0.04	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.06	0.00	0.00	0.00
	Other-Residential	0.26	0.02	0.00	0.00
	Single Family	0.06	0.00	0.00	0.00
	Total	**2**	**0**	**0**	**0**
5 PM	Commercial	0.56	0.05	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.13	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.04	0.00	0.00	0.00
	Other-Residential	0.30	0.03	0.00	0.00
	Single Family	0.07	0.00	0.00	0.00
	Total	**1**	**0**	**0**	**0**

Economy: According to FEMA, earthquake events can have profound and multifaceted economic impacts, affecting communities, businesses, and governments at all levels. Initially, earthquakes inflict direct damage to infrastructure, including buildings, roads, and bridges, leading to substantial repair and reconstruction costs. These costs not only strain public budgets but also divert resources from other vital community needs. Businesses experience significant disruptions, with some forced to cease operations temporarily or permanently, resulting in lost income, employment, and productivity. The ripple effects extend to the wider economy, as supply chains are disrupted, and consumer spending patterns shift in the aftermath of the disaster.

According to FEMA, earthquakes can undermine investor confidence and lead to declines in property values, especially in areas deemed at high risk for future seismic events. The insurance sector faces increased claims, which can impact the availability and cost of coverage for businesses and homeowners. Efforts to rebuild and recover from an earthquake often require substantial investment, which can stimulate economic activity in construction and related sectors but also highlight the need for improved resilience and preparedness strategies.

Changes in Development and Impact of Future Development: According to FEMA, earthquake events significantly influence changes in development and future planning strategies, primarily through the lens of enhancing resilience and safety in earthquake-prone areas. In the aftermath of significant seismic activity, there is often a reassessment of building codes and construction practices to reduce the vulnerability of structures to future earthquakes. This includes the adoption of more stringent engineering standards, the use of earthquake-resistant materials, and the incorporation of innovative design techniques that allow buildings and infrastructure to withstand seismic forces. Such measures are crucial in minimizing physical damage and ensuring the safety of occupants during subsequent earthquakes. Lastly, urban planning and zoning regulations may be revised to limit development in high-risk areas, such as fault zones and areas susceptible to soil liquefaction, further mitigating potential damage and loss of life.

According to FEMA, earthquake events also impact long-term planning of communities, through higher building code standards and retrofitting existing structures to improve their earthquake resilience. Efforts to enhance public awareness and preparedness, including earthquake drills and the development of emergency response plans, become integral components of community planning.

Effects of Climate Change on Severity of Impacts: According to NOAA, the relationship between climate change and the severity of earthquake events is not direct, as earthquakes are primarily caused by geophysical processes related to the movement of tectonic plates beneath the Earth's surface. According to NOAA, earthquakes result from the buildup and release of energy along faults or by volcanic activity, processes that are generally considered to be independent of atmospheric conditions influenced by climate change.

4.7.7 FEMA NRI Expected Annual Loss Estimates

Table 4-16. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – EARTHQUAKE

Annualized Frequency	Population	Population Equivalence	Building Value	Agriculture Value	Total Value	Expected Annual Loss Score	Expected Annual Loss Rating
0.165% chance per year	0.05	$534,394	$1,762,969	N/A	$2,297,363	87.1	Relatively Low

Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*

Expected Annual Loss *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*

Source: FEMA National Risk Index (2024)

4.7.8 FEMA Hazard-Specific Risk Index Table

Table 4-17. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA
FEMA HAZARD SPECIFIC RATINGS – EARTHQUAKE

Risk Index Score	Social Vulnerability Rating	Community Resilience Rating
90.1	Very High	Relatively Low

Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*

Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*

Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2024)

4.7.9 FEMA NRI Exposure Value Table

Table 4-18. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE – EARTHQUAKE

Hazard Type	Total Value	Building Value	Population Equivalence	Population	Agriculture Value
Earthquake	$1,136,316,911,000	$14,028,511,000	$1,122,288,400,000	96,749.00	N/A

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 million of economic loss (2022 dollars).*
Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

Source: FEMA National Risk Index (2024)

4.8 Flooding

4.8.1 Hazard Description

Flooding is defined by the National Weather Service (NWS) as “the inundation of normally dry areas as a result of increased water levels in an established water course.” River flooding, the condition where the river rises to overflow its natural banks, may occur due to a number of causes, including prolonged, general rainfall, locally intense thunderstorms, snowmelt, and ice jams. In addition to these natural events, there are a number of factors controlled by human activity that may cause or contribute to flooding. These include dam failure (discussed below) and activities that increase the rate and amount of runoff, such as paving, reducing ground cover, and clearing forested areas. Flooding is a periodic event along most rivers, with the frequency depending on local conditions and controls, such as dams and levees. The land along rivers that is identified as being susceptible to flooding is called the floodplain.

Flooding can also threaten life, safety, and health and often results in substantial damage to infrastructure, homes, and other property. The extent of damage caused by a flood depends on the topography, soils, and vegetation in an area, and the depth and duration of flooding, velocity of flow, rate of rise, and the amount and type of development in the floodplain.

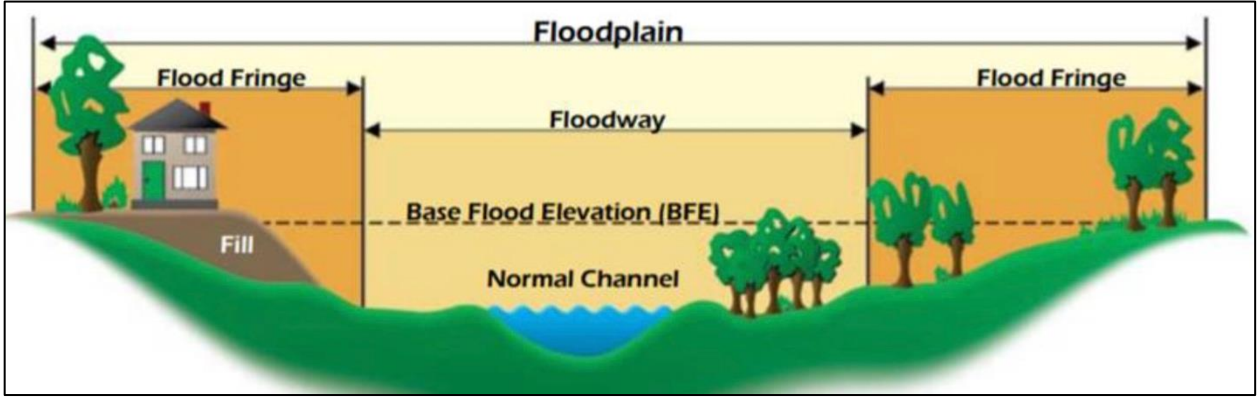
Flooding can occur in a number of ways, and many instances are not independent of each other and can occur simultaneously during a flood event. The types of flooding considered for this plan include:

- Heavy rainfall
- Urban stormwater overflow
- Rapid snowmelt
- Rising groundwater (generally in conjunction with heavy prolonged rainfall and saturated conditions)

- River ice jams
- Flash floods
- Alluvial fan flooding
- Flooding from dam failure

Riverine Flooding: Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks onto adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snowpacks, heavy spring rains, or a combination of the two.

Figure 4.10 NFIP Riverine Floodplain Characteristics



Urban/Flash Flooding: Urban (or "Flash") flooding, as defined in the Urban Flooding Awareness Act, is "the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. 'Urban flooding' does not include flooding in undeveloped or agricultural areas. 'Urban flooding' includes (i) situations in which stormwater enters buildings through windows, doors, or other openings, (ii) water backup through sewer pipes, showers, toilets, sinks, and floor drains, (iii) seepage through walls and floors, and (iv) the accumulation of water on property or public rights-of-way. Urban flooding is characterized by its repetitive, costly, and systemic impacts on communities, regardless of whether or not these communities are located within formally designated floodplains or near any body of water. These impacts include damage to buildings and infrastructure, economic disruption, and negative effects on health and safety.

A watershed is the land area that drains to a particular waterbody, such as a river, lake, or ocean. It is a geographic region that collects and channels precipitation and surface water to a common outlet, a stream, river, or other waterbody. Watersheds can vary in size, from a small drainage basin encompassing only a few acres to a large river basin spanning thousands of square miles. The health and quality of a watershed are critical for the sustainability of the ecosystem and the organisms that depend on it, including humans.

A healthy watershed is one in which natural land cover supports:

- Dynamic hydrologic and geomorphologic processes within their natural range of variation
- Habitat of sufficient size and connectivity to support native aquatic and riparian species

- Physical and chemical water quality conditions can support healthy biological communities.

Natural vegetative cover in the landscape, including the riparian zone, helps maintain the natural flow regime and fluctuations in water levels in lakes and wetlands. This, in turn, helps maintain natural geomorphic processes, such as sediment storage and deposition, that form the basis of aquatic habitats. The connectivity of aquatic and riparian habitats in the longitudinal, lateral, vertical, and temporal dimensions helps ensure the flow of chemical and physical materials and the movement of biota among habitats.

A healthy watershed has the structure and function in place to support healthy aquatic ecosystems. Key components of a healthy watershed include:

- Intact and functioning headwater streams, floodplains, riparian. corridors, biotic refugia, instream habitat, and biotic communities.
- Natural vegetation in the landscape; and
- Hydrology, sediment transport, fluvial geomorphology, and disturbance regimes are expected for its location.

A stream’s flow regime refers to its characteristic pattern of flow magnitude, timing, frequency, duration, and rate of change. The flow regime plays a central role in shaping aquatic ecosystems and the health of biological communities. Alteration of natural flow regimes (e.g., more frequent floods) can reduce the quantity and quality of aquatic habitat, degrade aquatic life, and result in the loss of ecosystem services.

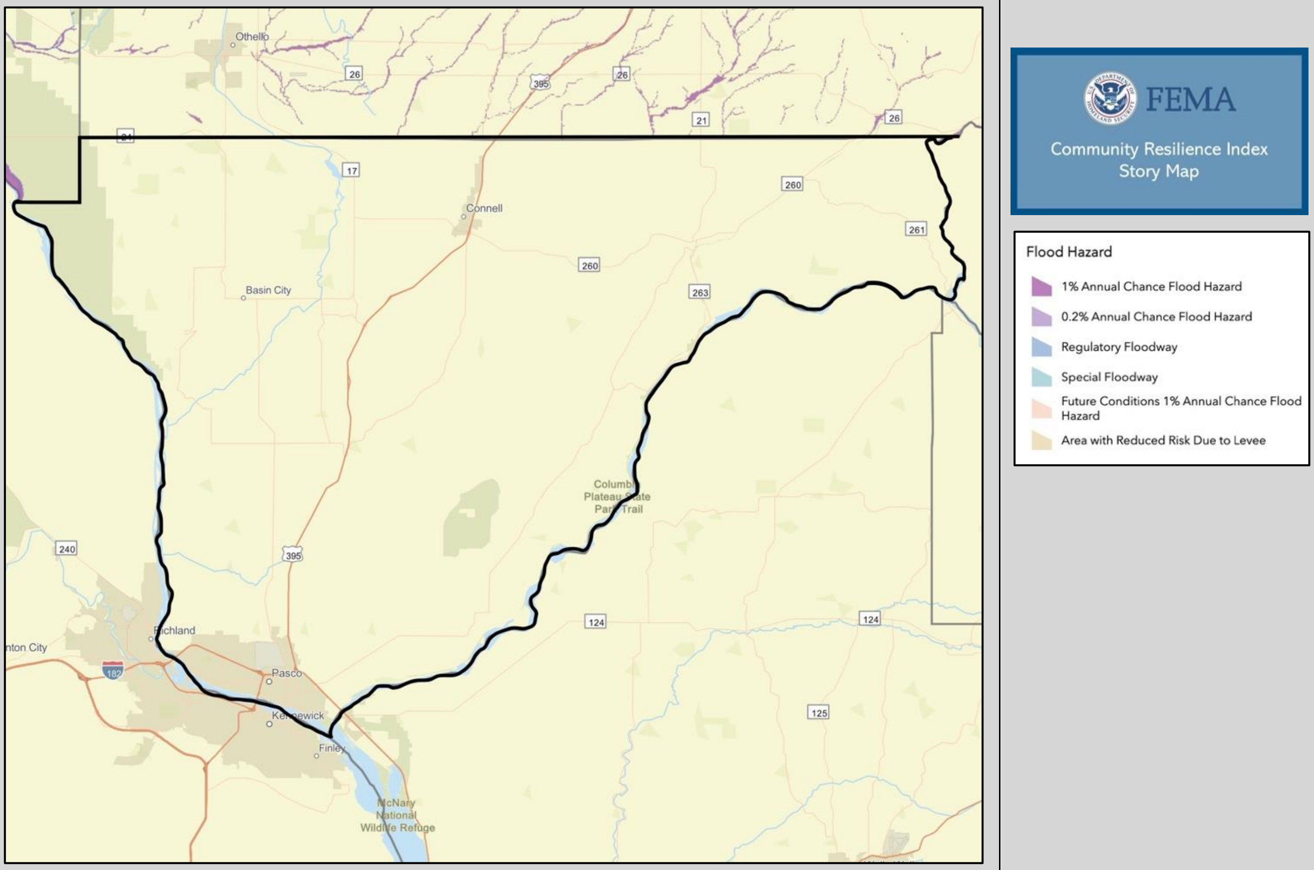
Most flooding occurs along natural streams or river channels. The land along a stream or river identified as susceptible to flooding is called the floodplain. Floods vary greatly in frequency and magnitude. Small flood events occur much more frequently than large, devastating events. A FEMA RAPT map illustrating flood risk to Franklin County is below.

4.8.2 Hazard Location

Figure 4.11 FEMA RAPT Tool Flood Hazard Map for Franklin County

FRANKLIN COUNTY, WA

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2024

Table 4-19. Pond Locations in Franklin County

FRANKLIN COUNTY POND LOCATIONS			
Pond Name/Location	**Type**	**Size/Description**	**Notes**
Columbia Basin Project Ponds	Irrigation/Retention	Varies significantly, generally small to medium-sized	Part of a broader network supporting irrigation in the region, part of South Columbia Basin Irrigation District
Pasco Municipal Retention Pond	Retention	~10 acres	Used for stormwater management in Pasco
Franklin County Irrigation District Ponds	Irrigation/Retention	Sizes vary, generally small to medium	Part of the district’s irrigation network.

4.8.3 Hazard Extent/Intensity

The NFIP classifies floods through the use of recurrence intervals as seen in the NFIP Flood Recurrence Intervals table below.

Figure 4.12 NFIP Flood Recurrence Intervals

Flood Recurrence Interval	Chance of occurrence during any given year
5 year	20%
10 year	10%
50 year	2%
100 year	1%
500 year	0.20%

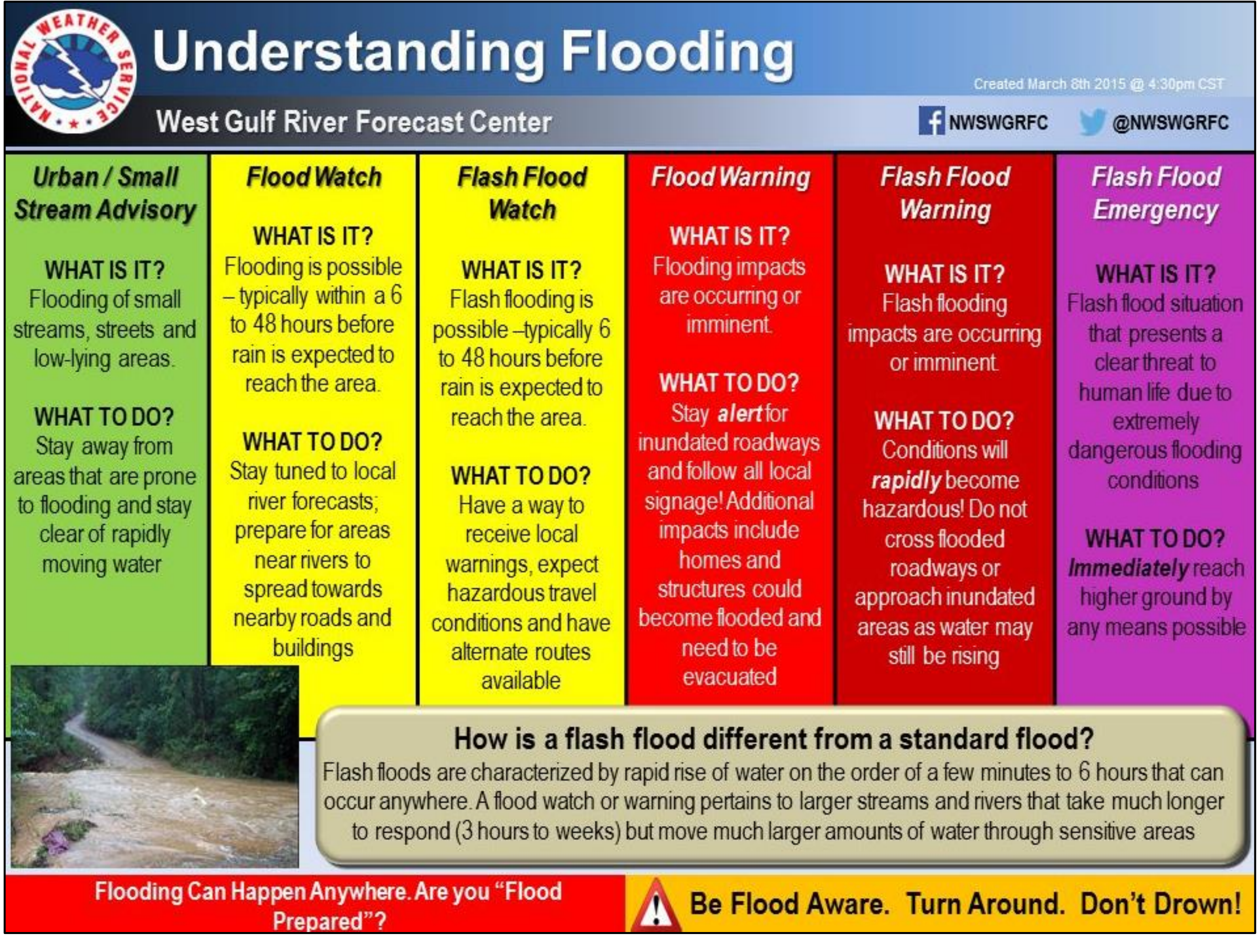
The federal standard for floodplain management under the National Flood Insurance Plan (NFIP) is the 100-year floodplain. This area is chosen using historical data such that in any given year there is a 1% chance of a “base flood (also known as 100-year flood or regulatory flood). A base flood is one that covers or exceeds the 100-year floodplain. A 500-year floodplain is an area with at least a .2% chance of flood occurrence in any given year.

When surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow, water overflows the stream banks, spilling out into adjacent low-lying areas. Riverine flooding occurs as a consequence.

Riverine flooding can cause two types of floods: overbank flooding and flash floods. Overbank flooding is the “increase in volume of water within a river channel and the overflow of water from the channel onto the adjacent floodplain.

Flash flooding can occur suddenly within six hours of intense rainfall from a thunderstorm or several thunderstorms. Flash floods are common near canyons, cliffs, and creek beds, making these areas especially hazardous during rainfall.

Figure 4.13 NWS - Understanding Flash Flooding



Understanding Flooding

West Gulf River Forecast Center

Created March 8th 2015 @ 4:30pm CST

NWSWGRFC @NWSWGRFC

Urban / Small Stream Advisory	Flood Watch	Flash Flood Watch	Flood Warning	Flash Flood Warning	Flash Flood Emergency
WHAT IS IT? Flooding of small streams, streets and low-lying areas. **WHAT TO DO?** Stay away from areas that are prone to flooding and stay clear of rapidly moving water	**WHAT IS IT?** Flooding is possible – typically within a 6 to 48 hours before rain is expected to reach the area. **WHAT TO DO?** Stay tuned to local river forecasts; prepare for areas near rivers to spread towards nearby roads and buildings	**WHAT IS IT?** Flash flooding is possible –typically 6 to 48 hours before rain is expected to reach the area. **WHAT TO DO?** Have a way to receive local warnings, expect hazardous travel conditions and have alternate routes available	**WHAT IS IT?** Flooding impacts are occurring or imminent. **WHAT TO DO?** Stay ***alert*** for inundated roadways and follow all local signage! Additional impacts include homes and structures could become flooded and need to be evacuated	**WHAT IS IT?** Flash flooding impacts are occurring or imminent. **WHAT TO DO?** Conditions will ***rapidly*** become hazardous! Do not cross flooded roadways or approach inundated areas as water may still be rising	**WHAT IS IT?** Flash flood situation that presents a clear threat to human life due to extremely dangerous flooding conditions **WHAT TO DO?** ***Immediately*** reach higher ground by any means possible

How is a flash flood different from a standard flood?

Flash floods are characterized by rapid rise of water on the order of a few minutes to 6 hours that can occur anywhere. A flood watch or warning pertains to larger streams and rivers that take much longer to respond (3 hours to weeks) but move much larger amounts of water through sensitive areas

Flooding Can Happen Anywhere. Are you "Flood Prepared"?

Be Flood Aware. Turn Around. Don't Drown!

4.9.4 Probability and Frequency

Franklin County has experienced 13 FEMA declarations associated with floods of all types between 1966-2023, which is an average of about 0.96 flood declarations every 4 years.

Riverine Flooding: According to NOAA, 49 riverine flooding incidents were recorded in Franklin County between 2019-2023 (1,826 days). This frequency averages to 0.02683 incidents daily during this timeframe and would indicate a similar trend moving forward.

Urban/Flash Flooding: According to NOAA, 187 flash flooding incidents were recorded in Franklin County between 2019-2023 (1,826 days). This frequency averages to 0.10240 incidents daily during this timeframe and would indicate a similar trend moving forward.

Urban areas (such as the City of Pasco) are typically connected to municipal sewer systems (stormwater and/or sanitary sewer). That said, it is more probable that flash flooding will occur within this area. Additionally, as development continues within Franklin County, an increase in flash flooding may occur.

4.9.5 National Flood Insurance Program (NFIP) Participation

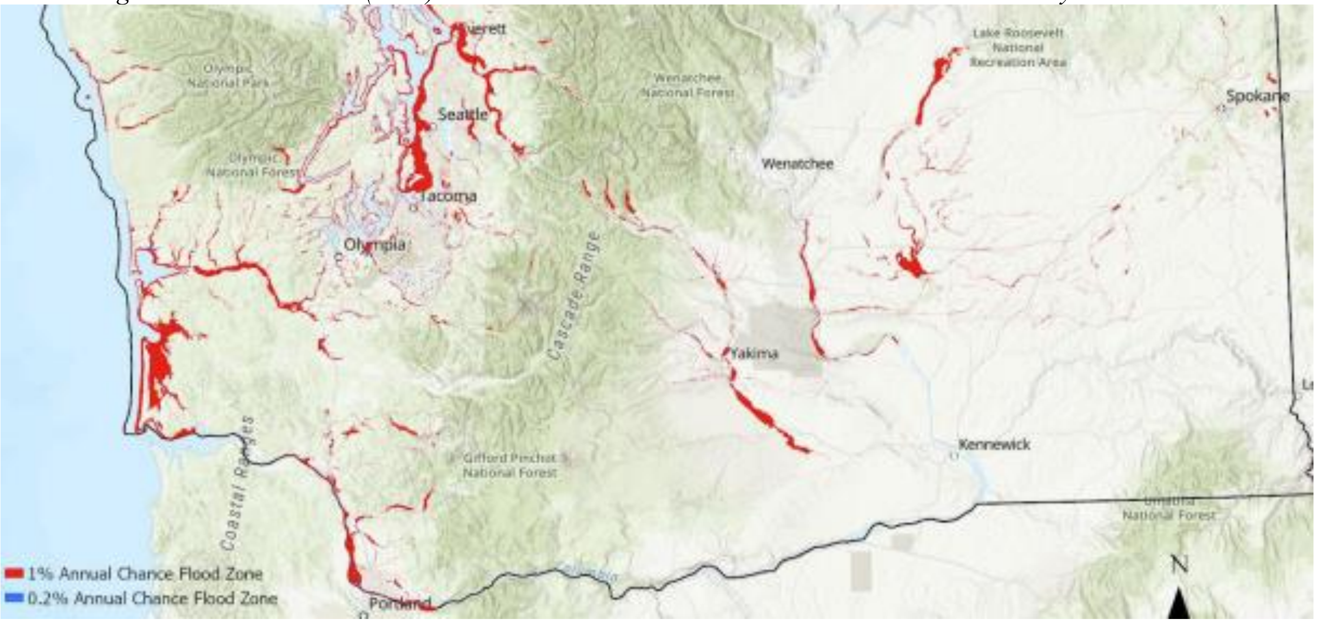
Franklin County participates in the National Flood Insurance Program. Persons buying homes in the floodway and/or the 100-year flood plain are almost always required to purchase flood insurance as a condition of financing; however, there is no requirement that all residential structures purchase flood insurance if not required by a lending institution. According to figures provided by the Washington State Floodplain Manager, there have been only a handful of flood insurance policies issued in Franklin County.

Figure 4.15 Franklin County CEMP – FEMA NFIP Insurance Report Washington (10/2021)

Jurisdiction		Policies	Total Coverage
Pasco		1	$350,000
Connell		3	$315,000
Mesa		0	-
Kahlotus		0	-
Unincorporated Franklin County		26	$6,988,600
	Total	30	$7,653,600

Warning and evacuation of flood-prone areas has improved significantly in the past 25 years. River flow gauging systems operated by the United Stated Geological Survey provide the National Weather Service, the River Forecast Center, and Franklin County Government with up-to-date river levels greatly increasing the ability to predict flood events on the Columbia River. The timeliness of these predictions, as well as the familiarity of local agencies as to their roles and responsibilities, significantly improves the county's preparedness level for flood events. During a flood event, every attempt is made to ensure that flood warning information is disseminated as widely as possible. In addition, 24-hour flood information is available via telephone and the Internet to aid citizen access to flood information. This information includes river-level gauge readings that are updated on a regular basis during flood emergencies.

Figure 4.16 WA SEHMP (2023) Annual Chance Flood Zones – National Flood Hazard Layer Data



4.9.6 Past Flood Events

On February 20, 2017 a county-wide declaration of emergency (Resolution 2017-48) was made in Franklin County due to severe winter storms and related flooding (rapid snowmelt). On April 5, 2017 a Presidential Declaration was filed by the Governor of Washington for the same flooding event caused by the severe winter storms. As of April 21, 2021 the Presidential Declaration of a major disaster was made for 13 counties within Washington State, including Franklin, for January 30 – February 22, 2017 under Major DR-4309-WA and federal assistance was provided. There haven't been any flood events in Franklin County since 2021. ???

According to NOAA, no flash/urban flooding events were reported between 01/01/2019 and 12/31/2023 (1,826 days).

4.9.7 Vulnerability and Impacts

Life Safety and Public Health: Safety and health concerns during a flood range greatly. One of the primary issues communities experience, especially during flash floods, is vehicles getting stuck and/or swept away by rapidly moving waters. These scenarios also present danger to first responders and bystanders attempting to rescue vehicle occupants.

According to FEMA:

- Six inches of water will reach the bottom of most passenger cars, causing loss of control and potential stalling.
- A foot of water will float many vehicles.
- Two feet of rushing water will carry away most vehicles, including SUVs and pickups.

According to the CDC, vehicles are recommended to stay away from standing and/or moving flood waters, the same is recommended for individuals. Flood waters can be both unsanitary and dangerous. When individuals do get stuck within flood waters, some experience heart attacks and other medical conditions while trying to free themselves from the water. Contact with flood waters can increase the possibility of contracting a communicable disease (and other medical issues due to pollutants, chemicals, waste, and an increased number of insects).

Flood waters can also saturate the ground, leading to infiltration into sanitary sewer lines. When wastewater treatment facilities are flooded, there is often nowhere for the treated sewage to be discharged or inflowing sewage to be stored. Infiltration and lack of treatment lead to overloaded sewer lines, which back up into low-lying areas and some homes. Even though diluted by flood waters, raw sewage can be a breeding ground for bacteria, such as E. coli, and other disease-causing agents. Because of this threat, tetanus shots are given to people affected by a flood.

Stagnant water is often a perfect breeding ground for insects, specifically mosquitoes, known to carry and distribute various types of diseases. Standing water also creates mold, which can be a health issue for everyone but is an extreme hazard to those with breathing issues, children, and the elderly. If forced-air systems are affected by floods and are not subsequently cleaned properly, individuals may inadvertently breathe in pollutants. If the water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

Force of flood waters can damage gas lines, which creates the potential for secondary hazards such as gas leaks and fires. This force, along with standing water, can also damage the structural integrity of buildings, which can cause injuries if issues go unnoticed or unrepaired. While fires have not resulted from flooding within Franklin County, history shows that floods can prevent fire departments and protection agencies from successfully combating and sometimes even accessing a fire, allowing it to spread.

According to FEMA, flooding can also disproportionately impact disadvantaged or challenged communities in the following ways:

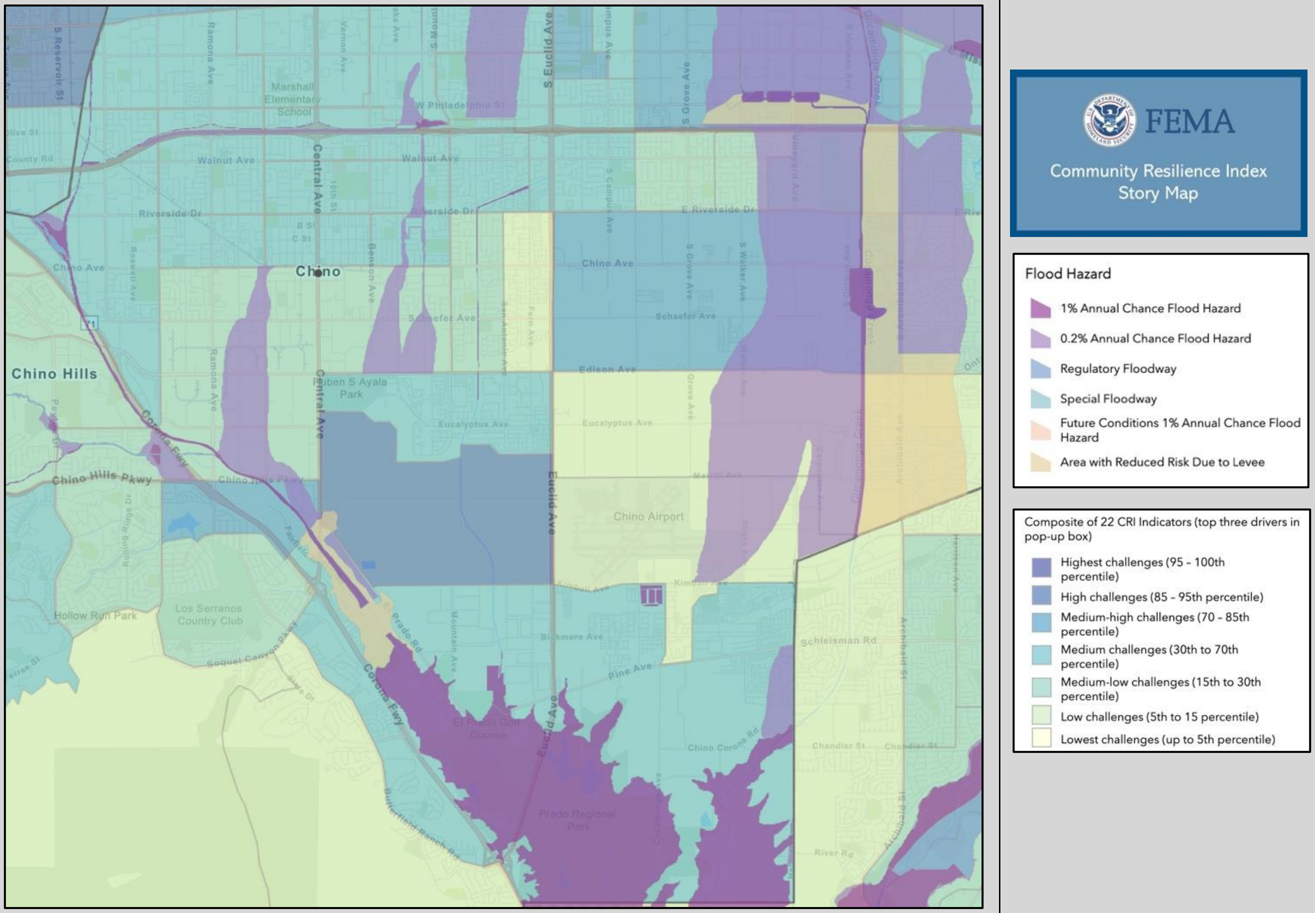
- Lack of Resilience Infrastructure: Disadvantaged communities often lack the infrastructure necessary to mitigate flood impacts, such as well-maintained levees, flood barriers, and stormwater management systems. The absence of these protective measures can make these areas more susceptible to flooding and its consequences.
- Inadequate Housing: Residents of disadvantaged communities may be more likely to live in substandard or low-lying areas prone to flooding. Such housing may lack flood-resistant construction and provide inadequate protection during floods.
- Limited Financial Resources: These communities often have fewer financial resources to prepare for, respond to, and recover from flooding. This can lead to difficulty purchasing flood insurance, repairing flood-damaged homes, or accessing emergency resources.
- Health Vulnerabilities: Residents of disadvantaged communities may have higher rates of pre-existing health conditions or limited access to healthcare services. Flooding can exacerbate these health vulnerabilities, especially if contaminated floodwater spreads diseases or disrupts medical care.
- Transportation Challenges: Limited access to reliable transportation can hinder evacuation efforts during flooding events, placing residents in these areas at greater risk. Public transportation options may be insufficient or inaccessible, leaving residents stranded.
- Information Access: Disadvantaged communities may have limited access to timely, accurate information about flood risks and preparedness measures. This lack of information can lead to delayed or inadequate responses to flood warnings.
- Environmental Justice Concerns: Flooding can lead to the release of hazardous materials, contaminating soil and water. Disadvantaged communities are likelier to be located near industrial sites or toxic facilities, exacerbating environmental justice concerns.
- Community Disruption: Flooding can displace residents from their homes, disrupting communities and increasing social and economic hardships. The recovery and rebuilding process may take longer in these areas due to limited resources.

The FEMA Community Resilience Challenges Index (CRCI) provides a relative assessment of a community's potential resilience and gives insights into population and community characteristics from which to build emergency operations plans and targeted outreach strategies. The following figure illustrates the impact of flooding on Franklin County.

Figure 4.14 Flooding Impacts to Franklin County

FRANKLIN COUNTY, WA

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2024

Property Damage and Critical Infrastructure: A HAZUS analysis was conducted for a 100-year and 500-year flood to examine the exposure and damages of buildings to flooding.

100-year Flood Analysis:

HAZUS estimates that about 176 buildings will be at least moderately damaged. This is over 63% of the total number of buildings in the scenario. There are an estimated 25 buildings that will be completely destroyed.

Table 4-20. HAZUS 100-year Expected Building Damage by Occupancy

Expected Building Damage by Occupancy												
Damage Level	**1-10**		**11-20**		**21-30**		**31-40**		**41-50**		**>50**	
Occupancy	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	12	39	10	32	4	13	2	6	0	0	3	10
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	2	100	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	47	23	81	40	27	13	16	8	9	4	22	11
Total	**59**		**91**		**33**		**18**		**9**		**25**	

Table 4-21. HAZUS 100-year Expected Damage to Essential Facilities

Expected Damage to # of Essential Facilities				
	Total	**At Least Moderate**	**At Least Substantial**	**Loss of Use**
Emergency Operations Centers	2	0	0	0
Fire Stations	13	0	1	1
Hospitals	1	0	0	0
Police Stations	7	1	0	1
Schools	42	1	0	1

Table 4-22. HAZUS 100-year Building-Related Economic Loss Estimates

Building-Related Economic Loss Estimates (Millions of Dollars)						
	Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Building Loss	Building	44.36	19.28	12.14	6.06	81.83
	Content	28.52	50.95	41.07	23.52	144.06
	Inventory	0.00	8.11	10.18	0.91	19.20
	Subtotal	**72.88**	**78.33**	**63.39**	**30.49**	**245.09**
Business Interruption	Income	0.75	50.25	1.61	13.87	66.48
	Relocation	10.35	15.92	1.76	10.67	38.69
	Rental Income	6.36	11.42	0.45	2.25	20.49
	Wage	1.76	48.37	2.28	123.83	176.24
	Subtotal	**19.22**	**125.96**	**6.10**	**150.62**	**301.89**
All	**Total**	**92.10**	**204.29**	**69.49**	**181.10**	**546.98**

The total economic loss estimated for the flood is $546.98 million, representing 23.50% of the total replacement value of the scenario buildings.

The total building-related losses were $245.09 million. 55% of the estimated losses were related to business interruption in the region. The residential occupancies made up 16.84% of the total loss.

HAZUS estimates the number of households expected to be displaced due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates that 774 households (2,323 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near the inundated area. Of these, 150 people are expected to seek temporary shelter in public shelters.

500-year Flood Analysis:

HAZUS estimates that about 310 buildings will be at least moderately damaged. This is over 55% of the total number of buildings in the scenario.

Table 4-23. HAZUS 500-year Expected Building Damage by Occupancy

Expected Building Damage by Occupancy												
Damage Level	**1-10**		**11-20**		**21-30**		**31-40**		**41-50**		**50>**	
Occupancy	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Agriculture	0	0	0	0	0	0	0	0	1	50	1	50
Commercial	12	29	14	34	7	17	3	7	1	2	4	10
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	2	67	0	0	1	33
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	79	22	140	39	43	12	33	9	20	6	40	11
Total	**91**		**154**		**50**		**38**		**22**		**46**	

Table 4-24. HAZUS 500-year Expected Damage to Essential Facilities

Expected Damage to # of Essential Facilities				
	Total	**At Least Moderate**	**At Least Substantial**	**Loss of Use**
Emergency Operations Centers	2	0	0	0
Fire Stations	13	0	1	1
Hospitals	1	0	0	0
Police Stations	7	1	0	1
Schools	42	2	0	2

Table 4-25. HAZUS 500-year Building-Related Economic Loss Estimates

Building-Related Economic Loss Estimates (Millions of Dollars)						
	Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Building Loss	Building	66.78	29.64	15.45	8.77	120.64
	Content	42.12	75.32	51.93	38.34	207.71
	Inventory	0.00	13.40	12.56	1.23	27.19
	Subtotal	**108.90**	**118.36**	**79.94**	**48.35**	**355.54**
Business Interruption	Income	0.81	70.45	1.84	16.26	89.36
	Relocation	17.06	22.97	2.02	12.14	54.18
	Rental Income	10.19	16.60	0.52	2.45	29.77
	Wage	1.92	68.38	2.66	138.77	211.73
	Subtotal	**29.99**	**178.40**	**7.03**	**169.62**	**385.04**
All	**Total**	**138.88**	**296.75**	**86.97**	**217.97**	**740.58**

The total economic loss estimated for the flood is $740.58 million, representing 31.81% of the full replacement value of the scenario buildings.

The total building-related losses were $355.54 million. 52% of the estimated losses were related to business interruption in the region. The residential occupancies made up 18.75% of the total loss.

HAZUS estimates the number of households expected to be displaced due to a flood and the associated potential evacuation. HAZUS also estimates the number of people requiring accommodations in temporary public shelters. The model estimates that 1,222 households (3,666 people) will be displaced due to a flood. Displacement includes households evacuated from within or very near the inundated area. Of these, 245 people are expected to seek temporary shelter in public shelters.

Repetitive Loss Properties: There are several different definitions of a "repetitive loss property." The current FEMA definition of a repetitive loss property is: needs to be filled in! There were xx in Franklin County in xx time period.

Repetitive Loss Structure: An NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. There were xx in Franklin County in xx time period.

Additionally, the definitions of a severe repetitive loss building, and severe repetitive loss property are:

Severe Repetitive Loss Building: Any building that:

1. Is covered under a Standard Flood Insurance Policy made available under this title.
2. Has incurred flood damage for which:

a. Four or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or
b. At least two separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss.

Severe Repetitive Loss Property: Either a severe repetitive loss building or the contents within a severe repetitive loss building, or both. There were xx in Franklin County in x time period.

FEMA encourages the mitigation of severe repetitive loss and repetitive loss properties through the distribution of mitigation grants, the NFIP's Increased Cost of the Compliance program, and the Community Rating System (CRS) program. Depending on the number of repetitive loss properties within a CRS community, the community may be required to develop a specific plan to determine the causes of the repetitive claims and ways to mitigate the causes of the repetitive claims. At a minimum, each CRS community must conduct an annual outreach project to these properties advising the owners of their location in the regulatory floodplain, property protection measures, and any funding options for property protection and flood insurance.

FEMA offers several programs to support communities in identifying and addressing the root causes of their repetitive losses. One such program is the Community Rating System (CRS), which this Plan fulfills the requirements for as outlined in Chapter X.

4.9.8 Property Damage and Critical Infrastructure

Flooding can also disproportionately damage property and critical infrastructure within disadvantaged or challenged communities. Here are some of the ways in which flooding can affect these communities more severely:

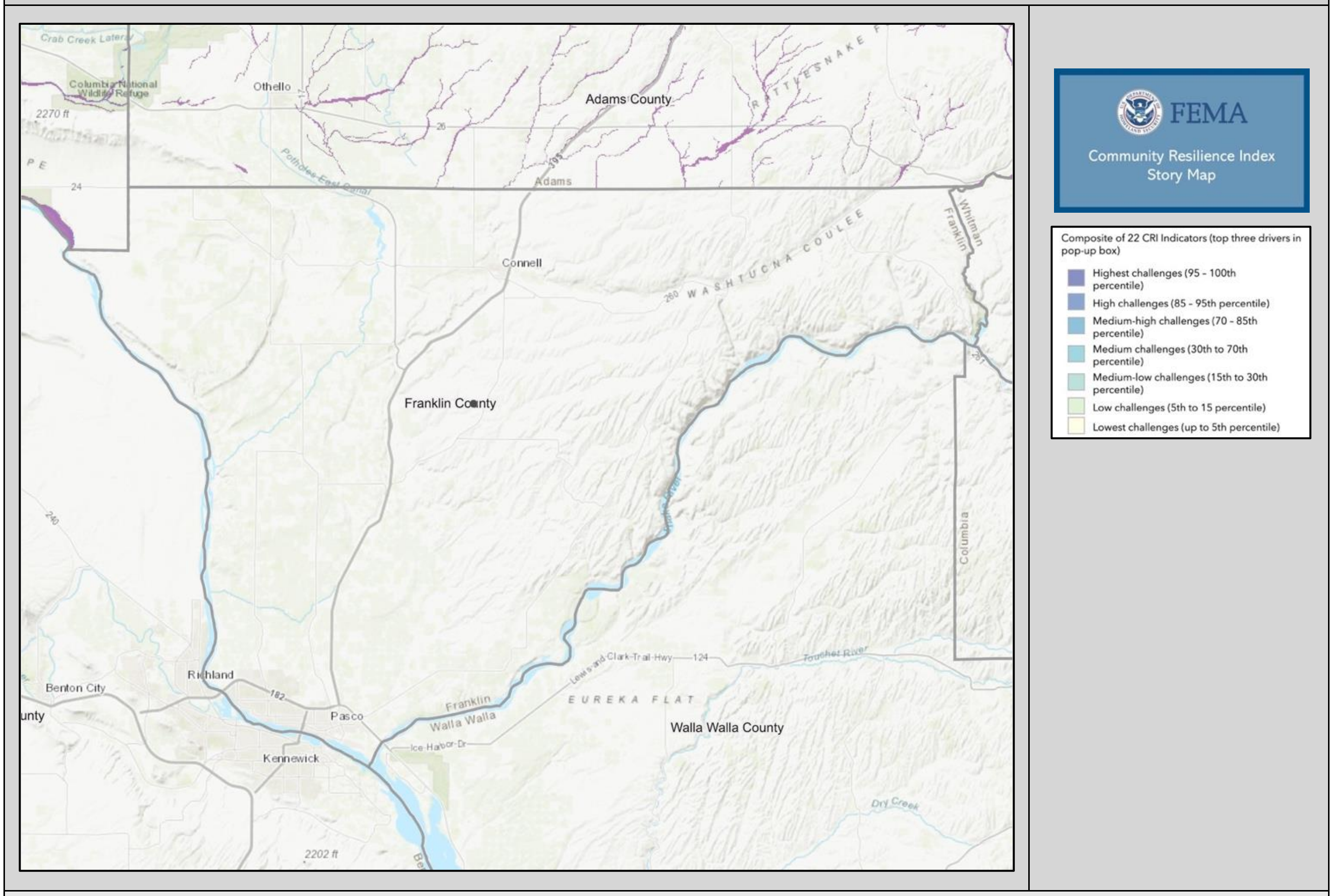
- Housing Vulnerability: Disadvantaged communities often have a higher percentage of residents living in substandard or poorly constructed housing. These homes are more susceptible to flood damage, leading to significant property losses and displacement of residents.
- Limited Insurance Coverage: Residents in disadvantaged communities may be less likely to have flood insurance, either due to affordability issues or lack of awareness. This leaves property owners financially vulnerable when flooding occurs, resulting in a heavier burden of property damage.
- Inadequate Infrastructure: Critical infrastructure, such as roads, bridges, sewage systems, and utilities, may be subpar or outdated in disadvantaged areas. Flooding can damage or disrupt these systems, impeding emergency response efforts and hindering recovery.
- Healthcare Facilities: These communities may have limited access to healthcare facilities and services. Flooding can damage or inundate healthcare facilities, making it challenging for residents to access medical care during and after a flood event.
- Schools and Education: Flood damage to schools can disrupt education for children in these communities. It may take longer for schools to reopen, affecting students' academic progress and overall well-being.
- Economic Impact: Flooding can devastate local economies, including small businesses, which are often the backbone of disadvantaged communities. Loss of income and job displacement can have long-lasting economic consequences.
- Transportation Disruptions: Inadequate transportation infrastructure can be overwhelmed by floodwaters, making it difficult for residents to evacuate or access emergency services. This can also impede the delivery of essential supplies and aid.
- Environmental Justice: Disadvantaged communities may be more likely to be located near industrial or hazardous sites, which can release pollutants during flooding events, further exacerbating environmental justice concerns.

The following figure illustrates flooding impact to critical infrastructure in Franklin County.

Figure 4.15. Flooding Impacts to Critical Infrastructure in Franklin County

FRANKLIN COUNTY, WA

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2024

4.9.9 Economy

Flooding can have several different impacts on the Franklin County economy. One potential impact is damage to university businesses and infrastructure. Flooding can damage or destroy buildings, equipment, and inventory, disrupting operations and resulting in significant financial losses for businesses. Infrastructure such as roads, bridges, and utilities can also be damaged, which can impede transportation and communication networks and further disrupt the operations of businesses and other economic activity.

Another potential economic impact includes local area property values and insurance rates. Properties located in flood-prone areas may decline in value, and insurance rates may increase as the risk of flooding increases. This can make it more difficult for homeowners and businesses to secure loans and other forms of financing.

4.9.10 Changes in Development and Impact of Future Development

The risks associated with flooding are directly related to the population and infrastructure located within the boundaries of the riverine floodplains. Development should be limited in these potential impact areas. Infrastructure improvements should also consider potential impacts. Existing floodplain and construction regulations are in place to help reduce the impacts of flooding. Stormwater infrastructure should also be looked at to determine the impact of flash flooding. This infrastructure does not always take into effect the growth of a community. Increasing impervious surfaces (e.g., concrete parking lots) may cause increased stormwater runoff during short rain events.

4.9.11 Effects of Climate Change on Severity of Impacts

According to NOAA, climate change is impacting the severity and frequency of flooding events, including higher temperatures, which lead to more intense and frequent heavy rainfall, and rising sea levels, which exacerbate coastal flooding. Warmer temperatures also increase the atmosphere's capacity to hold moisture, resulting in more substantial and intense rainfall events.

This increase in heavy precipitation can overwhelm drainage systems and lead to flash flooding. Additionally, the increase in sea levels, driven by the melting of ice caps and thermal expansion of seawater, means that coastal areas are more prone to flooding during storms and high tide events. This combination of factors creates a greater risk of severe flooding, both inland and along the coasts.

Table 4-26. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-27. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.9.12 FEMA NRI Expected Annual Loss Estimates

Table 4-28. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – RIVERINE FLOODING

Annualized Frequency	Population	Population Equivalence	Building Value	Agriculture Value	Total Value	Expected Annual Loss Score	Expected Annual Loss Rating
0.2 events per year	0.00	$6,511	$59,666	$2,571	$68,748	21.2	Very Low

Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*
Expected Annual Loss *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*

Source: FEMA National Risk Index (2024)

4.9.13 FEMA Hazard-Specific Risk Index Table

Table 4-29. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA
FEMA HAZARD SPECIFIC RATINGS - RIVERINE FLOODING

Risk Index Score	Social Vulnerability Rating	Community Resilience Rating
22.2	Very High	Relatively Low

Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*
Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*
Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2024)

4.9.14 FEMA NRI Exposure Value Table

Table 4-30. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA FEMA EXPOSURE VALUE TABLE - RIVERINE FLOODING					
Hazard Type	**Total Value**	**Building Value**	**Population Equivalence**	**Population**	**Agriculture Value**
Riverine Flooding	$4,730,080,857	$151,519,310	$4,568,446,796	393.83	$10,114,751
Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 millions of economic loss (2022 dollars).* ***Agriculture:*** *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*					
Source: FEMA National Risk Index (2024)					

4.10 High Hazard Dams/Levees and Canals

4.10.1 Hazard Description

Dam: A barrier constructed across a watercourse for storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings.

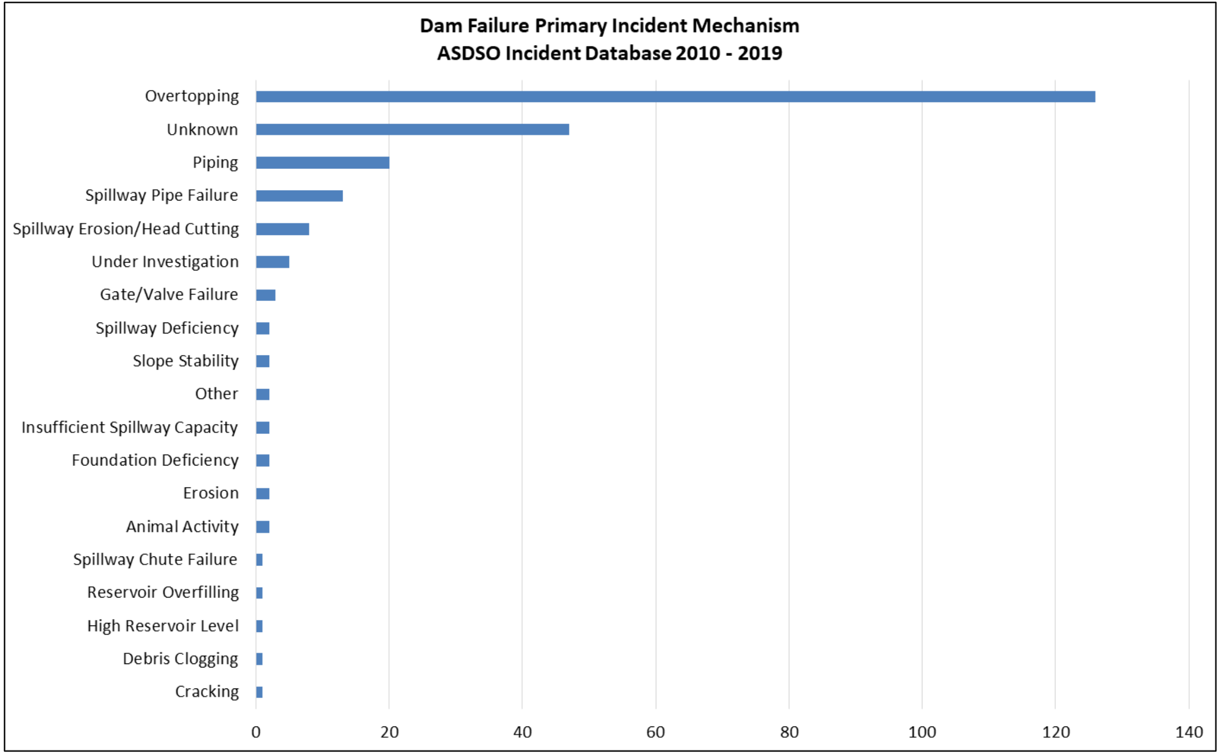
Dam Failure: Failure characterized by the sudden rapid and uncontrolled release of impounded water or liquid-borne solids. It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water could be considered a failure.

The Causes of Dam Failure: Dam failures are most likely to happen for one of five reasons:

1. Overtopping caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam failures.
2. Foundation defects, including settlement and slope instability, cause about 30% of all dam failures.
3. Cracking caused by movements like the natural settling of a dam.
4. Inadequate maintenance and upkeep.
5. Piping is when seepage through a dam is not properly filtered, and soil particles continue to progress, and form sink holes in the dam. Another 20% of U.S. dam failures have been caused by piping (internal erosion caused by seepage). Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of

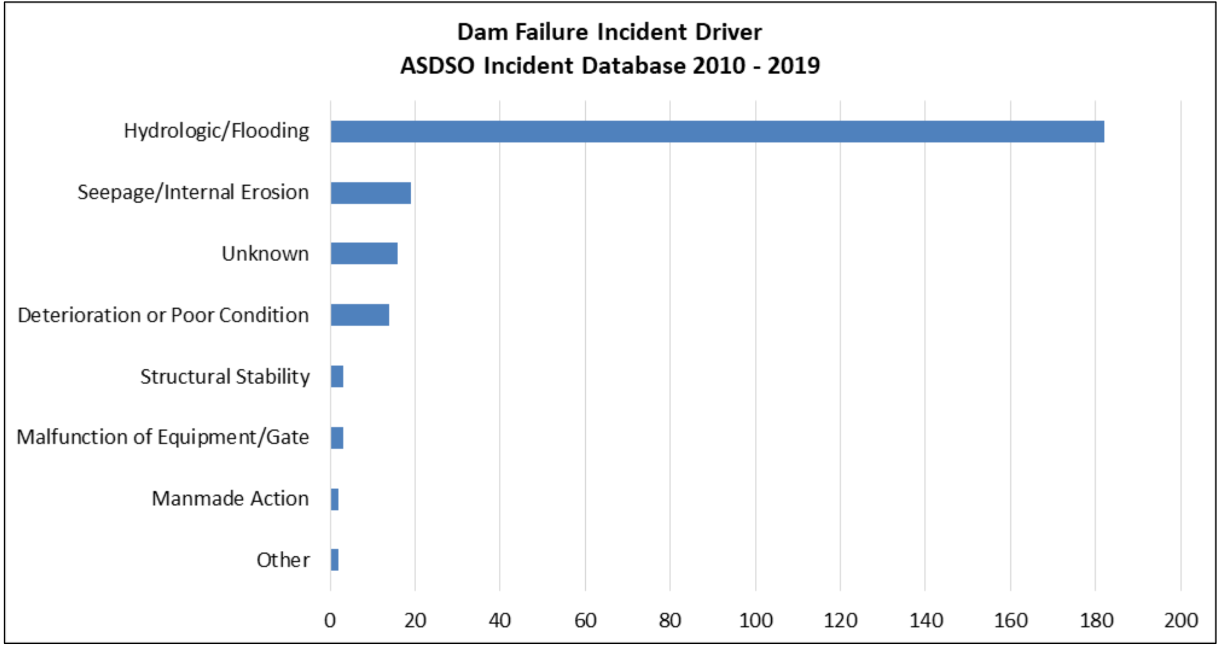
woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.

*Figure 4.16. Causes of Dam Failure Incidents, 2010-2019***



*** From the ASDSO Dam Incident Database, dam failure incidents for the years 2010 through 2019. Incident data mostly obtained from the state dam safety programs and/or media reports. The incident data is not inclusive of all dam safety incidents.*

Figure 4.17. Dam Failure Incident Driver, 2010-2019



Levees: A man-made structure, typically an earthen embankment, designed and constructed according to sound engineering practices to contain, control, or divert the flow of water in order to provide protection from temporary flooding. Levees are often built alongside rivers and are used to prevent high water levels from flooding adjacent land. The primary function of a levee is to provide flood risk reduction; however, they may also serve other purposes such as water conservation, irrigation, or to support a roadway or railway.

Levees can vary in size and complexity, from simple mounds of earth to large-scale systems incorporating elements such as floodwalls, gates, and pumps. The effectiveness of a levee can be influenced by its design, construction, and maintenance, as well as by natural factors like river flow and sedimentation.

Causes of Levee Failure: The definition of a "levee failure" according to the National Levee Database (NLD) generally encompasses the following:

1. **Breach:** The most severe form of failure, a breach occurs when a levee fails completely, resulting in an opening that allows water to flow through uncontrolled. This can lead to significant flooding and damage to areas that the levee was intended to protect.
2. **Overtopping:** Occurs when water levels rise above the height of the levee, leading to spillover on the protected side. While technically an overtopping may not be a structural failure of the levee itself, it represents a failure to contain the water as designed.
3. **Structural Damage:** This includes any form of damage that compromises the integrity of the levee, such as erosion, seepage, or structural weakening. These issues may not immediately lead to a breach or overtopping but indicate that the levee is at risk of failing.
4. **Inadequate Performance:** This refers to situations where the levee does not perform as designed, even if there's no visible structural damage. This could be due to design flaws or unforeseen environmental conditions.

Canal Breach: According to NOAA, a canal breach is defined as a failure in the structure of a canal, which leads to an uncontrolled release of water from the canal. This failure can be caused by structural weaknesses, overtopping, or other factors that compromise the integrity of the canal's walls or embankments, resulting in potential flooding and damage to surrounding areas.

4.10.2 Hazard Location

4.10.2.1 High Hazard Dams

The following image and table illustrate the locations and details of all significant and high-hazard dams located within Franklin County, according to the National Inventory of Dams.

Figure 4.18. High-Hazard Dams in Franklin County

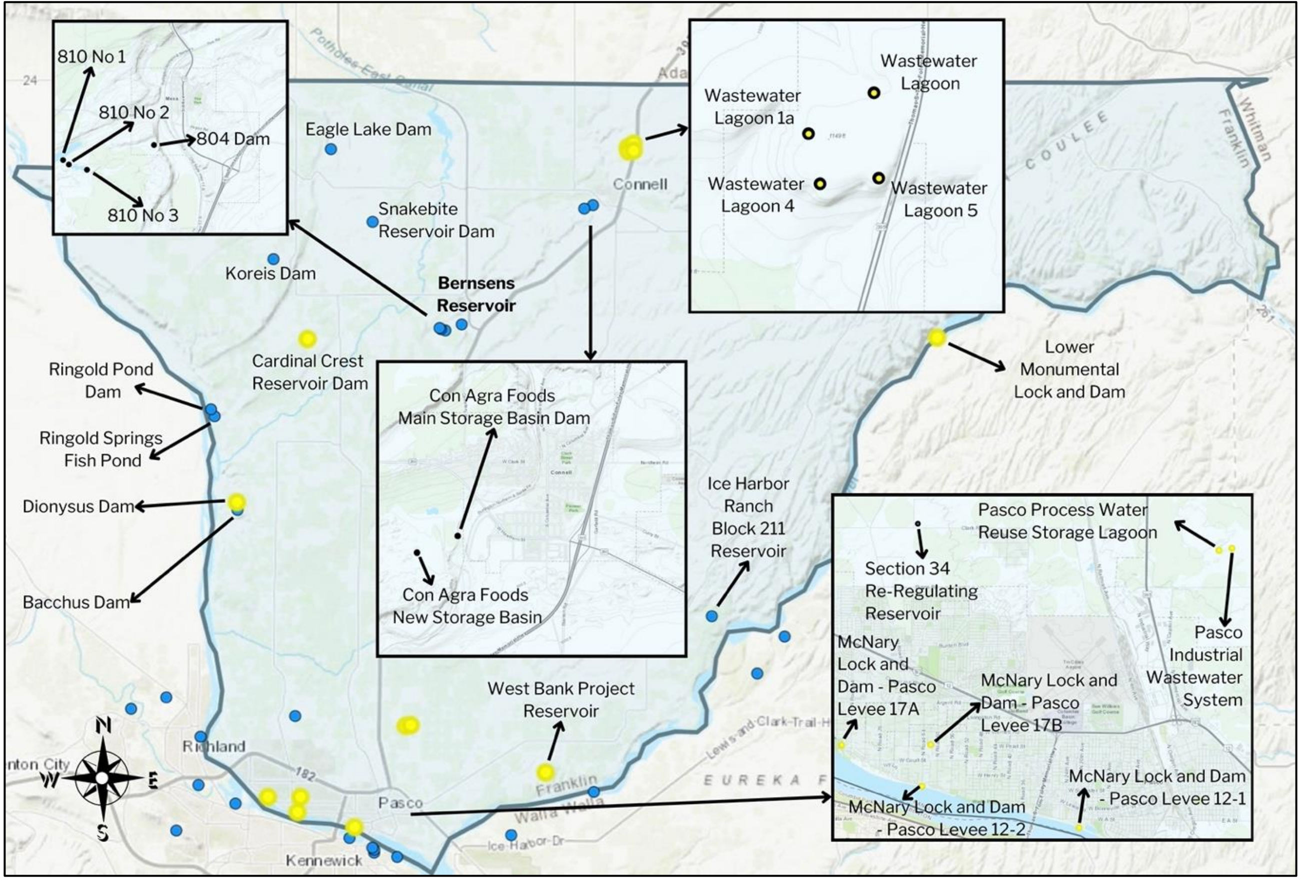


Table 4-31. List of Dams in Franklin County, Washington

Name	National ID#	Location	Owner	Year Built	Primary Purpose	Height (feet)	Storage Capacity (acre-feet)	Max Discharge (cubic feet/sec)
Eagle Lake Dam	WA00537	Franklin, Washington	Black Dog Lakes Ranch LLC	1955	Irrigation	8	7,933	60
Snakebite Reservoir Dam	WA00389	Franklin, Washington	Sugar Ranch, LLC	1976	Irrigation, Recreation	56	56	7
Koreis Dam	WA00484	Franklin, Washington	Dennis Koreis	1982	Irrigation	8	82	2
Cardinal Crest Reservoir Dam	WA01946	Franklin, Washington	Cardinal Crest Farms LLC	1990	Irrigation	14	18	-
Ringold Pond Dam	WA00219	Franklin, Washington	WA DFW	1962	Fish and Wildlife Pond	10	60	-
Ringold Springs Fishpond	WA00252	Franklin, Washington	WA DFW	1961	Fish and Wildlife Pond	12	55	-
Dionysus Dam	WA01985	Franklin, Washington	North Columbia River Road Pasco WA, LLC	1973	Irrigation	17.7	53	-
Bacchus Dam	WA01986	Franklin, Washington	North Columbia River Road Pasco WA, LLC	1973	Irrigation	22	80	-
Section 34 Re Regulating Reservoir	WA01896	Franklin, Washington	Columbia Water Farms LLC	2005	Irrigation	17	50	30
Pasco Process Water Reuse Storage Lagoon	WA00661	Franklin, Washington	Pasco City Public Works Dept	1997	Other	18	352	18
Pasco Industrial Wastewater System	WA00627	Franklin, Washington	Pasco City	1995	Irrigation, Other	15	168	12
West Bank Project Reservoir	WA00684	Franklin, Washington	Borton Fruit Co.	2003	Irrigation	34.2	171	215

Ice Harbor Ranch Block 211 Reservoir	WA00737	Franklin, Washington	Stemilt Holdings, LLC	2013	Water Supply	24.5	103	-
Lower Monumental Lock and Dam	WA00270	Franklin, Washington	USACE - Walla Walla District	1969	Navigation, Fish and Wildlife Pond, Recreation, Hydroelectric	226	432,000	850,000
Con Agra Foods Main Storage Basin Dam	WA00023	Franklin, Washington	Lamb Weston Inc	1970	Other	23	123	160
Con Agra Foods New Storage Basin	WA00699	Franklin, Washington	Lamb Weston Inc	2006	Other	13	150	15
Connell Wastewater Lagoon	WA01821	Franklin, Washington	Connell City	2000	Other	20.2	322	-
Connell Wastewater Lagoon 1a	WA01913	Franklin, Washington	Connell City	2009	Other	22.5	17	-
Connell Wastewater Lagoon 4	WA00710	Franklin, Washington	Connell City	2009	Other	10	107	-
Connell Wastewater Lagoon 5	WA00711	Franklin, Washington	Connell City	2009	Other	8	141	-
Source: National Inventory of Dams (2024)								

4.10.2.2 Levees

Table 4-32. List of Levees in Franklin County, Washington

Name	National ID#	Location	Owner	Year Built	Primary Purpose	Avg Height (feet)	Levee Length
Esquatzel Coulee – Main (Left Bank)	6005000540	Connell, Franklin County, Washington	USACE - Walla Walla District	1966	Flood Risk Reduction	-	2.272 miles
Esquatzel Coulee – Main (RB Lower)	6005000547	Connell, Franklin County, Washington	USACE - Walla Walla District	1966	Flood Risk Reduction	-	0.775 miles
Esquatzel Coulee – Main (Right Bank)	6005000555	Connell, Franklin County, Washington	USACE - Walla Walla District	1966	Flood Risk Reduction	-	0.43 miles
McNary Lock and Dam - Pasco Levee 17A	OR00616S009	Franklin, Oregon	USACE - Walla Walla District	1952	Flood Risk Reduction	-	0.164 miles
McNary Lock and Dam - Pasco Levee 17B	OR00616S005	Franklin, Oregon	USACE - Walla Walla District	1952	Flood Risk Reduction	-	0.396 miles
McNary Lock and Dam - Pasco Levee 12-2	OR00616S008	Franklin, Oregon	USACE - Walla Walla District	1952	Flood Risk Reduction	-	1.403 miles
McNary Lock and Dam - Pasco Levee 12-1	OR00616S007	Franklin, Oregon	USACE - Walla Walla District	1952	Flood Risk Reduction	-	2.702 miles
Source: National Inventory of Dams (2024)							

Esquatzel Coulee – Main (Left Bank): According to the National Levee Database, the Esquatzel Coulee 1 (Left Bank) Levee segment was constructed in 1965 to provide flood risk reduction to the City of Connell, in Franklin County, Washington. It extends from 1.3 miles upstream of the City, to within 400 feet of State Route 260, for a total length of approximately 2.4 miles. The levee embankment is constructed of local silty fine sand and is 0 to 4 feet in height with 2H:1V slideslopes and a crown width of approximately 12 feet. Only portions of the alignment were re-vetted with 1.5 ft thick riprap armor stone. Past channel maintenance activities have buried significant portions of the revetment.

Esquatzel Coulee – Main (RB Lower): According to the National Levee Database, the Esquatzel Coulee 1 (Right Bank, Lower) Levee segment was constructed in 1965 to provide flood risk reduction to the City of Connell, in Franklin County, Washington. Levee extends downstream from the Clark Street Bridge, approximately 3,400 feet, to a return that ties into high ground that is about 1,000 feet upstream of State Route 260. Many areas along the landside of the levee appear to have been backfilled since construction, which leaves the appearance of bank protection. The levee embankment was constructed of local silty fine sand and is 0 to 3 feet in height with 2H:1V slideslopes and a crown width of approximately 12 feet. The alignment was revetted with 1.5 ft thick riprap armor stone.

Esquatzel Coulee – Main (Right Bank): According to the National Levee Database, the Esquatzel Coulee Side Drainage Levee segment was constructed in 1965 to provide flood risk reduction to the City of Connell, in Franklin County, Washington. The levee begins where it ties to high ground approximately 425 feet north of Nordheim Road and 300 feet east of State Route 395. It extends south, ties into the Road, and continues south approximately 1,610 feet to an access road. It is on the right bank of an excavated channel that does not have a left bank embankment. Flow in the channel drain south under Nordheim Road and the access road through triplet culverts constructed without headwalls. The levee was designed to divert water from the area to the east downslope to the south, where it can infiltrate. The embankment was constructed of local silty fine sand and is 0 to 5 feet in height with 2H:1V side slopes and a crown width of at least 12 feet. The levee was not riveted.

Table 4-33. National Levee Database Information Table

NATIONAL LEVEE DATABASE INFORMATION TABLE								
Name	**People**	**Buildings**	**Property Value**	**Acres of Farmland**	**Endangered Species**	**Critical Structures**	**Communities**	**Tribal Area? (Y/N)**
The Esquatzel Coulee 1 (Left Bank)	289	88	$40 Million	2.4 acres	None	1	2	No
The Esquatzel Coulee 1 (Right Bank, Lower)	9	3	$200 Thousand	2.2 acres	None	0	1	No
The Esquatzel Coulee Side Drainage Levee	18	0	$380 Thousand	None	None	None	2	Non
Source: National Levee Database (2024)								

4.10.3 Hazard Extent/Intensity

Dams: Existing dam classification systems are numerous and vary within and between both federal and state agencies. Although differences in classification systems exist, they share a common thread: each system attempts to classify dams according to the potential impacts from a dam failure or mis-operation, should it occur. The hazard potential classification does not reflect in any way on the current condition of the dam (e.g., safety, structural integrity, flood routing capacity).

State and private classifications are the two primary dam hazard potential classification systems utilized in Franklin County. Washington dam classifications are defined under XXXXXX), and used to permit construction, operation, and maintenance of dams by the Washington State Department of Ecology's Dam Safety Office (DSO). Federal dam safety hazard classifications can be found in FEMA's *Federal Guidelines for Dam Safety Hazard Potential Classification System for Dams* publication.

The State of Washington uses FEMA's categorization of dams and FEMA categorizes dams "according to the degree of adverse incremental consequences of a failure or mis-operation of a dam. The National Inventory of Dams uses the federal classification system. Dams are federally categorized into Low, Significant and High Hazard Potential based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests. Improbable loss of life exists where persons are only temporarily in the potential inundation area.

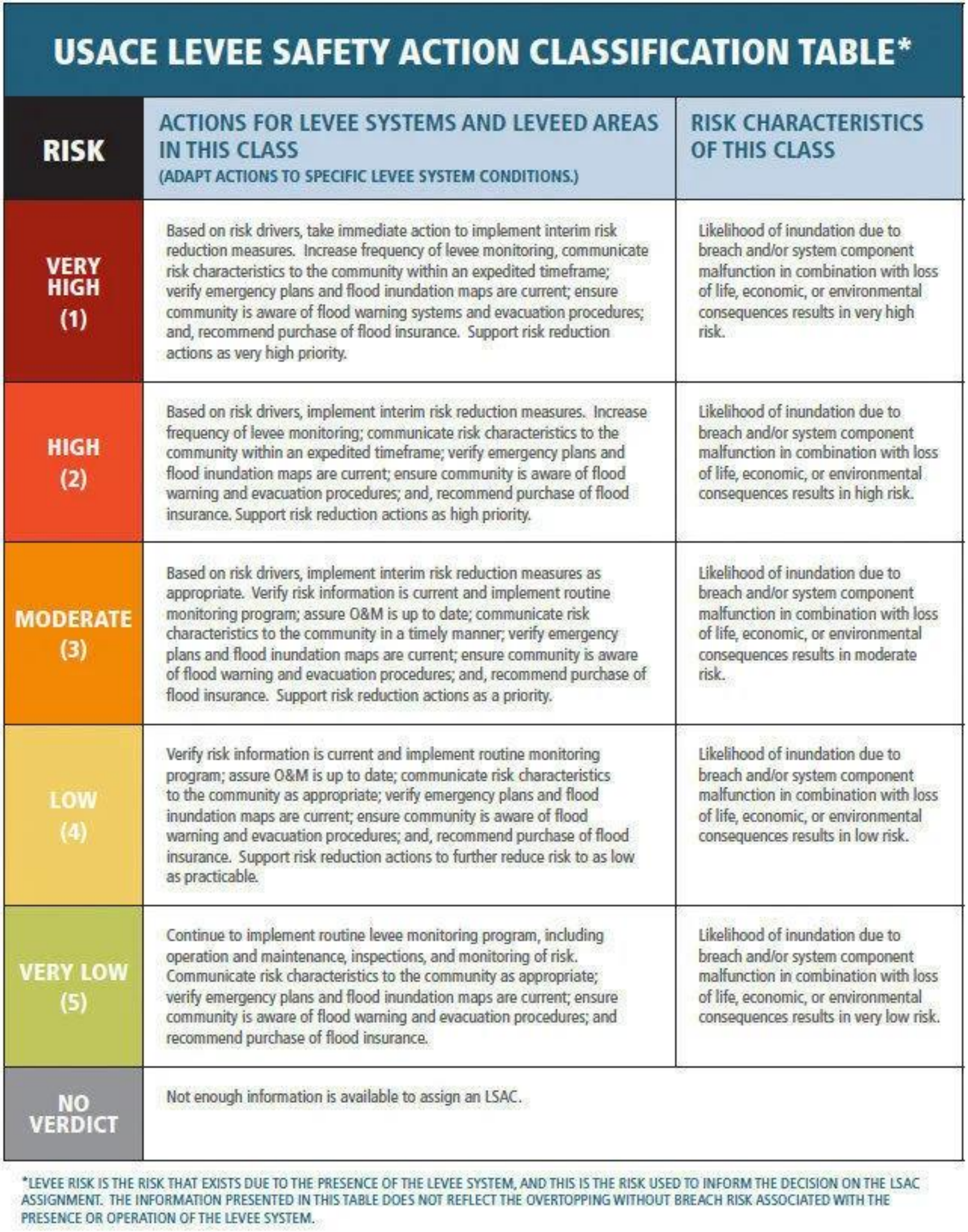
1. **Low Hazard Potential**: dams where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
2. **Significant Hazard Potential:** dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.

3. **High Hazard Potential**: dams where failure or mis-operation will probably cause loss of human life.

Levees: The Levee Safety Action Classification (LSAC) is one of the many tools used to better inform stakeholders and residents of the residual risk in their communities.

The LSAC is neither a levee rating or grade, it is a classification system designed to take into account the probability of the levees being loaded (Hazard), existing condition of the levee, the current and future maintenance of the levee (Performance), and the Consequences if a levee were to fail or be overwhelmed. The following table illustrates the Levee Safety Action Classification Table.

Figure 4.19. Levee Safety Classification



USACE LEVEE SAFETY ACTION CLASSIFICATION TABLE*

RISK	ACTIONS FOR LEVEE SYSTEMS AND LEVEED AREAS IN THIS CLASS (ADAPT ACTIONS TO SPECIFIC LEVEE SYSTEM CONDITIONS.)	RISK CHARACTERISTICS OF THIS CLASS
VERY HIGH (1)	Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as very high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very high risk.
HIGH (2)	Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in high risk.
MODERATE (3)	Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as a priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk.
LOW (4)	Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk.
VERY LOW (5)	Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk.
NO VERDICT	Not enough information is available to assign an LSAC.	

*LEVEE RISK IS THE RISK THAT EXISTS DUE TO THE PRESENCE OF THE LEVEE SYSTEM, AND THIS IS THE RISK USED TO INFORM THE DECISION ON THE LSAC ASSIGNMENT. THE INFORMATION PRESENTED IN THIS TABLE DOES NOT REFLECT THE OVERTOPPING WITHOUT BREACH RISK ASSOCIATED WITH THE PRESENCE OR OPERATION OF THE LEVEE SYSTEM.

4.10.4 Probability and Frequency

Dams: A dam can fail at any time, given the right circumstances. As a dam ages, the likelihood of failure increases as undesirable woody vegetation on the embankment, deteriorated concrete, inoperable gates, and corroded outlet pipes become problems. Since dam failures are often exacerbated by flooding, the probability of dam failures can be associated with projected flood frequencies. The probability of future dam failure for regulated dams can be reduced by proactive preventative actions in compliance with existing dam safety programs.

Levees: Determining levee failure probability depends on the condition and level of protection that levees provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps clearly reflect the flood protection capabilities of levees, and that the maps accurately represent the flood risks posed to areas situated behind them. Levee owners—usually states, communities, or in some cases private individuals or organizations—are responsible for ensuring that the levees they own are maintained according to their design.

Canals: the probability and frequency of canal breaches are influenced by several factors, including the age and condition of the canal infrastructure, maintenance practices, and the surrounding environmental conditions. Older canals or those with insufficient maintenance are more prone to breaches due to structural deterioration. Additionally, extreme weather events, such as heavy rainfall or rapid snowmelt, can increase water pressure on canal walls, raising the likelihood of breaches. Changes in land use or nearby construction activities can also contribute to structural vulnerabilities, further affecting the probability and frequency of canal breaches.

4.10.5 Vulnerability and Impacts

According to FEMA, the public health and life safety impacts of dam/levee failure or canal breaches can be significant and wide-ranging. The primary concerns include:

- Loss of Life: This is the most serious impact. A sudden dam/levee failure or canal breach can lead to fast-moving floods, potentially resulting in loss of life, especially in areas immediately downstream of a dam or in the protected area behind a levee.
- Injuries: The force and unpredictability of floodwaters can result in physical injuries to people in the affected areas.
- Displacement of Populations: Dam/levee failure or canal breaches can lead to the displacement of people from their homes, either temporarily or permanently, due to flood damage. This displacement can have long-term impacts on mental health and community stability.
- Contamination of Water Supplies: Floodwaters can contaminate drinking water sources, leading to waterborne diseases and health complications. This is a particular concern in urban areas or where industrial and agricultural chemicals may be present.
- Sanitation and Hygiene Issues: Flooding can disrupt sewage systems and overwhelm sanitation services, leading to increased risks of diseases, particularly in densely populated areas.
- Disruption of Healthcare Services: Flooding can damage healthcare facilities and disrupt services, making it difficult for injured or ill individuals to receive necessary medical care.
- Mental Health Impacts: The trauma and stress associated with flooding, displacement, loss of property, and potential loss of life can have long-lasting effects on mental health.

- Strain on Emergency Services: Dam/levee failure or canal breaches require significant emergency response efforts, which can strain local resources, especially in smaller or rural communities.

4.10.6 Property Damage and Critical Infrastructure

According to FEMA, dam/levee failure or canal breaches can have severe impacts on property and critical infrastructure. These impacts include:

- Extensive Property Damage: The sudden release of water from a dam/levee failure or canal breaches can lead to widespread flooding, resulting in significant damage to residential, commercial, and industrial properties. This includes damage to buildings, homes, and vehicles.
- Critical Infrastructure Damage: Flooding from dam/levee failure or canal breaches can severely impact critical infrastructure such as bridges, roads, railways, and utilities (water and sewage systems, electrical grids, gas lines). This not only causes immediate disruption but can also lead to long-term economic impacts due to the time and cost associated with repairs and reconstruction.
- Agricultural Losses: In rural areas, flooding can inundate farmland, leading to crop destruction, soil erosion, and loss of livestock, which can have a profound impact on local and regional agricultural economies.
- Environmental Contamination: Floodwaters can carry and spread pollutants and hazardous materials from industrial sites, sewage systems, and other sources, leading to environmental contamination of water, soil, and ecosystems.
- Disruption of Services: Essential services such as healthcare, education, emergency services, and transportation can be disrupted, affecting the wellbeing and daily life of the community.
- Economic Impact: The combined effect on property, infrastructure, and services can lead to significant economic losses, both direct and indirect. The cost of repairs, loss of business operations, and decrease in property values can have a lasting impact on affected communities.
- Recovery and Mitigation Costs: The financial burden of recovery and rebuilding can be substantial. In addition to immediate repair costs, there is often a need for investing in mitigation measures to prevent future incidents.

4.10.7 Economy

No data exists demonstrating the economic impact of past dam/levee failure or canal breach events within Franklin County. However, past events have shown to impact water supply, and could lead to costly repairs.

4.10.8 Changes in Development and Impact of Future Development

According to FEMA, dam/levee failure or canal breaches can significantly impact current and future development in several ways:

- Reassessment of Land Use: After a dam/levee failure or canal breach, there may be a need to reassess land use in affected areas. This can lead to changes in zoning laws and development regulations, especially in areas deemed high-risk for future flooding.
- Impact on Real Estate Values: The perceived risk of flooding due to potential dam/levee failure or canal breach can affect real estate values. Properties in areas identified as high

risk may see a decrease in value, which can impact both current and future development decisions.

- Changes in Insurance and Financing: The risk of flooding may lead to higher insurance premiums for properties in the affected areas. In some cases, insurance may become difficult to obtain. This can influence development decisions, as the cost and availability of insurance are important factors in real estate development and investment.
- Infrastructure Redesign and Reinforcement: Existing and future infrastructure projects may need to be redesigned to withstand potential flood events. This can include strengthening or raising buildings, bridges, and roads, as well as improving drainage systems.
- Mitigation and Resilience Planning: There may be an increased focus on mitigation and resilience in future development to reduce the impact of potential flood events. This can include creating more green spaces, implementing better water management practices, and using flood-resistant building materials and techniques.
- Shift in Development Focus: In some cases, there might be a shift away from developing in high-risk areas. Development might be directed towards safer areas, potentially leading to changes in urban and regional planning strategies.
- Emergency Preparedness and Response Planning: Future development may need to incorporate improved emergency preparedness and response plans, including evacuation routes, emergency shelters, and communication systems.

4.10.9 Effects of Climate Change on Severity of Impacts

According to NOAA, as global temperatures rise, the frequency and intensity of extreme weather events, such as heavy rainfall and storms, increase. This leads to higher water levels and greater stress on these infrastructures. Additionally, sea level rise contributes to the heightened risk of overtopping and structural breaches. The combination of these factors results in a greater likelihood of catastrophic failures, leading to more severe flooding, extensive property damage, displacement of communities, and potential loss of life. Consequently, the adaptive capacity and resilience of dam and levee systems must be enhanced to mitigate the amplified risks posed by a changing climate.

Heavy precipitation also leads to both riverine flooding and flash floods as the ground fails to absorb the high volume of precipitation that falls in a short period. Increasing annual precipitation contributes to sustained flooding.

Table 4-34. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-35. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.11 Landslide

4.11.1 Hazard Description

According to the USGS, a landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses five modes of slope movement: falls, topples, slides, spreads, and flows. Each of these modes can further be subdivided based on the type of geologic material involved, such as bedrock, debris, or earth. Common examples of landslides include debris flows, also known as mudflows or mudslides, and rockfalls.

Landslides are triggered by various factors that increase the forces acting down-slope or reduce the strength of the materials composing the slope. These factors include heavy rainfall, snowmelt, changes in water level, stream erosion, changes in groundwater, earthquakes, volcanic activity, and disturbances from human activities. Submarine landslides, which occur underwater, can also be triggered by similar factors and may cause tsunamis that affect coastal areas.

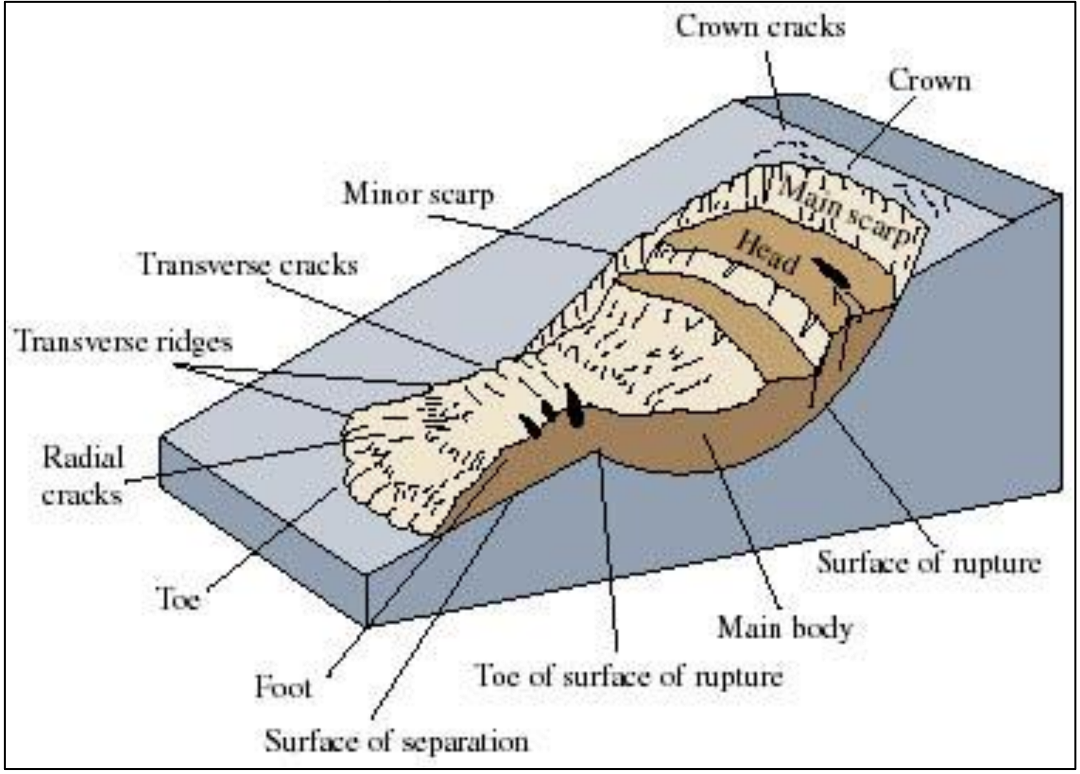
4.11.1.1 Type of Landslides

According to USGS there are different types of landslides, each classified based on the type of movement and the type of material involved. The table below illustrates the main types of landslides.

Table 4-36. USGS Types of Landslides

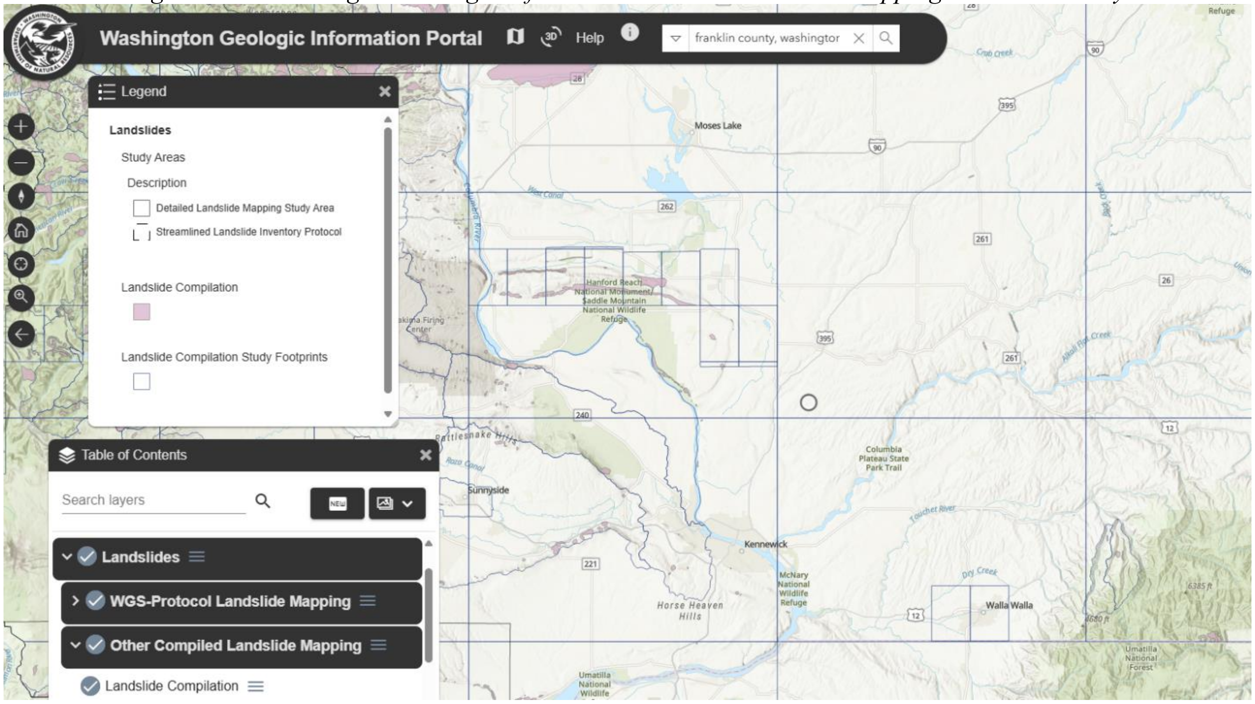
USGS TYPES OF LANDSLIDES		
Type	**Movement**	**Characteristics**
Falls	Sudden movements of rock or debris detaching from steep slopes or cliffs.	Free-fall or bounce of material down a slope; includes rockfalls.
Topples	Forward rotation of rock, debris, or earth out of a slope.	Material tilts or rotates forward before falling or rolling down.
Slides	Downslope movements along a defined surface.	Includes rotational slides and translational slides.
Rotational Slides	Curved concave surface of rupture with rotational movement.	Material moves along a curved surface with backward tilting.
Translational Slides	Movement along a roughly planar surface with little rotation.	Material moves along a flat surface without rotation.
Spreads	Lateral extension and fracturing of coherent material.	Caused by liquefaction or flowage of underlying material.
Flows	Movement where material behaves like a fluid.	Includes debris flows, earthflows, mudflows, and lahars.
Debris Flows	Rapid movements of loose, water-saturated debris.	Fast-moving with high water content.
Earthflows	Slow to rapid movements of fine-grained materials.	Can vary in speed and involve fine sediments.
Mudflows	Flows of water and fine sediment.	Can travel long distances; high water content.
Lahars	Volcanic mudflows or debris flows.	Associated with volcanic activity; can be extremely destructive.
Source: USGS Landslide Hazard Program (2024)		

Figure 4.20. Landslide Processes



4.11.2 Hazard Location

Figure 4.22. Washington Geologic Information Portal – Landslide Mapping Franklin County



4.11.3 Hazard Extent/Intensity

The USGS measures the extent and intensity of landslide events using a combination of field assessments, aerial photography, satellite imagery, and remote sensing technology. Field assessments involve on-the-ground observations by experts who analyze the physical characteristics of the landslide, such as its size, depth, and the type of materials involved. These assessments provide critical information on the landslide's impact on the terrain and any structural damage caused. Aerial photography and satellite imagery offer a broader view of the affected area, allowing scientists to assess the landslide's overall scope and the changes it has made to the landscape. This imagery is particularly useful for identifying the boundaries of the event and for tracking changes over time.

In addition to these methods, the USGS utilizes remote sensing technologies, including Light Detection and Ranging (LiDAR), to create detailed topographic maps and 3D models of the landslide area. LiDAR data can reveal subtle changes in the terrain that may not be visible from aerial photographs alone, providing precise measurements of the landslide's volume and the extent of earth movement.

4.11.4 Probability and Frequency

Probability: The USGS determines the probability of landslide events through a multifaceted approach that incorporates historical landslide data, terrain and geological analysis, rainfall patterns, and predictive modeling. This process begins with the identification and mapping of areas that have experienced landslides in the past, as historical occurrences are strong indicators of potential future events. The USGS also analyzes the physical characteristics of the landscape, including slope steepness, soil composition, rock type, and the presence of fault lines, which can all contribute to landslide susceptibility. Rainfall is another critical factor, especially in regions where landslides are often triggered by heavy or prolonged precipitation. By examining historical weather patterns and current meteorological data, the USGS can assess how changes in rainfall might influence landslide risk.

In addition to these factors, the USGS employs advanced geographic information systems (GIS) and remote sensing technology to create detailed maps and models of landslide-prone areas. These tools allow scientists to visualize and analyze the complex interactions between various risk factors, including human activities such as deforestation, urban development, and mining, which can exacerbate landslide vulnerability. Predictive models are then developed to estimate the probability of landslide occurrences under different scenarios, taking into account the likelihood of triggering events like earthquakes or storms.

Other factors that influence landslides include soil type and slope steepness. Soil type is a key indicator for landslide potential and is used by geologists and geotechnical engineers to determine soil stability for construction standards. Soil Types known to cause slope instability are listed in the following table.

Table 4-37. Geologic Types Known to Cause Slope Instability

Type	Description
Kg	Granodiorite and two-mica granite (Cretaceous)—Granodiorite and granite containing biotite, commonly with muscovite.
Qs	Fluvial and lake sediment (Quaternary)—Largely fine-grained sediment, in part playa deposits of evaporative lakes.
Qg	Glacial deposits (Pleistocene)—Till and outwash consisting of gravel, sand, silt, and clay. Formed by valley glaciers at higher elevations and by the Cordilleran ice sheet.
Tes	Sedimentary rocks (Eocene)—Fluvial, lacustrine, and air-fall deposits of conglomerate, volcanic sandstone, mudstone, and tuff.
Tcr	Columbia River Basalt Group (Miocene)—Large-volume lava flows of tholeiitic basalt, basaltic andesite, and subordinate andesite.
Qls	Landslide deposits (Quaternary)—Unsorted gravel, sand, and clay of landslide origin; includes rotational and translational blocks and earth flows.
Tcv	Volcanic Group (Eocene)—Dacite, andesite, and rhyolite tuffs and flows and subordinate basalt and latite flows.
Kpro	Metasedimentary and metavolcanic schist, gneiss, amphibolite, and marble, all of uncertain age, typically hornblende-rich.
QTb	Basalt (Pleistocene and Pliocene)—Flows and cinder cones of olivine tholeiite basalt. Largely Pleistocene (<2.6 Ma) but includes flows as old as 3 Ma. Covered with 1-3 m (3-10 ft) of loess.

Source: Physical Geology (2024)

4.11.5 Past Events

Franklin County has some areas that exhibit steep terrain, are heavily irrigated and have an abundance of weak soils. All this combines to make portions of the county susceptible to land movements. It is important to note that not all of the conditions listed above guarantee that a landslide will occur just like assuming that a landslide will occur only if all of the conditions above have been met. Franklin County has had landslides in the past. Evidence is clearly present along the high cliffs and steep slopes of the Columbia and Snake Rivers. Additionally, inland portions of the county, particularly in the northeastern portion of the county, have some high slope areas that are susceptible to landslides. Two notable landslides that occurred in Franklin County more recently were: during the irrigation season of May 2006 and covered state highway State Route 170. The other landslide occurred along the White Bluffs along the Columbia River in August 2008.

4.11.6 Vulnerability and Impacts

Life Safety and Public Health: According to USGS, landslides present a direct threat to human lives, potentially causing injuries and fatalities due to the rapid movement of debris and soil. Furthermore, landslides can inflict damage on homes, infrastructure, and transportation systems, resulting in both physical harm and substantial economic losses for individuals and communities. Displacement and evacuation may be necessary, with affected residents requiring emergency shelter and support services. Additionally, landslides can disrupt or contaminate water sources, posing health risks associated with tainted drinking water. The blockage of transportation routes can hinder access to affected areas and emergency response efforts, impacting public safety and the delivery of essential services. Moreover, the long-term effects of landslides, including mental health concerns stemming from displacement, property loss, and community upheaval, are also a consideration. Finally, landslides can strain emergency response resources and infrastructure, potentially compromising the capacity to provide timely assistance during and after a landslide event.

Property Damage and Critical Infrastructure: According to USGS, landslides can cause extensive structural damage, resulting in the destruction or impairment of residential and commercial properties, as well as vital infrastructure elements like roads, bridges, and utility systems. This disruption extends to transportation networks, including railways, roads, and airports, creating logistical challenges and hindering the flow of goods and services. Landslides can also compromise utility services by damaging or burying utility lines such as those for water, gas, and electricity, thereby affecting the essential functions of communities. Telecommunication networks may also be at risk, hampering the efficiency of emergency communication systems. Additionally, landslides can have detrimental environmental consequences, releasing hazardous materials and pollutants into the environment, causing harm to ecosystems, wildlife, and contaminating soil and water sources. This necessitates extensive and costly cleanup and restoration efforts. The economic fallout is significant, encompassing financial losses for businesses and the considerable cost of reconstruction. Landslides can also result in enduring disruptions, including community displacement, prolonged infrastructure disturbances, and ongoing economic challenges in affected regions.

Economy: According to USGS, economic impacts from landslides encompass property damage, resulting in the destruction or impairment of residential and commercial structures, incurring considerable financial costs for individuals and communities. Landslides may also disrupt and damage critical infrastructure like roads, bridges, utilities, and communication networks, necessitating significant investments for repair and replacement. Such disruptions can lead to reduced productivity for businesses, entailing increased expenses due to delays and the need to seek alternative routes. The costs of responding to landslide events, including search and rescue operations, temporary housing for displaced individuals, and emergency services, can strain public resources and contribute to heightened government expenditures. Landslides can also release hazardous materials and contaminants into the environment, prompting the need for costly cleanup and environmental restoration efforts. The overall economic stability of regions affected by landslides can be jeopardized, with economic disruption impacting local businesses, employment, and the broader economic landscape. These economic consequences may extend well beyond the initial landslide event, resulting in long-term challenges related to recovery, rebuilding, and the restoration of economic activities.

Changes in Development and Impact of Future Development: According to USGS, landslides can impact future development strategies through several mechanisms, including alterations in land-use planning and zoning regulations in landslide-prone areas. Communities may introduce stricter building codes, zoning constraints, and construction guidelines to mitigate the risks associated with landslides for upcoming development initiatives. Additionally, the aftermath of landslide events may necessitate redevelopment and reconstruction efforts, leading to changes in urban landscapes and construction practices. Mitigation measures, like the installation of retaining walls and stabilization techniques, can influence the design and location of future development projects. The protection of critical infrastructure may drive enhancements and structural modifications that affect the positioning of infrastructure initiatives. Heightened community awareness about landslide risks can also sway public perceptions and behaviors, subsequently impacting future development decisions. Furthermore, developments may be relocated to safer areas in response to high landslide risk, ensuring sustainable and secure development. Lastly, geological assessments are conducted in landslide-prone regions to enhance understanding and inform future development choices, collectively shaping development strategies in these areas.

Effects of Climate Change on Severity of Impacts: Climate change can impact on the severity of landslides in several ways. First, climate-induced alterations in precipitation patterns, characterized by more intense and prolonged rainfall events, can saturate the soil, rendering it more susceptible to landslides and elevating their severity. Additionally, rising temperatures linked to climate change can lead to the thawing of permafrost, instigating ground instability and an increased likelihood of landslides, especially in permafrost regions. Glacial retreat due to warming temperatures can expose previously glaciated slopes, making them more vulnerable to landslides. Changes in vegetation patterns, caused by climate change, can also affect slope stability, as shifts in plant cover and root systems can render slopes more precarious. The heightened risk of wildfires prompted by climate change can strip areas of vegetation and alter soil properties, amplifying landslide susceptibility. Furthermore, the increased occurrence of severe weather events associated with climate change can trigger landslides through rapid water infiltration and slope destabilization. A lengthened thaw season in mountainous and high-latitude regions, driven by warmer temperatures, may intensify freeze-thaw cycles, potentially weakening slopes and contributing to landslides.

Table 4-38. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-39. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51%% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31%% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.
Source: Neighborhoods at Risk (2024)

Table 4-40. Future Climate Temperature Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual Days With Maximum Temperature >95	**17 days**	**28 days**	**29 days**	**34 days**	**41 days**	**44 days**	**67 days**
	15-20	19-36	19-36	24-50	24-55	25-64	37-91
Annual Days With Maximum Temperature >100	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Annual Days With Maximum Temperature >105	**0 days**	**2 days**	**3 days**	**4 days**	**7 days**	**8 days**	**22 days**
	0-1	1-4	1-6	1-9	2-17	2-18	5-46
Annual Temperature							
Annual Single Highest Temperature °F	**103ºF**	**106ºF**	**106ºF**	**107ºF**	**108ºF**	**109ºF**	**114ºF**
	102-104	104-108	103-109	105-110	105-113	105-114	108-120
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**98ºF**	**101ºF**	**102ºF**	**103ºF**	**104ºF**	**105ºF**	**109ºF**
	97-100	98-103	99-105	100-106	100-109	101-110	104-117
Cooling Degree Days (CDD)	**695 degree days**	**951 degree days**	**986 degree days**	**1,098 degree days**	**1,243 degree days**	**1,293 degree days**	**1,873 degree days**
	626-785	787-1,183	807-1,181	846-1,421	937-1,596	948-1,671	1,223-2,576
Source: Climate Mapping for Resilience and Adaptation (2024)							

Table 4-41. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.11.7 FEMA NRI Expected Annual Loss Estimates

Table 4-42. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, WA FEMA NRI EXPECTED ANNUAL LOSS TABLE – LANDSLIDE							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
0 events per year	0.00	$17,400	$4,500	N/A	$21,900	56.0	$21,900
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2024)							

4.11.8 FEMA Hazard-Specific Risk Index Table

Table 4-43. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS - LANDSLIDE		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
65.7	Very High	Relatively Low
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2024)		

4.11.9 FEMA NRI Exposure Value Table

Table 4-44. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA FEMA EXPOSURE VALUE TABLE - LANDSLIDE					
Hazard Type	**Total Value**	**Building Value**	**Population Equivalence**	**Population**	**Agriculture Value**
Landslide	$103,906,910,494	$1,382,100,740	$102,524,809,754	8,838.35	N/A

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*

Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 million of economic loss (2022 dollars).*

Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

Source: FEMA National Risk Index (2024)

4.12 Severe Summer Storms

4.12.1 Hazard Description

In this *Plan*, Severe Summer Storms are considered to be extreme heat, dust storms, and straight-line winds.

Extreme Heat: NOAA defines extreme heat as a period of excessively high temperatures that significantly exceeds the long-term average for a particular location. This definition takes into account the local climate and expected temperature ranges for a given region. Extreme heat events are typically characterized by several consecutive days of high temperatures that can pose significant health and safety risks. NOAA often uses specific temperature thresholds, such as heat indices or heat advisories, to define extreme heat conditions. During such events, there is an increased likelihood of heat-related illnesses, including heat exhaustion and heatstroke, as well as potential stress on critical infrastructure, power grids, and water resources. Extreme heat events are becoming more frequent and severe due to climate change, making them a growing concern for public health and safety.

Dust Storms: According to NOAA, a dust storm is a wall of dust and debris that is blown into an area by strong winds, often from thunderstorms. These storms can be miles long and several thousand feet high, significantly reducing visibility and creating hazardous conditions for motorists and air traffic. Dust storms are most common in arid and semi-arid regions, such as the southwestern United States, where they can occur frequently during certain seasons.

Straight-Line Winds: According to NOAA, straight-line winds are any thunderstorm winds that are not associated with rotation, distinguishing them from tornado winds. These winds, which are often responsible for significant damage, result from the downdraft of a thunderstorm, where cooled, dense air descends rapidly and spreads out upon reaching the ground. This spreading air can create gust fronts and cause extensive damage over a broad area.

Straight-line winds can be as powerful as tornadoes, with speeds potentially exceeding 100 mph. They are categorized into macrobursts and microbursts. Macrobursts cover areas larger than 2.5 miles in diameter and can last for several minutes, while microbursts are smaller, covering less than 2.5 miles but can be equally intense and short-lived, lasting only a few minutes

4.12.2 Hazard Location

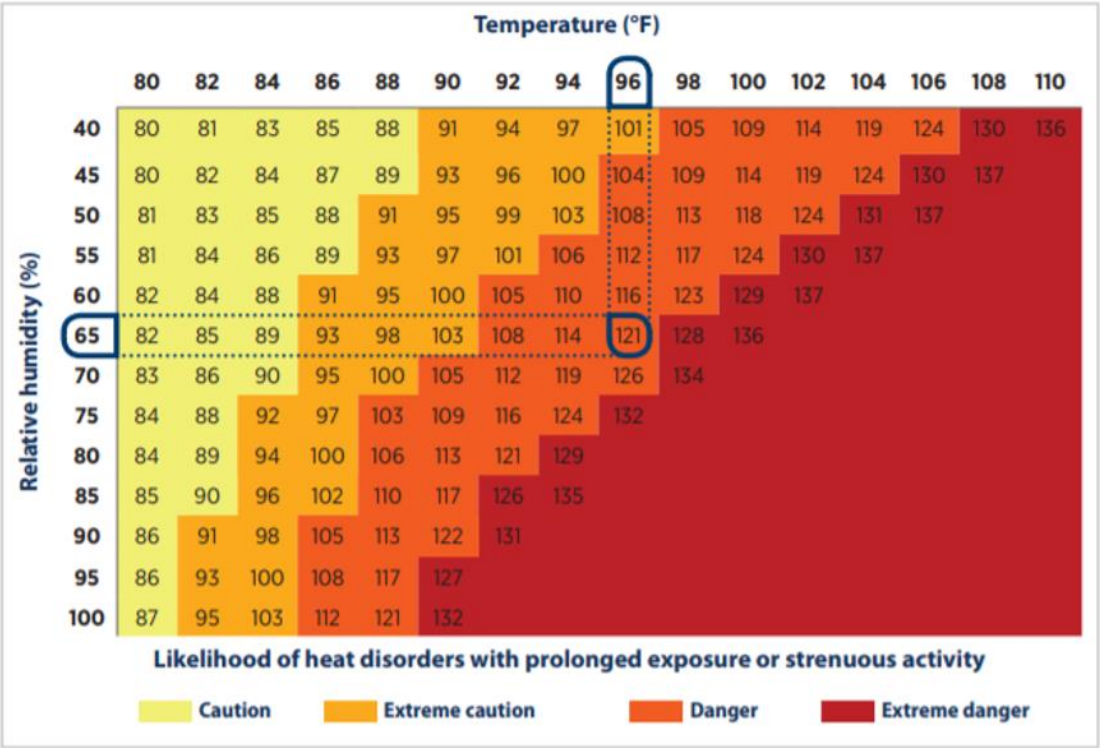
Severe summer storms could occur anywhere in Franklin County.

4.12.3 Hazard Extent/Intensity

Extreme Heat: When an extreme heat event occurs, NWS may issue an excessive heat warning, an excessive heat watch, a heat advisory, or a heat outlook. The NWS defines these as the following:

- Excessive Heat Warning – Take Action. An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105° or higher for at least two days and nighttime air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas not used to extreme heat conditions. If you don't take precautions immediately when conditions are extreme, you may become seriously ill or die (NOAA, 2024).
- Excessive Heat Watches—Be Prepared. Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain (NOAA, 2024).
- Heat Advisory – Take Action. A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100° or higher for at least two days, and nighttime air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions. Take precautions to avoid heat illness. If you don't take precautions, you may become seriously ill or even die (NOAA, 2024).
- Excessive Heat Outlooks are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event (NOAA, 2024).

Figure 4.21. National Oceanic and Atmospheric Administration National Weather Service Heat Index



Temperature (°F)

Relative humidity (%)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of heat disorders with prolonged exposure or strenuous activity

Dust Storms: NOAA measures the extent and intensity of dust storms using a combination of satellite imagery, atmospheric models, and ground-based observations. Satellites such as GOES-16 and Suomi NPP are essential tools for tracking dust particles in the atmosphere. These satellites provide both visible and infrared imagery, allowing scientists to distinguish dust from other atmospheric elements like clouds and smoke. Advanced imaging techniques, including RGB (red-green-blue) enhancements, highlight dust in false-color imagery, facilitating more accurate tracking and analysis of dust storms.

Atmospheric models like the Global Ensemble Forecast System – Aerosol (GEFS-Aerosol) and the FENGSHA dust model play a crucial role in predicting the distribution and movement of dust particles. These models account for factors such as wind speed, direction, and source regions, and provide forecasts for aerosols, including dust, helping to predict air quality impacts. GEFS-Aerosol, for instance, offers seven-day forecasts for various aerosols, aiding in air quality predictions.

Straight-Line Wind: NOAA measures and monitors wind incidents through a combination of meteorological tools, observation networks, and reporting systems, including:

1. Weather Stations and Anemometers: NOAA operates a vast network of weather stations equipped with anemometers that measure wind speed. These stations are strategically located across the United States and provide real-time data on wind conditions. The data collected from these stations is crucial for monitoring wind speed and direction.
2. Weather Radar: NOAA's Doppler weather radar systems ~~are capable of~~ detect~~ing~~ and track~~ing~~ severe weather events, including high winds associated with thunderstorms, hurricanes, and other atmospheric disturbances. Radar data help meteorologists identify areas with strong winds and their movement.

3. Satellite Observations: NOAA uses weather satellites equipped with various sensors, including instruments that can provide information about atmospheric circulation and wind patterns. These satellite observations are particularly valuable for tracking high wind incidents in remote or oceanic areas.
4. Meteorological Models: NOAA utilizes advanced meteorological models and computer simulations to forecast and predict high wind events. These models use factors such as atmospheric pressure gradients, temperature differences, and weather patterns, to anticipate areas where high winds may occur.
5. NWS Reporting and Warnings: NOAA's National Weather Service (NWS) issues a range of alerts and warnings related to high wind events. These include High Wind Watches, High Wind Warnings, and Wind Advisories. The NWS uses data from weather stations, radar, and satellite observations to issue these alerts when high winds are expected.
6. Storm Spotter Reports: NOAA encourages the participation of trained storm spotters, emergency responders, and the public in reporting high wind incidents. Observations from storm spotters and the public help validate and refine NOAA's understanding of ongoing weather conditions.
7. Real-Time Data and Observations: NOAA continuously collects and analyzes real-time data and observations to monitor wind conditions. This information is disseminated through various communication channels, including websites, mobile apps, and weather broadcasts.

The NOAA Beaufort Wind Scale shown below is a system used to estimate wind speeds based on observed sea conditions or the effects of the wind on land features. The scale ranges from 0 to 12, with each number corresponding to a specific range of wind speeds and associated sea or land conditions.

Table 4-45. NOAA Beaufort Scale for Estimating Wind Speed

NOAA BEAUFORT WIND SCALE				
ESTIMATING WIND SPEED AND SEA STATE WITH VISUAL CLUES				
Beaufort Number	**Wind Description**	**Wind Speed (Knots)**	**Wave Height**	**Visual Clues**
0	Calm	0 kts	0 feet	Sea is like a mirror. Smoke rises vertically.
1	Light Air	1-3 kts	< 1/2	Ripples with the appearance of scales are formed, but without foam crests. Smoke drifts from funnel.
2	Light breeze	4-6 kts	1/2 ft (max 1)	Small wavelets, still short but more pronounced, crests have glassy appearance and do not break. Wind felt on face. Smoke rises at about 80 degrees.
3	Gentle Breeze	7-10 kts	2 ft (max 3)	Large wavelets, crests begin to break. Foam of glassy appearance. Perhaps scattered white horses (white caps). Wind extends light flag and pennants. Smoke rises at about 70 deg.
4	Moderate Breeze	11-16 kts	3 ft (max 5)	Small waves, becoming longer. Fairly frequent white horses (white caps). Wind raises dust and loose paper on deck. Smoke rises at about 50 deg. No noticeable sound in the rigging. Slack halyards curve and sway. Heavy flag flaps limply.
5	Fresh Breeze	17-21 kts	6 ft (max 8)	Moderate waves, taking more pronounced long form. Many white horses (white caps) are formed (chance of some spray). Wind felt strongly on face. Smoke rises at about 30 deg. Slack halyards whip while bending continuously to leeward. Taut halyards maintain slightly bent position. Low whistle in the rigging. Heavy flag doesn't extend but flaps over entire length.
6	Strong Breeze	22-27 kts	9 ft (max 12)	Large waves begin to form. White foam crests are more extensive everywhere (probably some spray). Wind stings face in temperatures below 35 deg F (2C). Slight effort in maintaining balance against wind. Smoke rises at about 15 deg. Both slack and taut halyards whip slightly in bent position. Low moaning, rather than whistle, in the rigging. Heavy flag extends and flaps more vigorously.
7	Near Gale	28-33 kts	13 ft (max 19)	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of wind. Necessary to lean slightly into the wind to maintain balance. Smoke rises at about 5 to 10 deg. Higher pitched moaning and whistling heard from rigging. Halyards still whip slightly. Heavy flag extends fully and flaps only at the end. Oilskins and loose clothing inflate and pull against the body.
8	Gale	34-40 kts	18 ft (max 25)	Moderately high waves of greater length. Edges of crests begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind. Head pushed back by the force of the wind if allowed to relax. Oilskins and loose clothing inflate and pull strongly. Halyards rigidly bent. Loud whistle from rigging. Heavy flag straight out and whipping.

9	Strong Gale	41-47 kts	23 ft (max 32)	High waves. Dense streaks of foam along direction of wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.
10	Storm	48-55 kts	29 ft (max 41)	Very high waves with long overhanging crests. The resulting foam, in great patches is blown in dense streaks along the direction of the wind. On the whole, the sea takes on a whitish appearance. Tumbling of the sea becomes heavy and shock-like. Visibility affected.
11	Violent Storm	56-63 kts	37 ft (max 52)	Exceptionally high waves (small and medium-sized ships might be for time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere, the edges of the wave crests are blown into froth. Visibility greatly affected.
12	Hurricane	64+ kts	45+ ft	The air is filled with foam and spray. The sea is completely white with driving spray. Visibility is seriously affected.
Source: National Weather Service (2024)				

4.12.4 Probability and Frequency

Extreme Heat Frequency: Between 01/01/19 and 12/31/23 Franklin County recorded six events over 1,826 days. This averages to 0.003285 incidents per day during this time and 1.2 incidents annually.

Extreme Heat Probability: NOAA measures the probability of extreme heat through a comprehensive approach, integrating meteorological tools and data analysis. It closely monitors temperature forecasts, heat index values, and the output of advanced meteorological models to assess the potential for extreme heat events. Comparisons to historical climate data help determine the likelihood of such events. NOAA also considers the duration and intensity of extreme heat conditions, with a focus on nighttime warmth, which can significantly affect public health. Collaboration with public health agencies contributes to the analysis of heat-related illnesses. Ultimately, NOAA issues Heat Advisories and Excessive Heat Warnings to provide the public with information on the probability of extreme heat, associated health risks, and recommended safety measures.

Dust Storms Frequency: Between 01/01/19 and 12/31/23 Franklin County recorded two events over 1,826 days. This averages to 0.001095 incidents per day during this time and 0.4 incidents annually.

Dust Storms Probability: NOAA measures the probability of a dust storm using a combination of satellite data, atmospheric models, and ground-based observations. Satellites like GOES-16 and Suomi NPP provide critical imagery that helps in tracking dust particles in the atmosphere. These satellites use visible and infrared channels to differentiate dust from other atmospheric elements. Advanced imaging techniques, such as RGB (red-green-blue) enhancements, make dust more visible in false-color imagery, enabling accurate tracking and analysis of dust storms. Atmospheric models, including the Global Ensemble Forecast System – Aerosol (GEFS-Aerosol) and the FENGSHA dust model, predict the distribution and movement of dust particles by considering factors like wind speed, direction, and source regions. These models provide forecasts for aerosols, including dust, aiding in air quality predictions and enabling more precise probability assessments of dust storms.

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Straight-Line Winds Frequency: Between 01/01/19 and 12/31/23 Franklin County recorded no events over 1,826 days.

Straight-Line Winds Probability: NOAA measures the probability of straight-line winds by utilizing meteorological tools and data analysis. Doppler radar systems monitor atmospheric conditions and the movement of weather systems, offering real-time information on high wind intensity. Advanced meteorological models consider atmospheric parameters, including pressure gradients, temperature differences, and wind patterns, to forecast the likelihood of straight-line winds. Monitoring temperature and pressure patterns in the atmosphere, in addition to wind speed and gusts, provides crucial indicators of high wind probability. NOAA tracks severe weather events associated with high winds, such as thunderstorms, hurricanes, and tornadoes. Real-time data from weather stations and public observations further contribute to the assessment of straight-line wind probability. This information supports NOAA in issuing weather advisories and warnings to ensure public safety during straight-line wind events.

4.12.5 Past Events

Table 4-46. Extreme Heat Events in Franklin County (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**2**	**0**	**0.0K**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	6/26/21	0:00	PST-8	Excessive Heat	2	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	7/1/21	0:00	PST-8	Excessive Heat	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	7/25/22	0:00	PST-8	Excessive Heat	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	8/1/22	0:00	PST-8	Excessive Heat	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	8/9/22	0:00	PST-8	Excessive Heat	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	8/18/22	0:00	PST-8	Excessive Heat	0	0	0.00K	0.00K
Totals:							**2**	**0**	**0.0K**	**0.00K**

Table 4-47. Dust Storm Events in Franklin County (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**5**	**0.0K**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	2/23/20	10:00	PST-8	Dust Storm	0	5	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	9/7/20	11:50	PST-8	Dust Storm	0	0	0.00K	0.00K
Totals:							**0**	**5**	**0.0K**	**0.00K**

Between 01/01/19 and 12/31/23 Franklin County recorded no Straight-Line Wind events over 1,826 days.

4.12.6 Vulnerability and Impacts

Life Safety and Public Health (Extreme Heat): According to NOAA, extreme heat events carry significant health and life safety risks, notably heat-related illnesses such as heat exhaustion and heatstroke. These conditions can be life-threatening if not promptly addressed, with the elderly, young children, and individuals with pre-existing health conditions being particularly susceptible. Dehydration is a common and dangerous consequence of high temperatures, leading to symptoms like dizziness and confusion, and exacerbating the effects of heat-related illnesses. Respiratory problems are also aggravated by the heat, especially in areas with poor air quality, increasing the likelihood of respiratory distress for individuals with chronic respiratory diseases.

Extreme heat also places strain on both the human body and critical infrastructure. The cardiovascular system can be overburdened, heightening the risk of heart-related issues in individuals with underlying heart conditions. Physical and cognitive functions can be impaired due to excessive body strain, which raises the risk of accidents and injuries. Infrastructure such as roads and power lines may fail, causing widespread disruptions. Heatwaves intensify water scarcity, affecting potable water availability and agriculture, and increase the propensity for wildfires, endangering both life and property. These conditions can also lead to a spike in heat-related mortality rates, particularly in vulnerable groups, underscoring the importance of effective heatwave preparedness and response strategies.

Life Safety and Public Health (Dust Storms): According to NOAA, dust storms impact life safety and public health in several ways. First, they drastically reduce visibility, creating hazardous driving conditions that can lead to serious traffic accidents, often involving multiple vehicles. Visibility can drop to less than a quarter mile, making navigation difficult for drivers. Additionally, inhaling dust particles poses serious respiratory health risks. Dust storms carry fine particulate matter (PM2.5), which can penetrate deep into the lungs and enter the bloodstream, exacerbating conditions such as asthma, bronchitis, and other chronic respiratory diseases. Vulnerable populations, including the elderly, children, and those with pre-existing health conditions, are at higher risk.

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Dust storms degrade air quality by increasing the concentration of airborne particles, impacting both human health and environmental health, affecting plant life and animal habitats. The air quality index (AQI) often rises to unhealthy levels during dust storms, prompting health advisories and warnings. Infrastructure and transportation systems also suffer as dust storms can damage power lines, causing outages, and disrupt air travel by reducing visibility and affecting aircraft mechanical systems. Roads can become slippery due to dust accumulation, leading to further transportation hazards.

Agriculture is notably affected as dust storms can strip topsoil from farmlands, reducing soil fertility and damaging crops, leading to economic losses for farmers and contributing to food supply issues. Dust deposition can also clog irrigation systems, impacting water availability for agriculture. Lastly, dust particles can carry spores and pathogens, such as the fungus that causes Valley Fever (Coccidioidomycosis), which can cause flu-like symptoms and is particularly prevalent in areas affected by frequent dust storms, posing additional public health risks.

Life Safety and Public Health (Straight-Line Winds): According to NOAA, straight-line winds present a range of health and life safety impacts including direct physical risks, such as injuries or fatalities caused by flying debris, falling trees, or structural damage. Individuals who are outdoors during high winds are particularly vulnerable to being struck by debris. Additionally, straight-line winds can cause significant property damage, including roof damage, broken windows, and structural failures, resulting in both financial losses and safety risks for occupants.

Straight-line winds can also damage power lines and electrical infrastructure, leading to power outages. These outages can disrupt essential services, affect communication systems, and impact public safety and emergency response efforts. Straight-line winds can also make travel hazardous, especially for high-profile vehicles, leading to accidents, road closures, and transportation delays, thereby posing safety risks for drivers and passengers.

Lastly, strong winds can exacerbate wildfires, causing them to spread rapidly and intensify, which threatens life and property. Damage to telecommunication infrastructure can disrupt emergency communication systems, hindering the ability to convey critical information and coordinate response efforts.

Property Damage and Critical Infrastructure (Extreme Heat): According to NOAA, extreme heat can lead to property damage and critical infrastructure impacts. Prolonged exposure to high temperatures can cause structural damage to buildings and transportation networks, affecting road surfaces and railway tracks. High demand for electricity during heatwaves can strain electrical grids, resulting in power outages that impact homes, businesses, and critical facilities. Water supply shortages and reduced water quality may occur due to drought conditions. Healthcare facilities may be overwhelmed with patients suffering from heat-related illnesses, affecting critical healthcare infrastructure. Extreme heat can also disrupt telecommunications equipment and communication systems and contribute to the ignition and spread of wildfires, resulting in property damage and environmental impacts. Lastly, vulnerable populations are at increased risk of heat-related illnesses, and public safety concerns arise, regarding strained emergency response and healthcare systems.

Property Damage and Critical Infrastructure (Dust Storms): According to NOAA, dust storms can lead to property damage and disruption of critical infrastructure . Prolonged exposure to high winds can cause damage to buildings and farmland. High dwinds Dust storms also create hazardous driving conditions with reduced visibility. Critical infrastructure in the county, including power lines, transportation routes like I-82 and local roads, irrigation systems crucial for agriculture, and communication networks, are susceptible to disruption from dust accumulation

and strong winds. These events can lead to economic losses for the agricultural sector and other industries, pose health risks from dust inhalation, and disrupt the daily lives of residents.
Property Damage and Critical Infrastructure (Straight-Line Winds): According to NOAA, straight-line winds can cause property damage and impact critical infrastructure in several ways. These winds, which can exceed speeds of 100 mph, are often the result of severe thunderstorms and can create extensive damage over a large area. Straight-line winds can knock down trees and power lines, leading to widespread power outages and posing a direct threat to homes and businesses. The force of these winds can cause structural damage to buildings, ripping off roofs, breaking windows, and even collapsing walls in extreme cases.

Straight-line winds can also severely impact transportation systems. Roads can become blocked by fallen debris, making travel hazardous or impossible. This can delay emergency response efforts and disrupt daily commutes. Airports can also be affected, with high winds posing risks to aircraft during takeoff and landing, potentially causing delays or cancellations.

Critical infrastructure, such as communication networks, can also be disrupted. Downed power lines can lead to communication outages, affecting both landline and cellular services. This can hinder emergency communications and coordination during and after severe weather events. Lastly, straight-line winds can damage pipelines and water treatment facilities, leading to interruptions in essential services like water supply and sewage treatment.

4.12.7 Economy

Extreme Heat: According to NOAA, there are several economic impacts associated with extreme heat including increased healthcare costs resulting from a surge in heat-related illnesses, which necessitate medical treatment and contribute to healthcare expenditures. Extreme heat can also lead to reduced productivity in various economic sectors, impacting labor efficiency and overall economic output. During heatwaves, cooling demands soar, driving up energy consumption, elevating utility bills, and placing strain on energy infrastructure.

The agricultural sector is also impacted by extreme heat due to damaged crops, reducing yields and affecting agriculture, thereby disrupting food supply chains and causing financial losses for farmers. Next, high temperatures can stress transportation infrastructure, causing road buckling, rail deformation, and necessitating repairs.

Water resources may also face increased demand, requiring additional treatment and distribution efforts, which come with associated costs. The tourism and outdoor recreation industries can be adversely affected as extreme heat deters tourists and outdoor enthusiasts, impacting local economies dependent on these sectors. In the realm of insurance, heightened heat-related property and infrastructure damage may lead to higher premiums for individuals and businesses.

Lastly, prolonged periods of extreme heat heighten the risk of wildfires, incurring costs associated with property damage, ecosystem disruption, firefighting efforts, and resource allocation.

Dust Storms: According to NOAA, dust storms have various economic impacts across different sectors. In agriculture, dust storms can strip topsoil from farmlands, reducing soil fertility and damaging crops, which leads to decreased agricultural productivity and financial losses for farmers. The deposition of dust can also clog irrigation systems, affecting water distribution and further harming crop yields.

In the transportation sector, dust storms can disrupt road, air, and rail transport. Reduced visibility can cause traffic accidents and delays, increasing travel time and the cost of goods transportation. Airports may experience flight cancellations and delays due to poor visibility and dust-related mechanical issues in aircraft.

The health impacts of dust storms translate into economic costs. Increased hospital admissions for respiratory and cardiovascular issues, particularly among vulnerable populations, lead to higher healthcare expenses. Workers' productivity may decline due to health issues caused by dust exposure, further impacting the economy.

Infrastructure damage is another economic concern. Dust storms can damage buildings, power lines, and communication networks, leading to costly repairs and maintenance. Power outages caused by dust storms can disrupt businesses and essential services, compounding economic losses.

Straight-Line Wind: According to NOAA, straight-line wind incidents have substantial economic impacts across multiple sectors. In the agriculture sector, these winds can cause extensive damage to crops and soil, leading to decreased agricultural productivity and financial losses for farmers. Fields may experience erosion, and crops can be physically damaged or destroyed by the high winds, resulting in lower yields and increased replanting costs.

In the infrastructure sector, straight-line winds can damage buildings, power lines, and other critical infrastructure. The winds can tear off roofs, break windows, and cause structural failures, necessitating costly repairs and replacements. Power outages caused by downed power lines can disrupt businesses, leading to economic losses due to halted operations and decreased productivity. Communication networks may also be affected, impacting both personal and business communications.

The transportation sector also faces significant economic challenges during straight-line wind events. High winds can block roads with debris, causing travel delays and increasing transportation costs. Airports may experience delays and cancellations due to unsafe flying conditions, which can affect both passenger travel and cargo transport, leading to economic disruptions and increased operational costs.

4.12.8 Changes in Development and Impact to Future Development

Extreme Heat: According to NOAA, extreme heat events can impact changes in development and future urban planning and construction. As temperatures rise, cities and developers are increasingly considering the heat resilience of buildings and infrastructure. Currently, there's an increasing emphasis on designing structures that can withstand high temperatures while minimizing the need for energy-intensive cooling methods. This includes integrating materials that reflect rather than absorb heat, enhancing natural ventilation, and increasing green spaces to reduce the urban heat island effect. Additionally, there's a trend toward "cool roofs," urban tree canopies, and permeable pavements to manage heat.

In many areas, climate-resilient urban planning is becoming a priority to accommodate the anticipated increase in frequency and severity of heatwaves due to climate change. This planning involves the creation of heat action plans, the development of early warning systems, and the construction of cool refuges to protect vulnerable populations. Water resource management also becomes more critical in the design of new developments, as extreme heat can exacerbate water scarcity. Communities are also re-evaluating building codes, zoning laws, and development policies to ensure that new constructions and city expansions are both sustainable and resilient in the face of rising temperatures.

Dust Storms: According to NOAA, dust storm incidents can impact future development and influence changes in development patterns. Dust storms can lead to increased costs for maintaining and repairing infrastructure, as the abrasive nature of airborne dust particles can damage buildings, roads, and power lines. This necessitates frequent repairs and can deter investment in affected areas due to the higher maintenance costs and potential for repeated damage.

Dust storms can also degrade air quality, making areas less attractive for residential and commercial development. Poor air quality can deter new businesses and residents from moving into affected regions, impacting economic growth and development opportunities. Additionally, health concerns related to dust inhalation, such as respiratory issues and diseases like Valley Fever, can lead to increased healthcare costs and reduce the workforce's overall productivity, further discouraging development

Straight-Line Wind: According to NOAA, straight-line wind incidents can impact future development and influence changes in development patterns, including extensive damage to buildings, infrastructure, and landscapes, which can lead to increased costs for repairs and maintenance. The frequent need for repairs due to wind damage can deter investments in affected areas, as businesses and developers may seek more stable environments to minimize potential financial losses.

Additionally, the threat of straight-line winds can influence building codes and construction practices. Areas prone to these incidents may implement stricter building codes to ensure structures can withstand high winds, increasing construction costs but ultimately leading to safer and more resilient communities. These enhanced building standards can impact the overall cost and design of new developments, potentially slowing growth but improving long-term sustainability.

Infrastructure planning and development are also affected by the risk of straight-line winds. Essential services such as power and communication lines may need to be buried underground or fortified to prevent outages, which can be costly but necessary to ensure reliability. Transportation infrastructure, including roads and airports, must be designed to withstand debris and damage from high winds, which can influence the location and design of new projects.

4.12.9 Effects of Climate Change on Severity of Impacts

Extreme Heat: According to the NOAA, climate change is impacting the severity and frequency of extreme heat events. As global temperatures rise due to increasing greenhouse gas emissions, extreme heat events are becoming more intense, frequent, and prolonged. NOAA data indicates that heatwaves are occurring earlier in the year and lasting longer, leading to higher temperatures than historically recorded. This increase in temperature exacerbates the urban heat island effect in cities, where concrete and asphalt store and re-radiate heat, further intensifying the impact of extreme heat events in these areas.

The compounding effects of climate change on extreme heat also have broader ecological impacts, such as altering natural ecosystems and increasing the risk of wildfires. Higher temperatures contribute to more significant evaporation and soil dryness, which in turn can lead to drought conditions, affecting water supplies and agriculture. Additionally, the changing patterns of extreme heat are impacting public health, with increases in heat-related illnesses and deaths, particularly among vulnerable populations such as the elderly, children, and those with pre-existing health conditions.

Dust Storms: According to NOAA, climate change can impact the severity of dust storm events. As global temperatures rise, changes in precipitation patterns and increased frequency and intensity of droughts can lead to more arid conditions. These conditions are conducive to the formation of dust storms, as dry soil and lack of vegetation provide an abundant source of dust particles that can be lifted by strong wind.

Higher temperatures can also enhance the intensity of convective storms, which are often responsible for generating the strong winds that trigger dust storms. With climate change, the frequency of these storms is expected to increase, leading to more frequent and severe dust storm events. Additionally, changes in land use and desertification, driven by climate shifts, can expand the areas susceptible to dust storms, further exacerbating their impact.

The increased severity of dust storms due to climate change poses additional challenges for public health, infrastructure, and agriculture. More intense storms can carry larger amounts of dust over greater distances, affecting air quality and respiratory health in broader regions. The economic costs associated with these impacts are likely to rise, necessitating more robust mitigation and adaptation strategies to protect vulnerable communities and ecosystems.

Table 4-48. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.
Source: Neighborhoods at Risk (2024)

Table 4-49. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-50. Future Climate Temperature Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual Days With Maximum Temperature >95	**17 days**	**28 days**	**29 days**	**34 days**	**41 days**	**44 days**	**67 days**
	15-20	19-36	19-36	24-50	24-55	25-64	37-91
Annual Days With Maximum Temperature >100	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Annual Days With Maximum Temperature >105	**0 days**	**2 days**	**3 days**	**4 days**	**7 days**	**8 days**	**22 days**
	0-1	1-4	1-6	1-9	2-17	2-18	5-46
Annual Temperature							
Annual Single Highest Temperature °F	**103ºF**	**106ºF**	**106ºF**	**107ºF**	**108ºF**	**109ºF**	**114ºF**
	102-104	104-108	103-109	105-110	105-113	105-114	108-120
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**98ºF**	**101ºF**	**102ºF**	**103ºF**	**104ºF**	**105ºF**	**109ºF**
	97-100	98-103	99-105	100-106	100-109	101-110	104-117
Cooling Degree Days (CDD)	**695 degree days**	**951 degree days**	**986 degree days**	**1,098 degree days**	**1,243 degree days**	**1,293 degree days**	**1,873 degree days**
	626-785	787-1,183	807-1,181	846-1,421	937-1,596	948-1,671	1,223-2,576
Source: Climate Mapping for Resilience and Adaptation (2024)							

Table 4-51. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.12.10 FEMA NRI Expected Annual Loss Estimates

Table 4-52. Franklin County Expected Annual Loss Table

<table>
<tr><th colspan="8">FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – EXTREME HEAT</th></tr>
<tr><th>Annualized Frequency</th><th>Population</th><th>Population Equivalence</th><th>Building Value</th><th>Agriculture Value</th><th>Total Value</th><th>Expected Annual Loss Score</th><th>Expected Annual Loss Rating</th></tr>
<tr><td>1.3 events per year</td><td>0.32</td><td>$3,705,578</td><td>$9,921</td><td>$52,019</td><td>$3,767,518</td><td>97.1</td><td>Relatively High</td></tr>
<tr><th colspan="8">FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – STRONG WIND</th></tr>
<tr><th>Annualized Frequency</th><th>Population</th><th>Population Equivalence</th><th>Building Value</th><th>Agriculture Value</th><th>Total Value</th><th>Expected Annual Loss Score</th><th>Expected Annual Loss Rating</th></tr>
<tr><td>0.3 events per year</td><td>0.01</td><td>$69,991</td><td>$65,586</td><td>$22,305</td><td>$157,883</td><td>31.9</td><td>Relatively Low</td></tr>
<tr><td colspan="8"><i><u>Annualized Frequency</u>: The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.
<u>Population</u>: Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.
<u>Expected Annual Loss</u> scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss</i></td></tr>
<tr><td colspan="8">Source: FEMA National Risk Index (2024)</td></tr>
</table>

4.12.11 FEMA Hazard-Specific Risk Index Table

Table 4-53. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS - EXTREME HEAT		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
97.7	Very High	Relatively Low
FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS - STRONG WIND		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
33.3	Very High	Relatively Low
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2024)		

4.12.12 FEMA NRI Exposure Value Table

Table 4-54. Franklin County FEMA NRI Exposure Value Table

<table>
<tr><th colspan="6">FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE - EXTREME HEAT</th></tr>
<tr><th>Hazard Type</th><th>Total Value</th><th>Building Value</th><th>Population Equivalence</th><th>Population</th><th>Agriculture Value</th></tr>
<tr><td>Extreme Heat</td><td>$3,767,518</td><td>$9,921</td><td>$3,705,578</td><td>0.32</td><td>$52,019</td></tr>
<tr><th colspan="6">FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE - STRONG WIND</th></tr>
<tr><th>Hazard Type</th><th>Total Value</th><th>Building Value</th><th>Population Equivalence</th><th>Population</th><th>Agriculture Value</th></tr>
<tr><td>Strong Wind</td><td>$157,883</td><td>$65,586</td><td>$69,991</td><td>0.01</td><td>$22,305</td></tr>
<tr><td colspan="6"><u>Buildings:</u> <i>Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.</i>
<u>Population:</u> <i>Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 millions of economic loss (2022 dollars).</i>
<u>Agriculture:</u> <i>Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.</i></td></tr>
<tr><td colspan="6">Source: FEMA National Risk Index (2024)</td></tr>
</table>

4.13 Severe Winter Storms

4.13.1 Hazard Description

In this *Plan*, Severe Winter Storms are considered to be extreme cold, blizzard, and heavy snow.

Extreme Cold: NOAA defines extreme cold as a period of excessively low temperatures that significantly fall below the long-term average for a specific location. This definition takes into account the local climate and expected temperature ranges. Extreme cold events are typically characterized by a prolonged duration of very cold weather, often accompanied by harsh wind chills, which can pose significant risks to human health, safety, and infrastructure. NOAA often uses specific temperature thresholds to define extreme cold conditions, and they issue advisories and warnings, such as Wind Chill Advisories and Extreme Cold Warnings, to alert the public to these hazardous conditions. During extreme cold events, there is an increased risk of cold-related illnesses, such as frostbite and hypothermia, and the potential for damage to water systems, transportation infrastructure, and power grids. Extreme cold events are a concern, especially during the winter months, and can vary in intensity based on geographical location and local climate.

Blizzard: NOAA defines a blizzard as a severe snowstorm characterized by strong winds and low visibility. Specifically, for a storm to be classified as a blizzard, it must have sustained winds or frequent gusts of 35 miles per hour or greater, accompanied by considerable falling or blowing snow that reduces visibility to less than a quarter mile. These conditions must persist for at least three hours. Blizzards create life-threatening travel conditions, significant disruptions, and potential power outages due to the intensity of the wind and snow.

Heavy Snow: NOAA defines heavy snow as snowfall accumulating to at least 4 inches (10 cm) in 12 hours or less, or to at least 6 inches (15 cm) in 24 hours or less.

4.13.2 Hazard Location

Severe winter storms could occur anywhere in Franklin County.

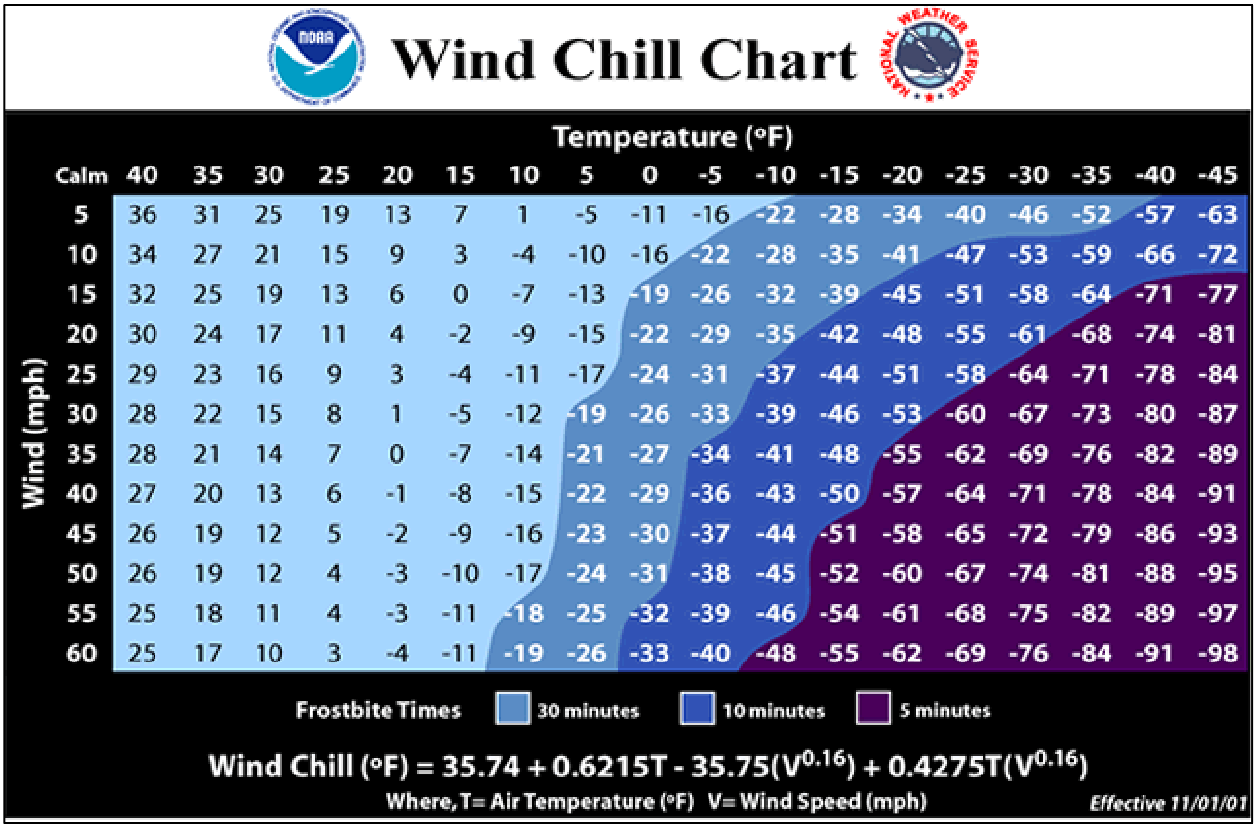
4.13.3 Hazard Extent/Intensity

Extreme Cold: NOAA measures the extent and intensity of extreme cold using a combination of meteorological tools and observation networks. The assessment of extreme cold conditions involves analyzing various data points and indicators, including:

- Temperature Readings: NOAA uses a network of weather stations and temperature sensors to record air temperature data. During extreme cold events, temperature readings well below the normal or seasonal averages are noted. Extremely low temperatures are a primary indicator of the intensity of extreme cold conditions.
- Wind Chill Index: In addition to actual air temperature, NOAA calculates the wind chill index. This index reflects how cold it feels to the human body and is determined by a combination of air temperature and wind speed. A lower wind chill index indicates more severe cold conditions.
- Historical Climate Data: NOAA maintains extensive records of historical climate data, including records of the lowest temperatures ever recorded in specific locations. Comparing current temperatures to historical records helps assess the extremeness of the cold event.
- Duration of Extreme Cold: The length of time that extreme cold conditions persist is another factor in assessing their intensity. Prolonged periods of extreme cold can have more significant impacts on both the environment and human health.
- Wind Speed and Gusts: Wind speed and gusts can exacerbate the intensity of extreme cold. NOAA monitors these parameters to determine whether wind-driven cold temperatures are causing more significant issues.
- Real-Time Monitoring: NOAA continuously collects real-time data from weather stations and sensors to monitor the current conditions during an extreme cold event. These data points provide insights into the extent and intensity of the event.
- Public Reports: Reports from the public, including trained weather spotters and community members, are valuable sources of information regarding the extent and impacts of extreme cold. Public reports contribute to NOAA's understanding of the real-time conditions on the ground.

NOAA uses all of these tools and data sources to assess the extent and intensity of extreme cold conditions and to issue appropriate advisories and warnings, such as Wind Chill Warnings and Extreme Cold Warnings, to inform the public and provide guidance on how to stay safe during extreme cold events.

Figure 4.22. NOAA / NWS Wind Chill Index



Wind Chill Chart

Temperature (°F)

Wind (mph)

Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times 🟦 30 minutes 🟦 10 minutes 🟪 5 minutes

$$\text{Wind Chill } (^\circ F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Blizzard: The extent and intensity of a blizzard are measured based on several key meteorological parameters tracked by NOAA. These parameters include wind speed, visibility, and duration of the storm conditions. To classify a storm as a blizzard, it must have sustained winds or frequent gusts of 35 miles per hour (mph) or greater, visibility of less than a quarter mile, and these conditions must persist for at least three hours.

Table 4-55. NOAA Blizzard Measurement Table

NOAA BLIZZARD MEASUREMENT TABLE	
Parameter	**Measurement**
Wind Speed	≥ 35 mph sustained or frequent gusts
Visibility	< 0.25 miles
Duration	≥ 3 hours

These measurements are obtained through a combination of surface observations from weather stations, satellite data, and radar information. The comprehensive analysis of these parameters allows NOAA to assess the severity of a blizzard, providing essential data for weather forecasting and public safety warnings.

Heavy Snow: NOAA measures the extent and intensity of heavy snowfall using a combination of ground-based observations, radar, and satellite data:

1. Ground-Based Observations: NOAA relies on a network of weather stations and observers who measure snowfall manually. These measurements are taken using standardized procedures to ensure consistency. Snow depth is measured using a snow gauge, which consists of a cylindrical container that captures the snowfall. The snow is then melted to measure the water equivalent, which helps in determining the snowfall's intensity.
2. Automated Weather Stations: These stations are equipped with instruments that automatically measure snowfall and other meteorological variables. These instruments can measure the depth of snow as it accumulates and provide continuous data.
3. Radar: Weather radars are used to estimate snowfall rates over large areas. By analyzing the radar reflectivity, meteorologists can estimate the intensity and extent of snowfall. This is particularly useful for identifying and tracking snowstorms as they move.
4. Satellites: Satellites provide a broader view of snow cover and can help track the development and movement of snowstorms. They use visible and infrared imagery to monitor snow extent and to estimate snowfall rates. This data is particularly valuable in remote areas where ground-based observations are sparse.
5. Numerical Weather Models: These models use mathematical representations of the atmosphere to simulate and predict weather conditions, including snowfall. The models assimilate data from ground-based observations, radar, and satellites to provide forecasts of snowfall intensity and extent.
6. Snow Water Equivalent (SWE): This measurement is crucial for understanding the water content of the snow, which impacts the potential for flooding when the snow melts. SWE is measured using snow pillows (which measure the weight of the snow) and manual snow surveys.

Table 4-56. National Weather Service - Snow Load Information

NATIONAL WEATHER SERVICE SNOW LOAD INFORMATION			
WATER = 62.4 pounds/cubic foot			
INCHES	**WE=lbs./sq ft.**	**INCHES**	**WE=lbs./sq ft.**
1.0	5.2	21.0	109.2
2.0	10.4	22.0	114.4
3.0	15.6	23.0	119.6
4.0	20.8	24.0	124.8
5.0	26.0	25.0	130.0
6.0	31.2	26.0	135.2
7.0	36.4	27.0	140.4
8.0	41.6	28.0	145.6
9.0	46.8	29.0	150.8
10.0	52.0	30.0	156.0
11.0	57.2	31.0	161.2
12.0	62.4	32.0	166.4
13.0	67.6	33.0	171.6
14.0	72.8	34.0	176.8
15.0	78.0	35.0	182.0
16.0	83.2	36.0	187.2
17.0	88.4	37.0	192.4
18.0	93.6	38.0	197.6
19.0	98.8	39.0	202.8
20.0	104.0	40.0	208.0
Source: NWS Snow Load (2024)			

NOAA uses these tools and data sources to assess the extent and intensity of a winter storm and to issue appropriate advisories and warnings, such as Winter Storm Watches and Winter Storm Warnings, to inform the public and provide guidance on how to stay safe during winter storm events.

In addition, NOAA also produces the Regional Snowfall Index (RSI) shown in the table below for significant snowstorms that impact the eastern two thirds of the U.S. The Regional Snowfall Index, however, can still be a useful tool for considering extent values of snowfall throughput the planning area.

Table 4-57. NOAA Regional Snowfall Index (RSI)

NOAA REGIONAL SNOWFALL INDEX (RSI)		
Category	**RSI Value**	**Description**
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme
Source: NOAA (2024)		

4.13.4 Frequency/Probability

Extreme Cold Frequency: Between 01/01/2019 and 12/31/2023 Franklin County recorded one extreme cold events over 1,826 days. This averages to 0.000547 incidents per day during this time and 0.2 incidents annually.

Extreme Cold Probability: NOAA measures the probability of extreme cold using meteorological tools and data analysis. It closely monitors temperature forecasts and calculates the Wind Chill Index, which assesses the impact of temperature and wind speed on human comfort. Advanced meteorological models are used to forecast extreme cold events by considering atmospheric conditions, high-pressure systems, temperature anomalies, and other relevant factors. Historical climate data and records of the lowest temperatures recorded in specific areas aid in evaluating the probability of extreme cold. NOAA also examines the expected duration and intensity of extreme cold, particularly during prolonged periods of low temperatures. Collaboration with public health agencies enhances the analysis of cold-related illnesses, and advisories and warnings are issued to provide the public with information about the likelihood of extreme cold, health risks, and recommended safety measures.

Blizzard Frequency: Between 01/01/19 and 12/31/23 Franklin County recorded two events over 1,826 days. This averages to 0.001095 incidents per day during this time and 0.4 incidents annually.

Blizzard Frequency: NOAA measures the probability of blizzard activity

Heavy Snow Frequency: Between 01/01/19 and 12/31/23 Franklin County recorded five events over 1,826 days. This averages to 0.002738 incidents per day during this time and one incident annually.

Heavy Snow Probability: NOAA measures the probability of heavy snow using meteorological tools, data analysis, and monitoring systems. Doppler radar systems track atmospheric conditions and the movement of weather systems that can lead to winter storms, offering real-time data on precipitation types. Advanced meteorological models consider atmospheric conditions, temperature gradients, moisture levels, and weather system movement to assess the likelihood of heavy snow. NOAA's network of weather stations measures temperature and precipitation, vital for evaluating heavy snow probability. Historical climate data and records of past heavy snow events contribute to the assessment. Additionally, NOAA analyzes the expected duration and intensity of heavy snow conditions. Reports from the public and the issuance of Winter Storm

Watches and Warnings inform the public about the likelihood of winter storms, expected snowfall amounts, and recommended safety measures.

4.13.5 Past Events

Table 4-58. Extreme Cold Events in Franklin County, WA (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**0.00K**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	12/22/22	0:00	PST-8	Extreme Cold	0	0	0.00K	0.00K
Totals:							**0**	**0**	**0.00K**	**0.00K**

Table 4-59. Blizzard Events in Franklin County, WA (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**0.00K**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	2/9/19	10:00	PST-8	Blizzard	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	11/27/19	19:00	PST-8	Blizzard	0	0	0.00K	0.00K
Totals:							**0**	**0**	**0.00K**	**0.00K**

Table 4-60. Heavy Snow Events in Franklin County, WA (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**0.00K**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	2/4/19	14:00	PST-8	Heavy Snow	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	2/8/19	8:00	PST-8	Heavy Snow	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	2/12/21	9:00	PST-8	Heavy Snow	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	1/5/22	19:00	PST-8	Heavy Snow	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	12/4/22	21:37	PST-8	Heavy Snow	0	0	0.00K	0.00K
Totals:							**0**	**0**	**0.00K**	**0.00K**

4.13.6 Vulnerability and Impacts

Life Safety and Public Health (Extreme Cold): According to NOAA, exposure to extreme cold can lead to hypothermia, a life-threatening condition where the body loses heat faster than it can produce it, causing confusion, loss of consciousness, and, if not treated promptly, death. Frostbite, which occurs when skin and underlying tissues freeze, typically affects extremities like fingers, toes, ears, and the nose, and severe frostbite can result in tissue damage and the need for amputation. Cold air can exacerbate respiratory conditions such as asthma and increase the risk of respiratory distress, particularly in areas with high levels of air pollution. Additionally, extreme cold can strain the cardiovascular system, increasing the risk of heart-related complications, especially in individuals with heart conditions.

Icy and slippery conditions elevate the risk of slips, trips, and falls, leading to injuries, fractures, and head trauma. Cold weather also impacts transportation systems, causing road closures, flight cancellations, and delays, which pose safety risks for travelers. Extreme cold can damage power lines and electrical infrastructure, leading to power outages that affect critical services, including heating and medical equipment. Freezing temperatures can also damage water supply systems, leading to water shortages or frozen pipes, affecting drinking water availability. Heavy snowfall and blizzards contribute to snow accumulation, road closures, and the risk of being trapped in vehicles or homes. Finally, extreme cold poses particular risks to individuals experiencing homelessness, who may lack access to shelter and adequate protection from the elements.

Blizzard: According to NOAA, blizzard events can create hazardous conditions that pose serious risks to individuals and communities. Travel hazards are a primary concern, as blizzards often lead to numerous accidents and fatalities on roads due to reduced visibility and slippery surfaces, resulting in road closures and stranded vehicles. The severe cold temperatures associated with blizzards can cause hypothermia and frostbite, especially for those without adequate shelter or protective clothing. Next, high winds and heavy snow can damage power lines and infrastructure, leading to widespread power outages. These outages leave homes and businesses without heat, light, and essential services, exacerbating risks associated with cold weather exposure.

Blizzards also limit access to emergency services, as snow-covered roads and poor visibility can delay or prevent emergency vehicles from reaching those in need, increasing the potential for injury or death. The disruption of healthcare services is another critical impact, as medical staff may be unable to travel to work and patients may be unable to reach healthcare facilities, with potentially severe consequences for those requiring urgent medical attention. The use of alternative heating sources such as generators, gas stoves, or charcoal grills indoors during power outages can lead to carbon monoxide poisoning. Without proper ventilation, the buildup of this odorless, colorless gas can be deadly.

Life Safety and Public Health (Heavy Snow): According to NOAA, transportation hazards are a primary concern, as heavy snow creates treacherous driving conditions, increasing the risk of car accidents. Snow and ice on roads can cause vehicles to skid, reduce visibility, and make travel dangerous, resulting in injuries and fatalities. Health risks are also prevalent, as exposure to severe winter weather can lead to hypothermia and frostbite. Hypothermia occurs when the body loses heat faster than it can produce it, causing dangerously low body temperatures, while frostbite can cause permanent damage to body tissues. Additionally, heavy physical exertion, such as shoveling snow, can lead to heart attacks, particularly in individuals with pre-existing heart conditions.

Carbon monoxide poisoning is another risk during heavy snow events, as power outages often lead people to use alternative heating sources such as generators, which can produce carbon monoxide (CO). Without proper ventilation, CO poisoning can be deadly. Heavy snow can also isolate homes and communities, cutting off access to essential services such as healthcare, food, and emergency aid. This isolation is particularly dangerous for vulnerable populations, including the elderly, sick, and those living in remote areas. Structural damage is also an impact, as the weight of accumulated snow can cause roofs to collapse and damage infrastructure, leading to potential injuries and disruptions in utility services such as electricity and water. In mountainous regions, heavy snow can trigger avalanches, posing severe risks to life and property.

Property Damage and Critical Infrastructure (Extreme Cold): According to NOAA, extreme cold can lead to property damage and critical infrastructure impacts. Low temperatures can result in frozen and burst water pipes, heating system failures, road and transportation infrastructure damage, and power outages, affecting homes, businesses, and critical facilities like hospitals. Healthcare facilities may struggle to provide care in frigid conditions, and transportation disruptions, including road closures and accidents, can impact critical infrastructure and supply chains. Communication equipment can be affected, potentially hindering emergency communication systems, and snow accumulation can stress roofs and structures, leading to damage. Finally, extreme cold poses health risks, particularly for vulnerable populations, and can strain emergency response and healthcare systems.

Blizzard: According to NOAA, the combination of heavy snowfall, high winds, and freezing temperatures during a blizzard can lead to various forms of property damage, including collapsed roofs, broken windows, and damaged vehicles. The weight of accumulated snow can strain building structures, particularly roofs, causing them to collapse, which poses risks to occupants and leads to expensive repairs.

Blizzards also have a profound impact on critical infrastructure. High winds and heavy snow can damage power lines and electrical grids, leading to widespread power outages. These outages disrupt heating systems, which are crucial during extremely cold weather, and can also affect communication networks, leaving residents without essential services. Additionally, blizzards can damage water supply systems, causing pipes to freeze and burst, leading to water shortages and flooding when the pipes thaw.

Transportation infrastructure is particularly vulnerable during blizzard events. Roads can become impassable due to heavy snow accumulation, and airports may experience closures or significant delays, disrupting travel and the delivery of goods and services. Railways can also be affected, with snow and ice interfering with tracks and signals.

Lastly, blizzards can delay or prevent emergency responders from reaching those in need, further endangering lives. This disruption extends to healthcare facilities, where staff may be unable to reach their workplaces, and patients may be unable to access medical care.

Property Damage and Critical Infrastructure (Heavy Snow): According to NOAA, heavy snow incidents can impact property damage and critical infrastructure. The accumulation of snow can lead to structural damage as the weight of the snow may cause roofs to collapse, particularly those of older buildings not designed to bear heavy loads. This structural damage extends to other infrastructure, including communication towers and utility lines, leading to widespread power outages and loss of communication services. The heavy snow and ice can knock down trees and power lines, further disrupting electricity supply and communication networks.

Transportation infrastructure is also impacted by heavy snow events, with roads becoming impassable, airports shutting down, and rail services being interrupted. This not only hampers daily commutes but also affects emergency services, making it difficult for ambulances, fire trucks, and other emergency vehicles to reach those in need. The snow removal process itself can be costly and time-consuming, and delays in clearing roads can prolong the isolation of communities, disrupting the flow of goods and services, and impacting local economies. Lastly, heavy snow can damage water supply systems and lead to flooding when the snow melts, overwhelming drainage systems and causing water damage to properties.

4.13.7 Economy

Extreme Cold: According to NOAA, Extreme cold has a range of economic impacts including healthcare costs stemming from cold-related illnesses and injuries, which result in medical expenses. Severe cold can also disrupt daily activities, reduce productivity across various economic sectors, and affect labor efficiency, impacting overall economic output. Cold weather necessitates increased heating demands, driving up energy consumption, utility bills, and placing strain on energy infrastructure. The agricultural sector is also vulnerable to extreme cold, which can damage crops and agricultural operations, causing food supply disruptions and financial losses for farmers. Transportation disruptions, including road closures, accidents, and heightened maintenance requirements, can affect supply chains and commerce. Infrastructure, such as roads, bridges, and water supply systems, is stressed by freezing temperatures, necessitating repairs and maintenance.

Extreme cold events may also increase the demand for emergency response and public safety services, resulting in additional costs, and can necessitate emergency shelters and services for vulnerable populations, incurring expenses for local governments. Insurance premiums for individuals and businesses may rise due to increased cold-related property damage. Lastly, extreme cold can harm wildlife and ecosystems, leading to conservation and recovery efforts.

Blizzard: According to NOAA, the direct costs of blizzard events associated with property damage, such as repairs to homes, businesses, and infrastructure, can be substantial. The weight of snow can cause structural failures, leading to expensive repairs and reconstruction efforts. Additionally, power outages caused by blizzards can result in lost productivity for businesses, as operations are disrupted, and employees are unable to work. Transportation disruptions further compound economic losses, as road closures and airport shutdowns hinder the movement of goods and people, delaying deliveries and travel plans.

The agricultural sector can also suffer considerable losses during blizzard events. Livestock may be at risk due to extreme cold and snow cover, which can disrupt feeding and sheltering practices. Crop losses can occur if a blizzard hits during a sensitive period for growth. Retail businesses may see a decline in sales as consumers stay home during severe weather, leading to decreased revenue. Lastly, the costs associated with emergency response and recovery efforts, including snow removal, road clearing, and public safety measures, place a financial strain on local governments and municipalities.

Heavy Snow: According to NOAA, heavy snow incidents can have various economic impacts on community areas. The direct costs of snow removal and infrastructure repair are significant, requiring substantial resources to clear roads, restore power, and repair damaged buildings and utilities. These activities can strain municipal budgets, particularly in regions unaccustomed to frequent heavy snowfalls. Additionally, the economic activities can come to a halt as businesses close, transportation networks are disrupted, and supply chains are interrupted. This leads to lost revenue for local businesses, increased operational costs for industries reliant on timely deliveries, and broader economic losses due to decreased productivity.

Property damage from heavy snow can be extensive, affecting homes, commercial buildings, and critical infrastructure such as power lines and water systems. This financial burden on property owners and insurance companies can be significant, with costs associated with repairs and claims adding up quickly. Prolonged power outages and communication disruptions can also lead to additional economic losses, affecting both residential and commercial sectors.
The agricultural sector can also be impacted by heavy snow, with livestock losses, damage to crops, and delays in planting or harvesting. These impacts can result in reduced agricultural output and financial losses for farmers.

In mountainous regions, the threat of avalanches can further endanger properties and infrastructure, necessitating costly preventive measures and emergency responses.

4.13.8 Changes in Development and Impact to Future Development

Extreme Cold: According to NOAA, extreme cold events can impact current and future development. In areas prone to such conditions, there is an increasing emphasis on constructing buildings and infrastructure that can withstand the rigors of extreme cold. This includes enhanced insulation, robust heating systems, and materials resistant to freezing and thawing cycles. Building codes are also being revised to incorporate these considerations, ensuring structures are not only energy-efficient but also resilient to cold-related damages like burst pipes and ice accumulation. Urban planning is also focusing on ensuring essential services and transportation remain operational during severe cold events, and that communities, (especially vulnerable populations), have access to adequate heating and emergency services.

According to NOAA, the frequency and intensity of extreme cold events, can potentially be exacerbated by climate change and are being factored into long-term development strategies. This involves planning for increased energy demands during cold snaps, incorporating sustainable and renewable energy sources, and developing emergency response protocols for cold weather events. Additionally, environmental considerations, such as the ecological impact of road salt and other ice-melting agents, are becoming a part of the planning process.

Blizzard: According to NOAA, the immediate impacts of blizzards, such as property damage, transportation disruptions, and infrastructure strain, can result in investment for repairs and upgrades. Communities may need to reconsider building standards and codes to ensure that structures can withstand the heavy snow loads and high winds associated with blizzards. This can lead to changes in construction practices, including the reinforcement of roofs, improved insulation, and the installation of more resilient utility systems.

In the long term, the experience of severe blizzards can drive urban planners and developers to incorporate climate resilience into their designs. This might involve developing better drainage systems to handle snowmelt, creating more reliable and redundant power grids, and planning for emergency services that can operate effectively under extreme weather conditions. Additionally, the increased frequency and intensity of blizzards due to climate change may prompt policymakers to revise zoning laws, restricting development in areas particularly vulnerable to severe winter storms
.
Future development plans can prioritize sustainable and resilient infrastructure to reduce the economic and social impacts of blizzards. Investments in advanced weather forecasting and early warning systems can improve preparedness and response, minimizing the disruption caused by such events.

Heavy Snow: According to NOAA, heavy snow incidents can necessitate the incorporation of resilient infrastructure and urban planning to mitigate the effects of extreme winter weather. Communities may need to invest in more robust building codes to ensure that structures can withstand the weight of heavy snow accumulation, which can lead to roof collapses and other structural failures. This could include the use of stronger materials and innovative architectural designs that facilitate the shedding of snow from rooftops.

Transportation infrastructure also requires adaptation, with the enhancement of road maintenance capabilities, including more efficient snow removal equipment and strategies to keep roads passable. Urban planners might prioritize the development of underground utilities to protect against outages caused by snow-laden power lines. Heavy snowfall can also isolate communities, ensuring accessible and reliable emergency services is critical. This might involve the creation of emergency shelters equipped with adequate heating, food supplies, and medical care.

Lastly, future development may also need to address climate change projections, as research suggests that the frequency and intensity of extreme snowstorms could be influenced by warmer ocean temperatures and changing atmospheric patterns. These projections highlight the need for adaptive strategies in urban planning and infrastructure development to handle the potential increase in severe winter weather events.

4.13.9 Effects of Climate Change on the Severity of Impacts

Extreme Cold: According to NOAA, climate change can lead to various effects on the severity of extreme cold events. While global temperatures are generally rising, shifts in atmospheric circulation patterns and disruptions in polar vortex behavior can contribute to more variable and severe cold weather in specific regions. These changes can result in intense cold snaps and frigid conditions, even during overall warming trends. Extreme cold events can also have adverse effects on public safety, infrastructure, and agriculture.

Blizzard: According to NOAA, climate change can significantly impact the severity of blizzard events. While warmer global temperatures might suggest a decrease in snowstorms, the reality is more complex. Climate change can lead to more intense and unpredictable weather patterns. Warmer air holds more moisture, which can result in heavier snowfall during winter storms. Consequently, blizzards may become more severe, with increased snowfall rates and accumulation.

The warming Arctic has been linked to disruptions in the polar jet stream, which can cause cold air to dip further south more frequently. These changes can lead to more frequent and intense cold snaps, increasing the likelihood of severe blizzards. In addition, the variability in temperatures caused by climate change can create conditions where rapid freezing and thawing occur, exacerbating the impact of snow and ice on infrastructure. The increased severity of blizzards due to climate change also highlights the need for enhanced preparedness and resilience measures. Communities may need to invest in more robust infrastructure, improved snow removal capabilities, and better emergency response systems to cope with the heightened risks associated with these extreme weather events.

Heavy Snow: According to NOAA, climate change has complex effects on heavy snow events. Despite global warming, heavy snowstorms and significant snowfall can still occur and, in some cases, may even become more intense. This is because warmer atmospheric conditions can hold more moisture, which can lead to heavier precipitation, including snow, when temperatures are conducive to snowfall.

The frequency of extreme snowstorms in the eastern two-thirds of the contiguous United States has increased over the past century. Factors such as warmer-than-average ocean surface temperatures can contribute to greater moisture availability and storm intensification. For instance, higher ocean temperatures in the Atlantic can lead to more moisture being transported into a storm system, resulting in heavier snowfall. This was observed during the "Snowmageddon" event in 2010, where Washington, DC, experienced one of its highest recorded snowfall totals due to these conditions.

Lastly, changes in Arctic sea ice and atmospheric circulation patterns may also play a role. The reduction in Arctic sea ice has been linked to the development of high-pressure blocking patterns over the North Atlantic, which can result in cold outbreaks and slower-moving storm systems in the eastern United States. These conditions can exacerbate the severity and duration of snowstorms.

Table 4-61. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-62. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.13.10 FEMA NRI Expected Annual Loss Estimates

Table 4-63. Franklin County Expected Annual Loss Table

<table>
<tr><th colspan="8">FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – EXTREME COLD</th></tr>
<tr><th>Annualized Frequency</th><th>Population</th><th>Population Equivalence</th><th>Building Value</th><th>Agriculture Value</th><th>Total Value</th><th>Expected Annual Loss Score</th><th>Expected Annual Loss Rating</th></tr>
<tr><td>0.2 events per year</td><td>0.03</td><td>$324,184</td><td>$1,617</td><td>$674,895</td><td>$1,000,696</td><td>93.5</td><td>Relatively High</td></tr>
<tr><th colspan="8">FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – WINTER WEATHER</th></tr>
<tr><th>Annualized Frequency</th><th>Population</th><th>Population Equivalence</th><th>Building Value</th><th>Agriculture Value</th><th>Total Value</th><th>Expected Annual Loss Score</th><th>Expected Annual Loss Rating</th></tr>
<tr><td>1.7 events per year</td><td>0.00</td><td>$30,064</td><td>$3,941</td><td>$2,275</td><td>$36,280</td><td>43.7</td><td>Relatively Low</td></tr>
<tr><td colspan="8"><i>Annualized Frequency:</i> <i>The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.</i>
<i>Population:</i> <i>Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.</i>
<i>Expected Annual Loss</i> <i>scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss</i></td></tr>
<tr><td colspan="8">Source: FEMA National Risk Index (2024)</td></tr>
</table>

4.13.11 FEMA Hazard-Specific Risk Index Table

Table 4-64. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS - EXTREME COLD		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
95.4	Very High	Relatively Low
FRANKLIN COUNTY, WA FEMA HAZARD SPECIFIC RATINGS – WINTER WEATHER		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
45.9	Very High	Relatively Low
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2024)		

4.13.12 FEMA NRI Exposure Value Table

Table 4-65. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE - EXTREME COLD

Hazard Type	Total Value	Building Value	Population Equivalence	Population	Agriculture Value
Extreme Cold	$1,135,928,010,236	$14,028,747,907	$1,121,174,800,000	96,653.00	$724,462,329

FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE – WINTER WEATHER

Hazard Type	Total Value	Building Value	Population Equivalence	Population	Agriculture Value
Winter Weather	$1,135,928,010,236	$14,028,747,907	$1,121,174,800,000	96,653.00	$724,462,329

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*

Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 millions of economic loss (2022 dollars).*

Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

Source: FEMA National Risk Index (2024)

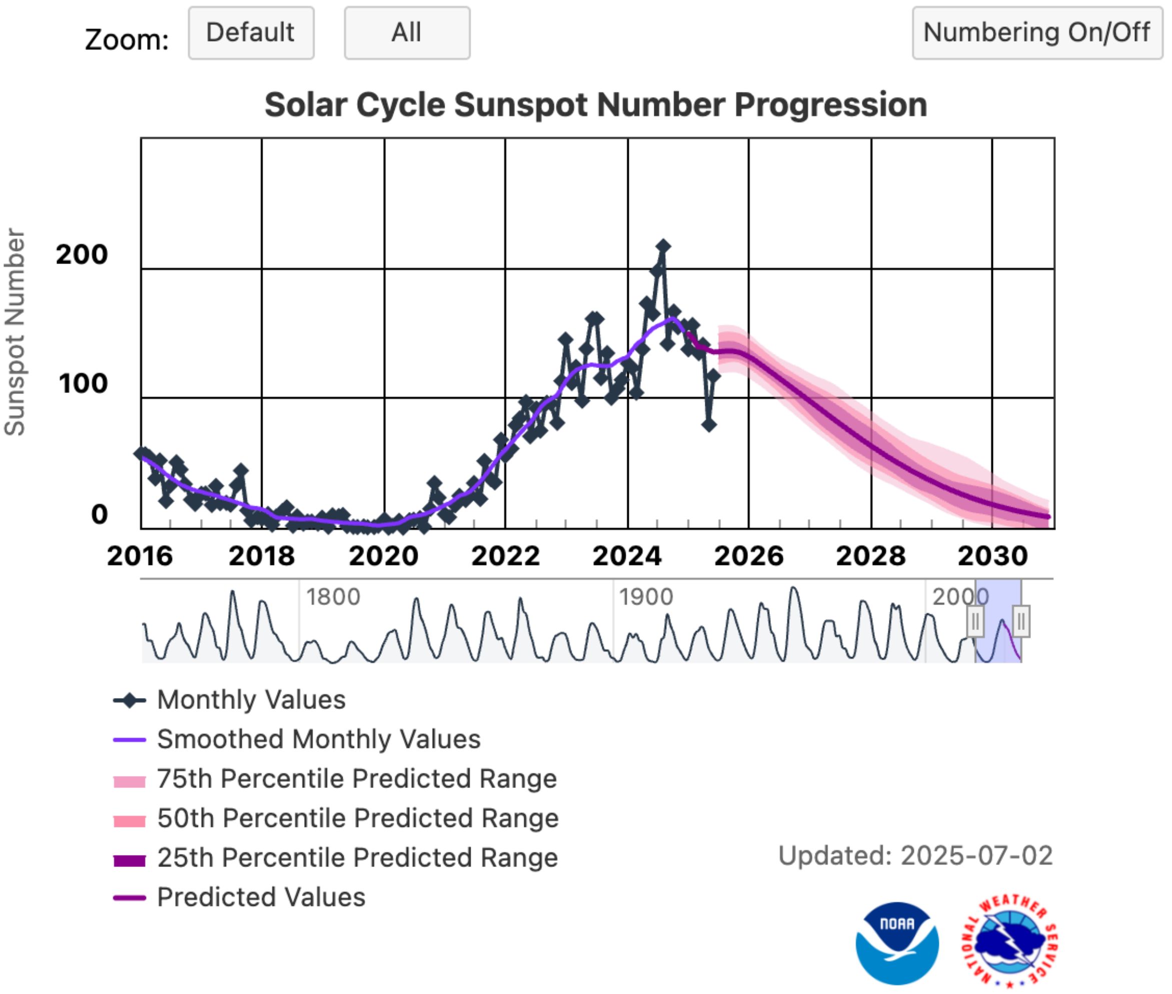
4.14 Space Weather

4.14.1 Hazard Description

The National Oceanic and Atmospheric Administration (NOAA) defines space weather as the variable conditions on the Sun and in space that can influence the performance and reliability of space- and ground-based technological systems, and endanger life or health.

During years of high solar activity, known as **solar maximum**, events like solar flares and eruptions occur more frequently. These events can release enormous amounts of energy over just a few minutes—enough to equal **200 times** the energy humans use in an entire year. When these eruptions are directed at Earth, they can result in **geomagnetic storms** after traveling the 93 million miles from the Sun.

Figure 4.25 NOAA Current Space Weather Conditions: Solar Cycle Progression



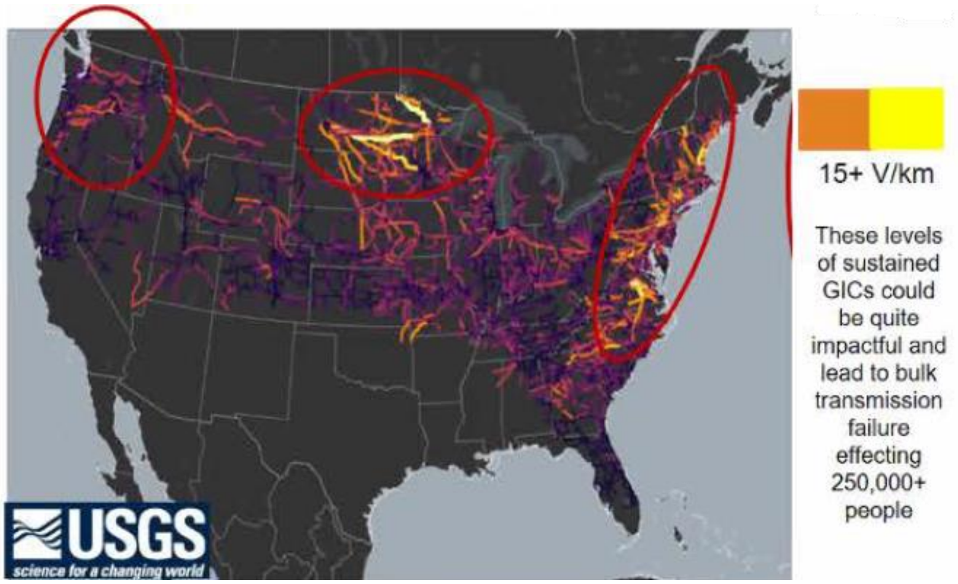
4.14.2 Hazard Location

Space weather can impact any location within Franklin County.

Coronal Mass Ejections (CMEs), which are large expulsions of plasma and magnetic field from the Sun, are the primary drivers of geomagnetic storms. While CMEs can reach Earth in as little as **15 hours**, typical travel times are **2–4 days**.

Washington State is known to be susceptible to geomagnetic storm impacts due to its geographic and magnetic positioning.

Figure 4.26 USGS Map from the report showing 100-year storm-induced voltages on the National Electric Power Grid



These levels of sustained GICs could be quite impactful and lead to bulk transmission failure effecting 250,000+ people

4.14.3 Hazard Extent/Intensity

Geomagnetic storms are measured using the **G-Scale**, which corresponds to the **Kp Index (0–9)**:

- NOAA issues alerts starting at **Kp level 4**.
- Once Kp exceeds 4, the G-Scale is applied:
  - **G1 (Minor)** to **G5 (Extreme)**
- NOAA issues official warnings between **G1–G5 / Kp4–Kp9**.

Table 4.75 NOAA G-Scale for Geomagnetic Storms

G-Level	Kp Index	Potential Impacts	Frequency (Approx.)
G1 (Minor)	Kp = 5	Minor impact on power grids, auroras visible at high latitudes	1700 days per 11-year cycle (~900/year)
G2 (Moderate)	Kp = 6	Possible transformer damage, HF radio issues, auroras at mid-latitudes	600 days per cycle (~55/year)
G3 (Strong)	Kp = 7	Voltage corrections needed, satellite orientation issues	200 days per cycle (~20/year)
G4 (Severe)	Kp = 8	Widespread voltage control problems, satellite and GPS degradation	100 days per cycle (~4/year)

G5 (Extreme)	Kp = 9	Grid collapse possible, severe satellite navigation and communication loss	4 days per cycle (very rare)

Source: NOAA Space Weather Scales - https://www.swpc.noaa.gov/noaa-scales-explanation

4.14.4 Frequency and Probability

The Sun undergoes an 11-year solar cycle, transitioning from quiet to active and back again. 2025 is projected to be the peak year of Solar Cycle 25.

4.14.4 Past Events

May 10–11, 2024 – G3/G4 Geomagnetic Storms
During the geomagnetic storms on May 10–11, 2024, which escalated from a G3 Watch to a G4 event, several sectors experienced significant disruptions:

Power and Grid Impacts: Grid operators across the U.S. and Canada, including those in Washington State, implemented numerous mitigative actions in response to the NOAA-issued G3 Watch, which was later upgraded to G4 status.

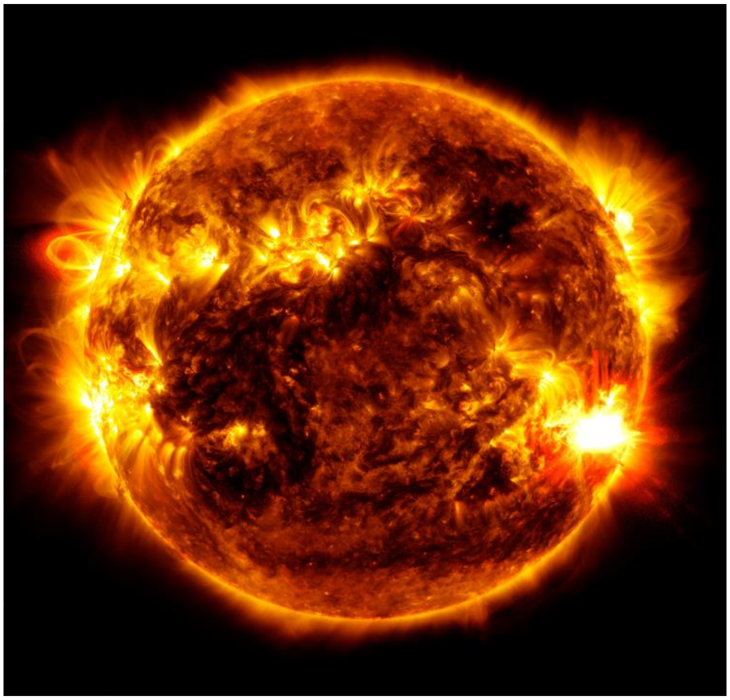
Aviation Disruptions: Trans-oceanic flights were rerouted due to the loss of High Frequency (HF) radio signals. Additionally, the Wide Area Augmentation System (WAAS), which supports precision landings and performance-based navigation, was offline for more than 15 hours, affecting aviation operations based in Washington.

GPS and Agriculture: The storms caused widespread loss of GPS signal lock and significant range errors, which led to halted GPS-guided farming operations in the Midwest and potentially disrupted agricultural machinery in Washington State.

Satellite Impacts: Satellite communications were degraded, with services such as Starlink and Iridium experiencing performance issues. Increased atmospheric drag on satellites required orbital adjustments to maintain proper positioning.

Communication & Infrastructure: NOTAMs (Notices to Air Missions) were issued to warn of ongoing communication and navigation disruptions. Furthermore, atomic clocks—specifically NIST cesium standards—exhibited a 0.1% variation in timing accuracy during the storm period.

Figure 4.27 NASA's Solar Dynamics Observatory captured this image of an X1.5 solar flare peaking at 7:44 am EDT on May 11, 2024



4.14.5 Vulnerabilities and Impacts

Public Health and Life Safety

Ongoing studies suggest that intense solar activity and geomagnetic storms may affect human health, potentially causing:

- Increased systemic inflammation
- Autonomic nervous system imbalances
- Reduced melatonin secretion
- Variability in heart rate

Property Damage and Critical Infrastructure:

Extreme solar weather events can disrupt:

- Power grids
- Water/wastewater systems
- Heating and cooling
- Communication networks
- Fuel distribution

4.14.6 Economy

Impacts may include:

- Disruptions and damage to satellites
- Power grid instability
- Losses in GPS-reliant industries (e.g., agriculture, logistics, aviation)

4.14 Tornado

4.14.1 Hazard Description

The National Weather Service describes a tornado as a violently rotating column of air, usually pendant to a cumulonimbus, with circulation reaching the ground. It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. On a local scale, it is the most destructive of all atmospheric phenomena. Like hail, most tornadoes are spawned by supercell thunderstorms. They usually last only a few minutes, although some have lasted more than an hour and traveled several miles.

4.14.2 Hazard Location

A tornado incident could occur anywhere within Franklin County.

4.14.3 Hazard Extent/Intensity

Wind speeds within tornadoes are estimated based on the damage caused and expressed using the Enhanced Fujita (EF) Scale.

Table 4-66. Header Enhanced Fujita (EF) Scale

EF Scale	Class	Windspeed (mph)	Windspeed (km/h)	Description
EF0	Weak	65–85	105–137	Gale
EF1	Weak	86–110	138–177	Weak
EF2	Strong	111–135	178–217	Strong
EF3	Strong	136–165	218–266	Severe
EF4	Violent	166–200	267–322	Devastating
EF5	Violent	> 200	> 322	Incredible
Source: NOAA (2024)				

4.14.4 Frequency and Probability

Frequency: Between 01/01/2014 and 12/31/2023 Franklin County recorded no tornadic event over 3,652 days.

Probability: To measure tornado probability, NOAA uses atmospheric data from satellites, radar systems, weather stations, and weather balloons. This includes information on temperature, humidity, atmospheric pressure, and wind patterns at various altitudes.

Typically, the probability of tornadoes is presented in percentages, reflecting the likelihood of occurrence in specific areas and timeframes. This probabilistic forecasting accounts for the inherent uncertainties in weather prediction. Meteorologists interpret this data and model outputs, considering both the current atmospheric situation and historical weather patterns, to assess tornado risks and generate accurate forecasts.

NWS issues tornado watches or warnings based on current conditions for tornadoes. A tornado watch indicates favorable conditions for tornadoes, while a warning signifies an imminent threat, often based on sightings or radar detection. This process involves continuous monitoring and updating of forecasts and warnings to adapt to rapidly changing weather conditions.

4.14.5 Vulnerabilities and Impacts

Public Health and Life Safety: According to NOAA, Tornadoes have potential to cause catastrophic life safety and public health impacts. The immediate threat to life from tornadoes can result in fatalities and injuries to humans and animals due to flying debris, collapsing structures, and the sheer force of the tornado itself. The risk to individuals in the path of a tornado is extremely high, as the rapid onset of these events often allows little time for seeking adequate shelter. Post-event, survivors may face a range of health concerns, including trauma, emotional distress, and the potential for injury during rescue efforts or cleanup operations.

Beyond personal safety, tornadoes can devastate critical infrastructure, leading to extended power outages, water supply contamination, and the disruption of healthcare services and emergency response capabilities. The destruction of homes and businesses contributes to public health concerns, displacing residents and potentially causing long-term socioeconomic challenges. The public health system can be strained as medical facilities cope with the influx of casualties and the broader needs of the affected community.

Property Damage and Critical Infrastructure: Tornadoes are among the most destructive weather events, with the potential to cause catastrophic property damage and critical infrastructure impacts, as per NOAA's findings. The intense winds of a tornado, which can exceed 200 miles per hour in the most severe cases, have the force to destroy buildings, homes, and vegetation, leaving a trail of debris. They can displace or overturn vehicles, rip apart roofs, and even lift and destroy well-built structures. The resultant debris can compound the damage by becoming airborne projectiles. For businesses, this means not only structural loss but also potential disruption of operations and economic activity, with recovery and rebuilding efforts often costing significantly.

When it comes to critical infrastructure, tornadoes can result in widespread destruction, compromising public safety and community functionality. They can severely damage power lines and utilities, leading to prolonged power outages and water supply contamination. Transportation infrastructure such as roads, bridges, and railways may be rendered unusable, hindering emergency response efforts and recovery operations. Tornadoes also pose a risk to healthcare infrastructure by damaging hospitals and medical facilities, thereby limiting access to medical care when it is most needed. The extensive damage to infrastructure necessitates comprehensive disaster response plans and resilient construction practices to mitigate the impacts of tornadoes.

Economy: According to NOAA, tornadoes can have severe economic impacts resulting in long-term recovery efforts. Tornadoes can obliterate buildings, homes, infrastructure, and agricultural fields in mere moments, resulting in significant repair and reconstruction costs. The destruction of commercial and industrial facilities can disrupt local economies, leading to job losses, business interruptions, and a reduction in tax revenues for affected communities. Furthermore, the cost burden is often shared by insurance companies, which may face substantial claims following a tornado, potentially increasing premiums for customers and influencing the insurance market's stability.

In addition to property damage, the economic repercussions of tornadoes include the expense of emergency response, debris cleanup, and temporary housing for displaced residents. Long-term economic impacts can be exacerbated by the loss of public services and utilities, reduced property values, and the potential for displaced businesses and residents to relocate permanently. These factors contribute to a complex economic aftermath, which can persist long after the physical debris has been cleared.

Changes in Development and Impact to Future Development: According to NOAA, tornadic events can impact changes in development and future construction practices, particularly in tornado-prone regions. Historical patterns and frequency of occurrence have also led to a focus on building resilience, with an emphasis on stronger construction standards to withstand high winds. This includes reinforcing the structural integrity of buildings, using wind-resistant materials, and incorporating tornado-safe rooms or shelters in both new and existing structures. Architects and engineers are increasingly adopting these enhanced safety measures in building designs, considering factors such as roof shapes and anchoring methods that can reduce wind damage. Finally, there's a growing trend towards community-wide tornado preparedness planning, which includes the development of emergency response strategies and the establishment of public storm shelters.

For future development, understanding and mapping tornado risk areas play a crucial role in urban planning decisions. This can influence zoning regulations, with potential restrictions on development in high-risk areas or requirements for specific building codes in such regions. The increasing frequency and intensity of tornadoes, possibly linked to climate change, also necessitate the integration of tornado risk assessments in long-term development plans.

Effects of Climate Change on Severity of Impacts: Climate change is impacting the severity and behavior of tornadic events, although the exact nature of these effects is complex and still a subject of ongoing research. One of the primary challenges in understanding the relationship between climate change and tornadoes is the complexity of tornado formation. Tornadoes require specific atmospheric conditions, including a combination of high instability and strong wind shear. Climate change may affect these conditions, but how these changes will influence tornado occurrence and intensity is not yet fully understood.

Climate change is expected to increase atmospheric instability by warming the Earth's surface and may also lead to a decrease in wind shear, particularly in areas where tornadoes are most common. This could potentially lead to a change in the number or intensity of tornadoes, but the evidence is not yet conclusive. Second, shifts in climate patterns could affect the geographical distribution and seasonality of tornadoes, potentially leading to tornadoes in regions where they were previously less common or during times of the year when they were less expected.

Table 4-67. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.
Source: Neighborhoods at Risk (2024)

Table 4-68. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-69. Future Climate Temperature Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual Days With Maximum Temperature >95	**17 days**	**28 days**	**29 days**	**34 days**	**41 days**	**44 days**	**67 days**
	15-20	19-36	19-36	24-50	24-55	25-64	37-91
Annual Days With Maximum Temperature >100	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Annual Days With Maximum Temperature >105	**0 days**	**2 days**	**3 days**	**4 days**	**7 days**	**8 days**	**22 days**
	0-1	1-4	1-6	1-9	2-17	2-18	5-46
Annual Temperature							
Annual Single Highest Temperature °F	**103ºF**	**106ºF**	**106ºF**	**107ºF**	**108ºF**	**109ºF**	**114ºF**
	102-104	104-108	103-109	105-110	105-113	105-114	108-120
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**98ºF**	**101ºF**	**102ºF**	**103ºF**	**104ºF**	**105ºF**	**109ºF**
	97-100	98-103	99-105	100-106	100-109	101-110	104-117
Cooling Degree Days (CDD)	**695 degree days**	**951 degree days**	**986 degree days**	**1,098 degree days**	**1,243 degree days**	**1,293 degree days**	**1,873 degree days**
	626-785	787-1,183	807-1,181	846-1,421	937-1,596	948-1,671	1,223-2,576
Source: Climate Mapping for Resilience and Adaptation (2024)							

Table 4-70. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.14.6 FEMA NRI Expected Annual Loss Estimates

Table 4-71. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, WA
FEMA NRI EXPECTED ANNUAL LOSS TABLE – TORNADO

Annualized Frequency	Population	Population Equivalence	Building Value	Agriculture Value	Total Value	Expected Annual Loss Score	Expected Annual Loss Rating
0 events per year	0.00	$54,417	$32,211	$827	$87,455	15.1	Very Low

***Annualized Frequency**: The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.*
***Population**: Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*
***Expected Annual Loss** scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*

Source: FEMA National Risk Index (2024)

4.14.7 FEMA Hazard-Specific Risk Index Table

Table 4-72. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, WA
FEMA HAZARD SPECIFIC RATINGS - TORNADO

Risk Index Score	Social Vulnerability Rating	Community Resilience Rating
13.6	Very High	Relatively Low

***Risk Index Scores**: are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*
***Social Vulnerability Ratings**: are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*
***Community Resilience Ratings**: are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2024)

4.14.8 FEMA NRI Exposure Value Table

Table 4-73. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, WA
FEMA EXPOSURE VALUE TABLE - TORNADO

Hazard Type	Total Value	Building Value	Population Equivalence	Population	Agriculture Value
Tornado	$1,135,928,010,236	$14,028,747,907	$1,121,174,800,000	96,653.00	$724,462,329

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 millions of economic loss (2022 dollars).*
Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

Source: FEMA National Risk Index (2024)

4.15 Volcanic Activity

4.15.1 Hazard Description

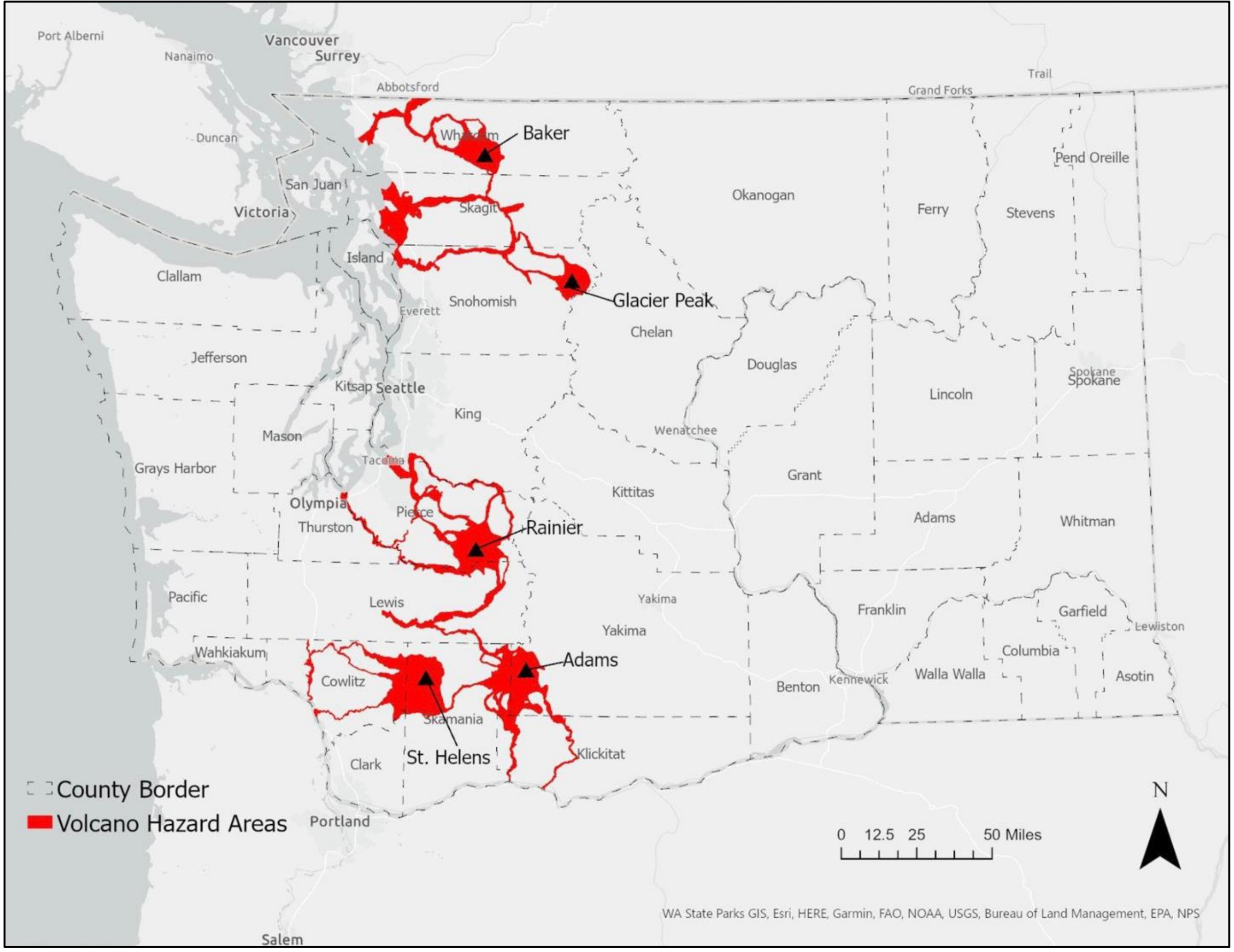
Often forming along boundaries of the Earth's crust, the USGS describes volcanoes as vents "at the Earth's surface through which magma (molten rock) and associated gases erupt, and also the cone built by effusive and explosive eruptions." Volcanic eruptions have created 80% of the Earth's surface. Although volcanoes can cause widespread damage during eruptions, they also create nutrient rich soil, and are a source of geothermal energy for many countries.

Volcanoes are classified as active, dormant, or extinct, although scientists disagree on defining criteria due to the long lifespans of volcanoes. The USGS, responsible for monitoring volcanoes in the United States defines any volcano that has erupted within the past 10,000 years as "Active." There are five active volcanoes in Washington State, all of which could begin erupting again if magma enters their systems. This is why the USGS watches these volcanoes closely, to help mitigate the potential damaging impacts of an eruption.

4.15.2 Hazard Location

There are no volcanoes located in Franklin County, however, the following image illustrates existing volcano hazard areas in the State of Washington.

Figure 4.23. State of Washington Volcano Hazard Areas



4.15.3 Hazard Intensity/Extent

USGS employs various techniques to measure the extent and intensity of volcanic activity. These methods include seismic monitoring, ground deformation monitoring, gas emissions monitoring, thermal imaging, visual and remote sensing observations, and geophysical surveys.

Seismic Monitoring involves using networks of seismometers to detect and record earthquakes associated with magma movement. This seismic data helps identify patterns of volcanic unrest and predict potential eruptions. Ground Deformation Monitoring utilizes GPS and InSAR (Interferometric Synthetic Aperture Radar) to measure changes in the Earth's surface, such as swelling or subsidence, which indicate the accumulation or withdrawal of magma.

Gas Emissions Monitoring measures the types and amounts of gases, like sulfur dioxide and carbon dioxide, emitted from a volcano. Variations in gas emissions provide insights into the volcano's activity levels. Thermal Imaging employs infrared cameras and satellite-based sensors to detect heat from volcanic activity, enabling scientists to monitor the temperature and movement of lava and hot gases.

Visual and Remote Sensing Observations use cameras and satellites to provide real-time imagery of eruptions, ash plumes, and lava flows, which are crucial for assessing immediate impacts and issuing public warnings. Geophysical Surveys, including gravimetry and magnetometry, measure variations in the Earth's gravitational and magnetic fields caused by volcanic processes, providing detailed information about the subsurface structure of a volcano. Volcanic Ash Monitoring tracks ash clouds using radar and other sensors, which is vital for aviation safety and assessing air quality and health impacts.

Table 4-74. Summary of USGS Volcanic Activity Monitor Types

USGS VOLCANIC ACTIVITY MONITOR TYPES AND PURPOSES	
Technique	**Purpose**
Seismic Monitoring	Detect and record earthquakes associated with magma movement
Ground Deformation Monitoring	Measure changes in Earth's surface (swelling/subsidence)
Gas Emissions Monitoring	Measure volcanic gas emissions (e.g., sulfur dioxide)
Thermal Imaging	Detect heat from volcanic activity (lava, hot gases)
Visual and Remote Sensing	Provide real-time imagery of eruptions and ash plumes
Geophysical Surveys	Measure variations in gravitational and magnetic fields
Volcanic Ash Monitoring	Track ash clouds for aviation safety and health impacts
Source: USGS (2024)	

Suggested alternate way to describe this section: *The Extent and intensity of a volcanic eruption depend on the eruption type, but are generally confined into three different hazard types: near-volcano hazards, lahar hazards, and ash hazards. Volcanic hazards assessments, available from the USGS and Washington Department of Natural Resources describe the areas in which Near-volcano hazards and lahar hazards can occur.*

Near-volcano hazards are the most potentially destructive hazards of an eruption, such as explosions, heavy ash fall, pyroclastic density currents, ballistics, and lava flows. All are possible during a volcanic eruption, however, they do not travel far from the slopes of the volcano itself, and are extremely unlikely to impact populated areas.

Lahars, or volcanic mudflows are also extremely destructuve, and can cause damage tens of miles downstream from the volcano. However these flows are contained within river channels, of rivers sources from the volcano itself. While they can be extremely damaging to areas within the lahar hazard zone, they will not cause any immediate destruction outside of the lahar hazard zones defined by studying previous areas of lahar hazard.

Volcanic Ash, or small pieces of volcanic glass fracured by the explosion, is potentially the farthest reaching hazard. It is not shown on hazard maps, ebcause it can travel in any direction from the volcano, depending on the direction the wind blows. FOr instance, on May 18th, 1980, during the catastrophic eruption of Mt. St. Helens, Ash travelled over 200 miles from the volcano, and deposited a centimeter of ash as far away as Montana, impacting all the communities in Washington along the way. On a later eruption in September 1980, Volcanic ash travelled to the Southwest, and fell in Portland, OR. Volcanic Ash can cause disruptions to a wide area. Volcanic ash is abrasive, conductive, easily redispersed through the air while attempting to clean up, can *be a respiratory nuisance, can cause trouble for machinery and agriculture, and becomes extremely heavy when wet. Fortunately, only the largest eruptions produce significant amounts of ash, and only Mt. St. Helens and Glacier Peak in Washington have had eruptions large enough for their ash to reach eastern Washington.*

4.15.4 Frequency and Probability

Frequency: Between 01/01/2014 and 12/31/2022 the state of Washington did not record any events over 3,652 days. According to the USGS, approximately 2-3 Volcanic eruptions happen in the Cascades (including Oregon) per century.

Probability: According to USGS, probability of volcanic activity is measured through a combination of monitoring techniques, historical data analysis, and volcanic hazard assessments. The USGS employs an array of instruments to monitor volcanic activity, including seismometers to detect earthquakes, GPS and satellite imagery to measure ground deformation, gas sensors to analyze volcanic gases, and thermal cameras to detect heat changes. Historical data on past eruptions and geological studies of volcanic deposits provide context and help identify patterns in volcanic behavior. The USGS also conducts hazard assessments, which integrate these monitoring data and historical records to evaluate the likelihood of future volcanic events.

It is important to note that due to monitoring being conducted by the USGS Cascades Volcano Observatory, our volcanoes will not erupt without warning. The instruments used in the table below describe ways that the USGS detect activity and can evaluate whether it indicates that it is leading to a potential eruption or not.

Table 4-75. USGS Volcanic Probability Measurement Table

USGS VOLCANIC PROBABILITY MEASUREMENT TABLE			
Measurement Technique	**What It Measures**	**Details**	**Typical Ranges**
Seismic Monitoring	Earthquake frequency and intensity	Detects earthquakes caused by magma movement. Increased activity indicates rising magma.	Typically, 10-100 events/day during unrest, varying by volcano
Ground Deformation	Changes in the Earth's surface	Measures swelling or sinking of the ground, indicating magma movement below the surface.	5-30 mm/year during significant volcanic unrest
Gas Emissions Analysis	Amount of volcanic gases released	Measures gases like sulfur dioxide and carbon dioxide. Changes in emissions can signal unrest.	500-2000 tons/day for sulfur dioxide during heightened activity
Thermal Imaging	Surface temperature changes	Detects heat from volcanic activity, identifying hot spots and changes in lava flow or eruption site.	Temperature increases of 2-10°C above baseline
Remote Sensing	Ash plumes and lava flow movement	Provides real-time data on volcanic activity, including ash plumes and lava flow extents.	Variable: plumes can extend tens of miles upwards, and may travel hundreds of miles from the volcano; lava flow rates vary
Source: USGS (2024)			

As seen in the table above, USGS measures the probability of volcanic activity with various monitoring techniques and data analyses including seismic monitoring, ground deformation measurements, volcanic gas emission analysis, thermal imaging, and remote sensing.

Seismic monitoring involves using networks of seismometers to detect and record earthquakes that indicate magma movement beneath the surface. Increased seismic activity often precedes volcanic eruptions, making it a critical factor in assessing eruption probabilities. Ground deformation monitoring uses GPS and InSAR (Interferometric Synthetic Aperture Radar) to measure changes in the earth's surface, such as swelling or sinking, which signal magma movement. Volcanic gas emissions are analyzed through instruments that measure gases like sulfur dioxide and carbon dioxide released by volcanoes. Variations in these gas emissions can suggest increasing volcanic activity.

Thermal imaging employs infrared cameras and satellite sensors to detect heat from volcanic activity, allowing scientists to monitor surface temperature changes and identify hot spots. Remote sensing, utilizing satellites, provides real-time data on volcanic activity, including the size and movement of ash plumes and lava flows.

By combining data from these various monitoring techniques, USGS develops probabilistic models that estimate the likelihood of volcanic activity. These models are essential for issuing warnings and planning mitigation strategies. For instance, increased seismic activity coupled with significant ground deformation and elevated gas emissions can collectively raise the probability of an eruption, prompting timely alerts and preparedness actions.

4.15.5 Vulnerability and Impacts

Public Health and Life Safety: According to the U.S. Geological Survey (USGS), volcanic ash events can have significant public health and life safety impacts. Volcanic ash, which consists of fine particles of volcanic rock and glass, can cause a range of health issues, particularly affecting the respiratory system and eyes. The following are examples of these impacts:

- Respiratory Effects: Inhalation of volcanic ash can irritate the upper airways, leading to symptoms such as nasal irritation, throat soreness, and coughing. Individuals with pre-existing respiratory conditions, such as asthma or bronchitis, may experience exacerbated symptoms, including shortness of breath, wheezing, and persistent coughing. The smallest ash particles (<4 µm) can penetrate deep into the lungs, potentially causing more severe health issues over prolonged exposure.
- Eye Irritation: Volcanic ash can also cause eye discomfort, including corneal abrasions and conjunctivitis. These effects are more pronounced for individuals wearing contact lenses, as ash particles can get trapped behind the lenses, leading to further irritation.
- Structural Damage and Indirect Health Risks: Heavy ashfall can accumulate on buildings, leading to roof collapses and associated injuries or fatalities. The clean-up process can also pose risks, including physical injuries and respiratory problems from stirring up ash particles.
- Psychological Impact: The disruption caused by volcanic ashfall can lead to increased levels of stress and anxiety among affected populations, particularly if the event leads to significant social and economic disruption.

Table 4-76. Health and Safety Impacts of Volcanic Ash

HEALTH AND SAFETY IMPACTS OF VOLCANIC ASH			
Impact	**Description**	**Severity**	**Preventative Measures**
Respiratory Issues	Irritation of nasal passages, throat soreness, coughing, exacerbation of asthma/bronchitis	Moderate to Severe (for pre-existing conditions)	Use masks, avoid outdoor activities, ensure medication availability
Eye Irritation	Corneal abrasions, conjunctivitis	Mild to Moderate	Wear goggles, avoid contact lenses, stay indoors
Structural Damage	Roof collapses due to ash accumulation	Severe (potential for injury/fatality)	Regular removal of ash from roofs, structural reinforcements
Psychological Impact	Increased stress and anxiety	Mild to Severe	Community support, mental health resources
Source: USGS Volcano Hazards (2024)			

Property Damage and Critical Infrastructure: According to USGS, volcanic ash events can cause extensive property damage and significantly impact critical infrastructure. Volcanic ash, consisting of fine particles of volcanic rock and glass, can cover vast areas, leading to both immediate and long-term damage to buildings, transportation systems, power supplies, and water resources. Typical impacts include the following:

- Buildings and Structures: The accumulation of volcanic ash on rooftops can cause them to collapse, particularly if the ash becomes wet and heavy. This can lead to severe structural damage and potential injuries or fatalities. Even small amounts of ash can infiltrate buildings, damaging electronics, HVAC systems, and other sensitive equipment.

- Transportation Systems: Ashfall can severely disrupt transportation, reducing visibility on roads and making surfaces slippery, leading to increased accidents. Airports can be closed as ash damages aircraft engines and affects ground operations. Roads may become impassable due to ash accumulation, hindering emergency response efforts.
- Power Supply: Volcanic ash can cause power outages by short-circuiting electrical grids and damaging power lines. Ash can also contaminate and clog power generation facilities, such as hydroelectric plants, leading to significant disruptions in electricity supply.
- Water Resources: Ash can contaminate water supplies, clogging filters and reducing water quality. This can affect both drinking water and water used for agriculture. In severe cases, entire water treatment facilities may need to be shut down for cleaning and repairs.
- Agriculture: Volcanic ash can blanket crops, leading to reduced photosynthesis and crop failure. Livestock can also be affected, as ash contaminates grazing areas and water sources, leading to dental or stomach damage in livestock animals.

Table 4-77. Property Damage and Infrastructure Impact of Volcanic Ash

PROPERTY DAMAGE AND INFRASTRUCTURE IMPACT OF VOLCANIC ASH			
Impact	**Description**	**Severity**	**Measurement/Indicator**
Buildings and Structures	Roof collapses, infiltration into buildings causing damage to electronics and HVAC systems	Severe	Ash load >100 kg/m² can cause roof collapse when wet
Transportation Systems	Reduced visibility, slippery roads, damage to aircraft engines, closure of airports	Moderate to Severe	Visibility <500 meters; airport closures lasting several days
Power Supply	Short-circuiting of electrical grids, damage to power lines, contamination of power generation facilities	Severe	Power outages affecting thousands of households; repair costs >$1M
Water Resources	Contamination of water supplies, clogging of filters, reduced water quality	Moderate to Severe	Ashfall >5 mm can necessitate water treatment shutdowns
Agriculture	Crop failure due to reduced photosynthesis, contamination of grazing areas and water sources for livestock	Moderate to Severe	Crop yield reduction >50%; livestock health issues reported
Source: USGS Volcano Hazards (2024)			

Economy: According to USGS, volcanic ash events have diverse and far-reaching economic impacts, including sectors such as infrastructure, transportation, agriculture impacts including:

- Infrastructure Damage: Volcanic ash can cause extensive damage to buildings and critical infrastructure, leading to high repair and maintenance costs. Roof collapses, damage to HVAC systems, and contamination of electrical equipment require significant expenditures to restore. The cleanup operations themselves can be costly and time-consuming, adding to the economic burden on local governments and property owners.
- Transportation Disruptions: Ashfall can severely disrupt transportation networks, including road, air, and rail systems. Reduced visibility and slippery road conditions increase the likelihood of accidents, necessitating road closures and cleanup efforts. Airports may shut down due to ash accumulation, resulting in flight cancellations and delays, which can cost airlines millions of dollars in lost revenue and operational expenses.

The economic impact extends to tourism and business travel, affecting local economies that depend on these sectors.

- Power Supply Issues: Volcanic ash can cause power outages by damaging power lines and electrical infrastructure. The costs of repairing these damages and restoring power can be substantial. Businesses and industries reliant on continuous power supply may face significant financial losses due to downtime and disrupted operations.
- Agricultural Losses: Ashfall can blanket crops, reducing photosynthesis and leading to crop failure. The agricultural sector can suffer from both immediate crop losses and long-term soil fertility issues, impacting food production and supply chains. Livestock can also be affected by contaminated grazing fields and water sources, leading to health issues and reduced productivity.
- Public Health Costs: The health impacts of volcanic ash, such as respiratory issues and eye irritation, can lead to increased healthcare costs. There may be a rise in hospital visits, medical treatments, and public health interventions. Additionally, the psychological stress associated with volcanic ash events can have economic implications, including lost productivity and the need for mental health services.

Table 4-78. Economic Impacts of Volcanic Ash

ECONOMIC IMPACTS OF VOLCANIC ASH			
Impact	**Description**	**Severity**	**Measurement/Indicator**
Infrastructure Damage	Costs for repair and maintenance of buildings, cleanup operations	Severe	Cleanup costs up to $200,000 per building
Transportation Disruptions	Flight cancellations, road closures, increased accidents	Severe	Airline losses up to $250 million per major event
Power Supply Issues	Damage to electrical infrastructure, power outages	Severe	Repair costs and economic losses exceeding $10 million
Agricultural Losses	Crop failure, reduced soil fertility, livestock health issues	Moderate to Severe	Crop yield reduction by 50%; financial losses up to $100 million
Public Health Costs	Increased healthcare costs, respiratory issues, psychological stress	Moderate	Hospital visits increase by 30%; healthcare costs surge by 20%
Source: USGS Volcanic Ash (2024)			

Changes in Development and Impact to Future Development: According to USGS, volcanic activity can impact changes in development and influence future development in various ways. Active and potentially active volcanoes pose substantial risks to nearby communities, infrastructure, and economies. Eruptions can lead to the destruction of property, the displacement of populations, and the disruption of essential services such as transportation, water supply, and power generation. The presence of volcanic hazards necessitates careful land-use planning and development regulations to minimize risk. For example, areas prone to lava flows, ashfall, and pyroclastic surges may be designated as exclusion zones where new construction is prohibited. Existing infrastructure might need to be retrofitted or relocated to withstand potential volcanic events. Lastly, future development plans must consider the availability of evacuation routes and emergency response strategies..

Effects of Climate Change on Severity of Impacts: According to USGS, as global temperatures rise, the accelerated melting of glaciers and ice caps can reduce the pressure on Earth's crust in volcanic regions, potentially triggering volcanic eruptions. Additionally, changes in precipitation patterns and the intensity of weather events can affect volcanic activity. Increased rainfall can lead to the formation of lahars—dangerous volcanic mudflows—by saturating volcanic ash deposits and loose materials on volcanic slopes. These climate-induced changes can exacerbate the impacts of volcanic eruptions, causing more widespread and severe damage to communities and ecosystems.

Table 4-79. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.
Source: Neighborhoods at Risk (2024)

Table 4-80. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-81. Future Climate Temperature Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual Days With Maximum Temperature >95	**17 days**	**28 days**	**29 days**	**34 days**	**41 days**	**44 days**	**67 days**
	15-20	19-36	19-36	24-50	24-55	25-64	37-91
Annual Days With Maximum Temperature >100	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Annual Days With Maximum Temperature >105	**0 days**	**2 days**	**3 days**	**4 days**	**7 days**	**8 days**	**22 days**
	0-1	1-4	1-6	1-9	2-17	2-18	5-46
Annual Temperature							
Annual Single Highest Temperature °F	**103°F**	**106°F**	**106°F**	**107°F**	**108°F**	**109°F**	**114°F**
	102-104	104-108	103-109	105-110	105-113	105-114	108-120
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**98°F**	**101°F**	**102°F**	**103°F**	**104°F**	**105°F**	**109°F**
	97-100	98-103	99-105	100-106	100-109	101-110	104-117
Cooling Degree Days (CDD)	**695 degree days**	**951 degree days**	**986 degree days**	**1,098 degree days**	**1,243 degree days**	**1,293 degree days**	**1,873 degree days**
	626-785	787-1,183	807-1,181	846-1,421	937-1,596	948-1,671	1,223-2,576
Source: Climate Mapping for Resilience and Adaptation (2024)							

Table 4-82. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.15.6 FEMA NRI Expected Annual Loss

According to the FEMA NRI, expected annual is not applicable to Franklin County.

4.15.7 FEMA Hazard-Specific Risk

According to the FEMA NRI, hazard-specific risk is not applicable to Franklin County.

4.15.8 FEMA NRI Exposure Value

According to the FEMA NRI, exposure value is not applicable to Franklin County.

4.16 Wildfire

Wildfire is an uncontrolled vegetative fire that burns in forests, grasslands, and other natural areas. Wildfires can spread quickly, driven by factors like wind and dry conditions, and they often pose significant threats to life, property, and the environment. These fires can be ignited by various sources, including lightning, human activities, and other natural causes. Wildfires can result in widespread devastation and require coordinated efforts for containment, suppression, and recovery.

4.16.1.1 General Wildfire Types

Flammable expanses of brush, diseased timberland, overstocked forests, hot and dry summers, extreme topography, intense fire weather wind events, summer lightning storms, and human acts all contribute to wildfire threat. Wildfires can generally be classified as follows:

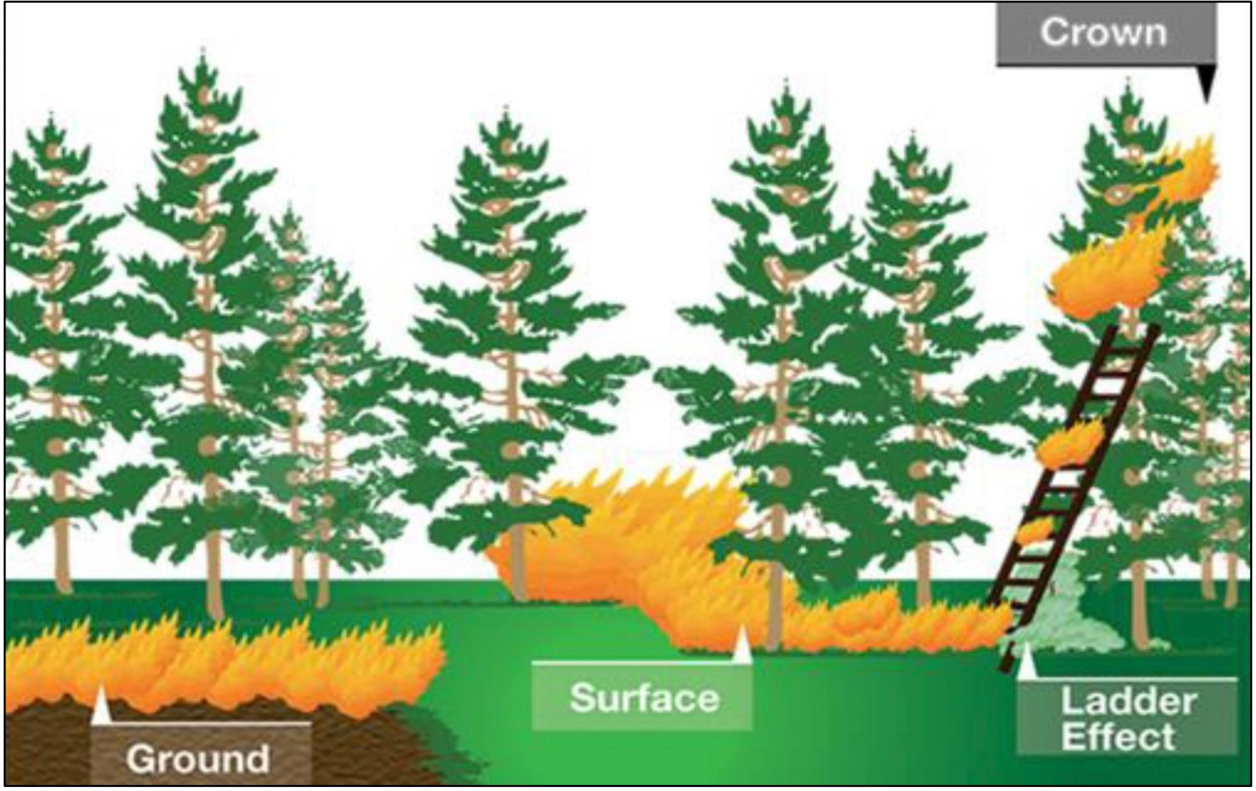
- Ground fires occur when fuels ignite and burn underground. Ground fires may eventually burn through the ground surface and become surface fires.
- Surface fires burn on the surface of the ground and are primarily fueled by low-lying vegetation.
- Ladder fuels are vegetation that allow surface fires to climb into the tree canopy and become crown fires.
- Crown fires spread from treetop to treetop spread at a rapid pace. Crown fires are often pushed by wind and can be extremely intense.

4.16.1.2 Factors Affecting Fire Behavior

The are several factors that affect fire behavior, including the following:

- Fuel: Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees, and above the ground in tree canopies. Lighter fuels such as Arundo donax and other 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. Trees killed or defoliated by forest insects and diseases are more susceptible to wildfire.
- Weather: Relevant weather conditions include temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere. Conditions are very favorable for extensive and severe wildfires when the temperature is high, relative humidity is low, wind speed is increasing and there has been little or no precipitation, so vegetation is dry. These conditions occur more frequently where temperatures are higher, and fog is less prevalent.
- Terrain: The slope and elevation of a region influences the amount and moisture of 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 (fire spreads more easily uphill than downhill).

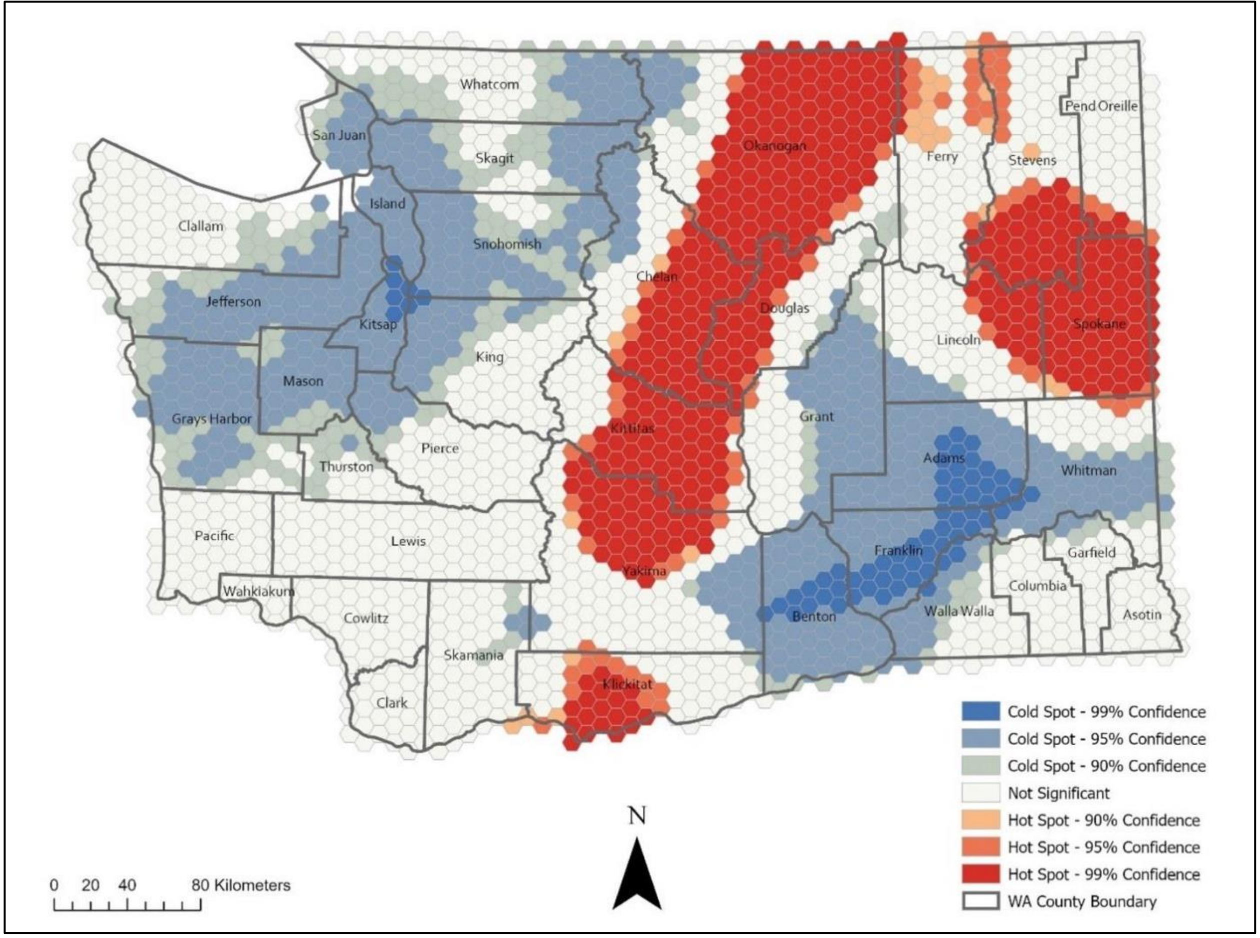
Figure 4.24. Types of Wildfires



4.16.2 Hazard Location

According to the 2023 State of Washington HMP, wildfire hot spots and cold spots are based on wildfire activity between 1970 and 2020. Hot spots were determined by counting the number of wildfire incidents within a 29-mile radius of each hexagon cell and comparing that number with the average for the state. The deepest red color is most prone to large fires in the future.

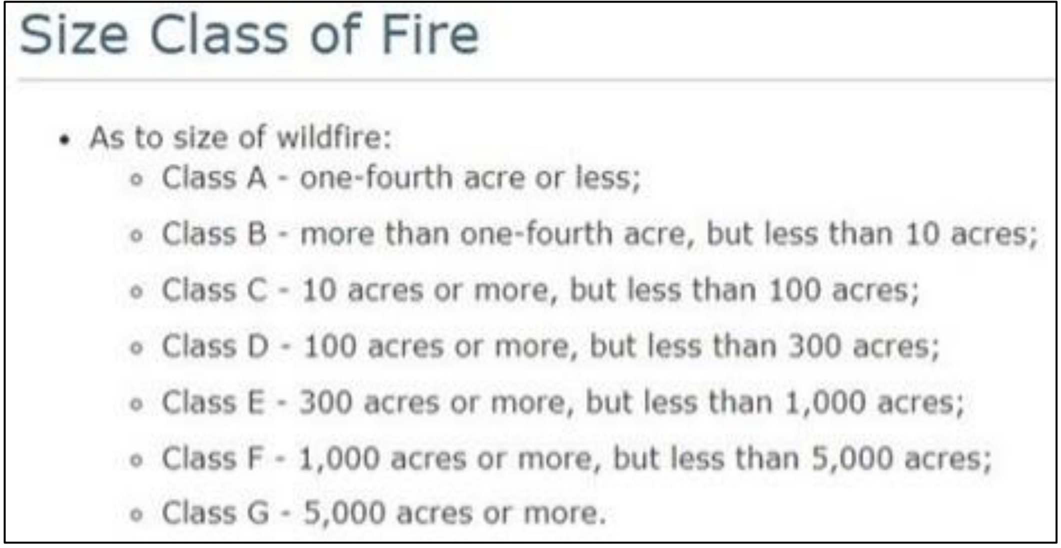
Figure 4.25. State of Washington Wildfire Hot Spots and Cold Spots



4.16.3 Hazard Extent/Intensity

The National Wildfire Coordinating Group (NWCG) classifies fire sizes using classification standards. The standard data values are included in the data table below.

Figure 4.26. NWCG Class Size of Fire



Size Class of Fire

- As to size of wildfire:
  - Class A - one-fourth acre or less;
  - Class B - more than one-fourth acre, but less than 10 acres;
  - Class C - 10 acres or more, but less than 100 acres;
  - Class D - 100 acres or more, but less than 300 acres;
  - Class E - 300 acres or more, but less than 1,000 acres;
  - Class F - 1,000 acres or more, but less than 5,000 acres;
  - Class G - 5,000 acres or more.

The National Interagency Fire Center (NIFC) employs several measures and tools to assess the extent and intensity of wildfires. These include the acreage burned, which quantifies the size of the affected area, with larger acreages indicating more extensive wildfires. Fire behavior indicators such as the rate of spread, fireline intensity, and flame length offer insights into the wildfire's intensity, with rapid spread and high-intensity flames signifying a more severe fire. The table below illustrates fire suppression interpretations of flame length and fireline intensity.

Table 4-83. Flame Length and Fireline Intensity Table

US DEPARTMENT OF AGRICULTURE – FOREST SERVICE

Fire Suppression Interpretations of Flame Length and Fireline Intensity

Flame Length	**Fire Intensity**	**Interpretation**
Feet	*Btu/ft/s*	
< 4	< 100	Fire can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the lire
4-8	100-500	Fires are too intense for direct attack on the head by persons using hand tools. Handline cannot be relied on to hold fire. Equipment such as plows, dozers, pumpers, and retardant aircraft can be effective.
8-11	500-1,000	Fires may present serious control problems-torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
>11	>1,000	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: US Department of Agriculture – Forest Service

The containment status, measured as the percentage of the fire's perimeter under control, tracks the progress in limiting the wildfire's spread. Meteorological data on temperature, humidity, wind speed, and direction are crucial for understanding fire potential, with critical fire weather conditions contributing to more intense wildfires. The extent of damage to homes, infrastructure, and communities, as well as the scale of evacuation orders issued, reflects the wildfire's impact. Lastly, resource deployment and fire danger ratings are considered, enabling NIFC to assess wildfire severity and effectively manage response efforts.

4.16.4 Frequency and Probability

Frequency: Between 01/01/2019 and 12/31/2023 Franklin County recorded two wildfire events over 1,826 days. This averages to 0.001095 incidents per day during this time and 0.4 incidents annually.

Probability: The National Interagency Fire Center (NIFC) measures the probability of wildfires by considering various factors and conditions that contribute to the likelihood of ignition and fire spread. Key elements in assessing this probability include:

- Weather Conditions: NIFC monitors weather data, including temperature, humidity, wind speed, and precipitation, to evaluate the fire weather outlook. Dry and windy conditions with low humidity increase the likelihood of wildfires.
- Fuel Moisture: The moisture content of vegetation, such as grasses, shrubs, and trees, is a critical factor. Dry or drought-affected fuels are more susceptible to ignition.
- Lightning Activity: NIFC tracks lightning activity in wildfire-prone regions, as lightning strikes are a common natural cause of wildfires.
- Human Activities: Monitoring human activities that can lead to unintentional ignitions, such as campfires, discarded cigarettes, and equipment sparks, helps assess the human-related wildfire risk.

- Historical Data: Historical wildfire data, including the frequency and size of past wildfires, can inform the probability of future incidents.
- Fire Danger Ratings: Fire danger ratings, such as the Fire Weather Index, provide a standardized assessment of fire risk based on weather and fuel conditions.

4.16.5 Past Events

The table below illustrates both wildfire events in Franklin County between 2019-2023. During this time there were two events with five deaths and no injuries reported.

Table 4-84. Past Wildfire Events in Franklin County (2019-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals							**0**	**0**	**0.00M**	**0.00K**
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	7/18/19	13:30	PST-8	Wildfire	0	0	0.00K	0.00K
LOWER COLUMBIA BASIN (ZO...	LOWER COLUMBIA BASIN (ZO...	WA	9/7/20	17:45	PST-8	Wildfire	0	0	0.00K	0.00K
Totals							**0**	**0**	**0.00M**	**0.00K**

4.16.6 Vulnerabilities and Impacts

Life Safety and Public Health: Wildfires can have significant life safety and public health impacts. First, wildfires produce smoke and particulate matter that can degrade air quality over large areas, potentially leading to respiratory issues, exacerbating pre-existing conditions, and causing symptoms such as coughing, shortness of breath, and irritation of the eyes and throat. Secondly, wildfires often necessitate the evacuation of communities, temporarily displacing residents from their homes. This displacement can result in stress, anxiety, and potential health risks, particularly for vulnerable populations.

Additionally, the dynamic nature of wildfires can lead to injuries and fatalities among responders and the public. These incidents may occur during evacuations, firefighting efforts, or while navigating hazardous fire conditions. Furthermore, the mental health impact of wildfires is noteworthy, as they can cause stress, anxiety, and trauma for those affected. The loss of homes and possessions, coupled with the uncertainty of wildfire impacts, can contribute to long-term mental health challenges. Wildfires also have the potential to disrupt the food supply chain and water infrastructure, potentially leading to contamination of drinking water sources and causing shortages of essential supplies. Lastly, evacuation centers and crowded living conditions can facilitate the spread of infectious diseases, making disease control and public health management a priority during and after wildfires.

Property Damage and Critical Infrastructure: Overall, wildfires have far-reaching consequences on both property and critical infrastructure, emphasizing the importance of fire prevention and mitigation measures. Wildfires can cause extensive destruction to homes, buildings, and infrastructure, resulting in significant financial losses. Homes and properties situated in or near the path of a wildfire are particularly vulnerable, and even with firefighting efforts, many structures may be lost. In addition to property damage, wildfires can disrupt critical infrastructure such as power lines, electrical substations, transportation networks, and communication facilities.

Power outages can occur as a result of infrastructure damage, impacting not only residents but also essential services like hospitals, water treatment plants, and emergency communication systems. Roads and bridges may be compromised or rendered impassable due to the force of the wildfires, hindering access to affected areas. The aftermath of wildfires can also lead to environmental damage, with erosion, sedimentation, and water quality issues affecting ecosystems and water sources. Cleanup and restoration efforts can be costly and time-consuming, and the long-term economic impact on communities and regions is a significant concern.

Figure 3-8 in the Community Profile illustrates the locations of critical facilities within Franklin County.

Economy: Wildfires can result in significant economic losses for communities and regions affected by these disasters. Some of the primary economic impacts include property damage and loss, the cost of firefighting efforts, and the expenses associated with recovery and rebuilding. Property damage encompasses homes, businesses, and infrastructure, leading to insurance claims and financial burdens on individuals and organizations. The cost of deploying firefighting resources, including personnel, equipment, and air support, is another significant economic factor. Additionally, post-fire efforts such as erosion control, reforestation, and repair of damaged infrastructure contribute to the economic toll. The disruption of economic activities, such as agriculture, tourism, and outdoor recreation, can further affect the local and regional economies.

Changes in Development and Impact of Future Development: Wildfires can significantly impact changes in development and future development in several ways. The effects of wildfires on communities, infrastructure, and ecosystems can influence land use planning and development decisions. After a wildfire, local authorities may reassess land use and zoning regulations, especially in areas prone to wildfires. They may impose stricter building codes, setback requirements, and vegetation management rules to reduce fire risk in future developments.

Wildfires can also expose vulnerabilities in critical infrastructure, such as power lines, roads, and water supply systems. This can lead to investment in infrastructure upgrades to enhance resilience and prevent future damage. Communities affected by wildfires often face the decision of whether to rebuild in the same location or relocate to safer areas. The experience of a wildfire can influence the choices made by property owners and developers. The increased frequency and severity of wildfires may impact the availability and cost of property insurance. Insurers may adjust premiums or coverage terms, affecting property development decisions. Moreover, wildfires can lead to increased community awareness and preparedness efforts, influencing development decisions. Communities may implement Firewise practices and community wildfire protection plans that affect future development.

Lastly, wildfires can alter ecosystems and natural landscapes. Land managers and conservationists may adjust their plans for ecological restoration and habitat conservation, which can, in turn, influence land development in affected areas. Lastly, the cumulative impact of wildfires on a region can inform long-term planning strategies, influencing where and how future development occurs. It may lead to regional development policies that prioritize resilience and fire risk reduction. In summary, wildfires can prompt changes in development and future development by affecting land use regulations, infrastructure investment, community resilience, and long-term planning. These changes are often driven by the need to reduce the risks associated with wildfires and their potential impacts on communities and the environment.

Effects of Climate Change on Severity of Impacts: According to NOAA, climate change is having a profound influence on wildfires. Climate change can manifest its impact in various ways, significantly intensifying the frequency and severity of wildfires. Firstly, escalating global temperatures lead to heightened evaporation rates, causing vegetation to dry out and become more susceptible to ignition. This prolonged warmth results in an extended fire season, providing more opportunities for wildfires to occur. Secondly, climate change can exacerbate drought conditions in many regions, depleting soil moisture and rendering vegetation more flammable. As a result, severe and extended droughts increase the ease with which wildfires ignite and spread. Additionally, alterations in precipitation patterns, driven by climate change, can lead to more intense rainfall events, followed by prolonged dry periods. This cycle promotes rapid vegetation growth, which, in turn, creates additional fuel for wildfires. The impact of climate change is further exacerbated by an increase in extreme weather events, like thunderstorms and lightning strikes, which often serve as ignition sources for wildfires. Changes in wind patterns, brought about by shifting atmospheric circulation, can result in more frequent and intense wind events, facilitating the rapid spread of wildfires. Warmer temperatures can also contribute to increased insect outbreaks, weakening and killing trees, thus providing more fuel for fires. Lastly, climate change can extend the fire season in many regions, heightening the likelihood of wildfires.

Table 4-85. 25-Year Climate Projections for Franklin County

25-YEAR CLIMATE PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **51% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 55°F to 57°F) in average annual temperatures.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a **31% increase** in extremely hot days within 25 years.
By 2049, Franklin County is expected to have a **2°F increase** (from 54°F to 56°F) in average annual temperatures.
Source: Neighborhoods at Risk (2024)

Table 4-86. 25-Year Precipitation Projections for Franklin County

25-YEAR PRECIPITATION PROJECTIONS FOR FRANKLIN COUNTY, WA
HIGHER EMISSIONS (RCP8.5)
Franklin County is expected to experience a **32% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.6″ increase** (from 10.6″ to 11.2″) in average annual precipitation.
LOWER EMISSIONS (RCP4.5)
Franklin County is expected to experience a 13**% increase** in heavy precipitation within 25 years.
By 2049, Franklin County is expected to have a **0.2″ increase** (from 11.0″ to 11.1″) in average annual precipitation.
Source: Neighborhoods at Risk (2024)

Table 4-87. Future Climate Temperature Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90	**34 days**	**52 days**	**54 days**	**60 days**	**66 days**	**69 days**	**91 days**
	34-41	42-65	42-63	47-77	49-83	50-90	61-112
Annual Days With Maximum Temperature >95	**17 days**	**28 days**	**29 days**	**34 days**	**41 days**	**44 days**	**67 days**
	15-20	19-36	19-36	24-50	24-55	25-64	37-91
Annual Days With Maximum Temperature >100	**5 days**	**11 days**	**12 days**	**15 days**	**20 days**	**21 days**	**43 days**
	3-6	6-15	5-19	8-24	9-34	9-24	18-70
Annual Days With Maximum Temperature >105	**0 days**	**2 days**	**3 days**	**4 days**	**7 days**	**8 days**	**22 days**
	0-1	1-4	1-6	1-9	2-17	2-18	5-46
Annual Temperature							
Annual Single Highest Temperature °F	**103ºF**	**106ºF**	**106ºF**	**107ºF**	**108ºF**	**109ºF**	**114ºF**
	102-104	104-108	103-109	105-110	105-113	105-114	108-120
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**98ºF**	**101ºF**	**102ºF**	**103ºF**	**104ºF**	**105ºF**	**109ºF**
	97-100	98-103	99-105	100-106	100-109	101-110	104-117
Cooling Degree Days (CDD)	**695 degree days**	**951 degree days**	**986 degree days**	**1,098 degree days**	**1,243 degree days**	**1,293 degree days**	**1,873 degree days**
	626-785	787-1,183	807-1,181	846-1,421	937-1,596	948-1,671	1,223-2,576
Source: Climate Mapping for Resilience and Adaptation (2024)							

Table 4-88. Future Climate Indicators for Franklin County

FUTURE CLIMATE INDICATORS FOR FRANKLIN COUNTY, WA							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**9”**	**9”**	**9”**	**10”**	**10”**	**10”**	**10”**
	8-9	8-11	9-10	9-11	9-11	9-11	9-11
Days Per Year With Precipitation (Wet Days)	**108 days**	**108 days**	**108 days**	**107 days**	**109 days**	**107 days**	**106 days**
	104-111	102-116	102-120	102-116	98-127	98-114	97-118
Maximum Period of Consecutive Wet Days	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**
	8-11	7-10	8-10	7-10	8-11	7-10	8-11
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**1 day**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**	**2 days**
	1-2	1-2	1-2	2-2	2-2	2-2	2-3
*Days With Maximum Temperature Below 32*F*	**17 days**	**13 days**	**11 days**	**10 days**	**9 days**	**8 days**	**5 days**
	14-20	8-17	6-15	5-16	4-12	3-12	2-10
Source: Climate Mapping for Resilience and Adaptation (2024)							

4.16.7 FEMA NRI Expected Annual Loss Estimates

Table 4-89. Franklin County Expected Annual Loss Table

FRANKLIN COUNTY, CA FEMA NRI EXPECTED ANNUAL LOSS TABLE – WILDFIRE							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
0.467% chance per year	0.00	$167	$3,941	$3,842	$326,972	77.5	Relatively Low
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2024)							

4.16.8 FEMA Hazard-Specific Risk Index Table

Table 4-90. Franklin County FEMA Hazard Specific Risk Index Table

FRANKLIN COUNTY, CA FEMA HAZARD SPECIFIC RATINGS - WILDFIRE		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
79.4	Very High	Relatively Low
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2024)		

4.16.9 FEMA NRI Exposure Value Table

Table 4-91. Franklin County FEMA NRI Exposure Value Table

FRANKLIN COUNTY, CA
FEMA EXPOSURE VALUE TABLE - WILDFIRE

Hazard Type	Total Value	Building Value	Population Equivalence	Population	Agriculture Value
Wildfire	$61,352,060,774	$790,569,606	$60,444,870,542	5,210.76	$116,620,626

Buildings: *Building exposure value is defined as the dollar value of the buildings determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible building exposure of an area (Census block, Census tract, or county) is its building value as recorded in Hazus 6.0, which provides 2022 valuations of the 2020 Census.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology. The maximum possible population exposure of an area (Census block, Census tract, or county) is its population as recorded in Hazus 6.0. Population loss is monetized into a population equivalence value using a VSL approach in which each fatality or ten injuries is treated as $11.6 million of economic loss (2022 dollars).*
Agriculture: *Agriculture exposure value is defined as the estimated dollar value of the crops and livestock determined to be exposed to a hazard according to a hazard type-specific methodology. This is derived from the USDA 2017 Census of Agriculture county-level value of crop and pastureland with 2018 values for the US territories. All dollar values are inflation-adjusted to 2022 dollars.*

Source: FEMA National Risk Index (2024)

OTHER HAZARDS OF CONCERN

Although FEMA does not require non-natural hazards for inclusion in a hazard mitigation plan, Franklin County wishes to rank an additional hazard that could impact the county. Due to the nature of non-natural hazards and the discretionary status regarding their inclusion, the following hazard of interest has been briefly and qualitatively assessed for public education and informing its inclusion within the hazard ranking and mitigation process:

- ***Natural Hazards***
  - Invasive Species
- ***Technological (Manmade Hazards)***
  - Structural Fire
- ***Biological Hazards***
  - *Public Health Emergency*

4.17 Invasive Species

4.17.1 Hazard Definition

According to the National Invasive Species Council (NISC), an invasive species is defined as a species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, or other organisms, such as microbes, that thrive in areas where they do not naturally occur, often to the detriment of native species and ecosystems.

There are different types of invasive species, categorized based on the ecosystems they impact and their modes of introduction. These categories include terrestrial invasives, aquatic invasives, and pathogens.

Table 4-92. Types of Invasive Species

TYPES OF INVASIVE SPECIES		
Type	**Description**	**Examples**
Terrestrial Invasives	These are non-native plants and animals that invade land ecosystems, often outcompeting native species.	- Japanese Beetle (insect) - Nutria (rodent) - Cheatgrass (plant) - Brown treesnake (snake)
Aquatic Invasives	These species invade freshwater or marine ecosystems, disrupting native aquatic life and habitats.	- Elodea (plant) - Zebra mussel (mollusk)
Pathogens	Disease-causing organisms that can spread rapidly and affect native plants, animals, and humans.	- Batrachochytrium dendrobatidis (fungus affecting amphibians)
Source: USDA National Invasive Species Center (2024)		

Invasive species are spread primarily through human activities, including international trade, travel, and transportation. For example, invasive plants and animals can be transported in ballast water of ships, on wooden shipping pallets, or as ornamental plants and pets that escape into the wild. The introduction and spread of invasive species can lead to significant ecological and economic impacts, such as the extinction of native species, loss of biodiversity, and damage to infrastructure and agriculture.

4.17.1.1 Cyanobacteria and Cyanotoxins

Cyanobacteria, sometimes called "blue-green algae," is an aquatic invasive and can occur in freshwater lakes, ponds, impoundments, rivers, and streams. They are a type of bacteria similar to algae that move vertically in the water column to find sunlight at the surface and nutrients in the deeper layers. Cyanobacteria convert inert atmospheric nitrogen into an organic form that is usable for growth. When the amount of sunlight, temperature, and nutrients are adequate, they reproduce rapidly. This rapid growth creates blooms that can appear as visible scum on the surfaces of lakes and rivers. They also can grow attached to sediments or rocks in rivers and lakes. When attached, these are known as benthic cyanobacteria. Since bacterial growth may not be apparent in visual inspection, water samples must be collected and analyzed for blooms. Blooms typically occur in late summer after nitrogen has been diminished from the water column.

Cyanotoxins are chemical compounds produced by some species of cyanobacteria that pose public health risks if they are found in drinking water. When cyanotoxins are present in high concentrations, they can harm people, animals, and wildlife. Health effects on people can include skin rashes, vomiting, gastroenteritis, headaches, and eye, ear, and throat irritations. Severe symptoms can affect a person's liver or nervous system.

Anatoxin-A: Anatoxin-A is a potent neurotoxin (it causes damage to the nervous system) and is the smallest of the cyanotoxins. Anatoxin-a was first detected in the Columbia River in 2021, along with reports of cattle, cat, and dog poisonings. Algal cells retain anatoxin-a in favorable growth conditions. These cells then release toxins if disrupted, such as when exposed to chlorine or through biological methods. When an animal consumes water that contains the algal cells either through drinking the contaminated water or licking the toxins on their fur, the cells will enter the animal's gastrointestinal tract. Pets are at high risk for anatoxin-a exposure. However, ingestion of a sub-lethal dose leaves no chronic effects and recovery appears to be complete. Anatoxin-a degrades to a non-toxic product in sunlight and at a high pH (8 to 9).

Microcystins: Microcystins are the most common cyanotoxin, and more than one microcystin may occur in a particular cyanotoxin strain. Microcystins cause liver damage; at lethal doses they can cause death by liver necrosis within a few hours or up to a few days. However, noticeable symptoms only occur in severe cases. Researchers suspect that microcystins are liver carcinogens, which would increase the cancer risk to humans following continuous low-level exposure. Unlike other cyanotoxins, microcystins are bound within the cell and are only released into water when the cell ruptures due to being oxidized. When released, microcystins are stable in water and can be found in the water for months.

4.17.2 Hazard Location

According to the Quad Cities Algal Management Plan, algal blooms on the Columbia River resulted in the detection of Anatoxin-a in water samples taken near Richland, WA in summer 2021. The Columbia River is main source of water supply, and has a combination of six intakes on the river for obtaining source drinking water.

4.17.3 Extent/Intensity

According to the NISC, the extent and intensity of invasive species are measured through several methods that provide quantitative data on their presence and impact. This process includes monitoring the distribution and abundance of invasive species, evaluating their ecological and economic impacts, and assessing the effectiveness of control measures. The following table illustrates these methods of measurement.

Table 4-93. USDA Measurement of Invasive Species

USDA MEASUREMENT OF INVASIVE SPECIES		
Measurement	**Description**	**Indicator**
Distribution and Abundance	Locations and population sizes of invasive species	Number of individuals per unit area (density)
Ecological Impact	Effects on native biodiversity and ecosystem processes	Change in native species richness and abundance
Economic Impact	Financial costs of damage and management	Cost in dollars per year
Control Effectiveness	Success of management strategies	Reduction in invasive species population (%)
Source: USDA National Invasive Species Center (2024)		

4.17.4 Probability and Frequency

Probability: The National Invasive Species Council (NISC) employs a multifaceted approach to measure the probability of invasive species establishment and spread. This approach integrates ecological modeling, risk assessment frameworks, and expert evaluations. NISC's methodology often involves the use of species distribution models (SDMs) that predict potential habitats based on environmental variables and species' characteristics. These models help in assessing the likelihood of a species becoming invasive in new environments. Additionally, risk assessments are conducted, considering factors such as the species' reproductive rate, dispersal mechanisms, environmental tolerance, and historical data on invasions in similar ecosystems. Expert panels and stakeholder consultations further refine these assessments by incorporating localized knowledge and recent observations. Anything specific to Franklin Co?

4.17.5 Vulnerability and Impacts

Public Health and Life Safety: According to the NISC, invasive species have public health and life safety impacts as some species can act as vectors for diseases, thereby increasing the incidence and spread of illnesses among human populations. For example, invasive mosquitoes like Aedes aegypti and Aedes albopictus are known to transmit viruses such as Zika, dengue, and chikungunya, posing substantial public health threats. Anything specific to Franklin Co?

Additionally, invasive plants can exacerbate allergies and respiratory issues by introducing potent allergens or increasing the pollen load in the environment. Invasive species also significantly impact water quality, often leading to the proliferation of harmful algal blooms. These blooms can produce dangerous toxins like Anatoxin-a and Microcystins, which are harmful to human health. Exposure to these toxins can cause severe neurological and liver damage, highlighting the critical need for monitoring and managing water systems.

In terms of life safety, invasive species can disrupt infrastructure and natural disaster mitigation systems. For example, invasive plants that alter fire regimes by increasing the frequency and intensity of wildfires can endanger lives and properties. Moreover, invasive aquatic species can damage levees and water conveyance systems, heightening the risk of flooding and compromising community safety.

Property Damage and Critical Infrastructure: According to the NISC, invasive species can have property damage and critical infrastructure impacts including damaged crops, forests, and urban landscapes. For example, invasive insects such as the emerald ash borer and the Asian long-horned beetle can devastate tree populations in both rural and urban areas, necessitating costly tree removal and replacement efforts. Invasive plants can overrun agricultural fields, leading to reduced crop yields and the need for expensive control measures.

In addition to these terrestrial impacts, invasive species can severely affect water quality and infrastructure. Harmful algal blooms caused by invasive species can produce toxins like Anatoxin-a and Microcystins, which pose significant threats to water systems. These toxins can damage water treatment facilities and create hazards for drinking water supplies, resulting in increased maintenance costs and the need for advanced treatment technologies.

Aquatic invasive species, such as zebra mussels and quagga mussels, can further exacerbate these issues by attaching themselves to water intake structures, pipes, and treatment facilities, leading to blockages and increased operational costs. These species can also damage critical infrastructure, including dams, levees, and irrigation systems, compounding the economic burden on affected communities.

Invasive species can also clog waterways and damage infrastructure such as dams, levees, and irrigation systems. Aquatic invasive species like anatoxin-a, zebra mussels and quagga mussels attach themselves to water intake structures, pipes, and treatment facilities, leading to blockages and increased maintenance costs.

Economy: According to the NISC, invasive species can have substantial economic impacts and financial harm by reducing agricultural productivity, degrading fisheries, and increasing the costs of managing and mitigating their spread. For example, invasive plants like kudzu and water hyacinth can overrun agricultural lands and waterways, leading to decreased crop yields and obstructed irrigation systems, which in turn increase operational costs for farmers and land managers. Similarly, invasive insects such as the emerald ash borer and the brown marmorated stink bug wreak havoc on forests and crops, necessitating expensive pest control measures and reforestation efforts.

The economic impacts are not limited to land-based invasions. Aquatic invasive species, such as zebra mussels, can clog water intake pipes and damage infrastructure, resulting in higher maintenance costs for water treatment facilities and power plants. Additionally, the proliferation of harmful algal blooms caused by invasive species can produce toxins like Anatoxin-a and Microcystins, which pose significant risks to fisheries and water resources. These toxins can lead to fish kills and contaminate drinking water supplies, further straining public health resources and increasing the financial burden on affected communities.

The tourism and recreation industries also suffer economic losses due to invasive species. Infestations can degrade the aesthetic and ecological value of natural areas, deterring tourists and impacting local economies that rely on outdoor recreation. The presence of toxic algal blooms, for instance, can close beaches and waterways, reducing tourism revenue and harming businesses that depend on these attractions.

Changes in Development and Impact of Future Development: According to the NISC, invasive species can alter land use patterns and development priorities by degrading natural resources and ecosystems that are critical for sustainable development. For example, the spread of invasive plants and animals can lead to the loss of native biodiversity, disrupting ecosystems and reducing the availability of essential resources like timber, clean water, and fertile soil. This degradation can hinder agricultural expansion, forestry activities, and other land-based developments.

Invasive species also complicate construction and infrastructure projects, increasing costs and complexity. For instance, invasive plant roots can damage foundations and drainage systems, while invasive animals can undermine the stability of infrastructure. Furthermore, the proliferation of harmful algal blooms, producing toxins such as Anatoxin-a and Microcystins, can contaminate water sources and disrupt water management systems, leading to delays and added costs in development projects.

The financial and human resources required to manage and mitigate invasive species often divert funds from other critical development initiatives. In urban areas, invasive species can decrease property values and necessitate increased spending on maintenance and control measures, impacting housing development and urban planning. The presence of toxic algal blooms, driven by invasive species, can further complicate urban water management and public health strategies, influencing future development plans.

Invasive species can shape future development by requiring stringent biosecurity measures and environmental assessments to prevent their spread. These measures can lead to delays and added costs in development projects, impacting overall planning and execution.

Effects of Climate Change on Severity of Impacts: According to the NISC, climate change can exacerbate the severity of invasive species events by altering environmental conditions in ways that favor the spread and establishment of these species. Rising temperatures, shifting precipitation patterns, and the increased frequency of extreme weather events create new opportunities and extend suitable habitats for many invasive species. For example, warmer temperatures can expand the range of invasive insects like the Asian tiger mosquito, which transmits diseases such as Zika and dengue fever, into regions that were previously too cold for their survival. Similarly, changes in precipitation patterns can benefit invasive plants like kudzu and cheatgrass, which thrive in disturbed environments and outcompete native vegetation.

In aquatic ecosystems, climate change further compounds these challenges by increasing water temperatures and altering hydrological cycles. These changes can enhance the proliferation of harmful algal blooms that produce toxins like Anatoxin-a and Microcystins, posing severe risks to water quality and public health. The warmer and altered water conditions also promote the spread of invasive aquatic species, such as zebra mussels and water hyacinth, which disrupt native species, alter community compositions, and impair ecosystem functions.

Extreme weather events, such as hurricanes and floods, further facilitate the spread of invasive species by dispersing seeds, larvae, and other propagules over large distances, accelerating their establishment in new areas. These events can also damage ecosystems, making them more vulnerable to invasions by creating openings in the landscape that invasive species can exploit. As climate change continues to intensify, the severity of these invasive species impacts is likely to increase, leading to more widespread ecological and economic consequences.

Table 4-94. Climate Change Impact on Invasive Species

CLIMATE CHANGE IMPACTS ON INVASIVE SPECIES		
Invasive Species Type	**Climate Change Impact**	**Species Impacted**
Invasive Insects	Expanded range due to warmer temperatures	Asian tiger mosquito
Invasive Plants	Increased growth and spread with altered precipitation	Kudzu, Cheatgrass
Aquatic Invasive Species	Enhanced proliferation with warmer water temperatures	Anatoxin-a, Microcystins, Zebra mussel, Water hyacinth
Invasive Pathogens	Increased disease transmission with changing climates	Phytophthora ramorum (Sudden Oak Death)
Source: USDA (2024)		

4.18 Reduced Air Quality Incidents

4.18.1 Hazard Definition

According to NOAA, reduced air quality refers to the presence of pollutants in the air at concentrations high enough to pose health risks and environmental hazards. This is typically quantified using the Air Quality Index (AQI), which reports daily air quality based on the concentrations of five major pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter (PM10 and PM2.5), carbon monoxide, sulfur dioxide, and nitrogen dioxide. These pollutants can cause various health problems, including respiratory issues, cardiovascular diseases, and premature death, especially in sensitive populations such as children, the elderly, and those with pre-existing health conditions.

4.18.2 Hazard Extent/Intensity

According to AirNow *(managed by U.S. Environmental Protection Agency)* (EPA), extent and intensity of an air quality incident are measured using the Air Quality Index (AQI), which is a numerical scale that ranges from 0 to 500. The AQI is used to communicate how polluted the air currently is or how polluted it is forecasted to become. The AQI focuses on health impacts people may experience within a few hours or days after breathing polluted air.

Air Quality Index Scale

EPA AIR QUALITY INDEX SCALE		
AQI Value	**Category**	**Health Implications**
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk.
51 - 100	Moderate	Air quality is acceptable; however, for some pollutants, there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
101 - 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
151 - 200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
201 - 300	Very Unhealthy	Health alert: everyone may experience more serious health effects.
301 - 500	Hazardous	Health warnings of emergency conditions. The entire population is more likely to be affected.
Source: AirNow / US EPA (2024)		

Measurement of Pollutants:

The AQI measures the following major pollutants:

1. **Ground-level Ozone (O_3)**
2. **Particulate Matter (PM2.5 and PM10)**
3. **Carbon Monoxide (CO)**
4. **Sulfur Dioxide (SO_2)**
5. **Nitrogen Dioxide (NO_2)**

Each of the above listed pollutants are measured in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$), and their concentrations are converted to the AQI scale. The pollutant with the highest AQI value for a given day is used as the overall AQI value for that day.

The table below illustrates shows how different levels of pollutants translate to the AQI values and their corresponding health categories. These measurements help the public understand the extent and intensity of air quality incidents and the potential health impacts they might experience.

EXAMPLES OF SPECIFIC POLLUTANT LEVELS CORRESPONDING TO AQI CATEGORIES

Pollutant	AQI Range	O_3 (ppm, 8-hr avg)	PM2.5 ($\mu g/m^3$, 24-hr avg)	PM10 ($\mu g/m^3$, 24-hr avg)	CO (ppm, 8-hr avg)	SO_2 (ppb, 1-hr avg)	NO_2 (ppb, 1-hr avg)
Good	0 - 50	0.000 - 0.054	0.0 - 12.0	0 - 54	0.0 - 4.4	0 - 35	0 - 53
Moderate	51 - 100	0.055 - 0.070	12.1 - 35.4	55 - 154	4.5 - 9.4	36 - 75	54 - 100
Unhealthy for Sensitive Groups	101 - 150	0.071 - 0.085	35.5 - 55.4	155 - 254	9.5 - 12.4	76 - 185	101 - 360
Unhealthy	151 - 200	0.086 - 0.105	55.5 - 150.4	255 - 354	12.5 - 15.4	186 - 304	361 - 649
Very Unhealthy	201 - 300	0.106 - 0.200	150.5 - 250.4	355 - 424	15.5 - 30.4	305 - 604	650 - 1249
Hazardous	301 - 500	0.201 - 0.404	250.5 - 500.4	425 - 604	30.5 - 50.4	605 - 1004	1250 - 2049

4.18.3 Past Events

Specify which data sets

4.18.5 Vulnerability and Impacts

According to NOAA, reduced air quality has significant life safety and public health impacts, particularly for vulnerable populations such as children, the elderly, and individuals with pre-existing health conditions. Poor air quality exacerbates respiratory conditions such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) due to exposure to pollutants like particulate matter (PM2.5 and PM10) and ground-level ozone, leading to increased respiratory symptoms, reduced lung function, and airway inflammation. Long-term exposure to air pollution is also linked to cardiovascular diseases, including heart attacks, strokes, and hypertension, with pollutants such as nitrogen dioxide (NO2) and sulfur dioxide (SO2) contributing to these conditions.

High levels of air pollution can lead to premature death, particularly from heart and lung diseases, with studies showing a correlation between elevated pollution levels and increased mortality rates. Additionally, exposure to certain air pollutants during pregnancy can harm fetal development, potentially resulting in low birth weight, preterm birth, and developmental issues in children. Long-term exposure to pollutants such as benzene and formaldehyde is associated with an increased risk of cancer, particularly lung cancer.

The overall public health burden from reduced air quality includes increased healthcare costs, more hospital admissions, and greater absenteeism from work and school, which strains healthcare systems and impacts economic productivity.

Property Damage and Critical Infrastructure: According to NOAA, reduced air quality can impact changes in development and influence future development trends. Poor air quality necessitates stricter environmental regulations and air quality standards, prompting the adoption of cleaner technologies and more sustainable practices in various industries. This includes advancements in emissions control technologies, the transition to renewable energy sources, and improvements in transportation infrastructure to reduce vehicular emissions.

In urban planning, efforts to mitigate air pollution lead to the incorporation of green spaces, increased public transportation options, and the development of pedestrian-friendly infrastructure. These changes aim to reduce the reliance on fossil fuels and lower overall emissions. Lastly, the economic implications of poor air quality, such as healthcare costs and lost productivity, drive investments in air quality monitoring and research. Enhanced monitoring capabilities, including satellite-based observations and advanced modeling, help provide accurate forecasts and inform public health interventions.

Economy: According to NOAA, reduced air quality can have economic impacts, including increased healthcare costs due to higher rates of respiratory and cardiovascular illnesses, leading to more hospital visits and treatments. It also reduces productivity by causing more sick days and limiting outdoor work. Additionally, businesses may face higher operating costs due to the need for air filtration systems and compliance with stricter air quality regulations. Long-term, these economic burdens can hinder economic growth and development by diverting resources away from other critical areas.

Changes in Development and Impact of Future Development: According to NOAA, reduced air quality can drive changes in development and influence future development trends. Poor air quality necessitates stricter environmental regulations, leading to the adoption of cleaner technologies and sustainable practices in various industries. Urban planning may incorporate more green spaces, increased public transportation options, and pedestrian-friendly infrastructure to reduce emissions. Additionally, economic implications like healthcare costs and productivity losses prompt investments in air quality monitoring and research, fostering innovation in air quality management and sustainable development strategies.

Effects of Climate Change on Severity of Impacts: According to NOAA, climate change can exacerbate the severity of air quality incidents in multiple ways. As global temperatures rise, the frequency and intensity of heatwaves are expected to increase, leading to more episodes of poor air quality. Hot, dry conditions and intense sunlight can enhance the production of ground-level ozone, a harmful air pollutant that negatively affects health, crops, and ecosystems. Stable atmospheric conditions during heatwaves can trap pollutants near the surface, further degrading air quality.

Additionally, climate change is expected to increase the frequency and severity of wildfires, which contribute significantly to air pollution. Wildfires release large quantities of particulate matter (PM2.5) and other pollutants into the atmosphere, worsening air quality over vast regions. For instance, the wildfires across western North America in recent years have caused widespread increases in PM2.5 pollution, exceeding World Health Organization air quality guidelines. This trend is anticipated to continue as the climate warms, even under low-emission scenarios.

4.19 Structural Fire

4.19.1 Hazard Definition

According to the National Interagency Fire Center (NIFC), a structural fire is defined as a fire that occurs in a building or other structure. This type of fire involves residential, commercial, or industrial buildings and can include houses, apartments, offices, factories, and other structures.

Structural fires differ from wildfires in that they are confined to man-made structures rather than natural vegetation. The response and management of structural fires typically involve local fire departments and emergency services, whereas wildfires often require coordinated efforts from multiple federal, state, and local agencies.

4.19.2 Hazard Location

A structural fire could occur anywhere in Franklin County.

4.19.3 Hazard Extent/Intensity

According to Science Direct, the intensity of an active fire is a measure of vertical heat transfer above ground, and the degree to which vegetation mortality has occurred. Although temperature extremes are an integral part of any fire, temperature itself is not a good indicator of fire intensity. Woody fuels ignite at roughly 350 °C and maximum temperatures in forest fire flames can reach 1000 °C. However, flames 5 cm high have a markedly different measure of intensity relative to flames 5 m high, despite having the same core temperature.

The following table illustrates ranges of fire severity and intensity with associated fire types.

Table 4-95. Ranges of Fire Severity and Intensity with Associated Fire Types

RANGES OF FIRE SEVERITY AND INTENSITY WITH ASSOCIATED FIRE TYPES			
	Severity (°C)	**Intensity (kW h^{-1})**	**Associated fire type**
Low	< 180	100–2000	Surface
Moderate	180–300	2000–10 000	Intermittent crown
High	> 300	> 1,000	Continuous Crown
Source: Science Direct (2024)			

4.19.4 Probability and Frequency

Probability: The National Interagency Fire Center (NIFC) measures the probability of structure fires through a combination of risk assessment models and historical data analysis. These methods consider several factors:

1. Historical Fire Data: Analyzing past fire incidents helps identify trends and areas with a higher likelihood of future fires. This includes data on fire frequency, causes, and locations.
2. Environmental Conditions: The probability of structure fires is influenced by current environmental conditions such as temperature, humidity, wind speed, and drought levels. These factors are monitored using weather stations and remote sensing technologies.
3. Vegetation and Fuel Load: The amount and type of vegetation surrounding structures can significantly impact fire risk. Areas with high fuel loads (dense vegetation) are more susceptible to fires. Fuel load assessments are conducted regularly to update risk models.
4. Human Activity: The presence of human activities such as construction, recreational fires, and industrial operations can increase the probability of structure fires. Risk assessments incorporate data on human activities to predict potential fire outbreaks.
5. Infrastructure Vulnerability: The construction materials and design of buildings, as well as the presence of firebreaks and other protective measures, are considered. Buildings made of fire-resistant materials and those with adequate spacing are less likely to catch fire.

4.19.5 Vulnerability and Impacts

Life Safety and Public Health: According to NIFC, structural fires can lead to severe injuries or fatalities due to burns, smoke inhalation, and toxic fume exposure. Smoke from structural fires contains hazardous substances such as carbon monoxide, cyanide, and fine particulate matter, which can cause respiratory issues, cardiovascular problems, and long-term health complications. Vulnerable populations, including children, the elderly, and individuals with pre-existing health conditions, are particularly at risk.

In addition to immediate health impacts, structural fires can lead to long-term psychological effects on survivors, including post-traumatic stress disorder (PTSD), anxiety, and depression. The destruction of homes and personal belongings contributes to emotional distress and can lead to displacement, further exacerbating public health issues. This can lead to strains on local healthcare systems and emergency response resources. Lastly, the release of pollutants during a fire can have environmental repercussions, affecting air quality and contributing to broader public health concerns.

Property Damage and Critical Infrastructure: According to NIFC, structural fires can often result in the complete destruction of buildings, causing significant financial losses. Damage from fire also extends beyond the physical structures to include personal property, essential documents, and irreplaceable items. In commercial settings, structural fires can disrupt business operations, leading to economic losses and unemployment due to the destruction of workplaces.

Critical infrastructure, such as power lines, water supply systems, transportation networks, and communication systems, is also vulnerable to structural fires. Damage to these systems can have widespread consequences, disrupting essential services and hindering emergency response efforts. For instance, fires can damage electrical grids, causing power outages that affect thousands of homes and businesses. Similarly, the destruction of water supply lines can impede firefighting efforts and disrupt access to clean water for affected communities.

Economy: According to NIFC, the economic impacts of structural fires can cause direct economic losses by destroying residential, commercial, and industrial properties, leading to the loss of goods, machinery, and inventory. The costs associated with rebuilding and repairing damaged structures are substantial, and often insurance does not fully cover these expenses, leaving property owners to bear significant financial burdens.

Structural fires can also disrupt economic activities by causing business closures and job losses. When businesses are forced to shut down temporarily or permanently due to fire damage, employees may face unemployment, and local economies can suffer from reduced commercial activity. The interruption of critical infrastructure, such as power grids and transportation systems, further exacerbates economic losses by hindering the movement of goods and services and impeding access to essential utilities.

Lastly, structural fires can lead to increased public spending on emergency response and recovery efforts. Firefighting, medical services, and temporary housing for displaced residents require significant financial resources from local and state governments. Long-term economic impacts include decreased property values in fire-prone areas, which can deter investment and development, further straining local economies.

Changes in Development and Impact of Future Development: According to NIFC, the immediate aftermath of a fire often involves reassessing building codes and safety regulations to prevent similar incidents in the future. This reassessment can lead to stricter construction standards, such as the use of fire-resistant materials and the incorporation of advanced fire suppression systems.

Developers and city planners may also re-evaluate the spatial design of communities to enhance fire safety. This includes increasing the distance between buildings, creating firebreaks, and ensuring adequate access for emergency vehicles. Urban development plans may integrate more green spaces and buffer zones to reduce the spread of fires.

Other impacts include changes in land use policies or restrictions on rebuilding in high-risk zones, leading to shifts in population density and the relocation of residential or commercial areas to safer regions. Insurance companies might also adjust their coverage policies and premiums based on the perceived risk, influencing where and how new developments are planned and financed.

Effects of Climate Change on Severity of Impacts: According to NIFC, rising global temperatures and prolonged periods of drought can lead to drier vegetation and building materials, creating ideal conditions for fires to ignite and spread more rapidly. Increased temperatures also result in more frequent and intense heatwaves, which can dry out potential fuel sources and lower humidity levels, further exacerbating fire risks.

Climate change is also linked to more extreme and unpredictable weather patterns, including stronger winds and more frequent lightning storms. High winds can fan flames and carry embers over long distances, spreading fires quickly across urban and rural areas. Lightning storms increase the likelihood of fire ignitions, particularly in areas with dry vegetation.

As a result, structural fires in a changing climate tend to be more severe and harder to control. They can cause greater damage to buildings and infrastructure, leading to higher economic losses and more significant impacts on communities.

4.20 Public Health Emergency

4.20.1 Hazard Definition

Vector-borne disease (or communicable disease) is usually discussed in two ways—an epidemic and a pandemic. An epidemic/pandemic is defined as a disease that appears as new cases in the human population at a rate, during a given time period and location, that substantially exceeds the number expected and causes a public health emergency.

It is, thus, a relative term, and there is no quantitative criterion for designating a health crisis as an epidemic. In addition to its application to infectious diseases, the term is sometimes used to describe outbreaks of other adverse health effects, including those stemming from chemical exposure, sociological problems, and psychological disorders. A "pandemic" is a worldwide epidemic, while the term "outbreak" may be applied to a more geographically limited medical problem as, for instance, in a single community rather than statewide or nationwide. The term "cluster" is often used with reference to non-communicable diseases.

Three factors combine to produce an epidemic: an "agent" that causes the disease, a "host" that is susceptible to the disease, and an "environment" that permits the host to be exposed to the agent. The spread of an infectious disease depends on the chain of transmission: a source of the agent, a route of exit from the host, a mode of transmission between the susceptible host and the source, and a route of entry into another susceptible host. Modes of spread may involve direct physical contact between the infected host and the new host or airborne spread, such as coughing or sneezing. Indirect transmission takes place through vehicles such as contaminated water, food, or intravenous fluids; inanimate objects such as bedding, clothes, or surgical instruments; or a biological vector such as a mosquito or flea.

Health agencies closely monitor for diseases with the potential to cause an epidemic and seek to develop immunizations and eliminate vectors. While this effort has been remarkably successful, there are many diseases of concern, and the HIV/AIDS pandemic is still not controlled despite more than 40 years of effort since recognition of the disease in 1981.

4.20.2 Hazard Location

This hazard effects every community in Franklin County.

4.20.3 Hazard Extent/Intensity

The Centers for Disease Control and Prevention (CDC) measures the extent or intensity of a public health emergency, including outbreaks such as bird flu, through a combination of surveillance systems, epidemiological data analysis, and health indicators. Surveillance systems collect data on various health-related events, such as the incidence and prevalence of diseases like bird flu, hospitalization rates, and mortality rates. These systems are essential for tracking the spread of infectious diseases, identifying outbreaks, and monitoring ongoing health threats. In the case of bird flu, this allows the CDC to detect its spread among bird populations and any transmission to humans.

Epidemiological data analysis involves studying the distribution and determinants of health states or events in specific populations, helping to understand the scope and impact of a public health emergency like bird flu. This analysis reveals trends, risk factors, and populations most at risk, guiding targeted interventions and resource allocation to mitigate the spread of the virus.

In addition to surveillance and epidemiology, the CDC uses specific health indicators to gauge the intensity of a public health emergency. These indicators may include the rate of disease transmission (in the case of bird flu, how quickly it spreads among birds and potentially to humans), the proportion of healthcare resources utilized, and the effectiveness of public health interventions. The CDC collaborates with local, state, and international partners to gather and analyze data, ensuring a comprehensive understanding of the situation. This integration of methods allows the CDC to assess the severity of a public health emergency like bird flu accurately, inform decision-making, and communicate risks to the public and policymakers.

4.20.4 Probability and Frequency

Public health emergencies, such as bird flu outbreaks, vary in their probability and frequency over time. Factors including emerging infectious diseases, natural disasters, and other health-related events influence the likelihood and occurrence of these emergencies. For example, bird flu can occur periodically in both poultry and wild bird populations, with the potential to affect humans, leading to public health concerns. While the exact probability and frequency of public health emergencies, including bird flu outbreaks, over the last ten years can fluctuate, the World Health Organization (WHO) and other public health agencies continuously monitor and prepare for potential threats. Anything in Franklin Co?

WHO collects and analyzes data from affected countries and regions to assess the magnitude, severity, and impact of health emergencies, including those caused by bird flu. They monitor disease outbreaks, conduct epidemiological investigations, and provide technical expertise to understand the dynamics of each crisis. The WHO collaborates with partners to develop standardized tools and methodologies for data collection and analysis, including for zoonotic diseases like bird flu. Additionally, they facilitate information sharing, research collaboration, and the dissemination of best practices among countries and stakeholders to ensure a coordinated global response to public health threats.

4.20.5 Past Events

Over the last five years, the most notable public health emergency has been the COVID-19 pandemic, which began in late 2019 and continues to have a global impact at the time of this plan. Another significant international event was the Ebola outbreak in the Democratic Republic of Congo, which persisted from 2018 to 2020. The ongoing crisis of opioid overdoses and addiction in various countries, including the United States, has also been considered a public health emergency. Additionally, the Zika virus outbreak in 2015-2016, primarily affecting the Americas, raised significant concerns.

In Franklin County, avian influenza (bird flu) has been a public health concern as well. In past events, outbreaks of bird flu among poultry and wild bird populations prompted emergency responses to contain the virus and prevent it from spreading to humans. While no widespread human infections have been reported, these events highlighted the potential risks and the importance of public health preparedness in managing zoonotic diseases such as avian influenza.

4.20.6 Vulnerability and Impacts

Health and Safety: Public health emergencies, including outbreaks of diseases such as bird flu, significantly impact health and safety. These emergencies often lead to increased morbidity and mortality rates, posing serious threats to the well-being of individuals and communities. In the case of bird flu, the virus can spread rapidly among bird populations and, in some cases, infect humans, leading to widespread illness and potentially overwhelming healthcare systems. Public health emergencies like bird flu can also disrupt routine healthcare services, delay access to necessary treatments, and hinder the management of chronic conditions. Additionally, the fear of infection and the associated public health responses can result in psychological distress, social disruption, and economic challenges within affected populations.

Property Damage and Critical Infrastructure: Public health emergencies can disrupt essential services and infrastructure systems critical for public health and safety. For instance, healthcare facilities may experience increased demands and strains on resources, potentially affecting their capacity to provide adequate care. In addition, transportation networks, including airports, seaports, and roadways, may face disruptions, impacting the movement of supplies, personnel, and patients. Public health emergencies can also affect the functioning of utilities such as water and wastewater systems, power grids, and communication networks.

Economy: Public health emergencies can often lead to disruptions in various sectors of the economy. For instance, lockdowns, travel restrictions, and social distancing guidelines can result in business closures, reduced consumer spending, and job losses. Industries directly impacted by public health emergencies, such as hospitality, tourism, and retail, may experience a decline in revenue and profitability. Additionally, healthcare systems and public health agencies may face increased financial burdens due to the surge in service demand and the need to invest in emergency response capabilities.

Part IV: Capability Assessment

CHAPTER 5 CAPABILITY ASSESSMENT

Franklin County has a dedicated Emergency Management department. Hazard Mitigation Planning efforts are led by the Emergency Management Director as well as staff.

5.1 Preventative Measures

Preventative activities keep problems related to natural hazards from escalating and ensure new developments have reduced vulnerability to hazards. The following examples of preventative measures are usually carried out by building, planning, zoning, and/or code enforcement officials:

- Floodplain Mapping and Data
- Open Space Preservation
- Floodplain Regulations
- Erosion Setbacks
- Planning and Zoning
- Stormwater Management
- Drainage System Maintenance
- Building Codes

The information within this Chapter largely focuses on building codes, planning and zoning, stormwater runoff, floodplain management, water quality protection, and soil erosion control.

5.1.1 Building Codes

Updating and adopting new building codes, as well as addressing the effectiveness of these codes, can be one of the best ways to conduct mitigation. When properly designed and constructed, many buildings can withstand the impacts of high winds, a flood, or a tornado. Franklin County works with various versions of the International Codes published by the International Code Council, Inc. (ICC). These codes include:

- International Building Code (IBC)
- International Residential Code (IRC)
- International Fire Code (IFC)
- International Mechanical Code (IMC)
- International Fuel Gas Code (IFGC)
- International Property Maintenance Code (IPMC)
- International Swimming Pool and Spa Code (ISPSC)
- International Zoning Code (IZC)

Additionally, Franklin County is required by the State of Washington to enforce the State Enviromental Policy Act.

5.1.2 Code Administration

Enforcement of code standards is very important to hazard mitigation. Adequate inspections are needed during the course of construction to ensure that the builder understands and implements the requirements. The Building Code Effectiveness Grading Schedule (BCEGS) is a national program used by the insurance industry to determine how well new construction is protected from wind, earthquake and other non-flood hazards. It is similar to the CRS program and the fire insurance rating scheme: building permit programs are reviewed and scored. A class 1 community is the highest rating, and a class 10 community is the most basic rating.

Training of code officials is also very important for code enforcement. Training of code officials and inspectors is a large part of the BCEGS rating for a community. Courses are offered through the building code associations to help local officials understand standards that apply to seismic, wind and flood hazards.

The table below lists building code adoptions in use within Franklin County and the City of Pasco.

Table 5-96. Building Codes used in the Franklin County, WA

	Building Code Residential/Commercial
City of Pasco	• 2021 NFPA 54 National Fuel Gas Code • 2020 NFPA 58 Liquefied Petroleum Gas Code • 2021 International Building Code • 2021 International Fire Code • 2021 International Fuel Gas Code • 2021 International Mechanical Code • 2021 International Property Maintenance Code/Chapter 16.30 • 2021 International Residential Code • 2021 Uniform Plumbing Code • ICC/ANSI A117.1-2017 Accessibility Code • Washington State Energy Code (PDF) • Washington State University Energy Program (PDF) • 2021 Energy Code Cycle Memo (PDF)
Franklin County	2018 ICC International Building Code

5.1.3 Planning and Zoning

Planning and zoning activities, such as land use plans, transportation plans, subdivision ordinances, zoning code and economic re-development plans, can be used to direct development away from hazardous areas. For example, comprehensive land use plans can designate floodplains, shrubsteppe and wetlands as areas for open space, wetlands, or low-density residential. The table below shows Franklin County's adopted comprehensive plans, zoning ordinances, and subdivision ordinances. The table also highlights communities where flood or other hazards are addressed or could be improved.

5.1.4 Comprehensive Plans

Comprehensive Plans are the primary tools used by communities to address future development. They can reduce future flood-related damages by indicating open space or low-density development within floodplains and other hazardous areas. Natural hazards should be emphasized in specific land use recommendations.

5.1.5 Capital Improvement Plans

Communities use Capital Improvement Plans or Community Investment Programs to guide major public expenditures for the next five to 20 years. Capital expenditures can include roadways, water and sewer lines, floodplain open space acquisition, and retrofitting existing public structures to withstand hazards.

The table below illustrates Franklin County’s efforts to integrate hazard mitigation, hazards, and other mitigation considerations into their comprehensive or related community-wide plans.

Table 5-97. Franklin County Planning and Land Use Ordinances

Community	Plans	Does the plan address hazards?	Does the plan identify projects to include in the mitigation strategy?	Can the plan be used to implement mitigation actions?
Franklin County	2018 – 2038 Franklin County Comprehensive Plan (being updated in 2026)	Wildfires, Floodplains, geologically hazardous areas	Yes	Yes
Franklin County	2023 Franklin County Shoreline Master Program	Floodplains, aquaculture, wetlands, geologically hazardous areas	Yes	Yes
Franklin County	Capital Improvements Plan	No		
Franklin County	Economic Development Plan	Extreme weather	No	
Franklin County	State Environmental Policy Act	No		
City of Pasco	Comprehensive Plan	Extreme weather, floods, geologically hazardous areas	Yes	Yes
City of Pasco	Capital Improvements Plan	Extreme weather, flooding	Yes	Yes
City of Pasco	Economic Development Plan	No		
City of Pasco	Shoreline Master Program	flooding	Yes	Yes
City of Connell	Comprehensive Plan	Flooding, fire, extreme weather	Yes	Yes

CHAPTER 6: MITIGATION GOALS

The mitigation strategy includes the development of goals and prioritized hazard mitigation actions. Goals are long-term policy statements and global visions that support the mitigation strategy.

6.1 Community Priorities

The following topics were identified by the planning team to be of priority for Franklin County:

- Life Safety
- Public Health
- Critical Infrastructure Maintenance and Protection
- Public Information and Warning
- Public Outreach, Education, and Awareness
- Equitable outcomes for underserved communities and socially vulnerable populations
- Inter-governmental Coordination
- Public-Private Partnerships
- Repetitive Loss Properties
- Climate Change

6.2 Goals and Guidelines

6.2.1 Mitigation Goals

The following goals (shown in order of importance) were developed by the planning team for the purpose of guiding and directing the Plan in accordance with governmental requirements, community priorities, and changing circumstances. These goals were compared with State of Washington Plans to ensure aligning viewpoints are used.

Goal 1. Life Safety: Prioritize the health and safety of Franklin County residents from the impacts of natural hazards.

Goal 2. Preventative Actions: Reduce risks through regulations, including building codes, limiting development within hazardous areas, and integrating mitigation strategies into local planning or capital improvement projects.

Goal 3. Property Protection. Reduce exposure to hazards through building or parcel-specific activities, such as structure/building acquisition, and protecting critical infrastructure and community lifelines within Franklin County by identifying and reducing impacts of natural hazards through activities such as floodproofing and retrofitting.

Goal 4. Emergency Services. Reduce impacts of natural hazards by building response and recovery capabilities that are implemented during a disaster.

Goal 5. Structural Projects. Minimize the impacts of natural hazards on key structures in within Franklin County through the implementation of mitigation projects, such as detention basins, tornado shelters, advanced warning systems, etc.

6.2.2 Mitigation Guidelines

The following guidelines were developed by the planning team for purpose of achieving the goals and to facilitate the development of hazard mitigation action items in Chapter 7:

- **Guideline 1.** Prioritize hazard mitigation projects on the hazards that pose the greatest threat to the community.
- **Guideline 2**. Promote public education strategies for the community around the need to take steps to protect themselves, their families, and their property.
- **Guideline 3**. Create and foster public-private partnerships and relationships with leaders from underserved communities to accomplish hazard mitigation activities and equitable outcomes for all communities, including underserved communities and socially vulnerable populations.
- **Guideline 4**. Encourage interdepartmental and multi-jurisdictional collaboration and shared resources when developing and conducting hazard mitigation exercises and projects.
- **Guideline 5**. Strive to improve and expand communication/coordination between public works and emergency services before, during, and after a disaster response.
- **Guideline 6**. Seek State, and Federal support for mitigation projects

CHAPTER 7: MITIGATION ACTION PLAN

The findings, conclusions, and recommendations presented in Chapters 1 through 6 of the Franklin County All-Hazard Mitigation Plan have been collated into this Action Plan. In addition, the guidelines and goals developed by the Workgroup, and presented in Chapter 6, set the context for these Action Items. The following Action Items align with the six mitigation areas outlined by the Federal Emergency Management Agency (FEMA) within their Community Rating System (CRS) Program. The Action Plan presented in this chapter establishes an overall direction for the county regarding natural hazard mitigation. The Action Plan is the most essential part of this Plan as it incorporates an awareness of local risks, resources, needs and plans a path forward.

7.1 Mitigation Action Plan

The Action Plan helps to prioritize mitigation initiatives according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The action plan also provides the framework for how the proposed projects and initiatives will be implemented and administered over the next five years.

7.1.1 Mitigation Strategy/Action Timeline Parameters

While the preference is to provide definitive project completion dates, this is only possible for some mitigation strategies/actions. Therefore, the parameters for the timeline (Projected Completion Date) are as follows:

- **Short-term**—To be completed in one to five years
- **Long-term**—To be completed in greater than five years
- **Ongoing**—Currently being implemented under existing programs but without a definite completion date

7.1.2 Mitigation Strategy/Action Benefit Parameters

Benefit ratings are defined as follows:

- **High**—The project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—The project will have a long-term impact on reducing risk exposure for life and property, or the project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

7.1.3 Mitigation Strategy/Action Estimated Cost Parameters

While the preference is to provide definitive costs (dollar figures) for each mitigation strategy/action, this is only possible for some mitigation strategies/action. Therefore, the estimated costs for the mitigation initiatives identified in this Plan are identified as high, medium, or low, using the following ranges:

- **High**—Existing funding will not cover the project's cost; implementation would require new revenue through an alternative source (e.g., bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportion of the budget or a budget amendment, or the project cost would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of a current ongoing program.

7.1.4 Mitigation Strategy/Action Prioritization Process

The action plan must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) grant program. A less formal approach was used because some projects may not be implemented for multiple years, and associated costs and benefits could change dramatically. Therefore, a review of the apparent benefits versus the evident cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

The priorities are defined as follows:

- **High**—A project that addresses numerous goals or hazards, has benefits that exceed the cost, has funding secured or is an ongoing project, and meets eligibility requirements for the HMGP or BRIC grant program. High-priority projects may be completed in the short term (1 to 5 years).
- **Medium**—A project that addressed multiple goals and hazards, with benefits that exceed costs, and for which funding has not been secured but is grant eligible under HMGP, BRIC, or other grant programs. The project can be completed in the short term once funding is secured. Medium-priority projects will become high-priority projects once funding is secured.
- **Low**—A project that will address a few or no goals, mitigate the risk of one or a few hazards, has benefits that do not exceed the costs or are challenging to quantify, for which funding has not been secured, that is not eligible for HMGP or BRIC grant funding, and for which the timeline for completion is long term. Low-priority projects may qualify for other grant funding sources from other programs.

For many of the strategies identified in this action plan, the participating jurisdictions may seek financial assistance under HMA programs, most requiring detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define "benefits" according to parameters that meet the goals and objectives of this Plan.

7.2 Mitigation Projects

Listed below are the projects that were developed to address the risks posed. It should be noted that this Plan serves only to recommend mitigation measures. Implementing these recommendations depends on adopting this Plan by the Franklin County Board of Commissioners and local jurisdiction's board of trustees of each participating municipality. It also depends on the cooperation and support of the designated offices responsible for each action item. In addition, each community was encouraged to include additional community-specific action/project items.

A summary of the previous plan's action items through the final annual report, along with the mitigation activities communities completed to achieve each action item, can be found in Appendix E.

Participating jurisdictions agreed upon the following mitigation actions. These shared actions, some of which address all hazards, help to meet the following requirement: "Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? Does the plan include one or more action(s) per jurisdiction for each hazard identified within the risk assessment?" In addition to the 17 mitigation measures that apply to the city/county and all participating jurisdictions, most communities identified additional mitigation actions unique to their jurisdiction. The following table summarizes the jurisdictions' mitigation measures in relationship to the hazards addressed in the risk assessment.

7.3 Mitigation Action Plan & Projects for Franklin County

The projects in this section considered the countywide coordination through the Franklin County Planning Team, Workgroup, Franklin County Public Works, and Franklin County Emergency Management.

Action 7.3.1

1. Mitigation Action Item:

It seems to me that the greatest source of wildfires in the county is fires starting from vehicles along our Washinton State highways. State highways should have at least 8-10 feet of buffer to mitigate potential sparks from vehicles before they hit combustible fuels that line the edge of the highways. Bare ground or perennial grasses planted along the highways can be an effective fire deterrent. Lack of funding has led to little or no fire mitigation along state highways.

Year Initiated (i.e. 2024, 2025)	
Applicable Jurisdiction/Special District	Franklin County Noxious Weed Control Board
Lead Agency/Organization	Washington State Department of Transportation
Supporting Agencies/Organizations (if applicable)	
Potential Funding Source **Examples:** Local Budgeted Funds, Local or State Special Taxes, Private/Non-Profit Funds, State Special Funds, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Community Development Block Grant (CDBG), FEMA Public Assistance (PA)	
Estimated Cost (If estimated cost is unknown, indicate Low=bellow $100,000, Medium= Between $100,00 & $500,000.00, or Hig 1M and above)	
Benefits (Indicate Low, Medium, or High)	Medium
Projected Duration (If estimated duration is unknown, indicate Short Term= Less than a Year, Long Term = ore than a year, or Ongoing/repeating)	
PRIORITY (High, Medium, Low)	High

X	Place an "X" by the applicable goals, if applicable
x	Goal 1: Save (or protect) lives and reduce injury.
x	Goal 2: Increase resilience of infrastructure and critical facilities.
x	Goal 3: Avoid (minimize or reduce) damage to property.
x	Goal 4: Encourage the development and implementation of long-term, cost-effective, and environmentally sound mitigation projects.
x	Goal 5: Build and support capacity to enable local government and the public to prepare for, respond to and recover from the impact of natural hazards.

This mitigation action:

The mitigation strategies/actions will be prioritized and evaluated using the STAPLEE+E method, which uses eight (8) criteria for evaluating a mitigation action – Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Additional considerations are within each of these criteria. Each criterion is evaluated on a scale from one (1) to five (5), with one (1) defined as strongly disagree and five (5) as strongly agree. The summation will result in the STAPLEE+E Prioritization Score.

Instructions: Circle the best option

	Strongly Disagree (1)	**Disagree (2)**	**Neither Agree or Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community, does not adversely affect a particular segment of the population, does not cause relocation of lower-income people, and is compatible with the community's social and cultural values?	1	2	3	4	[✓ 5]
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts?	1	2	3	4	[✓ 5]
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action?	[✓ 1]	2	3	4	5

Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process?	1	2	[✓ 3]	4	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action?	1	2	[✓ 3]	4	5
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund?	1	2	3	4	[✓ 5]
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community’s environmental goals?	1	2	3	[✓ 4]	5
Equity: Do you agree or disagree that the mitigation actions are consistent and systematically fair? (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.).	1	2	3	[✓ 4]	5

X	Place an “X” by the applicable hazard
x	Air Quality Incidents
x	Wildfire
	Volcano
	Severe Summer Weather (Dust, Heat & Straight-line Wind Events)
	Earthquake
	Severe Winter Weather (Blizzard, Heavy Snow & Extreme Cold)
	Drought
x	Structural Fire

	High Hazard Dams and Levees
	Flooding (combined with Flash/Urban and Riverine)
x	Invasive Species
	Landslide
	Space Weather
	Tornado
x	Public Health Emergency

2. Mitigation Action Item:

We provide weed control along most of the County roads thereby providing a more defense able buffer along county roads We provide this service through an interlocal agreement with Franklin County Public Works. We prioritize dryland area roads as they are the most critical and contain more combustible fuels. I would only suggest that we would expand our spray zone from 8 feet wide to 12 feet wide in order to provide a more defense able space.

Year Initiated (i.e. 2024, 2025)	**2025**
Applicable Jurisdiction/Special District	Franklin County Noxious Weed Control Board
Lead Agency/Organization	
Supporting Agencies/Organizations (if applicable)	Franklin County Public Works
Potential Funding Source **Examples:** Local Budgeted Funds, Local or State Special Taxes, Private/Non-Profit Funds, State Special Funds, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Community Development Block Grant (CDBG), FEMA Public Assistance (PA)	
Estimated Cost (If estimated cost is unknown, indicate Low=bellow $100,000, Medium= Between $100,00 & $500,000.00, or Hig 1M and above)	$50000
Benefits (Indicate Low, Medium, or High)	Medium

Projected Duration (If estimated duration is unknown, indicate Short Term= Less than a Year, Long Term = ore than a year, or Ongoing/repeating)	Ongoing
PRIORITY (High, Medium, Low)	Medium

X	Place an "X" by the applicable goals, if applicable
x	Goal 1: Save (or protect) lives and reduce injury.
x	Goal 2: Increase resilience of infrastructure and critical facilities.
x	Goal 3: Avoid (minimize or reduce) damage to property.
	Goal 4: Encourage the development and implementation of long-term, cost-effective, and environmentally sound mitigation projects.
	Goal 5: Build and support capacity to enable local government and the public to prepare for, respond to and recover from the impact of natural hazards.

This mitigation action:

The mitigation strategies/actions will be prioritized and evaluated using the STAPLEE+E method, which uses eight (8) criteria for evaluating a mitigation action – Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Additional considerations are within each of these criteria. Each criterion is evaluated on a scale from one (1) to five (5), with one (1) defined as strongly disagree and five (5) as strongly agree. The summation will result in the STAPLEE+E Prioritization Score.

	Strongly Disagree (1)	**Disagree (2)**	**Neither Agree or Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**
<u>Social</u>: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community, does not adversely affect a particular segment of the population, does not cause relocation of lower-income people, and is compatible with the community's social and cultural values?	1	2	3	4	[✓ 5]
<u>Technical</u>: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts?	1	2	3	4	[✓ 5]

Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action?	1	2	3	[✓ 4]	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process?	1	2	[✓ 3]	4	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action?	1	2	3	[✓ 4]	5
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund?	1	[✓ 2]	3	4	5
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals?	1	2	3	[✓ 4]	5
Equity: Do you agree or disagree that the mitigation actions are consistent and systematically fair? (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.).	1	2	3	[✓ 4]	5

X	Place an "X" by the applicable hazard
x	Air Quality Incidents
x	Wildfire
	Volcano
	Severe Summer Weather (Dust, Heat & Straight-line Wind Events)
	Earthquake

	Severe Winter Weather (Blizzard, Heavy Snow & Extreme Cold)
	Drought
x	Structural Fire
	High Hazard Dams and Levees
	Flooding (combined with Flash/Urban and Riverine)
x	Invasive Species
	Landslide
	Space Weather
	Tornado
	Public Health Emergency

3. Mitigation Action Item: Toxic Algae Research Project

Year Initiated (i.e. 2024, 2025)	**2024**
Applicable Jurisdiction/Special District	Benton-Franklin Health District
Lead Agency/Organization	Benton-Franklin Health District
Supporting Agencies/Organizations (if applicable)	
Potential Funding Source **Examples:** Local Budgeted Funds, Local or State Special Taxes, Private/Non-Profit Funds, State Special Funds, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Community Development Block Grant (CDBG), FEMA Public Assistance (PA)	
Estimated Cost (If estimated cost is unknown, indicate Low=bellow $100,000, Medium= Between $100,00 & $500,000.00, or Hig 1M and above)	Low to Medium
Benefits (Indicate Low, Medium, or High)	High
Projected Duration (If estimated duration is unknown, indicate Short Term= Less than a Year, Long Term = ore than a year, or Ongoing/repeating)	Long Term, Ongoing
PRIORITY (High, Medium, Low)	High

X	Place an "X" by the applicable goals, if applicable
X	Goal 1: Save (or protect) lives and reduce injury.
	Goal 2: Increase resilience of infrastructure and critical facilities.
	Goal 3: Avoid (minimize or reduce) damage to property.
X	Goal 4: Encourage the development and implementation of long-term, cost-effective, and environmentally sound mitigation projects.

	Goal 5: Build and support capacity to enable local government and the public to prepare for, respond to and recover from the impact of natural hazards.

This mitigation action:
The mitigation strategies/actions will be prioritized and evaluated using the STAPLEE+E method, which uses eight (8) criteria for evaluating a mitigation action – Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Additional considerations are within each of these criteria. Each criterion is evaluated on a scale from one (1) to five (5), with one (1) defined as strongly disagree and five (5) as strongly agree. The summation will result in the STAPLEE+E Prioritization Score.

	Strongly Disagree (1)	**Disagree (2)**	**Neither Agree or Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community, does not adversely affect a particular segment of the population, does not cause relocation of lower-income people, and is compatible with the community's social and cultural values?	1	2	3	4	○
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts?	1	2	3	4	○
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action?	1	2	○	4	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process?	1	2	3	○	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action?	1	2	3	4	○
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree	1	2	3	○	5

that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund?					
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals?	1	2	3	4	○
Equity: Do you agree or disagree that the mitigation actions are consistent and systematically fair? (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.).	1	2	3	4	○

X	Place an "X" by the applicable hazard
	Air Quality Incidents
	Wildfire
	Volcano
	Severe Summer Weather (Dust, Heat & Straight-line Wind Events)
	Earthquake
	Severe Winter Weather (Blizzard, Heavy Snow & Extreme Cold)
	Drought
	Structural Fire
	High Hazard Dams and Levees
	Flooding (combined with Flash/Urban and Riverine)
	Invasive Species
	Landslide
	Space Weather
	Tornado

	Public Health Emergency

4. Mitigation Action Item: Toxic Algae Public Information Campaign

Year Initiated (i.e. 2024, 2025)	2025
Applicable Jurisdiction/Special District	Benton-Franklin Health District
Lead Agency/Organization	Benton-Franklin Health District
Supporting Agencies/Organizations (if applicable)	
Potential Funding Source Examples: Local Budgeted Funds, Local or State Special Taxes, Private/Non-Profit Funds, State Special Funds, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Community Development Block Grant (CDBG), FEMA Public Assistance (PA)	
Estimated Cost (If estimated cost is unknown, indicate Low=bellow $100,000, Medium= Between $100,00 & $500,000.00, or Hig 1M and above)	Low
Benefits (Indicate Low, Medium, or High)	High
Projected Duration (If estimated duration is unknown, indicate Short Term= Less than a Year, Long Term = ore than a year, or Ongoing/repeating)	Long Term, Ongoing
PRIORITY (High, Medium, Low)	High

X	Place an “X” by the applicable goals, if applicable
X	Goal 1: Save (or protect) lives and reduce injury.
	Goal 2: Increase resilience of infrastructure and critical facilities.
	Goal 3: Avoid (minimize or reduce) damage to property.
X	Goal 4: Encourage the development and implementation of long-term, cost-effective, and environmentally sound mitigation projects.

	Goal 5: Build and support capacity to enable local government and the public to prepare for, respond to and recover from the impact of natural hazards.

This mitigation action:

The mitigation strategies/actions will be prioritized and evaluated using the STAPLEE+E method, which uses eight (8) criteria for evaluating a mitigation action – Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Additional considerations are within each of these criteria. Each criterion is evaluated on a scale from one (1) to five (5), with one (1) defined as strongly disagree and five (5) as strongly agree. The summation will result in the STAPLEE+E Prioritization Score.

	Strongly Disagree (1)	**Disagree (2)**	**Neither Agree or Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community, does not adversely affect a particular segment of the population, does not cause relocation of lower-income people, and is compatible with the community's social and cultural values?	1	2	3	4	○
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts?	1	2	○	4	5
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action?	1	2	○	4	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process?	1	2	3	○	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action?	1	2	3	4	○
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund?	1	2	3	○	5

Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals?	1	2	3	4	○
Equity: Do you agree or disagree that the mitigation actions are consistent and systematically fair? (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.).	1	2	3	4	○

X	Place an "X" by the applicable hazard
	Air Quality Incidents
	Wildfire
	Volcano
	Severe Summer Weather (Dust, Heat & Straight-line Wind Events)
	Earthquake
	Severe Winter Weather (Blizzard, Heavy Snow & Extreme Cold)
	Drought
	Structural Fire
	High Hazard Dams and Levees
	Flooding (combined with Flash/Urban and Riverine)
	Invasive Species
	Landslide
	Space Weather
	Tornado
	Public Health Emergency

5. Mitigation Action Item: Toxic Algae & Safe Drinking Water Public Health Integrated Preparedness Plans

Year Initiated (i.e. 2024, 2025)	**2025**
Applicable Jurisdiction/Special District	Benton-Franklin Health District
Lead Agency/Organization	Benton-Franklin Health District
Supporting Agencies/Organizations (if applicable)	
Potential Funding Source Examples: Local Budgeted Funds, Local or State Special Taxes, Private/Non-Profit Funds, State Special Funds, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Community Development Block Grant (CDBG), FEMA Public Assistance (PA)	
Estimated Cost (If estimated cost is unknown, indicate Low=bellow $100,000, Medium= Between $100,00 & $500,000.00, or Hig 1M and above)	Low
Benefits (Indicate Low, Medium, or High)	High
Projected Duration (If estimated duration is unknown, indicate Short Term= Less than a Year, Long Term = ore than a year, or Ongoing/repeating)	Short to Long Term; Ongoing
PRIORITY (High, Medium, Low)	High

X	Place an "X" by the applicable goals, if applicable
X	Goal 1: Save (or protect) lives and reduce injury.
	Goal 2: Increase resilience of infrastructure and critical facilities.
	Goal 3: Avoid (minimize or reduce) damage to property.

X	Goal 4: Encourage the development and implementation of long-term, cost-effective, and environmentally sound mitigation projects.
	Goal 5: Build and support capacity to enable local government and the public to prepare for, respond to and recover from the impact of natural hazards.

This mitigation action:
The mitigation strategies/actions will be prioritized and evaluated using the STAPLEE+E method, which uses eight (8) criteria for evaluating a mitigation action – Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Additional considerations are within each of these criteria. Each criterion is evaluated on a scale from one (1) to five (5), with one (1) defined as strongly disagree and five (5) as strongly agree. The summation will result in the STAPLEE+E Prioritization Score.

	Strongly Disagree (1)	**Disagree (2)**	**Neither Agree or Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community, does not adversely affect a particular segment of the population, does not cause relocation of lower-income people, and is compatible with the community's social and cultural values?	1	2	3	4	[✓ 5]
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts?	1	2	3	4	[✓ 5]
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action?	1	2	3	[✓ 4]	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process?	1	2	3	[✓ 4]	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action?	1	2	3	4	[✓ 5]
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree	1	2	3	[✓ 4]	5

that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund?					
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals?	1	2	3	4	○
Equity: Do you agree or disagree that the mitigation actions are consistent and systematically fair? (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.).	1	2	3	4	○

X	Place an "X" by the applicable hazard
	Air Quality Incidents
	Wildfire
	Volcano
	Severe Summer Weather (Dust, Heat & Straight-line Wind Events)
	Earthquake
	Severe Winter Weather (Blizzard, Heavy Snow & Extreme Cold)
	Drought
	Structural Fire
	High Hazard Dams and Levees
	Flooding (combined with Flash/Urban and Riverine)
	Invasive Species
	Landslide
	Space Weather
	Tornado

	Public Health Emergency

CHAPTER 8: PLAN MAINTENANCE

Franklin County Emergency Management (FCEM) will continue to monitor, evaluate, and update the Plan, specifically focusing on progress towards each action item within the All-Hazard Mitigation Plan (Plan). The Franklin County Hazard Mitigation Plan will be reviewed on an annual basis to determine the effectiveness of mitigation programs, projects, or other related activities, and to reflect changes in land development or programs that may affect mitigation priorities and/or strategies. The plan will be updated every five years. These fire-year updates will be delivered to the Washington State Hazard Mitigation Program Manager for review and forwarding to the Federal Emergency Management Agency, Region X Office.

To facilitate the annual plan review process, the Franklin County Hazard Mitigation Planning Committee will remain a semi-active group following the formal adoption of this plan and shall be charged with the responsibility of conducting an annual plan review. The Director of Franklin County Emergency Management or his/her designee assigned shall be responsible for coordinating and overseeing the annual review process. In addition, to continue to encourage community participation, annual meetings shall be open to the public and a public comment period shall be incorporated into each meeting.

Per the Federal Emergency Management Agency (FEMA), this Plan shall be updated every five years. Franklin County coordination shall be overseen by Franklin County Emergency Management. In addition, it is recommended that the next 5-year update be conducted over the process of one to two years. This will provide the Steering Committee ample time to meet, develop drafts, involve the public, coordinate with stakeholders, and finalize the Plan.

This chapter describes the Plan maintenance process for Franklin County.

8.1 Formal Review Process

The Plan will be reviewed on an annual basis by FCEM and/or the Steering Committee to determine the effectiveness of programs and to reflect changes that may affect mitigation priorities. The Director of Franklin County Emergency Management or designee will be responsible for contacting the Steering Committee and organizing the review. FCEM will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. FCEM and/or the Steering Committee will review the goals and action items to determine their relevance to changing situations in the county as well as changes in Federal policy and to ensure they are addressing current and expected conditions. FCEM will also review the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The organizations responsible for the various action items will report on the status of the projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised or removed.

The Director of FCEM or designee will be responsible for ensuring the updating of the Plan. The Director or designee will also notify all holders of the Plan and affected stakeholders when changes have been made. Every five years, the updated Plan will be submitted to Washington State Hazard Mitigation Program Manager and to the Federal Emergency Management Agency for review and approval.

8.2 Continued Public Involvement

All participating entities are dedicated to involving the public directly in the review and updates of the Plan.

Copies of the Franklin County Hazard Mitigation Plan will be kept and made available for public review at the following locations:

- Franklin County Emergency Management
- Franklin County Planning & Building Department and/or website
- City of Pasco Department of Community & Economic Development and/or website
- City of Connell City Hall and/or website
- City of Mesa City Hall and/or website
- City of Kahlotus City Hall and/or website
- Mid-Columbia Regional Library System (2 copies) and/or website
- Online at www.franklinem.org

Franklin County Emergency Management shall be responsible for receiving, tracking, and filing public comments regarding the Franklin County Hazard Mitigation Plan. Contact information for Franklin County Emergency Management is included in the Point of Contact information page. A public meeting will be held as part of the review process as well as the final five-year plan update. The purpose of these meetings is to provide a public forum so that citizens can express concerns, opinions, or ideas about the Franklin County Hazard Mitigation Plan. The Franklin County Hazard Mitigation Planning Committee will continue to meet as needed and be made up of representatives from the participating jurisdictions as well as entities, departments, and agencies involved or impacted by hazard events in Franklin County.

8.3 Monitoring, Evaluation, and Updating the Plan

Franklin County Emergency Management is responsible for contacting Steering Committee members and organizing a meeting if updates to the plan are necessary. FCEM’s responsibilities include:

- Reviewing each goal to determine its relevance and appropriateness.
    - Monitor and evaluate the mitigation strategies in this Plan to ensure the document reflects current hazard analyses, development trends, code changes and risk analyses and perceptions.
    - Ensure the appropriate implementation of status reports and regular maintenance of the Plan.
    - Create future action plans and mitigation strategies. These should be carefully assessed and prioritized using benefit-cost analysis (BCA) methodology that FEMA has developed.
    - Ensure the public has access to the plan and are encouraged to comment and be involved in mitigation plan updates.
    - Ensure that the city/county complies with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR.
    - Reassess the Plan in light of any major hazard event. FCEM and appropriate stakeholders will convene within 45 days of any major event to review all

applicable data and to consider the risk assessment, Plan goals, and action items given the impact of the hazard event.
- Review the Plan in connection to other plans, projects, developments, and other significant initiatives.
- Coordinate with appropriate municipalities and authorities to incorporate regional initiatives that transcend the boundaries of the county.
- Update the Plan every five years and submit for FEMA approval.
- Amend the Plan whenever necessary to reflect changes in State or Federal laws and statutes required in 44 CFR.

8.3.1 The Five-Year Action Plan

This section outlines the implementation agenda that Franklin County Emergency Management should follow five years following adoption of this Plan, and then every five years thereafter. Franklin County Emergency Management is responsible to ensure the All-Hazard Mitigation Plan is updated every five years.

Franklin County Emergency Management will consider the following action plan for the five-year planning cycle. It should be noted that the schedule below can be modified as necessary and does not include any meetings and/or activities that would be necessary following a disaster event.

If an emergency meeting occurs, this proposed schedule may be altered to fit any new needs.

Year 0:
- **2024:** Update Franklin County All-Hazard Mitigation Plan, including a series of meetings & public meetings.
- **January 2025 – December 2025:** Submit 2024 All-Hazard Mitigation Plan for FEMA approval.

Year 1:
- **2026:** Work on mitigation actions. Franklin County Emergency Management to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage Plan integration efforts.

Year 2:
- **January 2027 – December 2027:** Work on mitigation actions. Franklin County Emergency Management to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage Plan integration efforts.
- **Fall/Winter 2027:** FCEM and Steering Committee review plan. Discuss opportunities for mitigation plan integration with other planning documents. Discuss recent hazards. Update the status of projects. If necessary, host a public meeting.

Year 3:
- **January 2028 – December 2028:** Work on mitigation actions. Franklin County Emergency Management to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage Plan integration efforts.
- **Summer/Fall 2028:** Apply for Hazard Mitigation Grant Program funds to update the next iteration of the mitigation plan.

- **Fall/Winter 2028:** FCEM and Steering Committee review plan. Discuss opportunities for mitigation plan integration with other planning documents. Discuss recent hazards. Update the status of projects. If necessary, host a public meeting.

Year 4:

- **January 2029 – December 2029:** Work on mitigation actions. Franklin County Emergency Management to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage Plan integration efforts. Update 2024 All-Hazard Mitigation Plan, including a series of meetings & public meetings.

Year 5:

- **2030:** Submit 2029 All-Hazard Mitigation Plan for FEMA approval. Repeat.

8.4 Natural Hazard Mitigation Plan Review Meetings

During each Hazard Mitigation Plan Review meeting, FCEM and the Steering Committee will be responsible for a brief evaluation of the 2025 All-Hazard Mitigation Plan and review the progress of mitigation actions.

8.4.1 Plan Evaluation

To evaluate the Plan, the Steering Committee should answer the following questions:

- Are the goals still relevant?
- Is the risk assessment still appropriate, or has the nature of the hazard and/or vulnerability changed over time?
- Are current resources appropriate for implementing this Plan?
- Have lead agencies participated as originally proposed?
- Has the public been adequately involved in the process? Are their comments being heard?
- Have city departments and participating jurisdictions been integrating mitigation into their planning documents?

If the answer to each of the above questions is “yes,” the Plan evaluation is complete. If any questions are answered with a “no,” the identified gap must be addressed.

8.4.2 Review of Mitigation Actions

Once the Plan evaluation is complete, FCEM will review the status of the mitigation actions. To do so, FCEM should answer the following questions:

- Have the mitigation actions been implemented as planned?
- Have outcomes been adequate?
- What problems have occurred in the implementation process?

8.4.3 Meeting Documentation

Each review meeting must be documented, including the Plan evaluation and review of mitigation actions. This may be done by survey or other means, as appropriate.

8.5 Implementation through Existing Programs

Hazard mitigation practices must be incorporated within existing plans, projects, and programs. Therefore, the involvement of all departments, private non-profits, private industry, and appropriate jurisdictions is necessary in order to find mitigation opportunities within existing or planned projects and programs. To execute this, Franklin County Emergency Management will assist and coordinate resources for the mitigation actions and provide strategic outreach to implement mitigation actions that meet the goals identified in this Plan.

Appendix A: Stakeholder Participation and Documentation

This appendix describes the methods Franklin County used to involve stakeholders in the mitigation planning process.

A.1 Local representatives, participation activities, and planning documents to facilitate the planning process

A.1.1 Plan Participants and Representatives

Organization	Name	Title	Email
Benton-Franklin Health District	Eli Bear	Operations Supervisor–Emergency Preparedness	Eli.bear@bfhd.wa.gov
Washington State Emergency Management Division	Brian Terbush	Earthquake/Volcano Program Coordinator	Brian.terbush@mil.wa.gov
City of Mesa	Cade Scott	Public Works Superintendent and FCEM Board Member	Pwsmesa@yahoo.com
City of Connell	Chris Lee	Police Chief	Clee@connelwa.org
City of Pasco	Chris Mortensen	Deputy Fire Chief	Mortensenc@pasco-wa.gov
Franklin County Public Works Department	Craig Erdman	Director	Cerdman@franklincountywa.gov
City of Pasco	Craig Raymond	Community & Economic Development Deputy Director	Raymondc@pasco-wa.gov
Franklin County Planning and Building	Wesley McCart	Director	wmccart@franklincountywa.gov
City of Connell	Hallie Tuck	Public Works Director	Htuck@connellwa.org
Franklin County Fire District #3	Jason Langston	Captain	Jlangston@fcfd3.org
Franklin County Assessors Office	John Rosenau	Franklin County Assessor	Jrosenau@franklincountywa.gov
Franklin County Conservation District	Kara Kaelber	Assistant Manager	Kara-kaelber@franklincd.org
Franklin County Public Works	Kathleen Stacey-Neuman	Engineer	Kneuman@franklincountywa.gov
National Weather Service – Pendleton	Katy Branham	Warning Coordination Meteorologist	Katy.branham@noaa.gov
City of Connell	Ken Wofffenden	Fire Chief and FCEM Board Member	Kwoffenden@connellwa.org
City of Pasco	Kent McCue	Public Works Operations Manager	Mccuek@pasco-wa.gov
City of Pasco	Kevin Crowley	Fire Chief and FCEM Board Member	Crowleyk@pasco-wa.gov

City of Pasco	Maria Serra	Public Works Director	Serram@pasco-wa.gov
Housing Authority of the City of Pasco and Franklin County	Matt Truman	Executive Director	Mtruman@hacpfc.org
Franklin County	Michael Morgan	GIS Manager	Mmorgan@franklincountywa.gov
City of Kahlotus	Michael Robitaille	Mayor and FCEM Board Member	Mayor.robitaille@gmail.com
Franklin County	Mike Troidl	Building Official	Mtroidl@franklincountywa.gov
Franklin County Fire District #3	Mike Harris	Fire Chief	Mharris@fcfd3.org
Washington Resource Conservation & Development Council	Sophia Fox	Environmental Planner	Sophia@washingtonrcd.org
WSU Extension Office	Tim Waters	Director	Twaters@wsu.edu
Washington State Department of Natural Resources	Tricia Sears	Geological Planning Liaison	Tricia.sears@dnr.wa.gov
WashingtonState Department of Natural Resources – Fire Management Division	Charlie Landsman	Community Reslience Coordinator	Charles.landsman@dnr.wa.gov
Franklin County Emergency Management	Sean Davis	Director	Sdavis@franklincountywa.gov
Franklin County Emergency Management	Jordan Hanes	Deputy Director	Jhanes@franklincountywa.gov

A.1.2 Mitigation Workshops

Placeholder Image

A.1.2.1 Mitigation Workshop Documentation

Placeholder
Image

Placeholder Image

Placeholder Image

A.1.2.2 Workshop Attendee List

Name	Organization	Title

A.1.2.3 Workshop Photos

Placeholder
Image

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Image

A.1.3 Mitigation Webinar Participation

Name	Organization	Title

A.1.4 Mitigation Participation Crosswalk

Name	Webinar Attendance	2024 All-Hazard Mitigation Plan Workshop	Other Participating Activities (Public Survey)	Hazard Analysis	New Mitigation Action	Reviewed/Updated Past Mitigation Project(s), as applicable

Appendix B: Public Involvement Activities and Documentation

Below are samples of public information and public involvement activities that were used during the development of the *Franklin County All-Hazard Mitigation Plan*, including:

- Survey Results
- Public Meeting Announcements / News Releases
- Outreach Activities
- Public Meeting Photos

Organization	Date	Outreach Activity	Method of Sharing

B.1 Survey

Note: If you are accessing the Microsoft Word version of this Plan, double-click on the icon below to access the survey report and findings. If you are using the PDF version of the Plan, please access the "Attachments" feature in Adobe PDF and click the corresponding file. This is the redacted version.

[INSERT FILE]

B.2 Public Meeting Announcements / News Releases

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Image

Placeholder Image

Placeholder Image

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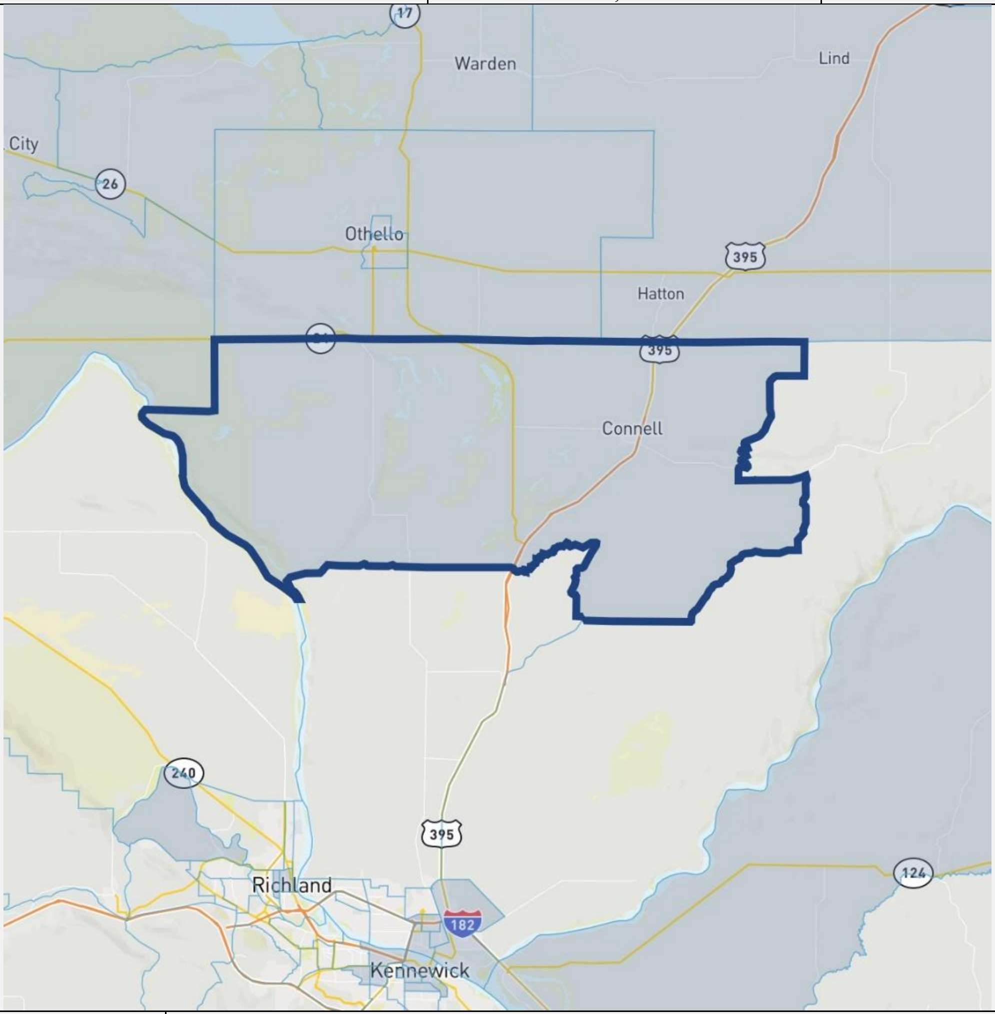
Image

Appendix C: Disadvantaged Community Maps

FRANKLIN COUNTY, WA		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - CENSUS TRACT ANALYSIS		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
53021020800	10,360	NO



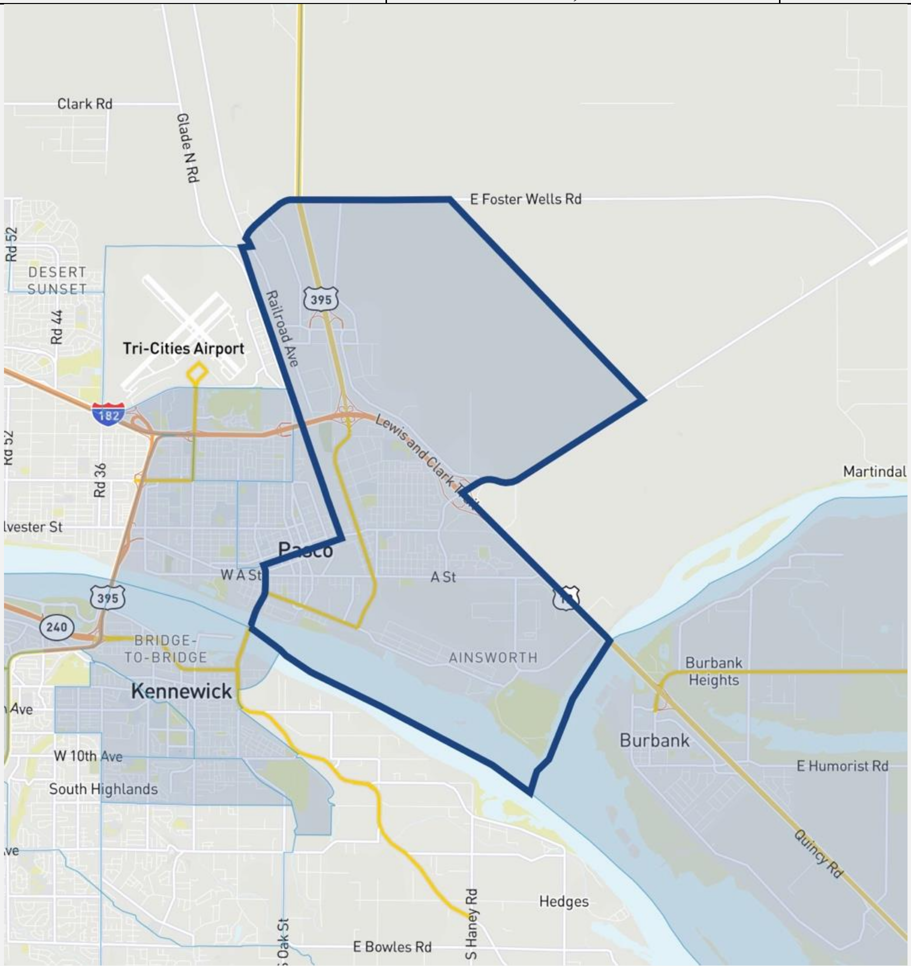
BURDEN	DESCRIPTION AND REPORTED DATA
Workforce Development	***Linguistic Isolation*** *Share of households where no one over age 14 speaks English very well (94th)*
Workforce Development	***High school education*** *Percent of people ages 25 years or older whose high school education is less than a high school diploma (94th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2024)

FRANKLIN COUNTY, WA

CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - CENSUS TRACT ANALYSIS

CENSUS TRACT 2010 ID	CENSUS TRACT POPULATION	LOW INCOME TRACT?
53021020100	11,279	YES



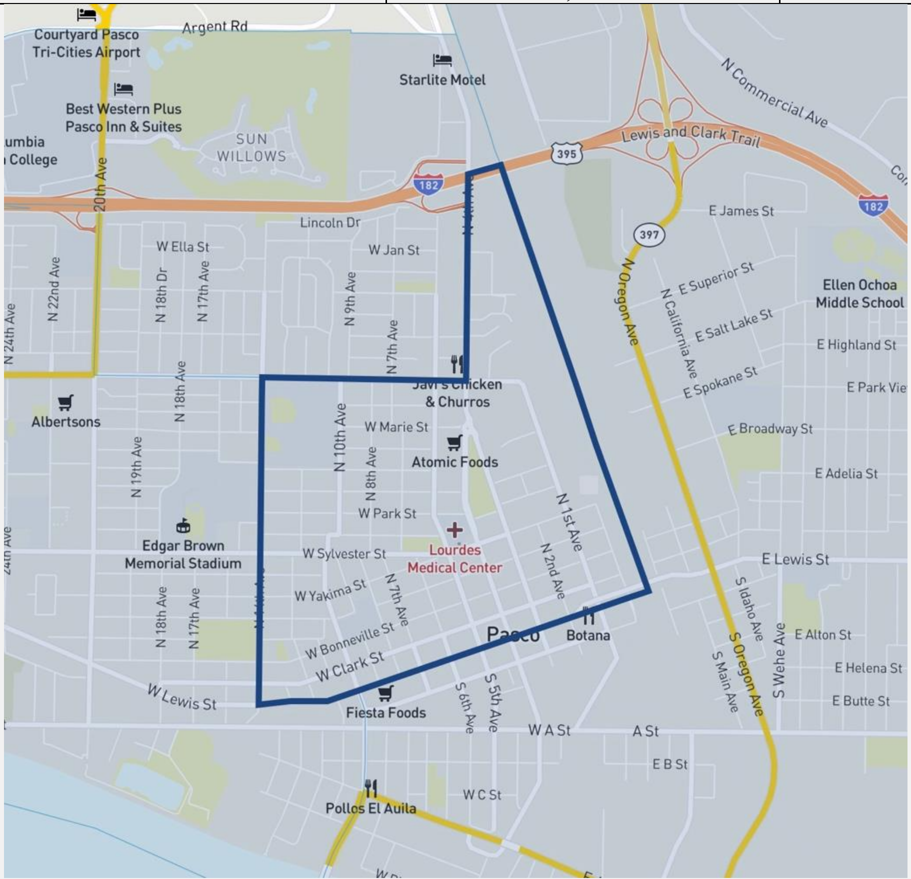
BURDEN	DESCRIPTION AND REPORTED DATA
Legacy Pollution	***Proximity to Risk Management Plan facilities:*** *Count of Risk Management Plan (RMP) facilities within 5 kilometers (99th)*
Legacy Pollution	***Proximity to Superfund sites:*** *Count of proposed or listed Superfund (or National Priorities List (NPL)) sites within 5 kilometers (91st)*
Workforce Development	***Linguistic isolation:*** *Share of households where no one over age 14 speaks English very well (99th)*
Workforce Development	***Unemployment:*** *Number of unemployed people as a part of the labor force (92nd)*
Workforce Development	***High School Education:*** *Percent of people ages 25 years or older whose high school education is less than a high school diploma (56%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2024)

FRANKLIN COUNTY, WA

CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - CENSUS TRACT ANALYSIS

CENSUS TRACT 2010 ID	CENSUS TRACT POPULATION	LOW INCOME TRACT?
53021020200	6,668	YES



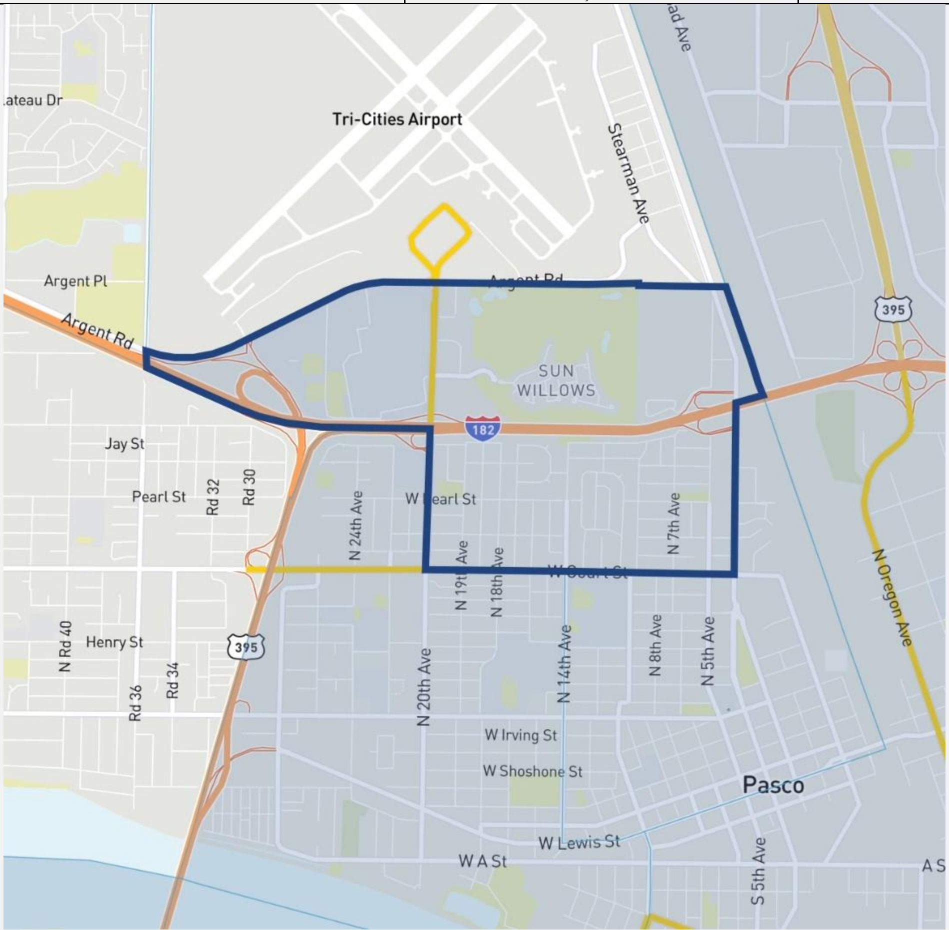
BURDEN	DESCRIPTION AND REPORTED DATA
Legacy Pollution	***Proximity to Risk Management Plan facilities:*** *Count of Risk Management Plan (RMP) facilities within 5 kilometers (99th)*
Workforce Development	***Linguistic isolation:*** *Share of households where no one over age 14 speaks English very well (99th)*
Workforce Development	***Poverty:*** *Share of people in households where income is at or below 100% of the Federal poverty level (90th)*
Workforce Development	***High School Education:*** *Percent of people ages 25 years or older whose high school education is less than a high school diploma (47%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2024)

FRANKLIN COUNTY, WA

CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - CENSUS TRACT ANALYSIS

CENSUS TRACT 2010 ID	CENSUS TRACT POPULATION	LOW INCOME TRACT?
53021020300	5,551	YES



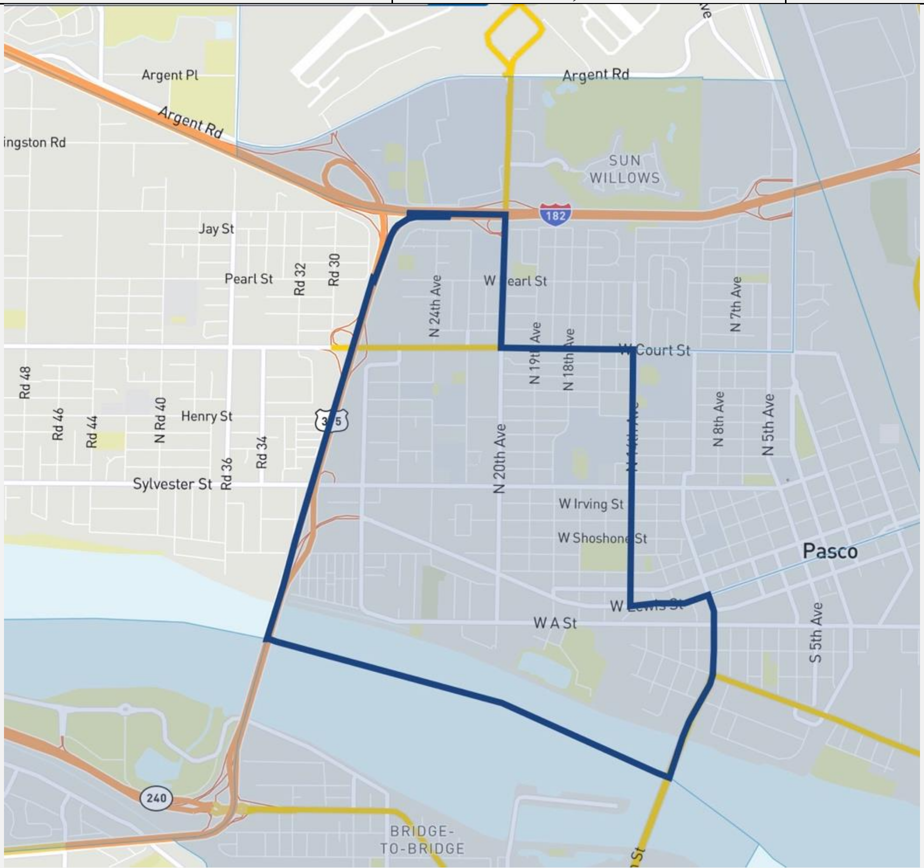
BURDEN	DESCRIPTION AND REPORTED DATA
Legacy Pollution	***Proximity to Risk Management Plan facilities:*** *Count of Risk Management Plan (RMP) facilities within 5 kilometers (99th)*
Workforce Development	***Linguistic isolation:*** *Share of households where no one over age 14 speaks English very well (96th)*
Workforce Development	***High School Education:*** *Percent of people ages 25 years or older whose high school education is less than a high school diploma (38%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2024)

FRANKLIN COUNTY, WA

CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - CENSUS TRACT ANALYSIS

CENSUS TRACT 2010 ID	CENSUS TRACT POPULATION	LOW INCOME TRACT?
53021020400	9,000	YES



BURDEN	DESCRIPTION AND REPORTED DATA
Climate Change	***Projected flood risk:*** *Projected risk to properties from projected floods, from tides, rain, riverine and storm surges within 30 years (93rd)*
Housing	***Lack of indoor plumbing:*** *Share of homes without indoor kitchens or plumbing (98th)*
Unemployment	*Number of unemployed people as a part of the labor force (91st)*
Legacy Pollution	***Proximity to Risk Management Plan facilities:*** *Count of Risk Management Plan (RMP) facilities within 5 kilometers (97th)*
Workforce Development	***Linguistic isolation:*** *Share of households where no one over age 14 speaks English very well (98th)*
Workforce Development	***Low median income:*** *Comparison of median income in the tract to median incomes in the area (92nd)*
Workforce Development	***High school education:*** *Percent of people ages 25 years or older whose high school education is less than a high school diploma (44%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2024)

APPENDIX D: HAZMAT Incidents

<table>
<tr><th colspan="9">FRANKLIN COUNTY, WA</th></tr>
<tr><th colspan="9">US DOT HAZARDOUS MATERIALS INCIDENTS (2010-2022)</th></tr>
<tr><th>Identification Number</th><th>Date Of Incident</th><th>Incident City</th><th>Carrier Reporter Name</th><th>Mode Of Transportation</th><th>Commodity Long Name</th><th>Hazardous Class</th><th>Fatalities</th><th>Total Damages</th></tr>
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APPENDIX E: Hazard Mitigation Actions from 2019 Plan

Initiative Name	Initiative Category	Initiative Description	Priority	stimated Co	Funding Sources	Responsible Organization	Timeline	Status	Contact Information
FC-MH1	Development Regulations	Review and Update/Improve Critical Area Regulations	High	$2,000	U	Franklin County Planning Department		Complete. FCC Chapter 18.08 was amended with the passage of Ordinance 8-2023.	Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov
FC-MH2	Development Regulations	Incorporate latest update to the Uniform Building Code into the County Building Code Ordinance	Low	$2,000	U	Franklin County Planning Department		Complete. Ordinance 5-2024 and 6-2024 amended Title 15 "Buildings and Construction" and incorporated the latest updates.	Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov
FC-FLH1	Development Regulations	Review and Update/Improve Floodplain Regulations	Moderate	$2,000	U	Franklin County Planning Department		Completed. The Flood Damage Prevention Code at FCC Chapter 15.08 was amended with the passage of Ordinance 2-2022.	Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov
FC-FIH1	Public Education	Review and improve Wildfire Mitigation Program Regulations	Moderate	$1,000	U	Franklin County Planning Department	Implemented Maintain	Not Complete	Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov
FC-FIH2	Public Education	Distribute Firewise-type educational brochures with occupancy permit.	High	$2,000	C, H, I, L, U	Franklin County Emergency Management	2020	We continue to have Firewise-type educational brochures available at our local facility.	Sean Davis - Director EM - sdavis@franklincountywa.gov
FC-FIH3	Emergency Response	Establish a delegation of authority plan to expedite the transition process between incident command teams.	High		U, C	Franklin County Commissioners	2021	Completed.	Sean Davis - Director EM - sdavis@franklincountywa.gov
FC-FIH4	Development Regulations	Adopt a County ordinance requiring all existing and new construction to create and maintain "defensible space" around homes.	Moderate		U	Franklin Conservation District and WSU Extension	Completed Maintain	I wasn't involved in the previous versions of this, so was unaware of the initiatives that WSU Extension were responsible for. We don't really do that type of work in my office, but if it is something that is needed, we could work to identify individuals that might be able to help in the areas below	Tim Waters - WSU Extension - twaters@wsu.edu
FC-FIH5	Public Education	Implementation of youth and adult wildfire educational program	High	$2,000	L, U	Franklin Conservation District and WSU Extension	2020	I wasn't involved in the previous versions of this, so was unaware of the initiatives that WSU Extension were responsible for. We don't really do that type of work in my office, but if it is something that is needed, we could work to identify individuals that might be able to help in the areas below	Tim Waters - WSU Extension - twaters@wsu.edu
FC-FIH6	Public Education	Prepare for wildfire events in high-risk areas by conducting home site risk assessments and developing area-specific "Response Plans to include participation by all affected jurisdictions and landowners	High	$5,000	C, L, U	Franklin Conservation District and WSU Extension	2020	I wasn't involved in the previous versions of this, so was unaware of the initiatives that WSU Extension were responsible for. We don't really do that type of work in my office, but if it is something that is needed, we could work to identify individuals that might be able to help in the areas below	Tim Waters - WSU Extension - twaters@wsu.edu

FC-FIH7	Public Education	Work with area homeowner's associations to foster cooperative approach to fire protection and awareness and identify mitigation needs.	High		C, L, U	Franklin Conservation District	2020		
FC-FIH8	Public Education	Work with WSU Extension, Master Gardeners, and other existing programs to offer Firewise landscaping clinics to assist property owners in maintaining fire-resistant defensible space around structures.	Moderate		C, H, L, U	Franklin Conservation District	2019		
FC-FIH9	Public Education	Develop a range of public education programs to encourage healthy management of natural resources on private property.	High	$2,000	C, H, L	CWPP Steering committee	2023	CWPP is in the process of being updated	
FC-FIH10	Development Regulations/ Public Education	Review building codes and promote the adoption of Firewise standards among builders and homeowners.	Low		U	Franklin Conservation District	Implemented Maintain		
FC-FIH11	Public Education	Promote a County wide chip day where property owners can have their slash chipped.	Moderate		C, H, L, U	Franklin Conservation District	Partially implemented/Ongoing		
FC-FIH12	Wildfire Mitigation	Identify fuel reduction projects throughout the County, but particularly around Pasco.	Moderate		C, L, O, Q, R	Franklin Conservation District	Implemented Maintain		
FC-FIH13	Public Education	Develop a residential/agriculture burning procedures pamphlet that addresses each Fire District, Pasco, and Connell.	Moderate		U	Franklin County Fire Districts	Completed	May need to be reprinted if supplies are getting low - Mike Harris	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org
FC-FIH14	Public Education	Fund the existing Fire Prevention/Public Education team to continue the public information campaign addressing wildland fire, fire safety, Firewise, etc.	Moderate	$3,000	H, L, U	Franklin County Fire Districts	2019	Nobody has the staffing for this program	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org
K-MH4	Critical Facility Replacement Retrofit	Install emergency generator for city hall and community evacuation center/shelter.	High	$50,000	A, D, O, U	City of Kahlotus	Contingent on funding		
K-FI1	Wildfire Mitigation	Purchase used dump truck for debris removal in the wildland urban interface.	Moderate	$20,000	A, K, O, U	City of Kahlotus	Contingent on funding		

FC-FIH15	Emergency Response	Map, develop a GIS database, and provide signage for onsite water sources such as hydrants, underground storage tanks, and drafting or dipping sites on all ownerships across the county.	High		G, O, R, U	Franklin County Fire Districts/	Started Continue (2020)	Michael Mendez at SEComm is maintaining GIS data for fire hydrants and their water sources for the 2 cities in Franklin County that use hydrants (Pasco and Connell), plus Fire District 3 in the Pasco growth area. I also have GIS data for rural water franchises in the county. I am currently not maintaining GIS data for fire hydrants outside of cities, which I believed was turned over to SEComm when they started managing dispatch for Franklin County in 2018, but I can assist if this is identified by SEComm and fire departments as a continuing need. - Michael Morgan For hydrant data, we just ingest whatever we're sent from municipalities to add to our hydrant layer but it's just a layer for visual representation on the CAD map. We don't maintain all the hydrant data. When I started, we had zero hydrant data for Benton City, and only about half of the hydrants for all other municipalities within Benton and Franklin Counties so I don't think it was ever being maintained here. I have no issues though taking that on from here on out. - Michael Mendez	Michael Morgan - mmorgan@franklincountywa.gov Michael Mendez - m.mendez@bces.wa.gov
FC-FIH16	Emergency Response	Develop a program to encourage landowners to install reflective address signage on their drive to allow firefighters and emergency responders to better locate residences.	High	$5,000	K,O,U	Franklin County Fire Districts	Started Continue (2020)	Rural addressing is still ongoing and maintained by FCFD#3 but supplies have not been replenished. Est. $1,000 annually	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org
FC-FIH17	Emergency Response	Develop a program to replace worn out road signage with new reflective road signs to allow firefighters to easily navigate to a wildfire.	High		K,O,U	Franklin County Public Works	2019	Completed	John Christensen - jchristensen@franklincountywa.gov
FC-FIH18	Emergency Response	Improve departmental capability by establishing a program to increase the retention and recruitment of volunteer firefighters.	High		U	Franklin County Fire Districts	2021		
FC-FIH19	Emergency Response	Enhance radio availability in each district, link to existing dispatch, improve range within the region, and convert to a consistent standard of radio types.	High	$20,000	D,U	Franklin County Information Services	2019 Maintain		Michael Namchek - mnamchek@franklincountywa.gov
FC-FIH20	Emergency Response	Training for Fire Districts including FFT1, Engine Boss, EWTZ (Eastern Washington Training Zone), etc.	High	$3,000	L,U	Region 8 Training Group	Yearly	Should be annual and ongoing. $450 each year for Pocket Guides, Instructor Guide and Student Workbook.	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org
FC-FIH21	Facilities Improvement	Install two single-phase backup generators for station 36 in Fire District #3.	High	$100,000	D,L,U	Franklin County Fire District #3	2019	Has not been funded. Increase to $250,000	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org
FC-FIH22	Wildfire Mitigation	Implement the 5-year priority fuels reduction projects identified in the Franklin County CWPP (see *Table G* , and *Figure 11*).	High		C,H,I,L,U	Franklin County Fire Districts	2020	Involve WSU Extension, Master Gardener's for a fire resistant landscape guide for Franklin County. Chelan and Douglas County Extension has a recommended plant guide to reduce flammable fuels around the home. https://extension.wsu.edu/chelan-douglas/gardening/firewise-landscapes/	Mike Harris - Fire Chief FCFD#3 - mharris@fcfd3.org

NEW						Franklin County Planning Department	2025, the County will be working on a periodic update to the Comprehensive Plan. The project will conclude in		Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov
NEW						Franklin County Public Works	with the PW Dept. mentioned that there is maintenance needed on a bridge, unsure if there are any natural hazards associated with it's condition. There are two road which have a continual water runoff issue and need to be raised. Elm and Everett Road and the other is Birch and Dayton. "A culvert would be helpful in both situations		Nicole Stickney, AICP (Contract Planner to Franklin County) contractplanner@franklincountywa.gov Craig Erdman - cerdman@franklincountywa.gov Andrea R. Cardoza - arcardoza@franklincountywa.gov Shirley Jones - sjjones@franklincountywa.gov
P-SSH1	Hazard Damage Reduction	Inspect all trees within falling distance of critical facilities	High	$500	D,L,U	Pasco Facilities	2019 Maintain	Our city arborist has inspected the trees within the city that pose hazards and has trimmed or removed any limb or tree that was considered a hazard. This is a continuous process that never stops. We do our best to mitigate any tree risk within the city.	Patrick Hicks - Parks Manager - hicksp@pasco-wa.gov
P-MH1	Critical Facility Replacement/ Retrofit	Procure and install emergency generators for the water and wastewater treatment plants.	High	$400,000	C, G, O, U	Pasco Public Works	2020		
P-MH2	Development Regulations	Incorporate mitigative policies into the planning process for all capital improvement projects.	High	$5,000	G, P, U	Pasco Planning	2021		
P-MH3	Development regulations	Update and maintain all hazard-specific ordinances.	Moderate	$4,000	A, N, O, R, U	Pasco Planning	2019		
P-MH4	Hazard Preparedness	Procure and install an adequate number of tone-alert radios for all city departments to ensure that each work area in all city buildings has an ability to receive rapid notification of emergency information during disasters or serious emergencies.	Moderate	$3,400	A,D,U	Franklin County Emergency Management/Pasco Fire Department	2019	Remove	Kevin Crowley - Fire Chief - crowleyk@pasco-wa.gov Chris Mortensen - Deputy Fire chief - mortensenc@pasco-wa.gov

P-FI1	Public Education	Implement a FIREWISE public education program to better inform citizens as to the wildland-urban interface fire hazard that exists locally and provide citizens with information to reduce their vulnerability to wildland fires.	Moderate	$10,000	I, L, U	Pasco Fire Department	2019	Remove - Firewise information had been offered at public functions like family festivals and national night out.	Kevin Crowley - Fire Chief - crowleyk@pasco-wa.gov Chris Mortensen - Deputy Fire chief - mortensenc@pasco-wa.gov
C-FIH1	Wildfire Mitigation	Provide residents of Connell with a one-time offer to remove debris from selected properties at no charge to the property owner (Properties will be identified by the Chief).	Moderate		L, U	Connell Fire	Implemented Maintain	Ongoing Project	Ken Woffenden - Fire Chief Connell - kwoffenden@connellwa.org
C-FIH2	Wildfire Mitigation	Purchase and installation of backup generator at the City of Connell Fire Department	High	$30,000	A, O, U	Connell Fire Department	Contingent on funding	Completed	Ken Woffenden - Fire Chief Connell - kwoffenden@connellwa.org
C-MH1	Critical Facilities Replacement Retrofit	Procure, install, and test propane powered emergency electric power generator of sufficient size and capability to operate the pump at Well #8 for at least 3 days.	High	$250,000	A, J, O, U	City of Connell	Contingent on funding		
C-MH2	Critical Facilities Replacement Retrofit	Relocate City Hall/ Police Department outside floodplain and ensure ability to conduct emergency operations for prolonged periods during a multitude of natural hazard emergencies.	High	#########	A, G, N, O, P, U	City of Connell	Contingent on funding		
C-EH1	Critical Facilities Replacement Retrofit	Install and replace/upgrade city water distribution lines to meet current seismic standards.	Moderate	#########	A, C, J, N, O, P, U	City of Connell	Contingent on funding		
C-FLH1	Plan Coordination & Implementation	Plan and implement improvements to the Esquatzel coulee floodway to reduce flood potential.	Moderate	#########	A, B, G, H, J, N, O, P, U	City of Connell	Contingent on funding		
C-EH2	Critical Facilities Replacement Retrofit	Install/replace wastewater collection lines to ensure system meets current seismic code and incorporates mitigative features that will reduce the affects to the system from an earthquake.	Moderate	#########	A, J, O, U	City of Connell	Contingent on funding		
C-MH3	Critical Facilities Replacement Retrofit	Install backup generator at the Community Center in Connell.	Moderate	$100,000	A, U	City of Connell	Contingent on funding	Completed	
C-MH4	Critical Facilities Replacement Retrofit	Install a backup generator at the Fire Station, including site preparation (Pad, Electrical, etc.).	Moderate	$100,000	A, U	City of Connell	Contingent on funding	Completed	
M-MH1	Critical Facility Replacement Retrofit	Install emergency electrical power generator at Water Well #1.	High	$40,000	U	City of Mesa	Completed	n/a	Cade Scott - mentioned that they may want to look into a generator on wheels to share between water wells.
M-SSH1	Hazard Damage Reduction	Inspect trees around public facilities and trim/remove to prevent damage due to broken branches or downed trees during a severe storm.	High	$6,000	O, U	City of Mesa	2019 Maintain	can keep	Cade Scott
K-MH1	Critical Facility Replacement Retrofit	Install emergency Generators for water wells.	High	$60,000	U	City of Kahlotus	Completed		
K-MH2	Plan Coordination and Implementation	Develop and implement a Continuity of Operations Plan	Moderate	$10,000	A, U	City of Kahlotus	2019		
K-MH3	Critical Facility Replacement Retrofit	Establish an emergency well as a backup source for city water	High	$50,000	A, G, H, O	City of Kahlotus	Contingent on funding		

K-MH4	Critical Facility Replacement Retrofit	Install emergency generator for city hall and community evacuation center/shelter.	High	$50,000	A, D, O, U	City of Kahlotus	Contingent on funding		
K-FI1	Wildfire Mitigation	Purchase used dump truck for debris removal in the wildland urban interface.	Moderate	$20,000	A, K, O, U	City of Kahlotus	Contingent on funding		

APPENDIX F: Resolutions of Adoption

Resolutions will be included upon approval and adoption of the Plan.