Washington State

Enhanced Hazard Mitigation Plan

Effective 2018-2023

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Prepared by the Washington Emergency Management Division

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Executive Summary and Section Guide

The Washington State Enhanced Hazard Mitigation (SEHMP) Plan profiles hazards, identifies risks and vulnerabilities, and proposes strategies and actions to reduce risks to people, property, the economy, the environment, infrastructure and first responders. The Washington SEHMP is a *multi-agency, statewide document*. It incorporates best practices, programs and knowledge from multiple state agencies, tracks progress in achieving mitigation goals through state and local programs and strategies, and communicates that progress among agency partners and elected leadership.

Key Definitions

Mitigation is taking long-term steps to reduce the risk to lives and property and ensure economic continuity in the event of a disaster. Risk can be reduced by:

- Reducing the value of exposed assets (e.g. converting developed land into a park)
- Reducing the vulnerability of an asset to a hazard (e.g. elevating a home in a floodplain)
- Reducing or eliminating the risk to an asset (e.g. replacing a culvert to lower floodplain)

A mitigation program provides resources, technical expertise, and/or coordination that leads to, or is the component of, the reduction of a risk or hazard identified in the 2018 SEHMP.

To be successful, the SEHMP:

- Identifies and explains the risks to Washington State from all major hazards.
- Coordinates and highlights mitigation activities across multiple state agencies.
- Develops a strategy and process to monitor and report on annual mitigation activities throughout the state.
- Identifies best practices to help local jurisdictions get the most out of mitigation planning processes and write more effective mitigation plans.
- Establishes updated guidance for Hazard Mitigation Assistance Grant programs.
- Builds a Multi-Agency Hazard Mitigation Workgroup of state agencies and federal partners involved in mitigation that will meet at least bi-annually to assess mitigation progress and support interagency efforts.
- Meets or exceeds FEMA requirements in 44 CFR Part 201.

How to Read this Plan

This plan meets the state mitigation planning requirements of 44 CFR Part 201 as interpreted by the Federal Emergency Management Agency (FEMA). It is divided into sections based on FEMA planning requirements and similar subject-matter.

Section 1: State Overview

Section 1 outlines Washington State's capabilities, including plans and policies that support hazard mitigation, and the relationship of the SEHMP to other state plans as well as the responsibilities and commitments of state and local jurisdictions to mitigation. Finally, letters of adoption and statements of promulgation are included in this section.

- For Local Jurisdictions: See this section for an outline of the relationship between state, local and federal mitigation planning expectations, commitments and responsibilities.

- For State Partners: This section describes the relationship between agency plans and policies and mitigation activities undertaken by local jurisdictions and the state. Use this section to help coordinate and identify stakeholders for policy changes or guidance updates.

Section 2: Planning Process

Section 2 describes the plan development process including outreach to local jurisdictions and state agencies, the plan update schedule, the strategy development process, and the monitoring and implementation strategy. A concept of operations for the Hazard Mitigation Workgroup and its role in long-term plan implementation is also described.

- For State Partners: This section describes your agency's involvement in, and commitment to, hazard mitigation planning and the monitoring and implementation strategy via the Hazard Mitigation Workgroup.

Section 3: Risk Assessment and Hazard Analysis

Section 3 includes hazard profiles, state asset vulnerability assessments and guidance to local jurisdictions undertaking risk assessments.

- For Local Jurisdictions: Use this section for guidance on how to consider each hazard in local mitigation planning and suggestions for mitigation actions.

- For State Partners: Use the hazard profiles as tools when updating planning guidance, emergency operations plans, ordinances, regulations or requirements and to coordinate any descriptions or analyses of hazards and risk.

Section 4: Comprehensive Mitigation Program

Section 4 lays out the state management of the Hazard Mitigation Assistance (HMA) grant programs, including prioritization methods, and our commitment to technical assistance to local jurisdictions. This section also includes planning technical assistance and the process for reviewing and approving hazard mitigation plans.

- For Local Jurisdictions: This section includes guidance and resources for local jurisdictions and potential eligible sub-applicants on the:
    - Development of comprehensive mitigation strategies, goals and action items.
    - Preparation of HMA grant applications, including cost-benefit analysis.

  - The development and approval of hazard mitigation plans.

- For State Partners: State agencies are eligible sub-applicants for many HMA grants. The guidance included in this section can be beneficial if submitting applications.
- For Federal Partners: See this section for a description of how Washington State develops project priorities and manages the HMA program and the mitigation planning program.

Section 5: State Mitigation Strategy

Section 5 details the goals, strategies and action items developed by the Hazard Mitigation Workgroup. These will be tracked over the SEHMP five-year cycle. This section also describes how mitigation strategies are prioritized.

- For State Partners: Use this section to track current mitigation strategies and for guidance on which mitigation programs are currently being included in the annual resilience report and to track past mitigation action items, identify the vulnerability of state facilities.

A Note about Acronyms

This plan uses acronyms following the first complete use of a word. The following are the most commonly used acronyms throughout this document.

- SEHMP: State Enhanced Hazard Mitigation Plan
- GMA: Growth Management Act
- CAO: Critical Areas Ordinance
- HMA: Hazard Mitigation Assistance Grants
- CWPP: Community Wildfire Protection Plan
- HMP, AHMP, or NHMP: Natural Hazard Mitigation Plan or All-Hazard Mitigation Plan
- DNR: Washington State Department of Natural Resources
- ECY: Washington State Department of Ecology
- EMD: Washington State Emergency Management Division
- MIL: Washington State Military Department
- WSDOT: Washington State Department of Transportation
- DOH: Washington State Department of Health
- UTC: Washington State Utilities and Transportation Commission
- DAHP: Washington State Department of Archaeology and Historic Preservation
- COM: Washington State Department of Commerce
- OIC: Washington State Office of the Insurance Commissioner
- OSPI: Washington State Office of the Superintendent of Public Instruction
- SCC: Washington State Conservation Commission
- FEMA: Federal Emergency Management Agency

Overview and Capabilities

Reducing hazards has long been a priority of the State of Washington. In the 1950s, earthquake construction standards were established in state law for schools, hospitals and places of public assembly for 300 or more people (RCW 70.86) and assistance was made available to local jurisdictions for flood control projects and planning (RCW 86.26). The Growth Management Act (GMA) of 1990 requires all cities, towns and counties to identify and protect critical areas, such as frequently flooded areas and geologically hazardous areas, and for the fastest-growing counties (and their cities) to develop comprehensive land use plans to limit growth to identified urban growth areas (RCW 36.70A). More recently, the 2015 editions of the International Codes (I-Codes) for building, residential, fire and mechanical codes have been effective since July 1, 2016, and portions of the International Wildland Urban Interface Code have been effective since June 7, 2018 (RCW 19.27.031).

Among the best examples of hazard mitigation in state government are the GMA, the Flood Control Assistance Account Program (FCAAP), Floodplains by Design, the Community Wildfire Protection Program, the Firewise Program, the Bridge Seismic Retrofit Program and the FEMA-funded (with State and Local matching funds) state-administered Hazard Mitigation Assistance programs (HMA). However, a myriad of other programs, funding sources, executive orders and interagency agreements have elements that support or facilitate hazard mitigation. These programs are discussed later in this section.

Division of Hazard and Risk Management in Washington State

One challenge in maintaining a comprehensive mitigation program, even when the state has committed significant resources, is that responsibility in the Revised Code of Washington for managing hazards is spread out across multiple state agencies. Effective multi-hazard mitigation therefore requires a commitment to cooperation.

Lead Agencies for the Mitigation, Response, and Recovery of Selected Hazards		
Hazard	**Primary Agency(s)**	**Secondary Agency(s)**
Avalanche	WSDOT (Avalanche Control)	National Weather Service (Forecasting and Warning)
Drought	Ecology (Planning, Preparedness, Response, Mitigation)	DOH (Water Systems, Response), WSDA (Crops and Livestock Response)
Earthquake	DNR (Geology)	EMD (Public Information), USGS (Geology)
Flood	Ecology (Planning, Mitigation, Funding)	EMD (Funding)
Landslide	DNR (Mapping)	EMD (Mitigation), Commerce (Mapping and Mitigation)
Severe Storm	National Weather Service (NWS, Forecasting, Preparedness)	
Tsunami	EMD (Public Information, Warning, Mitigation)	NOAA (Public Information, Warning), DNR (Mapping)

Volcano	USGS (Mapping, Monitoring, Warning, Public Information), EMD (Public Information)	DNR (Mapping)
Wildfire	DNR (Response, Mitigation)	EMD (Mitigation), DFW (Response), Ecology (Recovery)
Coastal Erosion	Ecology (Mitigation, Planning)	
Agricultural Disease Outbreak	WSDA (Response, Mitigation)	USDA (Mitigation, Response)
Dam Safety	Ecology (Mitigation, Planning, Monitoring, Regulating)	FEMA (National Dam Safety Program)
Pipelines	UTC (Monitoring, Regulating)	US Department of Energy
Public Health	DOH (Planning, Monitoring, Response, Mitigation)	
Hazardous Materials	Ecology (Planning, Response)	EMD (Planning)
Climate Change	Ecology (Planning, Research)	Health (Planning), EMD (Planning, Mitigation), DFW (Planning, Mitigation), WSDOT (Planning, Mitigation)
Air and Water Quality	Ecology (Monitoring, Regulating), Health (Monitoring, Regulating)	
Oil Trains	Ecology (Regulating, Monitoring, Response)	EMD (Response, Planning)

Mitigation is further complicated by the complexity of state – federal relationships for grantmaking purposes. In many cases, there are multiple state partners for a single federal agency or a state agency may pass through federal dollars to another state agency. Accordingly, the successful management of grant dollars for hazard mitigation relies heavily on cooperation, especially where local or state jurisdictions must be careful to not mix federal funds, such as with the relationship between CWPPs and HMPs. A great example of a successful federal program delivered by multiple state agency partners is FEMA's RiskMAP. The following table lists some of the most important hazard mitigation funding programs and partnerships for Washington State.

Federal – State Interagency Relationships and Critical Mitigation Fund Sources		
Fund Source/Program	**State Partners (Primary First)**	**Federal Resource**
Hazard Mitigation Assistance Grants (PDM, FMA, HMGP)	EMD, DNR, ECY	FEMA
RiskMAP	ECY, EMD, DNR, COM	FEMA
Water Revolving Loan Fund	Ecology	EPA
Earthquake Early Warning	EMD, DNR	USGS
StormReady	EMD	NOAA
TsunamiReady	EMD	NOAA
Silver Jackets	ECY, EMD, DNR	USACE
Community Development Block Grants	COM	HUD

Federal – State Interagency Relationships and Critical Mitigation Fund Sources		
National Tsunami Hazard Mitigation Program	EMD, DNR	NOAA
National Earthquake Hazard Reduction Program	EMD, DNR	USGS, FEMA
National Flood Insurance Program	ECY	FEMA
Public Assistance	EMD	FEMA
Community Assistance Grants	DNR	BLM
National Dam Safety Program	ECY	FEMA
Volcano Hazards Program	EMD, DNR	USGS
Earthquake Hazards Program	EMD, DNR	USGS

Agencies also must work together to prepare for, respond to, mitigate and recover from disasters since the responsibilities for each kind of hazard cross multiple mission areas and the regulatory authority for regulating risk is deconcentrated as well. While this fragmentation can make effective mitigation more difficult, it also leads to greater opportunities for the development and maintenance of successful partnerships. The workgroups and programs listed in the Mitigation Strategy section and Comprehensive Mitigation Program section are some of the ways Washington works together.

Best Practices: CWPPs and HMPs

Community Wildfire Protection Plans and Hazard Mitigation Plans are both federally-funded and use nearly-identical requirements. Nevertheless, the close relationship between the two plans provides an opportunity to integrate existing CWPPs into updated HMPs if federal funds do not pay for the integration. Future FEMA mitigation planning grants can update a complete and integrated hazard mitigation plan and communities may be able to use their mitigation plan to fulfill CWPP requirements from BLM. This is an example of where careful cooperation and integration between state, federal and local partners can lead to better planning practices and more efficient use of resources.

Local, State, and Federal Responsibilities and Involvement in Mitigation

Most of the above, and other, risk-reducing activities, projects and programs in Washington State are carried out by local jurisdictions through planning, public information, capital improvements and environmental measures. As a home rule state, it is the lowest-level of incorporated government that has the most responsibility to implement mitigation programs

In general, the federal level sets requirements for local and state government and enforces those requirements through grant restrictions. The state administers federal grants and adds additional requirements for local authorities. Local jurisdictions and authorities are responsible for implementing mitigation activities and administering programs in accordance with grant requirements.

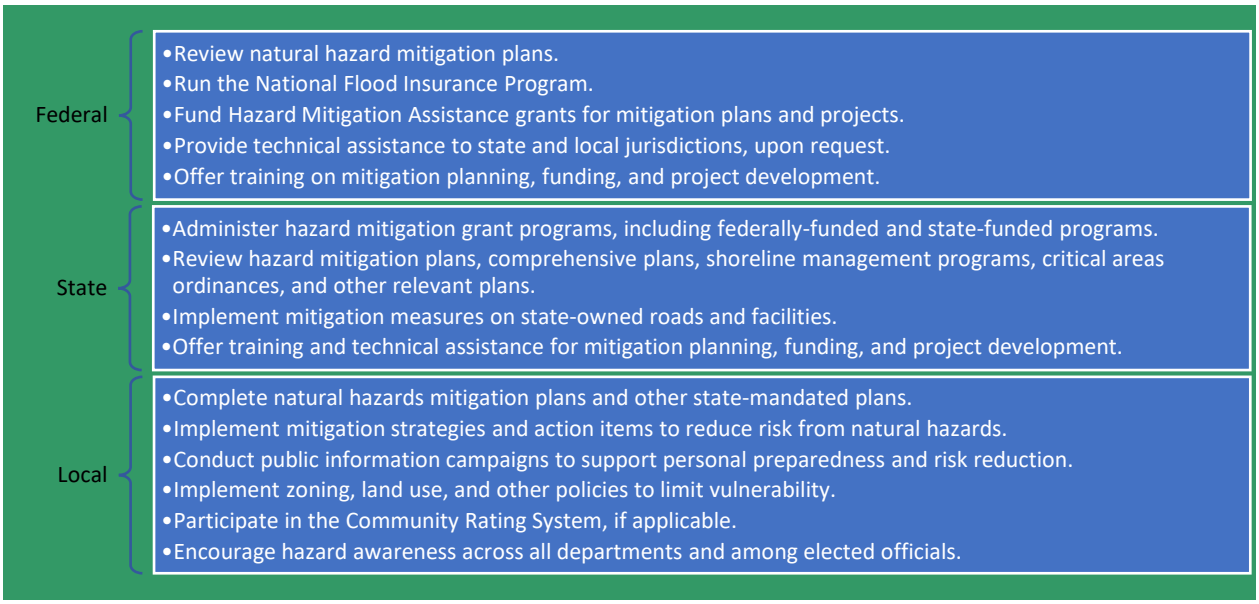


FIGURE 1: MITIGATION ACTIVITIES AND RESPONSIBILITIES

State Expectations for Maintaining a Mitigation Program

To maintain funding eligibility for the Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program, as well as to receive aid for permanent work (Categories C-G) under a Disaster Declaration authorizing Public Assistance, the state must maintain an approved and up-to-date hazard mitigation plan. The "Enhanced" designation provides an additional 5 percent of the total disaster declaration value toward the Hazard Mitigation Grant Program.

HMGP Award for Washington = Damages Declared x 20 percent (normally x 15 percent)

The extra 5 percent in many disasters is worth millions. As such, maintaining the enhanced designation is one of the most important state expectations.

As part of maintaining the enhanced designation, the state must maintain a comprehensive mitigation program. This includes the mitigation grant program coordination through Washington EMD as well as the establishment and maintenance of a close working relationship across state agencies. The mitigation grant program assistance includes outreach and engagement with local jurisdictions and technical assistance in developing mitigation plans and receiving and managing mitigation grants. EMD is assessed annually for compliance with both elements. For more information, see Section 4.

Local Expectations for Mitigation Planning

To receive any mitigation funding through a Hazard Mitigation Assistance grant program, a jurisdiction must have a FEMA-approved and adopted mitigation plan. In some instances, Washington EMD may accept applications from jurisdictions without an approved plan, but usually only in cases where the plan is in development and is close to completion. Local jurisdictions must

also be prepared to identify mitigation projects and submit applications through EMD or other state partners.

Training on mitigation planning, benefit cost analysis and grant administration may be available. To request training, contact the State Hazard Mitigation Officer.

The Growth Management Act (GMA) and associated Critical Areas Ordinance (CAO) are another requirement for local governments. The GMA (RCW 36.70A) requires all cities, towns and counties in the state to identify critical areas and to establish regulations to protect and limit development in those areas. Among the critical areas defined by state law are frequently flooded areas (floodplains, and areas potentially impacted by tsunamis and high tides driven by strong winds) and geologically hazardous areas (those areas susceptible to erosion, landslide, seismic activity or other geological events such as coal mine hazards, volcanic hazard or mass wasting).

The extent to which local jurisdictions in Washington use policy and regulations to control, eliminate, prevent or reduce risk has been found by the Central Puget Sound Growth Management Hearings Board to be within the discretion of local officials in the Tahoma Audubon Society, et al v. Pierce County 2005 decision, stating: "low probability, high consequence" events – is within the discretion of the elected officials; they bear the burden of deciding "How many people is it okay to sacrifice."[1]

Home Rule or Dillon's Rule:

The cornerstone of local response is either Home Rule or Dillon's Rule. The authority of local government derives from the State government. There are two legal paths by which a State grants authority to a local government to govern its own affairs.

Home Rule is a delegation of power from the State to its sub-units of governments (including counties, municipalities, towns or townships, or villages). That power is limited to specific fields and subject to constant judicial interpretation. Home Rule creates local autonomy and limits the degree of State influence in local affairs.

Dillon's Rule is derived from a written decision by Judge John F. Dillon of Iowa in 1868. It is a cornerstone of American municipal law. It maintains that a political subdivision of a State is connected to the State as a child is connected to a parent. Dillon's Rule is used in interpreting State law when there is a question of whether a local government has a certain power.

Dillon's Rule narrowly defines the power of local governments. As long as there have been incidents, emergencies and disasters, local responders and communities have been conducting aspects of emergency management. Events impact local emergency managers and their jurisdictions long before anyone else is involved. For large events, surrounding jurisdictions and charities have played a major role in support. President Theodore Roosevelt entrusted the American Red Cross with coordinating relief efforts.

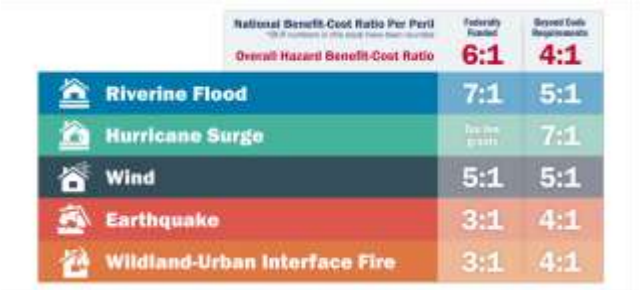
(Definition: FEMA.Gov, IS0230)

[1] *Tahoma Audubon Society, et al v. Pierce County*, 05-3-0004c, Final Decision and Order, July 12, 2005, at 23 – 25.

From the mitigation perspective, this also means that local jurisdiction officials are responsible for properly analyzing, assessing and understanding the risks and vulnerabilities a community faces in order to make an accurate and informed decision. This perspective is supported by decisions of the Growth Management Hearings Board, as in the Seattle Audubon Society v. City of Seattle, where the Board found that the city violated the Growth Management Act when it failed to include a great deal of new science on geologically hazardous areas. [2]

Benefits of Hazard Mitigation

According to the 2017 Interim Report, Natural Hazard Mitigation Saves, from the National Institute of Building Sciences, federal mitigation grants save on average $6 for every $1 spent, and regulatory mitigation measures such as exceeding earthquake, wildfire or flood codes save $4! This varies somewhat by hazard, as illustrated below, but nevertheless demonstrates a huge return on investment in hazard mitigation – in terms of property alone.



These benefits include deaths and injuries prevented as well as damage to facilities prevented.

In Washington State, in many cases the benefits of regulatory measures for these hazards is even greater. In Western Washington, the benefits of stronger earthquake codes are between 4 and 8 to 1. In Central Washington, the benefits of improved wildland fire code are between 2 and 6 to 1. Flood mitigation in Washington has a potential benefit of between $1 and $10 billion, the same as southeastern states like Florida and Georgia.

Source: Natural Hazard Mitigation Saves: 2017 Interim Report.

State Mitigation Capabilities, Fund Sources, and Program Relationships

Hazard mitigation in Washington State is supported by an array of programs, plans, policies and fund sources. The matrix later in this chapter lists each program, policy, plan and potential fund source, including a description of its functionality and how it relates to the State Enhanced Hazard Mitigation Plan. Many of these state programs and policies are implemented locally, such as with the building code programs, critical areas or Shoreline Management Act. The maintenance of these programs, policies and plans materially represents Washington's commitment to mitigation and the state's capability to implement mitigation actions.

Evaluating the Effectiveness of Washington State Mitigation Programs

Due to the effectiveness of risk reduction measures incorporated into the Growth Management Act and associated Critical Areas Ordinance as well as the Shoreline Management Act and programs such as Floodplains by Design, Washington State has a strong history of natural hazard risk reduction

[2] *Tahoma Audubon Society, et al v. Peirce County, 05-3-0004c, Final Decision and Order, July 12, 2005, at 23 – 25., of the Central Puget Sound Growth Management Hearings Board.*

through regulations. This success has not always been evident in mitigation planning however, where, for example, regulatory mitigation strategies are the most often neglected category of mitigation action, strategy or program. The CAO, when applied as intended using best available science, requires local jurisdictions to either prohibit development in "Geologically Hazardous (landslides, erosion, earthquake, liquefaction)" and "Frequently Flooded" areas or include required mitigation measures in local building codes. The effectiveness of this has been demonstrated, for example, in the reduction of current and future flood hazard risk in King, Pierce and Thurston Counties, which have achieved a Community Rating System (CRS) rating of two (out of 10). In fact, communities applying for CRS receive some credit automatically in recognition of state flood risk reduction requirements. Other programs, such as Floodplains by Design, have excelled at uniting benefits and fund sources for both people and the environment. In the areas of risk reduction through land use regulation and multi-benefit projects, Washington has been a leader and this strength is recognized in the floodplain management and environmental communities.

Where state-led risk reduction measures have struggled has been in the establishment of statewide requirements for mitigation of hazards requiring significant local jurisdiction and resident investment, such as with programs to retrofit unreinforced masonry structures and critical facilities. This has given rise to some of the criticisms in the media surrounding the 2016 Cascadia Rising exercise, which accused state government of "planning, doing nothing, planning again." The political, economic and technical difficulty of implementing the Resilient Washington State (2012) recommendations illustrates this. Many local jurisdictions, such as the Cities of Seattle and Everett, have done extensive risk assessments and some mitigation work, but even as of Governor's Directive 16-19, Resilient Washington Subcabinet, state agencies are still working out strategies for establishing a mandatory building code and a model to fund the retrofits of historic structures and schools. Mandatory actions requiring significant local investment and little new state funding are extremely difficult in Washington, where local jurisdictions maintain

Washington State Invests in Local Mitigation by Matching Local and Federal Dollars

Washington is one of a small number of states that matches local investments in mitigation through the HMGP program by paying half of the 25 percent federal required local match. Since 2006, this has totaled $8,785,050.17.

The Public Assistance program is another area with significant state investment. Since 2006, not including DRs 1671 and 1682, Washington State has invested more than $30 million in state funds to match $41 million in local funds for the $352 million received in federal monies. Of this, almost $10 million has been spent on mitigation.

As of February 2018, the following is a summary of federal, state, and local funding to the Public Assistance Program:

- Federal Share (75%): $351,337,514
- State Share (25%): $30,324,325
- Local Share (12.5%): $41,737,950
- Federal Admin Costs: $166,493
- State Admin Costs: $22,418,908

most of the authority to implement building codes and land use laws.

An area of mixed success has been in the state's demonstrated commitment to funding mitigation using state dollars. One strength in this area has been the Washington State Legislature's continued allocation of 12.5 percent matching funds to support meeting the federal match requirements. Since 2006, this has totaled $8,785,050.17 – this number includes only the state share for projects that have been awarded. Several million dollars more in projects from 2015, 2016 and 2017 have yet to be awarded and are not included in this number. This is a huge investment and removes much of the burden from local jurisdictions. In other areas, however, the state continues to under-invest. For example, the Flood Control Assistance Account Program (FCAAP) is authorized in RCW, but is cut by more than 50 percent each legislative session. This program would, if fully funded, support local flood mitigation and floodplain management projects. On another note, Washington has seen an expansion of the Floodplains by Design program, an innovative multi-benefit floodplain mitigation and habitat restoration effort.

An area where Washington mitigation programs are improving significantly has been in the interagency coordination of mitigation policies, programs, funding and practices. Led by existing institutions such as the Infrastructure Assistance Coordinating Council (IACC), which does not have an explicit "risk reduction" mission, and the RiskMAP Community Technical Partner (CTP) program, which does, agencies are working to unify mitigation messaging and find opportunities to partner on projects. The "comprehensive mitigation program" requirement for maintaining Washington's "Enhanced" status has further spurred program integration. The primary objective of many of the joint mitigation strategies developed in this plan is to further integrate statewide mitigation planning and practice.

An area of success has been the Public Assistance group and mitigation through permanent work during and after disaster declarations. There have been 15 disaster declarations since 2006, including DR 4309 in 2017, all but one only authorizing Public Assistance. As a Joint Damage Assessment state, in which FEMA and WA EMD work together to determine damages from a major disaster, the Public Assistance group at EMD has a good track record of taking advantage of 404 mitigation opportunities. Another effort, called 404/406 Coordination, is still nascent, but may result in more comprehensive risk reduction in projects throughout the state by coordinating the work of EMD's PA and hazard mitigation staff.

Hazard Mitigation Investments through the Public Assistance Program, 2006-2017

Year	Disaster (DR)	HM total	% of projects with HM
2006	1671	$319,624.89	2.17%
2006	1682	(closed)	
2007	1734	$137,921.78	0.60%
2009	1817	$2,819,100.47	35.75%
2008	1825	$485,946.18	28.34%

2011	1963	$254,907.29	10.33%
2012	4056	$96,820.44	19.91%
2012	4083	$3,119.72	20.42%
2014	4168	-	
2014	4188	$655,074.16	60.77%
2015	4242	-	
2015	4243	$21,227.77	36.54%
2016	4249	$4,234,838.11	52.22%
2016	4253	$478,411.71	40.45%
2017	4309	$242,184.14	36.03%
Total		**$9,749,176.66**	

In terms of the HMA program, Washington continues to invest in local projects in accordance with the priorities laid out in the 2013 SEHMP, State HMA Admin Plan and local mitigation plans. One way that Washington measures effectiveness of HMA is through the commitment of HMA and other funds to priority hazards. The 2013 SEHMP recognizes that floods are the most common, damaging events in Washington, whereas earthquake is potentially the most severe. Also, more recently, wildfire has been particularly serious and has risen in priority. In accordance with this hazard ranking, the most common projects in Washington are for flood mitigation (84 since 2006), followed by seismic mitigation (39). Wildfire (14) and severe storm projects (11) are also common as are mitigation plans or related data projects (74).

Since 2013, there have been only limited changes to the form and function of mitigation-related programs. Washington's understanding of hazards has improved, especially as it relates to a Cascadia Subduction Zone event, but the state is only now attempting to follow up on the 2012 Resilient Washington State recommendations. There are some notable exceptions to this, however, as WSDOT has made significant progress on the establishment of a lifeline corridor along Interstate 5. For flooding, the other priority hazard, the FCAAP program continues to be underfunded, though the Floodplains by Design program has continued to expand. There have been much more significant changes to wildfire mitigation efforts. While most of the mitigation work is done by DNR and USFS, EMD has applied HMA to several fuels reduction projects. Finally, Commerce is currently working on a new land use planning framework for the state. This framework will influence future land use decisions – and therefore reduce risk and vulnerability.

Distribution of HMA Funds by Aggregate Project Type and Hazard, 2006-2016								
Hazard	**Earthquake**	**Flood**	**Landslide**	**Plan**	**Severe Storm**	**Tsunami**	**Wildfire**	**Grand Total**
Acquisition		41	3					44
Elevation		22						22
Flood Improvement		13						13
Generator					8			8
Outreach	1			1			2	4
Plan		1		73				74
Roadway Reconstruction	3	1						4
Seismic Retrofit	33							33
Tsunami Mitigation						1		1
Utility Mitigation	2	6	1		3			12
Wildfire Mitigation							12	12
Grand Total	**39**	**84**	**4**	**74**	**11**	**1**	**14**	**227**

Hazard	**Earthquake**	**Flood**	**Landslide**	**Plan**	**Severe Storm**	**Tsunami**	**Wildfire**	**Grand Total**
Acquisition		$31,648,210	$1,126,003					$32,774,213
Elevation		$15,716,511						$15,716,511
Flood Improvement		$11,401,510						$11,401,510
Generator					$1,432,335			$1,432,335
Outreach	$71,905			$110,000			$124,990	$306,895
Plan		$66,699		$8,806,431				$8,873,131
Roadway Reconstruction	$2,218,507	$160,000						$2,378,507
Seismic Retrofit	$29,645,408							$29,645,408
Tsunami Mitigation						$449,500		$449,500
Utility Mitigation	$3,602,735	$3,741,399	$450,000		$1,161,689			$8,955,823
Wildfire Mitigation							$3,439,025	$3,439,025
Grand Total	**$35,538,555**	**$62,734,330**	**$1,576,003**	**$8,916,431**	**$2,594,024**	**$449,500**	**$3,564,015**	**$115,372,858**

State Mitigation Programs, Plans, Policies, and Fund Sources

Washington's plans, programs, policies and fund sources are the most visible state commitment to hazard mitigation. Responsibilities for hazard analysis, regulation and mitigation are divided among a number of agencies. Many smaller agencies also carry specific responsibilities. For example, the Department of Archaeology and Historic Preservation is responsible for assessing and recognizing historic structures and facilities, something that is closely related to work retrofitting unreinforced masonry buildings. This section highlights the primary sources of regulation and mitigation funding for the natural hazards identified in this plan. For a full list of programs and capabilities, see the Appendix: State Mitigation Capabilities.

Hazard-Specific Mitigation Capabilities

Hazard	Major Fund Sources	Common Projects	Regulatory Mitigation
Avalanche	NOAA USFS Northwest Avalanche Center partnership WSDOT Avalanche Forecasting and Control Washington State Parks and Recreation Commission National Park Service PNW Ski Areas Association NW Winter Sports Foundation	Public information campaigns Avalanche control measures on transportation routes Avalanche closures and access restrictions	
Coastal Hazards	ECY Coastal Zone Management Washington Sea Grant NOAA Regional Coastal Resilience Grants Program Puget Sound Partnership	Erosion control Seafloor mapping Community engagement Sea level rise mapping Climate change planning Home elevations Property buyouts	Shoreline Management Act Coastal Zone Management Act Ocean Resources Management Act Aquatic Lands Law

Hazard	Major Fund Sources	Common Projects	Regulatory Mitigation
	US Coast Guard FEMA HMA RiskMAP RiskMAP CTP		
Drought	ECY Water Resources Program Office of the Columbia River Bureau of Reclamation	Emergency water permits Water use restrictions Large-scale water supply projects Drought Continency Plan Aquifer recharge projects	
Earthquake	EMD Mitigation and Geologic Hazards DNR Geologic Survey NEHRP FEMA HMGP FEMA PDM WSDOT Seismic Retrofit Program	Structural retrofits of buildings Bridge retrofits Non-structural building content retrofits Public information campaigns	Critical Areas Ordinance Building Codes
Flood	ECY Flood Control Assistance Account EMD Mitigation FEMA HMA ECY Floodplains by Design RiskMAP NFIP RiskMAP CTP WSDOT	Barrier culvert removal Building elevations Property acquisitions Floodplain restoration Floodplain management planning Levee Setbacks and strengthening Establish floodplain mapping priorities Local flood risk reduction projects	Critical Areas Ordinance Building Codes Shoreline Management Act Floodplain Management Act

Hazard	Major Fund Sources	Common Projects	Regulatory Mitigation
		Localized flood control systems	
Landslide	EMD Mitigation DNR Geologic Survey FEMA HMGP FEMA PDM	Property acquisitions Landslide hazard mapping	Critical Areas Ordinance
Severe Weather	NOAA NWS EMD Mitigation FEMA HMGP FEMA PDM	StormReady Emergency generator purchases Structural retrofits Continuity of operations planning Utility undergrounding	
Tsunami	EMD Mitigation DNR Geologic Survey NTHMP FEMA PDM FEMA HMGP	Evacuation route mapping Tsunami siren installation Public education Building code updates Elevated structure construction	Critical Areas Ordinance Building Codes
Volcano	EMD Mitigation DNR Geologic Survey USGS Cascades Volcano Observatory	Lahar route mapping Volcano monitoring Public education	Critical Areas Ordinance
Wildfire	DNR Fire Forest Stewardship Program EMD Mitigation WSP USFS	Defensible space Fuel reduction measures Controlled burns Structural retrofits with inflammable materials Public education	Building Codes WUI Codes

Hazard	Major Fund Sources	Common Projects	Regulatory Mitigation
	BLM FEMA HMGP FEMA PDM	Building code/WUI code updates CWPPs	
Agricultural Disease Outbreak	WSDA Animal Health Program WSDA Livestock Inspection Program USDA	Monitoring Access control	Quarantines Revised Code of Washington (RCW) requirements
Dam Safety	Ecology Water Resources Program FEMA Dam Safety Program	Mapping Public information Dam inspections	Dam Safety Permits
Hazardous Materials	Ecology Spill Response Program Oil Spill Response Account EMD Local Emergency Planning Committee Program Washington Pipeline Safety Program	Response planning Public information Inspections Mapping	Revised Code of Washington (RCW) requirements on trains, pipelines, and Tier II hazmat facilities
Public Health Emergency	DOH Environmental and Public Health Division DOH Health Systems Quality Improvement DOH Prevention and Community Health DOH Disease Control and Health Statistics	Testing and monitoring Construction review Water system loan funds	Revised Code of Washington (RCW) requirements
Radioactive Release	EMD Radiological Preparedness	Preparedness and response planning	

Hazard	Major Fund Sources	Common Projects	Regulatory Mitigation
	USDOE Columbia Generating Station	Exercises and evaluations Equipment stockpiling	
Terrorism	DHS EMPG DHS UASI	Preparedness/protection projects Threatened facility hardening projects	

Sector	Fund Source	Common Projects
Water Systems	Source Water Protection Grant Program State Water Pollution Control Revolving Fund USDA Rural Development Grants for low-income communities Centennial Clean Water Fund Stormwater Financial Assistance Program Public Works Board Loan Programs USDA Rural Development Assistance Corporation Community Development Block Grants Drinking Water State Revolving Fund Construction Loan Program Rural Water Revolving Loan Fund Community Economic Revitalization Board Emergency Community Water Assistance Grants Emergency Loan Programs	Source water protection and feasibility studies Pollution prevention planning and studies System planning Environmental work Pre-development studies System and project design Project construction Emergency projects and system repairs

Effectiveness of Local and Tribal Policies, Programs, and Capabilities

Local governments have policies, programs and capabilities designed to mitigate – or assist in the mitigation of – impacts of hazard events on communities. Each community has its own policies, programs and capabilities, depending upon several factors such as size of area and population, and amount of funding available through local resources. Regardless of size, each community will have a core set of policies and programs related to hazard reduction and mitigation – building codes and

land use plans and regulations. The table that follows highlights local capability related to these issues. Agencies and programs listed above drive many of these policies and programs.

Specifically, in terms of risk reduction planning, a major challenge in the effective execution of mitigation plans is the disconnect between land use planners working under the GMA to write comprehensive plans and emergency managers writing hazard mitigation plans. Even though the basic risk assessment produced by the mitigation planning process is capable of serving as the vulnerability-assessment underpinning of comprehensive plans, shoreline management plans, comprehensive emergency management plans, and hazard mitigation plans, and likely represents best available science, the lack of joint workgroup participation at the local level means this is rarely done. An important step in the improvement of local mitigation capability will be better plan integration.

Building Codes

Adoption of building codes initially was the discretion of individual cities and counties. Passage of the State Building Code Act in 1974 (RCW 19.27) mandated the use of 1973 UBC building codes throughout the state. Since this time, local jurisdictions can make amendments to the code but changes cannot diminish code requirements.

The State Building Code Council (SBCC) now adopts building, fire, and mechanical codes for the State of Washington. These codes set minimum performance standards for buildings. The council amends the codes to meet state needs, but only if changes improve upon the original codes.

As of this plan update, the SBCC has adopted and amended the 2015 editions of the International Codes for Building, Residential, Mechanical, and Fire as published by the International Code Council (ICC), and the 2015 edition of the Uniform Plumbing Code. Additionally, it adopted the ICC's International Existing Building Code and Wildland and Urban Interface (WUI) Codes as appendix chapters available for local adoption. Yakima County, Kittitas County, and the cities of Wenatchee and Chelan are among those who have adopted WUI codes. The SBCC also adopted the 2015 Washington State Energy Code.

Applicability:

Since 1974, building codes adopted by the State Building Code Council have been applicable statewide. Counties and cities can amend the state codes, but they cannot diminish the minimum performance standards of the codes. The 2015 versions of the codes took effect July 1, 2016. All structures built after that date must comply with the new building codes, which includes provisions for the state's seismic hazard. Prior to July 1, 2016, new structures had to comply with the 2012 versions of the codes.

Effectiveness:

Before adoption of a statewide building code in 1974, there was a wide variation of minimum standards, as well as variation in use of requirements to address hazards including earthquake and winter storm.

The state building code is updated every three years as new model codes are published. During updates, the Council, with the assistance of Technical Advisory Groups, adopts new editions.

In Washington state, about 100,000 building permits are issued annually by local building departments. The enforcement of new codes is a primary mechanism to mitigate seismic vulnerability over time.

In accordance with its mission to provide for safety, health and energy efficiency in buildings, the State Building Code Council monitors fire deaths per million residents, which have declined from 11.8 in 2002 to 9.2 in 2012.

For seismic safety, however, building codes in Washington State require that new buildings (and any retrofits) be built to a 7.2M standard which falls short for the risk we anticipate.

Planning Enabling Act, Planning Commission Act, Optional Municipal Code

The Planning Enabling Act (Chapter 36.70 RCW) requires counties to adopt a comprehensive plan. The plan provides the framework for guiding and regulating the physical development of a county or region.

Comprehensive plans prepared under this act must include a land-use element to designate the general distribution, location and extent of various land uses (i.e., agriculture, housing, commerce, industry, education, recreation), and a circulation element with the location, alignment and extent of various transportation routes.

Optional elements of comprehensive plans prepared under this act cover conservation of natural resources, use of solar energy, recreation, transportation, public services and facilities, housing, renewal and redevelopment, and capital improvements.

Applicability:

The Planning Enabling Act applies only to counties. Options for cities include the Planning Commission Act for counties and cities (Chapter 35.63 RCW), and Optional Municipal Code for cities (Chapter 35A.63 RCW).

Effectiveness:

The Planning Enabling Act provides the basic framework for counties to develop land-use plans and development regulations.

Planning under this law is not as comprehensive as required by the Growth Management Act (see below). It does not address ties between transportation and housing, and other factors required under GMA planning. Also, it does not require updates of plans. The Planning Enabling Act is silent on the need for comprehensive plans to address hazard avoidance or hazard reduction.

In 2017, the Washington State Legislature tasked the Ruckelshaus Center to assess Washington State's planning framework to identify opportunities to improve and adjust state planning requirements. As part of this process, EMD, COM, FEMA and others are working together to develop an improved strategy to integrate hazards into statewide planning, thereby improving its effectiveness as a regulatory mitigation mechanism.

Critical Areas Ordinance Protection

The Growth Management Act of 1990 (RCW 36.70A) requires all cities, towns and counties in the state to identify and protect the functions and values of critical areas. The act defines critical areas as frequently flooded areas (including areas prone to tsunamis), geologically hazardous areas (including areas prone to erosion, landslide, seismic activity, volcanic activity, etc.), fish and wildlife habitat conservation areas, wetlands and critical aquifer recharge areas for aquifers used for potable water.

The concept of protecting the function and values of critical areas includes protecting humans from flood and geologic hazards.

Long-term enforcement of science-based building codes is the most effective mitigation for seismic hazards.

Critical areas regulations must be reviewed and evaluated every eight years; amendments can be made annually.

Applicability:

The Growth Management Act requires that comprehensive land use plans and development regulations, including critical areas regulations, be subject to continuing review and evaluation by the county or city that adopted them. Counties and cities are required to take legislative action to review and, if needed, revise their comprehensive land use plans and development regulations to ensure the plans and regulations comply with the requirements of the Act according to an eight-year cycle. Small or slow-growing counties have an additional 24 months. See the Growth Management Act section below for more information.

The Legislature provided an additional 12-month grace period for the completion of critical area ordinances for all jurisdictions. This means that if the update is due in 2017, the review and any revisions to the plan and regulations must be complete by June 30th of that year for the jurisdiction to continue to be in compliance with the Growth Management Act. However, for the purposes of grants and loans, a jurisdiction would not be considered out of compliance until June 30th of 2018 if they had not completed the review and update of their critical areas ordinance.

Effectiveness:

Cities and counties since 1995 must use best available science to develop and update policies and regulations to protect the function and values of critical areas. Most initial critical area regulations did not take into account best available science.

Among the issues facing local jurisdictions preparing critical area regulations are balancing the use of scarce available resources for detailed planning and regulation development versus providing other services, and balancing the protection of critical areas with rights of owners to use or develop their property.

Most jurisdictions have prepared critical area regulations that meet minimum state standards, but their effectiveness varies, depending upon local resources and local political considerations. Overall,

however, the requirement for using best available science has improved their effectiveness over time.

Overall, critical areas ordinances are among the state's most effective sources of regulatory mitigation. In recognition of the ordinance potential to influence long-term risk creation or reduction based on local applications of building codes and land-use requirements, COM, EMD and others are working closely on a strategy to integrate hazard risk assessments and critical areas ordinances. This could make the program more effective. This work will occur over the next 2-3 years.

Growth Management Act (GMA)

The GMA, enacted in 1990 and subsequently amended, builds on the Planning Enabling Act and other planning laws by requiring all cities and counties in the state to:

- Designate and protect critical areas (see previous page).
- Designate and conserve natural resource lands of long term commercial significance, including agricultural, forest and mineral resource lands.
- Plan for adequate public facilities and services to support planned development.

Additionally, fully planning counties (and their cities) must agree on countywide land-use policies, plan for growth within designated urban growth areas, identify lands for public purposes and essential public facilities, and adopt development regulations to carry out comprehensive plans.

Comprehensive plans are built around 14 goals and must provide for 20 years of growth and development needs. Plans must include elements on land use, utilities, housing, transportation, capital facilities, rural lands and shorelines.

Plans can address hazard reduction or hazard avoidance in one of two ways – through policies in the required planning elements or through a separate but optional natural hazard reduction element.

Applicability:

The Legislature set a schedule for when the GMA periodic updated is required to be complete. The periodic update schedule is established to begin on or before:

- June 30, 2015, and every eight years thereafter for King, Pierce and Snohomish counties and the cities within those counties;
- June 30, 2016, and every eight years thereafter for Clallam, Clark, Island, Jefferson, Kitsap, Mason, San Juan, Skagit, Thurston and Whatcom counties and the cities within those counties;
- June 30, 2017, and every eight years thereafter for Benton, Chelan, Cowlitz, Douglas, Kittitas, Lewis, Skamania, Spokane and Yakima counties and the cities within those counties; and

- June 30, 2018, and every eight years thereafter for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Grays Harbor, Klickitat, Lincoln, Okanogan, Pacific, Pend Oreille, Stevens, Wahkiakum, Walla Walla and Whitman counties and the cities within those counties.

Small or slow-growing counties and cities have an additional 24 months for meeting the update deadline. Small or slow-growing is defined as follows:

- A county with a population of no more than 50,000 and a growth rate of no more than 17 percent in the 10 years preceding the deadline established in RCW 36.70A.130.
- A city with a population of 5,000 or less and has had its population increase by the greater of either no more than 100 persons or no more than 17 percent in the 10 years preceding the deadline established in RCW 36.70A.130.
- Either no more than 100 persons or no more than 17 percent in the 10 years preceding the deadline established in RCW 36.70A.130.

Effectiveness:

38 of 39 Washington counties fully plan under the GMA. Only Ferry County has been exempted. That decision is under appeal. Of the 38 counties fully planning under the GMA, 29 are required to have up to date comprehensive plans.

Land-use plans and regulations under GMA requirements are much more comprehensive than those developed under the Planning Enabling Act.

Among the issues facing local jurisdictions preparing GMA plans and regulations include balancing the use of scarce available resources for detailed planning and regulation development versus providing other services, and balancing the protection of critical areas with rights of owners to use or develop their property.

The Five State Laws that Govern Floodplain Management

RCW 86.12, Flood Control by Counties, gives counties the power to levy taxes, condemn properties and undertake flood control activities directed toward a public purpose.

RCW 86.15, Flood Control Zone Districts, provides authority for counties to create quasi-municipal districts to engage in flood safety planning and projects. Flood Control Zone Districts have taxing authority.

RCW 86.26, State Participation in Flood Control Maintenance, established the Flood Control Assistance Account Program (FCAAP) to provide state funding for local flood hazard management planning and implementation efforts.

RCW 86.16, Floodplain Management, states that prevention of flood damage is a matter of statewide public concern and placed regulatory control within the responsibilities of the Department of Ecology.

RCW 86.09, Flood Control districts can be organized for planning, construction and operation of certain flood control works.

The GMA has proven effective in concentrating development in areas identified through the comprehensive plan and growth boundary updates. It has also proved effective in protecting resource lands and critical areas, including geologically hazardous areas, from development. The effectiveness isn't universal since it depends in-part on local political will and plans are considered as in compliance unless they are successfully challenged by a local organization with standing.

Floodplain Management and the Community Rating System

The state's floodplain management law allows local governments to adopt floodplain management requirements that exceed National Flood Insurance Program requirements, and requires local governments to enforce restrictions prohibiting new residential construction or reconstruction of substantially damaged residential structures in mapped floodways. In very limited circumstances, reconstruction or replacement of substantially damaged residences is allowed in the floodway. In areas designated for agriculture, farmhouses in floodways can be replaced if a variety of conditions are met.

Floodplains by Design (FbD) is a capital budget program that provides funding for integrated floodplain management projects.

Applicability:

RCW 86.12 applies to all counties of the state.

Participation in the Flood Control Assistance Account Program requires local jurisdictions to participate and be in good standing in the National Flood Insurance Program, and their activities must be approved by the Department of Ecology in consultation with the Department of Fish and Wildlife.

Emergency grants are available to respond to unusual flood conditions.

The FbD Program provides funding for integrated floodplain management throughout the state. FbD projects combine flood safety and ecological restoration into a single package. FbD projects also can promote agricultural viability, recreation, and other benefits.

Effectiveness:

Washington communities continue making floodplain management a priority.

Washington has 33 communities participating in the Community Rating System. King, Pierce and Thurston Counties have a CRS rating of 2, making them the highest ranked counties in the nation.

Many communities have created innovative floodplain management techniques, such as:

- Higher freeboard standards than federal regulations require (e.g., Everett and Chelan County).
- Providing storage to compensate for filling floodplains (many localities).
- Exceeding federal standards for floodways (Pierce County).
- Mapping the flood of record and utilizing that area for floodplain management when it is larger than the FEMA mapped floodplain (Thurston County).

FCAAP grants have not been funded in recent years.

Floodplains by Design grants are awarded on a biennial funding cycle. Since 2013, a total of $114 million dollars has been awarded supporting 36 projects.

Shoreline Management

A public referendum adopted the Shoreline Management Act in 1971 to prevent the "inherent harm in an uncoordinated and piecemeal development of the state's shorelines."

The act covers three basic policy areas:

1. Accommodation of reasonable and appropriate uses. The act prefers uses consistent with control of pollution and prevention of damage to the natural environment, or uses that are unique to or dependent upon shorelines.
2. Protection of shoreline environmental resources. The act intends to protect shoreline natural resources including the land and its vegetation and wildlife, and the waters of the state and their aquatic life, against adverse impacts.
3. Protection of the public's right to access and use the shorelines. The act requires local shoreline master programs (SMPs) to include provisions for public access and recreational opportunities at publicly owned shorelines.

State shoreline regulations were updated in 2003; they are more comprehensive than before; include a greater basis in science; and take into consideration protection of critical resources and physical and biological processes and functions.

Applicability:

The Shoreline Management Act applies to all 39 counties and more than 220 cities with shorelines created from:

- Marine waters (Pacific Ocean, Strait of Juan de Fuca, Puget Sound).
- Streams and rivers with a mean annual flow greater than 20 cubic feet per second.
- Lakes and reservoirs greater than 20 acres in area.
- Upland areas called shore lands that extend 200 feet landward from the edge of these waters.
- Biological wetlands and river deltas, and some or all of the 100-year floodplain when associated with one of the above.

The act establishes a balance of authority between local and state government. Cities and counties are the primary regulators.

Effectiveness:

Unlike land-use plans prepared under the Growth Management Act, which are presumed valid upon local adoption, local Shoreline Master Programs (SMPs) must be approved by the Department of Ecology before they are effective.

SMPs ensure "no net loss of ecological functions" through locally-tailored buffers, setbacks, use restrictions and appropriate design criteria. SMPs must address critical areas including wetlands, geologically hazardous areas such as unstable slopes, and frequently flooded areas.

All communities are expected to revise their master programs by Dec., 2018. The Department of Ecology has made planning grants available to eligible communities to inventory shoreline

resources and develop updated SMPs. Ecology prepared maps showing the general location of channel migration zones which are potentially hazardous areas.

State Environmental Policy Act

The State Environmental Policy Act was adopted in 1971 to provide a regulatory framework for state and local agencies to address environmental issues in their decisions. The act provides information to agencies, applicants and the public to encourage the development of environmentally sound proposals. The environmental review process involves the identification and evaluation of probable environmental impacts and the development of mitigation measures that will reduce adverse impacts.

SEPA was modeled after the National Environmental Policy Act.

The act ensures that environmental values are considered during decision making by state and local agencies. When the act was adopted, the Legislature identified four primary purposes:

1. To declare state policy that will encourage productive and enjoyable harmony between man and the environment;
2. To promote efforts which will prevent or eliminate damage to the environment;
3. To stimulate the health and welfare of man; and
4. To enrich the understanding of the ecological systems and natural resources important to the state and nation.

Applicability:

The law requires local governments to:

- Utilize a systematic, interdisciplinary approach that ensures the integrated use of natural and social sciences and the environmental design arts in planning and decision-making that may affect the environment.

Ensure that environmental amenities and values are given appropriate consideration in decision making along with economic and technical considerations.

Effectiveness:

SEPA provides a process to give local decision makers information on environmental protection and hazard reduction related to new development. In its early years, this law was the only mechanism that provided for mitigation from natural hazards such as flooding and landslides. Today, critical area regulations required by the Growth Management Act have taken much of this responsibility.

Larger and more sophisticated counties use SEPA in combination with their own critical area regulations to provide a holistic approach to environmental protection and hazard avoidance. Thurston County, for example, uses SEPA to fill gaps in local regulations related to mitigating hazards. However, this county is the exception rather than the rule throughout the state.

Communities that take the SEPA process seriously can use it to improve their mitigation efforts. A checklist helps communities determine the environmental impact of a proposed development.

SEPA's effectiveness depends upon its application by local jurisdictions. Many communities face the issue of balancing environmental protection with rights of owners to use or develop their property. In practice, this has limited SEPA's effectiveness.

Hazard Mitigation Planning and Project Implementation

Hazard Mitigation Assistance Grants are provided to Washington state jurisdictions and tribal governments to reduce the effects of natural hazards and mitigate vulnerability to future disaster damage. EMD maintains a mitigation planning and project grant-making technical assistance team to support local jurisdictions in developing, funding and implementing mitigation plans and projects. There are two types of grant programs: Disaster (HMGP) and Annual (PDM, FMA).

Washington's HMGP funding is equal to 20 percent of the federal disaster assistance dollars provided by FEMA. FEMA determines a 30-day estimate, a six-month estimate, and a final 12-month "lock-in" amount for HMGP funds. HMGP application review, ranking and submission to FEMA for funding is managed by EMD. PDM and FMA are nationally competitive programs, dependent on congressional appropriation instead of disaster damages. PDM and FMA are non-disaster, annual programs, while HMGP is disaster-declaration dependent.

The State Disaster Response Account covers 12.5 percent of the 25 percent match requirement for HMGP. Recipients for PDM and FMA are responsible for the full 25 percent match.

Applicability:

All counties, incorporated cities and towns, special districts and applicable nonprofits with, or covered by, an adopted hazard mitigation plan are eligible to apply for project grants through any of the HMA grant programs. Jurisdictions without mitigation plans are only eligible for planning grants. Most projects must meet a minimum cost-benefit analysis. EMD may choose to develop new priorities for each HMGP grant cycle. Priorities for PDM and FMA are set nationally by FEMA.

Effectiveness:

As of November 2015, not including DR 4309, there are *currently* 85 local entities (cities, towns, counties, tribes, special districts, and nonprofits) leveraging more than $58 million in HMA partnership money (federal, state, and local) to mitigate natural hazards. This number only includes open projects.

Since 2006, HMGP plus more from PDM and FMA, has funded:

- 11 generators, 26 home or infrastructure elevations, 79 mitigation plans or mapping projects, 40 acquisitions of SRL/RL flood or other hazard-impacted properties, and 29 seismic retrofits

Other projects include culvert replacements, water system retrofits, outreach and public information projects, defensible space projects and utility resilience (e.g. transmission line under-grounding) projects.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) makes flood insurance available for individual properties within communities participating in the program. As part of participation in the NFIP, communities must adopt and implement a minimum set of building and floodplain development standards defined by 44 CFR 60.3 and RCW 86.16. The State of Washington urges local governments to adopt higher standards to address the flood risks unique to their community.

- Federal rules do not allow communities to build lower than the base flood elevation. The state encourages communities to require that the usable space of buildings in the floodplain be at least one foot above the Base Flood Elevation.
- Federal rules place no restrictions on the type of facilities that communities can build in a floodplain, such as homes, businesses and important infrastructure. A U.S. Presidential Executive Order prohibits federally-funded infrastructure from being built in floodplains – unless there are no other viable options.
- The state encourages adoption of higher floodplain standards for critical facilities, that is, structures for which even a slight chance of flooding can be too great, such as schools, nursing homes, hospitals, police, fire and emergency response installations, and installations which produce, use or store hazardous materials or hazardous waste.

Two elements which must be met by all jurisdictions within a local mitigation plan is the issue of Repetitive Loss (RL) properties and Severe Repetitive Loss (SRL) properties as they relate to floods. Jurisdictions must identify RL and SLR properties for mitigation in their HMPs and work with the state to implement their mitigation strategy.

Applicability:

The Washington State Department of Ecology is tasked by the Legislature through RCW as the coordinating agency responsible for floodplain management and the NFIP. To help local governments implement their local floodplain management programs, Ecology offers the following services:

- Flood hazard mapping assistance to individuals, communities, businesses, consultants, academic and non-profit organizations.
- Providing Model Flood Plain Management Ordinances in cooperation with the Federal Emergency Management Agency (FEMA).
- Training to communities for managing local flood hazards through Comprehensive Flood Hazard Management Plans, including a guidebook for local governments preparing Comprehensive Flood Hazard Management Plans. The book outlines a step-by-step public process to identify and analyze flood problems, design strategies to solve the problems and locate funds to implement hazard reduction plans.
- Flood hazard planning and grant assistance to communities with adopted flood mitigation strategies and plans.
- Assistance through flood grants and response contracts.
- Assistance to local governments and citizens on complying with the state floodway prohibition.

- Assisting local governments in complying with the standards expressed in the National Marine Fisheries Service NFIP Biological Opinion.

Effectiveness:

Washington is one of the most flood-prone states in the nation.

- From 1980 through 2011, Washington had 22 Presidentially-declared flood disasters.
- Washington ranks high in the number of flood insurance policies - 37,000 policies providing $9.4 billion in insurance coverage.
- Thirty-five percent of flood insurance policies are outside the mapped Special Flood Hazard Area also known as the "100-year floodplain."

Floodplain Management in Washington State

- In 1935, the Washington State Legislature enacted the nation's first State Flood Plain Management laws in the United States. The Washington Legislature created authority to issue permits for construction in Flood Control Zones.
- In 1969, the state Legislature passed a measure prohibiting construction of residential structures in floodways.
- In 1989, the state Legislature granted Ecology authority to manage state flood plains.
- In 1989, the Washington Legislature also required the state to establish “minimum state requirements for floodplain management that equal the minimum federal requirements for the national flood insurance program.” The only exception is the state floodway prohibitions.
- In 2001, the Department of Ecology became a CTP in the FEMA RiskMAP program.
- Three counties in Washington – King, Pierce, and Thurston – are CRS Class 2 communities. There are only six total CRS Class 2 communities in the entire country and only one CRS Class 1.

Washington Hazards and their Impacts

This plan profiles and analyzes the impacts of 10 natural and 7 human-caused hazards. Climate change is considered as a separate plan element and as an exacerbating factor to other natural hazards.

Natural:

- Avalanche – NWS, WSDOT
- Drought – Ecology
- Earthquake – EMD, DNR, UW
- Flood - Ecology
- Landslide - DNR
- Severe Storm – NOAA, NWS
- Tsunami - EMD
- Volcano – EMD, DNR, CVO
- Wildfire – DNR, EMD
- Coastal Erosion - Ecology

Human-Caused:

- Agriculture Disease Outbreak - Agriculture
- Dam Safety – Ecology
- Public Health/Pandemic – DOH
- Terrorism – MIL, WSP
- Hazardous Materials (Oil Trains, Pipelines, Hazmat) – Ecology
- Cyber Incident (included in Terrorism profile) – EMD, MIL
- Radiological Incident – EMD

The plan also considers the risk and vulnerability to, and potential impacts from, all hazards to:

- The Public
- First Responders
- Continuity of Government Operations
- Property, Facilities and Infrastructure
- The Environment
- The Economy
- Public Confidence in Government

Adoption and Promulgation

Adoption of the State Hazard Mitigation Plan

The 2018 SHMP, standard plan, as defined in 44 CFR 201.4 was adopted by a promulgated memorandum to agencies of state government by the Washington Military Department, Adjutant General. This was done following receipt from FEMA Region X of a notice of "pre-adoption" approval of the plan. FEMA was sent a copy of the adoption/promulgation memorandum immediately upon its issuance. Copies of documentation showing FEMA Region X's formal approval of the plan and state adoption of the plan are included in the appendix.

Assurances

The State of Washington will comply with all applicable Federal statutes and regulations in effect with respect to the periods which it receives grant funding, in compliance with 44 CFR 13.11.c. The Washington SHMP will be amended according to the process described in the Plan Maintenance section whenever necessary to reflect changes in State or Federal statutes as required in 44 CFR 13.11.d.

Planning Process

The planning process for the SEHMP update was designed around the primary planning objective: the creation of robust mitigation strategies that could be tracked and maintained over a long period of time. The strategies also needed to represent real commitments and priorities, rather than just ideas generated by the planning team members. Additionally, the process included the work done to support the Resilient Washington Subcabinet, which was created by Gov. Inslee near the start of the mitigation planning process.

The process consisted of strategy development meetings, hazard/risk review meetings, individual conversations to map out mitigation strategies with planning partners, and then a broader outreach period following the completion of the risk assessment, where input and feedback was solicited from state agencies and local jurisdictions who were not planning partners.

Key Dates:

- January – September 2017 – Resilient Washington Subcabinet report
- March 2017 – Publish project plan
- April 2017 – First Mitigation Workgroup meeting
- May – June 2017 – Stakeholder awareness meetings
- June – September 2017 – Stakeholder engagement and mitigation strategies
- September 2017 – HIVA process kickoff
- October 2017 – Complete first draft of strategies
- December 2017 – Complete final draft of strategies
- January 2018 – Publish HIVA
- January - February 2018 – FEMA Initial Review
- March 2018 – Begin all-stakeholder comment period
- May 2018 – Final internal review
- June 2018 – Final plan delivered to FEMA

Planning Team and Stakeholder Involvement

A planning team consisting of state agencies and members of the Hazard Mitigation Workgroup took the lead on developing and reviewing this plan update. The Multi-Agency Hazard Mitigation Workgroup consists of **state agencies with primary responsibility for the identification, mitigation or regulation of hazards, risks and vulnerabilities**. This workgroup met frequently during the hazard mitigation plan update.

Team members were selected based on the following criteria:

1. Participation in previous iterations of the SEHMP.
2. Participation in the Hazard Mitigation Workgroup.

3. Agencies that own risk, vulnerability and mitigation programs or regulatory capabilities.

The following agencies and individuals comprised the planning team throughout the process. Core planning team members who attended most workgroup meetings are **bolded**. Sign-in sheets from meetings are available upon request. EMD's Mitigation Strategist, the program manager and primary author for the plan update project, was responsible for running meetings, inviting attendees, and managing the process.

2017-2018 Mitigation Workgroup Representatives		
Agency	**Designee**	**Title**
Department of Natural Resources	**Corina Forson**	**Chief Hazards Geologist**
	Tim Walsh	Assistant State Geologist
	Stephen Slaughter	**Landslide Mapping Program Coordinator**
	Andy Tate	**DNR Fire**
	Janet Pearce	DNR Fire
Utilities and Transportation Commission	Joe Subsits	Chief Pipeline Safety Engineer
Department of Ecology	Brian Lynn	Coastal/Shorelands Section Manager
	Joe Witczak	Dams and Wells Section Manager
	Scott McKinney	Floodplain Management State Coordinator
	Jeff Marti	Drought Program Coordinator
	Charlotte Lattimore	**Dam Safety Program**
	Jerry Franklin	**Mapping Coordinator and Analyst**
	Bobbak Talebi	Coastal Planner
	Dave Radabaugh	**NFIP State Coordinator**
Washington State Department of Transportation	**Carol Lee Roalkvam**	**Policy Branch Manager**
	Catherine Pearce	**Emergency Management Planning Program Manager**
Department of Commerce	**John Schelling**	**Emergency Management and Safety Administrator**
	Kaaren Roe	CDBG Program Manager
	Jill Nordstrom	Program Administrator
	Heather Ballash	Commerce Specialist, Growth Management
	Doug Peters	Commerce Specialist, Growth Management
	Charlene Andrade	Commerce Specialist, Growth Management
Washington State Conservation Commission	**Bill Eller**	**Voluntary Stewardship Program Coordinator**

Office of the Superintendent of Public Instruction	**Scott Black**	**Program Development Manager**
Washington State Emergency Management Division	**Derrick Hiebert**	**Mitigation Strategist**
	Maximilian Dixon	Earthquake Program Manager
	Tim Cook	**State Hazard Mitigation Officer**
	Tristan Allen	Private Sector Program Manager
	Stacey McClain	Mitigation and Recovery Section Manager
Department of Fish and Wildlife	Tim Burns	Capital and Asset Management Program Assistant Director
Department of Health	**Greg McKnight**	**Water Systems**
	Nathan Weed	**Deputy Chief of Emergency Operations**
	Kevin Wickersham	Emergency Preparedness Specialist
Department of Archaeology and Historic Preservation	Greg Griffith	Deputy State Historic Preservation Officer
Department of Enterprise Services	Tim Nogler	Managing Direct, State Building Code Council
	Matt Jones	Physical Security Manager
	Craig Ginn	**Risk/Emergency Support Manager**
Washington State Department of Agriculture	**Paige Beck**	**Emergency Management Specialist**
	James Marra	Pest Program
	Sonia Soelter	Emergency Management Coordinator
Office of the Insurance Commissioner	**Matt Stoutenburg**	**Emergency Management Program Specialist**
	Stacy Middleton	Senior Policy Analyst
Puget Sound Partnership	Heather Benson	Action Agenda Planning Manager
	Mike Johnson	**Environmental Planning and Implementation Strategies Manager**

Once established, the planning team immediately began working on mitigation strategies. Each team member worked directly with project managers in their own agency to identify *existing programs, future opportunities and mitigation partnership needs*. The Mitigation Strategist then met directly with each agency representative and their program managers to draft mitigation strategies. Since existing mitigation, or mitigation-related, programs represent the state's concrete commitment to risk reduction, these were the first strategies to be identified. Next, gaps and opportunities to partner were developed into comprehensive strategies through Workgroup

meetings in October and December. Finally, gaps between existing strategies were assessed following the publication of the risk assessment in January.

In addition to work on the strategies, committee members also supplied data to the contractor developing the risk assessment and updated the capabilities section of this plan.

Stakeholders from agencies not eminently involved in hazard mitigation were engaged by email with an invitation to submit comments via an online form. Presentations and conference calls were also offered to any stakeholders who requested them.

Stakeholders from multiple state, federal and local agencies were reached informally and formally through regularly scheduled conference calls and meetings. For example, the Mitigation Strategist attended the Infrastructure Assistance Coordinating Council and discussed the state mitigation plan with participants. Also, monthly resilience meetings and calls associated with the RiskMAP program, meetings of the USACE Silver Jackets, and meetings of the Interagency Growth Management Workgroup were used as forums for discussions about the state mitigation plan. Section 4 includes a complete list of workgroups where the SEHMP was discussed beyond the official Hazard Mitigation Workgroup.

To reach the local jurisdiction partners, the emergency management Homeland Security Region structure was used. The Mitigation Strategist presented on the state plan at the start of the process in April 2017 and again in January 2018 and April 2018 at the start and end of the stakeholder comment period through the monthly all-region conference calls. This body is especially valuable since it reaches all emergency management agencies in the state. To supplement this, former sub-applicants were contacted through the HMA distribution email list and invited to review and comment on the plan and a presentation was made to the regularly-scheduled State Agency Liaison meeting. Furthermore, the mitigation strategist met personally through technical assistance visits with over two-thirds of Washington counties. The technical assistance and mitigation planning section of this document was developed through these meetings.

Although a majority of tribes either annex to a county mitigation plan or go direct to FEMA for grant funding as co-equal governments, tribal emergency managers were specifically invited to comment on the SEHMP. Outreach was conducted via the EMD Tribal Liaison via internal email distribution lists.

Once an initial draft of the state mitigation plan was complete, stakeholders were contacted directly via workgroups and email lists and invited to review the plan and submit comments through an online survey. Specific stakeholder groups reached in this manner include:

- State Agency Liaisons
- Local Emergency Managers
- Tribal Emergency Managers
- Homeland Security Regions
- Interagency Growth Management Working Group (IAWG)
- Interagency Climate Adaptation Network (ICAN)

- Hazard Mitigation Workgroup
- Washington Silver Jackets
- Previous and current HMA sub-applicants
- Interagency Continuity of Operations Workgroup

The plan was posted on the emd.wa.gov website along with a link to a survey where comments could be collected. This link, and a description of the plan, were also publicized over social media and a Military Department blog post to solicit any additional comment from the public. These assets were made available to state agency partners for additional publication. EMD used this word-of-mouth and social-media focused public outreach strategy since the plan is oriented more toward specific stakeholders in state and local government as opposed to the general public, but the agency still wanted to offer the opportunity for the interested public to offer comments or suggestions on the plan.

Comments were compiled from the survey and from direct communications with stakeholders. Comments that were not content related were immediately integrated into the plan by editing the appropriate section. Five comments were received that edited descriptions or typographical errors, but did not significantly change content. An additional six comments updated some content, usually a mitigation strategy assigned to the commenting agency. In total, comments were received by representatives from the following organizations:

- Department of Ecology (Air Quality, Drought, Coastal Hazards, Water Resources)
- Department of Transportation
- Office of the Insurance Commissioner
- Department of Commerce (Growth Management Services)
- Puget Sound Partnership
- Department of Agriculture
- Department of Social and Health Services
- Walla Walla County

Each comment was fully integrated into the appropriate section of the plan.

Major Mitigation Plan Public and Stakeholder Outreach	
Date	**Agenda**
January 19, 2018	Present to HLS Regional Coordinators
March 21, 2018	Present to State Agency Liaisons
April 10, 2018	Plan posted to website, email EMD lists for emergency managers, Washington tribes, HMA applicants, others.
April 20, 2018	Present to HLS Regional Coordinators
April 25, 2018	Brief agency director (The Adjutant General)
May 11, 2018	Initial comment period completed, begin internal review, begin public comment period.
May 16, 2018	Present mitigation plan to Department of Commerce, Interagency Growth Management Working Group.
May 23, 2018	Presentation to the Interagency Continuity of Operations Workgroup

The final plan was submitted to the Director of EMD and the Washington Military Department in May 2018. Once signed off on, the plan was submitted to FEMA for review.

Workgroup Meeting Logistics

Workgroup meetings took place at the Washington State Emergency Management Division on Camp Murray or at the Department of Health in Tumwater. The Mitigation Strategist from EMD was responsible for scheduling meetings. For those unable to attend in person, a conference call line was provided.

Time Commitment

Each meeting was expected to last three hours. There were six meetings of mitigation program managers (18 hours total) and five meetings for hazard experts (15 hours total). Additional time was spent completing one-page mitigation strategy sheets for inclusion in the mitigation plan and reviewing for accuracy sections written by EMD or the UW contractors.

Workgroup Meeting Agendas

Mitigation Workgroup meetings were scheduled throughout the year to provide regular input into the planning process. Since mitigation strategies were developed using agency programs and priorities, the role of participants was significant. In addition to the below meetings, there were at least two, one-on-one meetings in person or over the phone with each planning partner.

Mitigation Plan Meeting Agendas	
Meeting/Landmark	**Agenda**
April 11, 2017 **Overview**	• Update on SEHMP update • Plan monitoring and implementation • Mitigation strategy and risk assessment development
June 29, 2017 **Overview**	• Identify which hazards will be included in the plan HIVA • Determine the audience for the plan • Define what is considered a mitigation program • Identify the list of state agencies responsible for mitigation programs • Discuss who should be involved in Mitigation Workgroup
August 22, 2017 **Mitigation Strategy**	• Develop initial list of mitigation agencies/program • Review status of existing mitigation strategies
September 22, 2017 **Hazard Assessment**	• UW contractors will outline their HIVA plan and describe the Mitigation Planning Portal • Confirm list of hazards to be profiled • Outline inclusion of private-sector vulnerability in profiles • EMD will outline process for human-caused hazards
October 10, 2017 **Mitigation Strategy**	• Present list of mitigation program strategies • Present data on local mitigation priorities • Identify state mitigation goals

December 12, 2017 **Mitigation Strategy**	• Review preliminary state mitigation strategies, capabilities, and priorities • Develop mitigation plan goals.
February 2018 **Hazard Assessment**	• Present HIVA, begin hazard and risk analysis validation
March **Mitigation Strategy**	• Review and revise mitigation strategies based on findings from January HIVA presentation.
April 10, 2018 **All**	• Present first draft of plan, began external review.
April 2018	• EMAP Review
May 2018	• Begin final internal review. Begin legal review.
May 17, 2018	• Annual FEMA Mitigation Consultation
June 5, 2018	• Present final plan for submission to FEMA
July 6, 2018	• Receipt of Approval – Pending Adoption letter from FEMA
October 1, 2018	• Final FEMA Approval

Resilient Washington Subcabinet


STATE OF WASHINGTON
Office of the Governor

DIRECTIVE OF THE GOVERNOR
16-19

The Resilient Washington Subcabinet created by Directive 16-19 developed dozens of well thought-out mitigation strategies, specifically for seismic risk reduction. A summary of the draft report recommendations is published in the appendix. This subcabinet built on the 2012 Resilient Washington State report developed by the Seismic Safety Committee of the Emergency Management Council and specifically included implementation strategies for a number of that report's recommendations. The report also addressed some of the deficiencies in state response capabilities identified in the Cascadia Rising 2016 Exercise. The primary areas of focus for the Governor included schools, hospitals and communications networks. The Subcabinet represented a huge opportunity for teams from across state government to be heard on strategies that could increase preparedness and reduce risk. Many of the mitigation strategies in this plan were taken from the multi-stakeholder processes that led to the report.

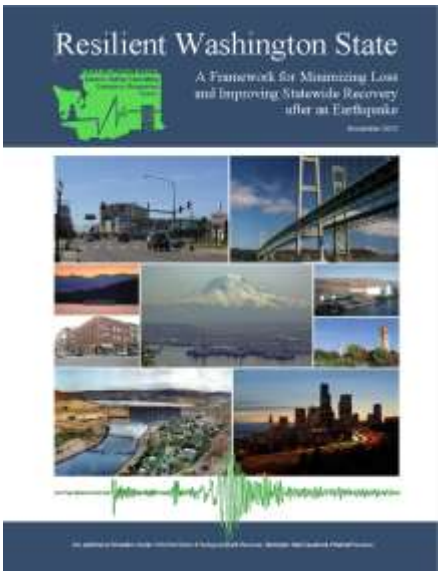
The final report included strategies to complete the following recommendations and directives.

- Recommendation 1: Make schools resilient: structurally, socially and educationally.
- Recommendation 2: Require that utility providers identify the vulnerabilities in their systems and mitigate deficiencies.

- Recommendation 3: Improve the resilience of buildings in areas of high seismic hazard to improve life safety and increase the number of people who will be able to shelter in place.
- Recommendation 5: Strengthen business continuity planning efforts by providing education, tools and training.
- Recommendation 6: Strengthen regional transportation networks.
- Recommendation 7: Make hospitals resilient: structurally and functionally.
- Recommendation 8: Identify and map in greater detail sources of seismicity and geologically hazardous areas and develop plans for mitigation of identified hazards.
- Recommendation 9: Improve life safety in communities at risk of local tsunamis.
- Directive 1: Plan for the distribution of bulk fuel through the use of master contracts in order to support relief efforts, restore essential services and re-establish commerce.
- Directive 2: Develop a Mass Care Operational Coordination Plan Annex to address collaboration among response agencies and organizations, to be housed under ESF 6.
- Directive 3: Build resilient communication systems and develop the relevant procedures to ensure reliable communications with clear protocol following a catastrophic seismic event.

Resilient Washington State

The Resilient Washington State Initiative identified a definition for resilience, Washington's vulnerabilities, and a proactive plan for action to increase Washington's resilience to seismic vulnerabilities. The report is available online and is still relevant today.



The final report included policy recommendations and common opportunities and needs across multiple recommendations. Several of the main areas of opportunity included building code revisions, interagency collaboration, outreach and training, and the needs for a complete inventory and assessment of statewide vulnerability at a level not seen in this plan, or even many local plans, due to lack of data.

For each focus area in the abovementioned strategies, a workgroup was formed and facilitated by project team members from the Washington Military Department's Emergency Management Division. The workgroups consisted of subject matter experts from state agencies, local jurisdictions, professional associations and other key stakeholders, and together they identified:

- Actions necessary for accomplishing the recommendations;

- Current actions being taken toward accomplishing the recommendations;
- Gaps and barriers hindering the accomplishment of identified actions;
- Anticipated costs and effort for completing necessary actions;
- Areas where additional collaboration is necessary and/or could help facilitate efforts;
- Which actions are highest priority (and categorized by short-term, medium-term and long-term); and
- Implementation plans for completing the prioritized actions.

Each workgroup met regularly between January and June of 2017. Their findings were reported out to the governor and subcabinet on January 17th, May 3rd and Sept 27th of 2017.

The workgroups were asked to rank each action in the following categories:

- **Priority**: Prioritize the actions as high, medium or low, with regards to the goal of a resilient state.
- **Estimate Effort**: This is the amount of effort/time/coordination/complexity/difficulty/FTE etc. that this action will take.
- **Estimate Cost**: This is the cost to complete this action: low = $0 to $50,000, medium = $50,001 to $1,000,000, and high = greater than $1,000,000.

Once ranked, the actions were compiled into a report and delivered to the Governor at the end of September 2017. Results from the above-described process are incorporated into the SEHMP as mitigation strategies.

Long-Term Monitoring and Implementation of the SEHMP

The Hazard Mitigation Workgroup will continue to be the monitoring and implementation body for the Washington State Enhanced Hazard Mitigation Plan, as well as the workgroup to support and inform the State Enhanced Hazard Mitigation Plan update. Following the adoption of the 2018 SEHMP, the workgroup will meet four times per year to discuss mitigation activities, align projects and seek opportunities to partner, once in the fall, once at the FEMA consultation, and once either via conference call or in-person in the summer and winter.

State agencies will also track program implementation and submit the data annually to EMD for inclusion in the Annual Resilience Report. This report will detail progress toward key mitigation goals and objectives highlighted in the SEHMP. This process will also allow for timely updates to plan strategies, programs and hazard analyses. Among the benefits for this report are improved interagency program coordination, regular progress numbers for elected officials and metrics to demonstrate the state's progress in meeting any federal disaster deductible, should one be required.

EMD's Mitigation Strategist will be responsible for developing and distributing this report to workgroup partners, agency leadership and to FEMA.

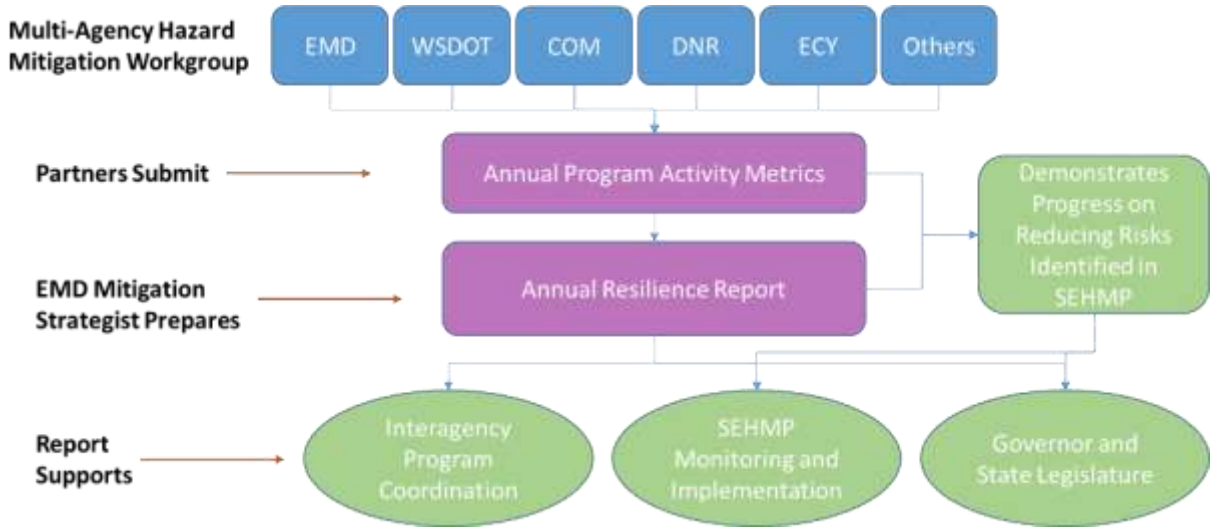


FIGURE 2: STRUCTURE OF THE ANNUAL RESILIENCE REPORT

The Multi-Agency Hazard Mitigation Workgroup is the monitoring and implementation body for the Washington State Enhanced Hazard Mitigation Plan. The workgroup consists of agencies with primary responsibilities either for specific hazards or mitigation programs.

- Washington State Department of Ecology (Ecology)
- Washington State Department of Natural Resources (DNR)
- Washington State Department of Commerce (Commerce)
- Washington State Emergency Management Division (EMD)
- Washington State Department of Transportation (WSDOT)
- Washington State Department of Health (DOH)

Additional participants may be invited depending on meeting agenda:

- Department of Archaeology and Historic Preservation (DAHP)
- Utilities and Transportation Commission (UTC)
- Washington State Conservation Commission (SCC)
- Office of the Superintendent of Public Instruction (OSPI)
- Department of Fish and Wildlife (DFW)
- Department of Agriculture (WSDA)
- Office of the Insurance Commissioner (OIC)
- Washington Technology Solutions (WATECH)

The workgroup is an essential part of demonstrating the state's commitment to a comprehensive mitigation program as well as in successfully delivering mitigation grants and technical assistance to local jurisdictions. Furthermore, the workgroup plays a role in demonstrating progress on statewide mitigation activities.

The essential meetings occur in the fall and cover mitigation accomplishments of the previous fiscal year and the spring, discussing opportunities to partner on upcoming mitigation projects and unmet mitigation needs. The spring meeting will be timed to coincide with the FEMA mitigation program

consultation. The fall meeting material informs the Annual Resilience Report, which is published each October/November. Additional meetings may cover issues including synchronizing planning requirements or presentations on best practices.

For the 2017 update, workgroup meetings primarily took place at the Washington State Emergency Management Division on Camp Murray in the Policy Room of Building 20, unless otherwise noted in the meeting invite. The Mitigation Strategist from EMD will be responsible for scheduling meetings. For those unable to attend in person, a conference call line will be provided as follows:

- Phone Number: 1-877-820-7831
- PIN: 681242

In addition to the above agencies and others who participated in the 2017-2018 plan update, other state agencies, elected officials and the general public may be notified of progress made implementing the SEHMP via announcements on the EMD's website and through distribution to State Agency Liaisons. The Annual Resilience Report will be designed for public and executive consumption.

Permanent workgroup members from participating state agencies will be encouraged to attend the Annual FEMA Program Consultation to review progress on mitigation strategies and assess the effectiveness of Washington's mitigation program. Results of this consultation will be used to improve program delivery in subsequent years.

The SEHMP will be maintained and implementation of mitigation action items will be tracked through regular meetings of the Hazard Mitigation Workgroup. The group will meet at least bi-annually, in addition to being invited to attend the annual FEMA HMA Program Consultation. The meetings will review progress on mitigation strategies as well as identify opportunities to partner and develop new strategies. In addition to the regular meetings, the Mitigation Workgroup may convene to jointly support opportunities such as grant funding rounds or to review the accuracy of the plan following releases of new scientific data or recent disasters. These events may also serve to reprioritize mitigation action items.

As the plan is updated and progress is made on mitigation action items, it will be documented in the Annual Resilience Report. This report will be made available to agency directors and Mitigation Workgroup members as a tool to publicize Washington's commitment to risk reduction and resilience.

The risk assessment and consequences analysis will be updated along with the mitigation strategies as new data comes available that improves the quality and accuracy of risk and vulnerability ratings. Changes to risk from new data on hazards will be included along with changes in vulnerability (new exposure, implemented mitigation strategies). The updates will follow the same method and schedule as for the mitigation strategies.

Finally, since the SEHMP impacts and influences local mitigation plans, the elements related to technical assistance and grant administration will be regularly reviewed during technical assistance with local partners.

Three years prior to the expiration of the SEHMP the Mitigation Strategist and the State Hazard Mitigation Officer at EMD will apply for grant funding for a plan update via the Hazard Mitigation Grant Program or Pre-Disaster Mitigation Grant Program. **Two years prior** to plan expiration, the Mitigation Workgroup will begin assessing the overall progress of mitigation strategies and expand participation in preparation for the plan update.

To update mitigation strategies for subsequent plans, the Mitigation Strategist will review the status of mitigation programs and multi-agency strategies and compile strategies for any new mitigation programs. The two, five and long-term checkpoints will be updated accordingly. The goal is for all future iterations of the mitigation plan strategies to fully represent Washington's commitment to risk reduction.

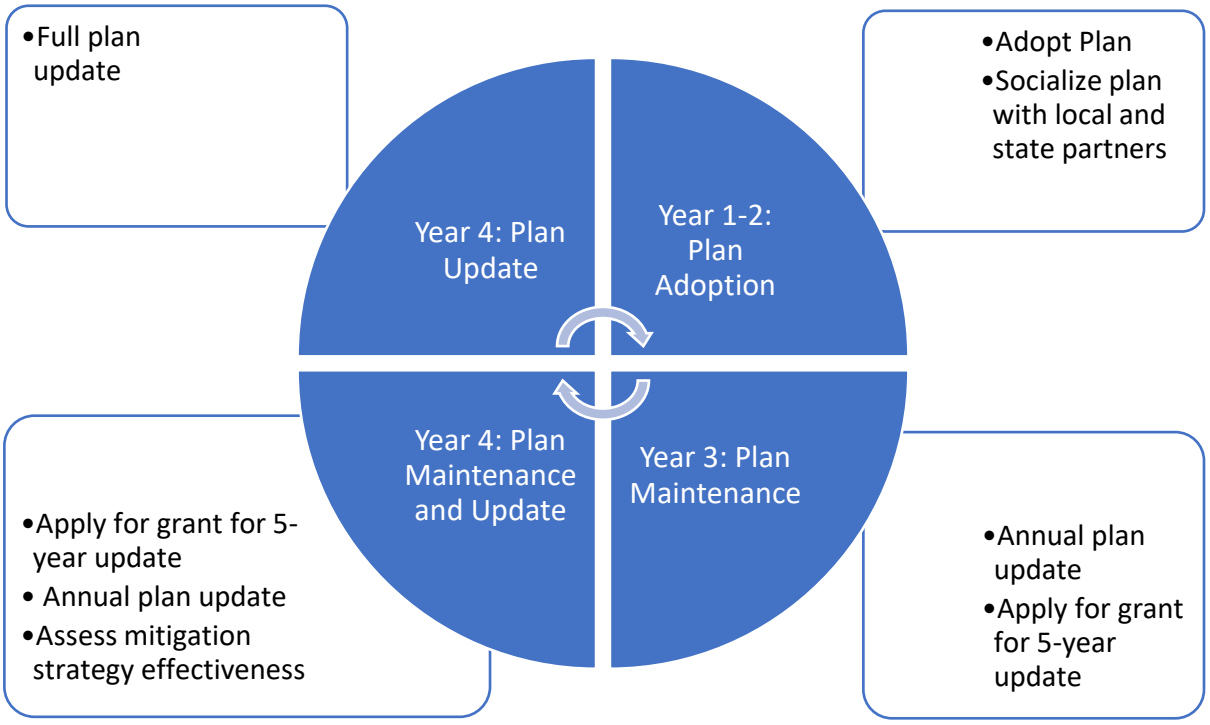


FIGURE 3: SEHMP PLAN UPDATE AND MONITORING CYCLE

Risk Assessment and Hazard Analysis

This hazard identification and risk assessment for Washington state provides the empirical basis for activities proposed in the strategy portion of the State Enhanced Hazard Mitigation Plan. The overall state risk summary provides a comparative risk assessment summarized for the 39 counties across 10 major natural hazards. The 10 major natural hazards identified for detailed risk analysis include:

1. Avalanche
2. Coastal Hazards
3. Drought
4. Earthquake
5. Flood
6. Landslide
7. Severe Weather (Hail, Lightning, Severe wind, Tornado, and Winter weather)
8. Tsunami
9. Volcano
10. Wildfire

While the above natural hazards can be further categorized into more detailed hazards based on various hazard parameters, for the purpose of this risk analysis only the general groupings of natural hazards were used. For example, all types of landslides were grouped into one category even though the physical processes and impacts of a creep versus a mudslide can be significantly different.

An additional seven human-caused hazards are considered. These are considered separately from the natural hazards and are not included in the Washington State Risk Index (WaSRI).

- Agriculture Disease Outbreak - Agriculture
- Dam Safety – Ecology
- Public Health/Pandemic – DOH
- Terrorism – MIL, WSP
- Hazardous Materials (Oil Trains, Pipelines, Hazmat) – Ecology
- Cyber Incident (incorporated into Terrorism profile) – EMD, MIL
- Radiological Incident – EMD

This risk analysis is the first step toward more detailed hazard specific risk analysis such as those based on specific hazard profiles for each type of landslide. In order to create the hazard profiles for each of the above hazards, some generalizations were made about the hazards. For example, no distinction was made between riverine floods and flash floods. Another example is that of volcanic eruptions, which can vary significantly in their duration, but have not been distinguished as such in this risk analysis.

In addition to the above, the impact of changing climatic conditions is also recognized in this risk analysis. Climatic changes are likely to have a significant impact on the future distribution and intensity of hazard events. Therefore, an additional section on climate change has been included in

this report. This section summarizes the key areas of concern that are likely to be relevant for hazard mitigation planning in the state.

Major Natural Hazards in Washington State

Since 1960, the state has experienced 8,736 significant hazard events resulting in 1,857 causalities (539 fatalities and 1,318 injuries), and $23.05 billion (adjusted to 2016 value) in property damages. The state also suffered $1.16 billion (adjusted to 2016 value) in crop losses from these hazard events. Severe storms (hail, wind, tornado, ice-storm, winter weather, lightning and heat waves) have been most common with 7,175 significant events recorded since 1960. Flooding, landslides and wildfires were the next three most frequent hazards.

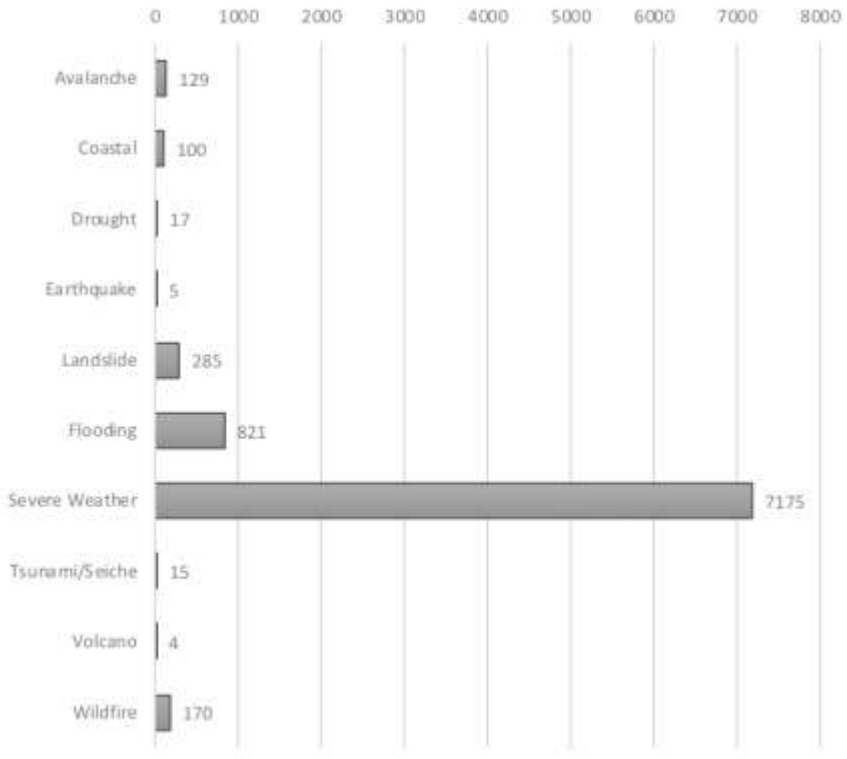


FIGURE 4: NUMBER OF NATURAL HAZARD EVENTS IN WASHINGTON (1960-2017)

Since 1960, the highest number of the casualties (fatalities and injuries) have resulted from severe weather, landslides and avalanches. In comparison, most of the property damage was caused by earthquakes, including the 2001 Nisqually Earthquake, which caused more than $2 billion in damages (2001 dollars).

Between 1960 and 2017, King county experienced the most hazard events (408), followed by Snohomish (349) and Jefferson (339) counties. During the same time, Clark county experienced the most casualties (316), followed by King (203), Snohomish (151) and Pierce (100) counties. The highest property damage was experienced by Skamania county ($9.6 billion), followed by Cowlitz ($3.8 billion), King ($2.6 billion) and Thurston ($1.2 billion) counties. The 1980 Mt. St. Helens eruption is a major driver in recorded damages for southwest Washington counties like Skamania

and Cowlitz. Rural counties of Chelan, Okanogan and Yakima cumulatively experienced 75 percent of the total crop damage in the state as a result of natural hazard events between 1960 and 2017.

Hazard Losses 1960-2017				
County Name	**Number of Hazard Events**	**Number of casualties**	**Property Damage (Adj. to 2016 $)**	**Crop Damage (Adj. to 2016 $)**
Adams	170	9	$39,120,339	$11,404,939
Asotin	129	2	$7,315,939	$522,628
Benton	169	47	$8,969,907	$13,590,021
Chelan	231	67	$97,487,885	$390,495,030
Clallam	271	22	$260,615,642	$467,110
Clark	212	316	$238,985,309	$632,674
Columbia	121	7	$8,715,461	$13,177,076
Cowlitz	202	40	$3,834,959,500	$541,082
Douglas	177	15	$148,741,102	$87,394,513
Ferry	155	6	$11,215,331	$6,017,397
Franklin	173	40	$35,096,774	$13,153,572
Garfield	123	2	$7,343,044	$5,628,380
Grant	207	33	$47,234,256	$1,561,553
Grays Harbor	273	36	$280,172,675	$334,548
Island	206	37	$65,290,942	$406,514
Jefferson	339	18	$279,709,040	$858,369
King	408	203	$2,667,586,442	$580,703
Kitsap	298	68	$309,860,381	$703,234
Kittitas	138	48	$96,650,269	$12,783,311
Klickitat	145	23	$11,061,368	$13,003,649
Lewis	292	51	$377,142,540	$455,685
Lincoln	213	8	$37,236,022	$35,263,824
Mason	280	17	$294,495,159	$703,234
Okanogan	303	42	$269,460,662	$258,858,070

Hazard Losses 1960-2017				
County Name	Number of Hazard Events	Number of casualties	Property Damage (Adj. to 2016 $)	Crop Damage (Adj. to 2016 $)
Pacific	225	26	$250,103,829	$355,161
Pend Oreille	153	9	$7,119,537	$5,928,076
Pierce	338	100	$1,130,804,188	$429,821
San Juan	152	7	$40,464,915	$265,273
Skagit	278	66	$167,643,351	$481,224
Skamania	132	87	$9,601,841,855	$515,363
Snohomish	349	151	$283,191,841	$600,595
Spokane	326	80	$57,733,905	$18,080,080
Stevens	176	4	$8,050,936	$6,033,584
Thurston	302	24	$1,255,482,099	$598,208
Wahkiakum	197	6	$222,328,792	$199,841
Walla Walla	205	24	$188,913,175	$13,729,754
Whatcom	265	51	$105,828,200	$1,707,920
Whitman	198	13	$11,759,677	$5,771,788
Yakima	205	49	$290,713,846	$237,549,874
Grand Total	8,736	1,857	$23,056,446,135	$1,160,783,679

Source: Hazards and Vulnerability Research Institute, 2017. Spatial Hazard Events and Losses Database for the United States, Version 16.0. [Online Database]. Columbia, SC: Hazards and Vulnerability Research Institute, University of South Carolina.

Washington State Natural Hazard Risk Assessment Approach

The Washington State Risk Index used here adopts a multi-hazard view of risk, combining the natural hazards with socio-economic factors, to create a holistic understanding of the risk faced by communities. This analytical approach is similar to the ongoing initiative by FEMA at the national level to create a National Risk Index (NRI). The NRI incorporates data on social vulnerability, built environment, community resilience and natural hazards to create a baseline of natural hazards risk for the U.S. at the county and census tract level.

The Washington State Risk Index (WaSRI) modifies the NRI process of variable selection and statistical methods to better reflect local priorities and concerns. The risk index is based on spatial overlays of the hazard zone with area, population distribution, vulnerable population distribution, built environment, critical infrastructure facilities (12), State facilities (owned and leased), and first responder facilities (fire stations, law enforcement buildings, and EMS). The proportional exposure along each of these dimensions were combined to create hazard risk indices for each county. The county indices were aggregated to create the Washington State Hazard Risk Index for each of the 10 natural hazards listed earlier.

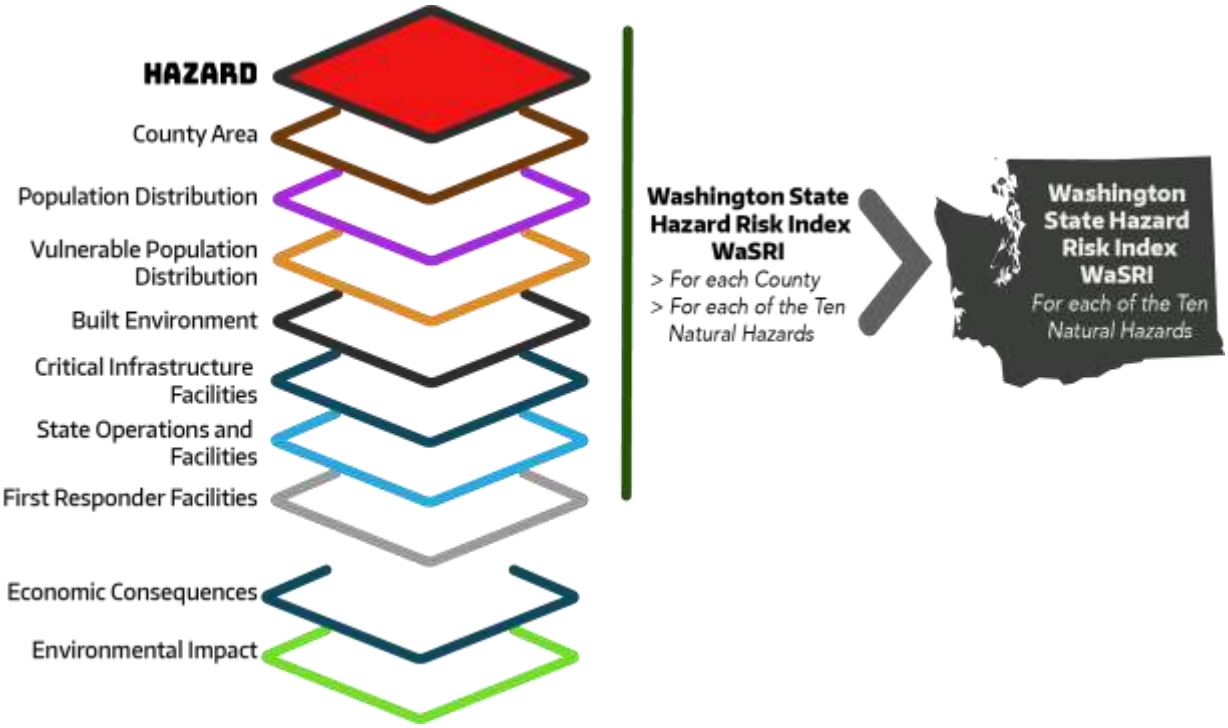


FIGURE 5: RISK INDEX CREATION METHODOLOGY

Assessment of economic consequences and environmental impacts were also conducted but were not included in the construction of the index due to methodological limitations as explained in each of the respective sections.

Washington State Natural Hazard Risk Index (WaSRI-NH)

The relative ranks of each of the risk analysis factors listed above are combined to create a cumulative hazard risk index for each county. The overall natural hazard risk index reflects the relative rank of each county with respect to the 10 major hazard types included in this risk assessment.

Seven counties are estimated to be at high risk from natural hazards. These include King, Lewis, Okanogan, Pierce, Skagit, Skamania and Whatcom Counties. High level of risk implies that a significant proportion of these counties is exposed to a number of natural hazards across all factors of risk analysis. Not all counties are exposed to all 10 natural hazards. Only Snohomish, Thurston, King, Pierce, Skagit and Whatcom Counties are at some degree of risk from all 10 of the natural

hazards. Most of these counties are ranked high or medium-high for multiple hazards that threaten their communities.

King County, the largest county in the state in terms of population and economic activity, is ranked at high risk overall to natural hazards. This is based on proportional risk relative to the size of King County's population, built environment, critical infrastructure facilities, state facilities and first responder facilities within the county, even though King County may not be at the highest risk to any individual natural hazard.

Along with King County, the other two counties among the top three ranked by GDP - Snohomish and Pierce Counties – are also exposed to threats from all 10 natural hazards. Both are ranked medium-high for overall natural hazard risk. Their overall risk rankings reflect their high density and large footprint of population and infrastructure across the respective counties.

Not only a risk, this high population density along with other resources provides a relatively higher degree of resilience for the county. The analytical approach adopted in this assessment and its relative proportional risk assessment is sensitive to this aspect of community resilience, and as such is reflected in the overall risk assessment rankings. Counties that have relatively smaller populations and lower number of infrastructure facilities, most of which are located in areas exposed to multiple natural hazards, are less resilient and more likely to experience catastrophic impacts from more minor hazard events. This degree of risk is reflected in the ranking approach adopted for this study.

Coastal hazards are not included in the risk assessment table due to a lack of data quality and availability, although coastal hazards are considered qualitatively.

What Is Social Vulnerability?

The concept of social vulnerability may be better understood as a measure to identify places where, if a disaster occurs, planners may expect outsized impacts or slower recovery times. Social vulnerability by itself does NOT consider hazard exposure.

Places are considered more socially vulnerable when they have a high degree of intersection among indicators related to vulnerability. This is because each variable by itself, for example, poverty, is not a predictor of vulnerability; however, poverty combined with limited access to transportation, large numbers of dependents, low rates of homeownership and other factors may be more predictive of vulnerability.

Social vulnerability as a concept is still undergoing considerable debate. A key aspect of that debate is around how variables such as race and ethnicity should be viewed in relation to vulnerability. It is the opinion of Washington's planning team that race is not a source of social vulnerability, even when it is correlated with it.

Local jurisdictions are encouraged to explore a model that works for them.

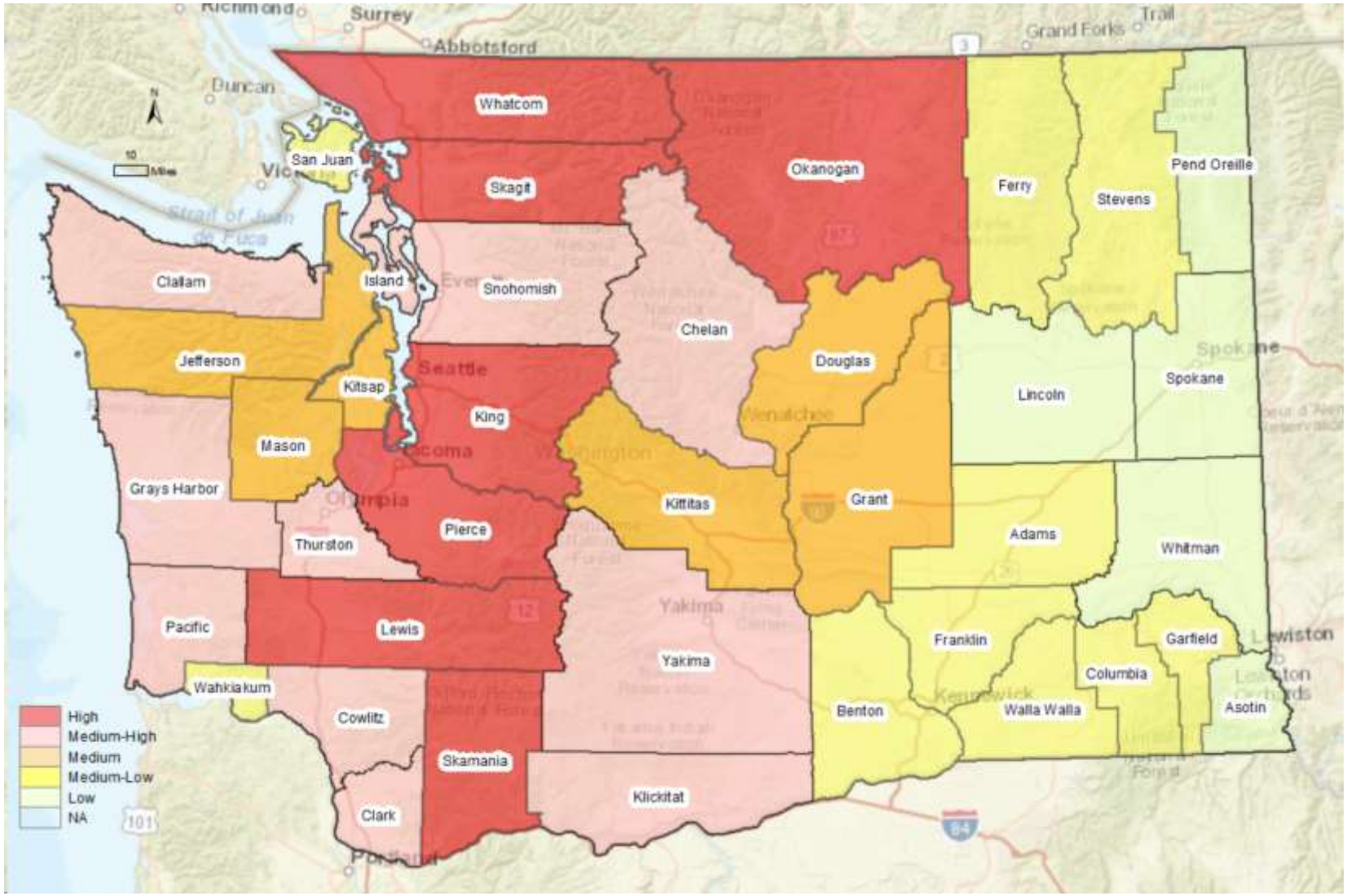


FIGURE 6: NATURAL HAZARD RISK INDEX (WASRI-NH)

Overall Summary of Natural Hazards Risks for Each County											
County	Avalanche	Coastal Hazards	Drought	Earthquakes	Floods	Landslides	Severe Weather	Tsunamis	Volcano	Wildfires	Cumulative Risk Ranking
Adams	NA	NA	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH	NA	NA	LOW	MEDIUM-LOW
Asotin	NA	NA	MEDIUM-HIGH	LOW	LOW	MEDIUM	MEDIUM	NA	NA	MEDIUM-HIGH	LOW
Benton	NA	NA	HIGH	LOW	LOW	HIGH	MEDIUM-HIGH	NA	NA	MEDIUM-LOW	MEDIUM-LOW
Chelan	HIGH	NA	HIGH	LOW	MEDIUM	MEDIUM	MEDIUM-HIGH	NA	NA	MEDIUM-HIGH	MEDIUM-HIGH
Clallam	LOW	NA	LOW	HIGH	MEDIUM	HIGH	LOW	MEDIUM-HIGH	NA	LOW	MEDIUM-HIGH
Clark	MEDIUM-LOW	NA	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	LOW	MEDIUM-HIGH	NA	HIGH	MEDIUM	MEDIUM-HIGH
Columbia	NA	NA	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	NA	NA	MEDIUM	MEDIUM-LOW
Cowlitz	MEDIUM	NA	LOW	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW	NA	MEDIUM-HIGH	MEDIUM	MEDIUM-HIGH
Douglas	MEDIUM-LOW	NA	HIGH	MEDIUM-LOW	LOW	MEDIUM	HIGH	NA	NA	MEDIUM-LOW	MEDIUM
Ferry	NA	NA	MEDIUM	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM	NA	NA	MEDIUM-HIGH	MEDIUM-LOW
Franklin	NA	NA	HIGH	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-LOW	HIGH	NA	NA	LOW	MEDIUM-LOW

Overall Summary of Natural Hazards Risks for Each County											
County	Avalanche	Coastal Hazards	Drought	Earthquakes	Floods	Landslides	Severe Weather	Tsunamis	Volcano	Wildfires	Cumulative Risk Ranking
Garfield	NA	NA	MEDIUM	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM	MEDIUM	NA	NA	MEDIUM	MEDIUM-LOW
Grant	NA	NA	HIGH	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-LOW	HIGH	NA	NA	MEDIUM	MEDIUM
Grays Harbor	NA	NA	LOW	HIGH	HIGH	MEDIUM	LOW	HIGH	NA	MEDIUM-LOW	MEDIUM-HIGH
Island	NA	NA	LOW	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-HIGH	LOW	MEDIUM-LOW	MEDIUM-LOW	HIGH	MEDIUM-HIGH
Jefferson	LOW	NA	LOW	MEDIUM-HIGH	MEDIUM-HIGH	HIGH	LOW	MEDIUM	NA	LOW	MEDIUM
King	MEDIUM	NA	MEDIUM	HIGH	LOW	MEDIUM	MEDIUM	MEDIUM-LOW	MEDIUM	MEDIUM	HIGH
Kitsap	NA	NA	LOW	MEDIUM-HIGH	LOW	MEDIUM-HIGH	LOW	LOW	NA	MEDIUM-HIGH	MEDIUM
Kittitas	HIGH	NA	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	MEDIUM	NA	NA	MEDIUM-HIGH	MEDIUM
Klickitat	MEDIUM-HIGH	NA	MEDIUM-HIGH	LOW	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM	NA	MEDIUM-HIGH	HIGH	MEDIUM-HIGH
Lewis	MEDIUM-HIGH	NA	MEDIUM-LOW	MEDIUM-HIGH	HIGH	HIGH	MEDIUM	NA	MEDIUM-LOW	MEDIUM	HIGH
Lincoln	NA	NA	MEDIUM	LOW	HIGH	LOW	MEDIUM	NA	NA	MEDIUM-LOW	LOW

Overall Summary of Natural Hazards Risks for Each County											
County	Avalanche	Coastal Hazards	Drought	Earthquakes	Floods	Landslides	Severe Weather	Tsunamis	Volcano	Wildfires	Cumulative Risk Ranking
Mason	LOW	NA	LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM	LOW	LOW	NA	MEDIUM-HIGH	MEDIUM
Okanogan	HIGH	NA	HIGH	MEDIUM	HIGH	MEDIUM-HIGH	HIGH	NA	NA	HIGH	HIGH
Pacific	NA	NA	LOW	HIGH	HIGH	MEDIUM	LOW	HIGH	NA	LOW	MEDIUM-HIGH
Pend Oreille	NA	NA	MEDIUM	LOW	LOW	LOW	MEDIUM	NA	NA	HIGH	LOW
Pierce	MEDIUM	NA	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-LOW	LOW	MEDIUM	MEDIUM	MEDIUM-HIGH	MEDIUM-LOW	HIGH
San Juan	NA	NA	LOW	MEDIUM	MEDIUM	LOW	LOW	MEDIUM-LOW	NA	HIGH	MEDIUM-LOW
Skagit	MEDIUM-HIGH	NA	MEDIUM-LOW	MEDIUM-HIGH	HIGH	MEDIUM-LOW	MEDIUM-LOW	MEDIUM	HIGH	MEDIUM	HIGH
Skamania	HIGH	NA	MEDIUM	LOW	MEDIUM	HIGH	MEDIUM	NA	HIGH	MEDIUM-HIGH	HIGH
Snohomish	MEDIUM-HIGH	NA	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-HIGH
Spokane	NA	NA	HIGH	LOW	LOW	LOW	MEDIUM-HIGH	NA	NA	MEDIUM-HIGH	LOW
Stevens	NA	NA	MEDIUM-HIGH	LOW	LOW	MEDIUM	MEDIUM-HIGH	NA	NA	HIGH	MEDIUM-LOW
Thurston	LOW	NA	LOW	HIGH	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-LOW	LOW	LOW	MEDIUM-HIGH	MEDIUM-HIGH

Overall Summary of Natural Hazards Risks for Each County											
County	Avalanche	Coastal Hazards	Drought	Earthquakes	Floods	Landslides	Severe Weather	Tsunamis	Volcano	Wildfires	Cumulative Risk Ranking
Wahkiakum	NA	NA	LOW	MEDIUM-HIGH	HIGH	MEDIUM-HIGH	LOW	LOW	NA	LOW	MEDIUM-LOW
Walla Walla	NA	NA	HIGH	MEDIUM	MEDIUM-LOW	LOW	HIGH	NA	NA	MEDIUM-LOW	MEDIUM-LOW
Whatcom	MEDIUM	NA	MEDIUM	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW	MEDIUM	MEDIUM	MEDIUM-LOW	HIGH
Whitman	NA	NA	HIGH	MEDIUM-LOW	MEDIUM	LOW	HIGH	NA	NA	LOW	LOW
Yakima	MEDIUM-LOW	NA	HIGH	MEDIUM	MEDIUM	MEDIUM-LOW	HIGH	NA	LOW	HIGH	MEDIUM-HIGH

Considering Seasonal Populations

The WaSRI analysis does not account for the significant increase in seasonal population experienced by a number of Washington counties. As per the 2015 Agricultural Workforce Report, the majority of the increase in seasonal population is a result of the seasonal employment which comprised more than half of the state's total covered employment in agricultural during both 2014 and 2015. The estimated annual average for seasonal employment grew by nearly one percent from 2014 through 2015, while the estimated annual average for non-seasonal employment grew by more than six percent during the same period. On average, the South-Central agricultural reporting area with Yakima and Klickitat counties produced the largest number of seasonal jobs and Eastern Area 6, consisting of Ferry, Steven, Pend Oreille, Lincoln, Spokane, Whitman, Garfield, Columbia and Asotin counties, produced the smallest number of seasonal jobs during 2015. While WaSRI does not take into account the influence of seasonal population on risk estimates, the implications for local hazard mitigation planning due to changes in seasonal population will need to be addressed in greater detail at the local level in the counties that experience significant increases in seasonal population.

These at-risk population estimates also do not include the thousands of tourists that populate at-risk areas at various times of the year. For example, an analysis of visitor data from Washington State Parks in Wood and Soulard (2008) suggests that 27 parks in the tsunami-inundation zone of the study area receive a significant amount of day tourists. The highest annual average of day-use visitors for the 27 parks are for Fort Worden (1,164,125 visitors near Port Townsend) and Cape Disappointment (1,162,447 visitors near Ilwaco). The sum of annual average visitors to the 27 coastal parks of the Washington State parks selected in Wood and Soulard (2008) is 6,215,569 people (2007 estimates). Assuming an equal distribution of visitors on every day of the year, this equates to 17,029 day-use visitors to these coastal State parks on average every day. In reality, this number is low because attendance is not equally distributed throughout the year; there will be seasonal peaks in park attendance (for example, summer months and holidays).

This issue extends to Eastern Washington counties and cities, such as Leavenworth, that are wholly dependent on tourists and where fire vulnerability coincides with the summer months popular with tourists.

Understanding Sector-Specific Risks

In accordance with best practices as outlined in the Emergency Management Accreditation Program (EMAP), Washington separately analyzes risks to the built environment, vulnerable populations, critical infrastructure, state operations and facilities, first responders, the economy, the environment, and public confidence. Each hazard assessment chapter contains a separate assessment for most of these sectors. A combined assessment is included in this chapter.

Estimating the Risk to State Facilities

Washington does not maintain a database of replacement values of facilities, which would be the most effective way to estimate the potential losses to state facilities. While agencies are required to implement hazard mitigation at their facilities for seismic threats, much of this mitigation may be to a life-safety standard. Finally, Washington maintains many historic buildings, which cannot be

replaced. Using currently available data, there is no way to make a truly accurate estimation of losses to state facilities. To provide an inkling of the levels of facility exposure and potential losses, however, state-owned facilities were examined based on their original, nominal (not inflation-adjusted) cost for construction or purchase. The average value of the 6,953 state-owned facilities for which there is purchase data is $1,449,518. This value is multiplied by the number of exposed state facilities to each hazard in the state. This can be thought of as a very low floor for the potential losses following the absolute destruction of all state facilities in a hazard exposure zone.

State agencies are currently in the process of updating a risk registry, which they will submit to the Department of Enterprise Services. This risk registry is a valuable tool for future estimates of potential losses to state facilities following a natural hazard event.

Hazard	Count of Exposed Facilities (Includes facilities for which there is no dollar value available)	Value of Potential Losses (County*$1,449,518)
Avalanche	417	$604,449,006
Climate Change*	No Direct Losses	No Direct Losses
Coastal Hazards*	No Data	No Data
Drought*	No Direct Losses	No Direct Losses
Earthquake	5992	$8,685,511,856
Flood	412	$597,201,416
Landslide	2466	$3,574,511,388
Severe Weather	5099	$7,391,092,282
Tsunami	109	$157,997,462
Volcano	165	$239,170,470
Wildfire	1658	$2,403,300,844

Even though the estimates above cannot accurately identify the total potential losses, it does reveal the magnitude of potential damages caused by some of Washington's most extreme – or most widespread – hazards.

The Impact of Population Growth and Development on Risk and Vulnerability in Washington

In April 2017, Washington's population reached an estimated 7.3 million, representing an increase of over 125 thousand persons, a 1.76 percent increase over 2016, and the largest increase since 2007. [3] This population increase, driven largely by migration, is part of a larger trend of an estimated 10.13 percent population increase since 2010, the seventh-highest growth rate in the country.

[3] State of Washington 2017 Population Trends, Washington State Office of Financial Management, November 2017.

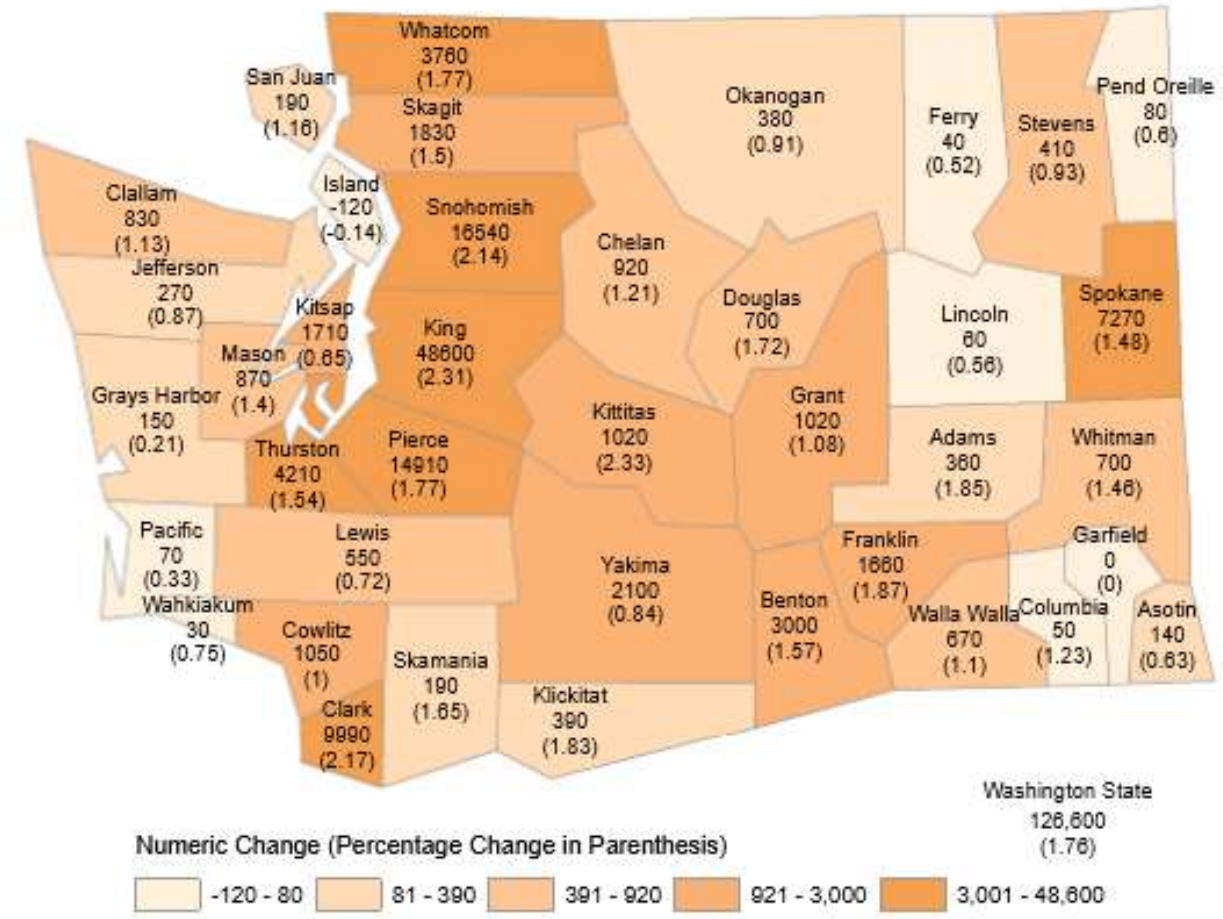


FIGURE 7: POPULATION CHANGE BY COUNTY 2016-2017 (WA OFM, 2017)

The takeaway from the above graphic is this: most of Washington is growing, though the growth is occurring in already-urbanized counties in larger number, and percentages, than in less-urbanized counties.

The trend is continued when looking at a larger time-scale, 2013-2017, revealing growth in many counties that, due to the huge differences between the Puget Sound counties and the rest of the state. Out of the total population of 7.3 million, 2.2 million of those people live in King County alone.

County	2013	2017	Percent Change
Garfield	2,250	2,200	-2.22%
Grays Harbor	73,200	72,970	-0.31%
Columbia	4,100	4,100	0.00%
Lincoln	10,675	10,700	0.23%

Wahkiakum	4,020	4,030	0.25%
Ferry	7,650	7,740	1.18%
Pacific	21,000	21,250	1.19%
Okanogan	41,500	42,110	1.47%
Stevens	43,800	44,510	1.62%
Lewis	76,200	77,440	1.63%
Pend Oreille	13,150	13,370	1.67%
Asotin	21,800	22,290	2.25%
Mason	61,800	63,190	2.25%
Yakima	247,250	253,000	2.33%
Cowlitz	103,300	105,900	2.52%
Clallam	72,350	74,240	2.61%
San Juan	16,000	16,510	3.19%
Walla Walla	59,500	61,400	3.19%
Skamania	11,300	11,690	3.45%
Adams	19,200	19,870	3.49%
Jefferson	30,275	31,360	3.58%
Island	79,700	82,790	3.88%
Kitsap	254,000	264,300	4.06%
Spokane	480,000	499,800	4.13%
Grant	91,800	95,630	4.17%
Chelan	73,600	76,830	4.39%
Skagit	118,600	124,100	4.64%
Klickitat	20,700	21,660	4.64%
Whatcom	205,800	216,300	5.10%
Douglas	39,280	41,420	5.45%
Benton	183,400	193,500	5.51%
Pierce	814,500	859,400	5.51%
Whitman	46,000	48,640	5.74%

Thurston	260,100	276,900	6.46%
Franklin	84,800	90,330	6.52%
Kittitas	41,900	44,730	6.75%
Snohomish	730,500	789,400	8.06%
Clark	435,500	471,000	8.15%
King	1,981,900	2,153,700	8.67%

The Growth Management Act (GMA), along with the critical areas ordinances, is one of the best tools Washington has to support risk reduction. Updates to comprehensive plans were completed between 2015 and 2018. These included updates to local critical areas ordinances, which must use best available science on the extent of geologic hazards and flooding. The updated ordinances and plans should result in a better risk trajectory for the state overall and slow the rate of development in high-hazard areas.

Washington land use and development policies reflect population growth trends. The new Buildable Lands Program authorized under RCW 36.70A.215 requires, as of 2017, only seven populous counties (King, Pierce, Snohomish, Whatcom, Clark, Thurston, and Kitsap) to look at projected versus actual development and determine whether land use allocations met development needs for industrial, residential, and commercial uses. These seven counties are home to nearly 70 percent of the total state population, or 5 million people. Much of the change in vulnerability to natural hazards is through development in these counties. Several of these counties are working to bring natural hazard information into current and future planning for buildable lands in order to exclude hazard-prone areas. Nevertheless, the critical areas ordinance doesn't necessarily prevent development in all high-hazard areas and so development may continue as long as "mitigation measures" are taken.

A major driver for increased vulnerability is new development in areas closer to the foothills of the cascades or in wildland-urban interface areas in the eastern portion of the state. These areas are prone to wildfire as well as landslides, and in many cases, may have limited ingress and egress routes. One illustrative example is the new development in Snoqualmie, Washington, where homes are being built in relatively hilly areas, surrounded by trees. While fires in Western Washington have a long return-period, the risk for major wildland-urban interface fires (WUI) is high.

FIGURE 8: NEW DEVELOPMENT IN SNOQUALMIE, WA (GOOGLE MAPS: ACCESSED 7/5/18)

Mitigating vulnerability caused by new development are building codes, including the updated Wildland Urban Interface fire code, which has been adopted by communities in Chelan, Kittitas, and Yakima counties. The WUI code is met by an increased awareness of fire danger in Eastern Washington, leading many communities to become FireWise or Fire Adapted. According to WA DNR, in 2016, Washington led the nation in adding new FireWise communities, with 32 communities making commitments.[4] Other mitigation efforts have included the purchase of properties in the Wenatchee foothills of Chelan County, both for fire risk avoidance and the preservation of natural beauty.[5] Due to this increased awareness and level of preparedness, wildfire risk may have actually been reduced in some parts of the state.

The new building codes, most recently effective as of 2016, are also contributing to construction practices for new developments that should lower the risk of, and damage from, a major earthquake. Washington's building codes, however, are yet to be tested by a major, subduction-zone earthquake. A recent article on earthquake risk to new construction in San Francisco indicates that development on marginal soils are a major concern.[6] Much of the new development in areas like Seattle's downtown and Pioneer Square neighborhood is also on marginal soil. While new building codes are designed to account for soil, this is still a possible area of vulnerability.

Although new population growth inevitably increases vulnerability, the relatively lower rates of growth in counties more at risk to major hazards, for example in the coastal counties, such as Grays Harbor, or the mountainous central counties, do ameliorate some of the potential new risk.

For hazards in general, and seismic hazards specifically, there have also been some significant state-led moves that may reduce vulnerability over the long term. The 2017 Governor's Resilient Washington Subcabinet produced a report, following up on a report from 2012, that identified key actions to reduce seismic risk. Some of these actions, including a statewide building inventory and school seismic safety assessments, which may lead to more risk reduction activities in the future.

Changes in risk to natural hazards are dynamic and multi-sided. The occurrence of a previously unknown event can lead to increased awareness and actions that reduce risk to that event.

[4] Washington Leads the Nation with New FireWise Communities, DNR, https://www.dnr.wa.gov/news/washington-leads-nation-32-new-firewise-communities
[5] Trust for Public Lands, Wenatchee Foothills, https://www.tpl.org/our-work/wenatchee-foothills
[6] San Francisco Earthquake Risks: Questions and Answers, New York Times, April 18, 2018, https://www.nytimes.com/2018/04/18/us/san-francisco-earthquake-risks.html.

Hazard	Summary of Changes to Risk Since 2013 Plan Update
Avalanche	Increased population leads to greater numbers of people involved in winter sports, leading to greater exposure to avalanche hazards.
Drought	Significant statewide investment in drought management strategies, such as through the new Drought Contingency Plan and a major Columbia River project by the bureau of reclamation help mitigate drought risk as climate variability increases the likelihood of drought.
Earthquake	New building codes reduce earthquake risk, while large-scale development and population growth in Western Washington have led to much greater earthquake exposure. Transportation system mitigation measures, while occurring, are not yet complete, leading to evacuation concerns. New residents are also likely to be less informed about earthquake hazards and personal preparedness expectations.
Flood	Washington still leads the country with three Class 2 CRS counties, and other counties and cities continue to make strides on flood risk reduction programs. The new Chehalis Basin flood control authority created by an Act of the State Legislature will also help reduce risk in one of the most flood-prone parts of the state. On the other hand, new development is increasing impervious surfaces, dramatically worsening potential flooding in as yet unforeseen ways.
Landslide	No significant change to landslide risk is recorded, although new landslide maps developed using LiDAR are assisting local jurisdictions in managing their landslide risk as the maps come available.
Severe Storm	No significant change to severe storm risk is documented beyond the increased population exposure.
Tsunami	The construction of the Ocosta Elementary School in Westport, Washington, in 2016 demonstrated the viability of a school doubling as a tsunami evacuation structure. Other structures continue to be studied and are making progress on design. The Shoalwater Bay Tribe is scheduled to receive a FEMA award for a vertical evacuation structure. New maps, sirens, improved outreach, and new evacuation routes continue to raise awareness and preparedness to help reduce the risk from tsunami.
Volcano	New evacuation maps and sirens help reduce the risk from lahar around Mt. Rainier. Work is also ongoing on lahar zones and potential siren locations or evacuation routes at other volcanos, notably Mt. Baker in Whatcom County.

Wildfire	The 2014 and 2015 wildfires demonstrated the risk to much of the state from widespread WUI and cabin development. New development in the foothills of the Cascades is also a risk, with the number and severity of west side fires increasing. On the east side, however, there is dramatically increased awareness and adherence to FireWise and Fire Adapted Communities principles, as well as the adoption of WUI codes, which is reducing wildfire risk.
Coastal Erosion	New maps are providing tools for planners involved in natural hazards, shorelines management, and comprehensive planning. Washington is trying to thread the needle between ecologically productive coastlines and the need to protect property. The risk to coastal erosion increases with new development and decreases with better coastal management principles. Washington has multiple agencies, including the Puget Sound Partnership and the Department of Ecology, working on these issues.

The updated risk assessment for the 2018 SEHMP accounts for changes in risk and vulnerability due to population growth and development through the calculation of a risk index for each natural hazard. This index included information on vulnerable populations, development patterns, and hazard exposure to identify areas of greater exposure and potentially increased vulnerability.

Changes to State Facility Vulnerability

A persistent challenge in this and previous mitigation plans has been the measurement of state facility vulnerability, and changes to that vulnerability. There have been some improvements that are recorded, for example, a long-running seismic retrofit project at the Evergreen State College and a program led by the Department of Enterprise Services to require each state agency to document risk to their facilities. This latter program should lead to significantly improved estimates in facility risk, and change in risk over time, in future updates of this plan. Based on current data, however, there is no significant change in Washington State facility risk since the 2013 update of the SEHMP.

Washington State Risk Index for Avalanche (WaSRI – A)

Avalanche Risk Summary	
WASHINGTON STATE RISK INDEX FOR AVALANCHE (WASRI-A)	MEDIUM-LOW
Likelihood	HIGH
Hazard Area	MEDIUM
Population	LOW
Vulnerable Population	LOW
Built Environment	LOW
Critical Infrastructure	LOW
State Facilities	LOW
First Responders	LOW
Economic Consequences	MEDIUM
Environmental Impacts	MEDIUM

In Washington State, avalanches occur in four mountain ranges – the Cascade Range, which divides the State East and West; the Olympic Mountains in Northwest Washington; the Blue Mountains in Southeast Washington; and the Selkirk Mountains in Northeast Washington. The avalanche season begins in November and continues until early summer for all mountain areas of the State. In the high alpine areas of the Cascades and Olympics, the avalanche season continues year-round.

Since 1995, a total of 106 significant avalanche events have occurred in the State, with King, Lewis, Pierce and Whatcom counties experiencing the highest number of these events. There were 63 avalanche related fatalities reported from 1995 to 2017. These were among the highest number of avalanche related fatalities in the nation.

Avalanche hazard values are derived from overlaying U.S. Forest Service National Avalanche Center forecast zones on the State map. Not all counties are at risk from avalanche hazards. Although King, Lewis, Pierce, and Whatcom counties have more recorded avalanches, Chelan, Kittitas, Okanogan and Skamania Counties are at the highest potential risk from avalanche hazards based on our hazard exposure analysis. All of these counties, except for Okanogan County, have a high proportion of county area (ranked high) located in areas exposed to avalanche hazard. The proportion of population exposed to avalanche hazards in these four counties is ranked high, except for Kittitas, where the population exposure to avalanche is ranked medium-high.

Only two counties, Okanogan and Chelan, are ranked high for vulnerable population exposure to avalanche, the other two are ranked only at medium.

FIGURE 9: AVALANCHE RISK (WASRI-A)

Avalanche Risk Index (WaSRI-A) and Constituent Avalanche Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Avalanche Risk Index (WaSRI-A)
Adams								
Asotin								
Benton								
Chelan	High	High	High	High	High	High	High	HIGH
Clallam	Medium-Low	Low	Medium	Low	Medium-Low	Low	Low	LOW
Clark	Medium-Low	Medium-Low	Medium	Medium-Low	Medium-Low	Medium	Medium	MEDIUM-LOW
Columbia								
Cowlitz	Medium-Low	Medium-High	Medium	Medium-High	Medium-Low	High	Medium	MEDIUM
Douglas	Low	Medium-Low	Medium	Medium-Low	Low	High	Low	MEDIUM-LOW

Avalanche Risk Index (WaSRI-A) and Constituent Avalanche Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Avalanche Risk Index (WaSRI-A)
Ferry								
Franklin								
Garfield								
Grant								
Grays Harbor								
Island								
Jefferson	Medium-Low	Low	Medium	Low	Medium-Low	Low	Low	LOW
King	Medium-High	Medium-High	Medium	Medium-High	Medium	Medium-Low	Medium	MEDIUM
Kitsap								
Kittitas	High	Medium-High	Medium	Medium-High	High	Medium-High	High	HIGH
Klickitat	Medium	Medium	Medium	Medium	Medium-High	Medium	High	MEDIUM-HIGH
Lewis	Medium	Medium	High	Medium	Medium-High	Medium	Medium-High	MEDIUM-HIGH
Lincoln								
Mason	Low	Low	Medium	Low	Low	Low	Low	LOW
Okanogan	Medium	High	High	High	High	High	Medium-High	HIGH
Pacific								
Pend Oreille								
Pierce	Medium-High	Medium	Medium	Medium	Medium	Medium	Medium-High	MEDIUM
San Juan								
Skagit	Medium-High	High	Medium	High	Medium-High	Medium-High	Medium-Low	MEDIUM-HIGH
Skamania	High	High	Medium	High	High	Medium-High	High	HIGH
Snohomish	High	Medium-High	Medium	Medium-High	Medium-High	Medium-Low	Medium	MEDIUM-HIGH

Avalanche Risk Index (WaSRI-A) and Constituent Avalanche Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Avalanche Risk Index (WaSRI-A)
Spokane								
Stevens								
Thurston	Low	Low	Medium	Low	Low	Low	Low	LOW
Wahkiakum								
Walla Walla								
Whatcom	Medium-High	Medium	Medium	Medium	Medium	Medium-High	Medium-Low	MEDIUM
Whitman								
Yakima	Medium	Medium-Low	High	Medium-Low	Medium	Medium-Low	Medium-High	MEDIUM-LOW

Likelihood

The State experiences a number of avalanche events annually. Most of these are small events in restricted regions. Annual likelihood of a major event is 42 percent, and of multiple events is 35 percent. Between 1960 and 2017, the State of Washington has experienced 129 avalanche events resulting in property losses worth $2.7 million (table A4). These events also resulted in 50 injuries and 46 fatalities. Most hazard events occurred in King County (27) followed by Pierce (22), Lewis (20), and Whatcom (11) counties. The number of avalanches may increase in the near future as climate change increases atmospheric moisture levels and winter rains fall as snow in the Cascades. With continued warming, however, snow will not collect on the lower slopes and there will less and less accumulated snow to form avalanches.

Area Impacted

The avalanche hazard area map was overlaid with the County map to estimate the percentage area exposed to avalanche hazards in each county. About 31 percent of the State area lies in avalanche hazard zones. Avalanche hazard exposure is concentrated in the Central Ecological Region. These areas are primarily located in the upper elevations of the Cascades. Chelan, Skamania, Snohomish, Kittitas, King, Skagit, Whatcom, Pierce, Yakima, Lewis, Okanogan, Klickitat, Jefferson, Cowlitz, Clark, Clallam and Mason Counties are the only counties exposed to major avalanche hazards. Some parts of Thurston and Douglas counties are also exposed to avalanche hazards.

Population

Overall, a very small proportion (<0.1%) of the total State population is both ranked medium or higher on the social vulnerability index and reside in areas exposed to an avalanche hazard. These vulnerable populations are located in four counties – Chelan, Lewis, Okanogan and Yakima. Chelan

County has most of this vulnerable population (about 300,000 individuals) in avalanche hazard areas. However, this constitutes less than 5 percent of the total county population. As such, avalanche hazard is not likely to be much of a concern with respect to significant direct impacts on the vulnerable population in the State.

Built Environment

Overall, less than 5 percent of the general building stock of the State is located in areas with exposure to avalanche hazards. King County has the highest value (approximately $10.4 million) of general building stock located in areas with avalanche exposure. In Chelan County, almost 85 percent of the general building stock value is in areas with avalanche exposure. In Skamania County, the avalanche hazard exposure of the building stock value is about 56 percent.

Critical Infrastructure

Only 13 percent of the critical infrastructure facilities in the State are located in areas exposed to an avalanche hazard. Chelan County has the most critical infrastructure facilities (439) located in areas with avalanche exposure. In Kittitas County, 142 of the 303 critical infrastructure facilities are located in areas with avalanche exposure. In Skamania County, 33 percent of the critical infrastructure facilities are located in areas exposed to avalanche hazards. In Okanogan County, approximately 29 percent of the critical infrastructure facilities are located in areas with avalanche exposure. In King County, 362 critical infrastructure facilities (13 percent) are located in areas with avalanche hazard exposure. While this analysis identifies critical facilities likely to be at risk from avalanche, it is important to note that specific risks to each facility results from the combination of the event characteristics (which are difficult to predict) and the site-level facility characteristics.

State Operations and Facilities Exposure

About 5 percent of State-owned facilities are located in areas with avalanche exposure. King County has the most (88) facilities located in areas with avalanche hazard exposure. Pierce County has 78 of its 864 State-owned facilities located in areas with avalanche hazard exposure. Overall, less than 1 percent of State-leased facilities are located in areas exposed to avalanche hazards.

First Responder Facilities Exposure

It is estimated that 10 percent of fire stations, 4 percent of law enforcement buildings, and 10 percent of EMS facilities are located in areas with avalanche hazard exposure. In Chelan County, almost 84 percent of all fire stations (25), 100 percent of law enforcement buildings (three), and 86 percent of EMS facilities (18) are in areas with avalanche hazard exposure (based on avalanche forecast zones). In Kittitas County, 19 of the 33 fire stations, one of the six law enforcement buildings, and 18 of the 33 EMS facilities are in areas with avalanche hazard exposure. Overall, the risk to first responder facilities from avalanche hazards is likely to be low because most of these facilities in the State are located outside of the avalanche exposure areas.

Economic Consequences

The four counties ranked high on the avalanche risk index contribute less than 1 percent of the State Gross Domestic Product. Among the top three contributors to State GDP - King, Pierce and Snohomish Counties – only Snohomish County is ranked medium-high for avalanche risks. The other two are ranked at medium for the avalanche risk index. Therefore, it is expected that major avalanche events are likely to have only a limited economic impact.

Environmental Impacts

The spatial analysis reveals that more than 80 percent of the environmentally sensitive areas in King County are exposed to avalanche hazards. In Chelan and Skamania Counties, more than 90 percent of the county ecologically sensitive areas are also exposed to avalanche hazards. In Snohomish, Pierce, Kittitas, Whatcom, Skagit, Yakima and Lewis Counties, more than 50 percent of the environmentally critical areas are in avalanche exposure areas.

Relationship to Other Hazards

Avalanches generally do not influence or impact the initiation of other hazards. They generally occur independently of other hazards, although they are often caused by increased snow pack from winter precipitation. Earthquakes, thermal changes and blizzards, on the other hand, are likely to trigger avalanches. Avalanche impacts (damaged structures, loss of life, etc.) can be similar to those resulting from landslides, mud/debris flows and rockfalls. However, locations of past avalanche paths do have the ability to increase the immediate area's susceptibility to future landslides and flooding due to the removal and transport of trees, vegetation and other ground cover elements.

Washington State Risk Index for Coastal Hazards (WaSRI – C)

Coastal Hazards in Washington include both unique coastal manifestations of region-wide hazards like earthquake, tsunami, severe storms and flooding, as well as hazards unique to the coast, including coastal erosion, tidal inundations and climate change-induced sea level rise. Washington's coast includes the 15 counties bordering Puget Sound, the Salish Sea or the Pacific Ocean, including:

- Whatcom
- San Juan
- Skagit
- Island
- Snohomish
- Kitsap
- King
- Pierce
- Thurston
- Mason
- Clallam
- Jefferson
- Grays Harbor
- Pacific
- Wahkiakum

Due to the composite nature of coastal hazards and severe limitations in data quality and availability, a separate risk index did not produce a meaningful assessment of overall coastal vulnerability using our methodology. There is not a comprehensive understanding of erosion risk in Washington because there hasn't been the investment needed to collect the data and analysis to accurately determine risk. Given the capacity and resources at the state and local level, erosion/shoreline change data and analysis has been site specific – collected in areas of highest concern or places facing existing loss (i.e., North Cove, Westport, Ocean Shores, etc.). The Grays Harbor Hazard Erosion Hazard Profile in its updated Hazard Mitigation Plan is an example of the kind of risk assessment required.

Erosion is one of the most visible threats to the coast and has inspired major mitigation and awareness efforts, such as the Grays Harbor Resilience Coalition. Although only the aforementioned 1 percent of Washington's coast is considered threatened by erosion, the threatened areas include multiple communities, including Westport, Ocean Shores and North Cove.

Sea-level rise (SLR) poses a chronic threat to the coastal communities as a significant proportion of the population in these communities live in low-lying areas along the shore. In addition to inundating low-lying coastal areas, rising sea level will increase coastal flooding caused by storm surges, tsunamis and extreme astronomic tides. Likewise, episodic storm surges of a given height will likely experience shortened recurrence intervals. Over the last century, the sea level rose at many locations along the shorelines of Puget Sound. Rates vary, however, as local land motion,

weather patterns and ocean currents can amplify or mask regional trends in sea level. Sea levels are projected to rise over the coming century, with a wide range of possible future amounts depending on the rate of global greenhouse gas emissions. Increases in sea level will amplify the rise of coastal flooding. (State of Knowledge: Climate Change in Puget Sound, Climate Impacts Group, University of Washington, 2015)

Washington State Risk Index for Drought (WaSRI – D)

Drought Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR DROUGHT (WASRI-D)	MEDIUM
Likelihood	MEDIUM
Hazard Area	HIGH
Population	LOW
Vulnerable Population	LOW
Built Environment	NA
Critical Infrastructure	NA
State Facilities	NA
First Responders	NA
Economic Consequences	HIGH
Environmental Impacts	MEDIUM

Drought is considered to be the most complex but least understood of natural hazards, affecting more people than any other hazard (Hagman 1984). According to the National Drought Mitigation Center (NDMC), drought "originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group or environmental sector". What is clear is that a condition perceived as "drought" in a given location is the result of a significant decrease in water supply relative to what is "normal" in that area. Washington State is one of the few states to have a statutory definition of drought (Revised Code of Washington Chapter 43.83B.400). Drought is defined as (1) the water supply for the area is below 75 percent of normal and (2) water uses and users in the area will likely incur undue hardships because of the water shortage. The drought hazard map was created based on drought hazard values derived from the National Drought Mitigation Center's U.S. Drought Monitor. Hazard values are the maximum number of weekly drought polygons overlapping a given census tract for the period of record (2000-2016). Seven counties including Spokane, Benton, Yakima, Chelan, Grant, Franklin and Whitman Counties are ranked high for drought risk. A number of these counties are predominantly agricultural; therefore, the timing of the drought will be a significant factor in ultimate impacts on the State. Grant County, the leading agricultural county in terms of crop sales and ranked 11th nationally by USDA in the 2012 Agricultural Census, is at high risk from drought. Whitman County, the top wheat producing county in the nation, is also estimated to be at high risk from droughts.

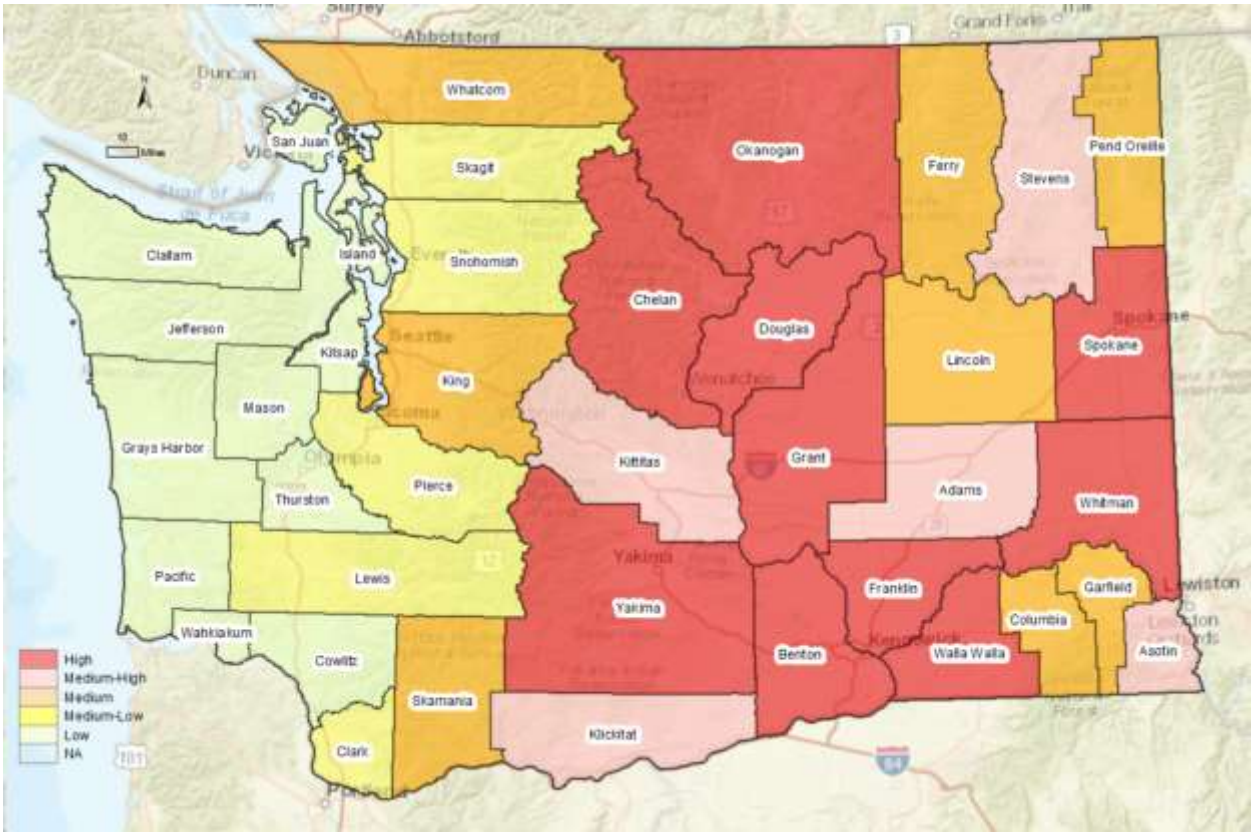


FIGURE 10: DROUGHT HAZARDS RISK (WASRI-D)

Drought Risk Index (WaSRI-D) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Drought Risk Index (WaSRI-D)
Adams	Medium-High	Medium	Medium-High					MEDIUM-HIGH
Asotin	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Benton	Medium-High	High	Medium-High					HIGH
Chelan	Medium-High	High	Medium-High					HIGH
Clallam	Low	Low	Low					LOW
Clark	Medium-Low	Medium	Medium-Low					MEDIUM-LOW
Columbia	Medium-High	Medium-Low	Medium-High					MEDIUM
Cowlitz	Low	Low	Low					LOW

Drought Risk Index (WaSRI-D) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Drought Risk Index (WaSRI-D)
Douglas	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Ferry	Medium-High	Medium-Low	Medium					MEDIUM
Franklin	Medium-High	High	Medium-High					HIGH
Garfield	Medium-High	Medium-Low	Medium-High					MEDIUM
Grant	Medium-High	High	Medium-High					HIGH
Grays Harbor	Low	Low	Low					LOW
Island	Low	Low	Low					LOW
Jefferson	Low	Low	Low					LOW
King	Medium	Medium-High	Medium-Low					MEDIUM
Kitsap	Low	Low	Low					LOW
Kittitas	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Klickitat	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Lewis	Medium-Low	Medium-Low	Medium-Low					MEDIUM-LOW
Lincoln	Medium-High	Medium	Medium-High					MEDIUM
Mason	Low	Low	Low					LOW
Okanogan	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Pacific	Low	Low	Low					LOW
Pend Oreille	Medium-High	Medium	Medium-High					MEDIUM
Pierce	Medium-Low	Medium-Low	Medium-Low					MEDIUM-LOW
San Juan	Low	Low	Low					LOW
Skagit	Medium-Low	Medium	Medium					MEDIUM

Drought Risk Index (WaSRI-D) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Drought Risk Index (WaSRI-D)
Skamania	Medium-High	Medium	Medium-High					MEDIUM
Snohomish	Medium-Low	Medium	Medium-Low					MEDIUM-LOW
Spokane	Medium-High	High	Medium-High					HIGH
Stevens	Medium-High	Medium-High	Medium-High					MEDIUM-HIGH
Thurston	Low	Low	Low					LOW
Wahkiakum	Low	Low	Low					LOW
Walla Walla	Medium-High	High	Medium					MEDIUM-HIGH
Whatcom	Medium	Medium	Medium					MEDIUM
Whitman	Medium-High	Medium-High	High					HIGH
Yakima	Medium-High	High	High					HIGH

Likelihood

Predicting future probability of a drought is difficult because of the number of variables involved in modeling the underlying climatic conditions. Whether a drought will occur (and how long it will last) depends on a huge number of factors including atmospheric and ocean circulation, soil moisture, topography, land surface processes and interactions between the air, land and ocean which ultimately influence temperature and precipitation. Predicting drought depends on the ability to forecast these two fundamental meteorological surface parameters, precipitation and temperature. From the historical record we know that climate is inherently variable, and that anomalies of precipitation and temperature may last from several months to several decades. But, given the number of variables involved it is difficult to predict future drought events. Climate change is making summers warmer with correspondingly drier water course. This is leading to prairie expansion in the Puget Sound Region and increasing the likelihood of periods of drought.

Area Exposure

Overall, about 75 percent of the total land area of the state is estimated to be at medium or higher exposure from droughts. All census tracts in Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Skamania,

Spokane, Stevens, Walla Walla, Whitman and Yakima Counties are ranked medium or higher for drought exposure.

Population Exposure

A significant proportion of the State population (21 percent) resides in areas ranked at medium or higher exposure from droughts. Top three counties with the most number of residents in areas with medium or higher drought exposure include Spokane, Yakima and Benton. All census tracts in these counties - Grant, Franklin, Chelan, Walla Walla, Whitman, Kittitas, Stevens, Okanogan and Douglas – are also ranked medium or higher for drought risk. Cumulatively, these counties account for 20 percent of the estimated total State population.

Vulnerable Population Exposure

Overall, only 5 percent of the total population residing in urban areas ranked medium or higher on the social vulnerability index are also exposed to medium or higher risks from droughts. In Adams County, 100 percent of the population with medium or higher drought exposure is also ranked medium or higher on social vulnerability. In Yakima County, almost 50 percent of the population with medium or higher drought exposure is also ranked medium or higher on social vulnerability. Spokane County, with the highest population exposed to medium or higher droughts, has less than 5 percent of this population also ranked medium or higher on social vulnerability.

Built Environment Exposure

Droughts are not expected to have a significant impact on the built environment. The primary impact of the drought is expected to be on the agricultural sector. Washington State Department of Agriculture (WSDA) made a preliminary estimate of the potential impact of the 2005 drought on Washington's agriculture industry. As per these estimates, assuming a worst-case scenario of below average precipitation throughout the growing season, WSDA anticipated that crop losses would be between $195 and $299 million, or up to eight percent of the Washington harvest.

Critical Infrastructure Exposure

Potential losses to critical infrastructure facilities are not estimated because drought does not pose a significant threat to most of these facilities.

State Operations and Facilities Exposure

Potential drought exposure of State facilities is not estimated because drought does not pose a significant threat to most of these facilities.

First Responder Facilities Exposure

Potential drought exposure of these facilities is not estimated because drought does not pose a significant threat to most of these facilities.

Although drought conditions will increase the need for wildland fire suppression responses and limit the availability of supporting water sources.

Economic Consequences

The seven counties ranked high on the drought risk index contribute 13 percent of the State Gross Domestic Product. Overall, counties ranked medium or higher on the drought risk index cumulatively account for 70 percent of the State GDP. The majority of these counties are key agricultural areas of the State. Therefore, prolonged periods of drought are likely to have major impacts on the local agricultural production.

Risk to Environment

An important risk from drought is the increased susceptibility to wildfires. In Washington State, 31 percent of critical environment areas are also ranked medium or higher for droughts. Many of these regions include forested lands that are prone to wildfires during prolonged periods of dry weather. Additionally, drought conditions can impact short-term water availability and soil productivity. Persistent drought conditions for longer periods of times can result in a significant threat to the local ecological diversity.

Washington State Risk Index for Earthquakes (WaSRI – E)

Earthquake Hazards Risk Summary	
WASHINGTON STATE RISK INDEX FOR EARTHQUAKES (WASRI-E)	**MEDIUM-HIGH**
Likelihood	**MEDIUM**
Hazard Area	**MEDIUM-LOW**
Population	HIGH
Vulnerable Population	LOW
Built Environment	MEDIUM-HIGH
Critical Infrastructure	**MEDIUM**
State Facilities	**MEDIUM-HIGH**
First Responders	**MEDIUM**
Economic Consequences	**HIGH**
Environmental Impacts	**MEDIUM-LOW**

Washington has the second highest risk of economic loss from earthquakes in the U.S., only behind California. The State experiences three types of earthquakes – Cascadia subduction zone, Crustal Shallow Zone Earthquakes and Wadati-Benioff Deep Zone Earthquakes. Each has a different profile often requiring different preparedness and mitigation approaches.

Earthquake hazard estimates are based on two key variables – modeled earthquake intensity and liquefaction susceptibility. Five counties – Clallam, Grays Harbor, King, Pacific and Thurston – are at the highest risk from earthquakes. All of these counties have a high proportion of residents located in areas at medium or higher earthquake exposure. However, not all counties with high population exposure to earthquakes (medium or greater) are ranked high on the earthquake risk index. Six counties – Island, Jefferson, Kitsap, Mason, Pierce and Snohomish – ranked high on population exposure to earthquakes, as well as ranked medium-high on earthquake risk because they have lower levels of earthquake exposure in other categories. Clallam County, which ranked high on the earthquake risk index, also ranks high on population, built environment, critical infrastructure and state facilities exposure to earthquake hazard.

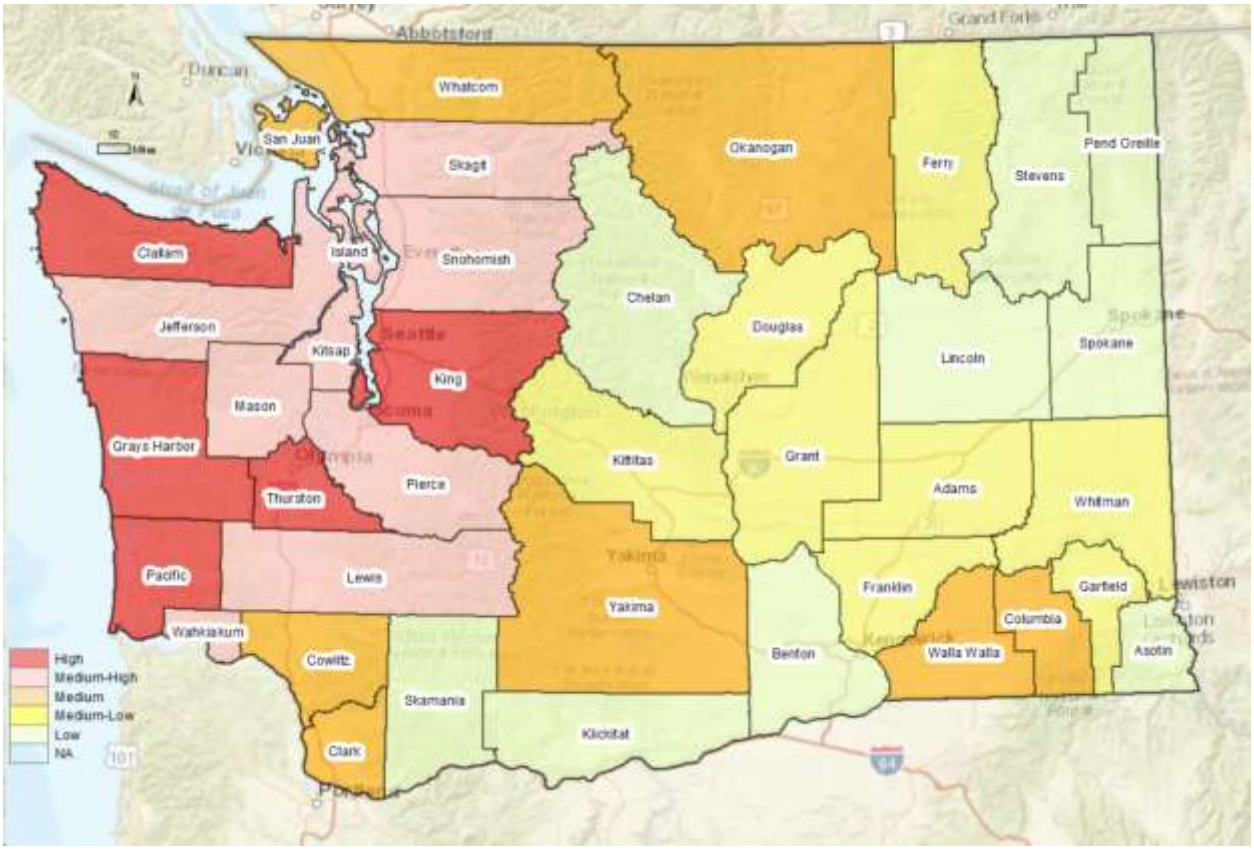


FIGURE 11: WASHINGTON EARTHQUAKE RISK INDEX (WASRI-E)

Earthquake Risk Index (WaSRI-E) and Constituent Earthquake Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	**Earthquake Risk Index (WaSRI-E)**
Adams	Low	Low	High	Low	Low	Medium-Low	Low	**Medium-Low**
Asotin	Low	Low	Low	Low	Low	Low	Medium	**Low**
Benton	Low	Low	Medium-Low	Low	Low	Medium-Low	Low	**Low**
Chelan	Low	Medium-Low	Low	Low	Low	Medium-Low	Low	**Low**
Clallam	High	High	Medium-Low	High	High	High	Medium-High	**High**
Clark	Medium-Low	Medium	Medium-Low	Medium-Low	Medium	Medium	Medium-Low	**Medium**
Columbia	Low	High	Low	Low	Low	High	High	**Medium**
Cowlitz	Medium	Medium	Medium	Medium	Medium	Medium	Medium	**Medium**
Douglas	Low	Low	High	Low	Low	Low	Medium-Low	**Medium-Low**
Ferry	Low	Medium	Low	Low	Low	Medium	Low	**Medium-Low**

Earthquake Risk Index (WaSRI-E) and Constituent Earthquake Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	**Earthquake Risk Index (WaSRI-E)**
Franklin	Low	Low	High	Low	Low	Medium	Low	**Medium-Low**
Garfield	Low	Low	Low	Low	Low	Medium	High	**Medium-Low**
Grant	Low	Low	Medium-High	Low	Low	Low	Low	**Medium-Low**
Grays Harbor	High	High	Medium	High	High	Medium	High	**High**
Island	High	High	Low	Medium	High	Medium-High	High	**Medium-High**
Jefferson	High	High	Low	Medium-High	High	High	Medium-High	**Medium-High**
King	Medium	High	Medium	Medium	High	High	High	**High**
Kitsap	High	High	Low	Medium	High	Medium-High	Medium-High	**Medium-High**
Kittitas	Medium-Low	Medium	Low	Low	Low	Medium	Medium	**Medium-Low**
Klickitat	Low	Low	Low	Low	Low	Medium-Low	Low	**Low**
Lewis	Medium	Medium-High	Medium-Low	High	High	Medium-High	Medium-High	**Medium-High**
Lincoln	Low	Low	Low	Low	Low	Medium-Low	Low	**Low**
Mason	High	High	Medium	Medium-Low	High	Medium-High	Medium-High	**Medium-High**
Okanogan	Low	Medium	Medium-High	Low	Low	Medium-Low	Medium	**Medium**
Pacific	High	High	Medium	High	High	Medium-High	High	**High**
Pend Oreille	Low	Low	Low	Low	Low	Low	Low	**Low**
Pierce	Medium-High	High	Medium-Low	Medium-Low	High	High	Medium-High	**Medium-High**
San Juan	Medium-High	High	Low	Medium-Low	Medium	Medium	Medium-High	**Medium**
Skagit	Medium	Medium-High	Medium-Low	Medium-Low	Medium	High	Medium-High	**Medium-High**
Skamania	Medium-Low	Medium-Low	Low	Low	Low	Medium	Low	**Medium-Low**
Snohomish	Medium	High	Medium-Low	Medium-Low	Medium-High	Medium-High	Medium-High	**Medium-High**
Spokane	Low	Low	Low	Low	Low	Low	Low	**Low**
Stevens	Low	Low	Medium-Low	Low	Low	Low	Low	**Low**

Earthquake Risk Index (WaSRI-E) and Constituent Earthquake Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	**Earthquake Risk Index (WaSRI-E)**
Thurston	High	High	Medium-Low	Medium-High	High	High	Medium-High	**High**
Wahkiakum	Medium-High	Medium	Low	High	High	Medium	Medium	**Medium-High**
Walla Walla	Medium-Low	Medium	Medium	Low	Medium-Low	Medium-High	Medium	**Medium**
Whatcom	Medium	Medium-High	Medium-Low	Medium-Low	Medium-Low	Medium-High	Medium	**Medium**
Whitman	Medium-Low	Low	Medium	Low	Low	Medium	Medium-Low	**Medium-Low**
Yakima	Medium-Low	Medium-Low	High	Low	Medium-Low	Low	Medium	**Medium**

Likelihood

Washington ranks second only to California for earthquake risk in the United States. There are thousands of earthquakes in Washington State every year, but most are too small to be felt. There have been 15 earthquakes greater than M5 since 1870.

Most recently, the 2001 Nisqually earthquake was a M6.8 deep earthquake. That earthquake caused roughly $2 billion in property damage. The most damaged buildings were the historic unreinforced masonry (URM) buildings in places such as Pioneer Square in Seattle.

According to the Washington State Department of Natural Resources, more than 1,000 earthquakes occur annually in the State. This is an average of approximately three per day, though most go unfelt and do not cause damage. Larger magnitude earthquakes, which result in damage, occur less frequently in the State. The annual likelihood of a major earthquake event is 17 percent. According to the Pacific Northwest Seismic Network, there's a 10-20 percent chance of a Cascadia subduction zone earthquake in the next 50 years.

Area Exposure

Overall, 25.48 percent of the total land area of the state is estimated to be at medium or higher (ranked medium, medium-high, and high) exposure from earthquake hazards. Only 1.42 percent of the area is ranked high, 1.69 percent is ranked medium-high and 22.36 percent is ranked as medium for earthquake exposure. In comparison, almost 40 percent of the land area in 15 coastal shoreline counties is ranked at medium or higher exposure from earthquake. Of the total area in coastal shorline counties, 2.6 percent is ranked high, 2.37 percent is ranked medium-high and 33.68 percent is ranked as medium for earthquake exposure. The higher degree of exposure in the coastal areas is indicative of the greater influence of the possible sources of earthquakes to the west of the

state, most notably the Cascadia subduction zone, and higher susceptibily to liquefaction in these coastal areas.

Population Exposure

The majority of the State population (61.47 percent) resides in areas ranked at medium exposure from earthquakes. Only 8.26 percent of the population resides in areas with high exposure to earthquakes, and another 6.65 percent resides in areas with medium-high exposure to earthquakes. The high degree of population exposure to earthquake hazard is primarily a result of the increased concentration of state population concentrated in coastal shoreline counties that have a higher percentage of area ranked medium or higher for earthquake exposure. King county has the maximum number of residents in areas ranked high for earthquake exposure, followed by Pierce and Snohomish counties.

Vulnerable Population Exposure

Overall, only 8 percent of the total population residing in urban areas with medium or higher earthquake exposure is also ranked medium or higher on social vulnerability. In Adams County, 58 percent of the urban population with medium or higher earthquake exposure is also ranked medium or higher on social vulnerability. In Yakima County, almost 50 percent of the population with medium or higher earthquake exposure is also ranked medium or higher on social vulnerability. None of the developed areas in Asotin, Chelan, Columbia, Ferry, Garfield, Island, Jefferson, Kitsap, Kittitas, Klickitat, Lincoln, Pend Oreille, San Juan, Skamania, Spokane and Wahkiakum counties are ranked medium or higher on both social vulnerability and earthquake exposure. King County, with the highest population exposed to medium or higher earthquake hazard, has almost 9 percent of this population also ranked medium or higher on social vulnerability.

Built Environment Exposure

Overall, almost 50 percent of the general building stock of the State is located in areas with medium or higher exposure to earthquake hazard. In three coastal shoreline counties – Grays Harbor, Pacific and Wahkiakum – all of the building stock is located in areas at medium or higher exposure from earthquakes. King County has the highest value of general building stock located in areas at medium or higher exposure from earthquakes. Lewis, Clallam and Thurston counties have more than 90 percent of the county building stock in areas exposed to medium or higher earthquake hazard. Jefferson and Island counties also have more than 75 percent of their building stock located in areas exposed to medium or higher earthquake hazard. Twenty-one non-coastal shoreline counties including Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Skamania, Spokane, Stevens, Walla Walla, Whitman and Yakima Counties do not have any significant amount of general building stock situated in areas at medium or higher exposure from earthquake hazard.

Critical Infrastructure Exposure

Almost 46 percent of the critical infrastructure facilities in the State are located in areas with medium or higher earthquake exposure. In nine coastal shoreline counties – Clallam, Grays Harbor,

Island, Jefferson, Kitsap, Mason, Pacific, Thurston and Wahkiakum – all of the critical infrastructure facilities are located in areas at medium or higher exposure to earthquake hazard. In Pierce, Lewis and King Counties, more than 75 percent of the critical infrastructure facilities are located in areas with medium or higher earthquake hazard exposure. In Snohomish County, almost 75 percent of the critical infrastructure facilities are located in areas at medium or higher earthquake hazard exposure. However, in Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Skamania, Spokane, Stevens and Whitman Counties, all of the critical infrastructure facilities are located outside of the areas at medium or higher exposure from earthquakes.

State Operations and Facilities Exposure

Overall, 71 percent of the State-leased facilities are also situated in areas at moderate to high exposure from earthquakes. In Clallam, Jefferson, Columbia, Pacific, Skagit, Pierce, Walla Walla, Mason, Lewis, King, Island, Kitsap, Thurston, Grays Harbor and Snohomish Counties, all of the State leased facilities are located in areas at medium or higher earthquake exposure. In Ferry, Skamania, Spokane, Franklin, Klickitat, Stevens, Asotin, Adams, Douglas and Grant Counties, none of the state-leased facilities are in areas at medium or higher earthquake exposure.

First Responder Facilities Exposure

It is estimated that 65 percent of the fire stations, 20 percent of the law enforcement buildings and 69 percent of the EMS facilities are located in areas identified at medium or higher earthquake exposure. In Clallam, Columbia, Garfield, Grays Harbor, Island, Jefferson, Kitsap, Mason, Pacific, San Juan and Thurston Counties, all fire stations and EMS facilities are in areas at medium or higher exposure to earthquakes. All law enforcement buildings in Asotin and Garfield counties are also located in areas at medium or higher exposure to earthquakes.

Economic Consequences

The five counties ranked high on the earthquake risk index contribute 54 percent of the State Gross Domestic Product. Among these, King County contributes 50 percent of the State GDP. The other four counties – Thurston, Clallam, Grays Harbor and Pacific – cumulatively contribute only 4 percent to the State GDP. The next three significant contributors (more than 5 percent) to State GDP – Pierce, Snohomish and Spokane Counties – are ranked medium-high, medium-high, and low respectively on the earthquake risk index. Overall, 22 counties ranked medium or higher on the earthquake risk index cumulatively are responsible for 87.75 percent of the State GDP. Thus, a major earthquake that impacts these counties will likely cripple the State economy.

Risk to Environment

It is estimated that 23 percent of the State's ecologically critical resources are located in areas at medium or higher risk from earthquake hazard. All ecologically critical areas in Clallam, Grays Harbor, Island, Jefferson, Kitsap, Mason and Pacific Counties are located in regions of medium or higher earthquake exposure. In Thurston, San Juan, Wahkiakum and Pierce Counties, more than 50 percent of the ecologically critical areas are in medium or higher earthquake exposure regions.

Flood Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR FLOODS (WASRI-F)	**MEDIUM**
Likelihood	**HIGH**
Hazard Area	**MEDIUM**
Population	**MEDIUM-HIGH**
Vulnerable Population	**MEDIUM**
Built Environment	**MEDIUM-LOW**
Critical Infrastructure	**LOW**
State Facilities	**LOW**
First Responders	**LOW**
Economic Consequences	**HIGH**
Environmental Impacts	**LOW**

Washington State Risk Index for Floods (WaSRI – F)

Flooding affects every county in Washington State. Since 1953, there have been 28 Presidential Disaster Declarations for flooding in Washington, where several types of floods occur. In most parts of Western Washington, floods generally occur in late fall and winter as a result of prolonged rainstorms. These floods may be augmented by water from snowmelt. The rain-on-snow floods are usually of short duration. In basins at higher elevations, floods may occur in the spring as a result of rapid snowmelt. These floods are usually less severe but continue for a longer duration than winter floods.

For this analysis, flooding was largely defined by FEMA's description on its Flood Insurance Rate Maps (FIRMs). A distinction was not generally made between riverine, surface or flash flooding.

Cascade drainages have peak discharges in the winter resulting from rain, and peak again in the early summer due to snow melt. These rain-snow dominated water systems are changing rapidly to just rain dominated ones because of our changing climate. With the reduction of snow at lower elevations, summer flows are reducing.

In Eastern Washington, floods generally occur in the foothills of the Cascade Range and in the highlands of Northeastern Washington during spring snowmelt. In some areas of Eastern Washington, flooding may occur during the winter when rain or unseasonably warm weather melts accumulations of snow. Flooding may also occur in small basins in response to summer thunderstorms.

The areas designated at 1 percent (100-year flood) and 0.2 percent (500-year flood) chance of annual flooding are mapped using FEMA's National Flood Hazard GIS Layer, preliminary data from FEMA's preliminary data site, and the Q3 layer for areas with paper maps from the Department of Ecology. Areas with a 1 percent annual chance of flooding are considered "frequently flooded areas." Development is generally prohibited in these areas. Areas within the zones designated as having a .2 percent annual risk of flooding are not excluded from development.

Seven counties including Grays Harbor, Lewis, Lincoln, Okanogan, Pacific, Skagit and Wahkiakum are ranked high for flood risks, followed by Cowlitz, Franklin, Garfield, Grant, Jefferson, Mason, Snohomish and Whatcom Counties that are ranked medium-high. Counties ranked medium for flooding risk include Adams, Chelan, Clallam, Columbia, King, Kittitas, Pierce, San Juan, Skamania, Thurston, Whitman and Yakima. The risk assessment is primarily based on the most recent flood maps available with the State of Washington. Not all of these maps have been updated in recent years and may under-represent the real flooding risk.

FIGURE 12: FLOOD RISK INDEX (WASRI-F)

Flood Risk Index (WaSRI-F) and Constituent Exposure Ranks for Each County

County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Flood Risk Index (WaSRI-F)
Adams	MEDIUM-LOW	LOW	MEDIUM-HIGH	LOW	MEDIUM	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM
Asotin	LOW	LOW	LOW	LOW	LOW	HIGH	MEDIUM-HIGH	LOW
Benton	MEDIUM	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	LOW	MEDIUM-LOW	LOW	LOW
Chelan	LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM	MEDIUM
Clallam	MEDIUM	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM
Clark	MEDIUM-HIGH	LOW	MEDIUM	LOW	MEDIUM	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW
Columbia	MEDIUM-LOW	MEDIUM-HIGH	LOW	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM	HIGH	MEDIUM
Cowlitz	MEDIUM	MEDIUM-HIGH	HIGH	MEDIUM-HIGH	MEDIUM-HIGH	HIGH	LOW	MEDIUM-HIGH
Douglas	LOW	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-LOW	LOW	MEDIUM	LOW	LOW
Ferry	LOW	HIGH	LOW	HIGH	LOW	MEDIUM-HIGH	LOW	MEDIUM-LOW
Franklin	MEDIUM	MEDIUM	HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM	MEDIUM-HIGH
Garfield	LOW	HIGH	LOW	HIGH	MEDIUM-LOW	HIGH	HIGH	MEDIUM-HIGH
Grant	MEDIUM-HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM	MEDIUM	HIGH	MEDIUM-HIGH
Grays Harbor	MEDIUM-HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM-HIGH	HIGH
Island	HIGH	MEDIUM-LOW	LOW	MEDIUM-LOW	LOW	LOW	HIGH	MEDIUM-LOW
Jefferson	HIGH	MEDIUM-HIGH	LOW	MEDIUM-HIGH	LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH
King	MEDIUM	MEDIUM-LOW	MEDIUM-HIGH	LOW	MEDIUM	MEDIUM-LOW	LOW	MEDIUM
Kitsap	HIGH	LOW	LOW	LOW	MEDIUM-LOW	LOW	MEDIUM-LOW	LOW

Flood Risk Index (WaSRI-F) and Constituent Exposure Ranks for Each County

County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Flood Risk Index (WaSRI-F)
Kittitas	MEDIUM-LOW	MEDIUM-HIGH	LOW	MEDIUM-HIGH	MEDIUM	MEDIUM	MEDIUM-LOW	MEDIUM
Klickitat	MEDIUM-LOW	MEDIUM	LOW	MEDIUM	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW
Lewis	MEDIUM-HIGH	HIGH	MEDIUM-HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH
Lincoln	MEDIUM-LOW	HIGH	LOW	HIGH	MEDIUM-HIGH	HIGH	HIGH	HIGH
Mason	HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM	HIGH	LOW	MEDIUM-HIGH	MEDIUM-HIGH
Okanogan	LOW	HIGH	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	HIGH
Pacific	MEDIUM-HIGH	MEDIUM	HIGH	MEDIUM	HIGH	MEDIUM-HIGH	MEDIUM-HIGH	HIGH
Pend Oreille	MEDIUM-LOW	LOW	LOW	LOW	LOW	LOW	MEDIUM-LOW	LOW
Pierce	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	MEDIUM	MEDIUM	LOW	MEDIUM
San Juan	HIGH	MEDIUM-LOW	LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	HIGH	MEDIUM
Skagit	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM-HIGH	MEDIUM-HIGH	HIGH
Skamania	LOW	MEDIUM-LOW	LOW	MEDIUM-LOW	MEDIUM-HIGH	HIGH	HIGH	MEDIUM
Snohomish	MEDIUM-HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM	HIGH	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-HIGH
Spokane	MEDIUM-LOW	LOW	MEDIUM	LOW	LOW	MEDIUM-LOW	MEDIUM-LOW	LOW
Stevens	MEDIUM-LOW	LOW	MEDIUM	LOW	MEDIUM-LOW	MEDIUM-HIGH	LOW	LOW
Thurston	HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	MEDIUM	LOW	LOW	MEDIUM
Wahkiakum	HIGH	HIGH	LOW	HIGH	HIGH	LOW	HIGH	HIGH
Walla Walla	MEDIUM	MEDIUM-HIGH	LOW	MEDIUM-HIGH	MEDIUM-LOW	LOW	MEDIUM	MEDIUM-LOW
Whatcom	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-HIGH	HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH

Flood Risk Index (WaSRI-F) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Flood Risk Index (WaSRI-F)
Whitman	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM-HIGH	**MEDIUM**
Yakima	LOW	MEDIUM-HIGH	HIGH	MEDIUM-HIGH	MEDIUM-HIGH	LOW	MEDIUM-LOW	MEDIUM

Likelihood

Climate change is increasing the extent and the frequency of flooding. This trend will continue. Heavy rain events are projected to intensify, increasing flood risk to all Puget Sound watersheds. In snow accumulating watersheds, winter floods will increase as the snow line recedes. Summer flows will reduce and corresponding flooding will become less likely as our Cascade drainages change from rain-snow systems to rain-dominant ones.

Area Exposure

While most communities in Washington are exposed to flood hazards, the total area designated as at risk from 1 percent or 0.2 percent annual chance of flooding is less than 10 percent of the total State area. Overall, less than 10 percent of the State area is identified to be within the 1 percent zone. and .2 percent within the flood zone. However, based on past experience, flooding events are likely to inundate much larger areas beyond the designated floodplain boundaries. Almost 45 percent of San Juan County is at risk from a 1 percent chance of annual flooding (coastal flooding). In Island County, 30 percent of the area is identified to be at risk from a 1 percent annual chance of flooding. In Wahkiakum, Kitsap, Mason, Jefferson, Thurston, Skagit, Pacific, Clark, Pierce and Whatcom Counties, 10-15 percent of the county area lies within the flood zones with 1 percent and 0.2 percent chance of flooding annually.

Population Exposure

While most communities in Washington are exposed to flood hazards, overall less than 10 percent of the population resides in areas identified to be at risk from 1 percent annual chance of flooding. It is likely that this assessment may under represent the true nature of population exposure because of spatial data limitations. In Skagit County, more than 50 percent of the population is located in areas identified to be at risk from flooding.

Also notable is the distribution of property within designated flood zones. Since the .2% annual chance zones are not precluded from development, they tend to be far more built up than the 1% zones, even though the .2% zone is a much smaller area overall.

Vulnerable Population Exposure

Overall less than 1 percent of the State population is vulnerable and resides in flood hazard zones. In Yakima and Okanogan Counties, about 5 percent of the population is ranked medium or higher on social vulnerability and is located in flood hazard zones. In all other counties, less than 5 percent of their population is both ranked medium or higher on social vulnerability index and is located in flood hazard zones.

Built Environment Exposure

Overall, only a small proportion of the State general building stock is located in flood hazard zones. However, in Garfield and Skagit Counties, a significant proportion of their building stock is located in flood hazard zones. In San Juan and Island Counties, the top two counties with the highest proportion of county area in flood hazard zones, only 6 percent of the respective county general building stock is located in flood hazard zones.

Critical Infrastructure Exposure

Less than 6 percent of the critical infrastructure facilities in the State are located in the identified flooding zones. In Skagit and Wahkiakum Counties, 23 percent of the county critical infrastructure facilities are located in flood hazard zones. Skagit County has the most critical infrastructure facilities (109) in a flood hazard zone, followed by King County with 74 facilities, which is about 3 percent of all the critical facilities in King County. In Grays Harbor County, 21 percent of all the critical infrastructure facilities are located in flood hazard zones.

State Operations and Facilities Exposure

It is estimated that less than 5 percent of the State-owned facilities and State-leased facilities are located in flood hazard zones. The highest number of State-owned facilities in the flood hazard zone is in King County (40) followed by Pierce County, which has 35 State-owned facilities located in the flood hazard zones. However, they constitute less than 5 percent of the total State-owned facilities in each of these counties. In Skagit County, 53 percent of the State-leased facilities are located in flood hazard zones.

First Responder Facilities Exposure

It is estimated that 5 percent of fire stations, 8 percent of law enforcement buildings and 6 percent of EMS facilities are in flood hazard zones. Skagit County has the most number of fire stations (7) and law enforcement buildings (4) located in flood hazard zones. Skamania County has the most number of EMS facilities (7) located in a flood hazard zone.

Economic Consequences

Flooding events are likely to have a significant impact on the State economy. The counties ranked medium or higher on the flood risk index account for 83 percent of the State GDP. King County, by far the highest contributor to the State GDP, is ranked medium for flood risks. The next two top

contributors to the State GDP, Pierce and Snohomish Counties, are ranked medium and medium-high on the flood risk index.

This assessment does not include impacts from flooded corridor segments.

Risk to Environment

Direct environmental impacts of flooding are likely to be limited. Flooding serves an important ecological function of floodplain enrichment. Increased urban growth and encroachment into the floodplain areas results in increased losses from flood events. Overall, the ecological species in flood zones are well-adapted to flooding events in their habitat areas. Flooding often washes manmade pollutants into water courses, stressing the riverine habitat.

Washington State Risk Index for Landslides (WaSRI – L)

Landslide Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR LANDSLIDES (WASRI-L)	**MEDIUM-HIGH**
Likelihood	**HIGH**
Hazard Area	**HIGH**
Population	**MEDIUM**
Vulnerable Population	**MEDIUM-LOW**
Built Environment	**MEDIUM**
Critical Infrastructure	**MEDIUM-HIGH**
State Facilities	**MEDIUM**
First Responders	**MEDIUM**
Economic Consequences	**MEDIUM-LOW**
Environmental Impacts	**HIGH**

Washington is one of the most landslide-prone states in the country and annually experiences hundreds to thousands of events across the state. Areas typically susceptible to landslides are steep hillsides (20 degrees and greater) and convergent topography. Landforms can also be a factor in landslide susceptibility, such as areas of steep shoreline bluffs, colluvium hollows (bedrock hollows), inner gorges, meander bends, rugged topography (mountainous terrain), and on deep landslides. Features such as alluvial fans may be a hazard for flooding and debris flows.

Since 1960, Washington State experienced 2 landslides that resulted in Presidential Disaster Declarations, DR-1255 (1988)

and DR-4168 (2014). Overall between 1960-2017, there were 285 landslides resulting in damages of almost $2.5 million and 142 causalities (Source: CEMHS 2018).

Based on the past records since 1960, the likelihood of a major landslide in any given year is 43 percent. The likelihood of multiple (2 or more) landslides in any given year is 32 percent.

Landslide hazard is estimated based on the digital version of the Geological Survey Professional Paper 1183, Landslide Overview Map of the Conterminous United States (Radbruch-Hall et al. 1982). This map delineates areas where large numbers of landslides have occurred and areas which are susceptible to landslides in the conterminous United States. These maps may underestimate risks attributable to runout however. The SR 520 Landslide near Oso, Wa., experienced a debris flow runout 10 times the height of the bluff failure.

The statistical analysis of landslide exposure assessments reveals that five counties – Benton, Clallam, Jefferson, Lewis and Skamania – are at the highest risk from landslides. All of these counties have a high proportion of residents located in areas exposed to landslides. While the proportion of county area at risk from landslides is among the lowest for Benton County, it has a significant proportion (medium or higher) of County population, vulnerable population, built environment, critical infrastructure, state facilities and first responder facilities situated in landslide areas. In contrast, Chelan County has a high proportion of County area with landslide exposure, however, the overall landslide risk is low because of lower than medium exposure of vulnerable populations and State facilities. The proportion of population, built environment and first responder facilities to landslide is also estimated to be medium in Chelan County.

FIGURE 13: LANDSLIDE RISK INDEX (WASRI-L)

Landslide Risk Index (WaSRI-L) and Constituent Landslide Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Landslide Risk Index (WaSRI-L)
Adams	Low	High	High	High	Medium-Low	Medium	Medium-Low	Medium-High
Asotin	Medium-High	Medium-Low	Low	Low	Medium	Medium	High	Medium
Benton	Low	High	Medium	High	Medium-High	High	High	High
Chelan	High	Medium	Low	Medium	Medium-High	Medium-Low	Medium	Medium
Clallam	High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium	High	High
Clark	Medium-Low	Medium-Low	Low	Low	Low	Medium	Low	Low
Columbia	Medium	Medium	Low	Medium-Low	Medium-Low	High	Low	Medium
Cowlitz	Medium-High	Medium	Low	Medium	Medium	Medium-High	Medium	Medium
Douglas	Low	Medium	High	Medium	Medium-Low	Medium	Low	Medium
Ferry	High	Medium	Low	Medium-Low	High	High	Medium	Medium-High
Franklin	Low	Medium	Medium	Medium	Low	Medium-Low	Medium-Low	Medium-Low
Garfield	Medium	High	Low	Low	Low	Medium-Low	High	Medium
Grant	Low	Medium-Low	High	Low	Medium-Low	Low	Medium-Low	Medium-Low
Grays Harbor	Medium	Medium-High	Medium	Medium	Medium	Medium	Medium	Medium
Island	Medium-Low	Medium-High	Low	Medium-High	Medium	Medium-High	High	Medium-High
Jefferson	High	High	Low	High	High	Medium	Medium-High	High
King	Medium	Medium	Medium	Medium	Medium	Medium	Medium-High	Medium
Kitsap	Medium-Low	Medium-High	Low	Medium-High	High	Medium-High	High	Medium-High

Landslide Risk Index (WaSRI-L) and Constituent Landslide Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Landslide Risk Index (WaSRI-L)
Kittitas	Medium-High	Low	Low	Low	Medium-High	Low	Medium-Low	Medium-Low
Klickitat	Medium-Low	High	Low	High	Medium-High	High	Medium	Medium-High
Lewis	High	High	Medium-Low	High	High	Medium	Medium-High	High
Lincoln	Low	Low	Low	Low	Low	Medium-High	Medium-Low	Low
Mason	Medium	Medium-High	Medium-Low	Medium	Medium	Medium	Medium	Medium
Okanogan	Medium-High	Medium	Medium-High	Medium-Low	Medium-High	Medium-High	Medium	Medium-High
Pacific	Medium	Medium-High	Low	Medium-High	Medium-High	Medium	Low	Medium
Pend Oreille	Medium-High	Low	Low	Low	Medium	Low	Low	Low
Pierce	Medium	Medium-Low	Low	Medium-Low	Low	Medium-Low	Medium-Low	Low
San Juan	Low	Medium-Low	Low	Low	Low	Medium	Low	Low
Skagit	Medium-High	Medium-Low	Low	Low	Medium	Medium	Low	Medium-Low
Skamania	High	High	Low	High	High	High	High	High
Snohomish	Medium	Medium-Low	Low	Medium-Low	Medium-Low	Medium	Medium	Medium-Low
Spokane	Low	Medium-Low	Low	Low	Medium-Low	Low	Low	Low
Stevens	Medium-High	Medium-Low	Medium-Low	Medium-Low	Medium-High	Low	Medium	Medium
Thurston	Medium	Medium	Medium-Low	Medium	Medium	High	Medium-High	Medium-High
Wahkiakum	Medium-High	Medium-High	Low	High	Medium-Low	Medium-High	Medium	Medium-High
Walla Walla	Low	Low	Low	Low	Low	Medium-Low	Low	Low
Whatcom	Medium-High	Medium	Low	Medium-Low	Medium	Medium-High	Medium	Medium

Landslide Risk Index (WaSRI-L) and Constituent Landslide Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Landslide Risk Index (WaSRI-L)
Whitman	Low	Medium-Low	Low	Medium-Low	Medium	Medium-Low	Medium-Low	Low
Yakima	Medium	Medium-Low	Medium-High	Low	Medium	Low	Medium-Low	Medium-Low

Likelihood

Climate change is increasing landslides and sediment transport. These are being caused by associated changes in rainfall, snowpack and stream flow. Climate change is also increasing the probability of wildland fires which in turn contribute to increases in the likelihood of landslides. The State experiences landslides almost annually. The annual probability of multiple landslides in Washington State is 82 percent (based on 2001-2017 data).

Area Exposure

Almost 55 percent of the total land area of the state is estimated to be at some level of risk from landslides. Steeper slopes in areas with greater possibility of anomalously high precipitation in these counties lead to a higher likelihood of landslides in these counties. In Chelan and Clallam Counties, more than 90 percent of the land area is exposed to landslide hazards. In Ferry, Lewis, Jefferson, Skamania, Okanogan, Cowlitz and Wahkiakum Counties, more than 75 percent of the land area is exposed to landslide hazards.

Population Exposure

While almost 55 percent of the State area is exposed to landslides, the population exposure is estimated to be less than 25 percent of the total estimated State population. More than 50 percent of the county population in Adams, Skamania, Lewis, Benton, Garfield, Jefferson, Klickitat and Wahkiakum Counties resides in areas exposed to landslides. In Adams County, almost all of the county population (approx. 20,000 persons) resides in areas at risk from landslides, which is less than 10 percent of the county area. King County has the largest amount of population (575,000 persons) residing in areas exposed to landslides.

Vulnerable Population Exposure

Overall, only 6 percent of the total State population is ranked medium or higher on social vulnerability and resides in areas exposed to landslides. In Adams and Grant Counties, all of the population exposed to landslide risk is also ranked medium or higher on social vulnerability. In Douglas and Yakima Counties, more than 50 percent of the county population exposed to landslides is also ranked medium or higher on social vulnerability. King County has the highest number of socially vulnerable individuals residing in areas exposed to landslides.

Built Environment Exposure

Overall, 22 percent of the general building stock of the State is located in areas exposed to landslides. King County has highest value of general building stock located in areas at risk from landslides. In Adams, Skamania, Lewis, Benton, Jefferson, Klickitat and Wahkiakum Counties, more than 50 percent of the general building stock is located in areas exposed to landslides. In Stevens, Whitman, Pierce, Yakima, Asotin, Grant, Skagit, Garfield, Clark and San Juan Counties, less than 10 percent of the county general building stock is exposed to landslide hazard. And, as mentioned above, this exposure may underrepresent impacts from extensive runout.

Critical Infrastructure Facilities Exposure

Critical infrastructure facilities that lie within the landslide hazard areas are likely to be directly impacted by landslide events. While the nature and degree of impact will largely depend on the size of the landslide and the physical details of the facility, location within the landslide hazard area can enable prioritization of site specific hazard mitigation studies. Forty-two percent of the critical infrastructure facilities in the State are located in areas exposed to landslides. King County has the most critical infrastructure facilities (1221) located in areas at risk from landslides. In Skamania, Ferry and Lewis Counties, more than 80 percent of the county critical infrastructure facilities are located in areas exposed to landslides. In a number of counties including Jefferson, Kitsap, Pacific, Klickitat, Stevens, Okanogan, Chelan, Kittitas, Benton, Clallam, Thurston and Whitman, more than 50 percent of the county critical infrastructure facilities are located in areas exposed to landslides.

These estimates do not include indirect impacts that may be caused by damaged road segments.

State Operations and Facilities Exposure

Twenty-six percent of State-owned facilities are situated in areas with landslide exposure. In all counties, at least 20 percent of the facilities are situated in areas at risk from landslides. More than 40 percent of the State-owned facilities in Ferry County are located in areas threatened by landslides. In Klickitat, Skamania, Columbia, Whatcom, Okanogan, Wahkiakum, Lincoln, Island and Cowlitz Counties, 30-35 percent of the State-owned facilities in the county are located in areas exposed to landslides. Overall, almost 25 percent of the State-leased facilities are also situated in areas threatened by landslides. In Adams and Columbia Counties, the lone State-leased facilities are located in areas with landslide exposure. Thurston County has the most (93) State-leased facilities located in areas exposed to landslides. In King County, 74 of the State-leased facilities are located in areas exposed to landslides.

First Responder Facilities Exposure

It is estimated that 23 percent of fire stations, 68 percent of law enforcement buildings, and 23 percent of EMS facilities are located in areas exposed to landslides. In Garfield County all fire stations (2), law enforcement buildings (1), and EMS facilities (1) are located in areas exposed to landslides. In King County, 40 fire stations, 19 law enforcement buildings and 40 EMS facilities are located in areas exposed to landslides. In Adams County, where all of the urban area is at risk from landslides, only 18 percent of fire stations and 50 percent of law enforcement buildings are located in areas exposed to landslides. None of the County's five EMS facilities are located in landslide risk areas.

Economic Consequences

The five counties ranked high on the landslide risk index contribute less than 5 percent of the State Gross Domestic Product. Among these, Benton is the largest contributor to the State GDP. King County, the top contributor to the State GDP, is ranked medium for landslide risks. The other four counties that are among the top 5 contributors to the State GDP – Pierce, Snohomish, Spokane and

Clark – are ranked low, except for Snohomish, which is ranked medium-low for landslide risks. It is expected that major landslides events are unlikely to result in significant economic impact on the State GDP.

These estimates do not include indirect impacts that may occur from interruptions in access due to road closures.

Risk to Environment

Landslides are common in areas with steeper slopes and wet environments, which are also often locations of greater ecological diversity. The spatial analysis reveals that more than 50 percent of the ecologically sensitive areas in 25 counties are exposed to landslides. These counties include Chelan, Clallam, Jefferson, Ferry, Lewis, Whatcom, Wahkiakum, Skamania, Cowlitz, Okanogan, Skagit, King, Kittitas, Pend Oreille, Asotin, Snohomish, Pacific, Stevens, Columbia, Pierce, Garfield, Yakima, Grays Harbor, Mason and Island Counties. In Chelan, Clallam and Jefferson Counties, more than 90 percent of the ecologically critical areas are exposed to landslides.

Landslides mobilize soil and often stress rehabilitative regeneration processes within upland denuded areas. This soil loss is often permanent. Also, landslide debris can block water courses, damming flows resulting in flooding and extreme surges when these blockages fail. These impacts often result in long-term changes. These changes can be beneficial to fluvial habitats while, as a result of soil losses, detrimental to upland ones

Washington State Risk Index for Severe Weather (WaSRI – SW)

Severe Weather Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR SEVERE WEATHER (WASRI-SW)	HIGH
Likelihood	MEDIUM-LOW
Hazard Area	HIGH
Population	MEDIUM-HIGH
Vulnerable Population	LOW
Built Environment	MEDIUM-HIGH
Critical Infrastructure	HIGH
State Facilities	MEDIUM-HIGH
First Responders	HIGH
Economic Consequences	HIGH
Environmental Impacts	LOW

A severe storm is an atmospheric disturbance that results in one or more of the following phenomena: severe/high winds, hail, lightning, tornadoes, and significant snowfall, ice or freezing rain (winter weather). This risk assessment includes the following weather-related hazards as part of severe weather risk analysis:

- Severe/high winds
- Hail
- Lightning
- Tornado
- Winter Weather

As a result of its location and topography, all areas of Washington are vulnerable to severe weather events. The location of the State of Washington combines climatic elements of a predominantly marine-type climate characteristic of the area west of the Cascade Mountains, with the dry climate in the area east of the Cascades. The severe weather risk assessment is based on cumulative hazard risk from hail, lightning, thunderstorms, tornadoes, wind and winter weather events in each census tract. The relative rankings of each of the hazard events were combined to create the overall severe weather hazard rank. This hazard data layer was used for individual exposure assessments to severe weather hazards.

Eastern counties are estimated to have the highest risk from severe weather hazards. The eight counties ranked high for severe weather risk include Okanogan, Douglas, Grant, Yakima, Adams, Franklin, Walla Walla and Whitman Counties. These counties also have significant agricultural areas that are likely at higher risk from severe weather in comparison to developed areas.

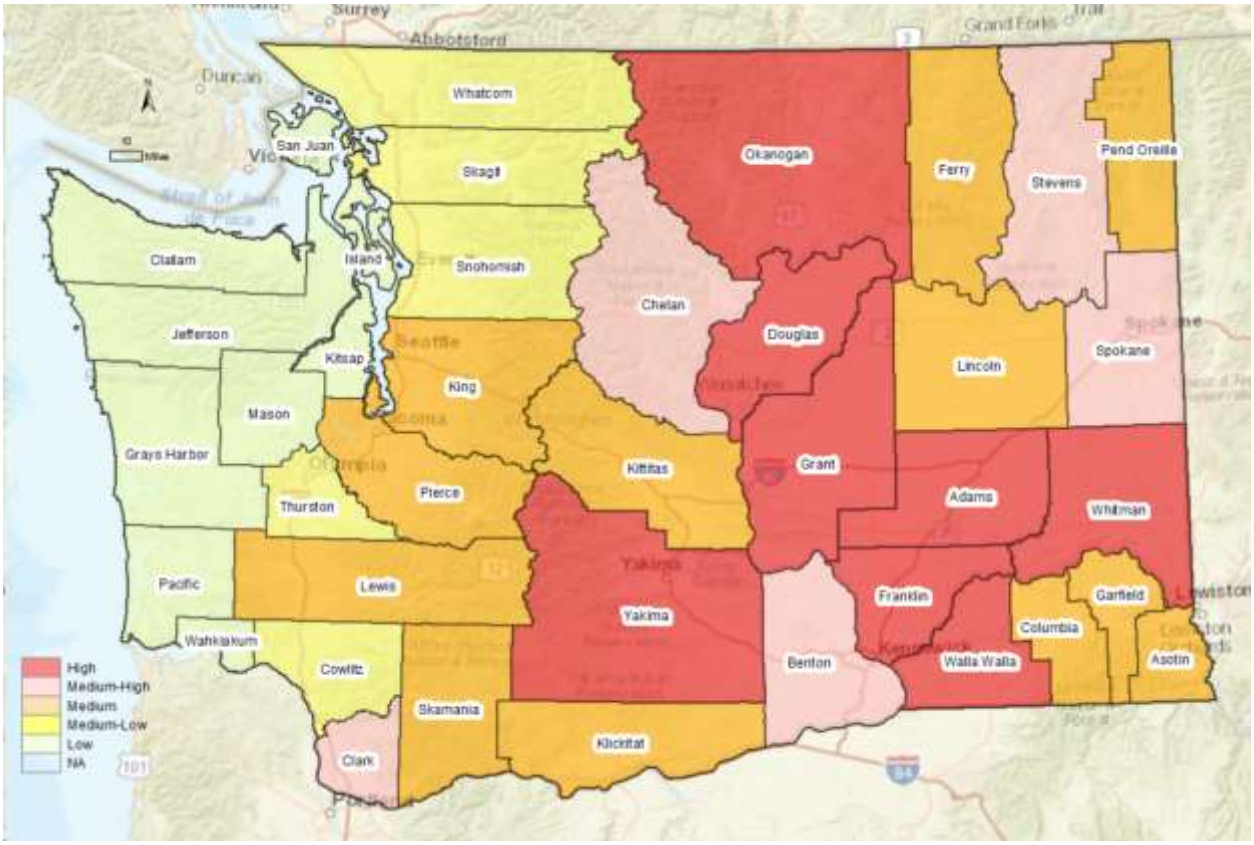


FIGURE 14: SEVERE WEATHER RISK INDEX (WASRI-SW)

Severe Weather Risk Index (WaSRI-SW) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Severe Weather Risk Index (WaSRI-SW)
Adams	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Asotin	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Benton	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM-HIGH
Chelan	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM-HIGH
Clallam	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Clark	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM-HIGH
Columbia	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Cowlitz	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	MEDIUM-LOW
Douglas	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH

Severe Weather Risk Index (WaSRI-SW) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Severe Weather Risk Index (WaSRI-SW)
Ferry	Medium-High	Medium	Medium-Low	Medium	Medium-High	Medium-High	Medium-High	MEDIUM
Franklin	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Garfield	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Grant	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Grays Harbor	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Island	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Jefferson	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
King	Medium	Medium	Medium-High	Medium	Medium-Low	Medium-Low	Medium-Low	MEDIUM
Kitsap	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Kittitas	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Klickitat	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Lewis	Medium-Low	Medium	Medium	Medium	Medium	Medium	Medium	MEDIUM
Lincoln	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Mason	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Okanogan	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Pacific	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Pend Oreille	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Pierce	Medium	Medium	Medium-High	Medium	Medium	Medium	Medium	MEDIUM
San Juan	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Skagit	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	MEDIUM-LOW
Skamania	Medium-High	Medium-High	Medium-Low	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM
Snohomish	Medium-Low	Medium-Low	Medium-High	Medium-Low	Medium-Low	Medium-Low	Medium-Low	MEDIUM-LOW

Severe Weather Risk Index (WaSRI-SW) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Severe Weather Risk Index (WaSRI-SW)
Spokane	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM-HIGH
Stevens	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	Medium-High	MEDIUM-HIGH
Thurston	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	MEDIUM-LOW
Wahkiakum	Low	Low	Medium-Low	Low	Low	Low	Low	LOW
Walla Walla	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Whatcom	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	MEDIUM-LOW
Whitman	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH
Yakima	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium-High	Medium-High	HIGH

Likelihood of Exposure

There is a high likelihood of numerous severe weather events annually. However, many of these are likely to be small weather anomalies that may not develop into a large event. The frequency, duration and intensity of extreme heat is expected to increase in Washington State. This will in turn increase other weather extremes including severe/high winds, hail, lightning, tornados and winter storms

Area Exposure

All communities in the State are exposed to some level of severe weather hazards. Overall, 80 percent of the State area is estimated to have medium or higher sever weather exposure. All census tracts in 22 counties are ranked medium or higher for severe weather exposure. This group includes all of the Eastern and Central counties of the State.

Population Exposure

As a result of the wide coverage of storm weather events, population exposure is also high. Overall, it is estimated that 48 percent of the population resides in areas (census tracts) ranked medium or higher for severe weather exposure.

Vulnerable Population Exposure

Overall, less than 10 percent of the State population is both ranked medium or higher on the social vulnerability index and resides in areas ranked medium or higher for severe weather exposure. In Adams County, all of the population in areas exposed to severe weather hazards is also ranked

medium or higher on the social vulnerability index. In Yakima County, 54 percent of the population is ranked medium or higher on the social vulnerability index and is located in areas ranked medium or higher for severe weather hazards.

Built Environment Exposure

Overall, 47 percent of the State building stock is located in areas with medium or higher severe weather exposure.

Critical Infrastructure Exposure

More than 60 percent of critical infrastructure facilities in the State are located in areas with medium or higher severe weather exposure. 22 counties with medium or higher severe weather exposure are estimated to have 6,530 facilities that are exposed to severe weather hazards. While these figures represent a high level of exposure, many of these facilities are expected to be built in a manner to withstand most local severe weather events.

State Operations and Facilities Exposure

It is estimated that less than 54 percent of the State-owned facilities and about 44.42 percent of State-leased facilities are located in areas ranked medium or higher for severe weather exposure. These include 3,748 State-owned and 367 State-leased facilities located in 22 counties with medium or higher severe weather exposure. In this case, too, it is expected that these facilities have been built to withstand local severe weather conditions and will likely survive the impact of most severe weather events.

First Responder Facilities Exposure

It is estimated that 58 percent of fire stations, 54 percent of law enforcement buildings, and 54 percent of EMS facilities are located in areas ranked medium or higher for severe weather exposure. All buildings are expected to have been built with higher building standards to often serve as shelters during severe weather events. Therefore, it is expected that severe storm events do not pose a major risk to these facilities.

Economic Consequences

The counties ranked medium or higher on the severe weather risk index account for 80 percent of the State GDP. This includes King and Pierce Counties, which are the top two contributors to State GDP. However, it is expected that economic consequences of severe weather events is likely to be much more significant in agricultural areas in the Eastern part of the State. In these regions, major economic consequences are likely to be due to loss of crop and farm productivity. Whereas, in the urban areas, most of the economic consequences are likely to be in form of lost productivity and minor damages.

Risk to Environment

Severe weather events are a part of the natural climatic cycle. As such, these events play an important role in maintenance and sustenance of local biodiversity. However, climate change, by its very nature, and following the basic laws thermodynamic and the conservation of energy, is adding energy to many systems. We can think of this process as our weather having a grand volume dial, a climate directed rheostat where climate change is turning up the energy volume and all atmospheric systems are impacted. This added energy in the atmosphere has to go somewhere and that somewhere can be realizing in stronger winds, more hail storms and greater rain intensity.

Washington State Risk Index for Tsunami Hazards (WaSRI – T)

Tsunami Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR TSUNAMIS (WASRI-T)	**MEDIUM-LOW**
Likelihood	**MEDIUM**
Hazard Area	**LOW**
Population	**LOW**
Vulnerable Population	**MEDIUM**
Built Environment	**LOW**
Critical Infrastructure	**LOW**
State Facilities	**LOW**
First Responders	**LOW**
Economic Consequences	**MEDIUM**
Environmental Impacts	**MEDIUM-HIGH**

Tsunamis are a series of extremely long waves caused by a large and sudden displacement of water. This is usually the result of an earthquake or volcanic eruption underwater but can also be caused by landslides flowing into bays or occurring under water. Tsunamis can occur in oceans, seas, lakes and rivers, although those occurring in closed bodies of water are often referred to as seiches. The most destructive tsunamis often occur in the ocean and are caused by earthquakes. Fifty-nine percent of the world's tsunamis occur in the Pacific Ocean Basin. Tsunamis pose a threat to people and property located along Washington State's coastline, Strait of Juan de Fuca, Puget Sound, large lakes and rivers.

While tsunamis have caused significant damage, deaths and injuries elsewhere in the world, only one significant tsunami struck Washington's Pacific coast in recent history. The 1964 Alaska earthquake generated a tsunami that resulted in more than $640,000 (2004 dollars) in damage.

However, geologic investigations indicate that tsunamis have struck the coast a number of times in the last few hundred years. Tsunamis generated elsewhere on the Pacific Rim are the ones that strike Washington most often. It is therefore difficult to estimate the future probability of tsunamis. It is estimated that the earthquake (M8 or M9) in the Washington portion of the Cascadia Subduction Zone will likely produce a significant tsunami with significant damaging and life-threatening impacts along the coastal shoreline communities. Scientists currently estimate that a magnitude 9 earthquake in the Cascadia subduction zone occurs about once every 200-600 years. The last one was in 1700.

Tsunami risk analysis is limited to the coastal shoreline counties in Washington State. The modeled tsunami inundation zones based on maps prepared by Washington Geological Survey were used to delineate tsunami hazard areas. The tsunami hazard area includes areas delineated in inundation maps for the Anacortes-Whidbey Island area, Everett, Bellingham area, Neah Bay area, Elliott Bay area, Port Angeles area, Port Townsend area, Quileute area, Tacoma, and Southern Washington Coast.

Tsunami risk analysis for the coastal shoreline counties of the State reveals that Grays Harbor and Pacific Counties are at highest risk from tsunamis. Kitsap, Mason, Thurston and Wahkiakum Counties are estimated to be at lowest risk from tsunamis. Island, King, San Juan and Snohomish Counties are estimated to be at medium-low risk from tsunamis. Clallam County is estimated be at medium-high risk from tsunamis. Four counties – Jefferson, Pierce, Skagit and Whatcom Counties – are estimated to be at medium risk from tsunamis. It is important to note that this risk assessment is based on specific scenarios. Lower risk in some of the coastal shoreline counties may be due to absence of tsunami inundation maps. These shoreline counties may not be at risk in the specific scenarios utilized for this risk assessment but may have higher risk in yet unpublished models. It is therefore important to interpret the results of this analysis within the limitations of data availability and models utilized for assessment.

Tsunamis can be classified by point of origin as being “near” or “distant” tsunamis. Near tsunamis occur relatively close to a Washington shoreline typically from faults along the Cascadia subduction zone or, within Puget Sound, they could occur with a rupture along the Seattle Fault. Waves from such near tsunami events can reach Washington shores within seconds or minutes. Distant tsunamis, originating from far-away locations including Japan, Chile or Alaska generate waves that my take many hours to reach the Washington coastline, thereby allowing for considerable response time. Wave energy from such “distant” tsunamis will also have attenuated considerably before they reach the State and may be no higher than that of normal daily tide.

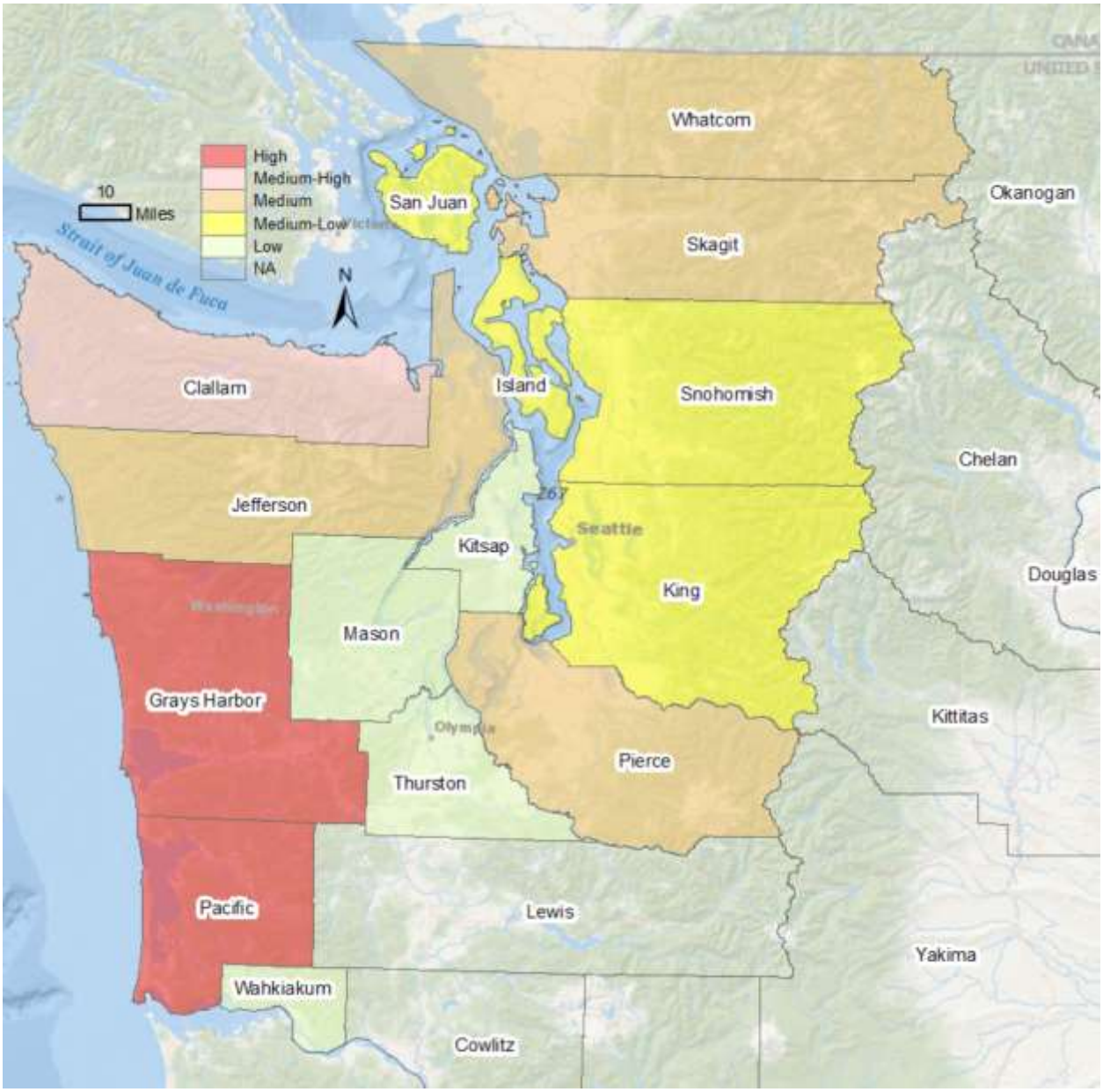


FIGURE 15: TSUNAMI RISK INDEX (WASRI-T)

Tsunami Risk Index (WaSRI-TS) and Constituent Tsunami Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Tsunami Risk (WaSRI-TS)
Clallam	Medium-Low	Medium-Low	High	Medium-Low	Medium	Medium	Medium-High	Medium-High
Grays Harbor	High	High	Medium-High	High	High	High	High	High
Island	Medium-Low	Medium-Low	Low	Medium-Low	Medium-Low	Low	Low	Medium-Low

Tsunami Risk Index (WaSRI-TS) and Constituent Tsunami Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Tsunami Risk (WaSRI-TS)
Jefferson	Medium	Medium	Low	Medium	Medium-Low	Medium-High	Medium	Medium
King	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium	Medium-Low	Medium-Low	Medium-Low
Kitsap	Low	Low	Low	Low	Low	Low	Low	Low
Mason	Low	Low	Low	Low	Low	Low	Low	Low
Pacific	High	High	High	High	High	High	High	High
Pierce	Medium-High	Medium	High	Medium	Medium-High	Medium-Low	Medium-Low	Medium
San Juan	Medium	Medium-Low	Low	Medium	Low	Medium	Low	Medium-Low
Skagit	Medium-High	Medium-High	Low	Medium-High	Medium-Low	Medium-Low	Medium	Medium
Snohomish	Medium-Low	Medium-Low	Medium-High	Medium-Low	Medium-Low	Low	Medium-Low	Medium-Low
Thurston	Low	Low	Low	Low	Low	Low	Low	Low
Wahkiakum	Low	Low	Low	Low	Low	Low	Low	Low
Whatcom	Medium	Medium-Low	Medium	Medium	Medium	Medium-High	Medium	Medium

Likelihood of Exposure

Tsunamis generated elsewhere on the Pacific Rim are the ones that strike Washington most often. It is therefore difficult to estimate the future probability of tsunamis. It is estimated that the earthquake (M8 or M9) in the Washington portion of the Cascadia Subduction Zone will likely produce a significant tsunami with significant damaging and life-threatening impacts along the coastal shoreline communities. According to the Pacific Northwest Seismic Network, there's a 10-20% chance of a Cascadia subduction zone earthquake in the next 50 years.

Area Exposure

Tsunami risk analysis is limited to the coastal shoreline counties in Washington State. The multiple modeled tsunami inundation zones by DNR were overlaid with the county map to estimate the area exposed to possible tsunami inundation in each county. Overall, less than 1 percent of the area in 15 coastal shoreline counties is at risk from tsunami inundation. Pacific, Grays Harbor and Skagit Counties are most at risk from tsunami inundation. Other counties at risk from tsunami inundation include Island, Whatcom, San Juan, Pierce, Clallam, King, Snohomish, and Jefferson Counties. Distant tsunamis impacts were not addressed, nor were events caused by crustal shallow zone earthquakes.

Population Exposure

Overall, only 1% percent of the population living in the coastal shoreline counties is estimated to be residing in tsunami inundation zones. However, in Pacific County, 15 percent of the resident population is within the modeled tsunami inundation area. Pierce County has the highest population (16,000) in tsunami inundation areas, followed by King County with 11,000 individuals.

It is suspected that the direct population exposure to tsunami inundation seems limited due to the methodological limitations imposed by data availability. The ultimate tsunami impact will largely depend on the timing of the event. If the event was to occur in summer on a sunny day, with a large number of people on the beach and along the coastline, the resulting impacts would be significantly higher. This temporary increase in population along the beach can range from an additional few hundred to a few thousand people depending on the season and local weather conditions.

However, to fully understand the threat, it is crucial to be aware that while only a small percentage of the population will be directly impacted, those impacted may not survive. Many coastal communities have insufficient warning time from near tsunamis to evacuate. There is limited, or no, access to existing high ground for much of the Long Beach or Ocean Shores communities.

Populations residing in or visiting the peninsulas of Long Beach within Pacific County or Ocean Shores in Grays Harbor County will not be able to evacuate to high ground from the impacts of a Cascadia Subduction Zone event.

Vulnerable Population Exposure

Overall, less than 1 percent of the State population located in the tsunami inundation zones is also ranked medium or higher on the social vulnerability index. In Clallam County, almost all the population located in the tsunami inundation zone is also ranked medium or higher on social vulnerability. In Pierce County, which has the largest number of persons in the inundation zone, and almost 70 percent of this population ranked medium or higher on social vulnerability index. In Pacific County, more than 50 percent of the population residing in tsunami inundation areas is also ranked medium or higher on social vulnerability index. In Snohomish County, almost 20 percent of the population residing in the tsunami inundation zone is also ranked medium or higher on the social vulnerability index.

Built Environment Exposure

Overall, only 1.21 percent of the State building stock in coastal shoreline counties are located in tsunami inundation zones. Among all counties, Pacific County has the highest proportion of its general building stock in tsunami inundation zones. Grays Harbor County has almost 9 percent of its general building stock within the tsunami inundation zones. About 4 percent of the general building stock in Skagit County is also at risk from tsunamis.

Critical Infrastructure Exposure

Only 3.86 percent of the critical infrastructure facilities located in the coastal shoreline counties are located within the tsunami inundation zones. Almost 30 percent of the critical infrastructure

facilities in Grays Harbor County are at risk from tsunamis. In Pacific County, 16 percent of critical infrastructure facilities are located in tsunami inundation zones. Out of the 1,130 critical infrastructure facilities mapped in Pierce County, 79 (7 percent) are at risk from tsunamis.

State Operations and Facilities Exposure

Overall, only 2 percent of the State-owned facilities in coastal shoreline counties are located in tsunami inundation zones. King and Pierce Counties have the most number (24 each) at risk from tsunamis. In Pacific County, only eight of the 233 State-owned facilities are located in tsunami inundation zones. Out of the 109 State-leased facilities in coastal shoreline counties, only 29 (less than 5 percent) are at risk from tsunamis. In Grays Harbor County, nine of the 12 State-leased facilities are located in the tsunami inundation zone. However, specific tsunami risk to each facility will ultimately be a function of event characteristics and local site characteristics

First Responder Facilities Exposure

Of the 666 fire stations located in coastal shoreline counties, only 26 are located in tsunami inundation zones. Pacific and Grays Harbor County have the most fire stations (nine each) at risk from tsunamis. In Pierce County, two of the 99 fire stations are located in the tsunami inundation zone. Clallam, Skagit, Snohomish and Whatcom Counties each has one fire station at risk from tsunamis. In Pacific County, four of the five law enforcement buildings are located in the tsunami inundation zone. In Grays Harbor County, four of the nine law enforcement buildings are located in the tsunami inundation zone. In Jefferson and King Counties, only one (each) law enforcement building is at risk from tsunamis. However, although overall less than 2 percent of the EMS facilities located in coastal shoreline counties are located in tsunami inundation zones, those that are will most likely not be functional following an event. And redundant assets are not available to many of these impacted coastal populations.

This analysis does not address the indirect impacts from damages to corridors where road segments or bridges have lost their functionality.

Economic Consequences

The two coastal shoreline counties ranked high on the tsunami risk index contribute less than 1 percent of the State Gross Domestic Product. King County, the top contributor to the State GDP, is ranked medium-low for tsunami risks. Pierce County, the next significant coastal shoreline county, is ranked medium for tsunami risk. Grays Harbor County is among those at high risk and is likely to experience catastrophic damages to the local economy. While this data provides a simplistic overview of the relative tsunami impacts in each of the coastal shoreline counties, it does not provide a full picture.

As per the tsunami impact study of the open-ocean and Strait of Juan de Fuca (Wood and Soulard 2008), the businesses in the tsunami inundation zone generated $4.6 billion annually in sales volume. In the same study, researchers found that the majority of the business in many of the coastal communities depend on the coast in some form of the other.

In case of a tsunami event, these businesses would likely be lost and lead to increased unemployment in the region. Losses would continue to mount for subsequent years as it would take significant time for the communities, businesses and vital lifelines to recover from tsunami impact. The same study estimated that total economic losses in Washington State would likely exceed $6 billion in the first year itself. This is equivalent to approximately 2 percent of the State GDP of $346 billion in 2007.

Risk to Environment

Tsunamis can lead to significant ecological damage in the coastal regions. Experiences from past tsunamis indicate that some of the key ecological impacts inflicted on the coastline include saltwater intrusion into the ground water table, irreversible changes to the coastal vegetation, and even the disappearance or relocation of the beaches, or in the case of the Ocean Shores and Long Beach peninsulas, entire communities. Depending on the size of the tsunami event, the resulting debris can itself can become an environmental hazard. Hazard materials from the coastal industries and other on-shore development can be released into the ocean and deposited on land. Contamination of soil and water is a major threat from tsunamis. This includes an increase in salinity of the rivers, wells, lakes and ground water aquifers. Salt-water intrusion, leaking septic tanks and debris contaminated water wells quickly impact the groundwater that lies just below the surface. Salination and debris contamination may also lower soil fertility for years.

Washington State Risk Index for Volcano Hazards (WaSRI – V)

Volcano Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR VOLCANO HAZARDS (WASRI-V)	**MEDIUM**
Likelihood	**LOW**
Hazard Area	**LOW**
Population	**MEDIUM**
Vulnerable Population	**MEDIUM**
Built Environment	**MEDIUM-LOW**
Critical Infrastructure	**LOW**
State Facilities	**LOW**
First Responders	**MEDIUM-LOW**
Economic Consequences	**MEDIUM-LOW**
Environmental Impacts	**MEDIUM-HIGH**

According to the USGS, Washington State is of great concern because of its several volcanoes that fall in the very high and high threat groups. The Cascade Range includes 10 very high threat volcanoes in Washington, Oregon and California – Baker, Crater Lake, Glacier Peak, Hood, Lassen, Newberry, Rainier, Shasta, South Sister, and St. Helens – whose explosive behavior and lahar potential can impact both large populations and extensive development on the ground as well as heavily traveled air-traffic corridors.

There are several kinds of events caused from volcanic action that can be harmful to life and property. These include lava flows, lahars, ash falls, debris avalanches and pyroclastic density currents. Most of the above tend to be limited to the nearby vicinity of volcanic eruption and are often referred to as near volcano hazards. Lahars and ash fall are the most widespread of the volcanic hazards that can cause concern for the communities near the volcanoes. Ash dispersion is primarily a function of the eruption intensity and the prevailing wind direction. As such, it is difficult to create ashfall hazard maps for volcanic eruptions. USGS provides a preliminary probabilistic tephra-hazard map for Pacific Northwest (Hoblitt et al. 2011), revised from Hoblitt et al. (1987) and Scott et al. (1995). Contours show the estimated probability of the accumulation of 10 centimeters or more of tephra from eruptions of the 16 major volcanic centers (black triangles) in the Cascade volcanic arc. It is evident that the contour pattern accentuates how Mount St. Helens' explosivity

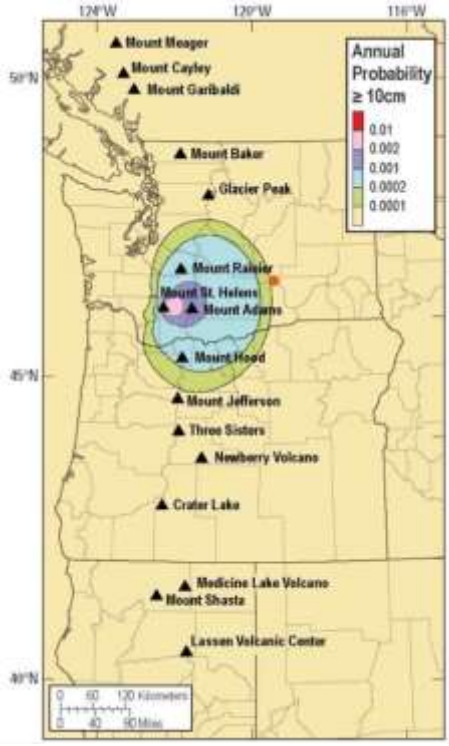


FIGURE 16: PROBABILITY OF ASHFALL (SOURCE: CVO-USGS)

and high eruption frequency dominates the probability analysis. Given the data limitations, ash hazard has not been considered in this vulnerability analysis.

However, the Cascade Volcano Observatory has also created detailed lahar hazard zone maps from key volcanoes in the State. These lahar hazard maps were used in this volcano risk assessment. Thus, the quantitative risk analysis is limited to the lahar hazards associated with possible volcanic eruptions of five high risk volcanos as identified by USGS.

Not all counties are likely to be impacted by lahars from volcanic eruptions in the State. The lahars are likely to follow the regional topography and flow toward the Puget Sound via regional drainage channels. Only 13 counties in the State are likely to be directly impacted by volcanic lahars or regional lava flows. Among these – Skamania, Clark (only impacted by lava flows) and Skagit – are at the highest risk from volcanic lahars or regional lava flows, followed by Klickitat, Cowlitz and Pierce Counties. King and Whatcom Counties are at medium risk from volcanic lahars.

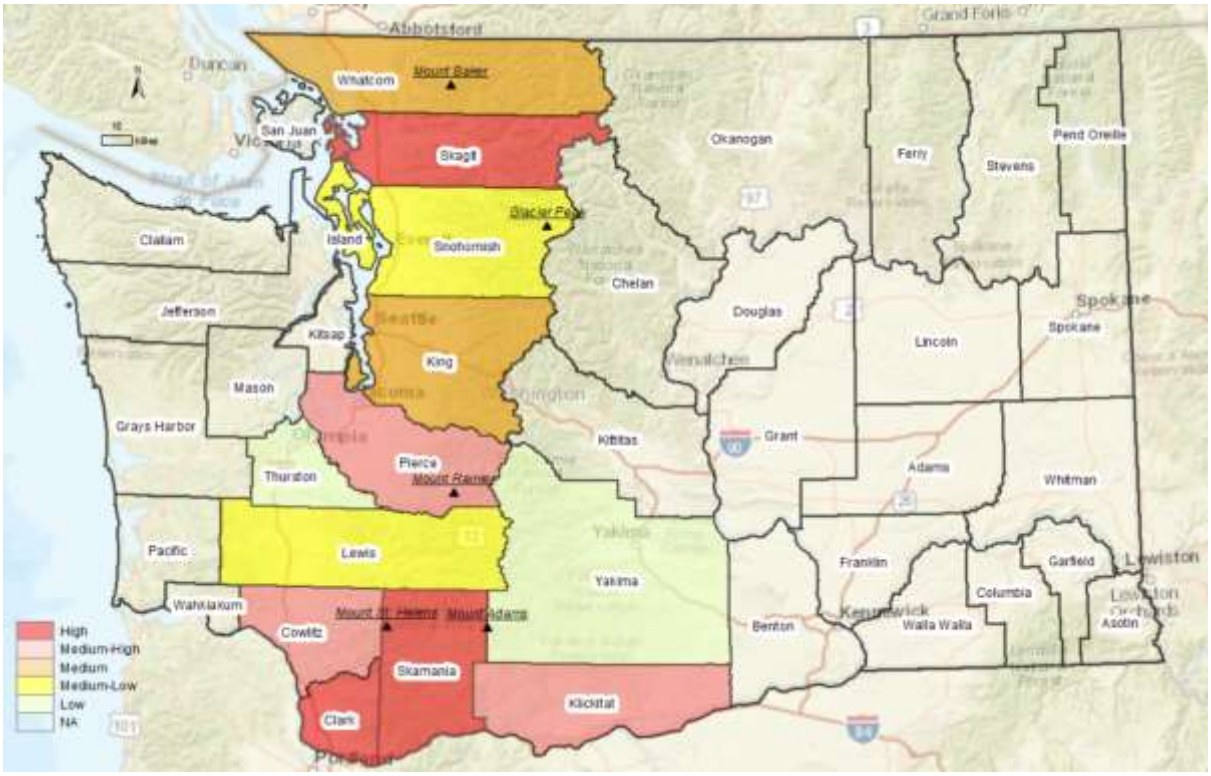


FIGURE 17: VOLCANO RISK INDEX (WASRI-V)

Volcano Risk Index (WaSRI-V) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Volcano Risk Index (WaSRI-V)
Adams								
Asotin								
Benton								
Chelan								
Clallam								
Clark	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Columbia								
Cowlitz	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-HIGH
Douglas								
Ferry								
Franklin								
Garfield								
Grant								
Grays Harbor								
Island	LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	LOW	MEDIUM-HIGH	LOW	MEDIUM-LOW
Jefferson								
King	MEDIUM-LOW	MEDIUM	HIGH	MEDIUM	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM
Kitsap								
Kittitas								
Klickitat	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-HIGH	HIGH	MEDIUM-HIGH	MEDIUM-HIGH
Lewis	MEDIUM	LOW	MEDIUM-LOW	LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM	MEDIUM-LOW
Lincoln								
Mason								
Okanogan								
Pacific								
Pend Oreille								
Pierce	HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM	MEDIUM-HIGH	MEDIUM-HIGH
San Juan								
Skagit	MEDIUM-HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM-HIGH	HIGH	HIGH

Volcano Risk Index (WaSRI-V) and Constituent Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Volcano Risk Index (WaSRI-V)
Skamania	HIGH	HIGH	MEDIUM-LOW	HIGH	HIGH	HIGH	HIGH	HIGH
Snohomish	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	LOW	MEDIUM-LOW	MEDIUM-LOW
Spokane								
Stevens								
Thurston	LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	MEDIUM-LOW	LOW	LOW	LOW
Wahkiakum								
Walla Walla								
Whatcom	MEDIUM	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM	MEDIUM
Whitman								
Yakima	MEDIUM	LOW	MEDIUM-LOW	LOW	LOW	MEDIUM-LOW	LOW	LOW

Likelihood of Exposure

Cascade volcanoes are considered among the most active in the world and will likely erupt again. While it's possible to have sufficient lead time for warning dissemination in the event of an imminent eruption through appropriate monitoring, it is often difficult to predict the future likelihood of volcanic events. Based on a study done by USGS, there is a one in 500 chance that portions of two counties will receive 10 centimeters (four inches) or more of volcanic ash from any Cascades volcano in any given year, and a one in 1,000 chance that parts or all of three more counties will receive that quantity of ash.

Area Exposure

About 6 percent of the land area in the State is exposed to volcanic lahar hazard. Almost 90 percent of Skamania County falls within the lahar or regional lava flow hazard zone. About 34 percent of the Clark County and 20 percent of Pierce County is also exposed to volcanic lahar hazards. Less than 5 percent of King, Thurston and Island Counties are exposed to lahar hazards.

Population Exposure

In Skagit County, almost all of the county population resides in the hazard zone. In Clark County, 65 percent of the population, and in Skagit County, 58 percent of the county population, is located in the lahar hazard zone. In King County, almost 10 percent of the county population resides within the lahar hazard zone. Less than 5 percent of the county population in Snohomish, Thurston, Island and Lewis Counties reside in the lahar hazard zone.

Vulnerable Population Exposure

Overall, less than 2 percent of the State population is vulnerable and resides in lahar hazard zones. In Clark, Skagit and King Counties, about 4 percent of the county population is ranked medium or higher on social vulnerability index and resides in lahar hazard zones.

Built Environment Exposure

Overall, about 12 percent of the State general building stock is located in a lahar hazard zone. However, in Skamania County, all of the county general building stock is located within the lahar hazard zone. In Clark County, 65 percent of the general building stock is located in the lahar hazard zone. In Skagit and Klickitat Counties, approximately 50 percent of the general building stock is located in a lahar hazard zone.

Critical Infrastructure Exposure

Less than 10 percent of critical infrastructure facilities in the State are located in lahar hazard zone. In Skamania County, 97 percent of the critical infrastructure facilities are located in the lahar hazard zone. Other counties with a significant number of critical infrastructure facilities in the lahar or regional lava flow hazard zone include Clark (40 percent), Skagit (27 percent), Pierce (24 percent), Klickitat (20 percent), Whatcom (11 percent) and King (10 percent).

State Operations and Facilities Exposure

It is estimated that less than 2 percent of State-owned facilities and about 7 percent of State-leased facilities are located in lahar hazard zones. The highest number of State-owned facilities in the lahar hazard zone is in King County (60) followed by Pierce County, which has 47 State-owned facilities located in the lahar hazard zone. However, they constitute approximately only 6 percent of the total State-owned facilities in each of these counties. In Skagit County, 67 percent of State-leased facilities are located in a lahar hazard zone.

First Responder Facilities Exposure

It is estimated that 7 percent of fire stations, 10 percent of law enforcement buildings and 8 percent of EMS facilities are located in a lahar hazard zone. Clark and Pierce Counties have the most number of fire stations (18) located in a lahar hazard zone. King and Clark Counties have the most number of law enforcement buildings (7 each) in lahar hazard zones. Clark and Pierce Counties have 18 (each) EMS facilities located in a lahar and regional lava flow hazard zone.

Economic Consequences

The counties ranked medium or higher on the volcano risk index account for 18 percent of the State GDP. King County, by far the highest contributor to the State GDP, is ranked medium for volcanic lahar risks. The next two top contributors to the State GDP, Pierce and Snohomish Counties, are ranked medium-high and medium-low on the volcano risk index. However, it is expected that

volcanic events are also likely to cause significant impact on the local and regional ground and air travel patterns. These economic consequences are not included in this analysis.

Risk to Environment

Volcanic eruptions will significantly impact local environmental resources. Lahars and pyroclastic flows will burn vegetation in its path. Ash deposits are also likely to negatively impact the local ecological diversity.

Ash fall can stress insect populations, bury grasses and reduce initial soil productivity due to reduced photosynthesis and reduced permeability. Ash flows can block water course, and initially at least, stress existing riparian environments. Also, the abrasive nature of the ash can stress both plants and animals. On the positive side, harmful insects can also be stressed resulting in reduced populations and the ash can add value to some soils over time. There may be a beneficial effect from the introduction of new nutrients being added to the soil and there could be an additional benefit through the suppression of germinating weed seeds

Washington State Risk Index for Wildfire (WaSRI – W)

Wildfire Hazard Risk Summary	
WASHINGTON STATE RISK INDEX FOR WILDFIRE (WASRI-W)	MEDIUM
Likelihood	HIGH
Hazard Area	MEDIUM
Population	LOW
Vulnerable Population	LOW
Built Environment	MEDIUM
Critical Infrastructure	MEDIUM-LOW
State Facilities	MEDIUM-LOW
First Responders	MEDIUM-LOW
Economic Consequences	MEDIUM
Environmental Impacts	MEDIUM

The wildland fire season in Washington usually begins in early July and typically culminates in late September with a moisture event; however, wildland fires have occurred in every month of the year. Drought, snow pack and local weather conditions can expand the length of the fire season. The early and late shoulders of the fire season usually are associated with human-caused fires. Lightning generally is the cause of most fires in the peak fire period of July, August and early September. Historically, wildland fire burns approximately 23,000 acres of state-owned or protected land annually. The cost of wildland fire on these lands is more than $28 million annually in firefighting and damage to timber, habitat, property, soil mobilization, landslides and flooding. Between 1960 and 2017, the state experienced 170 wildfire events, with Okanogan county experiencing the most (35) events.

Douglas, Chelan, Lincoln, Grant, Spokane and Adams Counties also experienced at least 10 wildfire events during this period. The wildfires resulted in approximately $309 million worth of property damages, and 18 casualties. Most property damage was reported in Okanogan County, followed by Douglas and Chelan Counties. Not all counties experienced wildfire events, with 15 counties not reporting any events between 1960 and 2017.

The wildfire risk assessment is estimated for each of the census tracts in Washington based on two variables. First is the wildfire potential assessment derived from the U.S. Forest Service Wildfire Hazard Potential raster data (Dillon et. al. 2015), and second is the Wildlife Urban Interface (WUI) community data created by the Washington Department of Natural Resources (DNR). The wildfire hazard potential and community hazard ratings were combined to create the wildfire hazard layer. The statistical analysis of wildfire exposure assessments reveals that six counties – Island, Klickitat,

Okanogan, Pend Oreille, San Juan and Stevens are at the highest risk from wildfires. Among these, Island County is estimated to have only medium wildfire hazard exposure. All of these counties, except for Stevens, have high proportion of residents (ranked high) located in areas exposed to medium or higher wildfire hazard. While the proportion of built environment at risk from wildfires is consistently high among these counties, exposure of vulnerable population varies greatly.

Ten counties – Asotin, Chelan, Ferry, Kitsap, Kittitas, Mason, Skamania, Spokane, Thurston and Yakima – are ranked at medium-high for wildfire. While the exposure assessment across all variables predominantly ranges from medium to medium-high for most of the variables, high vulnerable population exposure is estimated in Mason, Spokane, Thurston and Yakima Counties.

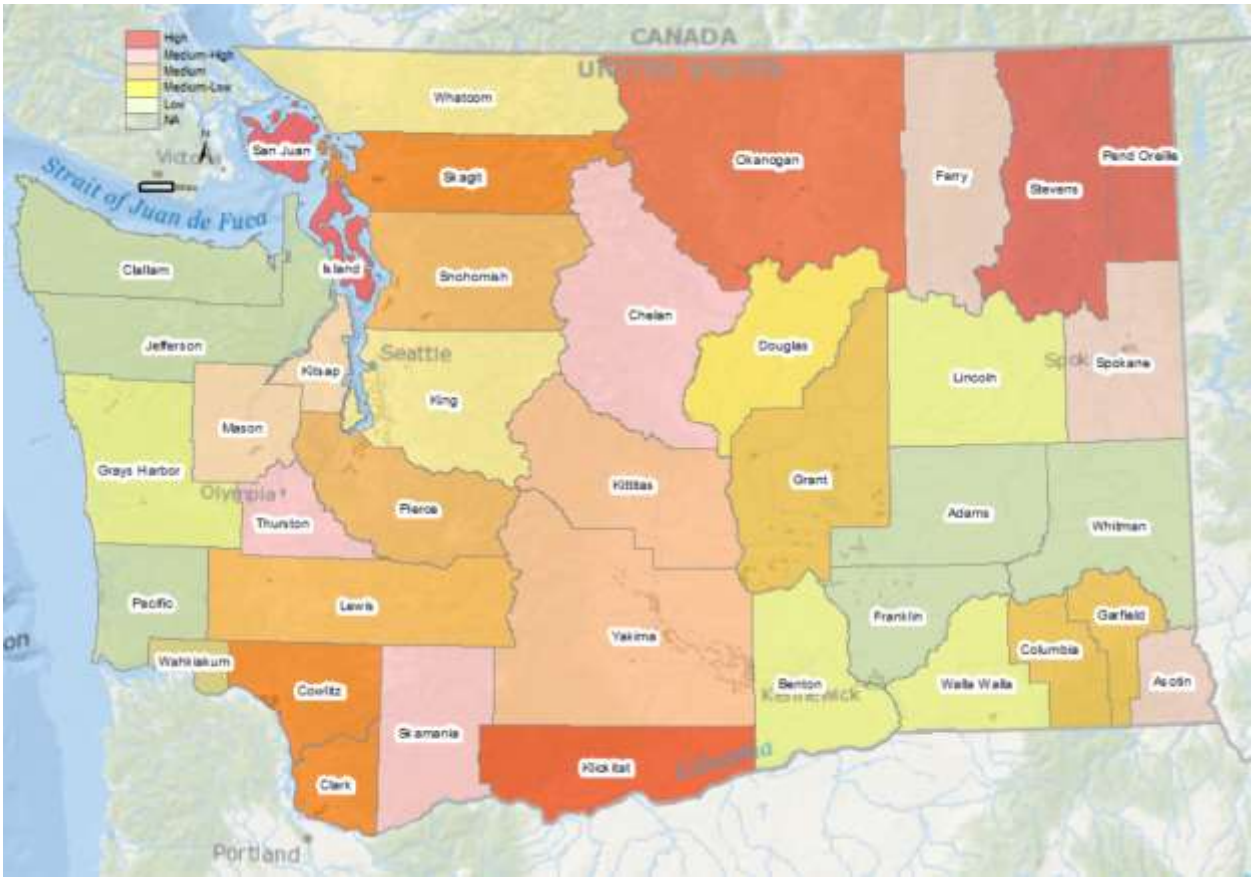


FIGURE 18: WILDFIRE RISK INDEX (WASRI-W)

Wildfire Risk Index (WaSRI-WF) and Constituent Landslide Exposure Ranks for Each County

County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Wildfire Risk Index (WaSRI-WF)
Adams	Low	Medium-Low	Medium	Medium-Low	Low	Low	Low	LOW
Asotin	High	Medium-High	Medium	Medium-High	Medium-High	Medium-High	Low	MEDIUM-HIGH

Wildfire Risk Index (WaSRI-WF) and Constituent Landslide Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Wildfire Risk Index (WaSRI-WF)
Benton	Medium-Low	Medium-High	Medium	Medium-High	Low	Low	Low	MEDIUM-LOW
Chelan	Medium-High	Medium-High	Medium	Medium-High	Medium-High	Medium-Low	Medium-High	MEDIUM-HIGH
Clallam	Low	Medium-Low	Medium	Medium-Low	Low	Low	Low	LOW
Clark	Medium	Medium-Low	Medium	Medium-Low	Medium	High	Medium	MEDIUM
Columbia	Medium-High	Medium-Low	Medium	Medium-Low	High	High	Low	MEDIUM
Cowlitz	Medium	Medium	Medium	Medium	Medium-High	Medium	Medium-High	MEDIUM
Douglas	Medium-Low	Medium-High	High	Medium-High	Medium-Low	Low	Low	MEDIUM-LOW
Ferry	High	Medium-Low	Medium	Medium-Low	Medium-High	Medium	High	MEDIUM-HIGH
Franklin	Low	Medium-Low	Medium	Medium-Low	Low	Low	Low	LOW
Garfield	Medium-Low	Medium-Low	Medium	Medium-Low	High	High	Low	MEDIUM
Grant	Low	Medium	High	Medium	Medium-Low	Medium-High	Medium	MEDIUM
Grays Harbor	Medium-Low	Medium-Low	Medium	Medium-Low	Medium-Low	Medium-High	Medium-Low	MEDIUM-LOW
Island	High	High	Medium	High	High	High	High	HIGH
Jefferson	Low	Medium-Low	Medium	Medium-Low	Low	Medium	Low	LOW
King	Medium	Medium	Medium	Medium	Medium-Low	Low	Medium-Low	MEDIUM-LOW
Kitsap	Medium-High	High	Medium	High	Medium	Medium-Low	Medium-High	MEDIUM-HIGH
Kittitas	High	Medium-High	Medium	Medium-High	High	Medium-Low	High	MEDIUM-HIGH

Wildfire Risk Index (WaSRI-WF) and Constituent Landslide Exposure Ranks for Each County

County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Wildfire Risk Index (WaSRI-WF)
Klickitat	High	High	Medium	High	High	Medium-High	High	HIGH
Lewis	Medium	Medium	Medium	Medium	Medium	Medium-Low	Medium	MEDIUM
Lincoln	Medium-Low	Medium-Low	Medium	Medium-Low	Medium-Low	High	Low	MEDIUM-LOW
Mason	Medium	Medium-High	High	Medium-High	Medium	High	Medium-High	MEDIUM-HIGH
Okanogan	Medium-High	High	High	High	High	Medium-Low	High	HIGH
Pacific	Low	Medium-Low	Medium	Medium-Low	Low	Medium	Low	LOW
Pend Oreille	High	High	Medium	High	Medium-High	Medium-High	Medium-High	HIGH
Pierce	Medium-Low	Medium	Medium	Medium	Medium-Low	Medium-Low	Medium	MEDIUM-LOW
San Juan	Medium-High	High	Medium	High	Medium-High	High	Medium-High	HIGH
Skagit	Medium	Medium-Low	Medium	Medium-Low	High	Medium-High	Medium-High	MEDIUM
Skamania	Medium	High	Medium	High	Medium	Medium	Medium-High	MEDIUM-HIGH
Snohomish	Medium-High	Medium-Low	Medium	Medium-Low	Medium	Low	Medium	MEDIUM-LOW
Spokane	Medium-High	Medium-High	High	Medium-High	Medium-High	Medium	Medium	MEDIUM-HIGH
Stevens	High	Medium-High	High	Medium-High	Medium-High	High	High	HIGH
Thurston	Medium-High	High	High	High	Medium	Medium-Low	Medium-High	MEDIUM-HIGH
Wahkiakum	Low	Medium-Low	Medium	Medium-Low	Low	Medium-High	Low	LOW
Walla Walla	Medium-Low	Medium	Medium	Medium	Medium-Low	Medium	Medium	MEDIUM-LOW

Wildfire Risk Index (WaSRI-WF) and Constituent Landslide Exposure Ranks for Each County								
County	Area	Population	Vulnerable Population	Built Environment	Critical Infrastructure	State Facilities	First Responder Facilities	Wildfire Risk Index (WaSRI-WF)
Whatcom	Medium	Medium-Low	Medium	Medium-Low	Medium	Medium	Medium	MEDIUM-LOW
Whitman	Low	Medium-Low	Medium	Medium-Low	Low	Medium-High	Low	LOW
Yakima	High	Medium	High	Medium	High	Medium-Low	High	MEDIUM-HIGH

Likelihood of Exposure

Based on the data since 2000, at least one major wildfire is likely to occur annually. The likelihood of multiple (two or more) wildfires in any given year is 94 percent. The likelihood of four or more wildfires in a year is 60 percent.

Climate change, coupled with the current high fuel and vegetation status of the forest, suggest that high intensity fires will continue to degrade the landscape unless proper management policies are implemented. Our winters are becoming shorter and wetter with less snow, while summers are becoming drier and longer. This process is resulting in the generation of flash fuels, uncharacteristically denser forests, and are stressing normal regenerative processes and increasing wildland fire risk.

Accordingly, forests are becoming less resilient and the risk of wildland fires in increasing.

Area Exposure

The majority of the State (59 percent) is ranked low for wildfire hazard exposure. In comparison, 21 percent of the total land area of the state is estimated to be at medium or higher level of risk from wildfires. Less than 2 percent of the area is ranked high for wildfire exposure, and another 7 percent is ranked medium-high for wildfire exposure. Most of these areas include WUI regions with high or extreme hazard ratings. In Kittitas County, almost 12 percent of the area is ranked high for wildfire exposure. Another, 16 percent of the county area is ranked medium-high. Overall, more than 60 percent of the area in Kittitas County is ranked medium or higher for wildfire hazard. In Asotin County, almost 10 percent of the county areas is ranked high, and 29 percent is ranked medium-high for wildfire hazard exposure. Predominantly, the wildfire hazard exposure is concentrated in the Central Ecological Region and Northern Counties of the Eastern Ecological Region. Pend Oreille, Ferry, Stevens, Chelan and Okanogan Counties have 35-40 percent of the area ranked at medium or higher from wildfire exposure.

Population Exposure

While less than 2 percent of the State area is ranked high for wildfire exposure, the population exposure is estimated to be 8 percent of the total estimated State population. More than 80 percent of the county population in Pend Oreille resides in areas with medium or higher exposure to wildfires. In Thurston County, 70 percent of the county population, approximately 200,000 individuals, is located in areas at medium or higher exposure to wildfire. In three counties – Okanogan, San Juan and Island – 31-33 percent of the county population is located in areas ranked medium or higher for wildfire exposure. Approximately 25 percent of the county population in Klickitat, Skamania and Kitsap Counties is located in areas with medium or higher wildfire exposure. In Mason, Kittitas and Stevens Counties, about 20 percent of the population resides in areas with medium or higher wildfire exposure. Asotin and Spokane Counties also have approximately 12 percent of the county population residing in areas with medium or higher wildfire risk.

Vulnerable Population Exposure

Overall, less than 2 percent of the total state population is ranked medium or higher on social vulnerability index and resides in areas with medium or higher exposure to wildfire. In Okanogan County, 13 percent of the county population is both ranked medium or higher on social vulnerability and is located in areas with medium or higher wildfire exposure. In Mason County, approximately 3,600 individuals (approximately 6 percent of the county population) reside in areas with medium or higher wildfire exposure and are also ranked medium or higher on social vulnerability. In Douglas County, 3.4 percent of the county population is located in areas with medium or higher wildfire exposure and is also ranked medium or higher on the social vulnerability index.

Built Environment Exposure

Overall, less than 3 percent of the general building stock in the State is located in areas with medium or higher wildfire exposure. Thurston County has highest value of general building stock located in areas ranked medium or higher for wildfire exposure. In Kitsap County, approximately $4.2 million and in Spokane County, approximately $390 million of general building stock is located in areas with medium or higher wildfire exposure. In Pend Oreille County, 84 percent of the county general building stock is located in areas with medium or higher wildfire exposure. Klickitat County, with 65 percent of county area with medium or higher wildfire hazard exposure, is estimated to have 26 percent of the county general building stock in these wildfire hazard areas.

Critical Infrastructure Exposure

Only 13 percent of the critical infrastructure facilities in the State are located in areas with medium or higher wildfire exposure. Yakima County has the most critical infrastructure facilities (280) located in areas with medium or higher wildfire exposure. In Spokane County, 272 of the 933 critical infrastructure facilities are located in areas with medium or higher wildfire exposure. In Island County, 67 percent of the critical infrastructure facilities are located in areas with medium wildfire

exposure. In Kittitas and Klickitat Counties, approximately 50 percent of the critical infrastructure facilities are located in areas with medium or higher wildfire exposure. While this analysis identifies critical facilities likely to be at medium or higher risk from wildfires, it is important to note that specific risk to each facility results from the combination of the event characteristics (which are difficult to predict) and the site-level facility characteristics. This analysis of critical facilities does not address the indirect vulnerabilities due to road segments or losses resulting from interrupted access.

State Operations and Facilities Exposure

Overall, 18 percent of the State-owned facilities are located in areas with medium or higher wildfire exposure. King County has the most facilities (182) located in areas with medium or higher wildfire exposure. Pierce County has 144 of its 864 State-owned facilities located in medium or higher wildfire exposure areas. In San Juan and Island Counties, approximately 27 percent of the State-owned facilities are located in areas ranked medium or higher for wildfire exposure. In these counties, most of these facilities are in areas ranked medium. In all counties with the exception of Ferry County, at least 10 percent of the State-owned facilities are located in areas with medium or higher wildfire exposure. In Ferry County, only three of the 32 State-owned facilities are located in areas with medium or higher wildfire exposure. In total, less than 1 percent of the State-leased facilities are located in areas with medium or higher wildfire hazard exposure.

First Responder Facilities Exposure

It is estimated that 18 percent of fire stations, 6 percent of law enforcement buildings, and 17 percent of EMS facilities are located in areas with medium or higher wildfire exposure. In Yakima County, almost 50 percent of all fire stations (28), law enforcement buildings (8), and EMS facilities (27) are located in areas with medium or higher exposure to wildfires. In Island County, nine of the 10 fire stations, one of the four law enforcement buildings, and eight of the nine EMS facilities are located in areas with medium wildfire hazard exposure. In Kittitas County, 67 percent of the fire stations (21), 33 percent of law enforcement buildings (1), and 89 percent of EMS facilities (8) are located in areas with medium or higher wildfire exposure. In King County, which has the largest number of each of these facilities, only three fire stations and three EMS facilities are located in areas with medium or higher exposure to wildfires. There are no law enforcement buildings exposed to wildfire risk in King County.

Economic Consequences

The six counties ranked high on the wildfire risk index contribute less than 2 percent of the State Gross Domestic Product. The 10 counties – Asotin, Chelan, Ferry, Kitsap, Kittitas, Mason, Skamania, Spokane, Thurston and Yakima – ranked at medium-high for wildfire risk contribute a combined 15 percent of the State GDP. The top three contributors to the State GDP – King, Pierce and Snohomish Counties – are ranked at medium-low from wildfire risks. Spokane County is the only county ranked higher than medium among the top five contributors to State GDP. Therefore, it is expected that major wildfire events are likely to have only a limited impact on the State GDP.

The indirect economic consequences including losses in work days because of poor air quality, loss of capital required for suppression efforts, interrupted access, and losses in tourist income were not included within this analysis.

Risk to Environment

It is estimated that 22 percent of the State's ecologically critical resources are also at medium or higher wildfire exposure. The high degree of overlap among the ecologically critical resources is expected because of the nature of the hazard. Most wildfires originate in forested areas, which provide a fuel rich environment. The spatial analysis reveals that more than 50 percent of the ecologically sensitive areas in Island, Klickitat, Kittitas and Yakima Counties also have medium or higher exposure to wildfires. In Asotin, Pend Oreille, Chelan, Ferry, Stevens, Okanogan, San Juan and Spokane Counties, 30-45 percent of the ecologically critical areas are also at medium or higher wildfire exposure. The greatest destruction resulting from high intensity fire are losses in ground cover. High intensity wildland fires render soils hydrophobic and increase flood velocities, which leads to soil mobilization that can cause permanent soil losses along with the inability of the forest to regenerate.

Overall Risk to Public Confidence – Assessment and Methodology

Public confidence was estimated in two ways. The first was through a detailed plan quality evaluation of the county hazard mitigation plans (HMP). It is assumed that a higher quality hazard mitigation plan is more likely to reflect a higher degree of public confidence in emergency management in comparison to counties with lower quality hazard mitigation plans because higher-quality plans are built with more robust public engagement and have a broader range of mitigation strategies. A plan quality evaluation protocol developed by the Institute for Hazard Mitigation Planning and Research at UW was used for evaluating local-level HMP quality. This protocol incorporates all the key principles of local-level plan quality from the HMP literature. Categories of criteria within this protocol consist of the vision statement, fact basis, planning process (e.g., level of participation), mitigation goals and objectives, inter-organization coordination and capabilities (e.g., identification of different levels of government), specific mitigation policies and actions, and implementation. Within each category, the protocol includes several items (for a total of 126 items). The protocol was tailored and tested on a county Hazard Mitigation Plan within Washington state. Afterward, the protocol was revised and updated.

Ordinal scores (0 = not mentioned; 1 = briefly mentioned; 2 = described in detail) were assigned for each of the 126 items. These were recorded in an Excel matrix and then aggregated to calculate scores for the components of quality and overall plans. These equations consist of calculating index scores for each of the components through a three-step process: (1) summing the indicator scores within the component; (2) dividing by the total possible score for the component; and (3) multiplying by 10 to give a component score on a scale from 0 to 10. After this process, the component scores are summed to give a total plan quality score.

A total of three coders (one graduate and two undergraduate students in the University of Washington's College of the Environment) were trained to code the same set of plans. The coding technique included training to develop strategies for consistency in coding of items. The inter-coder reliability was assessed for each of the 126 items and between each pair of coders. Reassessment of the plans was done until an acceptable level of agreement (e.g., 0.67) was achieved across all coding criterion.

Hazard Mitigation Plan Quality Analysis							
County	Plan Quality Component						
	Vision Statement	Fact Base	Planning Process	Mitigation Goals & Objectives	Inter-organization coordination & Capabilities	Specific Mitigation Policies & Actions	Implementation
Asotin, Columbia, Garfield	9.58	6.81	6.67	6.15	5.76	5.23	7.39
Benton	8.75	5.32	7.38	7.19	3.59	4.03	6.79
Chelan	8.06	6.57	6.19	8.56	2.96	4.85	7.13

Hazard Mitigation Plan Quality Analysis							
County	Plan Quality Component						
	Vision Statement	Fact Base	Planning Process	Mitigation Goals & Objectives	Inter-organization coordination & Capabilities	Specific Mitigation Policies & Actions	Implementation
Clallam	10.00	6.16	6.55	6.52	4.30	5.16	7.92
Clark	9.72	7.36	7.74	7.85	6.20	5.55	6.19
Cowlitz	9.72	7.73	6.31	6.26	5.59	5.61	5.87
Douglas	7.78	5.97	6.67	5.74	4.88	3.90	6.03
Franklin	9.45	7.31	7.02	5.96	3.57	4.59	8.16
Grant	9.72	7.64	6.79	7.41	4.59	5.63	7.11
Grays Harbor	9.72	7.22	6.79	7.15	4.60	4.97	6.52
Island	9.58	8.01	7.62	6.74	6.03	6.03	7.16
Jefferson	10.00	8.43	7.62	6.52	4.75	4.97	7.39
King	9.72	8.57	7.98	7.15	6.98	6.80	8.01
Kitsap	9.72	7.82	6.55	6.52	4.95	5.45	7.71
Kittitas	9.72	7.08	6.43	7.74	5.07	6.29	6.08
Lewis	8.75	6.32	6.79	6.89	4.05	3.86	7.09
Lincoln	10.00	7.04	6.31	6.67	3.41	3.52	5.63
Mason	9.03	7.82	6.31	6.44	4.49	4.95	6.94
Okanogan	9.44	6.90	6.91	5.78	4.82	4.25	6.21
Pacific	8.89	8.24	6.79	9.11	4.57	4.67	6.66
Pend Oreille	9.31	7.73	6.19	5.48	3.84	4.22	5.93
Pierce	5.97	5.97	6.19	5.18	3.51	4.14	6.76
San Juan	9.03	6.25	4.88	5.59	2.58	2.26	4.54
Skagit	9.58	7.82	7.03	6.56	5.90	5.49	7.13
Skamania	9.17	7.50	7.26	5.59	3.91	3.56	6.37
Snohomish	9.44	7.92	5.95	8.37	5.24	6.60	7.09
Spokane	10.00	6.25	5.95	8.30	4.03	5.60	6.06
Stevens	9.03	6.44	6.67	6.67	4.43	3.17	5.44
Thurston	9.72	7.36	6.19	8.04	4.63	5.42	7.21
Wahkiakum	8.75	6.48	6.67	6.37	4.92	4.50	6.58
Walla Walla	7.92	7.96	6.07	6.93	2.71	3.85	6.49
Whatcom	9.31	7.55	6.55	5.48	4.21	5.31	5.65
Whitman	9.72	7.41	7.38	7.89	5.59	5.15	7.12

Hazard Mitigation Plan Quality Analysis							
County	Plan Quality Component						
	Vision Statement	Fact Base	Planning Process	Mitigation Goals & Objectives	Inter-organization coordination & Capabilities	Specific Mitigation Policies & Actions	Implementation
Yakima	9.03	7.08	7.98	9.11	6.98	5.99	6.52
Mean (Max. 10)	8.20	6.92	6.80	6.88	4.64	5.77	6.67

The second method of assessing public confidence in emergency management is through surveys. While most of these are conducted locally, the following are the results from the 2017 Grays Harbor County Citizen Expectation Survey. These results are illustrative of confidence and perceptions of emergency management because Grays Harbor has a particularly active emergency management department and is one of the most vulnerable counties to nearly every major hazard in Washington State, including severe storm, flood, tsunami and earthquake. The public is considered confident of emergency management if their answers to the below questions reflect emergency management as the primary source of critical information and if they trust warnings they receive and are willing to heed evacuation orders. Overall, the survey results indicate that the public is willing to heed emergency management notices, but while they don't expect assistance immediately, they do expect it within three days and they expect to see responder agencies working immediately. Furthermore, they do not necessarily turn first to emergency management for confirmation of disaster information. These results indicate that emergency management has a long way to go to be seen as the undisputed leader and source of guidance for disaster preparedness, response and recovery.

IF YOU RECEIVED CONFLICTING INFORMATION ABOUT AN APPROACHING DISASTER EVENT, WHO WOULD YOU CONTACT IN ORDER TO OBTAIN THE CORRECT INFORMATION YOU WILL NEED?

Local Emergency Management – 40.13% Local Law Enforcement – 10.6%
Local County Government – 9.53% Local Fire Department – 8.59% All Others 31.1%

SUMMARY – These numbers are extremely worrisome. Over 1/3 of respondents will be in search of confirmation of an approaching disaster event by someone other than local emergency management, law enforcement, fire or county government. Rumor and misinformation could gain momentum during this search period and contribute to significant impact of the event upon citizens receiving such information.

IF A DISASTER SITUATION WAS IMMINENT, WOULD YOU EVACUATE YOUR HOME IF TOLD BY AUTHORITIES?

YES – 80.29% NO – 2.78% UNSURE – 16.93%

SUMMARY – These numbers indicate nearly 20 percent of respondents will not evacuate or will need to think about the situation before leaving home. Understanding every emergency or disaster

event is unique, these responses truly signify how important the initial message to evacuate will be for all citizens and the fact a consistent message needs to be broadcast over a variety of communication outlets for those seeking confirmation.

I EXPECT EMERGENCY RESPONSE AGENCIES TO ASSIST ME IF I MUST EVACUATE MY HOME.

YES – 19.74% NO – 61.19% UNSURE – 19.07%

SUMMARY – In a true disaster, emergency response agencies will be overwhelmed with emergency calls. The expectation that any response agency will arrive to assist is another area to increase citizen awareness. These results indicate 38.81 percent of respondents are unsure or believe response agencies will come to assist them, resulting in time lost waiting and looking for answers when they could be attempting to evacuate. Response agencies will most likely NOT be able to assist individual citizens during an event of any magnitude. Personal preparedness and readiness actions must be instilled in all citizens through public awareness programs.

IF GRAYS HARBOR COUNTY WAS IMPACTED BY A SIGNIFICANT DISASTER EVENT LASTING MULTIPLE DAYS, I EXPECT FEDERAL AND STATE RESPONSE AGENCIES, INCLUDING FEMA AND THE RED CROSS TO RESPOND WITHIN:

19.26% - 12 hours 31.4% - 24 hours 13.06% - 2 days 10.82% - 3 days 25.46% - 4 days or more

SUMMARY – 69.35 percent of citizens who responded to the survey expect federal and state assistance within two days following a significant event, which is improbable, if not impossible, following any type of major earthquake or tsunami event. They occur without notice and no pre-staging of necessary supplies would be taking place at the time of occurrence. The 2-day threshold could possibly be reached in a major flood event.

These results may be generated by the old “3 Days - 3 Ways” program of FEMA and Washington State with respondents picking a midrange figure. The new standard in Washington State is “2 Weeks Ready,” a campaign encouraging people to be prepared to be on their own for at least two weeks. It will be interesting to see if this answer changes once the “2 Weeks Ready” program has had a chance to be spread throughout the state.

IF GRAYS HARBOR COUNTY WAS IMPACTED BY A SIGNIFICANT DISASTER EVENT LASTING MULTIPLE DAYS, I EXPECT LOCAL, CITY AND COUNTY RESPONSE AGENCIES TO RESPOND WITHIN:

44.52% - 12 hours 26.95% - 24 hours 8.72% - 2 days 5.42% – 3 days 14.4% - 4 or more days

SUMMARY - Although local response agencies may attempt to mount a quick response in a major event, many access roads, facilities and equipment might be unusable affecting all efforts. The other most notable issue will be how long agencies can assist without reinforcement or being completely overwhelmed by the situation?

IN A SIGNIFICANT DISASTER EVENT LASTING MULTIPLE DAYS, WHO WOULD YOU SEEK OUT TO OBTAIN FOOD OR SHELTER ASSISTANCE?

38.06% - Unsure 11.46% - Church 7.64% - School 14.73% - Fire Department

SUMMARY – Any large impact event will definitely test our preparedness if we cannot evacuate prior to the event. Seeking food, shelter and medical attention will be a priority for all. With 38.06 percent of respondents unsure about where they’d seek assistance, it’s a major indication of the

need for public outreach and awareness in every community. Food, water and sheltering are essential during the first 12-48 hours of an event.

In many of the other locations selected – churches, schools and fire departments—they may not have the necessary resources to deal with those in search of food, shelter or medical attention.

HAVE YOU SIGNED UP FOR THE GRAYS HARBOR COUNTY NOTIFICATION SYSTEM?

YES – 59.95% NO – 12.47% I don't know what the Notification System is – 27.59%

SUMMARY – The 2013 YES (40 percent) and NO (25.81 percent) responses show our outreach efforts have been very successful to date. The responses indicating 27.59 percent not knowing there was a Notification System in the county (34.19 percent in 2013), also indicates outreach efforts are working. However, it still indicates a strong need for better practices to increase awareness not only from a county level but in our tribal nations, cities and fire districts. The 12.47 percent of NO responses to the notification system must be further investigated for information on why those respondents decided not to join.

Comprehensive Mitigation Program

Washington's commitment to a comprehensive hazard mitigation program is most evident in the 2018 updated mitigation strategies, which include commitments to new and continued interagency cooperation. Other examples include the RiskMAP program, which includes DNR, ECY, COM and EMD as Cooperative Technical Partners.

The maintenance of a comprehensive mitigation program entails:

- Regular participation in interagency workgroups.
- Clear process for reviewing and approving local and tribal plans and projects.
- Consistent mitigation planning guidance to local jurisdictions.
- Multiagency coordination of related mitigation planning activities.
- Mitigation capability includes housing, economy, cultural and natural resources, infrastructure, community resilience, and health systems subject areas.
- Accountability for the effectiveness of hazard mitigation projects.
- Consistent prioritization in accordance with identified vulnerabilities.
- End-to-end support for local jurisdiction hazard mitigation through HMA grants.

The State of Washington's Comprehensive Mitigation Program includes mitigation planning, projects and multi-agency coordination. This section describes the maintenance of the multi-agency program as well as provides guidelines for local jurisdictions engaged in mitigation projects or plans. Assessing the comprehensive mitigation program should include this section of the plan, along with the proposed interagency mitigation strategies, the long-term plan monitoring strategy, and the mitigation capabilities section.

Specifically, Washington maintains a comprehensive mitigation program in several ways, including:

- Integration of technical assistance and support to local jurisdictions in related planning processes, including Growth Management, Critical Areas, Floodplain Management and Hazard Mitigation. This includes state agency partners such as COM, DNR, ECY and their local counterparts.
- Presence in workgroups related to hazard mitigation planning, research and projects. EMD staff support dozens of workgroups, including for hazard mitigation, preparedness, response and recovery mission areas. A sample list is provided below.
- Support for other agency practice initiatives, most recently exemplified by EMD's leadership in the Resilient Washington Subcabinet, which developed multi-agency mitigation strategies to address key vulnerabilities. These strategies are included in the Mitigation Strategy section of this plan.
- HMA funds granted to state agency sub-applicants such as DNR, and EMD participation in programs such as Cooperating Technical Partners, which is funded by FEMA but led by another agency.

- Maintenance of the Mitigation Workgroup and preparation of the Annual Resilience Report on the status of state mitigation strategies.
- Annual FEMA Consultation of the HMA program and the maintenance of the SEHMP.
- The Community Resilience Recovery Support Function, currently being developed for the Washington Restoration Framework.
- Leveraging of 404/406 Public Assistance opportunities.
- Use of Public Assistance program dollars to implement effective mitigation actions following disaster declarations.
- Participation in catastrophic planning working groups and planning teams to provide the mitigation perspective.

Interagency Workgroup Participation

Given the primacy of local jurisdictions, Washington State's comprehensive mitigation program focuses on maintaining strong technical assistance capacity to local jurisdictions and on coordinating consistent regulatory and programmatic guidance. For example, the Department of Ecology floodplains team works closely with EMD's mitigation team to ensure that flood mitigation planning requirements align with those for natural hazards mitigation plans. Additionally, initiatives such as the Coastal Resilience Coalition or the Interagency Climate Adaptation Network include representatives from multiple agencies who work together to align projects and programs. These networks supplement the Hazard Mitigation Workgroup – the primary monitoring and implementation body for this plan. The following table highlights many of the state workgroups and initiatives with mitigation missions or with missions that are related to mitigation.

Workgroup/Organization	Description	Lead
Coastal Resilience Coalition	A network dedicated to improving regional coordination and collaboration through effective partnerships among practitioners to make Washington's coastal communities more resilient to natural hazards. Participants consist of environmental non-profits, state agencies, local jurisdictions, and academic researchers.	Ecology
Interagency Climate Adaptation Network	Interagency workgroup discussing latest climate science and statewide and agency-specific initiatives to mitigate the impacts of climate change. Primarily includes state agencies, with some local jurisdiction and academic institution representation.	WSDOT
Interagency Working Group – Growth Management	Interagency workgroup supporting the Growth Management Act implementation and updating. Includes discussions on key topics, such as the inclusion of risk assessments into growth	COM

Workgroup/Organization	Description	Lead
	management and comprehensive planning guidance.	
Northwest Recovery Interagency Working Group	FEMA-led group of disaster recovery partners, including federal agencies and Region X state emergency management.	FEMA
Silver Jackets	US Army Corps of Engineers-led group of floodplain managers and state floodplain staff. Focuses on flood mitigation primarily as well as climate change resilience.	USACE
Drought Contingency Plan Task Force	Multiagency task force supporting drought planning for mitigation and response. Includes state agency representatives from DOH, EMD, ECY and others.	Ecology
Washington State Resilience Coordination Group	Regular conference call of DNR, ECY and EMD risk reduction programs in support of Risk Map.	Ecology
Washington Coastal Resilience Project	An ECY-led project bringing together agencies and organizations (local, state, federal, environmental non-profit) to support specific mitigation projects in response to catastrophic erosion along Washington's coast.	Ecology
Homeland Security Region Quarterly Meetings	Meetings in each of Washington's nine homeland security regions, frequently attended and supported by state staff and local emergency management to share information and resources.	EMD
Hazard Mitigation Workgroup	Multiagency workgroup responsible for the writing, monitoring and implementation of the FEMA-approved Enhanced Hazard Mitigation Plan. Members include state agency partners from each agency that regulates or owns significant risks or vulnerabilities.	EMD
Resilient Washington Subcabinet	Subcabinet created by Gov. Jay Inslee in Directive 16-19 to implement many of the recommendations in the 2012 Resilient Washington Report. Most cabinet-level agencies, plus the OIC and DNR, participated in developing recommendations. Meetings also included some private sector participation and briefings were open to the public.	EMD
Coalition on Inclusive Emergency Planning	Coalition of planners in emergency management, advocates and local organizations supporting inclusive planning for those with limited English proficiency and access and functional needs. Workgroup includes non-profits specializing in accessibility as well as state and local jurisdictions.	DOH
Equity and Inclusion Subcommittee	Workgroup consisting of state agencies, independent living councils and private non-profits	DOH

Workgroup/Organization	Description	Lead
	that discusses how to plan with inclusion and equity for the whole community.	
Washington Restoration Framework Steering Committee	State agencies and non-profits (Red Cross, VOADs) involved in disaster recovery. Includes each agency/program supporting a recovery support function, including DSHS (Mass Care), WSDA (Natural Resources, Economic Recovery), ECY (Natural Resources), DAHP (Cultural Resources), EMD (Community Resilience, Infrastructure), COM (Economic Recovery, Infrastructure, Housing).	EMD
Community Resilience Recovery Support Function	The Community Resilience RSF, currently in development through EMDs Disaster Recovery Program, will work to identify and implement mitigation strategies that specifically speed disaster recovery through pre-disaster implementation or will avoid future disasters (post-disaster implementation). Membership made up primarily of state agencies and local jurisdictions. EMD mitigation strategist is RSF lead.	EMD
Post-Wildfire Flood Committee	A committee jointly led by NOAA and USACE supporting flood and debris flow risk identification and mitigation in support of jurisdictions that have experienced wildfire in recent years. Participants include state, local and federal representatives plus some non-profits.	USACE
State Catastrophic Incident Planning Team	EMD-led team developing the state's catastrophic plan to response to a Cascadia-style earthquake event. Participants include state agency partners, including COM, DNR, WSP and others, and local jurisdictions. Topics include infrastructure, mass care and the development of tools to support local jurisdiction catastrophic planning.	EMD
Cascadia Regional Earthquake Workgroup (CREW)	Supported by EMD Geologic Hazards staff, this workgroup focuses on earthquake information, preparedness, science and risk reduction.	CREW
RiskMAP	FEMA-led project focused on developing new flood maps and advanced hazard analyses. The data is useful for mitigation planning and project identification.	FEMA
Infrastructure Resilience Sub-Committee	One of seven sub-committees of the Governor's Emergency Management Council. Meets quarterly to address issues of critical infrastructure resilience. Membership includes state and federal agencies,	EMD

Workgroup/Organization	Description	Lead
	public infrastructure owner/operators and private infrastructure owner/operators.	
USCG D13 Area Maritime Security Committees (Sector Puget Sound and Sector Columbia River)	Hosted by USCG District 13 Sector Puget Sound and Sector Columbia river, respectively. Meet quarterly to address security and resilience issues in the maritime domain for the Puget Sound and Columbia River. Membership includes local, state and federal agencies, public port personnel and private sector maritime operators.	USCG
National Tsunami Hazard Mitigation Program Committee(s)	NTHMP committees are made up primarily of federal and state mitigation and preparedness specialists from coastal western states and territories. The committees work to share best practices and further goals of preparedness, mitigation, response and recovery through planning, projects and improved federal-state coordination.	FEMA
Volcano Working Groups	Working groups supporting messaging and preparedness for each active Cascade Range volcano. Includes representatives from local jurisdictions, state agencies (EMD, DNR) and federal agencies (USGS, others).	USGS
Washington Emergency Communications Coordination Working Group	A working group made up of state, federal and local agencies plus private-sector and industry representatives that build relationships between members, identify risks, participate in exercises, maintain the ESF 2 roster and support disaster response communications planning.	EMD
Washington ShakeAlert Communications, Education, and Outreach Committee	ShakeAlert is an earthquake early warning system developed by the USGS. The committee works with local jurisdictions, state and federal officials, non-profits, utilities and businesses to identify pilot program participants and to coordinate outreach and communications across states and the private sector.	USGS
Western States Seismic Policy Council	The Western States Seismic Policy Council (WSSPC) is a regional earthquake consortium in the western states organized and supported by FEMA. Members include state, federal and local jurisdictions, corporations, non-profits and universities.	FEMA

Workgroup/Organization	Description	Lead
Washington Coalition of Recovery Planners	State agencies, private nonprofit, federal partners, local jurisdictions meet to discuss recovery issues around Washington State. Include conversations around each Recovery Support Function (Resilience, Infrastructure, Economy, Health, Environment, Cultural Resources, Housing).	EMD

SRL/RL property buyouts and EMD Mitigation's engagement with ECY's floodplain managers is an example of successful interagency collaboration. EMD works with ECY to identify high-priority SRL and RL properties in jurisdictions interested in supporting buyouts and with homeowners interested in selling. This collaboration includes EMD's designation as a Cooperative Technical Partner (CTP) in the RiskMAP program, specifically so that EMD can help local jurisdictions apply for grant funds to address mitigation strategies identified through the RiskMAP process. SRL/RL buyouts are a common project. Among HMGP, PDM and FMA grants awarded by EMD and FEMA since 2006, approximately 40 were for property buyouts, second only to mitigation planning grants.

Technical Assistance and Planning Guidance to Local Jurisdictions

The EMD Mitigation Program is committed to offering coordinated, consistent assistance and support to local jurisdictions through all stages of the mitigation planning and project implementation process. By coordinating planning and grant application assistance, the program ensures that local jurisdictions can submit grant applications, and ideally receive awards, before a plan expires. Furthermore, the coordination supports plans that are more likely to lead to projects that are supported by mitigation plans.

FIGURE 19: 5-YEAR MITIGATION PLAN MAINTENANCE PROCESS

Local and Tribal Mitigation Plan Funding, Review, and Approval Process

Once a grant has been awarded, the Washington State Mitigation Strategist becomes the primary point of contact for the jurisdiction for all planning activities, helping ensure that the mitigation plan is approved with minimal revisions required by FEMA. To facilitate this, the Mitigation Program kicks off each awarded grant with a full review of the jurisdiction's priorities, old plans (if requested) and FEMA mitigation planning elements and recommendations as well as state Mitigation Program expectations. Once planning begins, a full planning process typically takes a year, with up to six months required for FEMA approval and any revisions.

FIGURE 20: STATE AND FEMA REVIEW PROCESS

The goal of the Mitigation Section of EMD is to work with communities developing hazard mitigation plans throughout their planning effort so that their plans are as close as possible to pre-adoption approval once they are submitted to FEMA Region X. Mitigation Section staff endeavor to review a local plan within 30 days of its submission to the state. Note: This time frame is a goal that depends upon other urgent state emergency response or disaster recovery activities going on at the time of submission, or other urgent hazard mitigation programmatic issues.

- The plans are evaluated against the local plan review crosswalk; the crosswalk will be completed with comments and suggestions for improvement if any element of the plan is found to be not satisfactory or not in compliance with federal plan guidance. When the review is complete, a copy of the completed plan review crosswalk is returned to the community.

- If the Mitigation Section believes the local plan meets FEMA's planning requirements for pre-adoption approval, then the staff forwards to FEMA Region X's mitigation planning staff electronic copies of the local plan, the completed plan review crosswalk with local and state comments, and the state's recommendation for pre-adoption approval.

- If the Mitigation Section believes the local plan does not meet FEMA's planning requirements for pre-adoption approval, then a copy of the completed plan review crosswalk is returned to the community with the comments and suggestions required to make the plan compliant with federal plan guidance. As requested, Mitigation Section staff

will discuss and/or meet with community planners to give the findings of the review along with suggestions for necessary revisions. Mitigation Section staff will continue to review the plan and work with the community until the staff believes the local plan meets FEMA's planning requirements.

- If FEMA's review of the plan indicates any inadequacies in the submitted local plan, the EMD Mitigation Section staff will continue working and coordinating with the community until its plan receives pre-adoption approval from FEMA. Both the State and Region X provide recommendations and examples to assist the jurisdiction via conference call or webinar to meet the various planning requirements in which deficiencies are noted on the crosswalk. Rather than merely returning the crosswalk to the jurisdiction, this practice allows the jurisdiction to have a better understanding of what is needed and how they can meet the various requirements. This extra communication step has been effective in that most plans are able to gain successful FEMA pre-adoption approval during the second review process.

- Once plans receive FEMA's approval, the Mitigation Section staff forward approval letters to the community.

When requested, Mitigation Section folks undertake a works in progress review of a draft plan to ascertain whether the jurisdiction is on target, compliant with federal guidance and receiving public input before the plan is complete. The jurisdictions engaged in this informal, cursory review as a check in that they were on the right path of plan development.

The most important consideration a local jurisdiction should have when developing a plan is what they want to get out of the plan and planning process. EMD Mitigation staff are committed to helping jurisdictions realize this goal, whatever it is, in a way that will meet FEMA guidance.

How to Request Technical Assistance

The EMD Mitigation Program is available to support jurisdictions in developing planning and project grant applications as well as in developing plans and ensuring that your mitigation plan meets your needs and objectives. Please visit our webpage for contact information and grant information: https://mil.wa.gov/emergency-management-division/grants/hazard-mitigation-grants. Pre-applications are also available on this page and may be completed and submitted to EMD at any time. **For mitigation planning questions and technical assistance, please contact the Mitigation Strategist**. All other questions can be directed at the State Hazard Mitigation Officer. Requests for technical assistance or questions can also be emailed to the Hazard Mitigation Assistance inbox at HMA@mil.wa.gov.

The following map illustrates the status for city, county, and tribal mitigation plans as of August 2017.

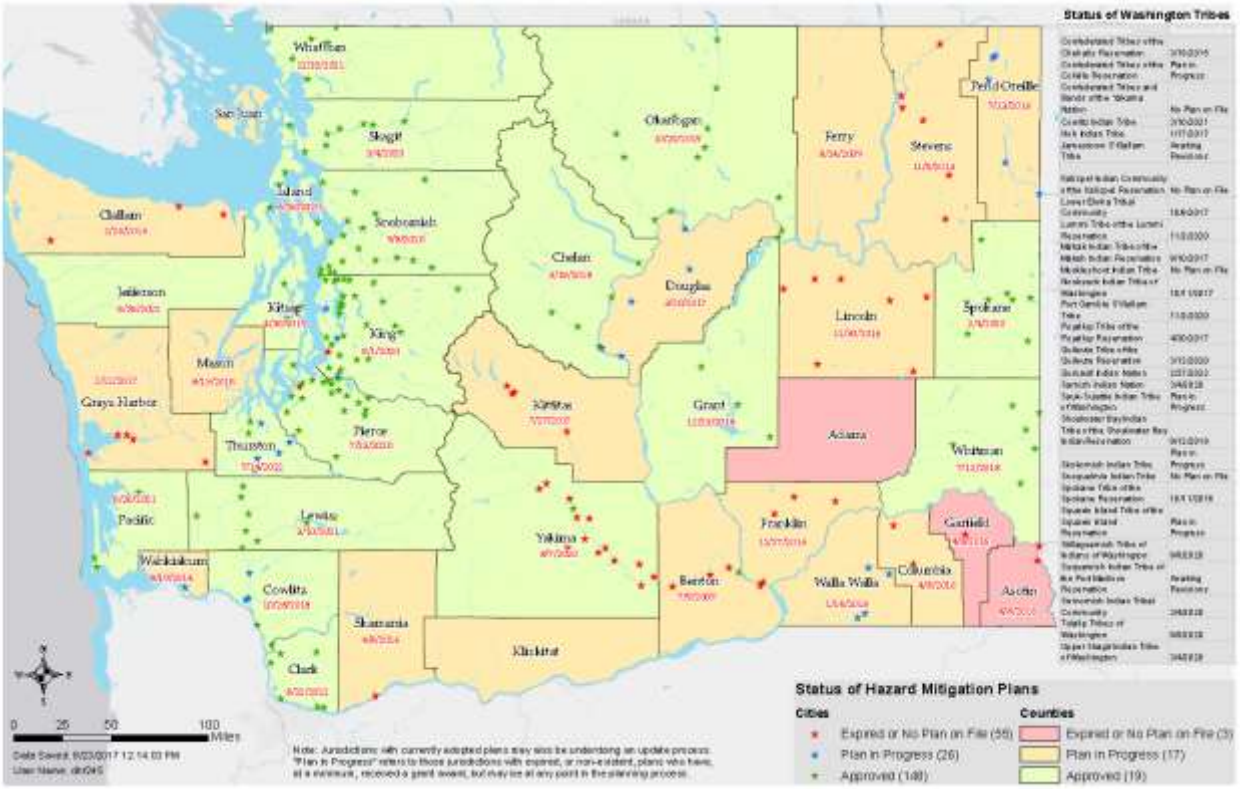


FIGURE 21: MITIGATION PLAN STATUS AS OF AUGUST 2017

Another source of valuable assistance is FEMA's G318 – local hazard mitigation planning. Courses are offered in Washington usually twice per year. All jurisdictions writing a mitigation plan are encouraged to attend. Attendance is an allowable cost to charge to a FEMA planning grant.

Evaluating the Effectiveness and Quality of Local Plans

The purpose of local mitigation plans is to provide a baseline understanding of local hazards and vulnerabilities and then mitigate those vulnerabilities through strategies. As part of our effort to maintain a mitigation planning program that leads to effective plans, a University of Washington graduate student, Daniel Feinberg, conducted an assessment of local plans using quality scores taken from Tang and Brody (2009).[7]

Plans were scored based on the quality of their vision, fact base and data quality, mitigation goals and objectives, interagency coordination and capabilities, specific mitigation actions, and quality of implementation plan. Each element is coded with a 0, 1 or 2 depending on the level of detail provided in the plan (respectively, not mentioned, no detailed coverage, detailed coverage of topic in the plan). The components include:

1. Vision Statement (problem description, vision) – **10 possible points**

[7] Tang, Z., Brody, S. D., 2009, Link Planning Theories with Factors Influencing Local Environmental Plan Quality, Environment and Planning B: Planning and Design 36: 522-537.

2. Fact Base (hazard identification, vulnerability assessment, emergency management data) – **16 possible points**
3. Planning Process (description, proposed techniques and actions) – **16 possible points**
4. Mitigation goals and objectives (economic impacts, physical and environmental impacts, public interest) – **22 possible points**
5. Inter-organization coordination and capabilities (cooperation/partnerships, information sharing, capacity development, conflict management strategy) – **38 possible points**
6. Specific mitigation policies (general policy, regulatory tools, incentive-based tools, structural tools, public education, public facilitation/infrastructure, recovery planning, preparedness, natural resource protection) – **126 possible points**
7. Implementation (implementation, evaluation/monitoring/updating) – **26 possible points**

The strength of the scoring method is that it counts not only plan quality from a completeness perspective, but also in terms of the comprehensiveness of mitigation activities and the inclusion of mitigation policies and projects that are best practices for certain kinds of mitigation. The scoring effectively weighs the quality of mitigation actions and the strength and breadth of partnerships most heavily by including more indicators under each of those components. The scoring method also gives extra points for the comprehensiveness of each plan element, including process, outreach, risk assessment and mitigation strategies.

A weakness of the scoring method is that it may not account for individual differences in plan methodology or regional differences that lead to plans with smaller scopes. For example, Snohomish County, one of the highest rated plans, received almost full points for several sections and did very well on Specific Mitigation Policies and Actions compared to the average. Pierce County, a similar county, has a very complete plan, but lost points for lack of description in Specific Mitigation Policies and Actions.

The summary scores are below. A comprehensive list of plans for all 39 counties is included in the appendix. Note: the review below is for plans developed or available online as of August 2017. Several of the counties (in red) are expired and are currently updating their plans.

County	Total score (out of 254)	Using Brody equations (out of 250)
Asotin/Columbia/Garfield	135	151.60
Benton	131	140.35
Chelan	131	145.54
Clallam	140	150.83
Clark	169	180.11
Cowlitz	149	159.96
Douglas	117	130.29
Franklin	125	142.06
Grant	144	159.44
Grays Harbor	131	147.88
Island	159	167.43

County	Total score (out of 254)	Using Brody equations (out of 250)
Jefferson	146	161.45
King	175	189.49
Kitsap	142	159.67
Kittitas	146	159.81
Lewis	125	138.72
Lincoln	106	123.75
Mason	144	153.82
Okanogan	117	132.54
Pacific	155	168.39
Pend Oreille	123	139.81
Pierce	121	133.27
San Juan	93	107.81
Skagit	165	174.11
Skamania	118	138.87
Snohomish	177	190.17
Spokane	146	160.86
Stevens	133	145.57
Thurston	149	160.60
Wahkiakum	122	139.76
Walla Walla	108	123.87
Whatcom	135	145.02
Whitman	141	155.32
Yakima	144	157.77

Plans generally score well in their inclusion of plan monitoring and update elements and in the comprehensiveness of their risk assessments. The biggest category where plans lose points is in the Specific Mitigation Policies and Actions section and the Inter-Organization Coordination and Capabilities section. While plans usually include structural mitigation strategies and often include outreach strategies, the regulatory elements are most often absent. This is consistent with the gap stated in the capabilities section, that there is a disconnect between the community planning and development departments and the emergency management departments and is reflected in both land use and emergency management planning.

Suggestions for a Successful Mitigation Planning Process

As the state reviewers of local mitigation plans, the Mitigation Program is a resource for jurisdictions engaged in the planning process. The following are some best practices to help facilitate an excellent process.

Project Design, Kickoff and Contractor Selection

1. Develop a project plan and use it to guide your planning grant application and the scope of work you provide your contractor, if hiring one. This step will help you meet your project milestones and ensure that you meet your grant obligations. Part of your project plan should include **public outreach and stakeholder outreach strategies**. Getting these processes right will help you avoid costly plan revisions and months of delay.

2. Your final product is a **FEMA Approved Hazard Mitigation Plan**. Require this explicitly from your contractor in your scope of work.

3. You do not have to "redo" your whole plan each update cycle. Many contractors will want to do a full rework of the risk assessment every plan update. This is not necessary. Focus on updating the plan elements that are your jurisdiction's highest priorities and greatest needs. Do not update what you do not have to and do not always reinvent the risk assessment.

4. Request a kickoff meeting with EMD Mitigation for your contractors. This will help EMD set expectations and support you throughout the plan development process.

Public Outreach and Stakeholder Engagement

1. Develop THEN implement your public outreach strategy. For multi-jurisdictional plans, make sure this will meet the engagement needs of each participating jurisdiction.

2. Build a planning team and stakeholder strategy that includes at a minimum those jurisdictions, departments and agencies that **are responsible for hazards, and/or own key vulnerabilities in your jurisdiction, and have mitigation measure implementation authority**. These organizations will have many of the best mitigation project ideas, will benefit the most of involvement in the discussion of risk, and have the most influence on the overall vulnerability trajectory of your organization. Some examples include public works, community development, flood control districts and community wildfire protection organizations.

3. Use existing bodies as planning teams, include Local Emergency Planning Committees (LEPCs), planning commissions and others. These are great ways to fulfill some of your public engagement requirements while also integrating other hazard-focused entities and minimizing the disruption caused by the planning process.

Effective Mitigation Strategies

1. Include timelines and checkpoints, even for strategies that are ongoing in nature.
2. Identify sources of funding, even a funding or implementation plan, for each strategy. Common sources of funding include specific grants, FEMA grants, state grants from DNR or ECY, money from local Conservation Districts, and local general or capital budgets.
3. Include at least one strategy per identified hazard. These strategies can be regulatory, physical and/or outreach-based. Some good examples include:

   a. Flood: elevations or buyouts of repetitive loss or severe repetitive loss properties.
   b. Wildfire: Defensible space measures and Firewise education programs.
   c. Landslide: Slope revegetation; designate steep slope or near-slope areas as critical areas and prevent development there.
   d. Earthquake: Structural retrofits, such as bridges or URM loan programs; non-structural retrofits, such as securing local library shelving.
   e. Severe Storm: Emergency generators for hospitals or responders; transmission line undergrounding.
4. Identify state and local partners for each strategy. Invite them to strategy-development sessions.
5. Focus on strategy quality instead of quantity. A well-thought-out strategy, with multiple action items, fund sources, and identified partners, is more likely to succeed and is easier to track.

Planning Tips

1. If your department does not have the capability to complete the mitigation plan, consider working with your public works, conservation or community development departments so they can take the lead. They can even apply for, and receive, the grants! Some counties have even used their floodplain managers and unified their Flood Hazard and All Hazard Mitigation plans.

2. Start applying for mitigation planning grants three years prior to your plan expiration. Expect 12 months for a grant award and 12 months to complete the plan. Additionally, many of the planning grants are disaster-dependent and so may require some flexibility.

3. Read the FEMA Local Mitigation Planning Guide, Local Mitigation Plan Review Guide, Mitigation Ideas Guide, and Integrating the Mitigation Plan into the Comprehensive Plan Guide at least once. They contain valuable information.

4. Plan to take the G318 course, Local Hazard Mitigation Planning. This is also an eligible pre-award cost that can be included with your grant application.

5. For multi-jurisdictional plans, the only entities that are required to have a mitigation plan in order to develop and apply for mitigation projects within their boundaries are incorporated towns/cities and counties. Special districts only need to have an adopted and approved mitigation plan if they wish to be their own applicant agent for a PDM, FMA or HMGP grant. As such, special districts only need to annex to a mitigation plan if:

   - They have the capability of managing mitigation grants and the interest in doing so.

   - The county/city in which the special district is located is unable or unwilling to serve as applicant agent on their behalf.

In any case, the special districts should be stakeholders to the mitigation plan; however, it is only necessary for them to annex officially to the plan if they plan to seek FEMA mitigation grants on their own behalf. As stated above, cities, towns and counties MUST have an adopted and current FEMA-approved mitigation plan to be eligible for FEMA-funded mitigation projects within their jurisdiction.

1. **Focus on mitigation strategies**. This is the purpose of the hazard mitigation plan and should be the primary output of the planning process. These strategies should include viable projects, partnerships and processes that will reduce risk in your jurisdiction. Having a project identified in a mitigation plan is an advantage if seeking a grant for that strategy.

2. Meet multiple planning requirements with your mitigation plan. Integrate the plan with other planning initiatives, including Comprehensive Planning and Critical Areas Ordinance development under the Growth Management Act and planning done for Community Wildfire Protection Plans, Community Rating System plans, capital improvement plans, and other sources of prioritization and authority. See the planning integration section below for information on how to maximize this process.

3. Meeting the minimum requirements of FEMA mitigation plans does not have to be difficult. Identify requirements you will meet and some you will exceed. In so doing, make sure your mitigation plan meets the needs and interests of your community.

4. Mitigation plans are one of the only plans a jurisdiction can receive a grant to write. Use them as a vehicle for your priorities. They can be your resilience plan as well as the vehicle to continue to update your wildfire protection, flood hazard mitigation and related plans.

5. The right people at the table during the planning process makes all the difference. For example, if the only outcome realized from a plan is that everyone agrees where unstable slopes are located, and that people should not build on or disturb them, then the plan will have paid for itself many times over.

Integrating Mitigation Planning with Other Statewide Initiatives

The hazard mitigation plan is a valuable tool to advance community priorities and even maintain and support other planning initiatives without dedicated fund sources and update requirements. Furthermore, many of these related planning processes occur in separate departments that can be valuable stakeholders. A plan that supports multiple initiatives is more likely to be maintained and utilized over time. The following are some of the best opportunities for local jurisdictions to integrate the hazard mitigation plan with other state or federally-mandated efforts. These are also areas where the state is working to improve interagency coordination.

Critical Infrastructure Dependency-Mapping

Critical infrastructure includes many locally-important sectors, including health care, housing, commercial, information technology and agriculture. It also identifies lifeline sectors, including water/wastewater, energy, transportation and communications, that are preconditions for the functioning of other critical infrastructure sectors and are highly interdependent.

The US Department of Homeland Security maintains a database of critical infrastructure collected through partnerships with local jurisdictions. They also can work with local jurisdictions seeking to better understand their risks, vulnerabilities, opportunities and interdependencies. A DHS Infrastructure Protection specialist can even meet with your team to help you identify critical infrastructure and map dependencies. To request support, contact the US Department of Homeland Security, National Protection and Programs Directorate, Office of Infrastructure Protection in Auburn, WA. The current representative supporting Washington is Jonathan Richeson, jonathnan.richeson@hq.dhs.gov, or the EMD Private Sector and Infrastructure Program Manager.

Meeting CRS Requirements Through the Hazard Mitigation Plan

The Community Rating System (CRS) is an optional program through the National Flood Insurance Program that provides a "grade" for completing tasks that reduce a jurisdiction's overall flood risk. The rating system runs from 1-10, with each improvement in score resulting in a 5 percent discount in flood insurance rates for residents of the jurisdiction. The lower the number grade (1-10), the more of a discount, up to a total of 50 percent for a level 1 rating. Washington is one of the highest-performing states in the program, with three counties with a level 2 rating, entitling their residents to discounts of 45 percent. There are only six level 1 jurisdictions in the entire United States.

A major source of points under the CRS is the flood hazard mitigation plan. Jurisdictions can earn up to 380 points toward qualifying for a CRS Rating improvement (500 points are required for a full CRS point – and its associated 5 percent flood insurance rate discount). The requirements of this plan

are identical to the Natural Hazard Mitigation Plan under 44 CFR 201, and the Natural Hazard Mitigation Plan can fulfill the CRS requirement. However, the interpretation of each of the requirements in the CFR differs considerably for the two programs, with the CRS being much more prescriptive. The following table is a crosswalk of the 10 CRS planning steps and the associated FEMA Mitigation Plan CFR sections.

Planning steps for mitigation and for the CRS.		
Multi-hazard Mitigation (44 *CFR* §201.6)	CRS Planning Regulations Planning Steps	Max Points
Phase I – Planning process *Organize Resources*		
§201.6(c)(1)	1. Organize	15
§201.6(b)(1)	2. Involve the public	120
§201.6(b)(2) & (3)	3. Coordinate	35
Phase II – Risk assessment *Assess Risks*		
§201.6(c)(2)(i)	4. Assess the hazard	35
§201.6(c)(2)(ii) & (iii)	5. Assess the problem	52
Phase III – Mitigation strategy *Develop a Mitigation Plan*		
§201.6(c)(3)(i)	6. Set goals	2
§201.6(c)(3)(ii)	7. Review possible activities	35
§201.6(c)(3)(iii)	8. Draft an action plan	60
Phase IV – Plan maintenance *Implement Plan and Monitor Progress*		
§201.6(c)(5)	9. Adopt the plan	2
§201.6(c)(4)	10. Implement, evaluate, revise	26
Total		382

Completing a joint Natural Hazards Mitigation Plan and CRS-qualified Flood Hazard Mitigation plan requires the intentional following of CRS requirements from the very start of the process. For a full description of those requirements, see Element 510 and Element 512 in the 2017 CRS

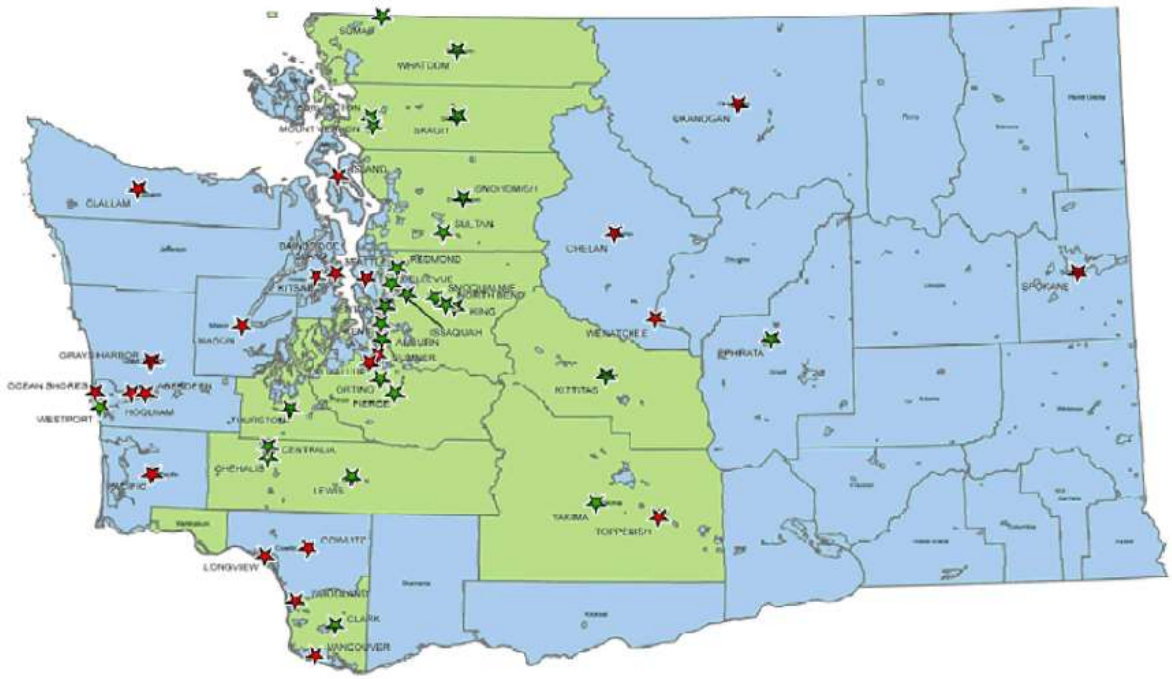


FIGURE 22: TOP 50 COMMUNITIES BY NFIP POLICY COUNT (GREEN STAR = CRS COMMUNITY)

Coordinators Manual, available from www.crsresources.org/manual. It is unlikely that you will receive full credit for a mitigation plan that does not intentionally follow the 10 planning steps laid out in CRS Planning Regulations. It is recommended that you contact the State Mitigation Strategist at EMD and State Floodplain Planner at ECY before kicking off this process and that, if using a contractor, you select one with experience doing joint plans.

Mitigation Planning and the Critical Areas Ordinance

The Washington State Growth Management Act (GMA) requires all counties and cities to adopt regulations to protect critical areas and to periodically review those regulations. All counties and cities in the state have adopted critical areas regulations and most have updated them at least once. The regulations must protect, among other things, Geologically Hazardous Areas and Frequently Flooded Areas. "Protection" in the context of critical areas under the GMA means preservation of the functions and values of the natural environment or to safeguard the public from hazards to health and safety with regard to Geologically Hazardous Areas and Frequently Flooded Areas.[8] The GMA also includes requirements for public engagement in the review and planning process. The following table details areas of potential overlap and opportunities to partner during the planning development and implementation processes.

Crosswalk of Critical Areas, GMA, and Hazard Mitigation Planning

FEMA Natural Hazard Mitigation Plan	Designate Critical Areas	Protect Critical Areas	Best Available Science	Periodic Update	Comprehensive Plan - Urban Growth Areas	Comprehensive Plan - Avoiding Conflicts	Comprehensive Plan - Land Use Element	Comprehensive Plans - Public Participation	WAC Implementation Plan
A1								■	
A2				■					
A3								■	
A4			■						
A5				■				■	
A6				■					
B1	■								
B2	■								
B3	■	■			■	■	■		
C1		■							
C2					■				
C3		■	■		■	■	■		
C4		■			■	■	■		■
C5									■
C6	■	■							■

[8] WAC 365-196-830(3)

The two plans are most closely related through the planning process, risk and vulnerability assessment, and strategy and plan implementation. The plans can be closely coordinated through:

- Coordinated development with intersecting processes to meet shared public and stakeholder engagement requirements.
- Risk identification elements and agreement on geologically hazardous and frequently flooded areas.
- The development and implementation of mitigation strategies, especially those pertaining to land use.
- HMGP grants can be used to support the joint updates of Critical Areas ordinances and Hazard Mitigation Plans.

For mitigation plans developed by emergency managers, the latter element, implementation, is especially promising because the planning regulations developed through the critical areas regulations are legally binding and can prevent development in hazardous areas. The critical areas regulations can also either benefit from, or be a source for, best available data on hazard inventories and vulnerabilities (Critical areas regulations are statutorily required to include best available science).

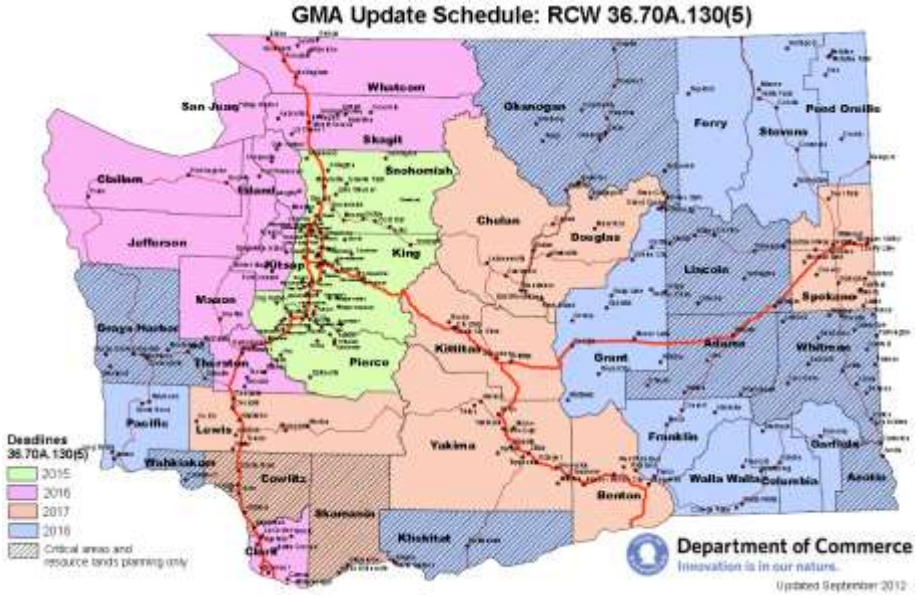


FIGURE 24: GMA UPDATE SCHEDULE FOR WASHINGTON COUNTIES (COMMERCE, 2017)

Improving coordination between these planning mechanisms is an important goal and mitigation strategy for this plan. For more details on coordination between critical areas and hazard mitigation planning, please contact the State Hazard Mitigation Strategist at Washington Emergency Management. For more general details on plan integration, please see FEMA's guide on Integrating Hazard Mitigation into the Comprehensive Plan.

Leveraging RiskMAP to write better plans

RiskMAP is a FEMA program that "delivers high quality data that increases public awareness and leads to action to reduce risk to life and property." RiskMAP in Washington State builds multi-hazard maps and analyses for jurisdictions prioritized by ECY, FEMA's state RiskMAP partner.

EMD, DNR, and ECY are Cooperative Technical Partners with FEMA to support RiskMAP outreach, resilience meetings and the integration of RiskMAP products into hazard mitigation plans and planning as well as the funding of projects identified through the RiskMAP process with HMGP, PDM and FMA grants.

Under the current Cooperative Technical Partners, Community Outreach and Mitigation Strategies Statement of Work agreement between EMD and FEMA, EMD Mitigation Program staff will support resilience meetings and other work in the following counties.

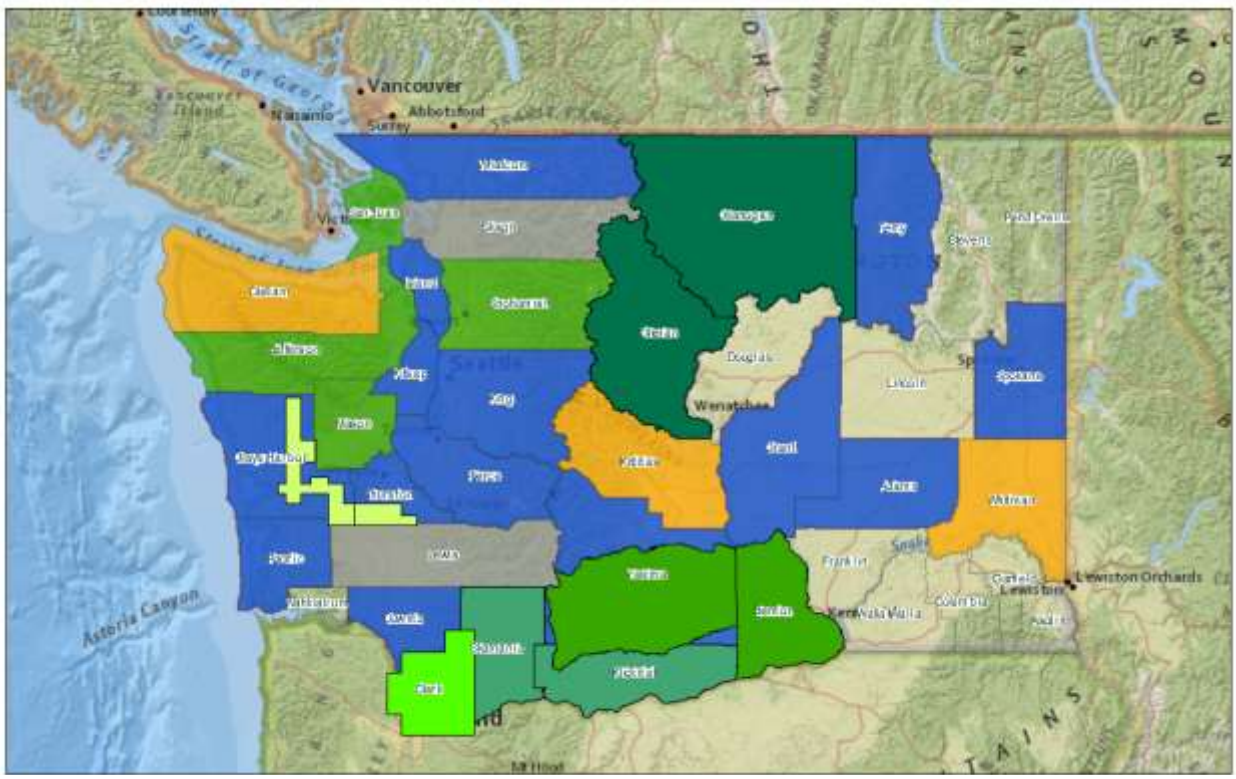


FIGURE 25: RISKMAP PROGRESS IN WASHINGTON COUNTIES

- Grays Harbor County
- Kitsap County
- Mason County
- Thurston County
- Snohomish County
- Whatcom County
- Clallam County
- Jefferson County
- Pierce County
- King County
- Skagit County
- Island County

- San Juan County
- Pacific County

For any county with new or recent RiskMAP data, it is expected that it will be included in the risk assessment and mitigation strategy sections of any hazard mitigation plan update.

Mitigation Planning and Community Wildfire Protection Planning

Through agreements between DNR and the US Forest Service (USFS), many Washington counties have developed Community Wildfire Protection Plans (CWPPs) as tools to reduce wildfire risk. This has become especially common following the 2014 and 2015 wildfires, for which the local mitigation plans were generally seen as having been ineffective at reducing risk and not properly prioritizing wildfire. CWPPs arose from the Health Forest Restoration Act of 2003 and have developed along with Hazard Mitigation Plans. In Washington, the requirements for CWPPs intentionally mirrors those established for HMPs.

There is tremendous advantage in integrating CWPPs and HMPs as both use similar processes but bring specific advantages. CWPPs, for example, focus uniquely well on fires and bring a high degree of involvement at the extremely local level. They have been successful in allowing communities to establish their own priorities and fully understand their vulnerability, with support and guidance from local fire chiefs and forest practices officials.[9] The flexibility of CWPPs, and their relevance given Washington's recent fire history, have led many communities to put significant effort into their development. While the plan's individual quality has often been high, however, there is no guarantee of sustained and regular funding, like there is with HMPs, and the hazard-specific nature of the plan results in limited stakeholder bases for the plans.

Currently, many counties are exploring options for developing CWPPs as part of HMPs, integrating existing CWPPs into HMPs, or running parallel processes so as to not duplicate the public outreach, stakeholder engagement and hazard analysis. The following table illustrates FEMA's recommendation for how to integrate CWPPs and HMPs. A full version of this table, produced by FEMA Region X, is available in the appendix.

[9] For more information, please see Jakes, Pamela, et al (2011). Community wildfire protection planning: is the Healthy Forests Restoration Act's vagueness genius? *International Journal of Wildland Fire*. 20. Pp. 350-363.

Planning Team /Stakeholder Involvement/ Public Outreach

Natural Hazards Mitigation Plan	Community Wildfire Protection Plan	Integration Opportunities
1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? 2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? 3. Does the Plan document how the public was involved in the planning process during the drafting stage?	1. Convene Decision Makers – Local Government, Local Fire Departments, State Forestry Agency, Indian Tribes, etc. 2. Involve Federal Agencies – U.S. Forest Service (USFS), Bureau of Land Management (BLM), Bureau of Indian Affairs, Department of Interior, etc. 3. Engage Interested Parties – Neighborhood Associations, Community Groups, others with interest in forest management.	• Involve natural resource managers, floodplain managers, seismologists, elected officials, community planning, public works, wildfire specialists on the planning team. • Involve stakeholders from Communities at Risk (CAR) in the NHMP planning process. • Involve USFS, BLM, BIA, state forestry agencies, local fire agencies, and other forestry stakeholders to Steering Committee. • Reach out to high-priority CAR's to educate them on their risk and mitigation opportunities.

FIGURE 26A: FEMA REGION X GUIDANCE ON INTEGRATING HMPS AND CWPPS

Risk Assessment

Natural Hazards Mitigation Plan	Community Wildfire Protection Plan	Integration Opportunities
1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? 2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? 3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction?	1. Establish a Community Base Map – Identify inhabited areas at risk, critical human infrastructure, designate wildland fire-urban interface, identify Communities at Risk. 2. Develop a Community Risk Assessment a) Evaluate Fuel Hazards b) Risk of Wildfire Occurrence c) Homes, Business, Essential Infrastructure at Risk d) Other Community Values at Risk e) Local Preparedness, Firefighting Capability	• Incorporate detailed wildfire risk assessments into NHMP. • Consider climate change impacts for all natural hazards using consistent sources. • Consider post-fire effects of flooding, debris flows, and mud flows. • Use State West Wide Regional Assessment Data output for inhabited areas, the WUI, and Communities at Risk (CAR). • Refine State Wildland Urban Interface (WUI) designation with local data/knowledge.

FIGURE 27B: FEMA REGION X GUIDANCE ON INTEGRATING HMPS AND CWPPS

Mitigation Strategy

Natural Hazards Mitigation Plan	Community Wildfire Protection Plan	Integration Opportunities
1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? 2. Does the Plan include goals to reduce/ avoid long-term vulnerabilities to the identified hazards? 3. 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? 4. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? 5. Does the plan describe how planning elements will be incorporated into local planning mechanisms?	1. Establish Fuels Reduction Priorities, Recommendations to Reduce Structural Ignitability, ID Local Response Capability Needs – Establish whether projects protect community/infrastructure or other community values. 2. Develop Action Plan and Assessment Strategy – Identify agencies responsible for implementation, timeline, funding.	• Include an action plan for each Community at Risk (CAR) to help create more Fire Adapted Communities. • Ensure specific fuels reduction projects are identified in the plan. • Wildfire strategies should address fuel treatments and education, but also policy recommendations and infrastructure retrofits. • Review overall community capabilities (policy, administrative, technical, financial) to implement projects. • Describe how wildfire and other hazards may be incorporated into comprehensive plans, transportation plans, capital improvement plans, codes and other regulations.

FIGURE 28C: FEMA REGION X GUIDANCE ON INTEGRATING HMPS AND CWPPS

Maintenance / Other

Natural Hazards Mitigation Plan	Community Wildfire Protection Plan	Integration Opportunities
1. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? 2. Was the plan revised to reflect changes in development? 3. Was the plan revised to reflect progress in local mitigation efforts? 4. Was the plan adopted by the elected officials for all participating jurisdictions?	1. Plan must be adopted by county commissioners and local . 2. No requirement to have an updated planning process and plan.	• Update the plan every 5 years. • Committee should meet at least annually to discuss. • Committee should meet after a significant natural hazard impacts the community. • Plan updates are used to reflect on changes in development and impact on wildfire vulnerability. • Plan updates are used to track progress in wildfire mitigation efforts.

FIGURE 29D: FEMA REGION X GUIDANCE ON INTEGRATING HMPS AND CWPPS

Mitigation Planning and Public Engagement

Public engagement in mitigation plans should be focused on developing a base of support for mitigation, identifying potential mitigation actions and hazards, and on encouraging personal/community risk reduction activities. The public process has *no mandated format*. Mitigation plans only must demonstrate that the public of the jurisdictions covered by the plan can participate. Options to do this include large-format public meetings (generally ineffective, but fulfill the requirement), online social media engagements, surveys, stakeholder workshops and presentations at existing public events, among other things.

FIGURE 30: EVERETT SAFE AND SOUND SUMMIT

A good example of public engagement is the World Café strategy used in the City of Everett's 2011 Hazard Mitigation Plan update. This format focuses on small group, iterative conversations seeking answers to specific questions. A data-gathering and survey effort supported a day-long workshop for local residents that worked through the facilitated mini-discussions to produce mitigation ideas for the final plan. These contributions were reviewed at a later walkthrough-style event with posters.

HMA Management and Priorities

Management of State Mitigation Programs

EMD's Mitigation staff is responsible for administering FEMA's Hazard Mitigation Assistance (HMA) grant programs for the state. This includes management and oversight of the two non-disaster grant programs, Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA), as well as the Hazard Mitigation Grant Program (HMGP), which is available with a Presidential disaster declaration.

EMD's Mitigation staff currently consists of the following full-time positions:

- State Hazard Mitigation Officer
- Hazard Mitigation Program Manager
- Hazard Mitigation Strategist
- Hazard Mitigation Program Coordinators (4)
- Mitigation Program assistants (2)

This staff works closely with federal, state and local stakeholders to conduct a broad array of HMA-related technical assistance and outreach efforts for entities throughout the state. They provide direct, comprehensive programmatic support and oversight to subrecipients beginning at the grant application phase and continuing through the implementation and grant closeout phases. Currently, EMD is running 21 ongoing HMGP rounds containing 110 individual grants (either pending or active), and another nine ongoing PDM and FMA rounds.

EMD's Mitigation staff also conducts non-HMA related work, supporting a variety of inter-agency mitigation efforts such as Resilient Washington, but the bulk of its current workload involves running HMA grant programs: conducting the grant application rounds, monitoring and assisting sub-grantees as they implement grant-funded work, closing out completed sub-grants, and doing outreach throughout the state.

Looking ahead, EMD has two basic objectives for its HMA programs. The first is to increase the overall quality of HMA proposals it receives from local entities and submits to FEMA. To do this, the Mitigation staff has focused on improving its internal application review and RFI processes and providing additional technical assistance to applicants during the initial stages of an application round. The second objective is to expand HMA participation among currently under-represented communities. This involves conducting specific outreach to targeted communities well in advance of an HMA funding announcement. Together, these two objectives will help EMD make the most of its HMA programs and ensure that all eligible entities have reasonable access to the mitigation funds they provide.

Hazard Mitigation Assistance Grants

Prioritizing Local Assistance and Mitigation Actions

WA EMD's Mitigation Section solicits, evaluates and selects mitigation projects for funding consideration under FEMA's three Hazard Mitigation Assistance grant programs—HMGP, PDM and FMA. While there are many factors used to determine which projects are ultimately prioritized, EMD's general approach to the process is straightforward: it supports the development and funding of feasible, cost-effective mitigation actions identified in FEMA-approved Hazard Mitigation Plans.

EMD's evaluation and ranking process is inherently competitive. There are never enough grant dollars available to fund all the submissions that meet its general criterion, so specific priorities are established and announced for each funding round to shape the competitive process and guide EMD's project solicitation efforts. For competitive HMGP rounds, EMD's priorities typically reflect geographic preferences as well as preferred project types. For PDM and FMA rounds, the priorities reflect those established by FEMA's Notice of Funding Opportunity.

Following a Presidentially declared disaster, FEMA makes HMGP funds available to all eligible agencies and organizations statewide for projects that reduce the risk of future damage, regardless of the hazard being addressed. But oftentimes, and especially when funding is limited, EMD will prioritize grant proposals submitted from eligible entities located within the declared counties over those from unaffected counties. This helps EMD support 404/406 coordination opportunities and allows EMD to make use of Joint Field Office mitigation staff for expedited application reviews. These "Tier 1" applications are considered first for funding. EMD still accepts and evaluates "Tier 2" applications (those from entities in non-Declared counties), but they are only considered for award if funds remain after Tier 1 projects are selected.

Within both Tiers, EMD may apply further priorities to reflect mitigation goals and objectives. For example, a 2017 HMGP round applied the following ranked prioritization for eligible proposals:

Tier 1: Declared Counties (Top Priority)

1. Previously submitted (but unfunded) HMGP applications
2. Newly submitted HMGP applications that address…
    - PA/HMGP Coordination (404/406 projects)
    - Hazard Mitigation Plans and Updates
    - Mitigating imminently threatened properties
    - Retrofitting critical infrastructure

Tier 2: Non-Declared Counties

1. Previously submitted (but unfunded) HMGP applications
2. Newly developed HMGP applications that address…
    - Hazard Mitigation Plans and Updates
    - Mitigating imminently threatened properties
    - Retrofitting critical infrastructure

Mitigation of SRL/RL properties is a perennial priority of every HMGP funding round.

In this example, all eligible, cost-effective HMGP submissions were still accepted and reviewed, but the above-listed established priorities helped EMD accomplish some important programmatic goals: to support and expedite 404/406 coordination opportunities, to leverage JFO staff for application reviews, and to establish clear criteria to guide its internal ranking and funding consideration process. Priorities can change from disaster to disaster depending on identified needs.

Proposals to create or update FEMA-approved Hazard Mitigation Plans are always given high priority and, as the above example shows, may be ranked above mitigation projects or actions. That's because up-to-date plans provide the basis of eligibility for all HMA grant programs, and they're EMD's preferred source of good mitigation proposals.

For annual PDM and FMA funding rounds, EMD bases its evaluation and ranking criteria on the prioritizations described in FEMA's Notice of Funding Opportunity. It then determines which of the proposals meeting that criteria best meet the goals and objectives identified in associated Hazard Mitigation Plans. Prioritized FMA proposals tend to be those that mitigate Repetitive Loss and/or Severe Repetitive Loss properties, while prioritized PDM project proposals typically involve seismically retrofitting critical infrastructure. More recently for PDM rounds, EMD has tended to prioritize Hazard Mitigation Planning grants for PDM over projects like seismic retrofitting. This approach is primarily due to FEMA's stated priorities for PDM, but it's also reflective of the 7 percent funding limitation on planning grants under HMGP rounds (no such limitation exists for PDM).

Technical Assistance

EMD's Mitigation staff provide the state's HMA program participants comprehensive technical assistance throughout the grant life cycle. Program Coordinators are assigned specific subawards to monitor and support, and act as primary points of contact for subrecipients on all technical assistance matters. These assignments are made when EMD receives a sub-application and remain in effect (barring staff turnover) through the subaward award, implementation and closeout phases. The intention of this approach is to provide continuity of service and build strong working relationships with EMD's local mitigation partners.

HMA related technical assistance takes many forms: conducting site visits and pre-application consultations, webinars and trainings, processing grant reimbursements, interpreting federal regulations and programmatic guidance, facilitating meetings and calls, etc. EMD's Mitigation staff, particularly its Program Coordinators, are trained to provide these services for subrecipients—and doing so comprises the bulk of their daily workload. With multiple, overlapping HMA grant cycles all running simultaneously, the Mitigation staff is typically assisting various external partners with all three phases of a grant's life cycle at the same time.

During the HMA application phase, the level of technical assistance is significant. EMD's Mitigation staff distributes the grant round's specific guidelines, priorities, timelines and submission criteria in multiple forms—webinars, in-person presentations, emails, phone calls, etc. The initial focus during this phase is on eligibility and competitiveness. EMD is busy determining if a given mitigation proposal is eligible and, if so, if it would be competitive for the given funding opportunity. Pre-

Application forms are distributed, collected, evaluated and—if approved—invited to complete full grant applications. Once grant applications are submitted, EMD works closely with sub-applicants to ensure the submission is complete and ready for an internal evaluation and ranking process. They conduct a Request for Information (RFI) process and assist the sub-applicants in presenting the strongest possible mitigation proposal. This typically includes working with sub-applicants on cost estimates, scopes of work clarification and Benefit-Cost Analysis.

During the HMA grant implementation phase, EMD's technical assistance shifts to ensuring sub-grantees have the resources and information needed to successfully complete their grant-funded action. Mitigation staff helps develop complete requests for reimbursements and quarterly reports, identifies scope of work challenges and solutions, attends onsite meetings and site visits, and secures any needed time extensions or other amendments to the grant contract. This phase typically lasts for years and, depending on the complexity of the project and the capacity of the subrecipient, comprises a large portion of workload for the Program Coordinators.

During the grant closeout phase, EMD guides subrecipients through the formal process of completing a federal grant cycle. This typically involves conducting onsite meetings to review the contractual obligations and ensure they've been met, gathering and completing the needed documents, issuing a final reimbursement, and compiling the closeout package for submission to FEMA.

Project Review Procedures

Before grant applications are ready to compete for funding, they must first meet established eligibility and completeness criteria. EMD now uses FEMA's Application Review Tool to guide this process. To help entities meet this criterion, EMD's Mitigation staff clearly communicates the programmatic requirements and grant-specific priorities to potential grant applicants throughout the application process. Well-informed and supported applicants tend to submit better, more complete applications, which in turn reduces the time and effort EMD spends on its review process. EMD also encourages applicants to request preliminary reviews and submit their application packages as early as possible.

There are three main steps to EMD's project review process: an initial completeness and eligibility review, followed by a Request for Information period, followed by evaluation and ranking. Submitted applications advance from one step to the next, so that only thoroughly vetted applications are ranked and considered for grant funding.

The initial eligibility and completeness review assesses how well each submission satisfies the required application elements and criteria. This review is intended to place all submissions, both Prioritized and non-Prioritized, into one of four completeness categories:

1 - Substantially Complete: Missing no required elements, needs little/no revisions.
2 - Mostly Complete: Missing few required elements, needs some revisions.
3 - Mostly Incomplete: Missing several required elements, needs several revisions.
4 - Substantially Incomplete: Missing most required elements, needs major revisions.

All these completeness categories are based upon submission of required elements (or lack thereof), which are based upon programmatic requirements (as described in HMA Guidance and FEMA's Application Review Tool) and are communicated to applicants throughout the application process.

The results of this review help inform the next step, Request for Information. Depending on whether a submission is prioritized or non-prioritized, and depending on the submission's completeness, EMD's Mitigation staff will ask for additional information and materials to further complete the application and prepare it for evaluation/ranking. Typically, an applicant is given at least two weeks to provide the requested information. Once completed, a second eligibility and completeness review will occur.

Once a submission is deemed eligible and sufficiently complete, then it will advance to the third and final review step, evaluation and ranking for funding consideration. Depending on the HMA program and availability of funds, this final step may involve a review committee to help apply grant-specific priorities and make funding recommendations. The State Administrative Plan in effect for a given grant round describes how and when such a committee will be used, but the basic methodology will always emphasize long-term protection of life and property, reduction of risk and overall feasibility.

All applicants are notified of the results of this review and ranking process when it's completed. EMD's Mitigation staff distributes notifications indicating either prioritized selection, alternate selection or non-selection. The non-selected applicants are given feedback and recommendations for improving future submissions, while the selected applicants are given information on next steps (timelines, FEMA review process, etc.).

Local Project Monitoring

All grant-funded mitigation projects are monitored throughout the award and implementation phases in accordance with state and federal guidelines. EMD's Mitigation staff conducts two basic types of local project monitoring: desktop monitoring and onsite monitoring.

Desktop monitoring involves a variety of routine, day-to-day interactions between subgrantees and EMD's Mitigation staff—typically the Program Coordinators (but not exclusively). When Coordinators review, validate and process reimbursement request packages from subgrantees, they ensure that grant-funded expenses are all eligible. They monitor compliance with scope of work requirements by reviewing quarterly reports, discussing implementation issues via phone calls and emails. These monitoring activities are all documented and kept in a designated project folder (electronically and/or physically).

Onsite monitoring involves EMD's Mitigation staff traveling to the physical location of grant-funded work to meet with the subrecipient. EMD requires Program Coordinators to perform at least 4 such visits during the life of a grant-funded mitigation project:

1. Initial Kickoff Visit/Meeting: conducted soon after the grant contract is finalized and involves meeting with local staff to review grant expectations and requirements, and visiting the worksite to ensure no work was conducted/completed prior to grant award (a violation of HMA requirements).

2. Onsite Progress Visit: conducted about midway through the Period of Performance and involves a worksite visit to verify progress and ensure that what's being done complies with the approved Scope of Work.
3. Formal Sub-Recipient Monitoring (SRM) Visit: Conducted midway through the Period of Performance and involves an in-person meeting with local staff to complete the formal SRM process, which is guided by EMDs SRM Policy and associated worksheet. It is intended to verify a subgrantees' compliance with state and federal accounting/programmatic standards (this can be conducted in coordination with the Onsite Progress Visit).
4. Final Inspection and Closeout Visit: Conducted once the grant-funded work is completed. EMD staff visit the work site to ensure the scope of work is complete and in compliance with the approved grant award conditions. An in-person meeting is also held with local staff to review closeout requirements and discuss next steps.

EMD's Mitigation staff successfully use both desktop and onsite monitoring activities for every grant-funded mitigation project it manages. The effectiveness of these methods ultimately relies on strong working relationships between EMD staff and the local entities doing the actual mitigation work. Program Coordinators and other Mitigation staff ensure their assigned subrecipients are fully aware of all grant-related responsibilities and expectations, and they're encouraged to help address challenges and concerns in a respectful and transparent manner—and it's proven effective. EMD has an excellent monitoring and compliance history for its HMA programs, and it has processes in place to ensure continued success in this area.

Evaluating Past and Future Hazard Mitigation Projects

To measure the effectiveness of hazard mitigation investments of federal and state funds, Washington reviews mitigation projects that have been tested by a hazard event, when possible, or performs theorized loss avoidance by comparing the pre-and-post mitigation losses from a modeled incident or hazard of record. In 2013, Atkins was contracted to perform loss avoidance studies for flood and earthquake hazards. Since the 2013 hazard mitigation plan was written, Washington has not completed any additional loss avoidance studies and continues to leverage the findings from the 2013 loss avoidance studies to estimate the effectiveness of investments in hazard mitigation for earthquake and flood events. In addition to the earthquake and flood mitigation, however, Washington has invested heavily in mitigation planning and wildfire mitigation projects. For wildfire, Washington has assessed the effectiveness of mitigation using the losses avoided from the 2015 Blue Creek Fire thanks to the Walla Walla defensible space project. The effectiveness of this project has led the state to increase investments in defensible space using both FEMA HMA and state funds.

Evaluating the Effectiveness of Flood Mitigation Projects

Since 2006, Washington has invested more than $62 million in flood hazard mitigation, the number one investment priority for Washington, clearly demonstrated in the commitment of these HMA funds to the flood hazard. Loss avoidance studies conducted in 2013, by Atkins on behalf of the Washington Military Department (which follows up on a study in 2008 undertaken by FEMA) indicated that mitigation performed in Lewis County would reduce damages by 70 percent over those sustained during a flood-of-record event without mitigation. The flood of record for both studies is the 2007 Chehalis floods. This study clearly indicates a large return on investment from the elevations performed in Lewis County, demonstrating the effective use of mitigation funds. The full loss avoidance study is presented in the appendix.

Flood of Record (December 2007) Total Damages and Losses	
Before Elevation	$5,778,091
After Elevation	$1,745,273
Avoided	$4,032,818
Percent Reduction	70%

Evaluating the Effectiveness of Earthquake Mitigation Projects

Since 2006, Washington has invested more than $35 million in earthquake risk reduction. Atkins was further commissioned by the Military Department to conduct a modeled loss-avoidance study for the earthquake hazard, using a series of scenarios and probabilistic models. To measure the effectiveness of investments in structural and non-structural earthquake retrofits, losses for eight retrofitted facilities were modeled in HAZUS-MH using Seattle Fault and Cascadia Subduction Zone scenarios. The average annualized losses were then compared to the original project cost, with and without casualties avoided. The full loss avoidance study is presented in the appendix.

Evaluating the Effectiveness of Wildfire Mitigation Projects

In 2012, using a $100,000 grant from FEMA and EMD, Walla Walla County Emergency Management and Fire District 4 completed a wildfire risk assessment which identified 79 primary residences at extreme risk to wildfire, including 40 in the community of Kooskooskie alone (Diane Reed, Walla Walla Union-Bulleting, March 29, 2016).[10] The Kooskooskie community was of special interest to the Chief of Fire District 4 since it was at an extremely high risk of fire prior to the mitigation effort. These property owners were offered contracted help to develop defensible 30-50-foot space perimeters around at-risk properties in addition to a 50-75-foot around the Kooskooskie community. The County and District was able to remediate 25 properties, including Kooskooskie, representing an estimated 65 high-risk dwellings.

FIGURE 31: VALUE OF DEFENSIBLE SPACE IN WALLA WALLA (PHOTO CREDIT: GREG LEHMAN, WALLA WALLA UNION-BULLETIN

In 2015, a fire burned almost the exact same area as that which had been mitigated through the defensible space project. Losses, however, were minimal, consisting of one home and six outbuildings, and four to five homes mitigated through the grant were positively impacted –a small wind shift would have put them directly in the fire's path. Unfortunately, the home that was lost had been contacted by the Fire District and offered defensible space protections, but had not contacted the district to schedule the work. Knowing that those homes were protected, the fire district was able to concentrate efforts on other fronts. The value of these properties is approximately $1 million.

The photo above is of a property mitigated not directly through work provided by the grant, but by a homeowner who attended Firewise workshops funded by the grant and who took it upon himself to develop defensible space. He was one of a number of residents who attended workshops and implemented mitigation actions on their own.

As of 2018, the county and fire district continue to hold annual Firewise workshops. Additionally, homeowners, especially in the community of Kooskooskie, are maintaining the defensible space both on their own and through contracts with the Department of Corrections. Current demand for this work, even at $225 a day for a DOC crew at owner's expense, remains high. The work and continued maintenance has resulted in positive pressure on other property owners, resulting in additional mitigation for a number of other properties.

[10] Reed, Diane; Walla Walla Union Bulletin, 2015: "Creating defensible space around properties keeps wildfire at bay," http://www.union-bulletin.com/lifestyles/places/creating-defensible-space-around-property-keeps-wildfires-at-bay/article_bcdd8632-f5d4-11e5-acb1-dbc005ce79c1.html. Accessed on 4/1/18.

Losses avoided in this project include homes saved due to the efforts of individual homeowners who were informed through grant-funded workshops as well as homes that may well have been lost had the wind patterns been slightly different. Furthermore, the project is deemed effective since it provided not only immediate fire protection through the defensible space, but is leading to long-term changes in behavior as residents maintain the defensible space and as the county and fire district continue to host Firewise workshops. Looking only at the value of properties protected by the 2015 fire, the return on investment (losses avoided vs. cost of grant) is at least 10:1.

Evaluating the Effectiveness of Hazard Mitigation Plans

Washington evaluates the effectiveness of hazard mitigation plans through how well the plans convert into mitigation projects. One measure for this is the ratio of mitigation projects funded by HMA to the mitigation plans funded in that jurisdiction through HMA, or return on spending for mitigation planning. We recognize that this is a very conservative estimate that does not account for the value to the community of planning or funds expended outside of HMA. Furthermore, the cycles of project awards and mitigation plans often do not align, although for a project to be awarded, except in rare cases, a plan must be in effect.

The following table shows all mitigation plan awards through HMA along with projects awarded through HMA for the period of 2006-2015. The data is incomplete in some areas, in that it does not capture planning grants awarded before 2006, plan or project awards from disasters after 2016, or plans self-funded by the jurisdiction. Also, some jurisdictions have never received planning grants since 2006, and yet have received project grants – (four counties in our sample, Whatcom, Lewis, Okanogan and Ferry meet this criteria). These are excluded from the analysis since these awards were either tied to extraordinary circumstances designations or to plans funded by the jurisdiction, for which data on funding is unavailable. Additionally, Tribes are excluded from the table below since this data only includes state HMA and not awards direct from FEMA. Finally, all grants are aggregated by county such that individual cities or special districts are not individually called out, except in the case of the city of Everett, for which long-term data is available. The remaining counties unaccounted for are Kitsap (funded own plan, no project awards), and Klickitat and Adams (no plans or projects).

The analysis shows that HMA funds dedicated to mitigation planning lead to large planning to project ratios – when jurisdictions do any projects at all. While completing the mitigation plan itself is a hurdle, a much larger hurdle is obtaining HMA funding for projects. Once a jurisdiction begins to apply for mitigation project grants, they often continue to do so. This indicates that mitigation planning is an effective and necessary condition of project investment, but only if the jurisdiction has the capability to develop project applications. Plans themselves do not necessarily lead to projects and are therefore only effective in either capable jurisdictions or when advanced grant technical assistance is provided. **Nevertheless, statewide, the ratio of planning grants to project grants is just over $16 in projects for every $1 in planning, indicating that mitigation planning is effective based on Washington's criteria: planning that supports the funding of projects. The**

average ratio of project spending for each dollar spent on mitigation planning is more than 21:1 for counties in which at least one mitigation project was funded.

HMA Awards County	Award Type Plan	Project	Plan Cost/Project Award Ratio
Benton	$70,000.00	$2,657,735.00	3796.76%
Chelan	$60,000.00	$1,608,529.00	2680.88%
Clallam	$81,160.00	$1,262,870.00	1556.03%
Clark	$128,760.00		0.00%
Columbia/Asotin/Garfield	$112,000.00		0.00%
Cowlitz	$115,000.00		0.00%
Douglas	$40,000.00	$499,112.00	1247.78%
Everett	$194,476.00	$3,531,191.00	1815.75%
Franklin	$29,093.00		0.00%
Grant	$50,000.00		0.00%
Grays Harbor	$175,000.00	$82,500.00	47.14%
Island	$149,965.00	$449,069.00	299.45%
Jefferson	$116,778.64	$5,286,507.40	4526.95%
King	$771,989.80	$25,118,871.71	3253.78%
Kittitas	$271,500.00	$884,632.56	325.83%
Lincoln	$85,000.00		0.00%
Mason	$134,500.00		0.00%
Pacific	$60,000.00	$549,500.00	915.83%
Pend Oreille	$73,300.00		0.00%
Pierce	$515,444.00	$21,683,230.27	4206.71%
San Juan	$50,974.00		0.00%
Skagit	$112,800.00	$3,295,844.14	2921.85%
Skamania	$54,000.00		0.00%
Snohomish	$450,000.00	$15,975,557.00	3550.12%
Spokane	$550,000.00	$67,500.00	12.27%
Stevens	$82,423.00		0.00%
Thurston	$535,000.00		0.00%
Wahkiakum	$30,000.00		0.00%
Walla Walla	$50,000.00	$168,355.00	336.71%
Whitman	$134,890.00		0.00%
Yakima	$66,699.46	$3,446,290.00	5166.89%
Statewide Total	$5,350,752.90	$86,567,294.08	1617.85%

Evaluating Mitigation Effectiveness Beyond 2018

To measure the effectiveness of mitigation investments for the period following the adoption of the 2018-2023 SEHMP, Washington will use the following methods.

1. Washington will request a loss avoidance study following any major disaster declaration for the four priority hazards (Flood, Earthquake, Wildfire, Severe Storm). This study would guide future investments in hazard mitigation.
2. Washington recognizes that effectiveness is not always quantitative and will leverage individual success stories from local jurisdictions that show, qualitatively, the benefits of hazard mitigation. These success stories will be shared with state and local partners as potential best practices.
3. Washington will leverage the findings of the *Mitigation Saves* report being developed by FEMA to assess the value mitigation investments made with expected dollar value benefits. This analysis will be completed at the county level for each major hazard area (flood, earthquake, fire, wind).

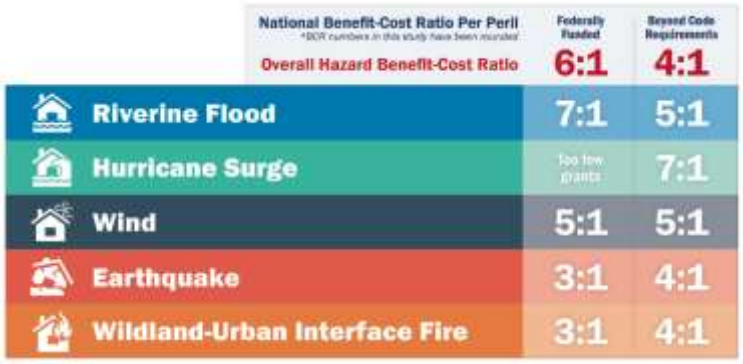


FIGURE 32: COST BENEFIT RATIO OF MITIGATION MEASURES FROM 2017 MITIGATION SAVES REPORT.

Using these methods to assess the effectiveness of mitigation will provide Washington a regular means to assess investment returns in hazard mitigation since using the updated *Mitigation Saves* report will allow an estimate of effectiveness without a major event occurring. This is especially important for hazards with a long recurrence interval, like earthquakes.

If the opportunity arises to conduct a loss avoidance study, EMD will have the means to compare expected returns with actual returns and will report those numbers as well.

Mitigation Strategy

Since the passage of the Disaster Mitigation Act of 2000, states, cities, counties and tribes have written mitigation plans that primarily focus on the risk assessment element. After 17 years, the planning team decided to emphasize mitigation strategies as the primary element in this plan update. The mitigation strategy development process occupied the majority of time spent updating this plan. The mitigation strategy development process included the following steps:

1. Reprioritize mitigation actions from the 2013 plan, removing those that are completed or preparedness-focused, and incorporate the continuing action items into more comprehensive, and complete, strategies.
2. Develop a comprehensive list of mitigation strategies covering profiled hazards. These strategies are state-focused and designed to represent Washington's financial and programmatic commitment to hazard mitigation. The strategies include those developed through the Resilient Washington process, distilled from existing mitigation programs, and those developed to fill gaps in partnerships or programs and address specific vulnerabilities.
3. Mitigation strategies consist of objectives and action items designed to reach them.
4. Develop policy-oriented goals that reflect investments and priorities identified by agency partners and elected officials.
5. Establish a process for the regular review and update of mitigation items such that there also would be more cross-program and inter-agency coordination to support local jurisdiction mitigation initiatives.

As noted above, mitigation actions were reprioritized and rewritten to better reflect Washington's risks (especially seismic hazard risks), need for focus on mitigation issues instead of preparedness, a difficulty tracking and implementing facility-specific tasks over which none of the program managers have any influence, a lack of impact of facility-specific tasks, a recognition that most mitigation in Washington is done at the local level, and an understanding that one of the biggest, and most easily addressed gaps in state mitigation is a lack of inter-program coordination.

Prioritizing Mitigation Actions and Strategies

The philosophy of the State Hazard Mitigation Program is to leverage state resources to support local risk-reduction efforts. Consequently, the mitigation strategies are not prioritized since they consist of individual agency-led mitigation programs and strategies, usually directed at supporting locally-led efforts. The strategies that support mitigation at the state level are usually regulatory or programmatic in nature and focus on better interagency coordination and more consistent use of accurate data and information. The goal is to leverage the comprehensive list of state mitigation capabilities to support broad-based risk reduction throughout the state. This accounts for the reality that most risk-reduction is locally led and that the state's primary role is that of a regulator

and funder. In terms of the notable exceptions, for example with WSDOT transportation strategies, these are long-term commitments captured in, but rarely influenced by, the state mitigation plan.

Additionally, the State Hazard Mitigation Program does not target available resources to a handful of local jurisdictions or to just a few hazards. Since Washington has a home-rule style of governance, local governments are responsible for maintaining control of government services and actions at the lowest possible level, rather than the state providing top-down direction to control decisions that affect local citizens. All disasters start and end locally. Local governments know their contingencies best and can facilitate a better community dialogue about disaster mitigation or recovery than the state can. Thus, sharing grant funds widely keeps more jurisdictions developing and maintaining hazard mitigation programs, plans and projects then if all available resources went to a targeted hazard area or a handful of local jurisdictions.

Cost-Effectiveness, Environmental Soundness, Technical Feasibility

Any state government construction project – regardless of potential funding source – must be cost-effective, technically feasible and meet all appropriate federal, state, and local environmental laws and regulations before it is started.

State government projects funded by federal hazard mitigation grant programs administered by the State EMD must meet specific criteria related to cost-effectiveness, environmental soundness, and technical feasibility.

So, rather than establish priorities for programs and strategies led at the agency level, the State Hazard Mitigation Program requires any mitigation project proposed for funding through the federal hazard mitigation grant programs administered by the State EMD (including state agency projects) to:

1. Support the goals and objectives of the State Hazard Mitigation Plan.
2. Reduce identified hazard risk.
3. Reduce repetitive and severe repetitive losses, without regard to hazard.
4. Protect critical areas, particularly frequently flooded areas and geologically hazardous areas.

Proposed state projects must compete with projects proposed by eligible local governments to ensure that federal grant-funded state and local projects address state hazard mitigation priorities with the highest benefit cost analysis. Through the Mitigation Workgroup, EMD also will encourage other state agency mitigation programs to support the above criteria as well.

Mitigation Strategy for Repetitive and Severe Repetitive Loss Properties

In accordance with the processes laid out in the 2013 SEHMP, the state has taken – and will continue to take – action to increase the number of project applications for the mitigation of Repetitive Flood Claims (RFC) for Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties. In notices of funding opportunities for Pre-Disaster Mitigation and the flood-mitigation programs, the

state has encouraged communities to consider applying for funds for projects to mitigate RL and SRL properties, noting that funding for SRL properties could be up to 90 percent federal funds thanks to the repetitive loss reduction strategy in the State Enhanced Hazard Mitigation Plan. Besides changing the scoring criteria and providing technical assistance and outreach to local jurisdictions, the state is working on Increased Cost of Compliance (ICC) issues within funded projects to maximize the return on investment. The state is encouraging jurisdictions to apply for the annual Hazard Mitigation Assistance funds through the Repetitive Flood Claims (RFC) and SRL program using Increased Cost of Compliance funding as match for the SRL grant program in another attempt to encourage projects to mitigate SRL properties.

Washington's commitment to SRL and RL property mitigation is evident in the prioritization of state funds for elevations and buyouts of these homes. Of the projects implemented since 2006 through all annual and disaster mitigation grants administered by EMD, 40 have been for flood risk reduction, especially to SRL and RL properties. This is second only in project count to planning grants. Furthermore, this represents more than half of all mitigation dollars spent from 2006-2016, nearly $63M of $115M. As of November 2017, Washington has 184 RL and 148 SRL properties.

2018 SEHMP Goals

Mitigation goals are often of limited value in mitigation plans. For this update, the planning team met to develop goals that align with their intended purpose: to be general policy statements that reflect the state's priorities and commitment to risk reduction.

Goal 1: Coordinate, across multiple agencies, the delivery of planning guidance and technical assistance to local jurisdictions, especially in areas relating to risk reduction activities.

Goal 2: Increase resilience through the implementation of Resilient Washington initiatives.

Goal 3: Develop a comprehensive understanding of hazards and potential risks, applicable and accessible to all state agencies and local partners.

Goal 4: Coordinate hazard and risk communications and improve communications effectiveness to the public and decision-makers.

Goal 5: Develop internal agency capacity to address risk and hazard mitigation.

Goal 6: Decrease the number of SRL and RL properties while increasing the number and rating of CRS-rated communities.

Goal 7: Embrace every opportunity for agencies and local jurisdictions to reduce risk as part of program delivery.

2013 Mitigation Action Status Update

The Mitigation Workgroup updated, removed and/or reprioritized strategies from the 2013 plan according to the following criteria:

1. Completed actions
2. Actions that are preparedness in nature

3. Facility-specific actions
4. Actions that are poorly scoped or are no longer supported
5. Actions that are not part of the state's commitment to a comprehensive mitigation program
6. Actions based on programs that are cancelled or deprioritized
7. Actions that are ongoing/perpetual in nature and are standard ongoing practice

The committee met on August 22nd, 2017 to complete this process.

The previous plan actions were largely facility-specific or preparedness in nature. In most cases, the committee determined that these were better covered by facility-specific improvement or continuity of operations planning or by preparedness/training and exercise activities. Furthermore, many of the actions were either very broad or overly limited in scope, for example, purchasing a NOAA Weather Radio for the Department of Licensing. In accordance with the mission of most agencies of facilitating local jurisdiction projects and programs, these kinds of activities do not rise to a level of being included in the state mitigation plan. Finally, as the updated plan focuses more on strategies with component actions, action items that do not contribute to a larger risk-reduction measure are not appropriate for the plan and would effectively be "orphans."

Actions that were poorly scoped or ongoing/perpetual in nature were removed as the plan focuses on programmatic commitments to risk reduction via specific measures. Also, the updated plans emphasis on strategies (with component actions) rather than action items themselves means that vague activities without measures of performance or that don't contribute to an overall risk reduction vision are not appropriate to the plan and are difficult to monitor.

Finally, some actions have been incorporated into new programs and priorities.

The list of actions from the 2013 SEHMP, including 2018 status, is provided in the appendix, 2013 Action Status Update. None of these actions are continued as-written in the updated plan, though many are incorporated into new actions in accordance with the updated template and refocus on larger mitigation strategies.

Mitigation Strategies

Washington's most significant demonstrated commitment to a comprehensive mitigation program consisting of a broad range of state-supported initiatives is through the mitigation strategies. Each strategy consists of agency leads and partners both in (state partners) and out (external partners) of state government. A specific objective for each strategy is identified, along with action items that contribute to the two-year, five-year, and long-term strategy checkpoints. Many of the strategies are multiagency in nature, though some are specifically designed to increase collaboration. Other strategies that are more programmatic in nature also have multiagency involvement. Finally, when taken as a whole, Washington's mitigation strategies cover all sectors and all natural and most human-caused hazards.

Mitigation Strategies – By Agency

Department of Agriculture

1. Animal Health Program
2. Animal Disease Traceability Program
3. Pest Program

Department of Archaeology and Historic Preservation

4. URM Seismic Retrofit Standards
5. Cultural Resources Resilience Planning

Department of Commerce

6. Incorporate Hazard Mitigation and Disaster Recovery into Comprehensive Plans
7. Critical Areas Ordinance – Hazard Mitigation Planning Coordination
8. Community Disaster Resilience
9. Resilient Affordable Housing

Department of Ecology – Water Resources

10. Dam Safety Program
11. Drought Mitigation Program

Department of Ecology – Shorelands Program

12. Floodplains by Design
13. Flood Control Assistance Account Program
14. Coastal Resilience Community Assistance
15. Floodplain Management Technical Assistance
16. Chehalis Basin Flood Reduction
17. Multi-Agency Engagement in RiskMAP

Department of Enterprise Services

18. Seismic Safety Disclosure in Real Estate Transactions
19. Capitol Campus Facility Resilience
20. Local and State Facility Insurance Pools

Department of Health – Emergency Preparedness and Response

21. Health System Disaster Resilience
22. Public Health Resilience

Department of Health – Environmental and Public Health

23. Water System Technical Assistance
24. Water System Revolving Fund

Department of Natural Resources – Geologic Hazards

25. Landslide Hazard Program
26. Tsunami Mapping Program
27. Lahar Evacuation Mapping
28. Geologic Mapping
29. Seismic Hazard Mapping

Department of Natural Resources – Wildland Fire

30. Community Wildfire Protection Planning
31. Education and Outreach

32. Wildfire Fuels Reduction

Department of Transportation

33. Replace Undersized Culverts
34. Address Chronic Environmental Deficiencies
35. Slope Stability Programs
36. Transportation System Climate Impacts Vulnerability Assessment
37. WSDOT "Seismic Lifeline Route" Retrofit Projects
38. Stormwater Retrofit
39. Bridge Scour Mitigation
40. Transportation Asset Management Repeat Repair Sites

Military Department – Emergency Management Division – Hazard Mitigation

41. Mitigation Planning Coordination
42. Mitigation Planning Technical Assistance
43. Hazard Mitigation Assistance Grants
44. Business Continuity Planning and Interagency Coordination
45. Earthquake Early Warning
46. Statewide Building Vulnerability Inventory
47. Tsunami Risk Mitigation

Office of the Insurance Commissioner

48. Insurance Incentives for Hazard Mitigation
49. Increase Earthquake Insurance Take-Up Rates

Office of the Superintendent of Public Instruction

50. School Seismic Safety Assessments and Retrofits
51. Earthquake Drills in Schools
52. School District Hazard Mitigation Plans
53. School District Continuity of Operations Plans

Puget Sound Partnership

54. Puget Sound Action Agenda
55. Shoreline Armoring Implementation Strategy
56. Reduce the Conversion of Ecologically Important Lands for Development

State Conservation Commission

57. Voluntary Stewardship Program

Utilities and Transportation Commission

58. Lifeline Sector Assessment and Resilience
59. Pipeline Hazards Program

Other Interagency Strategies

60. Statewide Resilience Program
61. Interagency Climate Adaptation Network
62. Address Disparities in Mitigation Activities and Capabilities

Animal Health Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
State Veterinarian WSDA	DOH ECY	WSVMA US Animal Health Assoc. Extension Services Producer Associations Animal Sales Markets Vet Schools USDA	Agricultural Disease **Goal 5**	USDA General Fund

Objective

Detect introduction of an out of state/foreign animal disease and prevent its spread by improving the quality of information available to private vets and the speed of detection by trained diagnosticians.

Description

The Animal Health Program is dedicated to supporting the productivity, economic viability and sustainability of animal agriculture in WA State by protecting animal and public health through the promotion of disease prevention, surveillance, traceability, control and eradication. Official detection requires a regulatory veterinarian to certify the occurrence. The program maintains veterinarians to conduct diagnoses based on reports of diseases on the international, federal and state reportable disease list from private practitioners.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Fully staff program; currently at 90% staff, but missing key positions. • Functional communications system to private vets established.	• Maintain preparedness, regardless of major incidents. • WSDA vets are all FAD trained. • Implement secure food supply plans with food industry.	• Maintain cooperative agreement with USDA.

Implementation Actions

- Outreach by field veterinarians and collaboration with state partners to expand reporting by private vet practitioners.
- Maintain national-level contacts.

Recent Advances

- Animal Health Program participated in Secure Food Supply plans.

Animal Disease Traceability

Lead	Partners	External	Hazards/Goals	Funding/Costs
Animal Disease Traceability Program Manager	N/A	Extension Services USDA Private Producers Animal Sales Markets Veterinarians	Agricultural Disease **Goal 5**	General Fund USDA Fees

Objective

To reduce disease spread by tracing an animal throughout its lifecycle at multiple points of contact, and at a minimum each time the animal is sold or transferred. 85% of test traces conducted can trace animals within 24 hours or less.

Description

The Animal Disease Traceability Program focuses on animal disease spread prevention, using animal health records from accredited veterinarians to track diseased animals. The Program is currently working to expand collection of livestock data at the largest points of co-mingling, the livestock marketplaces. WSDA operates the program utilizing both state and federal funding sources. A 3-year "Road Map" plan is developed to support annual cooperative agreement funding received from USDA.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maintain quarterly and annual targets in accordance with the USDA cooperative agreement.	• Transition to electronic-based systems and improve tracing speed.	• Create additional requirements for tracking movement of animals at more points of contact.

Implementation Actions

- Develop electronic traceability infrastructure.
- Install RFID traceability infrastructure at four largest livestock markets and increase data gathering.
- Implement electronic systems to improve tracing speed.

Recent Advances

- Pilot project at Everson Livestock Market to start the process of introducing traceability into livestock marketplaces is underway in 2017.

Pest Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Pest Program Manager WSDA	DNR DFW Invasive Species Council Noxious Weed Board WSU	Local Jurisdictions USDA US Customs Industry Groups	Agricultural Disease **Goal 5**	USDA APHIS USDA USFS General Fund Fees

Objective

Protect the agriculture, environment and natural resources of Washington State by preventing the introduction and spread of high risk invasive insects, terrestrial snails, plant diseases and noxious weeds.

Description

The Pest Program, Plant Protection Division, engages in the detection, eradication, inspection, identification, quarantine administration and outreach to control the introduction and spread of invasive, non-native insects, plant diseases, terrestrial snails and noxious weeds in Washington State. The program emphasizes detection, deploying insect traps statewide (approx. 50k annually), and collects thousands of plant and insect tissue samples each year. The program also operates control and inspection points and eradication programs, such as the gypsy moth eradication efforts in 2016.

Programs include:

- Gypsy Moth Detection and Eradication
- Japanese Beetle Survey
- Apple Pest Certification
- Exotic Wood Boring Insect Survey
- Exotic Pine Pest Survey
- Grape Pest Commodity Survey
- Hardwood Pest Commodity Survey
- Softwood Pest Commodity Survey
- Asian Defoliator Moth Survey
- Exotic Snail Detection
- Vineyard Snail Eradication
- Regional Lepidopteran Diagnostic Center
- Sudden Oak Death Certification
- Knotweed survey and eradication
- Spartina
- Purple Loosestrife
- Karnel Bundt

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Eradicate two identified reproducing populations of gypsy moth.	• Show continued declines in spartina (invasive tidal grass) acreage. • Maintain Apple Maggot certification program.	• Protect against introduction of 150 invasive pests. • Protect against future introductions of gypsy moth. • Administer pest and disease quarantines.

Implementation Actions

- Work with the USDA to enforce federal gypsy moth quarantine law.
- Work with military installations to hand out self-inspection information to incoming/transferring soldiers and families.
- In 2018, conduct gypsy moth eradication programs around the City of Graham and in Kitsap County.
- Continue waystation inspection operations.
- Continue trap placement operations.
- Continue the inspection of waste management facilities.

Recent Advances

- Developed excellent electronic mobile GIS data collection and mapping system.
- Advances in molecular diagnosis, now able to differentiate between European and Asian gypsy moths.
- 10500-acre successful Asian gypsy moth eradication program in 2016.

URM Seismic Retrofits and Standards

Lead	Partners	External	Hazards/Goals	Funding/Costs
DAHP DES-SBCC	COM DAHP OSPI	Main Street Organizations Structural Engineers Assoc. Local Jurisdictions Property Owners WABO	Earthquake **Goal 2**	$22M/ first biennium from the Capital Budget 56M in subsequent biennia.

Objective

Pass legislation to authorize the Washington State Building Code Council to develop a mandatory building retrofit code, which includes funding for code development, enforcement and financing options for building retrofits. This action will require time and funding to develop the code in collaboration with a coalition of stakeholders, legislators, agencies and the Governor's Office to develop and introduce legislation. This group will then work with key sponsors and legislative leadership to schedule hearings and workshops to present findings, including need, assessment of risk and examples of successful programs.

Description

URM buildings are highly susceptible to damage from an earthquake and pose a serious life and safety risk. While many URMs have been retrofitted, an unknown but likely larger number have not. Barriers to completing building retrofits include not only access to capital but also assistance to property owners to understand and negotiate the technical aspects of a retrofit project. Needs associated with this action include a capital allocation to fund retrofit work and state/local agency capacity to administer the program including developing guidelines, monitoring contracts, and providing technical assistance.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop local model legislation.	• Pass legislation to authorize mandatory building retrofit code, including funding for code development, enforcement and building retrofit.	• Implement updated code.

Implementation Actions

- Develop models of local legislation requiring mandatory or voluntary building retrofits accompanied by a capital program that provides financial and technical assistance or incentives for seismic retrofitting of vulnerable buildings and structures, especially URMs.
- Configure the program; convene advisory committee of stakeholders to define program parameters such as funding criteria, eligibility requirements, funding priorities, application procedures, etc.;
- Develop technical standards for the retrofit of URM buildings, including a basic retrofitting technique known as "bolts-plus," which is designed to attach the buildings' walls to its floors, and an "aspirational" (above code minimum) standard.
- Address these issues in regard to properties listed in, or eligible for listing in the National Register of Historic Places and/or local registers of historic places; apply the Secretary of the Interior's Standards for Rehabilitation for retrofitting strategies of historic buildings.
- Pass legislation to authorize mandatory building retrofit code, including funding for code development, enforcement and building retrofit.

Recent Advances

- N/A

Cultural Resource Resilience Planning

Lead	Partners	External	Hazards/Goals	Funding/Costs
DAHP	State Parks	WABO FEMA NPS Local Jurisdictions	All Hazards **Goal 2**	$200k PDM General Fund

Objective

Develop and disseminate a template for cities, counties and tribes to adopt that articulate and detail strategies, tasks and tools needed to prepare those resource types and their stakeholders for disaster and provide a platform for rapid recovery.

Description

Develop and disseminate a Disaster Preparedness and Resilience Plan and Toolkit for Cultural and Historic Resources. Development a template for cities, counties and tribes to adopt that articulate and detail strategies, tasks and tools needed to prepare those resource types and their stakeholders for disaster and provide a platform for rapid recovery. The template document will articulate specific tasks and strategies for local jurisdictions and tribes to adopt as a disaster preparedness and recovery plan for cultural and historic properties; include efforts to incorporate the plan/toolkit into local emergency preparedness planning frameworks and plans.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Request funding and/or apply for a grant. • Begin toolkit development.	• Complete toolkit. • Conduct outreach and disseminate toolkit to stakeholders.	• Conduct periodic reviews and recirculation of toolkit.

Implementation Actions

- Request funding and/or apply for a grant.
- Recruit stakeholder workgroup; select, hire and brief a consultation.
- Scan and evaluate existing resources, materials, case studies, etc.
- Draft document and circulate to stakeholders for comments; revise draft as appropriate and re-circulate for 2nd round of review and comments; finalize document.
- Disseminate to stakeholders; conduct training and outreach.
- Conduct periodic (not longer than 5 years) review of the document, revise as needed, and circulate.

Recent Advances

- Databases have been developed and are being enhanced at DNR, DAHP, and other agencies that provide useful information.

Incorporate Hazard Mitigation and Disaster Recovery into Comprehensive Plans

Lead	Partners	External	Hazards/Goals	Funding/Costs
COM	DES – SBCC EMD DAHP	FEMA Local Jurisdictions	Earthquake Landslide Flood **Goal 1**	Existing Staff Time

Objective

Improve community resilience through better guidance and technical assistance to local government for comprehensive planning and Critical Areas Ordinance updates and through coordination between Commerce and EMD. Locally adopted comprehensive plans, development regulations and capital improvement plans (programs) consider the impacts of disasters on the natural and build environments to ensure actionable local strategies are developed and, when adequately resourced, implemented.

Description

The local government comprehensive plan is an important first step to incorporating resiliency and risk reduction strategies at a community level. Strategies can be implemented through development regulations, critical area ordinances (CAOs) and other mechanisms once a comprehensive plan has been approved by the local jurisdiction. For communities that are not fully planning under the GMA, and may not have an up-to-date comprehensive plan, considering the effects of disasters within the context of a local hazard mitigation plan with actionable risk reduction strategies in conjunction with their CAO, should also yield positive outcomes. Fewer than half (45%) of respondents indicated that they incorporate information from a FEMA approved Hazard Mitigation Plan into the land use planning efforts.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Incorporate a Community Resiliency Guidebook into the Growth Management Services Unit's annual work program. • Select an inter-agency committee to advise the development of the guidebook, including content.	• Complete the Guidebook. • Outreach to local governments to improve plan coordination and encourage the use of the Guidebook.	• Conduct assessment of guidebook effectiveness and compile ideas for future updates. • Locally plans consider the impacts of disasters and develop strategies accordingly.

Implementation Actions

- Define how resiliency relates to the GMA. Incorporate a Community Resiliency Guidebook into the Growth Management Services Unit's annual work program.
- Select an inter-agency committee to advise the development of the guidebook, including content.
- Complete the guidebook over a one-year period.
- Outreach to local governments to educate about the guidebook and applicability to local planning and development.
- Assess guidebook effectiveness and compile ideas for future updates.

Recent Advances

- Additionally, the Department of Commerce conducted a survey of all cities and counties within Washington to ascertain their existing level of planning about community resilience from disasters. Fewer than half (45%) of respondents indicated that they incorporate information from a FEMA approved Hazard Mitigation Plan into the land use planning efforts.

Critical Areas Ordinance/Hazard Mitigation Planning Coordination

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
EMD Mitigation COM Critical Areas	ECY DNR DFW	FEMA Local Jurisdictions	Flood Landslide Earthquake Tsunami **Goal 1**	General Fund

Objective

COM and EMD will develop a process to coordinate on planning, guidance, and local-jurisdiction technical assistance to better align comprehensive plans, Critical Areas Ordinances and hazard mitigation plans with the aim of producing more effective, more accurate plans that better reduce long-term vulnerability and include more local stakeholders.

Description

Critical Areas Ordinances are required by Washington's Growth Management Act and protect Frequently Flooded, Geologically Hazardous, Wetland, Aquifer Recharge, and Animal and Fish Habitat areas. The hazard elements of CAOs cover multiple hazards in most mitigation plans, flood, landslide, and earthquake, as well as erosion. The CAO, as an enforcement mechanism, is one of the best tools a community has, to change the vulnerability trajectory – reducing future vulnerability by protecting sensitive areas. Hazard mitigation plans develop risk reduction strategies and analyses, but usually lack a strong regulatory or enforcement element. By coordinating CAOs, comprehensive plans, and HMPs, the mitigation plan can develop strong risk prevention strategies and the comp plans and comprehensive planners can gain access to updated data and risk assessments.

HMGP Planning grants could also pay for the update of the CAO as a standalone activity or part of the plan update. PDM could possibly pay for it through the plan update/development. This would need to be piloted and has limits due to limited planning funds, but may be an option in priority cases.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop a pilot strategy and identify a community.	• Apply for planning grant. • Support pilot community through 60% of the process.	• Closely coordinated comprehensive and mitigation planning reduces existing and prevents new vulnerability in all Washington communities.

Implementation Plan/Actions

- Finalize Comp Plan/HMP crosswalk.
- Work with RiskMAP partners to identify possible pilot communities.
- Develop a pilot coordination strategy and identify community partners.
- Support local jurisdiction planning grant application.
- Publicize joint HMP/Comp Plan guidance.

Recent Updates and Advances

- EMD currently contributes to COM Critical Areas Ordinance planning guidebooks.
- EMD and COM have written a draft Comp Planning/HMP crosswalk.

Community Disaster Resilience

Lead	Partners	External	Hazards/Goals	Funding/Costs
COM	All State Agencies	Local Jurisdictions Organizations Federal Agencies	All Hazards **Goal 3**	Federal Grants General Fund Capital Budget

Objective

Align COM's programs to coordinate locally identified mitigation, preparedness, response, and recovery priorities. Increase and support resilience planning efforts and encourage integration of locally identified strategies into Comprehensive and Resilience Plans for review and potential resourcing by COM. Assess internal opportunities and barriers in using new criteria to prioritize investments outside of known hazardous areas and develop a framework for incorporating new criteria into COM-managed grant/fund applications.

Description

Communities throughout Washington are subject to a variety of natural, economic, human-caused, and technological disasters, which can have detrimental effects, both immediate and long-term. Without considering these effects in advance of funding or program delivery, it can inhibit pre-disaster prevention and post-disaster recovery efforts.

The Washington Department of Commerce has over 100 programs that impact and strengthen Washington communities. While the programs are usually not designed to directly mitigation disaster risk, they have that effect. Some examples include the Clean Energy Revolving Loan Fund, Growth Management Services, Community Development Block Grants, Mobile and Manufactured Home Relocation Assistance, and the Public Works Board.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Complete internal planning process • Pilot one or more identified strategies	• Continue to develop strategies that support community resilience • Collaborate with internal and external stakeholders that support locally-based resilience actions	• Evaluate the effectiveness of the Community Disaster Resilience effort through the agency's Results Commerce performance management system

Implementation Actions

- Complete internal breakthrough planning process and identify specific implementation strategies.
- Assess community resilience data collection efforts (i.e. toolkits, planning processes, etc.) for potential application
- Conduct pilot projects for one or more of the identified strategies
- Engage federal, state, local, and tribal partners in resilience-based efforts in order to ensure proposed actions are synchronized with locally-identified needs.

Recent Advances

- Commerce's Executive Leadership Team has initiated an internal planning process designed to seek ways in which to align Commerce's programs in support of state, local, and tribal resilience needs.

Resilient Affordable Housing

Lead	Partners	External	Hazards/Goals	Funding/Costs
COM	DNR EMD	Affordable Housing Groups Local Jurisdictions	All Hazards **Goal 2**	Greater than $500k

Objective

Improved resilience of affordable community housing stock and an enhanced ability for affected populations to shelter in place through reduction of publicly funded projects within high-hazard zones. Development and Implementation of a Hazard Mapping Criterion and Associated Mapping Products as part of the Evergreen Sustainable Development Standard (ESDS) v3.0

Description

The Evergreen Sustainable Development Standard (ESDS), now in version 3.0, is a green building performance standard required of all affordable housing projects receiving capital funds from the Washington State Housing Trust Fund. ESDS is compliant with RCW39.35D.080 and contains criteria that safeguard health and safety, increase durability, and promote sustainable living, preserve the environment, and increase energy and water efficiency.

The ESDS criterion are informed by the Enterprise Green Communities standard, building and energy code, and best practices from across a wide spectrum of the construction industry. In February 2016, after much stakeholder review and process, a provision requiring Emergency Planning was included in the ESDS. This requirement applies to affordable housing projects funded with WA State Department of Commerce Housing Trust Fund dollars. The criterion is a mandatory requirement of ESDS v3.0.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Implement hazard mapping criterion. • Engage existing stakeholders. • Complete requirements.	• Develop mapping tool and user manual. • Revise HTF applications and documents. • Complete assessment of effectiveness.	• Using hazard mapping and risk criteria, state-funded housing is not built in high-hazard zones.

Implementation Actions

- Engage existing stakeholders.
- Complete requirements and data review.
- Develop hazard mapping tool and user manual.
- Review Housing Trust Fund application documents and process to integrate risk assessment information.
- Review and revise ESDS and tools to integrate the use of hazard and risk assessment modeling into the criterion.
- Assess effectiveness of processes and program.

Recent Advances

- N/A

Dam Safety Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Dam Safety Office Manager ECY	DFW EMD	Dam Owners USACE Local Jurisdictions FEMA	Dam Safety Flood **Goal 4**	Fees via the General Fund FEMA Grants

Objective

100% of emergency action plans completed for all high and significant hazard dams (currently 90%), and risk levels are correctly established.

Description

The Dam Safety Program ranks dams based on environmental hazard and downstream population. Dams are assessed through risk-based analysis and dams are required to be built or retrofitted to standards based on risks. Low-hazard dams don't pay fees, but the hazard level of a dam can change if there is development downstream that changes the dam risk profile. Communities do not usually consider dam placement and risk when citing new housing developments.

Emergency Action Plans must include location information, owner and local emergency management contact details, access information, waterbody data, height of embankment, and a flow-chart based on failure risk of the dam. Finally, the plan should include a risk assessment, including an inundation map and potential population impacts. The goal is to encourage owners to curb potential hazard.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Increase outreach to dam owner and public outreach and awareness program. • Increase compliance and follow-up with dam owners in the period between inspections.	• Update technical guidance documents.	• 100% of emergency action plans completed for all high and significant hazard dams (currently 90%).

Implementation Actions

- Outreach to local dam owners each inspection cycle along with technical guidance on completing the EAP. There is no enforcement mechanism to compel owners to complete EAPs, so concerted outreach is necessary. New dams require an EAP.
- Complete inspections of each site every five years and ensure that each EAP reflects actual risk.
- Maintain and update EAP template with new information on an ongoing basis.
- Maintain data and documentation on all 1300+ dams for use in planning and disaster response.
- Participate in emergency response exercises with dam owners.

Recent Advances

- General guidelines were developed for procedures to take and things to identify in post-wildfire, burned watersheds.

Drought Mitigation Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Drought Coordinator ECY	DFW DOH WSSCC WSDA EMD OWSC	NOAA/NWS NRCS USGS Bureau of Reclamation	Drought **Goal 3**	General Fund User Fees Bureau of Reclamation Cost Share

Objective

Promote statewide water security by developing improved water management and water infrastructure and by improving the drought contingency planning and response capabilities. Secure a permanent source of drought contingency fund as part of a strategy to provide more options for drought response and mitigation.

Description

The Drought Program supports the drought committees and drought planning to support multi-agency planning, decision-making, and drought response activities. The program can request a Drought Declaration, giving certain water rights review and approval powers to Department of Ecology and the legislature may appropriate funds for emergency drought response infrastructure projects.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Secure year-to-year drought contingency funding from the Legislature. • Develop long-term water rights leases.	• Update the Drought Contingency Plan on a five-year cycle. • Update drought planning based on improved NOAA forecasts.	• Less dependence on drought emergency response framework, instead maintaining a running grant program to fund projects that improve drought resiliency and water supply reliability. • Develop a process with DOH to formally track which water systems implement conservations measures annually.

Implementation Actions

- Implement the Drought Contingency Plan and plan recommendations.
- Secure year-to-year drought contingency funding from the Legislature.
- Develop long-term water rights leases – long-term contracts with farmers to fallow land in case of a drought.
- Expand state funding and technical assistance for local government drought contingency planning, especially for remote and rural users of water.

Recent Advances

- Completed the Drought Contingency Plan update in 2018 for the first time since 1992.

Floodplains by Design

Lead	Partners	External	Hazards/Goals	Funding/Costs
Flood Team Policy Lead ECY	Puget Sound Partnership DFW DNR	The Nature Conservancy Local government Tribes Special Districts Non-profit organizations	Flood **Goal 6** **Goal 7**	State Capital Budget

Objective

Further flood safety, floodplain ecological restoration, and support agriculture in floodplains around the state. Achieve protection of 15% of PSP floodplains.

Description

Floodplains by Design (FbD) is a partnership of local, state, federal and private organizations focused on coordinating investment in and strengthening the integrated management of floodplain areas throughout Washington State. Floodplains are vital to the ecological health of the state. They are critical to the economic vitality, cultural heritage and quality of life provided by our region—from salmon to farmland and commercial development, and recreational opportunities.

FbD is a statewide program to simultaneously support flood risk reduction and ecosystem restoration in floodplains. FbD also supports benefits to agriculture in agricultural areas and other relevant benefits such as recreational opportunities.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maintain consistent capital funding that meets program needs. • Release RFPs and accept applications for 2019-2021 and RFPs for 2021-2023.	• N/A	• Support program benefits on a statewide basis including support of the PSP goal of 15% of Puget Sound floodplains restored.

Implementation Actions

- Release bi-annual RFP to local partners to submit projects. Projects are selected based on updated guidance such as how well they address the primary components of the program and the readiness of the project to proceed.
- Receive applications and request funds from the Legislature based on applications received (projects are funded in the biennium following the RFP).
- Monitor projects through grant administration to ensure they are completed according to project design, reimburse according to milestones.
- Track and assess program metrics over time to show program accomplishments
- An update to the 5-year business plan for FbD is underway
- Promote the broader multi-benefit approach to floodplain management in WA State

Recent Advances

- An update to the Floodplains by Design Grant Funding Guidelines is complete as of October 2017.
- The RFP for the 2019-21 state biennium went out on November 7, 2017.
- Once the capital budget is released drafting of new grant agreements for the 2017 round will begin.

Flood Control Assistance Account Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Ecology	Local governments Special Districts	FEMA Emergency Management Division	Flood **Goal 5** **Goal 7**	Authorized in statute at $4 million/biennium; funded at $2 million/biennium from 2013 to 2017.

Objective

To promote flood risk reduction throughout the state. This fund enables communities to do flood risk reduction planning and projects that can include house elevations and buyouts, levee work, and ecosystem improvements. Creation of comprehensive flood hazard management plans is a central goal of the program. Creation of comprehensive flood hazard management plans is a central goal of the program.

Description

Provide technical support to counties, cities, and state agencies in support of improved flood safety and resiliency in a manner consistent with ecosystem restoration. Technical assistance can be in the areas of mapping, engineering, planning, regulatory review, channel migration zone assistance, and funding. Due to budget reductions, funding to support planning and individual projects has been reduced in recent years.

Coordinate floodplain planning federal and state agencies including the Washington Silver Jackets, the Emergency Management Division and Department of Commerce.

The Flood Control Assistance Account Program (FCAAP) is the primary operating fund for the Ecology Flood Team. FCAAP provides money for the required match for the grant to support the National Flood Insurance Program and supports Ecology staff that provide technical assistance on floodplain management issues and compliance with the NFIP and state flood laws. FCAAP also supports a small emergency flood risk reduction fund. FCAAP has historically funded the preparation of local Comprehensive Flood Hazard Management Plans and the completion of flood risk reduction projects, including levee improvements, levee setbacks, house buyouts, house elevations, and flood studies. FCAAP projects can be integrated with natural beneficial functions and ecological restoration activities.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Funded through biennial operating budget.	• N/A	• N/A

Implementation Actions

- Develop adequate funding for floodplain planning and flood risk mitigation.
- As resources are available, update Comprehensive Flood Hazard Management Plan guidance
- Integrate floodplain planning with other programs such as Floodplains by Design
- Actively work with communities statewide to support flood safety planning.
- Provide technical assistance and guidance for floodplain management planning.

Recent Advances

- Ecology flood team has provided technical support to various floodplain management planning activities throughout the state. Since FCAAP funding was reduced, grant money has been rarely available to support flood mitigation projects.

Coastal Resilience Technical Assistance

Lead	Partners	External	Hazards/Goals	Funding/Costs
Ecology Coastal Planner	EMD Washington Sea Grant WDFW UW Climate Impacts Group DNR Commerce	The Nature Conservancy NOAA Office for Coastal Management FEMA	Flood Landslide Tsunami Coastal Hazards **Goal 1** **Goal 3** **Goal 7**	Capital Budget Operational Budget Federal Grants State Grants Contracts

Objective

Avoid or minimize the existing and future impacts of coastal hazards on communities and natural resources.

Description

Washington's 3,300 miles of marine coastline provides the basis for thriving economic and social life in communities around the state and across the country. Natural hazard threats, however, are a growing reality for everyone working, living, or visiting our invaluable, dynamic shoreline areas. The Department of Ecology's Shorelands and Environmental Assistance Program is working to enhance Washington's resilience to natural hazards in our coastal and shoreline areas:

- Conducting scientific research and analysis to help communities understand and evaluate risks.
- Offering hands-on technical assistance to design solutions that achieve multiple benefits.
- Providing tailored planning assistance and guidance to support locally relevant policy and regulatory decisions.
- Developing training to build skills and best practices.
- Working across agencies and levels of government to provide the coordination and leverage the resources needed to act.
- Deploying recovery support to communities after an incident.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maintain or increase grant funding. • Develop coastal hazard risk assessment.	• Maintain or increase grant funding.	• N/A

Implementation Actions

- Participate and support community hazard resilience initiatives.
- Continue to provide technical assistance to local governments on hazard awareness and community education.
- Complete the Washington Coastal Resilience Project (update Sea level rise information, coastal planning and capital program guidance, and training and hands-on community assistance).
- Continue operation and management of the Washington Coastal Hazards Resilience Network.
- Continue partnership with FEMA's Risk MAP process in coastal counties, including participation in Coordinating Technical Partnership Program.
- Maintain and enhance Padilla Bay's Coastal Training Program Adaptation Series.
- Continue to lead a bi-state effort with Oregon on policy, projects, and research related to dredge material disposal and sediment management in the Lower Columbia River and its littoral cell.
- Continue coastal monitoring and analysis of Washington's coastal areas.
- Maintain Washington Conservation Corps services for community assistance during and after a disaster.

Recent Advances

- N/A

Floodplain Management Technical Assistance

Lead	Partners	External	Hazards/Goals	Funding/Costs
Ecology	Commerce EMD	FEMA USACE UW Climate Impacts Group	Flood **Goal 3** **Goal 6**	General Fund

Objective

Reduce flood damage and support ecosystem recovery in floodplains.

Description

Provide technical support to counties, cities, and state agencies in support of improved flood safety and resiliency in a manner consistent with ecosystem restoration. Technical assistance can be in the areas of mapping, engineering, planning, regulatory review, and funding. Due to budget reductions, funding to support planning and individual projects has been reduced in recent years.

Coordinate floodplain planning with federal and state agencies including the Washington Silver Jackets, the Emergency Management division and Department of Commerce.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Continuing to develop objectives based on the biennial operating budget and the CAP-SSSE grant from FEMA.	• N/A	• N/A

Implementation Actions

- Outreach to counties prior to the RiskMAP process. Coordinate with local governments to ensure local information is integrated into the map update process. Update flood maps and develop all-hazard risk assessments through the RiskMAP program. Review ordinances that are updated following flood map updates. Support communities developing appropriate flood standards.
- Conduct NFIP training, Community Assistance Visits, Community Assistance Contacts, and ordinance assistance.
- Provide planning assistance for Comprehensive Flood Hazard Management Plans and Hazard Mitigation Plans.
- Provide CAO frequently Flooded Area update assistance.
- Provide Engineering technical assistance and channel migration zone mapping technical assistance.
- Provide technical support for Flood Control Zone Districts.

Recent Advances

- Developed guidance for Frequently Flooded Areas.

Chehalis Basin Flood Reduction

Lead	Partners	External	Hazards/Goals	Funding/Costs
Chehalis Board Ecology	OFM		Flood **Goal 3** **Goal 6**	Capital Budget

Objective

In 2016, the Washington State Legislature created the Office of Chehalis Basin to "aggressively pursue implementation of an integrated strategy and administer funding for long-term flood damage reduction and aquatic species restoration in the Chehalis River Basin."

Description

The Legislature also created in that same Act a seven-member Chehalis Board to (a) oversee implementation of the Chehalis Basin Strategy and (b) develop budget recommendations to the Governor. The Board will oversee efforts intended to restore habitat for aquatic species like salmon, and to improve the environmental health of the Chehalis River and its tributaries. The Board will also ensure actions are implemented to significantly reduce damage from major floods and protect communities throughout the Basin. The Board will make recommendations to the Washington State Department of Ecology, Governor and Legislature regarding changes in laws, budgets and other actions needed to achieve the dual objectives of the integrated Strategy.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Implement program following the passage of a state Capital Budget.	• N/A – Not yet established.	• Reduce flood damage, especially repetitive flood damage, in the Chehalis Basin.

Implementation Actions

- Complete a basin-wide plan to restore up to 200 miles of aquatic habitat and initiate projects that restore 10 miles of aquatic habitat.
- Construct local flood damage reduction projects to protect critical infrastructure throughout the basin.
- Determine the feasibility of the North Shore Levee to protect the communities of Aberdeen and Hoquiam from coastal flooding and reduce flood insurance rates for property owners.
- Determine the feasibility of a natural approach for flood damage reduction in the upper Chehalis Basin.
- Determine the feasibility and environmental impacts of a potential dam on the mainstem of the Chehalis River near Pe Ell.

Recent Advances

- Establishment of Chehalis Basin Board.
- In the last two years, 33 acres of wetlands have been restored, and 27 fish barrier corrections or removals have been completed.
- Since 2012, 19 local flood damage reduction projects have been completed.

Multi-Agency Engagement in RiskMAP

Lead	Partners	External	Hazards/Goals	Funding/Costs
State RiskMAP Coordinator ECY	DNR EMD COM WSDOT Coastal Resilience UW OSPI	FEMA	All Hazards **Goal 1** **Goal 3** **Goal 4** **Goal 5** **Goal 6**	FEMA CTP annual grant $130k/year to ECY. Additional CTP grant for $28k for one year to EMD.

Objective

Increase community resilience to natural hazards by identifying actions they can take now to reduce their hazard risk, enhancing local plans, improving outreach through risk communication, and delivering quality multi-hazard data and tools to support those actions. Achieve this, in part, by bringing in partner agencies, such as EMD and DNR, as Cooperative Technical Partners, as funding and project needs entail.

Description

Risk Mapping, Assessment, and Planning (Risk MAP) is a Federal Emergency Management Agency (FEMA) Program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. Risk MAP strengthens local government's ability to make informed decisions about reducing risk through more precise flood mapping products, risk assessment tools, and planning and outreach support.

In Washington State, Risk MAP is a coordinated alignment of several State & Federal Agencies focused on increasing our resilience to natural hazards including floods, earthquakes, wildfires, landslides, tsunami, and volcanoes. The program is managed by the Dept. of Ecology providing the full range of regulatory and technical assistance to local communities to reduce losses to life and property, and protect the natural environmental functions and values of our floodplains. DNR, EMD, COM, and others support Ecology as Cooperative Technical Partners.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maintain existing scopes of work including both Program Management and Community Engagement and Risk Communication tasks.	• Update based on 5-year evaluation of annual Business Plan updates.	• Advance the program to further integrate the State's interests and resources in natural hazard resilience strategies.

Implementation Actions

- Complete Flood Map Adoption and Ordinance Updates
- Discovery and Resilience Phases produce reports with implementing actions
- Inform Critical Area Ordinance updates with RiskMAP data.
- Technical Assistance is provided from Cooperative Technical Partner agencies.
- Hazard Mitigation Plan updates include RiskMAP data and identified projects.

Recent Advances

- Integrating DNR LiDAR
- Partnering with EMD, Commerce, WSDOT
- Flood Map Updates to all Coastal Floodplains

Seismic Safety Disclosure in Real Estate Transactions

Lead	Partners	External	Hazards/Goals	Funding/Costs
Real Estate Commission DES-SBCC	COM DNR DAHP	Realtors Local Jurisdictions	Earthquake Tsunami **Goal 2**	$50k-$500k

Objective

Establish a working group of key stakeholders to examine the development of voluntary or mandatory seismic evaluations or reporting completed as part of real estate transactions. Develop mandatory requirements for mitigation of geologic hazards in Washington through the use of land use and zoning.

Description

Currently there is no requirement to evaluate or disclose the expected seismic performance of a building in a real estate transaction. Some lenders require what is known as a Probable Maximum Loss (PML) or Scenario Expected Loss (SEL) as a condition of providing funding on a property. Utilizing the sale of a building as a mandatory trigger to report on seismic performance is an opportune time given all the other disclosures and requirements that go along with a property sale. This would help ensure disclosure of a property's seismic condition between buyers and sellers. Suggested workgroup members would consist of representatives from the real estate, insurance, finance, historic preservation specialists, engineering and building management industries and other relevant parties that need to be engaged. Reprioritization of staff time or recruitment of additional staff may be required to support the workgroup.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop draft legislation. • Convene workgroup. •	• Examine RCW revision options. • Develop draft legislation.	• Support long-term program implementation.

Implementation Actions

- Develop draft legislation and a program for disclosure of a building and a property's seismic condition.
- Establish a workgroup of key stakeholders.
- Define the scope of the disclosure program and any performance code revisions that may be needed.
- Examine options to amend RCW 64.06 related to the disclosure of seismic condition and tsunami hazards.
- Develop draft legislation that could be adopted through RCW or by local ordinance. California's Alquist-Priolo Act may be used as an example of such legislation that has been used in the past. This would include recognition of a property's seismic vulnerability (including to liquefaction, ground failure, or shaking amplification), or its location within a potential tsunami inundation zone during real estate transactions.

Recent Advances

- N/A

Capitol Campus Resilience

Lead	Partners	External	Hazards/Goals	Funding/Costs
DES	WSP Agency Security Designees WSDOT	Elected Officials Legislature City of Olympia Port of Olympia Thurston County Squaxin Island Tribe LOTT Intercity Transit WATECH	All Hazards	Capital Budget General Fund Agency Fees

Objective

Provide well-maintained, safe, secure, and comfortable facilities on the Capitol Campus to ensure continuity of government, daily operations, and visitor access.

Description

The Washington Department of Enterprise Services is tasked with protecting, improving, and maintaining the Washington State Capitol Campus. Tenants and customers include 6000 state employees of 28 agencies, elected officials (senators, representatives, the Insurance Commissioner, Governor, others), civic education tours, hundreds of thousands of individual visitors, and over 400 public events

As an historic facility, there a are many challenges related to natural and human-caused hazards that are constantly being addressed. Recent studies on the fire system in the Capitol Building, emergency generators throughout the campus, and underground Campus facilities have identified several key priorities to be addressed within the next several years.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Install distributed antenna systems in garages. • Complete installation of card-key system. • Upgrade legislative fire panel and fire-flow water system. • Implement a campus-wide crisis communication system. • Install analog cameras. • Conduct a campus-wide security study. • Expand WSP Capitol Campus detachment to 24/7 service.	• Install PA equipment and signage to communicate hazards. • Mitigate West Campus slope hazard. • Mitigate communications system risks in steam tunnels.	• Replace power plant.

Implementation Actions

- Establish a robust Capitol Security & Visitor Services program to protect state employees, visiting public, and property. Extensive gaps currently exist which require mitigation. The program provides primary focus on the State Capitol, but provides optional statewide security and event/protest management services.
- Install a Distributed Antenna Systems in the Plaza Garage, National Resources Building Garage, Department of Transportation Garage, the Columbia Garage, and other campus locations for life safety, first responder safety, and employee safety. Currently cannot communicate in the garages and some buildings via cell phone or radio.
- Coordinate internal and external crisis communication for employees and the public by identifying and implementing tools and systems needed to support campus security initiatives.
- Replace existing campus analog cameras (147) to support campus security initiatives.
- Create a 24/7 campus monitoring function to proactively monitor and dispatch security and law enforcement personnel.
- Install new cameras to mitigate risk and exposure of people and property.
- Completion of a security study to further identify risks and mitigation opportunities.
- Addition of PA equipment and digital signage to communicate building hazards and emergencies, internal and external to facilities.
- Addition of emergency call stations for campus grounds and garages.
- Re-clad sandstone-wrapped facility; clips that secure the sandstone need to be replaced to prevent cladding from collapsing during any seismic, windstorm, or other event.
- Replace the fire panel in the legislative building. This requires replacing all devices in the facility to be compatible with the new system. There is a budget request in the current capital budget.
- Install shoring material for the hill on west campus that could severely damage campus critical infrastructure and potentially cause injury or loss of life.
- Increase seismic safety for all campus facilities and the steam tunnel.
- Upgrade the heating system from steam to hot water; consider moving the steam plant to East Campus to reduce risk to landslide, earthquake, and reduce climate impacts.
- Implement seismic retrofits for steam plan piping.
- There are significant issues with water supply for firefighting to the Capitol Building that need to be addressed.
- The data and telecommunications house, located in the steam tunnel, is vulnerable to a steam pipe rupture from any hazard, including seismic activity. This would cut communications throughout all of Capitol Campus.
- Implement a gunshot detection system.
- Install facility and barrier protections, including bollards and bullet-proof glass.
- Update emergency generators.
- Complete seismic studies

Recent Advances

- Completed underground utility critical infrastructure study looked at risks to water, sewer, communications, and other underground infrastructure.
- Completed investment-grade audit of the Capitol Campus powerhouse for investment needs to replace it.

Local and State Facility Insurance Pools

Lead	Partners	External	Hazards/Goals	Funding/Costs
DES	All State Agencies (customers)	Governor's Office State Legislature Local Jurisdictions Non-profits	All Hazards	State Agency Fees (Central Service Billing Model) Fees charged to insurance pools

Objective

Increase coverage breadth and depth across all state agencies and increase take-up rates of products such as cyber coverage.

Description

The Office of Risk Management (ORM) at the Department of Enterprise Services (DES) administers the Self-Insurance Liability Program. This program receives, processes, investigates and approves or denies all tort and sundry claims filed against Washington state agencies. ORM also manages risk financing (including commercial insurance), and provides loss prevention services. ORM maintains the centralized loss history information system for the purpose of tracking all tort claims filed against Washington State agencies and analyzing risk exposures.

DES regulates local government, hospitals, and non-profit organization self-insurance pools allow jurisdictions to pool together and purchase insurance. The Local Government and Nonprofit Self-Insurance (LGSI) Program provides approval and oversight of the following programs:

- Joint self-insured local government and non-profit property/liability programs.
- Individual and joint self-insured local government employee health/welfare benefit programs.

Currently, many agencies do not maintain sufficient coverage, even those with heightened specific risks. Another gap is for catastrophic incidents, such as earthquakes. DES and the Governor are looking into parametric insurance options for catastrophic incidents.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Conduct audits of local government pools every two years. • Increase take-up rates for property and cyber insurance by state agencies.	• Implement umbrella catastrophic policy, such as a parametric policy.	• Establish parametric insurance option for catastrophic incidents. • Establish an Earthquake Insurance Authority.

Implementation Actions

- Complete implementation of the local government self-insurance portal and conduct audits of local government pools.
- Expand cyber insurance coverage options for state agencies, especially for small agencies that don't have property coverage.
- Expand property coverage for small agencies that don't own large properties (the current deductible is $250K which is not cost effective for small agencies that don't own a building).
- Increase availability of the crisis management policy, the current fund is only $100k. This helps pay for unexpected costs after a crisis, such as the I-5 Amtrak crash, the Aurora Duck Boat accident, and the SR 530 Landslide.

Recent Advances

- The 2017 Legislative Session created an insurance pool option for hospital districts, effective July 1, 2017.

Health System Disaster Resilience

Lead	Partners	External	Hazards/Goals	Funding/Costs
DOH	EMD	HHS Hospital Association Medical Associations CDC FEMA	Earthquake Public Health/Pandemic **Goal 2**	$100k

Objective

Make hospitals resilient, structurally and functionally.

Description

Hospitals are critical facilities for saving and sustaining lives. Due to high demand, and in keeping with good business practice, hospitals are typically at full capacity with patients at any given time of any given day. Making hospitals more resilient helps save patient lives by maintaining continuity of care in their hospital, instead of "decompressing" the degraded hospital wherein patients are moved (a highly stressful activity for both patients and personnel) to another, non-degraded healthcare facility (NOTE: patient movement is heavily dependent upon available vehicles and usable routes). Important planning factors to consider for hospital resilience are the ability to quickly assess the structure following a catastrophic earthquake and maintain critical supply chains required to keep a hospital in operation as a healthcare facility. Finally, making hospital facilities resilient means that they could potentially remain functional following a catastrophic earthquake thereby assisting in the response by being able to admit new patients and saving more lives.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Conduct hospital resilience assessment.	• Enact necessary state building code changes.	• N/A

Implementation Actions

- Clarify the goal for hospital structures. What is the intended function of a facility after an event of what magnitude?
- Collect, compile and assess data for existing hospitals related to long-term functionality after an event and supply chains. Includes internal data and cross-agency data sources in multiple content forms (plans, maps, files, etc.).
- Enact changes to the state building codes for addressing performance gaps. New construction standards are sufficient and regularly updated with current technical data. Existing structures will have a greater challenge in meeting the new building codes. A technical advisory team would review requirements to correct gaps, draft code change proposals and attend hearings at the national level, while relying on private input for code changes.
- Assemble group of interested/impacted parties to discuss retroactive seismic of existing hospitals.

Recent Advances

- Within the Office of the Assistant Secretary for Preparedness and Response (ASPR) funding opportunity announcement for budget year 2017–2022, there is a requirement to assess supply chain inventory.

Public Health Resilience

Lead	Partners	External	Hazards/Goals	Funding/Costs
DCHS – DOH HSQA – DOH	DES – SBCC DSHS WSDA OSPI Health Care Auth. EMD UW	Hospital Association Medical Associations Local Health Districts Health NGOs EPA CDC FEMA	Public Health/Pandemic **Goal 5** **Goal 7**	HHS Fees General Fund

Objective

To mitigate the effects of either a pandemic or natural disaster, the Department of Health seeks to improve the health of all people in Washington as well as helping to create conditions that promote good health and safety for everyone.

Description

Public health resilience is measured by morbidity from preventable causes. DOH's mission is to reduce morbidity from preventable causes. Having a healthier population makes a community more resilient to disasters, and DOH is focused on building resilience by building a healthier population.

DOH assesses effectiveness through several measures including the Public Health Security Preparedness Index, which looks at over 130 measures of health system preparedness and resilience.

The DOH Strategic Plan is the source of workplans and measures for each implementation action.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• The DOH Strategic Plan runs 2017-2019. The below actions will be assessed on this timeframe.	• N/A	• N/A

Implementation Actions

- Describe, plan for, track, and begin adapting to the public health impacts of climate change.
- Work to reduce the impacts on water quality and food from agricultural sources.
- Resolve healthcare provider and facility complaints and allegations of misconduct or unsafe care.
- Ensure all children have appropriate developmental screenings and access to services.
- Increase immunization rates in children.
- Create environments and systems that support healthy eating and active living.
- Promote safe and nurturing environments and relationships, including mitigating Adverse Childhood Experiences and other complex trauma.
- Implement public health elements to Healthier Washington.
- Implement, support, and evaluate policies that are community informed and create the social, environmental, and economic conditions necessary to achieve health equity.

Recent Advances

- Developed approaches to health system resilience through the Resilient Washington Subcabinet.

Water System Technical Assistance

Lead	Partners	External	Hazards/Goals	Funding/Costs
Office of Drinking Water Policy Lead DOH EPH	ECY COM UTC WSDA	EPA FEMA Water Systems PNNL USDOE WA PUD Assoc. WA Utilities Council Water Supply Pierce	All Hazards **Goal 1** **Goal 7**	EPA

Objective

Work in partnership with water systems to develop the technical, managerial, and financial capacity to provide safe and reliable drinking water. The water system technical assistance and planning programs work to ensure that all water systems are resilient, technically, financially, and managerially.

Description

The Office of Drinking Water regional planning program provides planning and technical assistance services to water systems. Every Group A water system (federally-regulated systems) must have a planning document. Office of Drinking Water reviews planning documents and provides technical assistance in planning to jurisdictions every 3-5 year to ensure that the documents are up to date and are meeting the goals of the program at the time. The ODW then works with the system to resolve vulnerabilities. During review, the planners consider plan mitigation strategies. Approved plans are required to access the DWRF.

The Source Water Protection Program provides grants to local jurisdictions in approximately $30k buckets to help utilities gain control of their sources. This includes risk assessment and partnership development to help local utilities conceptualize problems and develop strategies for amelioration.

DOH ODW provides technical assistance of a hydrologist for the identification of waterborne risks, including the identification of contaminates and support to the jurisdiction for their reduction.

DOH ODW provides capacity development assistance for the development of technical, managerial, and financial capabilities to improve drinking water systems abilities to respond to threats.

DOH ODW runs a water system efficiency program that addresses systemic water use.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Work with systems to embrace and implement asset management criteria. • Develop an integrated information sharing effort within ODW. • Finalize water system planning manual.	• N/A	• N/A

Implementation Actions

- Small water systems are especially vulnerable to service interruptions in Washington State, lacking redundancy and capability. The ODW is working with small systems to manage vulnerability and uncertainty through systematic planning and technical assistance.
- Follow up on the sanitary surveys from every Group A system (submitted every 3-5 years), specifically related to public health, but also based on risks to other natural hazards, such as landslides. Sanitary surveys, however, only require the addressing of public health risks.
- Develop asset management criteria for water systems to implement.
- Ensure that all program plans in ODW interact with each other and identify goals for emergency management.
- Develop a water system planning manual, including shortage response and emergency management elements.

- Identify a method to provide information to water systems on threats and risks and begin sharing this information with water systems.
- Implement consolidation feasibility study grants to encourage small system (less than 20k) consolidation.

Recent Advances

- N/A

Water System Revolving Fund

Lead	Partners	External	Hazards/Goals	Funding/Costs
Office of Drinking Water SRF Program Supervisor DOH EPH	ECY COM UTC WSDA	EPA FEMA Water Systems PNNL USDOE WA PUD Assoc. WA Utilities Council Water Supply Pierce	All Hazards **Goal 1** **Goal 7**	EPA Capital Budget Loan Repayments

Objective

Provide loans to public water systems for capital improvements aimed at increasing public health protection, and provide a source of funds for other Safe Drinking Water Act activities.

Description

The Drinking Water State Revolving Fund Program makes grants and loans available to drinking water systems for infrastructure improvements. The Program is funded through EPA grant money, state match money (20%), and repayments from loans. Programs include:

- Preconstruction Grant/Loan: Available for systems serving fewer than 10,000 people to assist with design, planning, permitting, and improvements.
- Consolidated Grant: Funds community water system feasibility studies for change of ownership or interconnection of systems.
- Construction Loan: Loans with possible 50% forgiveness to address improvements for public health and consolidation projects.
- Emergency Loan: Loans with possible 75% principal forgiveness for water systems serving fewer than 10,000 people to address an emergency.

Project risk category created that recognizes resiliency projects such as seismic retrofits, backup sources, etc. Resiliency projects are ranked as Risk Category 4 projects out of the five risk categories available, with Risk Category 1 addressing the highest health risk projects.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Continue with funding cycles as described above.	• Continue with funding cycles as described above.	• Continue with funding cycles as described above.

Implementation Actions

- Continue to evaluate funding cycles and modify the process as needed to meet stakeholder's needs.

Recent Advances

- Transition DWSRF Program construction loan contracting and administration from COM to DOW by 2018.
- Developed a new program to award loan recipients up to $300k when bids exceed amount of funding.

Landslide Hazard Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Landslide Hazards Program Manager - DNR	N/A	DOGAMI Local Jurisdictions USGS	Landslides **Goal 3** **Goal 5**	General Fund

Objective

100% of Washington jurisdictions have landslide inventory and susceptibility products (GIS data, maps). Department of Commerce integrates this data into critical areas guidance as best available science.

Description

As high-quality LiDAR is collected, DNR identifies landslide deposits and produces susceptibility maps to distribute to cities, counties, tribes, and the public. DNR also works closely with Washington Department of Commerce to ensure that Critical Areas Ordinance guidance related to geologic hazards is accurate and accessible to planners.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maps for Whatcom, Snohomish, Island, and Skagit Counties completed.	• Complete 2-year plan counties plus LiDAR for at least 10 other counties, dependent on funding.	• Map inhabited or locally-important areas across the entire state.

Implementation Actions

- Continue mapping per the existing process with current staffing and funding levels.
- Work with legislature to maintain staffing and funding levels.
- Work with communities to educate on landslide hazards.
- Work with planners, emergency managers, and other officials on implementing landslide hazard mapping into CAO, emergency planning, and community education.

Recent Advances

- Pierce County landslide inventory and susceptibility data products completed in 2017.
- Columbia Gorge and King County landslide inventory and susceptibility data products nearing completion.

Tsunami Mapping Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Chief Hazards Geologist DNR	EMD UW ECY OSPI	NOAA PMEL Local Jurisdictions NTHMP RiskMAP	Tsunami **Goal 3** **Goal 4** **Goal 5**	NTHMP General Fund

Objective

100% of jurisdictions with tsunami risk are modeled for tsunami inundation. Data provided to local jurisdiction land use organizations and the public for the development of evacuation route maps, local development regulations, and public education campaigns.

Description

The Tsunami Program conducts gap analyses to determine coastal areas without modeling and then develops models and analyses for those areas. Analysis outputs and models are put into GIS and published in reports. DNR then works with local jurisdictions to help them interpret data and publish information for the public.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• 50% of Washington State modeled for L1 scenario inundation.	• 100% of the state modeled for L1 scenario, 50% modeled for Small-XXL scenarios.	• Continually update and amend modeling as new science becomes available and provide updated data to communities.

Implementation Actions

- Complete gap analysis by 2018.
- Conduct modeling according to gap analysis and priority.
- Publish inundation models as modeling completes for each area.
- Share inundation data with communities and establish evacuation routes.
- Work with communities to refine evacuation routes.

Recent Advances

Finished inundation maps for Hood Canal and Seattle-Everett areas.
Published inundation maps for Southwest Washington and Port Angeles – Port Townsend areas; published evacuation maps for Port Angeles – Port Townsend.

Lahar Evacuation Mapping

Lead	Partners	External	Hazards/Goals	Funding/Costs
Chief Hazards Geologist DNR	EMD OSPI	Local Jurisdictions USGS Mount Rainier Workgroup	Volcano **Goal 3** **Goal 4** **Goal 5**	General Fund FEMA

Objective

Complete evacuation maps for all lahar-threatened communities around Washington State's five volcanoes.

Description

Use existing lahar inundation maps from USGS to identify planning areas and work with local jurisdictions in these areas to identify, develop, and publicize evacuation routes and maps. Currently, only the City of Orting has been mapped.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Assess all communities. • Complete routes and maps for 25% of Rainier communities.	• Complete 100% of routes and maps for Rainier communities.	• Complete routes and maps for 100% of impacted communities around all Washington volcanoes.

Implementation Actions

- Conduct gap analysis with local jurisdictions and develop a plan by 2018.
- Develop evacuation routes and generate products with local jurisdictions around Mount Rainier within five years.

Recent Advances

- Developed new outreach materials.

Geologic Mapping

Lead	Partners	External	Hazards/Goals	Funding/Costs
Chief Hazards Geologist DNR	EMD ECY COM UW	Local Jurisdictions USGS Industry Partners	Landslides Earthquakes Floods **Goal 5**	USGS (50%) General Fund (50%)

Objective

Map in detail areas of societal relevance on an ongoing basis at a 1:24k scale.

Description

The Geologic Mapping program maps two quads per year, highlighting an area of societal relevance, including transportation corridors, cities, and towns. Mapped details include faults, landslide areas, transportation corridors, and flood hazard areas.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Complete four maps.	• Complete 10 maps.	• Continue to develop new and updated maps as technology and techniques improve.

Implementation Actions

- Propose quads to be mapped to the advisory committee, consisting of USGS, COM, and EMD.
- Receive funding from USGS.
- Conduct field investigation in partnership with local jurisdictions.
- Publish the map and post to USGS and DNR websites and provide access to local jurisdiction partners.

Recent Advances

- Currently publishing two maps per year.

Seismic Hazard Mapping

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
DNR	COM EMD UW – PNSN	USGS	Earthquake **Goal 3** **Goal 4** **Goal 5**	$2M General Fund USGS FEMA

Objective

Identify and map in greater detail sources of seismicity and geologically hazardous areas and develop plans for mitigation of identified hazards. Map this data available for partners engaged in planning, code development, and risk assessments.

Description

Learning more about the full impacts of Washington's seismic hazards is a continuous process which will require understanding the current unknowns. Further paleo seismic studies are critical to understanding the recurrence intervals of earthquakes along surface faults, such as the Seattle and Southern Whidbey Island faults. Computer simulations of shaking from a variety of sources help to constrain details about how Washington's building stock will be affected by different subsurface effects, and different durations of shaking. Continuing to improve seismic and geodetic monitoring will increase not only the understanding of Washington's geologic hazards, but improve the capabilities for Earthquake Early Warning system, providing additional automatic mitigation actions by technical users

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Include seismic risk in DNR's Lidar acquisition program	• Prioritize areas for seismic hazard mapping. • Develop and maintain an online subsurface database.	• Create a statewide hazards and resilience center.

Implementation Plan/Actions

- Include seismic risk in DNR's Lidar acquisition program.
- Prioritize areas for detailed liquefaction and other seismic hazard mapping and accelerate these efforts. Reference the updated liquefaction hazard maps in building codes and establish a consistent means of communicating maps and related information to local jurisdictions for use as best-available-science under the Growth Management Act (DNR and COM).
- Develop and maintain an online subsurface database for the state combining data from geotechnical work, geophysical surveys, and deep-well studies to provide easily-accessible resource assessments, hazard maps, and raw data.
- Create statewide hazards and resilience center to integrate scientific findings and develop and implement practical mitigation measures.
- Improve seismic network; there are many gaps in the seismic network and it is necessary to install more stations and modernize older ones.
- Update the seismic scenario catalog to help support local jurisdictions and creating mitigation plans. Priority analyses would focus on the 20 most important seismic scenarios in the state.
- Publish databases necessary to implement seismic provisions of building codes and accurately interpret seismic recordings in real time to allow for quicker response to events
- Develop liquefaction and site class maps for counties and cities for appropriate identification for earthquake hazard critical area ordinances
- Develop a database that enables the Pacific Northwest seismic network to calibrate their seismic recordings leading to improved seismic hazard analysis

- Obtain funding for FTEs for DNR, UW and USGS to do earthquake evaluations, subsurface database management, and geological mapping
- Develop 3-D geologic models to help assess active faults
- Work with local jurisdictions on implementation of these tools in critical area ordinances and mitigation plans with the desired outcome of a reduction of losses from earthquakes and more effective response after an earthquake
- Develop foundational geologic maps and databases that support the geological hazards programs and local and state government
- Develop and maintain an Internet accessible subsurface geotechnical database for the state moving data from geotechnical work geophysical surveys, and other deep wells to provide easily accessible and better resource assessments, hazard maps and databases

Recent Updates and Advances

- Currently DNR is collecting seismic shear wave data at schools and coordinating that with structural engineering data.

Community Wildfire Protection Planning

Lead	Partners	External	Hazards/Goals	Funding/Costs
State Forester/ Wildfire Prevention and Fuels Reduction Program Manager DNR	EMD ECY COM WSDOT DNR	BLM Fire Districts Local Jurisdictions USFS Ranger Districts Conservation Districts Environmental Nonprofits	Wildfire Flood Landslide **Goal 1** **Goal 4** **Goal 7**	WSFM BLM EMD

Objective

100% of Washington counties are covered by Community Wildfire Protection Plans or integrated hazard mitigation plans. Where appropriate, these CWPPs will be updated based on HFRA requirements and integrated into hazard mitigation plans at the local level.

Description

Community Wildfire Protection Plans are a requirement for various federal grant programs including Western State Fire Managers Wildland Urban Interface grants. These grants require projects to be specifically identified in CWPPs, which requires frequent updates. The CWPP program supports local jurisdictions developing these plans.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Check and verify status of all Washington CWPPs. • Engage all counties without CWPPs. • In partnership with Federal and State partners, issue consistent guidance on CWPP and HMP integration.	• All existing CWPPs integrated into HMPs. • All existing standalone CWPPs updated. • CWPP educational materials and guidance distributed to all Firewise communities.	• All counties covered by CWPPs. • All CWPPs updated. • All CWPPs integrated into Hazard Mitigation Plans.

Implementation Actions

- Educate communities on CWPP uses and requirements. Develop guidance and educational materials for community groups and local jurisdictions.
- Engage state and federal partners on CWPP, HMP, and Comprehensive Plan integration.
- Develop CWPP-HMP requirements crosswalk.
- Identify metrics and standards for CWPPs and communicate them to partners.

Recent Advances

- Some counties independently updating/integrating CWPPs.

Wildfire Education and Outreach

Lead	Partners	External	Hazards/Goals	Funding/Costs
Community Wildfire Preparedness Coordinator DNR	ECY Conservation Comm. WSP MIL GOV OIC OSPI	Conservation Districts Fire Districts USFS BLM Indian Affairs Fire Adapted Communities Network	Wildfire **Goal 4**	General Fund

Objective

100% county-level participation in wildfire education and outreach activities, specifically Wildfire Awareness Month activities. All communities-at-risk in Washington encourage homeowners to acknowledge personal responsibility and take wildfire risk reduction/mitigation actions by working with local media and the public. Where possible, support Firewise and Fire Adapted Communities efforts. Add 45 new CWPPs, Firewise Communities, or Fire Adapted Communities in 2017-2019 biennium.

Description

The wildfire prevention program works with internal and external partners, residents, local jurisdictions, and the media to disseminate wildfire risk, preparedness, and mitigation measures to residents and visitors of Washington. The program also works with Firewise coordinators, local fire districts, and others to educate residents and visitors as well as encourage risk reduction activities.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Update and make available educational documents such as "Living with Fire" to all Washington residents and visitors through various avenues.	• Active participation from all counties in Wildfire Awareness Month activities. • Add five Firewise communities in each Washington county.	Host education/outreach and Wildfire Awareness Month events in communities in each region.

Implementation Actions

- Write, collect, and edit Living with Fire update material. Obtain or develop new graphics.
- Identify distribution channels and distribute publications.
- Develop Wildfire Awareness Month participation guides.

Recent Advances

$10k in Firewise re-appropriation budget to update Living with Fire publication.

Wildfire Fuels Reduction

Lead	Partners	External	Hazards/Goals	Funding/Costs
Wildfire Prevention and Fuels Reduction Program Manager DNR	EMD ECY COM WSDOT DNR	Landowners BLM Fire Districts Local Jurisdictions USFS Ranger Districts Conservation Districts Environmental Nonprofits	Wildfire **Goal 5** **Goal 7**	WSFM NFP Capital GNA BLM

Objective

Implement, coordinate, and expand hazardous fuels reduction treatments in Wildland Urban Interface areas (target of 9,500 acres per biennium). Base all treatment locations and priorities on accurate and timely hazard/risk assessment data.

Description

The fuels reduction program collaborates with numerous partners to design and implement hazardous fuels reduction activities through contracts and cost-share programs on State and private lands. Currently identified treatment locations and priorities are either based outdated risk data or political influences not representing the greatest impact to the communities in the highest need areas. The current scale of treatments does not allow for adequate or timely protections of federally designated communities at risk.

The 2010 Western Wildfire Risk Assessment and the 2017/2018 Qualitative Risk Assessment (available soon) datasets are available and represent the best information upon which treatment decisions can be made.

Hazardous fuels reduction treatments are a performance measure for DNR reported to the legislature and are majority funded through federal grants and partially through State appropriations on a biennial basis.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Statewide hazard/risk assessment data available for public consumption.	• Update hazard/risk assessment data. • Align existing or conflicting treatment priorities. • Develop methods to remove program from biennial funding cycle.	• Unified collection of statewide fuels hazard and home risk assessment data. • Identify alternate funding sources to alleviate dependence on State capital and federal funds.

Implementation Actions

- Define and disseminate hazard/risk assessment standards and methodology.
- Develop portal for public consumption of hazard/risk assessment data.

Recent Advances

- Budget requests to support hazardous fuels reduction activities and cost-share programs.
- QRA update for wildfire risk is nearly complete.

Replace Undersized Culverts

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Environmental Services	DFW Tribes	Tribes Local agencies Private landowners Federal agencies	Flood **Goal 5** **Goal 6** **Goal 7**	Transportation Budget

Objective

Remove and replace 30 barriers to fish migration, statewide, each year, currently funded to build 11-15 (depending on individual project costs).

Description

This strategy focuses on removing fish barrier culverts under state highways. This has the dual benefit of reducing upstream flood risk and facilitating the migration of endangered salmon. As of June 2017, WSDOT completed 319 fish passage projects statewide, improving more than 1,032 miles of upstream habitat and flood resiliency.

As of June 2017, WSDOT has documented 978 barrier culverts under state highways that are subject to the federal Culvert Injunction of March 2013. To comply with the injunction by 2030, WSDOT needs to correct 30 per year; however, current funding is falling short of this goal.

Culverts are corrected through transportation improvements and stand-alone corrections. Each barrier needs to be replaced by a bridge or a new culvert large enough to fully span the channel and simulate natural stream flow, gradient and bed configuration. On state highways, this can be very expensive. To speed the pace of culvert fixes the Governor worked with the state legislature to secure a steady flow of state funds for the next fifteen years.

This is part of a larger effort tracked by Results Washington. The Washington Department of Fish and Wildlife (WDFW) estimates that about 30,000 fish passage barriers exist in Washington because of road-crossing culverts. WDFW is coordinating with local governments, private landowners, and other state agencies to identify, prioritize, fund, and repair these barriers.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Submit funding request to the legislature to meet 30/year replacement goal. • Increase use of design/build to expedite delivery.	The six-year plan for fish passage is a long-range project delivery plan. It incorporates the Legislature's new revenue funding and communicates WSDOT's intentions for specific investments in transportation infrastructure.	• Replace all fish barrier culverts statewide, approximately 1,977 highway crossings. • Identify funding mechanism to support local barrier replacement.

Implementation Actions

- Find opportunities to partner and identify a process to file letters of map revision with the NFIP following culvert replacement.
- Use design-build contracting to expedite design.
- Streamline permits and approvals.
- Conduct asset management and risk assessments, produce culvert condition ratings.
- Identify areas at risk for emergency replacement and prepare design options in advance of an emergency.
- Work with the Fish Barrier Removal Board to identify other funding opportunities to support the replacement of local barriers.

Recent Advances

- Agencies are recognizing multiple co-benefits of fish passage projects, including improved climate resilience and regional floodplain enhancement.
- Betterments and resiliency are now eligible expenses included FHWA emergency relief funding manuals.
- Public and legislature awareness of nature-based solutions, green infrastructure benefits.

Address Chronic Environmental Deficiencies

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Environmental Services	DFW DNR ECY	Tribes Local Jurisdictions Non-profits Federal Resource Agencies	Flood **Goal 5**	Transportation Budget

Objective

Address areas of repeated maintenance and include them in the Transportation Asset Management Plan. Mitigate using nature-based solutions that are resilient to climate hazards.

Description

Chronic Environmental Deficiency sites (CEDs) are locations along the state highway system where recent, frequent, and chronic maintenance repairs to the state transportation system are causing impacts to fish and fish habitat. CED site projects are those where maintenance has been conducted on the site at least 3 times in the past 10 years. This frequent repair causes impacts to the fish habitat. Repair may be needed due to frequent flooding and streambank erosion.

For each site, WSDOT conducts either a reach assessment that evaluates and identifies the hydrologic mechanisms for failure and develops a conceptual design solution. By the end of FY 2017, 39 projects were completed, and seven are funded for design and/or construction (through CED or other funding program). A total of 154 sites (or groups of sites) have been nominated for CED analysis over the life of the program. Some CED projects are funded under emergency situations.

http://www.wsdot.wa.gov/NR/rdonlyres/D1C5C43D-A352-4651-9A98-F9D7AEEF6059/0/FY201617CEDAnnualReportFinal.pdf

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Fix 2-year project list.	• Fix up to 6-year project list.	• Program is perpetual in nature, responding to environmental and human/land use change.

Implementation Actions

- Add CED to risk-based Transportation Asset Management Plan. https://www.fhwa.dot.gov/asset/pubs/incorporating_rm.pdf
- Complete current prioritization list and continue adding to the list over time.

Recent Advances

- Completed CED status report
- Ongoing technical support

Slope Stability Programs

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Engineering Geology Section	WSDOT EMD DNR	Local Jurisdictions Tribes	Landslide **Goal 5**	Transportation Budget

Objective

Reduce the safety and economic impacts of unstable slopes on transportation facilities through the integration of geotechnical recommendations into infrastructure design, proactive mitigation of known unstable slopes, and effective emergency response to emergent slope failures.

Description

The WSDOT Engineering Geology Section is tasked with mitigating hazard related to unstable slopes (landslides, rockfall, and debris flows) through four distinct functions: 1) hazard input to design, 2) administration of the Unstable Slope Management (USMS) Program, 3) administration of the Risk Reduction Scaling (RRS) Program, and 4) emergency response to slope failures. Hazard input to design takes the form of providing design recommendations to capital improvement projects in order to reduce or mitigate the impact of slope hazards on fish passage, bridge replacement, and highway improvement projects. Administration of the USMS and RRS Programs involves maintaining an up-to-date database of all known unstable slopes that impact highway infrastructure, including rating the relative hazard of these slopes. This database feeds programming of design and construction projects to either fully mitigate the unstable slope hazard or reduce risk on the slope through scaling of loose rock material. In addition to the above, this group responds to unstable slope emergencies that impact state routes, assesses the need for route closure to protect the public, and designs and assists in the construction of repair of the emergent slope failure. The above functions include outreach and coordination with our partners at the Department of Natural Resources (State Geologic Survey and Forest Practices) as well as providing specialized engineering geology expertise to local jurisdictions.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Continue to provide hazard support to ongoing Improvement and Preservation Project design. • Complete 2-year funded slope mitigation priorities. • Develop Unstable Slope and Constructed Features Asset Management Plan	• Implement Unstable Slope Constructed Feature Asset Management Plan • Initiate seismic resilience planning for unstable slopes in cooperation with EMD	Continue to develop in-house expertise in the area of unstable slope mitigation through investment in staff development and technology

Implementation Actions

- Maintain USMS Database and priority programming array for mitigation of unstable slope repair projects and execute design and construction of these repairs.
- Develop and implement the Unstable Slope and Constructed Features Asset Management Plan.
- Deploy real time GPS-based monitoring system on active landslides to aid in assessment of risk.

Recent Advances

- Increase in drone application for rockslope mitigation projects, including structure-from-motion imaging
- Acquisition of LiDAR processing software to assist in rockslope mitigation design
- Development of specification language for debris flow and rockfall impact fences
- Pilot study of real time GPS movement of landslides

Transportation System Climate Impacts Vulnerability Assessment

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Climate Change Steering Committee	UW Climate Impacts Group	FHWA State Agencies (Interagency Climate Adaptation Network)	Flood Wildfire Coastal Erosion Landslides **Goal 3** **Goal 5**	Transportation Budget FHWA

Objective

Use WSDOT Climate Vulnerability Assessment to improve resilience of WSDOT-owned assets. Ensure that *WSDOT's plans and projects undergoing environmental review, will document how climate change and extreme weather vulnerability are considered, and propose ways to improve resilience. (Results WSDOT Strategy 3.2)*

Description

This qualitative assessment ranked all WSDOT assets for vulnerability to statewide climate threats. Results indicate where climate may exacerbate or intensify known risks to state roads, rail, ferry terminals, airports. These results are used in planning and project level improvements. Planners and project teams use this information to flag potential risks for infrastructure investments. This information is shared with project stakeholders and discussed in plans and environmental documents so that decision makers are informed of risk and ways to reduce risks.

WSDOT completed Federal Highway Administration's climate change vulnerability assessment pilot program in 2011 and immediately began implementing its results in project-level planning and design. In 2015, WSDOT completed a second FHWA pilot in cooperation with the major flood study underway in Skagit County. Currently working on third pilot with FHWA and The Netherlands. WSDOT is testing European climate assessment tools and nature based solutions/climate adaptation strategies.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Complete pilot with FHWA and The Netherlands re: SR 167 completion project's riparian / floodplain enhancement • Integrate consideration of climate vulnerability into corridor plans and project design for resilience • Partner with UWCIG to keep current on regional, actionable climate change science	• TBD	• Improve resilience of transportation system

Implementation Actions

- Educate planners on use of results in corridor plans.
- Institutionalize climate consideration through internal guidance and manual updates and training.
- Work with federal, state, tribal and local partners, including ICAN

Recent Advances

- Completed guidance for planners describing how and when to use the results of the vulnerability assessment, July 2017 http://www.wsdot.wa.gov/sites/default/files/2017/07/24/GuidanceDoc-ConsideringClimateChangeInWSDOTPlans.pdf
- WSDOT's corridor sketch plans now contain climate vulnerability assessment results for each corridor. http://www.wsdot.wa.gov/planning/corridor-sketch-initiative

WSDOT "Seismic Lifeline Route" Retrofit Projects

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Emergency Management	DNR EMD	Local Jurisdictions	Earthquake **Goal 2** **Goal 5** **Goal 7**	Transportation Budget

Objective

Retrofit seismically-vulnerable bridges in Western Washington to prevent collapse; develop a lifeline route connecting Paine Field in Everett to McChord Field on JBLM.
Expand lifeline north and south from Portland to Canada, and east-west to Moses Lake. Include tsunami evacuation routes to the coast. Complete this plan within 50 years. Design all new bridges to at least the 1000-year probability event.

Description

For nearly 30 years, incremental steps have been taken to increase overall resilience and prevent structure collapse along Washington's most densely populated transportation corridor. This "Seismic Lifeline Route" includes the Interstate 5 (I-5) corridor from Paine Field (Everett) in the North, to Joint Base Lewis–McChord (Lakewood) in the South. This Central Puget Sound section of the Seismic Lifeline Route is planned to be completed within the next 10 years, but there is much more to be done. Statewide, an additional 592 bridges are identified as requiring seismic retrofitting. American Association of State Highway and Transportation Officials (AASHTO) standards currently address 1,000-year and 2,500-year seismic events, and it is still unknown if retrofitting to these standards would be enough to withstand the impacts of a full rupture of the CSZ.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Most of the next 2 years will be spent in a design and planning phase, prioritizing bridges for retrofit	• Retrofit construction based on priorities identified during design and planning phase	• Expansion of the Seismic Lifeline into a comprehensive North to South route from the Oregon State Line to the Canadian Border, and East to West from I-5 to the coast and beyond the Cascades.

Implementation Actions

- Identify the AASHTO standard that bridges should be built and retrofitted to withstand a Cascadia Subduction Zone event (i.e. 1000-year, 2500-year, or greater).
- Identify priority routes and conduct research on the liquefaction hazards under bridges.
- Conduct research to thoroughly analyze the effects of a CSZ event on WSDOT structures (bridges, tunnels, etc.).
- Submit a funding request to expand the lifeline to comprehensive a north/south route from the Oregon Border to the Canadian Border, and east/west from I-5 to the coast and beyond the Cascades.
- Continue with emergency management planning and communication with local jurisdictions.

Recent Advances

- In the past 2 decades, WSDOT has addressed bridge seismic retrofit needs through the following actions:
  - 316 bridges have been seismically retrofit with one (Bridge 405/16 – I-405/SR167 Connectors Design Build) currently under contract.
  - Another 119 have been partially retrofit, but require additional work to meet current seismic standards.
  - Investing more than $195 million on stand-alone projects to strengthen bridges to better withstand earthquakes
  - Construction of the following bridges to incorporate 2,500-year seismic standards: the new SR 99 Tunnel, SR 520 floating bridge, and the new Tacoma Narrows Bridge.

Stormwater Retrofit

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Environmental Services	ECY	Public and private land managers	Flood **Goal 5**	Transportation Budget

Objective

Build flow control facilities to address existing pavement that does not have flow control, or for which flow control is not to current standards contained in the Highway Runoff Manual, using project-triggered, stand-alone, and opportunity-based stormwater retrofits.

Description

Most of WSDOT's highways and facilities were built before the federal Clean Water Act and the Washington Water Pollution Control Act were enacted. Thus, many of the existing highways do not have facilities to control stormwater flow or treat stormwater runoff. WSDOT addresses these deficiencies through stormwater retrofits, as required by our National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Permit (Permit).

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Complete flow control retrofits on active construction projects in the 17-19 biennium that trigger requirements. • Complete construction of retrofits funded in the 17-19 biennium (may include stormwater treatment only). Scope retrofit needs for future projects.	• Complete flow control retrofits on active construction projects (on 6-year plan) that trigger requirements. • Complete construction of retrofits based on I-4 funding appropriated by the Legislature (may include stormwater treatment only).	• Continue to address project-triggered retrofit requirements based on triggers. • Continue to complete stand-alone stormwater retrofits based on I-4 funding appropriated by the Legislature (may include stormwater treatment only).

Implementation Actions

- Project-triggered stormwater retrofits are evaluated when a transportation project's boundaries include untreated impervious surfaces, and the project triggers requirements in Sections 3-3 and 3-4 of the HRM to add stormwater treatment and/or flow control. Project- triggered retrofits are funded by project funds.
- Standalone stormwater retrofits funded through the Environmental Retrofit sub-program (I-4) occur when projects are initiated to address stormwater treatment and/or flow control at a prioritized location defined by WSDOT's stormwater needs prioritization process described in our Permit. An updated prioritized list of needs is submitted annually to Capital Program Development and Management for funding decisions.
- Discussions are underway to address retrofit with community partners such as non-profit groups, private developers, and local jurisdictions. These discussions are just beginning.

Recent Advances

- Completed statewide prioritization of high and medium standalone stormwater retrofit needs in July 2017.

Bridge Scour Mitigation

Lead	Partners	External	Hazards/Goals	Funding/Costs
Bridge Engineer WSDOT	Local agencies FHWA	WDFW, WA Ecology, US Corps of Engineers, Native American Tribes, local Jurisdictions, land owners	Flood **Goal 5**	Transportation Budget

Objective

Scour is the leading cause of bridge failures in Washington State and nationwide. Of the 70 documented bridge failures in Washington State history, 43 were due to scour. The goal of WSDOT's Bridge Scour Mitigation Program effort is to address the risk of future bridge foundation undermining due to scour during flooding events.

Description

Scour is the removal of soil from around bridge piers and abutments. Flowing water transports soils from around bridge piers and abutments and moves it down stream, leaving the bridge foundations exposed and in some cases undermined. Undermined bridge foundations can compromise the integrity of the structure and in some cases cause collapse. WSDOT has approximately 1,583 vehicular bridges and culverts over 20-feet in length that span over water. 262 of these bridges are considered "scour critical" which means there is potential for the bridge to be damaged by scour. WSDOT's efforts to ensure that these bridges are safe and haven't been damage by scour fall in to two categories, monitoring and response.

Monitoring: WSDOT performs routine inspections of its bridges at least once every two years. In some cases where there are specific concerns, bridge inspections are more frequent.

Responding: If scour damage has occurred that compromises the integrity of a bridge, the bridge is closed to traffic until repairs are made. If scour has occurred but the damage does not compromise the integrity of the bridge, WSDOT will take action to repair the damage.

http://www.wsdot.wa.gov/publications/fulltext/Bridge/Scour_Folio.pdf

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• $4.8M Funded in 2017-19 Biennium • Complete Repair of 3 bridges • Develop PE on 3 bridges.	• $21M funded in 2017-23 biens • Complete Repair of 10 bridges	• Program is perpetual in nature, responding to changing conditions.

Implementation Actions

- Identify Needs – Bridge inspection data is reviewed to identify bridges that have a bridge scour repair need.
- Prioritize Needs – Once the list of needs is determined, the details of each case are reviewed and prioritized against each other on a statewide basis.
- Program and Fund Projects – The funds that are available for bridge scour repairs are assigned to the top bridge scour needs. Usually only three or four bridge scour repair projects are programmed each biennium.
- Design Repair – WSDOT staff including bridge engineers, hydraulic engineers, and environmental staff work together to design the repair and appropriate mitigation.
- Obtain Permits – WSDOT staff work to obtain permits from the appropriate entities to construct the repair. This process usually takes about 2-years.
- Construction – The project is advertised and awarded to the Contractor with the lowest bid. Construction of most scour repairs typically takes less than a month.

Recent Advances

Bridge scour repairs were completed by WSDOT maintenance crews in years past. Recent changes to permitting processes have precluded maintenance crews from completing bridge scour repairs due to limitations in staff and funding. Today, most bridge scour repair projects are completed through the Bridge Scour Mitigation Program.

Transportation Asset Management Repeat Repair Sites

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSDOT Highway Asset Manager	WSDOT Internal: Capital Program Development Division Maintenance Division	FHWA Regional Transportation Planning Organizations	Flood Landslide **Goal 5**	Transportation Budget

Objective

As part of the agency's risk-based asset management program, WSDOT will fully comply with the following federal rule: Statewide Evaluation 23 CFR Part 667, Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction due to Emergency Events, 667.1 Statewide Evaluation.

State DOTs shall conduct statewide evaluations to determine if there are reasonable alternatives to roads, highways, and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events. Repair and reconstruction includes permanent repairs but excludes emergency repairs.

Description

As part of the federal National Highway Performance Program (NHPP), MAP-21 adopted a requirement for state DOTs to develop and implement risk-based asset management plans for the National Highway System (NHS) to improve or preserve the condition of the assets and the performance of the system.

Conduct periodic evaluations to determine if reasonable alternatives exist to roads, highways, or bridges that repeatedly require repair and reconstruction activities.

FHWA's rule calls for State DOT submission of an asset management plan meeting all requirements by **June 30, 2019**. FHWA will make an annual determination whether the State DOT has developed and implemented an asset management plan consistent with this rule. FHWA's determination will be based on whether the state DOT:

a. developed its asset management plan using certified processes;
b. the plan includes the required content;
c. the plan is consistent with the statute and this rule; and
d. the State DOT has implemented the plan.

The State DOT must show that it is using the investment strategies in its asset management plan to make progress toward achievement of its targets for asset condition and performance of the NHS, and to support progress toward the national goals identified in 23 U.S.C. 150(b).
State DOTs are required to update their asset management plan development processes, and the asset management plans themselves, at least every 4 years.
Updated procedures and plans must be submitted to FHWA for recertification of the procedures and a new consistency determination at least 30 days before the deadline for the next FHWA consistency determination.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Complete statewide evaluation of National Highway System (NHS) by November 23, 2018 • Complete all other state highways by November 23, 2020	• Complete updates every 4 years • Consider results when developing projects	• Improve resilience of National Highway System

Implementation Actions

2018:

- Research emergency repair information sources from 1997 to present
- Compile data needed for evaluation
- Conduct evaluation of NHS routes
- Hold risk-management workshop to develop potential solutions / reasonable alternatives

2020:

- Complete similar work for remaining routes (non-NHS) excluding tribally owned and federally owned (per law)

Mitigation Planning Coordination

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
Mitigation Strategist EMD	COM ECY DNR DOH OSPI	Local Jurisdictions FEMA BLM	All Hazards **Goal 1** **Goal 4** **Goal 5** **Goal 6**	HMGP PDM FCAAP

Objective

All Natural Hazard Mitigation Plans are integrated, where appropriate, with applicable Community Wildfire Protection Plans (CWPP) and Flood Hazard Mitigation Plans (FHMP). NHMP risk assessments inform Critical Areas Ordinances (CAO). Comprehensive plans consider and implement risk reduction and resiliency strategies. EMD, COM, ECY, and DNR provide mutually consistent technical guidance for all planning efforts. Planning teams include school districts, water systems, and other important local entities.

Description

There is a close relationship between NHMPs, CWPPs, Comp Plans, and FHMPs. NHMPs, CWPPs, and FHMPs have essentially identical requirements and can easily be integrated into a NHMP planning process. Comprehensive plans should reflect risks identified in NHMPs and are valuable tools, along with the CAO, to implement regulations to control development in Geologically Hazardous and Frequently Flooded Areas. EMD, ECY, DNR, and COM will work together to develop guidance and crosswalks to support integrated, and closely related, plans. This will save money for local jurisdictions in the state by unifying planning processes and will improve the effectiveness of GMA regulation.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop consistent, interagency planning guidance. • Develop crosswalks for requirements between CWPPs, FHMPs, NHMPs, and Comp Plans/COAs.	• Incentivize plan integration and, where appropriate, unification through state and federal planning grants.	• Plan unification or integration is the norm.

Implementation Plan/Actions

- Develop plan crosswalks and include them in the 2018 State Enhanced Hazard Mitigation Plan update.
- Work with state agencies to develop guidance on mitigation planning team formation and outreach to make sure that stakeholders who should be involved at the local level, are.
- Incorporate guidance into existing agency outreach and plan review procedures.
- Consider developing local mitigation plan requirements that incorporate newly-developed guidance.
- Provide additional funding for NHMPs that integrate other relevant plans.

Recent Updates and Advances

- Draft guidance has been developed for integrating CWPPs and FHMPs with NHMPs.

Mitigation Planning Technical Assistance

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
EMD Mitigation Strategist	ECY Academic Institutions COM DNR	Planning Contractors Local Jurisdictions	All Hazards **Goal 1** **Goal 5**	HMGP PDM FCAAP HFRA

Objective

100% of Washington Counties, Cities, and Tribes are covered by updated, FEMA-approved hazard mitigation plans and these plans lead to projects that reduce identified hazards and vulnerabilities. These plans will be, where appropriate, closely integrated with local Critical Areas Ordinances, Community Wildfire Protection Plans, and be worth at least 250 CRS points.

Description

Washington Emergency Management Division, Mitigation and Recovery Section, manages grants, reviews local plans, and provides technical assistance to support mitigation planning and mitigation projects. Currently, many county plans expire before they apply for grant awards to update their mitigation plan, rendering them ineligible for mitigation grants. To reach full mitigation plan coverage, and maintain consistent plan updates prior to expiration, the Mitigation Strategist will work with the Hazard Mitigation Program Manager to engage and fund plan updates for jurisdictions three years prior to plan expiration. The Mitigation Strategist will provide at least two technical assistance visits for each jurisdiction during the planning process (at kickoff and one follow-up at 50%) in addition to engagement prior to and during grant applications. Additionally, the Mitigation Strategist will work closely with partners at Departments of Commerce, Ecology, and Natural Resources to align planning for all hazard mitigation with critical areas planning, flood mitigation, wildfire risk reduction respectively and unify technical assistance to local jurisdictions to encourage better plan integration.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• All counties have updated mitigation plans by 2020 • Institute improved planning contracting standards.	• All counties, cities, towns, and participating tribes have updated, or are updating, hazard mitigation plans by 2023.	• Mitigation plan updates are funded prior to plan expiration. HMPs, CWPPs, Flood Hazard, and Comprehensive Plans are integrated.

Implementation Plan/Actions

- Develop planning guidance and best practices for coordinating Comprehensive Planning, Flood Mitigation Planning, Multi-Hazard Mitigation Planning, and Community Wildfire Protection Planning and incorporate into technical assistance strategy in 2018 SEHMP.
- Develop a list of approved contractors for mitigation plans as a tool to make the planning process easier and less costly. Work with contractors to communicate State expectations; as necessary, implement state planning requirements.
- Investigate available options to improve contracting practices and standards, including an approved contractors list or a statewide master contract for local mitigation planning.
- Present at statewide forums, conferences, and to planning contractors on state mitigation planning guidance and expectations.

Recent Updates and Advances

- Planning crosswalks for Critical Areas, Flood Mitigation, and Wildfire Protection Planning were developed in 2017.
- All counties without plans were funded or applied for planning grants in 2017.

Hazard Mitigation Assistance Grants

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
EMD SHMO	DNR ECY OSPI COM DAHP	Local Jurisdictions FEMA Conservation Districts Fire Districts	All Hazards **Goal 1** **Goal 4**	HMGP PDM/FMA General Fund

Objective

Increase the quality of HMA proposals submitted to FEMA, expand HMA grant participation in "underrepresented" communities, and proposal connection to long-term resiliency goals established by each sub applicant through more organization, outreach, and application development in advance of disasters so that more entities have "shovel-ready" projects ready for submittal during open HMA funding opportunities.

Description

Hazard Mitigation Assistance Grants are provided to Washington state local and tribal governments to reduce the effects of natural hazards and mitigate vulnerability to future disaster damage. As an Enhanced state, Washington maintains a comprehensive HMA program to engage local jurisdictions and state partners and receives an extra 5% (for a total of 20%) of the total allocation of federal assistance from a Presidential Disaster Declaration for the Hazard Mitigation Grant Program following a Presidential Disaster Declaration. Other funding opportunities include Pre-Disaster Mitigation and Flood Mitigation Assistance, which are annual, nationally-competitive, programs, not associated with a disaster declaration.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Every jurisdiction with SRL/RL submits at least one application. • Establish intern-reservist program. • Establish broader-based HMA-outreach program. • Achieve reduced turnaround, submission to award, for HMA applications. Reflect achievement in annual HMA consultation. • Develop HMA Coordinator Manual.	• By meeting plan update schedules, direct more PDM funds to hazard-specific projects. • Deeper and stronger connections with the academic community around mitigation and resiliency issues. • Improve the Mitigation Program website. • Reduce POP Extension Requests by a significant percentage.	• Achieve broad-based awareness among communities of their mitigation goals and objectives and where HMA fits in reaching resiliency.

Implementation Plan/Actions

- Develop a pool of interns and/or reservists to support application development during and after disasters. Start with a relationship with Pierce College.
- Increase outreach to sub-applicants with limited staff or application experience.
- Improve review process for application completeness and quality to reduce RFIs and RFI complexity and review time. This also supports the maintenance of Washington's Enhanced status. This is done through better year-round coordination with FEMA and proactive engagement with sub-grantees.
- Improve application and sub-grantee engagement tracking, using tools such as SharePoint Workflows. Establish this in a desktop HMA Coordinator manual.
- Improve coordination with Public Assistance, including through joint technical assistance to impacted jurisdictions and 404/406 coordination.
- Proactive, data-targeted outreach, including state partners, to potential FMA partners in advance of NOFOs. Especially take advantage of Community Flood Mitigation priorities.
- Advocate with FEMA for expanded Community Flood Mitigation options in FMA.

- Follow up with HMA-funded projects to assess effectiveness.
- Improve EMD Mitigation website.

Recent Updates and Advances

- EMD HMA streamlined planning and project grant administration, reorganizing workload among HMA staff and streamlining the process, using efficiency tools such as workflows, and managing all HMA grant applications through a shared process.
- FEMA implemented a new priority for FMA, Community Flood Mitigation.

Business Continuity Planning and Interagency Coordination

Lead	Partners	External	Hazards/Goals	Funding/Costs
EMD Private Sector Program	EMD COM OIC	CREW WAFAC Local Jurisdictions	All Hazards **Goal 2** **Goal 4**	$100k

Objective

EMD will support activities to help prepare all businesses, from microbusiness to large corporations, for the hazards that are present in their communities. This will be done through coordinated outreach and technical assistance to small and community businesses and the development of a framework to facilitate information sharing with large businesses.

Description

In the aftermath of an emergency or disaster, reviving the local and/or regional economy is essential for the recovery of impacted communities and improving community resilience. Without gainful employment, residents leave, and often never return. Further, a healthy, vibrant community cannot exist when unemployment, as well as homelessness, housing shortages, and poor water quality persist and are exacerbated by a disaster. Business continuity planning helps companies reduce their vulnerabilities prior to an emergency or disaster; aiming for a quicker recovery following the emergency or disaster.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Establish stakeholder workgroups and develop tailored training programs. • Identify partner organizations at the local level to engage small/medium businesses.	• Deliver training to rural businesses. • Fund the DRB toolkit as a web-based application.	• Explore legislation to establish one FTE that is dedicated to increasing business continuity efforts statewide.

Implementation Actions

- Establish a stakeholder business continuity workgroup of relevant entities.
- Upon establishment of a business continuity workgroup, complete an assessment of programs to determine how to best leverage existing training and outreach opportunities that may be available for small-to-medium sized businesses within Washington.
- Continue the Emergency Management Division's business outreach campaign by continuing to work through partnering business networks to reach small & medium sized business audiences.
- Deliver training and provide technical assistance to rural businesses.
- Establish state funding for conversion of the Disaster Resistant Business Toolkit (www.DRBToolkit.org) from a desktop application to a web based application.
- Explore legislation to establish one FTE that is dedicated to increasing business continuity efforts statewide.

Recent Advances

- Following years of development, the Business Re-Entry (BRE) Registration program has been approved and be activated pending the completion of necessary software.
- A Business Preparedness Survey created by the EMD Private Sector Program in collaboration with the Department of Commerce was released through business communities.
- Between June 2016 and June 2017, the EMD Private Sector Program has presented on continuity planning to 18 different small & medium business audiences reaching over 700 individuals.

Earthquake Early Warning

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
Earthquake Program EMD	UW – PNSN WSDOT OSPI DOH ODW	USGS FEMA NOAA Private Industry Ports Utility Companies	Earthquake Tsunami **Goal 2** **Goal 3** **Goal 4** **Goal 5**	NEHRP

Objective

Full, public rollout of Earthquake Early Warning in Washington State.

Description

Earthquake early warning (EEW) detects and measures earthquakes fast enough that warning can be given before the strongest shaking arrives, providing seconds to minutes to prepare. Earthquake early warning is being implemented in many locations around the world. The 2011 Tohoku Earthquake demonstrated some of its advantages. The earthquake was recognized as serious within 30 seconds of its initiation offshore. Tokyo residents had ~30 seconds warning of approaching strong ground motion. Cell phone alarms warned millions of people when large aftershocks were likely to soon rattle them.

On the west coast of the US, with USGS funding, Cal Tech and UC Berkeley have developed and are testing an early prototype EEW system known as ShakeAlert in California. In November 2012, the Moore Foundation announced awarded grants to Cal Tech, UC Berkeley, and the University of Washington to develop and begin testing this prototype system.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Have funding in place for system implementation. • Begin automated system outreach and education strategy, focusing on schools, first responders, and critical facilities.	• Complete full public system rollout.	• Maintain and improve system, with statewide use by all major private and public-sector partners and the Washington residents.

Implementation Plan/Actions

- Develop and implement a joint Oregon and Washington earthquake early warning implementation strategy, including a cost estimate.
- Submit funding requests to the state legislature.
- Conduct education, training, and outreach to all users of earthquake early warning, including private industry, utilities, government agencies, public.
- Support, as an information clearing house, technical coordination and facilitation for users to develop and install automated early warning mitigation systems.
- Develop and publicize protective action best practices for system users.
- Maintain and improve earthquake early warning implementation and outreach programs.

Recent Updates and Advances

- Formed a committee and received a NEHRP grant to develop an Oregon and Washington joint system implementation strategy.

Statewide Building Vulnerability Inventory

Lead	Partners	External	Hazards/Goals	Funding/Costs
EMD	DAHP DES DNR COM	WABO ASCE AIA FEMA SEAW	Earthquake **Goal 2** **Goal 5**	Greater than $500k to develop system.

Objective

Undertake a comprehensive inventory and assessment of earthquake-vulnerable buildings, including historic buildings, URMs, schools, and hospitals across Washington and make the data publicly available. This will provide critical data on areas with high seismic risk and buildings in need of retrofit for planning purposes.

Description

Unreinforced Masonry Buildings (URMs) are one of the most vulnerable building types for earthquake-prone regions of the country like Washington state. A typical URM is a brick building built prior to 1940 that lacks the steel reinforcement and structural connections needed to stand up to seismic motion. While some individual jurisdictions have made efforts to catalogue URMs in their communities, there is no central data source to estimate the number and locations of these buildings statewide. To understand the magnitude and geographical distribution of the risk both at a community- and statewide scale, and to estimate the potential costs to reduce the risk through seismic retrofit, it will be necessary to conduct an inventory. This will provide critical data on areas with high seismic risk and buildings in need of retrofit for planning purposes. While the inventory/database will only need to be completed once (then maintained as new information arises), this project will require a high level of effort over a long term to complete

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Initiate and make progress in statewide inventory. • Convene advisory committee.	• Conduct RFI and RFP for assessment contractor. • Begin statewide building assessment based on inventory. • Request appropriation from Legislature.	• Compile data provided by inspectors that conducted building assessments • Conduct public outreach.

Implementation Actions

- Convene a stakeholder advisory committee including representatives from relevant organizations with roles in building ownership, assessment, building attribute collection and inventory.
- Complete an inventory of existing earthquake-vulnerable buildings and a repository of information accessible to stakeholders.
- Conduct a Request for Information (RFI) process to solicit information from qualified contractors on their proposed solutions to develop and deploy a statewide assessment process. Follow with an RFP process.
- Complete an assessment of existing database/building inventory systems used by local jurisdictions.
- Begin building assessment and initiate data collection if resources are appropriated by the Legislature.
- Compile data provided by inspectors that conducted building assessments.
- Include information about data and where it can be found within broader public education and outreach efforts that may be initiated as part of Resilient Washington.

Recent Advances

- A request was included in the 2017-2019 Capital Budget for the Department of Commerce to initiate an assessment process of URM structures and 2017 HB 1075 Section 1053 requested funding for the Department of Commerce to contract for a seismic study regarding suspected unreinforced masonry buildings in Washington state.
- DAHP's WISAARD database is starting point for targeting historic properties to participate in this program.

Tsunami Risk Mitigation

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
Tsunami Program EMD	DNR UW	NOAA FEMA USGS	Tsunami **Goal 1** **Goal 3** **Goal 4**	NTHMP FEMA Local Bonds Capital Budget

Objective

Design, develop and fund tsunami vertical evacuation structures and continue to install sirens in tsunami inundation zones. Maintain engagement with communities and the public through information campaigns.

Description

The 2011 Project Safe Haven Study established that for life safety along the coast in the event of a tsunami, at least 50 more of the structures are needed, with locations varying by population density. Many coastal areas are working on modifying planned or routine construction into vertical evacuation structures. Each project is a multi-year effort involving the collaboration of multiple agencies in a process that includes feasibility, design, site-selection, geotechnical analysis, community involvement, acquisition of funding, and site-specific aspects.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Support existing efforts to build and/or adapt local structures into tsunami vertical evacuation structures with a focus on schools.	• Support one or more local jurisdiction projects to build a pilot vertical evacuation structure.	• Support the planning, development, and construction of tsunami vertical evacuation structures by local and tribal jurisdictions.

Implementation Plan/Actions

- Implement/build tsunami vertical evacuation plans developed by local and tribal jurisdictions through "Project Safe Haven" to minimize loss of life during local tsunamis. Secure adequate funding to construct a sufficient number of vertical evacuation structures for the safety of the Washington populace. Support one or more local jurisdiction projects to build a pilot vertical evacuation structure and demonstrate the most cost-effective approaches and identify funding options that may be instituted on a regional or local basis.
- Develop a guidebook on steps to take for jurisdictions or organizations who want to build a vertical evacuation structure.
- Develop guidance and continue to support the installation of sirens.
- Develop and adopt tsunami-resilient building codes, dedicating resources to the enforcement of the updated codes, especially for critical infrastructure in high risk tsunami zones
- Integrate safe-haven structures into school funding.

Recent Updates and Advances

- Project Safe Haven Round 3, workshops to identify potential sites for Tsunami Vertical Evacuation Structures will occur in 2018.
- Pacific County Fire District was awarded HMGP funds to begin planning a fire training tower and vertical evacuation structure.
- One structure completed at Ocosta Elementary School.
- One structure in design phase at Long Beach.
- Plans in place to relocate Taholah and Makah Reservation infrastructure out of tsunami zone.
- Pedestrian evacuation modeling being conducted to show where improvements are necessary.
- Tsunami inundation mapping being conducted to understand where there are tsunami hazard areas.

Insurance Incentives for Hazard Mitigation

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
OIC	EMD DNR ECY	Insurance Industry State Legislature	Earthquake Wildfire Flood **Goal 2** **Goal 5**	Staff Time

Objective

Pass legislation to allow insurers to provide incentives for loss mitigation by offering policyholders goods and services intended to reduce the probability of loss and or to reduce the extent of loss from a covered event, such as earthquake, wildfire, and flood to mitigate the impacts of earthquakes, wildfires, and floods to their properties that are in compliance with federal and state law and local ordinances.

Description

Washington State law (RCW 48.30.150) prohibits insurers from offering inducements to purchase insurance. Allowing insurers to offer policyholders goods and services intended to reduce the probability and extent of loss from any undesirable, covered event may increase policy offerings, reduce premiums, and result in more property owners purchasing coverage. Coverage for fire damage is common to property insurance policies. Insurance policies typically do not include coverage for damage related to floods or earthquakes, they must be purchased separately. Limiting the incentives to loss mitigation hopefully ensures that the incentives are tied to sound business practices, rather than aggressive sales tactics.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Pass draft legislation and develop outreach strategies.	• N/A	• N/A

Implementation Plan/Actions

- Draft legislation – Fall 2017.
- Obtain sponsorship and pre-file bill for 2018 legislative session.
- Develop support among state agencies, local government, private industry, and consumers.
- Passage and implementation of legislation.
- Develop rules for implementing legislation.

Recent Updates and Advances

- The Governor signed SHB 2322 into law on March 22, 2018. The law gives property and casualty insurers the ability to offer policyholders up to $1,500 for goods or services to reduce the risk of losses. The OIC must review and authorize the incentives before they can be offered. The bill has an effective date of June 7, 2018. OIC has referred this measure to its rules committee.

Increase Earthquake Insurance "Take-Up" Rates

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
OIC	EMD DES-SBCC	Insurance Industry Other States Property Owners NAIC	Earthquake Fire Flood **Goal 2** **Goal 4** **Goal 5**	OIC Budget

Objective

Improve earthquake insurance take up rates through increasing affordable options and regular, on-going public education efforts targeted to raise consumer awareness of their property insurance protection gap and the need for earthquake insurance.

Description

OIC's Consumer Advocacy Program and Public Affairs Division track issues and work with other agencies, insurers, and consumers to educate and create awareness of safety, and other issues related to insurance. These divisions can update the agency website, hotlines, social networks, and deliver and receive information via a number of media. OIC staff could reach out to other states and work collaboratively with stakeholders to develop methods for increasing take up rates. Private industry associations would be of great help with this initiative.

The California Seismic Safety Commission is working with public universities and the California Earthquake Authority (CEA) to tackle the mitigation efforts and building codes and risk modeling. CEA incentive programs such as "Brace and Bolt" have been effective in encouraging behavior change in some consumers. However, even though a public policy change in requiring earthquake insurance in real estate transactions, stricter land use rules, and stronger building codes and planning are all effective, they will involve significant effort (from many stakeholders) and cost (including time). Public and private work with the (re)insurance industry can be low-hanging fruit as the industry can help regulators or stakeholders to understand the latest modeling techniques and methods.

Washington OIC also proposes consideration of an inquiry for an earthquake/disaster program that would create affordable options for providing earthquake and flood insurance. The proposed program would leverage public relations tools to promote risk mitigation and uptake of flood and earthquake insurance, as well as work to reduce costs for property owners in wildfire prone areas by promoting wildfire mitigation measures. To improve affordability, work to introduce insurance products with broader deductible options, such as 5-10-15-20-25% of insured home value. The proposed program may also focus on public awareness, education, safety, and lowering premiums and deductibles through prescribed mitigation efforts. The proposed program would also work with representatives of federal, state, local, and private interests to ensure that there is a linkage between insurance rates, uptake and mitigation efforts and programs. The proposed program may initiate risk mitigation, or resiliency, programs similar to California Earthquake Authority (CEA) "Brace and Bolt," Insurance Institute for Business & Home Safety (IBHS) "Fortified Homes," National Fire Protection Association's (NFPA) "Firewise" or other similar programs.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop recommendations based on 2017 data call. • Consider legislation for an inquiry of a disaster program.	• N/A	• N/A

Implementation Plan/Actions

- Coordinate public outreach opportunities with EMD. Receive OIC executive's approval to assign staff to research mitigation initiatives in other states and collaborate on methods to increase insurance take-up rates.
- Conduct an earthquake insurance data call to ascertain the take up rate and availability of earthquake insurance in Washington State. Receive responses by fall 2017.
- Increase earthquake mitigation efforts through partnering on earthquake insurance education, strong building codes/land use and improved risk modeling.
- Encourage public-private work with insurers and reinsurers to identify risk and engineer solutions.
- Consider an inquiry of a disaster program.

Recent Updates and Advances

- Office of the Insurance Commissioner was invited and attended the California Seismic Safety Commission's "Seismic Insurance in California, Oregon and Washington: A Meeting of Experts" on August 31, 2017. The meeting was to assess whether there is a need for a collaborative effort to increase earthquake insurance take up rates.
- Meeting with CA and OR to discuss earthquake insurance take up rates and CA study of take up rates with National Academy of Sciences.

School Seismic Assessments and Retrofits

Lead	Partners	External	Hazards/Goals	Funding/Costs
School Facilities OSPI	EMD Geology DNR	WSSDA WAMOA WASBO WASA School Districts FEMA State Legislature	Earthquake **Goal 2**	• $15-25M over 6-10 years. Legislative appropriation required. • Full school retrofit and replacement could cost $450-$900M over 50 years.

Objective

Complete consistent, cost-effective, comprehensive inventories and assessments of Washington school buildings to prioritize seismic risk reduction efforts. Use the methods and system already developed by OSPI to continue work already initiated. Apply the new SSC-developed assessment process for gathering building information which address seismic hazards, liquefaction and nonstructural deficiencies. Use the EPAT tool developed by EERI to populate OPIS ICOS system to prioritize engineering studies at the most at-risk buildings.

Description

The School Seismic Assessment strategy is a statewide, multi-agency effort to assess and prioritize seismic risk at schools. Initially, OSPI and DNR would facilitate school seismic safety surveys by geologists and engineers for every school district and school building. With limited funding OSPI recommends assessing the highest risk building in the state and utilize the established process by OSPI Once the inventory and assessment is complete, building remediation priority can be established and plans and funding mechanisms developed. This strategy will require funding, legislative action, and staff time.

Once assessment and prioritization is complete, repair or replace schools as outlined in the plans.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Request capital funding for evaluations. • Prioritize highest at-risk school buildings and perform assessments for those buildings	• Begin school seismic evaluations throughout the state. • Complete updated ICOS inventory. • Develop retrofit plan. •	• Work with the legislature to establish a retrofit grant program and retrofit or replace identified buildings.

Implementation Actions

- Request capital funding to perform the school evaluations over a six to ten-year period (DNR and engineers) using ASCE 41 methodology
- Update and refine OSPI Information & Condition of Schools (ICOS) with hazard and risk data. Engage districts and provide technical support to school districts
- Run statewide report to identify school building risks to hazards. Prioritize school buildings statewide per highest risk. Based on report provide next step Engineering report using new Earthquake Performance Assessment Tool (EPAT) - designed by a sub group of Earthquake Engineering Research Institute (EERI).
- Based on engineering reports performed on the most at-risk buildings across the state, prioritize the largest risk buildings and request State funding to retrofit or replace the identified buildings
- Establish Earthquake School Retrofit or replacement grant program that could be maintained year after year for continuing to retro fit or replace buildings prioritized in the above Assessments
- Consult with historic preservation agencies (DAHP, others) on appropriate retrofit strategies.

Recent Advances

- DNR, structural engineers, EMD, and FEMA have completed pilot school assessment studies in several locations around the state.
- A FEMA/EMD PDM grant funded OSPI's Information and Condition of Schools inventory system mitigation program.
- 25 school district hazard mitigation plans are completed. As part of grant and seven benefit-cost analyses were performed leading to 2 approved FEMA grants and 1 pending FEMA grant.

- EERI Developed an Earthquake Performance Assessment Tool (EPAT) to provide quantitative damage estimates for a range of earthquake ground motions.

Earthquake Drills in Schools

Lead	Partners	External	Hazards/Goals	Funding/Costs
School Safety OSPI	DNR EMD	School Districts State Legislature	Earthquake Tsunami **Goal 2**	$30k, Annually

Objective

Update language in RCW 28A.320.125 (6)(d) that requires school safety drills from "may" to "must" incorporate an earthquake drill annually, using the state-approved earthquake safety technique "drop, cover, and hold on."

Description

Previous legislation in 2016 allows a school district to voluntarily include this type of drill but falls short of requiring earthquake safety drills. This drill requirement may be satisfied by participating in the annual Great Washington ShakeOut Drill.

School districts in Washington are independent entities, and as such require an act of the legislature if earthquake drills are to be required.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• OSPI and DNR map legislative strategy. • Update SHB 1279. • Establish statewide information collection process to include review and compliance	• Continue to support and show increasing participation in annual Great Washington Shakeout Earthquake drills.	• Update and maintain earthquake drill requirements and continue to expand participation.

Implementation Actions

- Update SHB 1279 – Drill requirements to require earthquake drop cover and hold drill. Change term "May" to "will."
- Continue to fund and use existing Great WA Shakeout Earthquake Drill registration to track metrics related to progress and participation.
- Establish statewide process for collecting information regarding earthquake and other drills this is currently not required at a statewide scale and reaches beyond seismic-related drill data collection.
- Outreach to school districts once the legislation is passed.
- Continue to fund and use Great Washington Shakeout Earthquake Drill to track participation progress and metrics.
- Develop updated safety drill requirements.

Recent Advances

- SHB 1279 in its current form was effective 7/23/2017.
- Participation by school districts in the Great Washington Shakeout continues to increase.

School District Hazard Mitigation Plans

Lead	Partners	External	Hazards/Goals	Funding/Costs
School Facilities OSPI	EMD DNR DOH	FEMA State Legislature School Districts	All Hazards **Goal 2** **Goal 3**	$10k-$30k/District to start. $5k/district/5 years to maintain.

Objective

Support and incentivize school districts to develop hazard mitigation plans, either independently or by participating in a city or county mitigation planning process.

Description

While school districts are not required to develop hazard mitigation plans, doing so makes them eligible for mitigation planning grants through FEMA Hazard Mitigation Assistance grants program. Districts can develop plans either independently or through a cooperative process with their city or county. Plans must meet FEMA requirements and be adopted. Once approved and adopted, they are current for 5 years.

The development and maintenance of a school district hazard mitigation planning program would require partnerships between OSPI, DNR, and EMD. EMD currently funds and reviews local hazard mitigation plans.

The RCW 28A.320.125 already requires all public-school districts and public schools to have current school safety plans and procedures in place. These address all 4 major areas of threats and hazards, and should be included in hazard mitigation and COOP plans. These and COOPs could be more specifically addressed in the RCW.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Work with districts without plans to develop FEMA-approved plans or annexes using OSPI chapters and ICOS information.	• Enact legislation or policy to support and incentivize school district mitigation planning.	• Districts maintain hazard mitigation plans by regularly revising and updating them.

Implementation Actions

- Enact legislation or policy to support and incentivize school district mitigation planning.
- Review opportunity to leverage existing hazard mitigation planning requirements from EMD to support school district involvement in county mitigation plans.
- Work with partner agencies to develop school-specific mitigation planning requirements, as appropriate.
- Work with districts that do not currently have a HMP to develop plan utilizing OSPI documentation or utilize information from OSPI Pre-Disaster Mitigation Program and develop annex to their County HMP
- Input data collected from school district mitigation plans into ICOS.
- Maintain FEMA-approved hazard mitigation plans in accordance with the 5-year FEMA update cycle.

Recent Advances

- 25 hazard mitigation plans from the PDM-grant pilot completed. Plans were both district plans and county annex.

School Continuity of Operations Plans

Lead	Partners	External	Hazards/Goals	Funding/Costs
School Safety OSPI	EMD	School Districts State Legislature WSSDA	All Hazards **Goal 2** **Goal 5**	

Objective

Enact legislation that requires all school districts to develop and maintain comprehensive continuity of operations plans, including provisions for mutual aid (e.g. facility-sharing) between districts.

Description

Continuity of operations planning (COOP) would help school districts respond to and recover from disasters more quickly. COOP planning supports the development of partnerships, mutual aid agreements, and strategies to ameliorate disruption to student learning. Implementing this strategy will require extensive training and in-depth technical assistance to all 295 school districts.

- Although schools may have COOPs, this is more of a district-level function which covers the schools.
- COOPs are functional annexes to the EOP/Safety plans. As noted above, this should/could be called out specifically in an RCW update.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Continue district-level COOP planning (currently in-progress). • Establish district-district Mutual Aid agreements	• N/A	• Maintain local COOPs

Implementation Actions

- Fund staffing and technical assistance resources across 9 ESD's.
- Enact HB 1003, requiring the WSSDA to develop a model disaster response policy and require districts to have continuity of operations plans.
- Maintain and update COOPs on selected update cycles.
- Establish Mutual Aid Agreements.

Recent Advances

- HB 1003 requires WSSDA to develop model policy around natural disaster response. Policy requires districts to have a Continuity of Operations Plan (COOP).

Puget Sound Action Agenda

Lead	Partners	External	Hazards/Goals	Funding/Costs
Puget Sound Partnership	ECY DNR DFW COM DOH WSC	Local Integrating Organizations Puget Sound Institute Puget Sound Ecosystem Monitoring Program NW Straits Commission & Marine Resources Committees Salmon Recovery & Watershed Groups Tribes Academic Institutions Federal and Environmental Caucuses	Coastal Hazards Flood Climate Change Drought **Goal 1** **Goal 5** **Goal 7**	State General Fund EPA National Estuary Program

Objective

The Action Agenda is our region's shared roadmap for Puget Sound recovery. The Action Agenda outlines the regional strategies and specific actions needed to protect and restore Puget Sound.

Description

The Action Agenda is comprised of two components including the Comprehensive Plan and the Implementation Plan. The Comprehensive Plan charts the course for long-term Puget Sound recovery by outlining strategies for protection and restoration, identifying the full scope of actions and funding necessary for recovery, and introducing the approaches by which issues and activities are prioritized, progress is evaluated, and strategies and actions are adapted over time. The Implementation Plan defines the suite of Near Term Actions and ongoing programs that are needed in order to make progress toward achieving the recovery targets for Puget Sound over the next four years. Many of the strategies and actions identified in the Action Agenda address potential impacts from coastal hazards, droughts, and flood, and/or aim to mitigate and account for climate change and changing ocean conditions. In many cases, these strategies constitute multi-benefit approaches that can be employed to mitigate and attenuate hazards of many kinds while also providing enhancements, protection, or restoration of critical natural environments and resources.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Funding and implementation of actions identified in the Action Agenda.	• The Action Agenda is updated every four years with revised and targeted strategies.	Protect and restore Puget Sound. Program is ongoing in nature and employs an adaptive management framework to accommodate new learning and address emerging concerns.

Implementation Actions

- Prioritize the most important strategies for protection and restoration of Puget Sound.
- Identify the full scope of actions, ongoing programs, and funding necessary for recovery.
- Review actions identified in the AA with coordinating state agencies, including the WA Emergency Management Division, and identify opportunities for collaboration and implementation.
- Update the SEHMP with relevant actions and strategies as needed and appropriate.
- Implement the plan through National Estuary Program funding.
- Identify additional mechanisms for funding and implementation of recovery and restoration.

Recent Advances

- The 2018-2022 Action Agenda is currently being updated, and is expected to be adopted in Dec 2018.
- Implementation Strategies associated with specific recovery targets continue to advance and are updated iteratively.

Shoreline Armoring Implementation Strategy

Lead	Partners	External	Hazards/Goals	Funding/Costs
DFW DNR	UW-Puget Sound Institute Puget Sound Partnership	Local Integrating Organizations Puget Sound Institute Puget Sound Ecosystem Monitoring Program NW Straits Commission & Marine Resources Committees Salmon Recovery & Watershed Groups Tribes Academic Institutions Federal and Environmental Caucuses	Coastal Hazards Flood Climate Change **Goal 1** **Goal 3** **Goal 5** **Goal 7**	State General Fund EPA National Estuary Program

Objective

Increase the health of Puget Sound shores while ensuring people and their property are safe and able to continue enjoying Puget Sound beaches. Sustaining shoreline processes provides habitat necessary to support a diverse and resilient marine food web, and also provides opportunity for adaptation to sea level rise and climate-driven changes. A functioning nearshore provides recreation and a natural buffer that protects waterfront properties.

Description

The Shoreline Armoring Implementation Strategy is a strategic plan for aligning opportunities across agencies, programs, projects, and funding. It also highlights the areas requiring the most attention in order to sustain and accelerate the progress of ecological restoration through strategic removal of bulkheads and "softening" of Puget Sound shorelines.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Host annual forum to update performance metrics, incorporate new information that is vital to the strategy, and determine if the regional planning community should make strategy changes.	• Incorporate learning through adaptive management to prioritize areas of focus for specific actions. • Monitor WDGW Hydraulic Project Approvals for permitted armor (installation or removal)	From 2011 to 2020 the total amount of armor removed should be greater than the total amount of new armor installed in Puget Sound.

Implementation Actions

Implementation Plan/Actions

Guiding and motivating action to achieve the objective includes four general strategy categories:

- Improve incentives and education for residential property owners to remove hardened shoreline and protect unmodified shorelines. This includes financial incentives, site visits and technical assistance, and outreach programs for shoreline property owners.
- Improve regulatory implementation, compliance, enforcement and communication to increase habitat protection through training and technical support, effectiveness monitoring, compliance monitoring, and political support for regulatory implementation.
- Increase and improve coastal processes-based design and technical training to expand technical solutions and capacity. Actions include analysis of existing monitoring information on implemented removal and softening projects, and development of a complementary guidance to the Marin Shoreline Design Guidelines.

- Improve long-term strategic planning to support and connect regional partners to develop integrated habitat restoration and protection, transportation, and infrastructure improvement plans. Actions include mapping Puget Sound shoreline attributes using standardized methods, improving quantification of shoreline armor impacts on nearshore ecosystems, developing case studies that can be scaled up to regional programs, and identification of vulnerable and aging infrastructure or unarmored shorelines vulnerable to future armor installation.

Recent Advances

Shoreline armor indicator status for 2011-2016:

- Sound-wide net *increase* of 0.8 miles of permitted armor (3.8 miles new, compared to 3.0 miles removed.)
- Since 2005, only years 2014 and 2016 saw net removal of shoreline armor
- Five counties had net decreases in permitted armor, and 73% of armoring removed occurring in Kitsap, Clallam, Jefferson, Pierce, and Island Counties.

Reduce the Conversion of Ecologically Important Lands for Development

Lead	Partners	External	Hazards/Goals	Funding/Costs
DFW DNR	UW-Puget Sound Institute Puget Sound Partnership	Strategic Initiative Leads Local Integrating Organizations	Coastal Hazards Flood Climate Change **Goal 1** **Goal 3** **Goal 5** **Goal 7**	EPA National Estuary Program

Objective

Reducing development impacts on ecologically important lands and enhance the ecosystem services those lands provide.

Goals:

- Puget Sound basin-wide loss of vegetation cover on ecologically important lands under high pressure from development *does not exceed* 0.15% of the total 2011 baseline land area over a five-year period.
- The proportion of basin-wide growth occurring within urban growth areas is at least 86.5% (equivalent to all counties exceeding their population growth goals by 3%), with all counties showing an increase over their 2000–2010 percentage.

Description

- Develop regional definitions of, standards for, and metrics on ecologically important lands to assist decision makers throughout Puget Sound to protect and restore ecologically important lands both proactively and opportunistically.
- Focus on directing development and population growth towards preferred growth areas, by making it more cost effective and desirable to live in compact areas.
- Reduce the barriers to urban living, simplify the permitting process, and promote growth in areas deemed more suitable for development because of their lack of ecological or agricultural possibilities. Combined, these actions will reduce the impacts of residential and commercial development on ecologically important by providing a shared understanding of locations for compact growth to occur. This strategy identifies needs in order for compact growth to occur in preferred areas including identifying those areas and the barriers associated with parcel-specific growth sites, seeking to understand the underlying costs of developing different areas, and seeking to guide social preferences towards compact growth for the purposes of channeling growth away from ecologically important areas.
- Make progress toward preserving working lands and their ecological function. Preserving working lands for agricultural purposes ultimately reduces land conversion and retains valuable ecological processes, especially in agricultural lands that use best management practices.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Define & locate ecologically important lands to determine which are under pressure of conversion. • Estimate cost of recovery of ecologically important lands.	• Identify and encourage science and research needs to address unknowns and uncertainties. • Complete updates to shared strategies based on information gathered in earlier phases.	Provide the information and tools necessary to help planners and decision makers throughout the region be proactive in protecting lands that are important and restore those that remain, guiding growth towards preferred growth areas.

Implementation Actions

Guiding and motivating action to achieve the objective includes three action areas:

- Protect and restore ecologically important and rural lands.
- Reduce barriers to infill and redevelopment within Urban Growth Areas.
- Support working lands by developing shared strategic plans to preserve working lands and help to maintain the land base and infrastructure to support the agricultural purposes.

Recent Advances

- From 2006 to 2011, the basin-wide loss of vegetation cover was 0.36%, more than double the target of 0.15%.
- Three counties with the greatest total acres of change:
    - Mason: 0.37 percent/year, or 23 percent of all change on Puget Sound ecologically important lands.
    - Pierce: 0.28 percent/year, or 15 percent of all change.
- Skagit: 0.26 percent/year, or 13 percent of all change.

Voluntary Stewardship Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
WSCC	ECY WSDA WDFW Commerce	Local Jurisdictions Conservation Districts	Flood Earthquake Landslide **Goal 1** **Goal 7**	General Fund

Objective

All 27 counties that opted into the Voluntary Stewardship Program have approved work plans that protect and enhance critical areas (wetlands, areas with a critical recharging effect on aquifers used for potable water, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas) while maintain the viability of agriculture.

Description

The Washington State Conservation Commission (Commission) administers the Voluntary Stewardship Program (VSP) which provides an alternative approach for counties to address our state's Growth Management Act requirements. The VSP uses a watershed-based, incentive-based process to protect critical areas, promote viable agriculture, and encourage cooperation among diverse stakeholders. Critical areas include:

- Wetlands
- Areas with a critical recharging effect on aquifers used for potable water
- Frequently flooded areas
- Geologically hazardous areas, and
- Fish and wildlife habitat conservation areas

The Commission manages the VSP budget for the creation and implementation of VSP work plans for each participating county. The VSP work plan seeks to adaptively manage agricultural activities that interest with critical area functions and values in order to protect and enhance those functions and values while maintaining the viability of agriculture. Counties with approved work plans must monitor the effectiveness of their efforts and adaptively manage their goals and objectives to ensure success of the VSP. The Commission provide staff support for the planning and implementation of VSP work plans, administrative support to the VSP Technical Panel which evaluates VSP work plans, and provides administrative support to the VSP Statewide Advisory Committee which provides policy guidance and direction for the VSP as a whole.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• All counties have approved work plans by 2019	• All counties have on-going requirements to adaptively manage their plans, with reporting requirements at regular intervals.	• All counties must adaptively manage their plans to ensure protection goals are being met.

Implementation Actions

- Develop planning guidance for the protection of critical areas.
- Develop 27 approved VSP work plans.
- Successfully implement those work plans to provide protection of critical areas while maintain agricultural viability for each participating county.
- Maintain administrative support for the VSP at the statewide and county level.

Recent Advances

- Seven VSP work plans have already been approved. Funding for all counties to continue planning or begin implementation have been made available for 2017.

Lifeline Sector Assessment and Resilience

Lead	Partners	External	Hazards/Goals	Funding/Costs
EMD	COM DOH MIL UTC DNR ECY OSPI WSDOT	NWPCC BPA USDOE USACE USCG USDHS FERC NERC	Earthquake **Goal 2** **Goal 5**	Greater than $2M

Objective

Address the threat posed by catastrophic earthquakes by improving coordination spanning public and private sector owner/operators and all levels of government to ensure a comprehensive and integrated approach to assessments, regulation, and mitigation.

- Prepopulate a public information campaign (i.e., flyers showing options for making water safe to drink and how to dispose of human waste appropriately).
- Conduct multi-agency legal mapping of "lifeline sector" agencies (energy, transportation, communication, and water/wastewater) emergency powers vs. governor's emergency proclamation. Analysis of statutory authority would need to occur in consultation with the Attorney General's office.
- Conduct jurisdictional/regulatory gap assessment, requiring multi-agency assessment. Specifically, there are multiple entities that require emergency backup generators.
- Detailed attention needs to be given to the Infrastructure Systems Target Capability Assessment in the State Preparedness Report (SPR). The current SPR lists response as a target capability, but this section is in need of an update based on new knowledge of the effects of a 9.0 CSZ event.

Description

Energy, water/wastewater, communication, and transportation make up the "lifeline sectors" within critical infrastructure. The survivability of publicly and privately-operated lifeline critical infrastructure is a crucial component of Washington's resilience. Restoration of lifeline critical infrastructure provides essential support to response operations and is a precondition for community recovery.

The community of public and private entities that make up the energy, water/wastewater, and telecommunications sectors is working to address vulnerability and mitigate deficiencies. In some cases, this is done by investor-owned utilities (IOUs) who have an interest in continuity of operations and are subject to regulatory requirements to provide safe and reliable service. In other cases, this infrastructure is operated by publicly-owned utilities (POUs) that place a high value on reliability and recovery, and provide these services to their own communities.

Projects focused on the resilience of these lifeline sectors are challenged by the number of regulators and difference in regulatory regimes for different utilities. Additionally, there are legal and statutory barriers to greater public-private cooperation due to funding rules and private sector desire to protect confidential information.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop prepopulated public information campaign. • Conduct regulatory gap assessment. • Improve Infrastructure Systems Core Capability in SPR.	• Conduct multi-agency legal mapping.	

Implementation Actions

- The IRSC should expand its membership to more fully incorporate members from both publicly and privately held lifeline owners and operators.
- Reinforce economic incentives to regulated Investor Owned Utilities (IOUs) to maintain preparedness, including reviewing procedures, providing direct incentives, requiring IOUs to submit annual reliability reports, and working with regulated utilities to identify best practices.
- Establish a working group including UTC, BPA, NWPCC, and representatives from utilities to clearly define interoperable systems and analyze the economic aspects of interchangeability and redundancy efforts.
- Leverage the expertise of the IRSC, the WA Military Department's Emergency Management Division's Infrastructure Program is working with the WA State Fusion Center to establish a survey-to-database tool to prioritize utility restoration using data.
- Conduct research to determine who has regulatory authority, what facilities currently have backup generation, and how many days of generation would be needed under given circumstances.
- Identify gas stations that are generator ready. This list had been populated in about 10 years ago but has not been updated since.
- Investigate using a Department of Energy (DOE) tool called Interruption Cost Estimate Calculator (www.ICEcalculator.com). This tool focuses on shorter term outages but may have some flexibility to be adapted for prolonged outages.

Recent Advances

- N/A

Pipeline Hazards Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
Pipeline Safety UTC	ECY DES – SBCC OSPI	PHMSA Pipeline Owners Other States Local Jurisdictions	Hazardous Materials **Goal 5**	PHEMSA (60%) Fees

Objective

Ensure public and environmental safety through a robust pipeline safety program that includes inspections, investigations, and incident prevention, ultimately achieving zero spills along regulated pipelines.

Description

UTC is delegated by the Federal PHMSA to enforce federal pipeline safety rules and the more stringent state rules. Regulations cover both interstate pipelines and intrastate pipelines, such as home gas distribution lines. Washington is unique in having authority to inspect interstate pipeline systems. This authority is usually assigned to Federal inspectors.

UTC enforces an integrity management rule that considers natural factors and hazards that threaten pipeline systems. This rule requires pipeline companies to conduct a hazard analysis, identify biggest threats, sensitive areas, and enact mitigation actions and preventative measures to ameliorate those threats. UTC verifies the risk assessments and mitigation strategies. Companies are also required to manage leak and repair histories to track consistent sources of leak or other failure and identify and eliminate causes.

The Pipeline Hazards Program also has a strong accident investigation program, including reviews of organizational weaknesses, especially systemic organizational weaknesses.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Fully implement inspector databases and fact sheets in a more mature investigation program. • Continue to develop the management system evaluation work.	• Continue to develop the management system evaluation work. • Expand GIS and use of spatial data usage.	• Be the national leader in pipeline safety.

Implementation Actions

- Remove all problematic pipe (pipe types/materials that have a poor spill/incident history).
- Enhance accident investigation program to reach more meaningful outcomes, especially through corrective actions that include organizational and managerial elements.
- Conduct more quality inspections, focusing on prevention and construction-practice inspections.
- Improve inspector databases and fact sheets to facilitate smoother inspections and provide more information on the company to the inspector.
- Maintain damage prevention program outreach and engagement – most pipeline releases are caused by third-party damages.

Recent Advances

- Launched inspector database and fact sheets project.
- Achieved a perfect score in 2016 PHMSA audit.

Statewide Resilience Program

Lead	Partners	External	Hazards/Goals	Funding/Costs
EMD OIC	All State Agencies	Local Jurisdictions State Legislature	All Hazards **Goal 2** **Goal 3** **Goal 4** **Goal 5**	General Fund

Objective

Implement, with a dedicated staff and leadership, a statewide resilience program to coordinate multi-agency actions in response to the Resilient Washington Subcabinet report that enhance resilience and reduce risk across all sectors of government and society.

Description

The Resilient Washington Subcabinet drafted a report based upon multi-agency workgroups. Through this process, it was determined that a statewide resilience program established at the direction of the Governor, would be necessary to carry out the goals requiring multi-agency coordination and legislative action. Washington currently does not have a cross-agency project champion with staff to work across state government to put together a resilience program with sustained funding. The initial iteration of this program would focus on identifying and bridging gaps in state capabilities to better achieve resilience objectives. The Office of the Insurance Commissioner is submitting legislation to enact a task force that would lay out what a resilience program looks like and what is done in Washington and other states.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Leverage existing workgroups to move forward key strategies. • Establish statewide resilience program • Integrate Resilient Washington Report into Results Washington • Establish a legislative task force.	• Develop and begin implementing plans and programs that address Resilient Washington strategies and actions.	• Leverage resilience program to reduce natural hazards risk that require decades of implementation and constant maintenance.

Implementation Actions

- Leverage existing planning teams, such as the Hazard Mitigation Workgroup, Emergency Management Council, and other groups that collectively comprise the components of a resilience program. This could be done through a "workgroup of workgroups" consisting of multiagency workgroup leads.
- Work with the OIC on their legislation to establish an interagency workgroup to identify what a state resilience program would look like and how it is funded.
- Receive a new Directive from the Governor, establishing, with corresponding authority and funding, a body to further the state's resilience goals by facilitating the strategies outlined in the Resilient Washington Subcabinet Report across state agencies.
- Convene a legislative task force to move forward on key recommendations and priorities.
- Integrate Resilient Washington Subcabinet report recommendations in to Results Washington.

Recent Advances

- The Resilient Washington Subcabinet report brought to light current progress, and opportunities to improve, on key seismic priorities and implementation gaps that require legislative and executive action, as well as those that require reprioritization of agency resources.

Interagency Climate Adaptation Network

Lead	Supporting Partners	External Partners	Hazards/Goals	Funding
DFW DOH ECY WSDOT DNR	All State Agencies UW	Nonprofits Local Jurisdictions Federal Agencies	Hazards Impacted by Climate Change **Goal 5**	N/A

Objective

Share information, tools, methods, and policy updates and coordinate action to facilitate adaptation to and awareness of climate change in Washington State.

Description

ICAN is an informal network of state agency staff and partners who are working to assess and address the impacts of climate change in Washington State. The ICAN steering committee is made up of representatives from the state departments of Ecology, Fish and Wildlife, Health, Natural Resources, and Transportation and the Puget Sound Partnership.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Maintain quarterly meetings.	• Maintain quarterly meetings.	• Continue to expand network and identify opportunities for interagency actions.

Implementation Plan/Actions

- In person meetings are held in Olympia on a quarterly basis, with some remote participation.

Recent Updates and Advances

- N/A

Address Disparities in Mitigation Activities and Capabilities

Lead	Partners	External	Hazards/Goals	Funding/Costs
EMD Hazard Mitigation	ECY DOH DNR COM	FEMA Local Jurisdictions	All Hazards **Goal 1**	Staff Time

Objective

Underserved and rural communities are provided additional technical assistance in integrating risk and hazard information into local infrastructure investments and in developing and submitting risk-reduction grant applications.

Description

There is a large disparity in capability to find and apply for funding to implement mitigation strategies among jurisdictions. These jurisdictions are usually rural and underserved, with minimal staff, and are often unable to incorporate risk and vulnerability information into local planning, much less major local investment decisions in water, wastewater, emergency services, and transportation infrastructure. There is also a considerable lack of funding, along with an inability or unwillingness to raise taxes or utility rates.

Agencies including Commerce, Ecology, and EMD all work regularly with such communities and have found that the number of successful applications for grants is lower than it should be given identified needs. This strategy will focus on improving local-level understanding of vulnerability assessments and the application of that understanding to investment decisions, targeted outreach programs to provide technical and application support, and cooperation among regulatory and grant-making agencies to better deliver outreach.

2-Year Fiscal Cycle	5-Year Plan Cycle	Long-Term
• Develop a joint-agency webinar series on grants and application best practices. • Design a project funding decision-tree. • Re-engage multi-agency grant review teams through Mitigation Workgroup members.	• N/A	• Rural and underserved communities successfully incorporate risk into decision making and receive grant awards commensurate with their demonstrated need.

Implementation Actions

- Investigate the possibility that regulatory and innovation assistance from the Governor's Office could help support local jurisdictions in application and project development.
- Develop and publicize joint-agency webinars and webinars series with a broad audience, including small and underrepresented jurisdictions, to inform on grants, risk assessments, and other funding opportunities and best practices. Include successful recipients and application reviewers as presenters.
- Design project funding decision-tree of common projects such as culvert replacements and home buyouts to identify potential sources of funding in a way that is project-oriented, instead of program oriented.
- Engage agency partners for service on review teams to diversify grant review panels; share HMA applications with agency partners; share grant information and unfunded projects with Mitigation Workgroup partners.
- Work with local jurisdictions on strategies to incorporate risk and vulnerability information into local investment decisions.

Recent Advances

- N/A