DEPARTMENT OF ECOLOGY
State of Washington

Washington State Climate Resilience Strategy

Appendix F:
How agencies respond to climate hazards

How agencies respond to climate hazards

This document explains how Washington state agencies respond to the top climate hazards facing our state. We've briefly described each hazard and outlined the tools and approaches agencies are currently using to prepare for, respond to, and recover from these climate impacts. The information compiled here was used by our agency partners to help identify gaps in the approach of state agencies when it comes to addressing climate risks. This helped inform the new actions our agencies proposed in the Climate Resilience Strategy.

Climate stressors

A wide range of climate-driven stressors are currently impacting Washington and are projected to continue. Based on climate modeling work conducted by the University of Washington Climate Impacts Group as well as feedback from local jurisdictions, community organizations, and members of the public, this summary will focus on the following priority climate stressors:

- Reduced water availability and drought
- Marine and coastal changes
- Flooding
- Extreme heat
- Wildfire and smoke

See Appendix A for specific citations to the climate projections and historical data presented here.

Tools and approaches

The work and function of state government is generally executed through a shared set of tools, approaches, and methods across all state agencies. These tools, approaches, and methods represent the types of work that state agencies use to carry out actions and programs that are intended to promote climate resilience. For example, state agencies can develop regulations related to land use, collect and disseminate data about environmental conditions, or directly implement large-scale infrastructure projects.

For purposes of this summary exercise, the following tools and approaches are defined and identified to aid in the summary of agency activities related to each climate stressor:

Policies, plans, and procedures

Management direction and internal agency processes that result in climate-resilient decisions.

Data and technical information

Collection and distribution of data, technical information, and guidance to inform climate preparedness and decision making.

Community partnerships

Support, resources, and guidance to advance community-led resilience policies and planning. This includes efforts to support community level planning (e.g.: local plans, ordinances, or land use regulations) as well as support for private landowners in adapting to climate change (e.g.: agriculture and forestry).

State asset management

Management of state-owned infrastructure and lands to mitigate climate risks and build resilience.

Resilience initiatives and projects

Funding, grant programs, and direct implementation of initiatives, projects, and on-the-ground actions that address specific climate risks.

Reduced water availability and drought

Stressor description

Snow Water Equivalent (SWE) on April 1st – April 1 SWE is the amount of water contained in the snowpack on April 1.

Historical conditions: April 1 snow water equivalent (SWE) increases with elevation and latitude in the Olympic and Cascades Mountains. Snowpack in the Cascade Mountains has decreased by about 25% between the middle of the 20th century and 2006, with the largest decreases in the low elevation foothills.

Projected change: Declines in spring snowpack are projected to accelerate. Models project a 40-60% decrease in spring snowpack, on average, by the 2080s.

Geographic variability of projected change: Climate projections show that few areas outside of the high elevations in the North Cascades Mountains will have substantial spring snowpack.

Late summer runoff – The amount of water from snow and ice melt from July through September.

Historical conditions: The Cascade and Olympics Mountains have more late summer runoff due to greater rainfall and cooler temperatures. Most of the snow typically melts by July, so the primary driver of late summer runoff is precipitation.

Projected change: Late summer runoff is projected to decrease on average 7-14% across the state by the 2080s.

Geographic variability of projected change: Projected decreases in summer runoff are largest in the Cascade and Olympic Mountains where precipitation is greatest and high elevations retain snowpack into early summer. Low elevation areas in the Puget Sound region and eastern Washington are projected to have smaller decreases in late summer runoff, but it is important to note that streamflow in these areas will be affected by the larger decreases in runoff upstream in the Cascade and Olympic Mountains. Areas in south central Washington are projected to have little to no change in late summer runoff.

Current and ongoing state agency actions

Nearly all agencies advance efforts to address water availability or drought. However, the primary state agencies tasked with preparing for climate-induced changes to water availability include the Department of Ecology, Department of Fish and Wildlife, Department of Natural Resources, and the Department of Health.

This work is primarily accomplished through **community partnerships**, **resilience initiatives and projects**, and **data and technical information**. State agency actions related to water are focused on outcomes for communities and ecosystems.

The Department of Ecology leads multiple efforts to increase the resilience of the state's water resources for both communities and ecosystems. **Community partnerships** led by Ecology include the Yakima Basin Integrated Plan, Walla Walla Water 2050, and Icicle Creek Strategy that bring together local and regional partners to advance water planning efforts for people and streamflow. Ecology also implements multiple **resilience initiatives and projects** such as water quality and infrastructure grants. Ecology is also responsible for declaring droughts and sponsors grants that support drought emergency actions as well as a new grant program to support the development of drought preparedness plans by local jurisdictions. Ecology's drought work is complemented by hazard planning activities of the Emergency Management Division. The Department of Health supports public water systems and drinking water infrastructure through the collection and dissemination of **data and technical information** as well as **resilience initiatives and projects** to monitor and fund infrastructure improvements.

Other agencies focus on water resources related to natural and working lands management. The Department of Natural Resources (DNR) leads multiple **policies, plans, and procedures** that focus on enhancing the resilience of agency programs like supporting drought planning for DNR-managed water rights and action plans for targeted watershed resilience. The Washington Department of Fish and Wildlife (WDFW) considers water from a habitat perspective for salmon and other fish by collecting **data and technical information** about stream temperatures, surface and groundwater interactions, and the restoration of streamflows. WDFW also implements **resilience initiatives and projects** to restore wetlands and riparian areas and leads **policies, plans, and procedures** that regulate projected streamflow impacts of construction projects under the Hydraulic Code. Similarly, the Puget Sound Partnership and Washington State Department of Transportation support **resilience initiatives and projects** that seek to enhance streamflows for fish, improve fish passage, and increase habitat connectivity.

The Washington State Department of Agriculture and the State Conservation Commission lead **resilience initiatives and projects** as well as **policies, plans, and procedures** to help support Washington's agricultural sector through improving irrigation efficiency, providing resources and grants to improve soil health and water use, and reducing vulnerability to drought.

Marine and coastal changes

Stressor description

Sea level rise

Historical conditions: Areas along the Pacific coast and in the Puget Sound region have experienced different rates of sea level rise due to differences in vertical movement of the land. Sea level is declining along parts of the Pacific coast where geologic factors are causing the land to rise faster than rates of sea level rise. Sea level is rising in the Puget Sound region and San Juan Islands where vertical land motion has not offset the effects of climate change.

Projected change: With climate change, the rate of sea level rise is projected to increase for all the coast and overtake vertical land movement on the Pacific coast.

Geographic variability of projected change: Sea level rise is projected to be greatest in Puget Sound and the central Pacific coast. Storm surge and waves will continue to contribute to coastal flooding due to this natural variability, with additional contributions from sea level rise.

Current and ongoing state agency actions

Many state agencies play a role in building climate resilience for marine and coastal regions of the state. Agency actions primarily focus on outcomes for communities and ecosystems.

The Department of Ecology leads **community partnerships** and **resilience initiatives and projects** aimed at advancing nature-based approaches to address sea level rise and coastal erosion. This includes updates to the shoreline planning efforts to require the consideration of sea level rise. Ecology also implements large-scale projects aimed at protecting coastal communities. Similarly, the State Conservation Commission advances **community partnerships** through its Shellfish Program to maintain harvest opportunities and limit closures due to poor water quality.

The Department of Transportation implements **resilience initiatives and projects** focused on protecting transportation infrastructure like ferry terminals and coastal highways from the impacts of sea level rise and erosion. Other impactful actions include current fish passage barrier removal projects (which accommodate projected water flows) and the Chronic Environmental Deficiencies (CED) program. The CED program uses nature-based solutions to address locations along state highways that interact with rivers, streams, or coastlines, that require frequent repairs or maintenance to highway infrastructure due to environmental hazards such as coastal and stream erosion.

As the primary steward for state-owned aquatic lands, the Department of Natural Resources leads several **resilience initiatives and projects** as well as **policies, plans, and procedures** that improve the resilience of marine and coastal ecosystems. These include the monitoring and restoration of marine and nearshore habitats, management of invasive species like European Green Crab, and plans for the recovery of important habitats like kelp forests and eelgrass.

The Puget Sound Partnership leads **resilience initiatives and projects** like the Puget Sound Ecosystem Monitoring Program which tracks and evaluates ecosystem conditions to inform project development and prioritization. Through implementation of the Action Agenda, the Puget Sound Partnership also leads **community partnerships** and ensures a coordinated approach across state and local government to Puget Sound Recovery. Similarly, the Department of Fish and Wildlife leads **resilience initiatives and projects** focused on the recovery of marine and coastal species. WDFW also supports coastal communities dependent on marine resources through fisheries disaster relief funding and other efforts following federally declared fishery disasters. Together, both agencies work to advance large scale **community partnerships** and **resilience initiatives and projects** focused in Puget Sound such as the Estuary and Salmon Restoration Program and Puget Sound Acquisition and Restoration Program.

Flooding

Stressor description

Extreme precipitation - the maximum magnitude of 24-hour precipitation that occurs, on average, once every 25 years.

Historical conditions: The magnitude of extreme precipitation varies across the state. In the Olympic and Cascade Mountains, extreme precipitation events exceed 8 inches in a 24-hour period. In eastern Washington, extreme precipitation events rarely exceed 2 inches in a 24-hour period. Given high year-to-year variability, there is no significant observed trend.

Projected change: The magnitude of extreme precipitation events is projected to increase across the state. Models project a 20% increase in the intensity of the biggest daily rain events each winter by the 2080s.

Geographic variability of projected change: Percentage changes in the magnitude of extreme precipitation are similar across the state. This means that increases in extreme precipitation are expected to be most pronounced in the Olympic Mountains and western slopes of the Cascade Mountains where extreme precipitation magnitudes are historically high.

Current and ongoing state agency actions

The Department of Ecology leads multiple efforts focused on planning and preparing for the heightened risk of flood hazards presented by climate change. Ecology leads **community partnerships** like the Floodplains by Design program that bring together state agencies, local jurisdictions, and other partners to identify and implement multi-benefit solutions that reduce flood risks to communities and support habitat restoration as well as flood-compatible land uses like agriculture. Ecology funds various **resilience initiatives and projects** through grant programs that require projects be designed with future climate conditions in mind and provides **data and technical information** to partners that helps advance flood hazard planning in local jurisdictions and priority basins like the Chehalis and Nooksack that are at a high risk for flood events.

Like Ecology, other agencies help advance multi-benefit solutions to flood risks. The Puget Sound Partnership works to integrate climate resilience into large-scale salmon and ecosystem restoration projects and the State Conservation Commission funds efforts to minimize flood risks to farms and expand habitat through its Voluntary Stewardship Program.

The Department of Natural Resources (DNR) and Department of Health (DOH) provide **data and technical information** to support flood planning like DNR's Lidar program that provides data to support hydrologic modeling and DOH guidance for flood hazard planning aimed at large onsite sewer systems. Additionally, the Washington State Department of Transportation uses data to assess flood risks to transportation infrastructure and preforms routine maintenance of culverts to reduce flood impacts. The Department of Agriculture also uses **data and technical information** in addition to **plans, policies, and procedures** to regulate and provide recommendations that ensure the proper use of pesticides and nutrient applications under changing climate scenarios like increased precipitation.

Plans, policies, and procedures are also used by the Department of Commerce in planning and preparing for impacts from events like flooding and severe storms on energy infrastructure and distribution systems. This work includes efforts to prepare and update contingency plans for securing energy infrastructure against physical threats as well as others like cybersecurity (RCW 43.21F.045). The Department of Commerce also supports power restoration activities during regional emergencies and supply disruptions. These efforts include coordination with the State Emergency Operations Center, local jurisdictions, electric utilities, and transmission operators to share information and inform the prioritization of restoration for critical community services. This type of work is limited to emergency events, the Department of Commerce does not engage in smaller, more localized outages. For example, recently the Department of Commerce was made aware that a tribal grocery store and fuel station in a remote area had its power disconnected for over eight hours due to wildfire activity. In response, the Department of Commerce worked with the local Public Utility District and the Bonneville Power Administration to request this specific location be added to the priority restoration list given the essential services it provides to the local community.

Relatedly, the Department of Commerce also implements **resilience initiatives and programs** that provide grants for back-up power sources in schools, community centers, and other public spaces after floods and severe storm events.

Beyond planning and preparing for flood hazards, state agencies also play a role in responding to flood events. The Emergency Management Division addresses flood response through the Enhanced Hazard Mitigation Plan and also distributes disaster recovery funding to affected communities and individuals. The State Conservation Commission also provides disaster assistance funding through its Disaster Assistance Program to farms and agricultural businesses impacted by severe flooding.

Similarly, the Department of Agriculture uses **policies, plans, and procedures** to minimize impacts to food supply chains caused by flooding and other severe weather-related events.

Extreme heat

Stressor description

Number of hot days – a 'hot day' is one where the daily high temperature is in the top 1% of historical high temperatures for June through August.

Historical conditions: High temperatures are warmer in eastern Washington and cooler in most of western Washington due to the maritime influence. Since the beginning of the 20th century, temperatures in Washington have risen 2°F.

Projected change: The number of hot days is expected to rise across all parts of the state. By the 2080s, different regions are projected to have 11 to 127 hot days per year, compared to about 1 day per year in the past.

Geographic variability of projected change: The projected increases are greatest in the northern Puget Sound Region, parts of the Pacific coast, and northeastern Washington. Projected increases are smallest in southwest Washington due to the influence of the Pacific Ocean.

Current and ongoing state agency actions

State agencies address heat from two perspectives: as a long-term hazard and emergency event. As noted above, temperatures in Washington are expected to increase over the coming years and decades which presents long-term challenges. However, extreme heat waves, like the 2021 Heat Dome, are expected to become more frequent.

Some agencies are focused on planning for the longer-term impacts of increased temperatures in the state. For example, the Department of Natural Resources and Department of Fish and Wildlife both lead initiatives focused on **state asset management** to improve plant and seed procurement strategies for plant nurseries. These efforts seek to build greater genetic diversity into plant communities used in restoration projects to improve their resilience to climate impacts like increased temperatures. The Department of Fish and Wildlife also uses **data and technical information** to inform restoration and management initiatives. For example, the agency is using thermal mapping to identify areas of cold-water refuge for fish habitat protection. The Department of Agriculture and Department of Health are leading efforts to prevent and eradicate emerging plant and animal diseases as well as pests that are likely to become more prevalent in Washington as temperatures rise.

Following the State Energy Strategy, the Department of Commerce is advancing **policies, plans, and procedures** to promote electrification across Washington. Through this work, the Department of Commerce is working to ensure sufficient resources are available to meet statewide electrification goals and balance existing needs and uses such as cooling.

Agencies are also working to address heat-related emergencies that often result from heatwaves. Heat is one category of extreme weather addressed through the State's Enhanced Hazard Mitigation Plan managed by the Emergency Management Division. The Department of Health uses several **resilience initiatives and programs** to expand access to cool air in public buildings, residential settings, and long-term care facilities. Similarly, the Department of Commerce awards grants through its Energy Efficiency Grant Program to improve the weatherization of public spaces, including the installation of cooling systems. Additionally, the Department of Health and the Department of Fish and Wildlife are working to implement advanced warning systems and response plans to prevent the harvest and consumption of shellfish during heat waves.

Wildfire and smoke

Stressor description

Wildfire likelihood - the likelihood that a given year in a 30-year period will have conditions conducive to wildfire.

Historical conditions: The likelihood of fuel moisture and climate conditions conducive to wildfire are highest in the eastern Cascade Mountains and eastern Washington. Historically, the likelihood of wildfire conditions has been low in the Olympic Mountains, Puget Sound Region, Southwestern Washington, and the western Cascade Mountains.

Projected change: Fire risk is projected to increase for most of Washington, primarily from summer drying associated with snowpack loss and projected declines in summer precipitation.

Geographic variability of projected change: Climate projections show that the likelihood of wildfire conditions is expected to increase the most in the central Cascade Mountains, southwestern Washington, and northeast Washington. Wildfire conditions are projected to decrease slightly in the Columbia Plateau, likely due to a combination of projected increases in precipitation and changes to vegetation.

Current and ongoing state agency actions

Several state agencies are actively working to support preparation, response, and recovery from wildfire and smoke hazards in Washington. These include the Department of Natural Resources, Emergency Management Division, Department of Ecology, Department of Transportation, Department of Health, and the State Conservation Commission.

Most of the agency work related to wildfire and smoke is done through **community partnerships**, **resilience initiatives and projects**, **data and technical information**, and **policies, plans, and procedures**.

The Department of Natural Resources leads several **community partnership** efforts aimed at preventing and minimizing wildfire events, preparing communities, and building resilience. The Community Wildfire Resilience and Preparedness program provides property-level guidance for home hardening and creating defensible space, supports community-level efforts to develop wildfire preparedness and mitigation plans, and provides technical guidance about vegetation management and fire-resistant landscaping. The Department also connects local jurisdictions and communities with federal grant funding which supports tribal and local governments with the development of Community Wildfire Protection Plans in coordination with federal agencies.

Other work led by the Department of Natural Resources includes **resilience initiatives and projects** like prescribed fire and other treatment initiatives, support for wildfire recovery including debris management and landslide hazard mitigation, and grants to schools and public spaces for infrastructure upgrades to improve resilience to wildfire and smoke.

Activities under the Department of Ecology and Department of Health consist of **data and technical information** related to smoke impacts. Through its Air Quality Program, the Department of Ecology forecasts and monitors the impacts of wildfire smoke on air quality across the state. This effort is also supported by the Department of Health which leads efforts improve indoor air quality during periods of heavy wildfire smoke. The Department of Health also administers the Climate Change Response Core Team which advances readiness to multiple climate stressors including wildfire smoke and its impacts on communities.

The Emergency Management Division advances **policies, plans, and procedures** as well as **community partnerships** focused on wildfire hazard mitigation. This work includes the Washington Enhanced Hazard Mitigation Plan which directs statewide actions to prepare for wildfire, and other hazards. Additionally, the Emergency Management Division also issues grants to tribal and local governments to support wildfire mitigation activities and provides technical guidance for hazard mitigation planning at the local and community level.