Washington State Climate Resilience Strategy

Public Comment Draft

Washington State Department of Ecology

Olympia, Washington

June 2024

DEPARTMENT OF ECOLOGY
State of Washington

The Washington State Climate Resilience Strategy is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

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How to Provide Comments and Feedback

Thank you for your interest in reviewing this draft of the Washington State Climate Resilience Strategy. The focus of this strategy is on what state agencies can do within our existing authorities and roles to better prepare communities, infrastructure, and natural and working lands across the state for the impacts of climate change. The strategies and actions presented here consist of work that Washington state agencies are already doing and new work they propose to carry out over the coming years; this strategy does not direct the work of tribal, local, or federal jurisdictions and agencies. However, the actions contained within this strategy are intended to reflect the priorities of tribal and local governments as well as those of communities across Washington.

The Washington State Department of Ecology (Ecology) is interested in any comments and feedback you can provide on this draft strategy, but is particularly interested in your thoughts on the following questions and topics:

- Do the actions presented align with the highest priority climate resilience needs of your community? If not, how can they be improved?
- Are any climate resilience priorities for your community missing from the strategy?
- How would your community best like to be engaged under our proposed governance and implementation structure?
- What challenges has your community faced during engagement with the state on related issues? What could be improved moving forward?

Please note, the strategy topics, action groupings, and individual agency actions are numbered and labeled for ease of review and commenting. These labels do not reflect any prioritization or ranking.

Submit written comments using our online commenting tool, SmartComment between June 11, 2024 (12:00am) and July 11, 2024 (11:59pm). Additionally, Ecology will host three virtual listening sessions to hear feedback and comments (registration is required):

- Thursday, June 20, 10:00am to 12:00pm: Register here!
- Wednesday, June 26, 12:30pm to 2:30pm: Register here!
- Tuesday, July 2, 6:00pm to 8:00pm: Register here!

The public comment period will be open from June 11th (12:00am) through July 11th (11:59pm)

If you have any questions, please contact Jimmy Kralj, Climate Resilience Strategy Planner, at 564.233.1961 or jimmy.kralj@ecy.wa.gov.

Washington State Climate Resilience Strategy: Summary of Draft Strategies and Proposed New Actions

Strategy Topics	Action Groupings
Coordinate ongoing implementation of the State Climate Resilience Strategy. Stressors addressed: 	• Establish a climate resilience governance structure.
Plan for, respond to, and recover from climate-driven hazards and emergencies. Stressors addressed: 	• Help communities prepare for and respond to extreme heat events and wildfire smoke. • Minimize wildfire risks in high-risk areas. • Address increased risks to human and animal health, working lands, and wildlife from pests, pathogens, and disease through integrated management. • Provide technical advice and guidance to support climate-driven hazard and emergency planning. • Examine agency rules, policies, and codes for vulnerabilities in addressing projected climate-driven hazards.
Support tribes, local governments, and communities with technical assistance, guidance, and best practices to advance and implement policies and actions that reduce climate risks. Stressors addressed: 	• Support local planning and accelerate implementation of nature-based solutions to improve the resilience of shorelines, floodplains, and coastal areas. • Build local-level resilience capacity in overburdened and underserved communities.
Support the vitality and viability of working lands under a changing climate through research, technical assistance, and incentives. Stressors addressed: 	• Promote agricultural viability under an uncertain climate future. • Explore novel market opportunities to support climate risk reduction efforts.

Reduce existing sources of pollution that exacerbate climate impacts. **Stressors addressed:** 	• Reduce smoke pollution through regulations and community outreach.
Implement innovative water conservation and management initiatives to ensure reliable and sufficient water for people, ecosystems, wildlife, and fish. **Stressors addressed:** 	• Prepare for changes in water availability and implement projects in multi-benefit, large-scale water plans. • Improve the resilience and efficiency of water use and infrastructure. • Improve water management through the collection, use, and standardization of shared water data across agencies.
Maintain the level of service and improve the performance of critical infrastructure and state assets to minimize vulnerability to climate impacts, including retrofits or removals. **Stressors addressed:** 	• Preservation and maintenance to improve the resilience of state assets. • Maintain energy security and reliability under changing climate conditions.
Plan, build, and invest in public infrastructure that considers future climate conditions, increases equity, and makes use of nature-based solutions. **Stressors addressed:** 	• Use climate projections to inform infrastructure funding and management. • Resilient transportation networks for a changing climate.
Improve land management and restoration practices to help ecosystems, habitats, and species adapt to changing climate conditions. **Stressors addressed:** 	• Climate-informed species and habitat management. • Prevent the worst effects of climate change on the Puget Sound ecosystem. • Support large-scale, interagency habitat planning.

Background and Context

Need for Action

Over the past several decades, climate change has increased the severity of wildfires, heatwaves, droughts, and floods across all corners of the state. This, combined with slower moving impacts like sea level rise, ocean acidification, and the loss of mountain snowpack has presented risks and challenges to communities, infrastructure, and natural and working lands across Washington.

Every region of our state has already been affected by climate change and over time these impacts will continue and accelerate, posing increasing threats to our state's economy, our environment, and the health and well-being of our communities. The effects of climate change are especially impactful for frontline communities including people of color, low-income individuals, and other vulnerable populations. Because they have often been denied access to important social services, they may not have the resources needed to adapt and prepare for these changing conditions.

While state agencies in Washington are leading transformative efforts to reduce greenhouse gas emissions and prevent future climate change, there is a need to better coordinate efforts across state agencies to prepare for the impacts of climate change. Recognizing this need, the Washington State Legislature and Governor Jay Inslee directed the Department of Ecology and partner agencies to update the state's Climate Resilience Strategy by September 30, 2024 in Chapter 70A.05 RCW.

This strategy provides state government with a unique opportunity to implement new and innovative actions to help prepare for, respond to, and recover from climate impacts while simultaneously continuing existing work and efforts that contribute to climate resilience. At the same time, this effort will allow the state to center environmental justice at the core of these actions to reduce inequities and direct resources to the people and communities that need them most.

This strategy identifies solutions to the highest priority climate risks facing our state and will improve the coordination and efficiency of state agency's climate change response efforts, align state-level work with tribal and local priorities, and prioritize environmental justice. Efforts to improve climate resilience result in impactful and lasting outcomes for communities and the environment. By using the best available science and planning for projected future conditions we can ensure our natural and built environments can meet the needs of people and ecosystems across the state for years to come.

Together, we can deliver a more equitable and resilient future for all Washingtonians.

Expected Climate Impacts in Washington

Given our state's large size and diverse geography, Washington is threatened by an array of climate change impacts. From sea level rise and erosion on the Pacific coast and Puget Sound to increasingly severe wildfires in central and eastern parts of the state, state agencies are tasked with preparing for, responding to, and recovering from a broad range of hazards and risks. Climate change effects our different communities in a variety of ways depending on their exposure to climate risks and their underlying vulnerability and sensitivity to impacts, including the potential for compounding impacts on top of existing social and economic disparities. Washington's State

Enhanced Hazard Mitigation Plan published by the Emergency Management Division in September 2023[1] includes a more detailed analysis of past natural hazards, future trends and their relationship to climate change in Washington. Released in November 2023, the 5th National Climate Assessment's Northwest Chapter[2] contains an extensive review of the scientific information of climate change in our region. The University of Washington Climate Impacts Group analyzed the most recent scientific information and provided summaries on the following five key climate stressors facing Washington which are the primary focus of this strategy:

- Reduced water availability and drought
    - Already mountain snowpack has decreased by about 25% between the middle of the 20th century and 2006. Already, glaciers in the Cascade Mountains have experienced significant declines in size while some, like Hinman Glacier, have fully melted away[3]. Projections show that this rate of loss will increase and that few areas outside of the high elevations in the North Cascades and Olympic Mountains will have snowpack by the 2080s. At the same time, rates of extreme precipitation events[4] are expected to increase across the state, but especially in the Olympic Mountains and western slopes of the Cascades.
    - Whereas historically our snowpack has provided a steady and reliable source of water during dry summer months, climate change projections indicate that precipitation will increasingly fall as rain and quickly runoff the landscape instead of slowly melting over longer periods of time. For people and ecosystems, this will mean reduced water availability during the summer and increased flooding during the winter.
- Marine and coastal changes
    - Sea level rise and coastal erosion present many risks and challenges for people and communities in Washington's Pacific coast and the Puget Sound region. For communities like North Cove on the Pacific coast near Willapa Bay, coastal erosion has already dramatically altered the landscape and environment. Over the last century, this area has experienced roughly 100 feet of erosion per year making it the area with the most rapid rate of erosion on the entire U.S. Pacific coast[5]. For communities like these, climate impacts like sea level rise will exacerbate these risks and pose increasing challenges.
    - Washington's Pacific coast and Puget Sound shorelines have experienced different rates of sea level rise due to geologic differences. On the Pacific coast, sea levels are declining as geologic activity pushes land upwards while in the Puget Sound region, sea levels are rising as upward land movement is slower than the impacts of climate change.
    - As a result of these trends, sea level rise is expected to be greatest in the Puget Sound region and select portions of Washington's central Pacific coast. Increased

[1] https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf
[2] https://nca2023.globalchange.gov/chapter/27/
[3] https://www.kuow.org/stories/rip-washington-s-hinman-glacier-gone-after-thousands-of-years
[4] The maximum magnitude of 24-hour precipitation that occurs, on average, once every 25 years.
[5] https://apps.ecology.wa.gov/publications/documents/1706010.pdf

sea level rise will exacerbate coastal flooding of infrastructure and communities. Areas that already experience coastal flooding will see increasingly frequent and intense flood events, while areas further inland will be newly at risk of flooding.

- Flooding
    - An estimated 2 million Washingtonians, nearly 25% of the state's population, live in identified flood zones and over the next 25 years that number is expected to rise by over 500,000 individuals[6]. Continued development and population growth in flood-prone areas means that flood events will result in greater impacts and destruction to individuals, communities, and infrastructure.
    - In Washington, flood events are often caused by extreme precipitation events like atmospheric rivers that quickly overwhelm the capacity of rivers and streams. Additionally, these heavy precipitation events can result in excessive runoff that overwhelms stormwater systems and leads to urban flooding.
    - Extreme precipitation events vary across Washington: in the Olympic and Cascade Mountains, extreme precipitation events are those that exceed 8 inches in a 24-hour period while in eastern Washington, events rarely exceed 2 inches in a 24-hour period.
    - Climate change is expected to increase the magnitude of extreme precipitation events across the state. This means that increases in extreme precipitation will occur in places where they are already high such as the Olympic Mountains and western slopes of the Cascade Mountains.
    - More extreme precipitation will lead to more frequent and more intense flood events across the state, particularly in Western Washington. These flood events, and secondary impacts like landslides and increased erosion, will threaten individuals, communities, and infrastructure across the state.
- Extreme heat
    - In early summer 2021, an extreme heat event took place across the Pacific Northwest and set 128 all-time heat records across the state. The event had significant impacts on public health and became the deadliest weather-related disaster in Washington history[7]. Beyond the lives lost, far greater numbers experienced negative health outcomes from heat-related illness and the event led to significant economic losses. This event has catalyzed communities and partners across the state to better prepare Washington for extreme heat events in the future.
    - High temperatures vary across Washington with the highest temperatures in the eastern parts of the state and the lowest in the Cascade and Olympic Mountains as well as the Pacific coast due to high elevation and marine influence.
    - Climate change is expected to increase the number of hot days across the state, with the greatest increases in the Puget Sound region, central Washington, and eastern Washington. Hot days are those that exceed the historic 99th percentile of observed high temperatures. By the end of the century, the state is expected to have between 7 and 49 hot days per year.

[6] https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf
[7] https://cig.uw.edu/wp-content/uploads/sites/2/2023/06/CIG-Report-Heat-202-pages.pdf

    - More hot days will lead to increased public health emergencies as well as heat stress on crops and livestock and increased air pollutants like ozone.
- Wildfire and smoke
    - Approximately 7.5 million people in Washington, nearly the state's entire population, are exposed to direct or indirect impacts of wildfires. Nearly 900,000 Washingtonians currently live in the most wildfire-prone parts of the state and by 2050 that number is expected to rise to between 1 million and 1.03 million[8].
    - Conditions conducive to wildfire including low moisture and abundant fuel have typically been most prevalent in the eastern Cascade Mountains and eastern parts of the state. The likelihood of wildfire conditions has generally been low in western parts of Washington and around the Puget Sound region.
    - Under future climate change, wildfire conditions are expected to increase in some parts of the state and decrease in others. Conditions will increase in the central Cascade Mountains and southwestern Washington with additional increases observed in areas with already high wildfire risk like northeast Washington. Conditions are expected to decrease slightly in the Columbia Plateau, likely due to increased precipitation and changes in vegetation.
    - Increased wildfire risk also leads to increased smoke that can reduce air quality in all parts of the state. Furthermore, smoke from wildfires outside of Washington has significantly degraded air quality in all parts of the state.

Interagency Climate Resilience Team and Development Process

The Department of Ecology has led the effort to develop this strategy alongside nine other state agencies:

- Department of Ecology
- Department of Agriculture
- Department of Commerce
- Emergency Management Division
- Department of Fish and Wildlife
- Department of Health
- Department of Natural Resources
- Puget Sound Partnership
- State Conservation Commission
- Department of Transportation

Staff from each of these agencies was identified to serve as a representative on the Interagency Climate Resilience Team, the group responsible for developing this strategy.

The development process began in September 2023 with the first monthly meeting of the Interagency Climate Resilience Team. The group began by reviewing the strategy requirements under RCW70A.05, discussing the success and challenges of past climate resilience planning processes, and identifying a shared vision and goals. The group then began collecting information to summarize the ongoing work of state agencies that contributes to climate resilience (see Appendix C), identifying gaps and needs, and then developing preliminary strategy and action concepts. Concurrently, the Department of Ecology led numerous outreach and engagement efforts with individuals, organizations, and communities across the state to inform this work (see Summary of Early

[8] https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf

Engagement later in this document). Information learned during early engagement was used to further refine agency action proposals and other strategy components.

University of Washington Climate Impacts Group

The University of Washington Climate Impacts Group supported the development of the draft strategy in several important ways:

1) **Serving as an independent scientific and technical advisor on climate impacts in Washington.** UW CIG staff helped synthesize the latest climate information for Washington including from regional, national, and international scientific reports. They provided information on status and trends of climate impacts, key impacts relevant to Washington, projected future conditions, and the geographic distribution of these changes.

2) **Advising on identifying effective adaptation strategies and recommended approaches to measure effectiveness.** See the section on Accountability, Implementation, and Measuring Progress for more details on this process. The state law also required UW CIG to provide a report to the legislature on this topic, provided here in Appendix B.

3) **Identifying and supporting access to climate data and information in a central location.** This included identifying the shared climate information gaps and needs of state agencies and prioritizing what information, resources, and services UW CIG can provide to state agencies. This will be an ongoing role for UW CIG to help state agencies build their capacity and knowledge and to support the agencies in the use of the most relevant and accurate scientific information on climate change.

Federal Funding Coordination

Given the recent surge of federal funding available to support climate resilience work, the Legislature also directed the Department of Ecology to work with the Office of Financial Management and the state agencies listed above to coordinate the state's response to these federal funding opportunities. The goal of this effort was to identify federal resources available to support action implementation, identify opportunities for agencies to collaborate on grant applications, and ultimately maximize the amount of federal funding awarded to Washington to support climate resilience initiatives.

This group began meeting in January 2024 and consists primarily of agency staff responsible for tracking and coordinating federal funding initiatives within their respective agencies. This group has worked to support the development of this strategy by assessing successes and challenges in securing federal funding for climate resilience, developing a plan to improve cross-agency coordination, and strategizing how to communicate federal funding opportunities to external partners. Together, this work will help to secure additional resources to support implementation of the actions contained within this strategy.

Vision and Goals for a Climate Resilient Washington

Vision

Washington State is equipped to prepare for, respond to, and recover from current and projected climate impacts in an integrated, strategic, equitable, and durable manner to increase the resilience of Washington's communities, infrastructure, natural systems, and working lands. State agencies create, support, and implement policies and actions that reduce risks, promote safe, healthy, and vibrant communities, lessen vulnerabilities, advance environmental justice, and deliver more equitable outcomes.

Goals

Communities

- Foster healthy, safe, equitable, and economically vibrant communities able to effectively and proactively reduce and adaptively manage their greatest climate change risks and vulnerabilities.

Infrastructure

- Advance and modify infrastructure that supports natural systems, considers the needs of vulnerable communities, and provides consistent, safe, and reliable services capable of withstanding disruptions and risks posed by current and future climate impacts.

Natural and Working Lands

- Protect, restore, and adaptively manage natural systems and working lands so they can provide continued and enhanced ecological, cultural, social, and economic benefits under current and future climate impacts.

Governance

- Develop efficient and lasting processes and structures across governments that ensure strategic alignment, collaboration, transparency, accountability, and allow for flexibility and adaptation in the implementation of Washington's Climate Resilience Strategy.

Collective Resilience Recommendations

The actions contained within this strategy will contribute to improved resilience against climate impacts for communities, infrastructure, and natural and working lands. But climate resilience is a broad topic with many contributing factors beyond those listed in this strategy and outside of the purview of any one state agency. Below are two recommendations related to policy areas that are essential in helping to create a climate resilient Washington.

Overarching Recommendation 1: Quickly Reduce Greenhouse Gas Emissions

Reducing greenhouse gas emissions quickly and in line with state limits and best available science offers the best pathway for Washington to reduce the severity of future climate impacts on our economy, communities, and natural systems. While reducing greenhouse gas emissions is not the primary purpose of this strategy, we recommend decision-makers continue to implement a suite of policies that reduce greenhouse gas emissions. This work is essential and complementary to the proposed strategies and actions in this strategy.

Overarching Recommendation 2: Promote Social and Economic Justice and Equity

A range of social and economic factors contribute to an individual's and community's ability to prepare for, respond to, and withstand the impacts of climate change. This includes long-standing structural inequities in our systems such as poverty and racism and issues like lack of affordable housing, educational opportunities and more. While these larger and complex societal needs are not the focus of this strategy, we recommend that decision-makers continue to advance policies that address social and economic inequality. Policies that advance social and economic equity will help reverse these trends and enable communities to be more resilient in the face of climate change.

Climate Resilience Priorities

Several principles guided our work to develop Washington's Climate Resilience Strategy as set forth by the Washington State Legislature in RCW 70A.05. These include:

- Prioritizing actions that:
  - **Reduce greenhouse gas emissions.**
    - Reducing greenhouse gas emissions to prevent future climate change is an essential component of climate resilience. The primary focus of this strategy is on state agency actions to prepare for, respond to, and recover from climate impacts. We prioritized those actions that also reduce greenhouse gas emissions.
  - **Provide co-benefits like nature-based solutions, restored habitat, and reduced stressors that exacerbate climate impacts.**
    - Throughout strategy development, we prioritized actions that provided multiple benefits beyond just those associated with climate resilience. For many of the actions in the strategy, these co-benefits support ecosystems and natural systems through habitat restoration and protection and programs that enhance or support natural systems like floodplains.
    - Functioning natural systems can buffer the impacts of climate change, increase biodiversity, and recover more quickly from external stressors like storms, floods, and drought. Nature-based solutions are projects that make use of natural features and processes to improve the resilience of built environments for the benefit of people and the environment.
    - For example, floodplain projects that restore side-channels and enhance riparian areas help floodplains store more water during flood events which protects people and communities while simultaneously improving habitat for fish and wildlife.
  - **Address specific issues of concern.**
    - Climate change will result in broad impacts across communities, infrastructure, and natural and working lands, however, some impacts will be more impactful on the health and wellbeing of people and environments than others. These include drought, flooding, wildfire, forest health, urban and extreme heat, Puget Sound health, and impacts to outdoor recreation, all of which are addressed in the strategy.
  - **Promote and protect human health.**
    - Human health and wellbeing are especially sensitive to climate impacts, particularly for overburdened and vulnerable communities that already face health disparities. In developing the strategy, we prioritized actions that address and reduce climate risks to human health.
  - **Protecting overburdened communities and vulnerable populations and providing more equitable outcomes.**

- Climate change impacts disproportionately effect people of color, low-income communities, and those with health disparities across Washington. In developing actions for the strategy, state agencies:
    - **Sought early input from frontline communities on actions.** Prior to the release of this draft for public comment, the Department of Ecology supported engagement efforts with tribes as well as overburdened communities and vulnerable populations to review the actions proposed by agencies. This helped agencies incorporate their input and recommendations in the draft strategy. Details from these engagement opportunities are below under "Summary of Early Engagement Process".
    - **Prioritized inclusion of actions that provide benefits for overburdened and underserved communities.** For example, the Emergency Management Division has proposed an action that would cover federal match requirements for overburdened communities with limited financial resources. Other work includes an interagency action to provide technical assistance to communities interested in building climate resilience hubs to provide spaces with cool and clean air for vulnerable populations during periods of extreme heat and wildfire smoke. Much more is included in the actions later in this document.
    - **Incorporated ongoing engagement of frontline communities in implementation of the strategy.** The strategy includes a governance structure which will be used to support strategy implementation, progress reporting, and future updates. This includes processes that consult and involve overburdened and underserved communities in the ongoing dialogue around climate resilience priorities, progress reporting and implementation of the strategy. Dedicated resources are proposed to help build capacity of frontline communities and support their engagement through forums such as climate assemblies. Additionally, dedicated engagement and outreach staff are needed to create, build, and sustain relationships with individuals and organizations from overburdened and underserved communities to support action implementation and identify community needs and priorities.
- Considering flexible and adaptive approaches for preparing for uncertain climate impacts.
    - Climate change is already impacting our state and will continue to do so, however, our understanding of specific events and situations, particularly those far in the future, is less certain. Accordingly, the strategy includes a robust adaptive management framework to report progress of actions, evaluate outcomes, and determine whether this work is contributing to the identified strategy goals. This information will then be used to support future strategy update efforts where agencies will have opportunities to adapt their approaches and meet the highest priority needs to build climate resilience across the state.
- Addressing risks in each geographic region of Washington.
    - Washington is a large state with a diverse geography and the impacts of climate change will look different in different parts of the state. Agencies worked to identify actions that

address these unique climate impacts across all regions of Washington. Several actions account for unique regional differences under broad reaching climate impacts. For example, responses to extreme heat will look different in urban areas compared to rural ones given that people in rural communities are more broadly dispersed and unable to easily access shared community spaces for cooling. Other actions focus on specific locations and regions like the Department of Ecology's proposed work to implement actions in the Walla Walla Water 2050 management plan to improve water supply and streamflows in the basin. Other interagency work like the Washington Shrubsteppe Restoration and Resiliency Initiative seeks to coordinate state agency efforts to restore habitat, reduce fire risk, and improve ecosystem resilience in central Washington.

Accountability, Implementation, and Measuring Progress

Accountability for implementation of the actions included in this strategy will ensure resilience benefits for communities, infrastructure, and natural and working lands. We have included several elements and features of this strategy to support accountability, implementation, and measuring progress.

Identified Lead Agencies for Actions

Each of the actions identified in the strategy has an identified agency, or group of agencies, responsible for leading the implementation of each action.

In addition, agencies only submitted action proposals that: 1) they had existing resources to implement or 2) they were committed to preparing proposals for budget requests or agency request legislation. This ensures that actions included in the strategy have identified pathways for implementation.

Reporting and Update Cycles

To further support accountability and implementation, RCW 70A.05 requires Ecology to submit progress reports on strategy implementation every two years beginning in 2025. The law also requires Ecology and partners to update the entire strategy every four years. Together these reporting and update cycles will ensure that agencies are making progress towards climate resilience goals and reflecting the highest priority needs of communities in the strategy over time.

Indicators and Metrics

The strategy will include a suite of indicators and metrics to evaluate progress on action implementation and assess progress towards the strategy's goals. These indicators and metrics are currently under development by the University of Washington Climate Impacts Group, Department of Ecology, and other agency partners. The final strategy will include complete information about indicators and metrics. The information below provides an overview of how indicators and metrics will be used to measure progress.

Measuring resilience using indicators and metrics supports understanding of what successful adaptation to climate change looks like and if strategies and actions are moving the state in the right direction. Indicators and metrics can be useful to communicate the vision of and progress toward adaptation success, make strategic decisions and align plans, justify investments, demonstrate accountability, support learning, and improve effectiveness. Additional information about proposed indicators is included in Appendix A.

No one set of indicators and metrics can fulfill these different purposes. Typically, a mixture of different types of indicators (capacity, process, output) and metrics (quantitative and qualitative) are useful and necessary to measure, track, and demonstrate progress toward accomplishing the goals and vision for climate resilience. Key terms being used for measuring progress are defined below.

- **Indicator**: A quality or trait that serves as a sign that a particular set of adaptation goals (strategies or actions) are yielding the desired results or making progress towards the right direction.
    - **Capacity indicator**: Indicative of the capacity and resources necessary to make progress towards or achieve a goal.
    - **Process indicator**: Indicative of the process towards the desired adaptation goal, such as what is being done or spent.
    - **Outcome indicator**: Indicative of the extent to which the desired future resilient state is being achieved.
- **Metric**: A variable that can be measured (quantitative) or tracked (qualitative) that represents the indicator.
    - **Quantitative metric**: A variable that can be counted or measured in numerical values.
    - **Qualitative metric**: A variable that can be tracked that helps to capture descriptive data.

Strategies and Actions

How to read this section:

The following section presents the new actions proposed by state agencies along with examples of ongoing agency work that contributes to climate resilience. Implementation of many of the new actions proposed below is contingent upon approval and support from the Governor and State Legislature.

Specific actions are grouped under higher-level groupings of similar work. These are further grouped under nine total strategy topic areas.

Summary: Provides a high-level summary of the specific work elements proposed by each agency or group of agencies.

Agency: Agency, or group of agencies, responsible for leading and implementing this action.

Climate Stressors Addressed:

The following icons have been developed to represent the primary climate stressors facing Washington:

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

State Roles:

The work and function of state government is generally executed through a shared set of tools, approaches, and methods across all state agencies. These state roles 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.

The following state roles are defined for use in the strategy:

- 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.

Resilience Priorities Addressed: The law guiding this work (RCW 70A.05) outlines several principles to guide development of this strategy. These include:

- Actions that provide co-benefits like greenhouse gas emissions reduction.
- Protect overburdened communities and vulnerable populations.
- Prioritize actions that deploy natural solutions, restore habitat, or reduce stressors that exacerbate climate impacts.
- Address specific impacts like drought, flood risk, forest health, urban heat islands, impacts on the built environment, Puget Sound health, and outdoor recreation impacts.
- Prioritize actions that protect human health.
- Consider flexible and adaptive approaches.
- Address the risks in each geographic region of the state.

Climate Resilience Strategy – Draft Strategies and Actions

Strategy I: Coordinate ongoing implementation of the State Climate Resilience Strategy

The climate resilience strategy statute requires Ecology, in consultation with partner agencies, to recommend a durable governance structure that supports implementation of the State Climate Resilience Strategy and coordinates efforts across agencies for funding of climate resilience actions. The actions below will ensure strategic alignment, collaboration, transparency, and accountability of the state's work on climate resilience as well as ongoing consultation and engagement with tribes and overburdened and vulnerable communities.

Examples of Ongoing State Work in this Space

University of Washington Climate Impacts Group: Data and Technical Guidance

The University of Washington Climate Impacts Group (UW CIG) is an essential partner in the implementation of climate resilience actions across the state. UW CIG provides valuable technical and scientific support including climate data and projections, information, tools, and services. This enables state agencies to better understand, prepare for, and respond to climate impacts with science-based decisions. Agencies use such data and information to identify the highest risks and vulnerabilities and help guide actions that reduce risks and support climate adaptation for communities, infrastructure, and natural and working lands across Washington. Ongoing support for this work by UW CIG is essential for the implementation of climate resilience efforts under this strategy.

Department of Ecology: Interagency Coordination on Federal Funding Opportunities to Support Climate Resilience

Recent federal laws such as the Inflation Reduction Act and Bipartisan Infrastructure Law have resulted in an influx of federal grants and resources to support climate resilience work at the state and local level. In response to this, the Washington State Legislature directed the Department of Ecology to lead an interagency effort focused on identifying strategic funding priorities and coordinating the state's response to these federal grant opportunities. The goal of this effort is to identify shared priorities for climate resilience funding and to maximize the funding we secure to support resilience projects and initiatives in Washington. Currently this group is looking to leverage recent investments made by the legislature that will streamline federal grant and tax incentive information to increase accessibility statewide for community-based organizations, local governments, tribes, and other entities. Funding will also provide technical assistance for grant seekers. This will help us continue to improve how we coordinate our response to federal funding opportunities.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP A: Establish a Climate Resilience Governance Structure

Summary	This action will form a governance structure to implement the climate resilience strategy. It will consists of: 1) an interagency climate resilience sub-cabinet comprised of agency leaders, 2) a staff-level climate resilience coordinating committee comprised of agency staff, 3) a dedicated set of core resilience state agency staff to support strategy implementation, tracking and reporting, and 4) consultation and engagement mechanisms that particularly focus on tribes and on frontline communities, including funding to reduce barriers to engagement. This action will require new staffing and will consist of funding a dedicated core staff team at Ecology for tracking, reporting, and updating the climate resilience strategy, coordinating sub-cabinet and committee meetings, and performing communication, outreach, and engagement. This action will also include proposed climate resilience capacity at partner agencies, as needed, and funding to establish consultation and engagement mechanisms and to reduce barriers for engagement with tribes and frontline communities such as funding for capacity of partner organizations and funding for participation.
Agency	Interagency action led by the Department of Ecology.
Climate Stressors Addressed	 Cross-hazard.
State Roles	Policies, plans, or procedures.
Resilience Priorities Addressed	All

Strategy II: Plan for, respond to, and recover from climate-driven hazards and emergencies.

Climate change is increasing the frequency and severity of environmental hazards in Washington. Shifting precipitation patterns have resulted in more intense floods; drier summers have led to larger wildfires, smokier skies and droughts; and heatwaves have lasted longer and become hotter. A changing climate spurs the spread of existing and new pathogens, pests and diseases. These climate-driven hazards and emergencies have and will continue to threaten the health and wellbeing of our communities, the services provided by our infrastructure, and the viability of natural and working lands across Washington.

Examples of Ongoing State Work in this Space

Department of Natural Resources: Wildfire Ready Neighbors Program

Wildfire Ready Neighbors is a free initiative by the Department of Natural Resources in collaboration with local partners that empowers residents to proactively prepare for wildfires with free resources, including a custom plan and optional home visits with a wildfire expert. The program assesses wildfire risks on residential properties, raises awareness about available resources, and connects individuals with contractors capable of making improvements. By enhancing community resilience, Wildfire Ready Neighbors aims to better protect homes and surrounding properties from wildfire events. This includes conducting Spanish-language workshops and home assessments in targeted areas in collaboration with local partners like the Latino Community Fund of WA and Community for the Advancement of Family Education (CAFÉ), ensuring accessibility and inclusivity.

Over 6,300 households have enrolled in the program across several counties, including Chelan, Okanogan, Spokane, Yakima, Klickitat, Kittitas, Pierce, Mason, Thurston, Grant, and San Juan.

Department of Ecology: Flood Hazard Management

The Department of Ecology works with communities across the state to provide technical assistance, grants, and coordination support to reduce flood risks, protect lives and property, and enhance and restore habitat and ecosystem services provided by floodplains.

The Floodplains by Design program provides grant funding to support partnerships of local governments, state and federal agencies, and private organizations to implement multi-benefit projects that reduce flood risks and restore natural floodplain functions. One program funded by Floodplains by Design is the Floodplains for the Future initiative in the Puyallup River watershed. Over the past several years, this program has implemented restoration projects and levee setbacks that reduce flood risks, protect and preserve agricultural land, and provide valuable instream habitat for salmon.

Department of Ecology: Office of Chehalis Basin

The Chehalis Basin Strategy is a network of partners and projects dedicated to protecting communities from major flood damage, restoring critical habitat for salmon and aquatic life, and ensuring the basin is safe and prosperous for people, fish and wildlife for generations to come. Since 2011, nearly $78 million in state funding has been allocated to 81 flood damage reduction projects and over $61 million allocated to 80 habitat restoration projects. These efforts have restored 9.9 miles of river shoreline, protected over 600 acres of salmon and floodplain habitat, and installed 13 high-water gauges as part of the Chehalis River Basin Flood Warning System. The legislature established Ecology's Office of Chehalis Basin and the Chehalis Basin Board to carry out this important work.

Emergency Management Division: Enhanced Hazard Mitigation Planning and Emergency Operations

The Emergency Management Division develops the Washington State Enhanced Hazard Mitigation Plan (EHMP) which profiles an array of hazards facing the state, identifies risks and vulnerabilities, and outlines action recommendations to protect communities, infrastructure, and state resources. Many of the hazards profiled in the EHMP, such as drought, extreme weather, floods, and wildfire are directly influenced by climate change. This plan is also used to support hazard mitigation assistance grant programs which provide funding to local jurisdictions to carry out projects that reduce risks from hazards identified in the EHMP.

The Emergency Management Division also plays a critical role in coordinating the state's response to emergency events through activation of the emergency operations center. During emergency and disaster events, the emergency operations center serves as a central location to coordinate state response efforts and communicate between federal, state, and local authorities.

Department of Health: Helping Communities Prepare for Increased Wildfire Smoke

In response to increasing frequency, intensity, and duration of wildfire smoke events across Washington, the Department of Health has published guidance and recommendations for individuals and communities to reduce exposures to wildfire smoke and minimize risks to health. This includes recommendations about actions that can reduce exposures ranging from reducing physical activity outdoors to steps for reducing wildfire smoke in indoor environments.

The Department of Health provides health education and best practices for the public, as well as a toolkit, guidance, and risk communication resources to support local areas during wildfire smoke events. Three toolkit resources are designed to support local decision-makers, people caring for children and youth, and the general public. The Wildfire Smoke Guidance for Canceling Outdoor Events or Activities and Closing Schools provides an action level for decisions, guidance on additional factors to take into consideration, a process for assessing indoor air quality to inform decision making. The Department of Health also convenes a multi-disciplinary Wildfire Smoke Impacts Advisory Group that contributes to these resources and informs ongoing efforts to protect people and communities during wildfire smoke events.

Department of Labor and Industries: New Protections for Washington's Outdoor Workers

Climate change presents unique risks and challenges for outdoor workers in Washington. Extreme heat places outdoor workers at heightened risk of heat-related illnesses like heat stroke and heat exhaustion while increased wildfire events worsen air quality and expose workers to numerous health hazards. In response to these threats, the Washington State Department of Labor and Industries adopted new and stronger heat and wildfire smoke exposure rules for outdoor workers in

2023. These rules apply to nearly 400,000 Washingtonians that work in agriculture, forestry, construction, roofing, landscaping, and other industries.

For heat, these rules require cool-down rest periods of 10 minutes every two hours when temperatures reach or exceed 90 degrees and rest periods of 15 minutes every hour when temperatures reach or exceed 100 degrees. Additional rules require shade and cool water, medical care when workers show signs of heat-related illness, heat exposure plans and trainings, and observation of employees during heat waves and when temperatures reach or exceed 90 degrees.

For smoke, these new rules require air quality monitoring, emergency response measures for workers experiencing smoke exposure systems, exposure controls including respirators, and the creation of smoke response plans and trainings.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP B: Help communities prepare for and respond to extreme heat events and wildfire smoke.

Unlike other climate impacts, such as floods and wildfires that affect communities in discrete geographic areas, wildfire smoke and extreme heat events can impact nearly all corners of the state with significant risks for individuals and communities. These events can often happen concurrently with compounding risks for human health and ecosystems. Below are two actions that seek to help communities prepare for these events and save lives.

Action 1: Saving Lives from Extreme Heat in Washington State

Summary	This action would seek to implement recommendations from the 2023 report "In the Hot Seat: Saving Lives from Extreme Heat in Washington State"[9]. Activities would include supporting weatherization and cooling for low-income individuals, enhance community outreach and early warning systems for extreme heat events, upgrade and install cooling infrastructure in facilities that serve vulnerable populations, and alternative efforts such as increased tree cover and shade structures.
Agency	Department of Health
Climate Stressors Addressed	 Extreme Heat
State Roles	Community Partnerships Resilience Initiatives and Projects

[9] https://cig.uw.edu/wp-content/uploads/sites/2/2023/06/CIG-Report-Heat-202-pages.pdf

	Policies, Plans, or Procedures
Resilience Priorities Addressed	Human health Protect overburdened and vulnerable communities

Action 2: Coordinate Agency Efforts to Reduce Wildfire Smoke Risks

Summary	Wildfire smoke has impacted every community in Washington in the last several years and climate models predict a doubling of large fires by 2050. Even without active fires in the state, Washington can experience wildfire smoke from neighboring states and British Columbia. This action proposes to address smoke risk through planning, intervention, and improved regulations. The Department of Health will work with the Emergency Management Division to include wildfire smoke and extreme heat into the Washington State Enhanced Hazard Mitigation Plan and subsequently into local hazard mitigation plans. The Department of Health will work with other agency partners to administer grants to facilities that serve vulnerable populations for infrastructure upgrades to improve indoor air quality and reduce smoke exposure. Other efforts include indoor air curriculum for HVAC programs and improved coordination for prescribed burn events to reduce smoke impacts.
Agency	Interagency action led by the Department of Health
Climate Stressors Addressed	 Wildfire and smoke
State Roles	Resilience initiatives and projects Policies, plans, or procedures
Resilience Priorities Addressed	Human health Protect overburdened/vulnerable communities

ACTION GROUP C: Minimize wildfire risks in high-risk areas.

As temperatures rise and droughts increase due to climate change, the risk of wildfire will increase across the state. Communities already at risk of wildfire will be even more vulnerable in the coming years. These actions seek to focus state efforts on preparing for and responding to wildfire risks in communities like these in Washington.

Action 3: Wildfire Risk Reduction Grants for the Built Environment in High Fire Risk Jurisdictions

Summary	The Emergency Management Division will create a state-funded grant program that will provide grants to local jurisdictions for wildfire risk reduction specifically in the built environment. This will include areas identified as the wildland-urban interface. Projects funded under this program will include structural hardening, improved water storage capacity, and wildfire risk assessments for communities and critical infrastructure.
Agency	Emergency Management Division
Climate Stressors Addressed	 Wildfire and smoke.
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Protect overburdened/vulnerable communities Built environment

Action 4: Roadside Wildfire Hazard Risk Reduction

Summary	The Washington State Department of Transportation will prepare roadsides and slopes in fire-prone areas through the removal of risk trees, vegetation management, slope stabilization, planting of fire-resistant native plants, burn stabilization, and debris management.
Agency	Department of Transportation
Climate Stressors Addressed	 Wildfire and smoke
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Advance natural solutions

Action 5: Post-fire Recovery

Summary	The escalating threat of wildfires, exacerbated by a warming climate, is pushing more communities into the monumental task of post-fire recovery. The absence of effective coordination from state and federal agencies in supporting these recovery efforts leaves communities to fend for themselves, often having to start from scratch after each fire.

	This action will improve coordination between state and federal agencies, providing direct funding to communities to support recovery efforts and technical assistance throughout a holistic recovery process. To effectively support communities and landscapes in recovery, it is imperative that state and federal agencies clearly define their roles, responsibilities, authorities, and recovery budgets to streamline resources with local and Tribal governments. Once roles are defined, we can work together to create climate resilience through post-fire recovery by closing policy gaps, funding the highest priority work, and addressing the unmet needs of communities and landscapes recovering from severe fires.
Agency	Interagency action led by the Department of Natural Resources
Climate Stressors Addressed	 Wildfire and smoke
State Roles	Policies, plans, or procedures Resilience initiatives and projects
Resilience Priorities Addressed	Protect overburdened/vulnerable communities

ACTION GROUP D: Address increased risks to human and animal health, working lands, and wildlife from pests, pathogens and disease through integrated management.

Increased temperatures and changing environmental conditions will increase the potential for the spread of new and emerging diseases, pests, and pathogens into the state. This risk will require a coordinated effort across agencies to monitor conditions across ecosystems, the agricultural sector, and public health networks.

Action 6: An Integrated Approach for Enhancing Climate Resilience by Improving Cross-Agency Pathogen and Pest Surveillance and Prevention, Management, and Mitigation

Summary	This action will coordinate efforts across the Washington Departments of Health, Agriculture, Fish and Wildlife, and Ecology to plan and prepare for climate-driven spread of existing diseases and the emergence of new pests and disease-causing pathogens. Initial coordination will identify the highest priority needs and a collaborative, coordinated approach to minimize impacts on human, animal, and environmental health.
Agency	Interagency action led by the Departments of Health, Agriculture, Fish and Wildlife, and Ecology

Climate Stressors Addressed	 Cross-hazard
State Roles	Policies, plans, or procedures
Resilience Priorities Addressed	Human health

Action 7: Composting Animal Mortalities and Waste to Promote Ecosystem Resilience

Summary	Washington's animal agricultural industries face increasing risks associated with natural disasters and disease outbreaks, due in part to changing climate patterns. This, coupled with new requirements to reduce landfill emissions, has increased the need to identify alternatives for animal carcass and offal disposal. Composting is a viable and environmentally responsible option to address both routine and mass mortality events in Washington. This action seeks opportunities to support a robust animal composting infrastructure in the state, to provide a viable, alternative disposal method for animal mortality and organic waste management. This approach will ensure a more sustainable agricultural industry and protect against disease transmission following climate-driven mass mortality events.
Agency	Department of Agriculture
Climate Stressors Addressed	 Cross-hazard
State Roles	Resilience initiatives and priorities
Resilience Priorities Addressed	Greenhouse gas emissions and co-benefits Human health

ACTION GROUP E: Provide technical advice and guidance to support climate-driven hazard and emergency planning.

As climate-driven hazards become more intense, frequent, and severe, state agencies will face increasing demands to support hazard and emergency planning efforts at the local level. These actions seek to improve the quality and types of data available to support hazard mitigation planning and better coordinate the state's response to climate-driven emergency events.

Action 8: Hazard Analysis and Planning Program Buildout

Summary	The Emergency Management Division will significantly expand its capacity to do statewide natural hazard analysis and planning. This would include multiple additional staff to improve climate-related hazard analysis, hazard mitigation planning, resilience, and local jurisdiction support. Additional staff would expand capacity for statewide climate-related hazard and vulnerability analyses, develop tools and resources for local hazard mitigation planning, develop long-lasting and effective partnerships with local emergency managers and planners, and improve the use of federal hazard mitigation grants for climate resilience. This action will support the ability of a city or county to address climate change in its updated hazard mitigation plan and adopt it, by reference, in its comprehensive plan -- one of the options available to meet Department of Commerce's climate resilience requirements.
Agency	Emergency Management Division
Climate Stressors Addressed	 Cross-hazard
State Roles	Resilience initiatives and projects Community partnerships
Resilience Priorities Addressed	Protect overburdened/vulnerable communities Flood risk mitigation

Action 9: Data Needs for Community-level Hazard Mitigation

Summary	The responsibility to mitigate the risks of climate-related natural hazards is shared by nearly all state agencies. Effective hazard mitigation must be based on data-driven risk and vulnerability analyses that use best-available science and information. There is a need for cross-agency and collaborative natural hazard analyses that can be used by all state agencies. This action will develop a standardized method for cross-agency collaboration on natural hazard analysis using the Washington Geoportal 2.0 developed by WaTech in 2023.
Agency	Interagency action led by the Emergency Management Division
Climate Stressors Addressed	 Cross-hazard
State Roles	Data and technical information

Resilience Priorities Addressed	Protect overburdened/vulnerable communities Flood risk mitigation Drought resilience Puget Sound health

Action 10: Emergency Food Security Resilience and Relief

Summary	This action will expand and establish a permanent funding pathway for measures launched during Washington's COVID-19 emergency food security response, including the ongoing state-driven procurement and management of emergency food reserves, and the strategic, transparent distribution of food and funding to enterprises and organizations deemed vital to emergency food security. This effort will ensure rapid emergency food distribution to communities impacted by fire, flood, extreme heat, drought, and other climate and public health emergencies.
Agency	Department of Agriculture
Climate Stressors Addressed	 Cross-hazard
State Roles	Policies, plans, or procedures
Resilience Priorities Addressed	Human health Protect overburdened/vulnerable communities

ACTION GROUP F: Examine agency rules, policies, and codes for vulnerabilities in addressing projected climate-driven hazards.

Agency rules and regulations are important tools in building and supporting the resilience of communities, infrastructure, and natural and working lands to climate impacts. However, these rules and regulations are not always effective, especially in emergency and hazard situations. For example, during the 2021 heat dome event, state rules and regulations regarding shellfish harvest offered insufficient protections for human health due to the unprecedented high temperatures. Under this action, agencies will work together to identify vulnerabilities in existing rules and regulations to future climate impacts.

Action 11: Climate Scenario Stress Test of Agency Rules, Policies, and Codes

Summary	Using scenarios of climate-related natural hazards and table-top exercises, agencies will explore the multitude of relevant policies, rules,

	and codes to evaluate potential failure points in the face of climate change. This effort will identify policies, regulations, and codes that may require changes to address potential failure points and better respond to climate impacts.
Agency	Interagency effort led by the Emergency Management Division
Climate Stressors Addressed	 Cross-hazard
State Roles	Plans, policies, and procedures
Resilience Priorities Addressed	Drought resilience Flood risk mitigation Built environment Puget Sound health Human health

Strategy III: Support tribes, local governments, and communities with technical assistance, guidance, and best practices to advance and implement policies and actions that reduce climate risks.

As the impacts of climate change continue and intensify, tribes and local governments across Washington will face increased urgency and need to prepare for these impacts and improve the resilience of communities, infrastructure, and natural and working lands within their jurisdictions.

For communities in Washington, climate impacts will simultaneously present new risks while exacerbating those they already face. In coastal communities for example, infrastructure and property already at risk of coastal flooding and storm surge will experience these impacts at a greater frequency and intensity. Meanwhile infrastructure and property further upland will be newly exposed to these risks as sea levels rise. This double-edged challenge will place added demands on the capacity of communities to plan for, respond to, and recover from climate impacts, particularly for communities who experience systemic social and economic inequities and disproportionate harm.

Through its role as a regulator, funder, and source of technical guidance, state government is well positioned to help communities address these challenges. As regulators, agencies oversee the rules and policies that set the requirements, standards, and procedures for resilience planning at the local level. As funders, agencies provide resources to support planning, design, and implementation of

projects and initiatives to reduce climate impacts. State agencies also provide valuable technical expertise and guidance and can partner with communities to navigate the complexities of climate impacts and identify solutions.

Examples of Ongoing State Work in this Space

Department of Commerce: Growth Management Act and Comprehensive Plans

The Growth Management Act directs local jurisdictions to develop comprehensive plans that guide land-use decisions. A 2023 law added a climate goal to the Growth Management Act and required local jurisdictions to incorporate a climate element with resilience and greenhouse gas emissions reduction elements in their updated comprehensive plans. To this end, the Department of Commerce developed planning guidance to help local jurisdictions develop a climate element, meet the law's requirements, and select climate goals and policies. Commerce also developed a database of more than 200 model goals and policies that cities and counties can adapt and prioritize to meet their communities' unique needs. Finally, the agency is developing greenhouse gas emissions inventories for 11 of the state's largest and fastest-growing counties and distributing about $30 million in grants between 2023 and 2025 to help to local jurisdictions develop and implement their climate elements. Together, this work will ensure that Washington's cities and counties are planning and preparing for the expected impacts of climate change on communities, infrastructure, and natural and working lands.

Department of Commerce: Supporting Communities to Add Their Voice to Local Plans

The Department of Commerce is pilot-testing a grant for community-based organizations to support the participation of vulnerable populations and overburdened communities in the planning process for comprehensive plan updates. Commerce is awarding about $2 million in public participation grants to community-based organizations between 2023 and 2025, with an expectation that this amount will be reauthorized for an additional period of four years, subject to the availability of funding and successful contract extension. Community-based organizations may use the funding to support community members' participation in the development of a climate element and other elements of a comprehensive plan like housing, transportation, land use.

Department of Ecology: Shoreline Master Programs and Sea Level Rise

The Washington State Department of Ecology will soon be updating its Shoreline Master Program Guidelines to require local governments to account for sea level rise in their Shoreline Master Programs. Shoreline Master Programs are local land use policies and regulations that manage shoreline development, environmental protection, and public access. This updated rule will ensure that local governments adopt policies and regulations that address the impact of sea level rise and increased storm severity on communities, property, shoreline natural resources, and the environment.

Department of Ecology: Coastal Hazards Organizational Resilience Team

Ecology initiated the formation of the Coastal Hazards Organizational Resilience Team (COHORT) to respond to coastal communities' request for the state to help address the growing severity of natural hazards, which include flooding, erosion, sea level rise, landslides, and a Cascadia earthquake and tsunami event. Communities identified limited local capacity a major barrier to building long-term resilience, particularly in small, underserved, and geographically isolated communities. Local governments and tribes recommended establishing a coordinated, multi-agency team to provide hands-on technical assistance that would help elevate existing local efforts, mobilize new efforts, and support collaborative, multi-benefit outcomes for communities.

The COHORT is a partnership between Ecology, Washington Sea Grant, the Emergency Management Division, and Washington State University Extension. This group works together to transform the state's vision for coastal landscapes by establishing a unified, cohesive, and equitable approach to resilience planning and implementation. It aims to empower frontline communities and tribes and build upon ongoing efforts that protect, restore, and conserve coastal environments, including the human communities that are a part of them.

Puget Sound Partnership: Strategic Funding Team

The Puget Sound Partnership's Strategic Funding Team (SFT) was established in 2023 to accelerate Puget Sound ecosystem protection, salmon recovery, and climate resiliency by mobilizing funding, particularly through new federal funding opportunities. The SFT assists tribes and local partners in responding to rapid funding availability that supports the implementation of the Puget Sound Action Agenda and Salmon Recovery Plan. This is achieved by providing technical assistance such as helping with grant strategy, supporting grant application development, facilitating the development of collective, cross-geography/sector grant proposals, helping to acquire funding for large-scale, transformative initiatives, and addressing barriers tribes and local partners face while acquiring funding. The team recently launched the Puget Sound Recovery Acceleration Funding Tool which collects and shares information about national, state, and regional funding opportunities in a central location. The U.S. Environmental Protection Agency is funding SFT through September of 2027. Extending SFT services beyond that time would require additional funding.

Puget Sound Partnership: Regional Climate Action Planning for the North Olympic Peninsula

In 2020, the Puget Sound Partnership awarded funding to the North Olympic Development Council, a regional nonprofit economic development district for both Clallam and Jefferson Counties, to establish regional adaptation and mitigation goals for the North Olympic Peninsula in response to climate change. The plans also developed specific climate action plans for local communities that integrate with local government comprehensive and shoreline master plans and other regional climate adaptation and development plans. Tribes, local governments, and community stakeholders came together to agree on actionable, regional goals to address climate change, including:

- Region-wide actionable goals for action by all partners, summarized in the report "Climate and Resiliency Planning on the North Olympic Peninsula (2022)[10]".
- Creation of a climate change planning toolkit available online for download, with sample decision-making checklists, codes, and regulations.
- Development of local climate action or implementation plans for Clallam County and the Jamestown S'Klallam Tribe as well as the cities of Port Angeles and Port Townsend.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP G: Support local planning and accelerate implementation of nature-based solutions to improve the resilience of shorelines, floodplains, and coastal areas.

Nature-based solutions are those that incorporate natural processes to restore ecosystem function and provide resilience benefits. Restoring natural processes improves an ecosystem's ability to withstand climate impacts such as through increasing available habitat, sustaining biodiversity and improving water quality. Restoring natural processes can also enhance the resilience of surrounding communities, infrastructure, and natural and working lands. For example, restoring floodplain functions can improve habitat for aquatic species and reduce the impact of flooding on adjacent communities.

The Department of Ecology proposes two actions to support tribes, local governments, and communities with the implementation of nature-based solutions in shorelines, floodplains, and coastal areas of Washington. These actions will help accelerate the implementation of nature-based solutions and support local jurisdictions to identify vulnerabilities and craft solutions.

Action 12: Accelerate Nature-Based Climate Adaptation by Improving Regulatory Efficiency

Summary	Permitting and regulatory processes are necessary to ensure responsible development and the protection of natural resources but can often be time intensive. Nature-based projects restore and enhance habitat and ecosystem functions that permit processes seek to protect. Permitting requirements and timelines can create barriers to implementing nature-based projects. The Department of Ecology will explore opportunities to improve regulatory efficiencies and address capacity and information needs to

[10] https://irp-cdn.multiscreensite.com/6c85e905/files/uploaded/The%20NOPRCD%20Climate%20Change%20Preparedness%20Plan%20for%20the%20North%20Olympic%20Peninsula.pdf

	accelerate nature-based climate adaptation in floodplain management. Work will focus specifically on the state-federal balance of regulatory responsibilities and identify opportunities for the state to take on new roles to reduce existing barriers and accelerate project implementation.
Agency	Department of Ecology
Climate Stressors Addressed	 Flooding and Marine and Coastal Changes
State Roles	Policies, plans, and procedures
Resilience Priorities Addressed	Natural solutions Restore habitat Reduce stressors that exacerbate climate impacts

Action 13: Support Local Governments in Assessing Vulnerability and Planning for Resilience

Summary	Through its efforts to support local governments in managing shorelines and floodplains, the Department of Ecology provides critical capacity and resources in preparing for climate-driven hazards through technical assistance and regulatory review. As the impacts of climate change accelerate and intensify, existing local capacity will be limited and support from the Department of Ecology will be increasingly necessary. The Department of Ecology will expand the agency's capacity to better support local governments in planning and preparing for climate hazards before they occur through increased technical assistance, permitting capacity, updating mapping and geospatial tools, and guidance. For example, updated map data for floodplains and channel migration zones are critical to understanding vulnerability and risk at a local level. This work will also prioritize emerging needs such as guidance on how to integrate riparian management best practices into shoreline planning.
Agency	Department of Ecology
Climate Stressors Addressed	 Flooding and Marine and Coastal Changes
State Roles	Policies, plans, or procedures Data and technical information
Resilience Priorities Addressed	Natural solutions Restore habitat Reduce stressors that exacerbate climate impacts

ACTION GROUP H: Build local-level resilience capacity in overburdened and underserved communities.

Overburdened and underserved communities often experience climate impacts more severely and at higher rates than others. And because people in overburdened communities have often been denied access to important social services and other support, they may not have the resources they need to reduce their exposure and adapt to changing conditions. In response, agencies have proposed the following actions:

Action 14: Support Local Match for Small Impoverished Communities

Summary	Many communities in Washington struggle to secure federal disaster recovery and mitigation grants because they cannot meet grant funding match requirements. This financial barrier means that many communities, typically small and rural ones, cannot pursue federal grant funding despite being impacted by disasters and having grant-eligible proposals to address climate-driven hazards. The Emergency Management Division will provide state funding to cover a portion of local match requirements for Washington jurisdictions, federally recognized tribes, and special-purpose districts that meet federal criteria for small, impoverished communities. This investment will ensure more equitable access to federal grant resources and build the resilience of small, rural communities in Washington.
Agency	Emergency Management Division
Climate Stressors Addressed	 Cross-hazard
State Roles	Community partnerships Resilience initiatives and projects
Resilience Priorities Addressed	Protect overburdened/vulnerable communities

Action 15: Community Resilience to a Changing Climate

Summary	Across Washington, conservation districts provide information, technical assistance, and financial support for communities to increase their resilience to climate-driven hazards. Much of this work is multi-benefit in nature and supports both communities and natural and working lands. As climate impacts increase and intensify, there is greater demand placed on conservation districts to advance this work.

	The State Conservation Commission seeks to increase investments in the programs and initiatives led by conservation districts. Additional resources will enable conservation districts to better serve ranchers and farmers at risk of climate driven hazards, advance habitat restoration initiatives, and support communities in preparing for wildfire risk.
Agency	State Conservation Commission
Climate Stressors Addressed	 Cross-hazard
State Roles	Community partnerships Data and technical information Resilience initiatives and projects
Resilience Priorities Addressed	Prioritizes natural solutions Restore habitat Reduce stressors that exacerbate climate impacts Address the risks in each geographic region of the state

Action 16: Catalyzing Community Climate Resilience Hubs

Summary	Climate resilience hubs are public spaces that help local communities, vulnerable populations, and individuals better withstand a range of climate-driven hazards such as extreme heat and wildfire smoke. Many communities have identified these spaces as a priority in their climate resilience planning efforts. This interagency action would identify priority communities in need of additional state support, connect communities with available state and federal funding opportunities, and develop policy and funding recommendations to enable facilities such as schools and community centers to serve as climate resiliency hubs through infrastructure and other upgrades. Other privately owned facilities that are open to the public like churches, museums, and cultural institutions may be included in this work.
Agency	Interagency effort led by the Departments of Ecology, Commerce, and Health, Puget Sound Partnership, and Emergency Management Division.
Climate Stressors Addressed	 Cross-hazard
State Roles	Community partnerships Resilience initiatives and projects
Resilience Priorities Addressed	Protect overburdened/vulnerable communities Prioritizes human health

Address the risks in each geographic region of the state

Strategy IV: Support the vitality and viability of working lands under a changing climate through research, technical assistance, and incentives.

Washington's working lands provide an array of goods and services as well as economic opportunities across all parts of the state. Working lands include agricultural lands, forests, shellfish farms and aquaculture facilities, fisheries, and other sectors that rely on Washington's natural resources.

Rich soils, diverse climates, and large-scale irrigation infrastructure make Washington one of the most productive forested and agricultural regions in the world. Washington working farms and forests are of global importance, producing over 300 different commodities and adding over $10 billion to the state economy. Washington forests account for 25% of U.S. log and lumber exports and 9% of the nation's paper products, with innovative wood product sectors expanding yearly. These activities are critical to urban and rural communities alike, providing food security, nutrition, and thriving livelihoods in Washington and beyond.

Climate change is already impacting working lands in Washington. Altered precipitation and temperature patterns have increased the incidence of extreme weather events such as flood, fire, heat, and drought. These have led to new challenges with invasive pests, diseases, and weeds, worker health and safety, and declining water quality and quantity. The actions below seek to support individuals, communities, and industries that rely on these working lands to better prepare for and adapt to changing climate conditions to protect livelihoods and the environment.

Examples of Ongoing State Work in this Space

Department of Agriculture: Washington Soil Health Initiative and Climate Resilience Planning

The Department of Agriculture leads multiple partnerships that provide resources, support, and guidance to communities and industries that rely on working lands. One such project is the Washington Soil Health Initiative (WaSHI), a partnership between the State Conservation Commission, and Washington State University. Together, WaSHI partners provide technical assistance, research, incentive funding, and policy support to advance healthy soils for farmers and the environment. WaSHI supports science-based programs that connect farmers with opportunities and guidance to improve soil health and sequester carbon on their farms.

An additional project in partnership with the Department of Health seeks to reduce the impacts of manure to water quality and to build climate resilience on livestock farms. Funded by the U.S. Environmental Protection Agency's Puget Sound Geographic Funds, the Department of Agriculture is improving nutrient management planning, adaptive management strategies, and build flood preparedness on livestock farms.

In partnership with Washington State University, the Department of Agriculture is also developing a Climate Resilience Plan for Washington agriculture. This plan will synthesize the latest science on agricultural resilience, engage with agricultural stakeholders on their climate-related concerns, identify vulnerabilities in the state's agricultural sector to expected future climate impacts, and propose action opportunities to help fill gaps and build resilience. The planning process is currently underway and will be completed in early 2025.

State Conservation Commission: Natural Resource Resilience through Voluntary Conservation

The State Conservation Commission presently offers a portfolio of natural resource focused voluntary incentive programs which utilize the extensive technical and local expertise of Washington's 45 conservation districts to provide technical and financial assistance to land stewards. This work creates greater resiliency in water quality and quantity, habitat for instream and out of stream organisms and other co-benefits of riparian restoration, protection of critical aquifer recharge areas, critical area conservation, soil health, air quality, reduction of greenhouse gas emissions and carbon sequestration, pollinator health, forest, and rangeland health.

These programs include Riparian Grants Program, Riparian Plant Propagation Program, Conservation Reserve Enhancement Program, Sustainable Farms and Fields Program, Natural Resource Investments Program, Regional Conservation Partnership Program, Shellfish Program, and the Voluntary Stewardship Program. The State Conservation Commission is working to incorporate additional climate resilience considerations into these existing programs.

Implementing Washington's Ocean Acidification Action Plan

Our oceans absorb carbon dioxide emissions from the atmosphere and, in doing so, have become more corrosive over time. This changing chemistry of our oceans is referred to as ocean acidification and it makes conditions difficult for some marine animals to form their shells and affects the behavior of other animals, like salmon. In the late 2000s, Washington experienced first-hand the impacts of ocean acidification on our shellfish industry - massive numbers of baby oysters died due to ocean acidification. In 2012, we led the nation by developing the first comprehensive plan to tackle ocean acidification and formed the Marine Resources Advisory Council in the Governor's office to guide the implementation of the plan. Washington has invested in the scientific understanding of ocean acidification, taken actions to help our shellfish industry be more resilient, advanced restoration and protection of species and habitats, and reduced sources of pollution that cause ocean acidification. Washington's leadership has advanced collaborations within our state, across our region and nation and even internationally through the International Alliance. More recently,

state agencies participated in the formation of the Olympic Coast Ocean Acidification Sentinel Site. These efforts continue to work to build broader awareness of and support for the many actions needed to minimize the impact of ocean acidification on Washington's marine waters and coastal communities.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP I: Promote agricultural viability under an uncertain climate future.

State agencies can support the agricultural industry and community with technical advice and guidance for strategies to manage climate impacts. Agencies such as the Washington State Department of Agriculture and the State Conservation Commission have extensive support networks within these communities and serve as trusted sources of knowledge and information. These actions will help expand this work to make Washington agriculture more resilient to climate impacts.

Action 17: Agricultural viability and farmland preservation

Summary	Climate change poses increasing threats to the long-term viability of agriculture. Recent data has shown that Washington has lost 6% of its farmland and 10% of its farm businesses between 2017 and 2022, outpacing the rest of the nation. Beyond agricultural products, farms provide other benefits for climate resilience such as water storage and filtration, aquifer recharge, habitat, and open space. The State Conservation Commission will advance agricultural viability work through increased resources and staff capacity under its Office of Farmland Preservation and its Voluntary Stewardship Program. The Voluntary Stewardship Program facilitates watershed-focused, incentive-based, voluntary collaboration among diverse stakeholders to protect critical areas and promote agriculture viability. The program provides resources and expertise to support on-farm conservation actions that provide benefits for agriculture, ecosystems, and surrounding communities.
Agency	State Conservation Commission
Climate Stressors Addressed	 Cross-hazard
State Roles	Community partnerships Resilience initiatives and projects

Resilience Priorities Addressed	Greenhouse gas emissions and co-benefits Advance natural solutions

Action 18: Supporting private landowners to provide public benefit.

Summary	In 2021, the Washington State Department of Agriculture published a survey that revealed Washington producers are overwhelmingly interested in implementing practices that increase climate resilience. The survey identified the associated costs of advancing this work as a major barrier. To ensure that the cost of conservation and environmental protection does not fall to the grower alone, WSDA proposes to expand funding for direct-to-producer incentive payments that support climate resilience and the provision of public benefits. Eligible types of work include livestock infrastructure improvements, soil health, equipment and technology upgrades, and habitat enhancement projects.
Agency	Department of Agriculture
Climate Stressors Addressed	 Cross-hazard
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Greenhouse gas emissions and co-benefits Advance natural solutions

Action 19: Climate resilience research, tools, and on the ground support for Washington agriculture.

Summary	To support the adaptation and resilience of Washington's agricultural industry, the Washington State Department of Agriculture and State Conservation Commission will continue to create comprehensive, science-based resources and opportunities for Washington producers. The Department of Agriculture will increase the quantity and quality of data-driven tools available to decision makers, industry, and producers. These will include predictive models for water demand and tools to mitigate the impacts of extreme weather on agricultural systems. The Department will also partner with Washington State University and the State Conservation Commission and others to provide place- and context-based solutions to climate resilience problems for growers through

	technical support networks embedded within the agricultural sector. This work will include efforts to permanently fund the Department's agricultural workforce program to foster a skilled workforce with expertise in climate resilient agriculture. The State Conservation Commission will similarly use its Science Hub and Center for Technical Development to connect producers with the latest science and knowledge for implementing climate resilient on-farm conservation practices.
Agency	Department of Agriculture and State Conservation Commission
Climate Stressors Addressed	 Cross-hazard
State Roles	Data and technical information
Resilience Priorities Addressed	Drought resilience Advance natural solutions

ACTION GROUP J: Explore novel market opportunities to support climate risk reduction efforts.

Risk reduction activities like forest thinning minimize wildfire risk and generate products that can be directly used for commercial purposes. However, these same activities also leave behind other products without such commercial uses like branches and treetops. Disposal strategies such as open burning degrade air quality and result in carbon emissions while leaving this material in the forest can exacerbate wildfire risks. To support continued risk reduction work, Washington needs novel solutions to identify market opportunities for the processing of this material.

Action 20: Economically Viable Uses for Biomass Generated by Forest and Rangeland Wildfire Mitigation Projects

Summary	The Department of Commerce will expand state resources and seek federal support to advance research of economically viable uses for biomass generated from forest and rangeland projects. Ultimately, this research will boost commercial demand and utilization for otherwise low-value byproducts that could help improve the overall financial viability of forest and rangeland projects.
Agency	Department of Commerce
Climate Stressors Addressed	 Wildfire and smoke

State Roles	Data and technical information, resilience initiatives and projects
Resilience Priorities Addressed	Greenhouse gas emissions Advance natural solutions

Strategy V: Reduce existing sources of pollution that exacerbate climate impacts.

Climate change worsens existing challenges already faced by communities throughout Washington, particularly overburdened and vulnerable communities. By working to reduce sources of existing pollution, we can lower people's overall exposure to harmful pollutants and reduces sources of greenhouse gas emissions. Additionally, deploying solutions also helps communities transition to cleaner technologies.

Examples of Ongoing State Work in this Space

Department of Ecology: Greenhouse Gas Emissions Reduction and Equitable Air Quality Improvement

The Department of Ecology is leading significant efforts to reduce greenhouse gas emissions across the state 95% by 2050. This work includes market-based cap-and-invest programs to reduce greenhouse gas pollution, clean fuel standards to reduce the carbon intensity of fuels and overall transportation emissions, efforts to promote zero-emissions vehicles, and regulations to curb potent hydrofluorocarbons from use in machinery and equipment.

The Department of Ecology is also working to improve air quality in 16 overburdened and vulnerable communities across the state. These communities represent areas highly impacted by criteria air pollution that have also been historically overburdened by health, social, and environmental inequities. This work includes efforts to expand air monitoring and consider rulemaking and regulations to improve air quality. In 2024, the Department of Ecology will make available $10 million in grants to support projects that reduce criteria air pollution in these communities.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP K: Reduce smoke pollution through regulations and community outreach.

Climate impacts such as increased wildfire smoke will lead to reduced air quality which will put communities with already poor air quality at greater risk of health impacts. By reducing existing

sources of air pollution within our control, we reduce the overall burdens of climate impacts for individuals and communities.

Action 21: Expand wood stove replacement grants.

Summary	The Department of Ecology's Wood Smoke Reduction Grant Program provides funding to individuals to replace uncertified wood-burning home heating devices with cleaner-burning heating options to reduce emissions and improve community air quality. This program prioritizes communities at high risk of violating ambient air quality standards. The Department of Ecology will increase funding for this program to help communities improve local air quality. Better overall air quality will improve health outcomes and make communities more resilient to wildfire smoke.
Agency	Department of Ecology
Climate Stressors Addressed	Wildfire and smoke
State Roles	Policies, plans, and procedures
Resilience Priorities Addressed	Greenhouse gas emissions Human health Protect overburdened/vulnerable communities

Action 22: Strengthen regulations of outdoor and agricultural burning.

Summary	This action would increase funding for compliance and enforcement of outdoor and agricultural burn requirements in central Washington. Currently, Ecology only has two staff responsible for implementing and enforcing agricultural and outdoor burn programs across five counties in central Washington. Additional capacity is needed to adequately oversee the program, as the wide geographic scope makes it challenging for the current inspectors to respond quickly and efficiently to complaints and oversee compliance with permits and regulatory requirements.
Agency	Department of Ecology
Climate Stressors Addressed	Wildfire and smoke
State Roles	Policies, plans, and procedures

Resilience Priorities Addressed	Greenhouse gas emissions Human health

Strategy VI: Implement innovative water conservation and management initiatives to ensure reliable and sufficient water for people, ecosystems, wildlife, and fish.

Climate change will continue to drive significant changes to water availability in Washington. Historically, Washington's mountains received substantial snowfall which provided a steady and reliable supply of water as it gradually melts over the summer months. However, climate projections show that Washington will receive less snowfall and more precipitation will fall as rain in the future. This rainfall will quickly move through the landscape resulting in reduced water availability in the drier summer months. This will result in more frequent and intense droughts across the state with impacts to communities, ecosystems and wildlife, and agriculture.

Now and in the coming years, state agencies will face increasing demands to support communities, infrastructure, and natural and working lands in preparing for changes in water availability and implementing innovative projects, initiatives, and policies to address these challenges.

Examples of Ongoing State Work in this Space

Department of Ecology: Yakima Basin Integrated Plan

With a large population and substantial agricultural industry, the Yakima Basin is a prime example of how reduced water availability threatens communities in Washington. To better prepare the basin for water supply impacts, the Department of Ecology developed the Yakima River Basin Integrated Plan in partnership with local, state, and federal partners to identify projects and initiatives to improve the basin's resilience to changes in water availability. The plan seeks to identify collaborative opportunities, reduce conflict, and build the resilience of the basin.

The Yakima Basin Integrated Plan outlines a 30-year approach to ensure water availability and reliability for people and the environment. Specifically, the plan focuses on fish habitat, agricultural irrigation, water storage, groundwater, and conservation practices. This includes projects and initiatives like water conservation programs for agriculture, investments in dam and irrigation infrastructure, fish passage improvements, and aquifer storage. Ecology works with partners to secure funding for projects from state, federal, local, and private sources.

Department of Ecology: Drought Preparedness and Emergency Response

The Department of Ecology monitors statewide water supply conditions, incentivizes drought planning and preparedness, and declares drought emergencies when water supplies meet certain thresholds that will create undue hardships for water users or the environment. Ecology declared drought emergencies in 2015, 2019, 2021, 2022, 2023, and most recently in spring 2024, in all or

parts of the state. Emergency drought declarations play a crucial role in promoting community awareness and understanding around water scarcity and prompting responsive actions. Drought declarations also provide the Department of Ecology with the authority to expedite emergency drought permitting and water transfers and award grant funds to mitigate hardships to water users and the environment. Grant funds can be used to support agriculture through purchasing or leasing water rights for use during the drought period, developing alternative sources of water for public water supply in coordination with the Department of Health's Office of Drinking Water, and enhancing habitat conditions for fish and wildlife by increasing streamflow and improving water quality. Messaging around drought in partnership with the Department of Health includes reuse, reclaimed water marketing and increasing the transparency on water use efficiency data and seasonal burdens.

State Conservation Commission: Irrigation Efficiencies Grant Program

Working with conservation districts across the state, the State Conservation Commission's Irrigation Efficiencies Grants Program provides funding and financial incentives to irrigators and water purveyors for projects and initiatives that conserve water and improve overall irrigation efficiency. The program provides funding for conservation district technicians that work directly with farmers to develop projects tailored to their unique needs. Funding and resources through this program provide on-farm solutions that generate multiple benefits for instream flows, drought mitigation, enhanced water quality, and agricultural productivity.

Department of Health: Local Watershed Health and Groundwater Protection

The Department of Health's Office of Drinking Water (ODW) oversees and supports Group A drinking water systems in planning for future demand, hazards such as drought and wildfire, water use efficiency and climate resilience. ODW works to subsidize and encourage coordinated water system planning to address long term water scarcity mitigation approaches including wholesaling water, cooperative agreements, water banking, reclaimed water investments, regional water rights, and trucking water. ODW also works with the Climate Impacts Group at the University of Washington to develop tools and resources for water systems to use in meeting new planning requirements. ODW funds groundwater level monitoring equipment for public water systems in vulnerable areas. ODW will increase community-based social marketing and outreach to improve transparency on water use efficiency data and seasonal burdens with clear a call to action focusing on behavior changes, tangible choices and outcomes.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP L: Prepare for changes in water availability and implement projects in multi-benefit, large-scale water plans.

Coordination within and across agencies is essential to ensure that communities, infrastructure, and natural and working lands are sufficiently prepared for changes in water availability. Projects that coordinate efforts across tribes, state agencies, local governments, and other stakeholders are especially useful in developing multi-benefit outcomes for all water users, ecosystems, wildlife, and fish.

Action 23: Local Drought Preparedness Planning

Summary	Ecology will establish a permanent funding pathway for its newly created drought planning and preparedness grant program. This funding will help communities proactively prepare for drought impacts before they happen by financing local drought planning initiatives and drought resilience projects throughout Washington.
Agency	Department of Ecology
Climate Stressors Addressed	 Reduced water availability and drought
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Drought resilience

Action 24: Walla Walla Water 2050 Strategic Plan Implementation

Summary	The Walla Walla Water 2050 Strategic Plan lays out a 30-year effort to improve streamflows and water supplies in the Walla Walla watershed. Employing an integrated water resource management approach, the plan integrates goals and solutions from the basin's diverse stakeholders in both Washington and Oregon to achieve a holistic and viable long-term plan for water use in the basin. The Department of Ecology will implement prioritized long term and short-term recommendations from the Walla Walla 2050 Strategic Plan to provide improved water supply reliability and streamflows.
Agency	Department of Ecology

Climate Stressors Addressed	 Reduced water availability and drought
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Drought resilience

Action 25: Reclaimed Water Rule Amendment to Address Streamflow Impacts

Summary	Current water resources law is a barrier to entities reclaiming and consumptively reusing water if their discharge is to freshwaters where instream flows have been established by rule. This is because changes to discharge may result in impairment to instream flows. The Department of Ecology will amend the reclaimed water rule to define standards for compensation of impairment to state administered instream flows. This action is intended to provide a permitting pathway for new reclaimed water facilities that discharge to fresh water.
Agency	Department of Ecology
Climate Stressors Addressed	 Reduced water availability and drought
State Roles	Resilience initiatives Projects, plans, policies, and procedures
Resilience Priorities Addressed	Drought resilience

Action 26: Increasing WDFW's Drought Coordination Capacity

Summary	Drought conditions and insufficient water resources present challenges for the Washington State Department of Fish and Wildlife to meet its goals and objectives. This action will increase staff capacity in the Energy and Major Projects Division to ensure on-going, year-round drought coordination capacity, including in years without drought declaration.
Agency	Department of Fish and Wildlife
Climate Stressors Addressed	 Reduced water availabiltiy and drought
State Roles	Policies, plans, and procedures

Resilience Priorities Addressed	Drought resilience

ACTION GROUP M: Improve the resilience and efficiency of water use and infrastructure.

Water conservation and improved efficiency are useful tools in ensuring the protection of water resources under reduced water availability. The actions below outline steps by state agencies to improve infrastructure, provide incentives, and bring together partners to help advance conservation and efficiency initiatives.

Public water systems face increasing challenges in ensuring safe and reliable drinking water to people across Washington because of climate change. Drought, fire, power outages, flooding, landslides, pathogens, and other hazards can temporarily or permanently disrupt drinking water service by both damaging infrastructure and affecting drinking water sources.

Action 27: Drinking Water System Resilience

Summary	In conjunction with the Department of Ecology, Ruckelshaus Center, and the governor's office, the Department of Health will work to implement actions identified in the required legislative report on the Water Use Efficiency Program. In addition to supporting the increased data collection and enforcement of water use efficiency, Office of Drinking Water will work to gather both static groundwater level measurements seasonal and pumping levels to integrate with new interagency water resources data sharing strategy as well as the proposed groundwater atlas to identify trends. The Department of Health will update both water system planning regulations and create a new guidebook to include climate resilience planning, assessing climate hazards and emergency response planning. The Water System Design Manual will include engineering guidance on project descriptions, analysis of alternatives and design criteria integrating climate constraints, contingency planning, and guidance on funding avenues. Improved analytics, anticipatory climate scenarios and proactive technical assistance would support preparedness of public water systems.
Agency	Department of Health

Climate Stressors Addressed	 Reduced water availability and drought
State Roles	Resilience initiatives Projects, plans, policies, and procedures
Resilience Priorities Addressed	Drought resilience Built environment Human health

Action 28: Irrigation Efficiencies, improved monitoring and management of water use

Summary	The agricultural sector in Washington is a significant user of water resources and water conservation is an important tool to ensure continued agricultural productivity under climate change. The State Conservation Commission will expand the capacity and reach of the Irrigation Efficiencies Grants Program and other voluntary incentive conservation programs to support the implementation of climate resilience practices and planning considerations. Irrigation efficiency technology will be eligible under the Department of Agriculture's direct-to-producer incentive program. Additional research by the Department will include a drought economic modeling project to help producers make irrigation decisions under drought scenarios. The Department of Ecology will seek incentives for reduced power rates for irrigators that pursue conversion of gravity irrigation water supply delivery systems to a downstream electrical pump station or system. Advancing this type of modern, more efficient irrigation infrastructure can improve instream flow and reduce water loss from seepage through a pressurized system. Additionally, these systems provide reliable and sustainable water supply when and where it may be needed. The Department of Ecology will expand its capacity to actively manage and monitor water use to promote compliance and a broader understanding of resource use. By actively measuring and tracking water use across the state and across sectors, Ecology will have a more complete understanding of demand, compared to water availability (supply), to advance conversations and projects that build climate resiliency.
Agency	Departments of Agriculture, Ecology the State Conservation Commission

Climate Stressors Addressed	 Reduced water availbility and drought
State Roles	Data and technical information Community partnerships
Resilience Priorities Addressed	Drought resilience

ACTION GROUP N: Improve water management through the collection, use, and standardization of shared water data across agencies.

Reliable and accurate data is necessary to support water management activities. Multiple agencies rely on a wide array of water data to guide decision making and regulations. These actions seek to coordinate efforts across agencies to better understand available water data resources and identify opportunities to improve collaboration, data sharing, and consistency across state agencies.

Action 29: Aggregate and Analyze Water Data and Communicate Information on Water Supply, Managed Aquifer Recharge Projects, and Groundwater

Summary	The Department of Ecology will fund new data collection and analysis of the water supply changes projected because of climate change, focusing on the Puget Sound and Western Washington watersheds. The proposal includes the development of compelling communication and outreach resources to support a broad public and legislative engagement strategy intended to improve awareness and understanding of significant predicted future impacts on water supplies. This will result in a broader awareness of projected impacts that will lead to informed dialog and broader public support for potential actions. Additionally, agencies will expand efforts to improve understanding of groundwater and surface water including studies to evaluate the effectiveness of Managed Aquifer Recharge (MAR) projects as well as groundwater modeling. These efforts will be supported the Department of Ecology and the Department of Fish and Wildlife.
Agency	Department of Ecology and Department of Fish and Wildlife
Climate Stressors Addressed	 Reduced water availabiltiy and drought
State Roles	Plans, policies, and procedures
Resilience Priorities Addressed	Drought resilience Puget Sound health

Action 30: Data Sharing to Support Water Management

Summary	This action will convene an interagency technical advisory team to develop a long-term statewide strategy for water resource data. To inform the strategy, the team would identify and describe groundwater and surface water resource data repositories as well as data gaps that limit our ability to manage water resources. The Department of Ecology will draft a report that describes available water resources data, identifies uses for the data, including barriers to data sharing, outlines options for improving data accessibility and usability, addresses data aggregation and access solutions, and makes specific recommendations on next steps, including potential tool development.
Agency	Interagency action led by the Department of Ecology
Climate Stressors Addressed	 Reduced water availabiltiy and drought
State Roles	Data and technical information
Resilience Priorities Addressed	Drought resilience

Strategy VII: Maintain the level of service and improve the performance of critical infrastructure and state assets to minimize vulnerability to climate impacts, including retrofits or removals.

Critical infrastructure like the energy grid, transportation systems, communication networks, and public utilities provide essential services for communities across Washington. As climate change impacts continue and accelerate, the services provided by the state's critical infrastructure are at risk over both the short and long term.

Short-term climate-driven hazards such as individual heatwaves, wildfires, and floods threaten the immediate operation of critical infrastructure while longer-term climate impacts such as reduced snowpack and sea level rise threaten the ongoing viability of services provided by critical infrastructure.

These challenges require a coordinated response by state government to ensure the reliable distribution of services to communities in the face of increasingly severe climate impacts. Responses may also include retrofits or removals of infrastructure depending upon its location and exposure to climate impacts. Additionally, efforts to improve the level of service and performance of

infrastructure should complement natural systems and ecosystem resilience efforts to improve equity for overburdened and underserved communities.

Examples of Ongoing State Work in this Space

Departments of Ecology, Fish and Wildlife, and Transportation: Washington State Coastal Climate Resilience Partnership

The Washington State Coastal Climate Resilience Partnership is a statewide inter-organizational collaborative of state agencies, tribes, local and national NGOs, and local government partners. Together, this group works to advance integrated and equitable coastal management priorities related to sea level rise and other coastal hazards across Washington's diverse marine shorelines. This work includes large-scale risk reduction projects that utilize nature-based solutions, develop scalable and adaptable responses that center climate justice, enhance human safety, protect and restore habitat, and enhance community resilience.

As part of this work, the Department of Transportation will update its 2011 climate impacts vulnerability assessment for all state roadways in Washington's 15 coastal counties. This work will make use of sea level rise projections to assess the vulnerability of coastal highways to climate impacts.

Department of Health: Preparing Public Water Systems for Climate

The DOH Office of Drinking Water (ODW) provides water system engineering guidance to integrate climate constraints, contingency planning, and guidance on reducing greenhouse gas emissions, energy conservation and reducing waste in water treatment. ODW also manages the Drinking Water State Revolving Fund (DWSRF), which makes funds available to drinking water systems to pay for infrastructure improvements, including resilience to hazards. DWSRF "set-aside" funds focus specifically on providing technical assistance to smaller public water systems in underserved communities, positioning these systems to take advantage of capital investment resources that could improve their system and infrastructure resilience.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP O: Preservation and maintenance to improve the resilience of state assets.

State agencies are directly responsible for the maintenance and operation of many assets that provide critical services such as buildings, energy storage and transmission, communication networks, state-owned vehicles and vessels, transportation infrastructure, and hatcheries as well as flood control and pollution monitoring infrastructure. Each of these assets and the services they provide to communities are vulnerable to climate impacts.

Action 31: Interagency coordination on improving the resilience of state-owned physical assets.

Summary	Under this work, agencies will update asset management plans and assess physical asset inventories to address expected future climate impacts on a wide range of state-owned assets. This effort will identify opportunities to reduce expected risks and increase the resilience of these assets. As one example, the Washington State Department of Transportation will develop risk-based asset management plans to address current and future climate impacts and identify where asset-specific vulnerability assessments are needed. Other efforts will focus on state facilities such as correctional facilities that directly serve vulnerable populations. The Department of Corrections will advance work to mitigate heat impacts in select correctional facilities and conduct a system-wide resilience planning effort to identify climate resilience needs and infrastructure upgrade opportunities.
Agency	Interagency effort led by the Departments of Transportation and Corrections
Climate Stressors Addressed	 Cross-hazard
State Roles	Management of state assets
Resilience Priorities Addressed	Protect overburdened and vulnerable communities Drought resilience Flood risk mitigation Built environment resilience

ACTION GROUP P: Maintain energy security and reliability under changing climate conditions.

Energy security and the reliable distribution of energy services is always a priority, but especially so before, during, and after climate-driven hazards and emergency events.

Action 32: Development of a State Energy Security and Resilience Framework.

Summary	The Department of Commerce, in partnership with electric and natural gas utilities and statewide energy sectors, will develop a State Energy Security and Resilience Framework that will identify vulnerabilities in the state's energy system and potential disruptions including those resulting from climate-driven hazards such as severe weather, wildfires, and

	heatwaves. This framework will identify energy sources especially vulnerable to climate-driven impacts and name specific actions to take in response to supply disruptions for different energy sources. Overall, this effort will seek to build energy-resilient communities across the state and ensure the reliable restoration of energy services when they are needed most.
Agency	Department of Commerce
Climate Stressors Addressed	 Cross-hazard
State Roles	Management of state assets Policies, plans, and procedures
Resilience Priorities Addressed	Built environment resilience Protect overburdened and vulnerable communities

Strategy VIII: Plan, build, and invest in public infrastructure that considers future climate conditions, increases equity, and makes use of nature-based solutions.

State agencies must also consider how new infrastructure can account for projected climate impacts while simultaneously balancing the needs of communities and natural systems.

Climate change will require new and alternative approaches to public infrastructure and the services it provides. Approaches that have worked in the past may be insufficient to meet future needs and current infrastructure may hinder opportunities to improve equity for overburdened communities and to restore habitat and natural processes. To build resilience more holistically, infrastructure must be designed to withstand future conditions and balance the needs of surrounding communities and ecosystems.

Examples of Ongoing State Work in this Space

Department of Transportation: Fish Passage Structures and Resilience Co-benefits

For 30 years, the Washington State Department of Transportation has improved fish passage and expand habitat access through the removal of barriers like culverts. Since 2013, much of this work has focused on restoring fish passage in the western part of the state in response to a federal injunction. As of June 2024, 146 injunction barriers have been corrected on state highways improving access to over 560 miles of habitat. While the Department of Transportation has made

significant progress, the Department needs additional investments to comply with the permanent injunction, to correct high priority fish passage barriers statewide, and to replace deficient or failing culverts.

Fish passage design carefully considers today's climate as well as future climate changes. Fish passage projects are built to handle increased stream flow and coastal flooding. The Department of Transportation uses climate science and tools available through Climate Impacts Group at the University of Washington and the Department of Fish and Wildlife to evaluate the influence climate change has on water crossing designs.

In 2019, the Department of Transportation added climate resilience guidance to their Hydraulic Manual. The Department of Transportation will continue to use best available science to update technical guidance to design new highway water crossing structures to be resilient to future climate conditions like expected sea level rise and increases in rainfall and stream flows. While the purpose of these projects is to remove barriers and expand access to fish habitat, they provide numerous resilience benefits for other ecosystem process as well as surrounding communities. Properly designed stream crossings reduce flooding risks and ensure that roads remain passable during increasingly severe storms and flood events.

State Parks: Climate Adaptation Risk Assessment Toolkit

The Washington State Parks and Recreation Commission oversees a wide array of assets and infrastructure in the more than 125 parks that comprise the state park system. These assets are distributed across a wide geographic range and are exposed to a broad range of climate risks. Climate change presents significant impacts on recreational opportunities for individuals and communities in Washington. State Parks is developing a climate adaptation risk and economic assessment toolkit to help the agency make decisions related to adaptation planning. This toolkit will consider risk exposure, resource significance, and other socio-economic factors to help support prioritization efforts and improve the overall resilience of the system's infrastructure and assets to climate impacts.

Department of Health: Public Water System Resilience

Public water systems face increasing challenges in ensuring safe and reliable drinking water to people across Washington, including an array of overburdened communities and a growing population. Drought, fire, power outages, flooding, landslides, cyanotoxin blooms, and other climate-sensitive hazards can temporarily or permanently disrupt drinking water service by both damaging infrastructure and affecting drinking water sources. Updating Water System Planning Guidance as well as Design Manual guidance will prepare public water systems to invest in proactive approaches. To encourage use of specific climate resilience strategies, Department of Health will develop a publication on resiliency project success stories.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP Q: Use climate projections to inform infrastructure funding and management.

Agencies should be planning for expected conditions under climate change to ensure that infrastructure and the services it provides can meet the needs of people and communities today and in the future.

Action 33: Incorporating climate projections into stormwater modeling.

Summary	Modeling data is used by stormwater managers to plan, analyze, and evaluate stormwater infrastructure and assess water quality and runoff quantities under various environmental conditions. Currently, stormwater models rely on past precipitation data and there are no stormwater models that incorporate expected changes in precipitation because of climate change. The Department of Ecology will update the Western Washington Hydrology Model to incorporate projected precipitation patterns. Ecology will also pursue updating the Eastern Washington models in the future. This effort will ensure that stormwater infrastructure has sufficient capacity to meet future needs under a changing climate.
Agency	Department of Ecology
Climate Stressors Addressed	 Reduced water availability and drought, flooding
State Roles	Data and technical information Policies, plans, and procedures
Resilience Priorities Addressed	Human health Puget Sound health

Action 34: Climate resilient guidance for state capital and transportation programs

Summary	State agencies fund a variety of capital and transportation programs that result in projects that provide public benefits. To ensure continued public benefits and to protect the longevity of these projects and of public funds, it is critical that these projects consider climate impacts in their design and construction. Several state capital and transportation programs already require climate change as a consideration, but requirements are inconsistent across

	programs and agencies which leads to added challenges for tribes, local governments, and others that apply for these funding sources. The Departments of Ecology and Commerce, in partnership with other agencies, would leverage work of the System Improvement Team (SYNC) at the Department of Commerce to develop guidance and resources for incorporating climate considerations in the funding of critical infrastructure in state capital and transportation projects.
Agency	Departments of Commerce, Ecology, Transportation, and Health
Climate Stressors Addressed	 Cross-hazard
State Roles	Policies, plans, and procedures Resilience initiatives and projects
Resilience Priorities Addressed	Management of state assets

ACTION GROUP R: Resilient transportation networks for a changing climate.

Transportation networks and systems provide essential services for all people and communities in Washington. Given their importance, climate-driven disruptions to these systems can result in significant impacts on communities across the state.

Action 35: Cascadia Program: A resilient multimodal Interstate 5 corridor

Summary	The Cascadia Program is a broad reaching planning effort that seeks to expand multimodal transportation options for individuals and communities throughout the Interstate 5 corridor. This effort will bring together communities, agency staff, and others to address transportation needs and develop a bold vision for a more connected and resilient region. The Washington State Department of Transportation will create a master plan for mobility that specifically addresses climate considerations such as emergency routes and threats from flooding and landslides.
Agency	Department of Transportation
Climate Stressors Addressed	 Cross-hazard
State Roles	Community connections; policies, plans, and procedures

Resilience Priorities Addressed	Greenhouse gas emissions Advance natural solutions Protect overburdened and vulnerable communities

Action 36: Transportation resilience improvement plan

Summary	The Washington State Department of Transportation is considering the development of a Resilience Improvement Plan (RIP) for submittal to the Federal Highway Administration. If approved, the plan would reduce cost share by up to 10% for projects identified in the plan. These plans must focus on improving the ability of the state to respond to impacts on transportation networks from climate-driven events and other hazards. The plan would include a risk-based assessment of current vulnerabilities of transportation assets and identify project opportunities to promote resilience.
Agency	Department of Transportation
Climate Stressors Addressed	 Cross-hazard
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Management of state assets

Strategy IX: Improve land management and restoration practices to help ecosystems, habitats, and species adapt to changing climate conditions.

The effects of climate change will dramatically impact ecosystems, habitats, and fish and wildlife populations across the state. Sea level rise will constrain nearshore habitat, changes in precipitation will lead to decreased streamflow, and increasing heat waves and wildfire events will threaten forest health. These impacts will also have wide-reaching effects for individuals and communities that rely on ecosystems and wildlife for cultural practices, subsistence, and recreational opportunities.

As climate change impacts increase and intensify, state agencies will seek to build the resilience of natural habitats and wildlife through climate-informed habitat restoration, environmental monitoring, and cross-agency collaborative efforts to improve ecosystem health.

Examples of Ongoing State Work in this Space

Puget Sound Partnership: Action Agenda

The Puget Sound Partnership is tasked with leading and coordinating efforts to restore and protect Puget Sound by advancing ecosystem recovery efforts that balance the needs of people, wildlife, and the environment. This work is guided by the Action Agenda which outlines shared goals and priorities for Puget Sound recovery. The Action Agenda outline actions necessary to achieve recovery goals, guides funding decisions, and measures implementation progress.

The 2022 – 2026 Action Agenda includes three specific strategies related to climate change mitigation and adaptation. Each strategy within the Action Agenda also contains implementation considerations for how a changing climate will impact or may inform various actions.

The Partnership also leads three major science and monitoring efforts in the region:

- The Partnership's Science Work Plan guides over $4 million dollars in research investments that fill decision-critical gaps in knowledge, including how climate change will affect multiple elements of the social-ecological landscape.
- The Alternative Future Scenarios initiative assesses the impacts of climate change and other drivers of change to the Puget Sound ecosystem to ensure the Partnership's strategies are robust to uncertainty and change. The scenarios initiative includes map-based modeling, which includes stream flow and temperature impacts and land use change, and a qualitative network model.
- The Puget Sound Ecosystem Monitoring Program is a collaborative network of subject matter experts from many monitoring organizations and different parts of the region. Together, they generate, organize, synthesize, and communicate scientific information across political and organizational boundaries, to track ecosystem conditions that directly address management and science questions critical to Puget Sound recovery.

Department of Natural Resources: Urban Forestry and Community Forest Programs

Through the Urban and Community Forestry Program, the Department of Natural Resources provides funding, education, and technical assistance to local jurisdictions to sustain healthy trees and forest in urban environments across Washington. Urban and community forests provide valuable resources and services and help improve the climate resilience of urban communities through improved air quality, reduced flood risk, and shade to mitigate heat impacts and the effects of urban heat islands.

To support this work, the Department of Natural Resources distributes up to $8 million in funding for communities to support tree planning, enhance urban forest health, support public outreach and engagement, and lead career training and workforce development.

In response to the heat dome event in 2021, the Department of Natural Resources partnered with American Forests to launch the Tree Equity Collaborative, the first statewide partnership focused on achieving tree equity. The Collaborative aims to expand and fortify neighborhood tree canopy cover by engaging cities, community organizations, tribes, and stakeholders to build more rigorous and

inclusive urban forestry programs across the state. The Department of Natural Resources is using American Forests' Tree Equity Score tool to prioritize equitable tree cover in the neighborhoods that need it most, as 85% of urbanized neighborhoods in Washington have inadequate tree cover. The goal of the collaborative is to work to raise all urban census block groups to a Tree Equity Score of 75 or higher through strategic tree planting and maintenance, workforce development, and just policies.

Department of Natural Resources: Watershed Resilience Program

The 2022 launch of the flagship Watershed Resilience Action Plan (WRAP) in the Snohomish Basin represents the Department of Natural Resource's effort to pilot a coordinated, watershed-scale management strategy with an emphasis on salmon recovery and climate resilience. Since launching the WRAP, the Department of Natural Resources has successfully built capacity, supported partners, and brought millions of dollars in state and federal funding to support ecosystem recovery and resilience in the Snohomish Watershed. To build on the success of the Snohomish WRAP, the Department of Natural Resources is exploring opportunities to apply similar watershed-scale coordination efforts in other watersheds, with the goal of accelerating the pace of salmon recovery. The Watershed Resilience Program (WRP) expansion will focus on better coordinating existing programs, finding opportunities to increase support for partners, and identifying where new Department of Natural Resources work could be additive to the existing salmon recovery landscape.

Department of Fish and Wildlife: Beaver Dam Analogs

Beaver Dam Analogs (BDAs) are simple artificial structures designed to mimic the form and function of natural beaver dams. Fill and drainage of wetlands coupled with declines in beaver populations has reduced the occurrence of slow water habitats that provide stream flow benefits and support salmon, birds, and other wildlife. Installation of BDAs is intended to increase the quality and quantity of these important habitats to benefit streamflow and support native fish and other aquatic species from the impacts of climate change. Research across the western United States demonstrates that installation of BDAs can effectively store water and recharge groundwater, increase aquatic habitat diversity, reconnect streams and floodplains, promote aquatic productivity, and reduce high water temperatures. The Department of Fish and Wildlife, in partnership with the Wild Fish Conservancy, are constructing and monitoring BDAs in select Chehalis Basin streams to better understand the benefits of BDA and to determine their effectiveness in achieving resilience goals.

Department of Natural Resources: Kelp Forest and Eelgrass Meadow Health and Conservation Prioritization plan

Kelp forests and eelgrass meadows are diverse and productive nearshore ecosystems, providing critical habitat for a wide array of marine life and playing and important role in climate mitigation and adaptation. Kelp and eelgrass have important cultural value to Northwest Tribal Nations. In December 2023, the Department of Natural Resources released the Statewide Kelp and Eelgrass Health and Conservation Prioritization Plan which provided a roadmap to identify priority kelp and eelgrass habitat and actions to improve resilience of these critical areas. Beginning in 2024, the Department of Natural Resources will engage in targeted conversations in three pilot sub-basins for

initial engagement and data integration in 2024. These sub-basins include Grays Harbor, South Puget Sound, and the Eastern Strait of Juan de Fuca.

Interagency Efforts to Improve Riparian Habitat

Healthy riparian habitat, the vegetated areas along rivers and streams, are important for clean, cold water that salmon and other species need. As climate change makes stream temperatures warmer, efforts to protect, improve and restore riparian habitat are even more critical. Several agencies are involved in improving riparian habitat through complementary efforts. This includes a wide range of riparian grant and easement programs, analyzing data and technical information on riparian health, and laws and regulations designed to protect and manage water quality, wetlands and shorelines.

At the same time, the Governor's office is convening a Riparian Roundtable to develop recommendations from stakeholders, tribes, and agencies on how to further improve riparian habitat and ensure salmon and steelhead recovery in Washington. Part of this work included an independent analysis of the effectiveness of state programs on riparian habitat protection and restoration. This helped guide subsequent discussions on gaps and potential recommendations. Their final recommendations for policy and funding are forthcoming.

New Actions Proposed through the Climate Resilience Strategy

ACTION GROUP S: Climate-informed species and habitat management

State agencies play a significant role in guiding and directing the management of habitat and species across Washington. These actions seek to improve rules, regulations, and procedures by incorporating expected climate impacts in the management of habitat and wildlife resources.

Action 37: Incorporating Climate Considerations into WDFW Guidance Updates

Summary	This action will provide additional capacity to update WDFW design guidance and incorporate climate considerations. WDFW design guidelines are broadly accepted technical guidance and are therefore used by many different stakeholders to design habitat restoration projects. Incorporating climate considerations into this guidance will ensure habitat restoration work considers expected future climate conditions during design and construction.
Agency	Department of Fish and Wildlife
Climate Stressors Addressed	 Cross-hazard
State Roles	Plans, policies, and procedures

Resilience Priorities Addressed	Advance natural solutions

Action 38: Enhance WDFW's Puget Sound Marine Fish Monitoring and Alternative Fishery Management Strategies

Summary	Understanding the impacts of climate change on marine fish species is critical to implementing effective management strategies in a dynamic system. This action will lead to the development of a novel and robust tool that will be used to evaluate alternative fishery management strategies under climate change and support the measurement of sea surface and sea bottom temperature to inform species distribution and habitat suitability models. These modeling efforts are necessary for the development of climate-ready fisheries management plans.
Agency	Department of Fish and Wildlife
Climate Stressors Addressed	 Marine and coastal changes
State Roles	Data and technical information
Resilience Priorities Addressed	Advance natural solutions Puget Sound health

Action 39: WDFW Hatcheries and Climate Change Impacts

Summary	This action will improve the resilience of WDFW managed hatcheries against climate resilience. Specific work will include a hatchery climate change vulnerability assessment of all agency-managed hatchery facilities. This work will help the agency identify and implement retrofits, modifications, and increases in staff capacity needed to build resilience of WDFW's hatchery program to the impacts of climate change.
Agency	Department of Fish and Wildlife
Climate Stressors Addressed	 Cross-hazard
State Roles	Plans, policies, and procedures
Resilience Priorities Addressed	Advance natural solutions Puget Sound health

ACTION GROUP T: Prevent the worst effects of climate change on the Puget Sound ecosystem.

The Puget Sound ecosystem is home to a wide range of habitats and wildlife that also encompasses some of the state's largest population centers. The Puget Sound is especially vulnerable to climate impacts which will have far reaching effects on communities, infrastructure, and natural and working lands. These actions outline the ways in which the Puget Sound Partnership will incorporate climate resilience into its work of supporting Puget Sound restoration and protection.

Action 40: Fully fund the Puget Sound Acquisition and Restoration Program

Summary	The Puget Sound Acquisition and Restoration (PSAR) Program funds projects that recover salmon and protect/restore salmon habitat across Puget Sound. Most of the projects are designed to adapt to the impacts of climate change and/or increase resiliency to impacts. Full funding of the program would allow the Puget Sound Partnership to fund more projects to increase habitat protection and restoration across the Sound.
Agency	Puget Sound Partnership
Climate Stressors Addressed	 Flooding, marine and coastal changes
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Advance natural solutions Puget Sound health

Action 41: Implement the Regional Chapter of the Puget Sound Salmon Recovery Plan

Summary	The Partnership is responsible for updating and assisting with implementation of the regional chapter of the Puget Sound Salmon Recovery Plan. The 2024 Salmon Recovery Plan Addendum (Addendum) provides a regional monitoring and adaptive management framework, which identifies climate change as a topic area with key strategies and actions to address impacts. Other strategies and actions in the Addendum also increase the resiliency of the Puget Sound ecosystem to climate change, such as estuary restoration. Implementation of the actions included within the Addendum will ensure salmon recovery efforts are resilient to projected climate impacts.
Agency	Puget Sound Partnership

Climate Stressors Addressed	 Marine and coastal changes
State Roles	Resilience initiatives and projects
Resilience Priorities Addressed	Advance natural solutions Puget Sound health

ACTION GROUP U: Support large-scale, interagency Habitat Planning

Climate change has wide ranging effects on landscapes and ecosystems. Building ecosystem resilience requires collaborative partnerships that benefit wildlife and human communities.

Action 42: Interagency Shrubsteppe Resilience Implementation

Summary	The Washington Shrubsteppe Restoration and Resiliency Initiative seeks to create a resilient shrubsteppe ecosystem, achieved through collaborative partnerships for the benefit of wildlife and human communities. This action will enhance personnel and resource capacity to strategically restore habitat both before and after wildfire events. By replacing non-native annual grasses and forbs with native perennial vegetation, we will reduce the primary driver of wildfire risk. This effort will result in a landscape both more resistant and resilient, where fires are less impactful, and habitats are more able to bounce back on their own.
Agency	Interagency action led by the Departments of Fish and Wildlife, Natural Resources, and State Conservation Commission
Climate Stressors Addressed	 Reduced water availability and drought, wildfire and smoke, extreme heat
State Roles	Policies, plans, and procedures Resilience initiatives and projects
Resilience Priorities Addressed	Drought resilience, advance natural solutions

Action 43: Increasing habitat connectivity in Washington State

Summary	The Washington Department of Fish and Wildlife and the Washington State Department of Transportation will continue promoting the

	protection and management of wildlife corridors as identified in the Washington wildlife habitat connectivity action plan to preserve the natural heritage of the state and to improve highway safety by reducing wildlife vehicle collisions. Specific work may include the purchase of land through voluntary conservation easements, landowner assistance programs to remove fencing and invasive weeds and other habitat restoration activities within corridors, development of wildlife crossing structures (overpass or underpass) at roadways, as well as increased agency capacity (administrative and personnel staffing needs) for implementation of Washington Habitat Connectivity Action Plan. This effort will also seek funding to complete the planning, scoping, design, and construction of wildlife crossing structures, fencing, and other wildlife safety and connectivity features.
Agency	Departments of Fish and Wildlife and Transportation
Climate Stressors Addressed	 Reduced water availability and drought, wildfire and smoke, extreme heat
State Roles	Resilience initiatives and projects Plans, policies, and procedures
Resilience Priorities Addressed	Advance natural solutions

Action 44: Forest Health

Summary	DNR is proposing the development of a comprehensive reforestation strategy for WA state and the enhancement of associated reforestation pipeline capacity to meet current and projected reforestation needs. The Reforestation Strategy will provide a coordinated and comprehensive approach to reforestation, allowing Washington to identify the scale and scope of need, address barriers to reforestation, and capitalize on opportunities to build resilience in our forests. Simultaneous improvements in our state's reforestation system will allow the state to produce the types and quantities of seedlings required for successful implementation of the strategy. This action will result in a strategy that is actionable and a supply of seedlings that is appropriate to meet the increasing reforestation need. The strategy will identify opportunity areas where reforestation makes

	ecological, social, and economic sense, and propose solutions to identified barriers to reforestation, including seed supply and workforce capacity. DNR will address known limitations in our state's ability to produce seedlings and lay the groundwork to scale up production as climatic changes necessitate greater levels of assisted reforestation in the coming years.
Agency	Department of Natural Resources
Climate Stressors Addressed	 Reduced water availability and drought, wildfire and smoke, extreme heat
State Roles	Resilience initiatives and projects Policies, plans, and procedures
Resilience Priorities Addressed	Forest health

Summary of Early Engagement Process

Climate change impacts are not evenly distributed. They disproportionately impact tribes, communities of color, low-income communities, and already overburdened communities worst and first. And because people in these communities have often been denied access to important social services, they may not have the resources they need to adapt to changing conditions. Our job is to make sure these challenges are addressed through our work. To support this, Ecology led early engagement efforts with individuals and communities across the state to identify climate justice priorities, center climate justice through actions and goals, and help Ecology and other state agencies address disparities exacerbated by climate change to build a more resilient future for all Washingtonians.

Early Engagement Work

While an interagency team developed this draft strategy, Ecology is the lead agency for the overall process, including outreach and engagement activities. At the outset of this process, Ecology developed an engagement plan to guide engagement activities with frontline communities, vulnerable populations, tribal governments and communities, as well as the general public. We also developed an extensive list of potentially interested parties with input from Ecology staff as well as staff from the nine other agencies involved in the strategy process. Ecology also maintains a comprehensive contact list of tribal leaders and natural resources staff from all federally recognized tribes in Washington. Together, we used these contact lists to share information about the strategy update process and engagement activities, and to direct individuals to sign-up for Ecology's email list.

Our initial engagement efforts focused on gathering input on the primary climate impacts and associated challenges facing communities, successes and challenges communities have had in building climate resilience, and their vision for a more climate resilient future. We used information learned during initial engagement activities to help develop goals, strategies, and actions.

Engagement activities included:

- Listening Sessions
    - We held three listening sessions in early December 2023. Over 180 individuals participated across the three listening sessions. Recordings of each session are posted on the Ecology website.
    - Information about the geographic distribution and representation of participants was not collected. However, based on the comments received, participants joined from areas across the state and represented tribal governments, county and city governments, academic institutions, business interests, and non-profit organizations.
- Survey
    - We opened an online survey from mid-November through mid-January as a companion to the listening sessions to provide another way for individuals to share thoughts and ideas.

    - Ecology received over 700 unique responses to the survey. These responses do not reflect a representative sample of communities in Washington. Yet, Ecology recorded survey responses from all parts of the state.
- Environmental Justice Document Review and Synthesis
    - Ecology staff completed a review of documents and reports related to environmental justice produced by various community-based organizations in Washington.
- Meetings with Tribal Governments and Communities
    - Ecology staff provided targeted outreach to tribal governments and communities through meetings with the Governor's Office of Indian Affairs – Climate Roundtable, the Affiliated Tribes of Northwest Indians, the Pacific Northwest Tribal Climate Roundtable, and the Puget Sound Partnership's Tribal Co-Management Council.
- Ecology staff were also invited to share information and solicit feedback about the Strategy by the following groups and organizations:
        - Northwest Climate Conference
        - Fifth National Climate Assessment – Washington State Webinar
        - Floodplains by Design – Funding and Policy Action Group
        - Environment and Culture Partners
        - Snohomish County Climate Action Advisory Committee
        - University of Washington – College of Built Environments Graduate Program
        - American Planning Association – Northwest Washington Section
        - Centralia College – East Lewis County Climate Connections Film and Speaker Series
        - Washington State University Extension - Washington Climate Education and Extension Team
        - Puget Sound Climate Preparedness Collaborative
        - Environmental Justice Council

Draft Action Preview with Tribes and Frontline Communities

To further advance engagement with overburdened communities and vulnerable populations, Ecology staff provided a preview of the draft actions proposed by agencies to tribal leaders and staff as well as representatives from frontline communities.

Frontline Communities

Ecology partnered with Front and Centered, a coalition of organizations and partners that represent the needs of frontline communities, to convene community leaders from around the state. They used the state's Environmental Health Disparities map to guide selection of leaders from communities who are disproportionately affected by climate change, pollution, and environmental hazards. The group of leaders completed a visioning exercise about climate resilience from the perspective of the populations and geographies they represent. Following this visioning exercise, community leaders reviewed and provided feedback and recommended changes to the list of draft actions proposed by state agencies.

Overall, the process revealed a strong desire by frontline communities to be involved in decision making processes related to planning, implementation, and evaluation. Community representatives

also noted the need for more explicit equity considerations in the strategy topic areas. Additionally, participants noted that language describing strategies and actions should be more accessible to allow frontline communities to see themselves reflected in the work of agencies, particularly for highly technical topics. Discussion also highlighted the importance of continuing greenhouse gas emissions reduction efforts by state agencies as well as the need to address structural inequities and socioeconomic disparities to support community resilience.

Tribal Listening Sessions

In late April and early May, Ecology held two listening sessions for tribal leaders and staff. These listening sessions provided an opportunity to share information and solicit feedback on draft strategies and actions developed by state agencies. Information about the listening sessions was provided to tribal staff and leaders via email using a distribution list compiled by Ecology's Executive Advisor for Tribal Affairs.

Prior to the listening sessions, Ecology provided participants with a summary document that provided a high-level overview of the ten strategy topics and the suite of actions proposed under each. Ecology was specifically interested in whether actions aligned with tribal climate resilience priorities as well as opportunities for ongoing engagement and consultation with tribes through implementation of the strategy.

Specific feedback included discussing other stressors that exacerbate climate impacts like elevated water temperature and impacts on salmon as well as ocean acidification and its impacts on shellfish and marine vegetation. On implementation and governance, participants noted the importance of coordinating engagement and consultation with tribes across agencies given the increasing requests for tribal comment on environmental issues. Additionally, participants considered making use of existing tribal forums like the Northwest Indian Fisheries Commission to provide updates and seek feedback on implementation of the strategy actions. Others suggested more direct participation by tribes where a single tribal representative could engage with the governance structure and provide updates to other tribes.

Ongoing Considerations

Ecology and partner agencies will continue to consider additional feedback and suggestions received by frontline communities and tribes for inclusion in the strategy. This will include suggested revisions to specific strategies and actions, particularly recommendations provided during the public comment period on the draft.

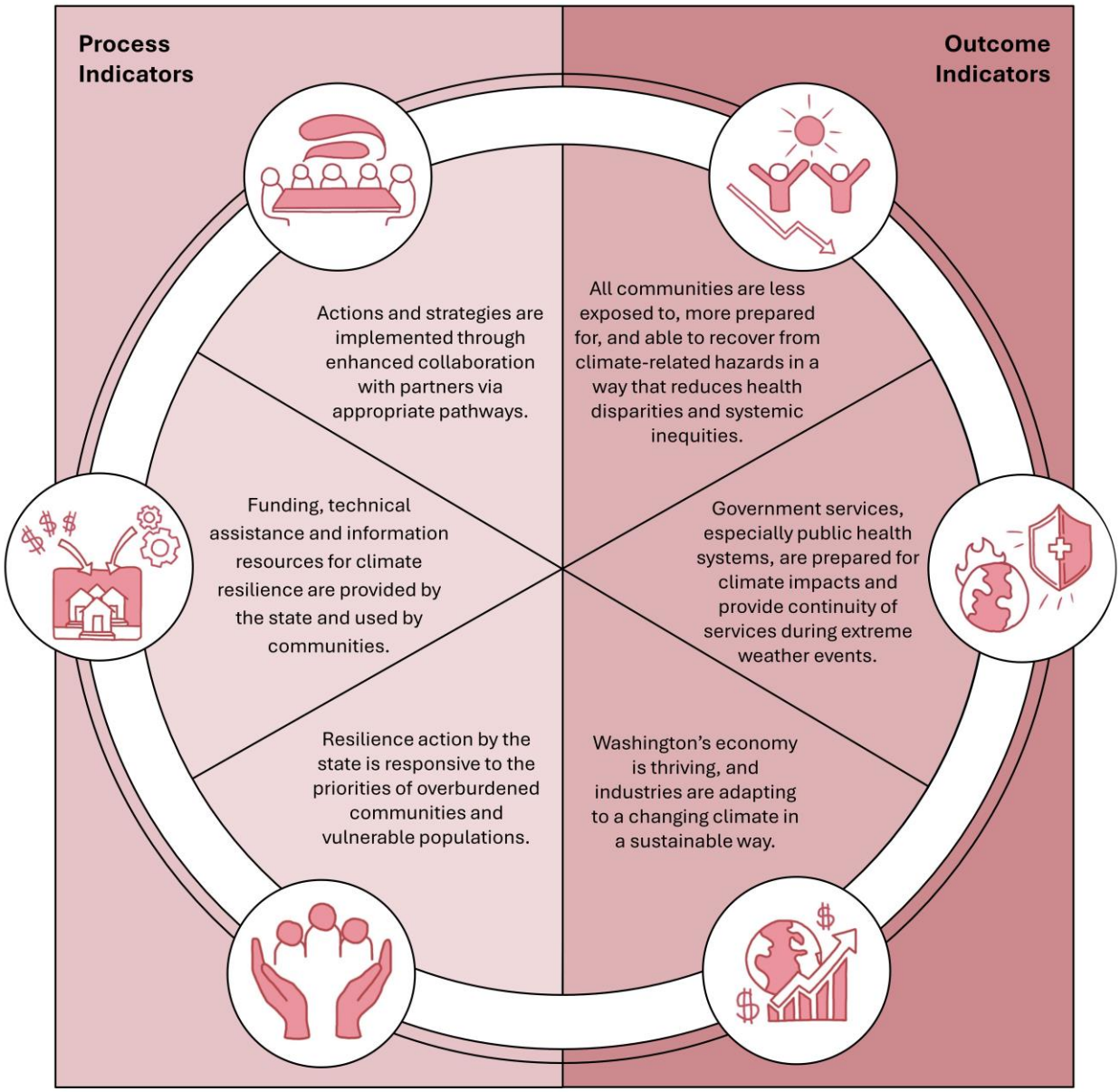
Appendices

1) **Appendix A:** Climate Resilience Strategy – Draft Indicators Graphics
2) **Appendix B**: Measuring Resilience in Support of Effective Investment in Climate Adaptation, University of Washington Climate Impacts Group, 2024.
3) **Appendix C**: Agency Climate Resilience Activities Summary

Appendix A: Climate Resilience Strategy – Draft Indicators Graphics

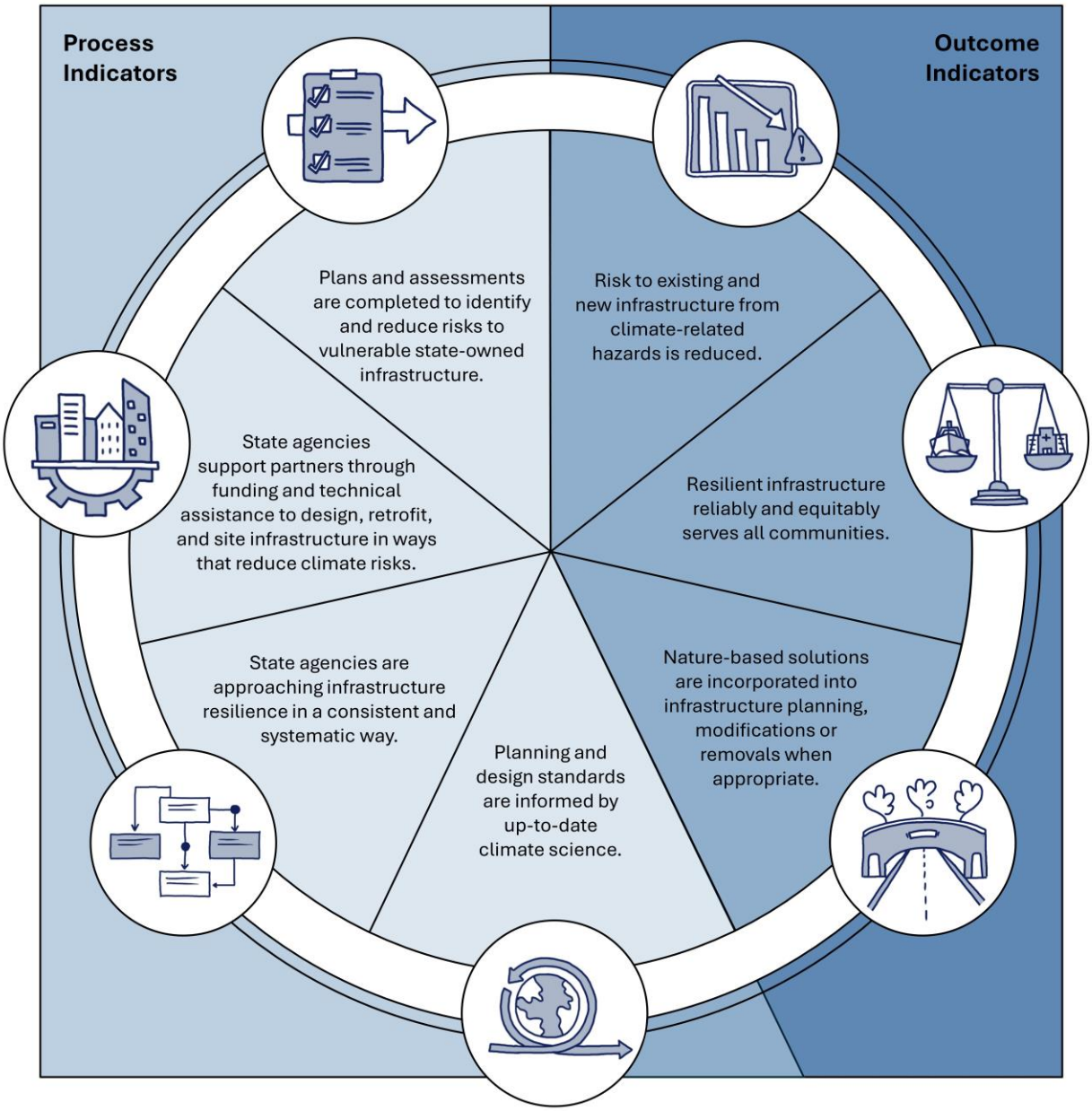
Communities

Foster healthy, safe, equitable, and economically vibrant communities able to effectively and proactively reduce and adaptively manage their greatest climate change risks and vulnerabilities.



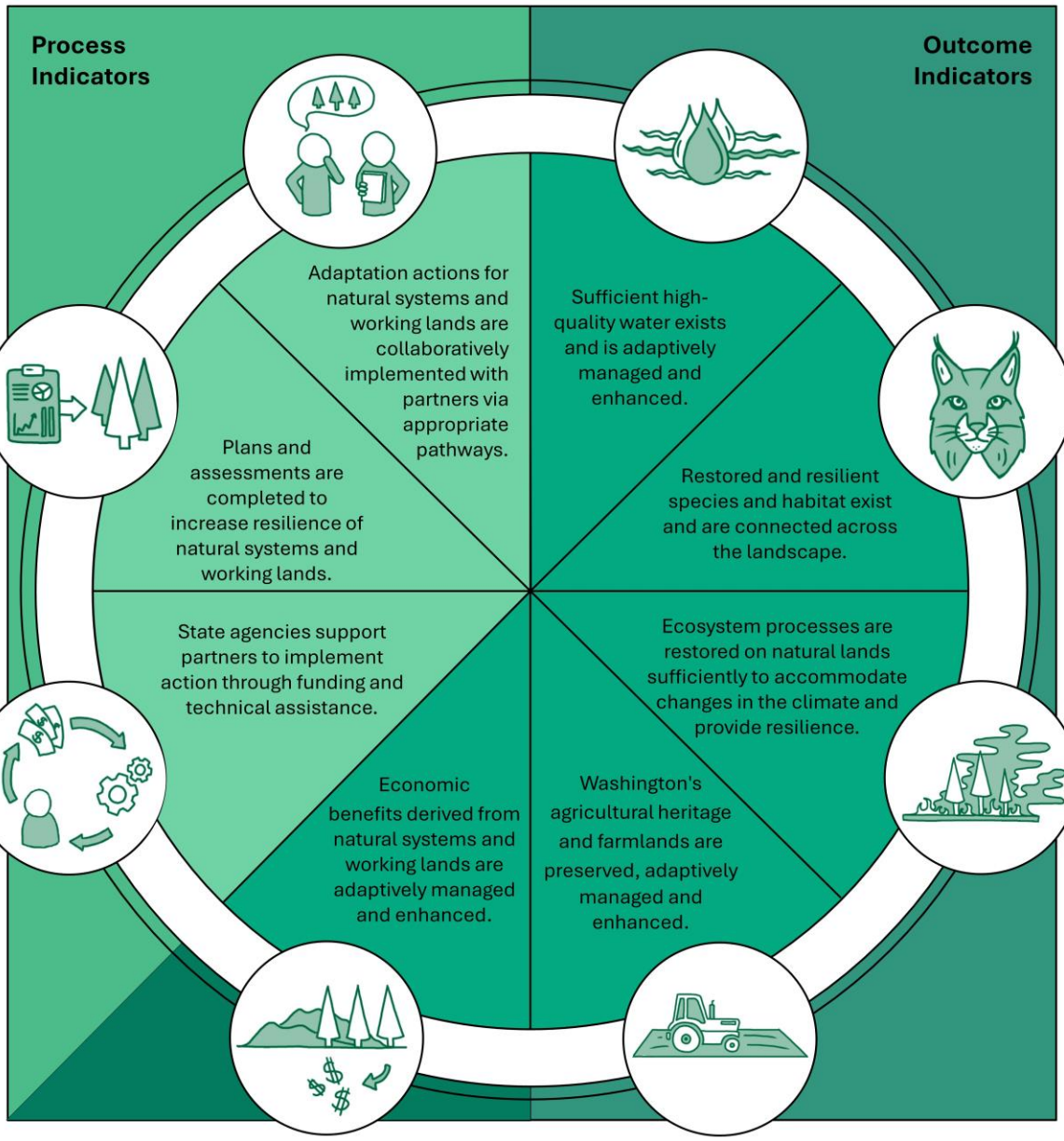
Infrastructure

Advance and modify infrastructure that supports natural systems, considers the needs of vulnerable communities, and provides consistent, safe, and reliable services capable of withstanding disruptions and risks posed by current and future climate impacts.



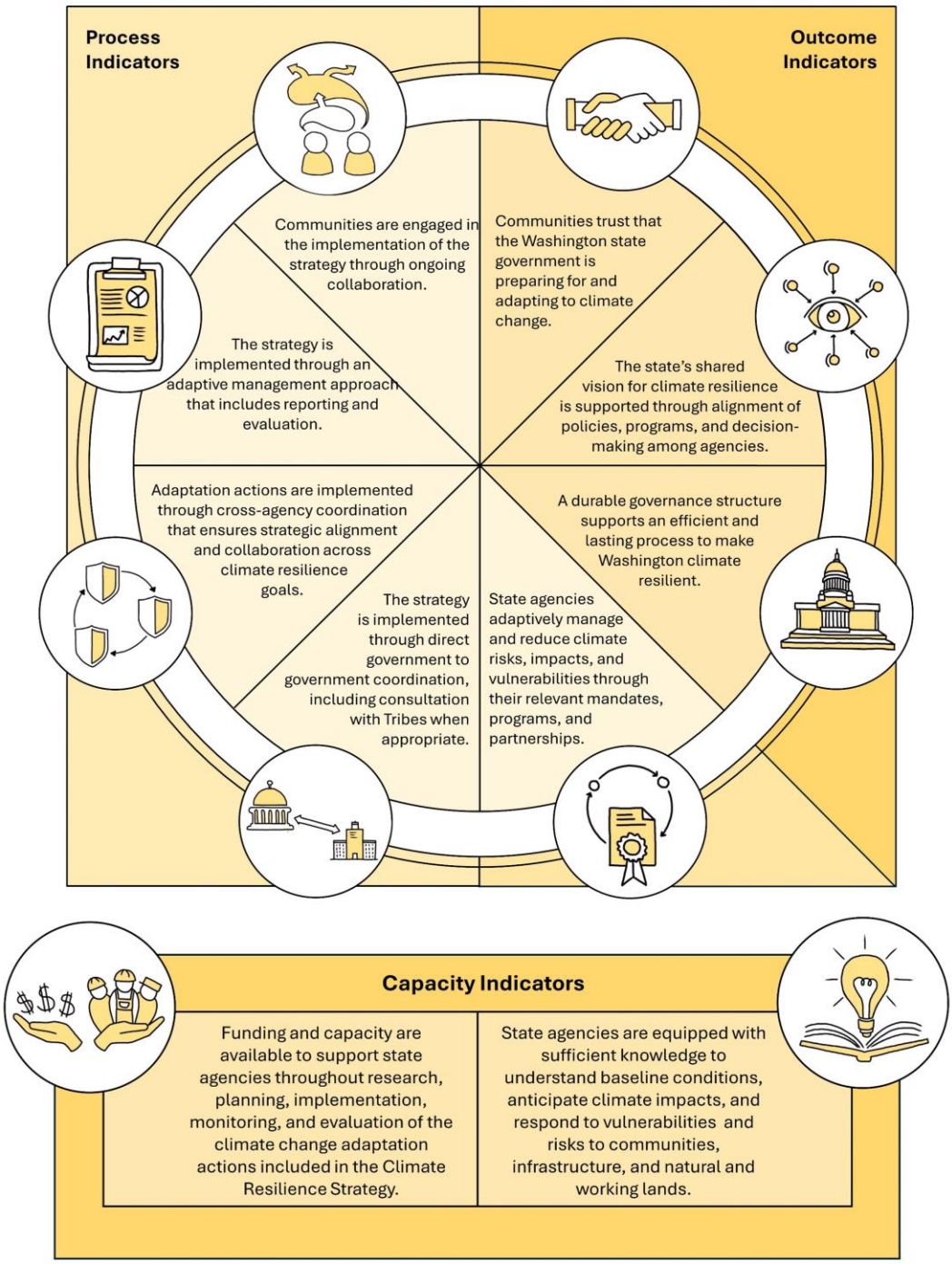
Natural and Working Lands

Protect, restore, and adaptively manage natural systems and working lands so they can provide continued and enhanced ecological, cultural, social, and economic benefits under current and future climate impacts.



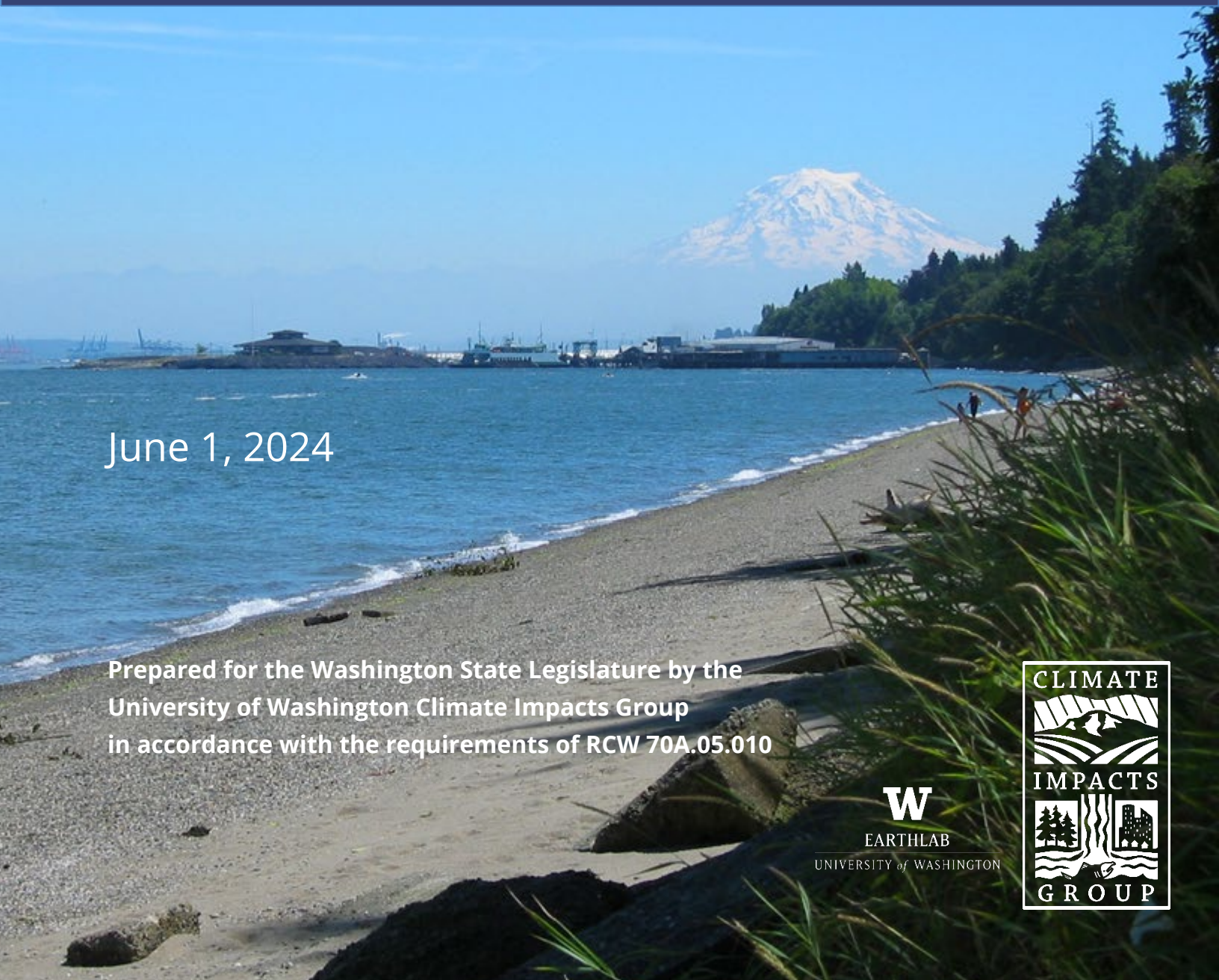
Governance

Develop efficient and lasting processes and structures across governments that ensure strategic alignment, collaboration, transparency, accountability, and allow for flexibility and adaptation in the implementation of Washington's climate resilience strategy.



Appendix B: Measuring Resilience in Support of Effective Investment in Climate Adaptation, University of Washington Climate Impacts Group, 2024.

MEASURING RESILIENCE IN SUPPORT OF EFFECTIVE INVESTMENT IN CLIMATE ADAPTATION



June 1, 2024

Prepared for the Washington State Legislature by the University of Washington Climate Impacts Group in accordance with the requirements of RCW 70A.05.010

EARTHLAB
UNIVERSITY of WASHINGTON

CLIMATE IMPACTS GROUP

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Executive Summary

The Washington legislature requested that the Climate Impacts Group at the University of Washington "examine existing best practices and new methods that could be used to measure and evaluate climate change resilience for the purpose of better understanding and tracking how investments made in climate change resilience translate into outcomes (RCW 70A.05.010 Development of an integrated climate change response strategy)." This report responds to the legislature's request by detailing best practices for measuring climate resilience in support of effective climate adaptation. Information provided is the product of three sources: 1) a comprehensive review of peer-reviewed published scientific and gray literature, 2) a review of current climate resilience plans of all states, and 3) ongoing collaboration with the Department of Ecology and the interagency team tasked with the update of Washington's Climate Resilience Strategy.

Why Measure and Evaluate Climate Resilience?

For governments to better understand how investments are moving the needle on climate resilience, strategies and actions must be monitored, measured, and evaluated to determine their effectiveness at contributing to desired outcomes. In addition to quantifying the benefits of investments, measuring and evaluating efforts to build climate resilience can help governments to communicate a vision of and progress toward adaptation success, make strategic decisions and align plans, justify investments to taxpayers, demonstrate accountability, support learning, and improve effectiveness.

Complexities of Measuring Climate Resilience

There are no universal metrics of climate resilience and effectively measuring climate resilience is difficult to do for multiple reasons. Unlike performance measurement for climate change mitigation where the almost universal standard metric is the reduction of greenhouse gas emissions, measuring climate resilience is a complex process with no universal metrics. It involves trying to track the causal relationship between changes made to social or natural systems and the increased ability of those systems to anticipate, prepare for, adapt to, and recover from the negative impacts of climate change. Challenges that have prevented the smooth implementation of climate resilience measurement include:

- distinguishing between resilience writ large and climate resilience;
- navigating the reality that climate adaptation doesn't always result in resilience; resilience doesn't always result in climate adaptation;

- determining the right scale of measurement, as climate change is global; climate impacts, resilience, and adaptation are local;
- understanding climate resilience as a continuous process rather than a discrete outcome;
- contending with the difficulty and limitations of establishing and measuring avoided loss.

Measuring and Evaluating Climate Resilience: Best Practices from the Literature

1. **The triple dividends of resilience are considered together when investing in resilience so that total benefits to society are not underestimated.** These dividends are saved lives and avoided losses, stimulated economic benefits as a result of reduced disaster risk, and broader social, environmental, and governance co-benefits.[1] [2]
2. **Climate resilience strategies and actions are designed with co-benefits in mind.** Investments in climate resilience will almost always have co-benefits which are important to account for when considering the value of the investment. When a process is intentional about co-benefits, more value will be gained from investments in climate resilience.
3. **Outcomes of strategies and actions are measured as building blocks of increased climate resilience**. Determining the actual impact of climate resilience actions is difficult to do because these impacts are often obscure and emerge in complex systems over long timeframes. Rather than trying to directly connect a climate resilience action to a discrete outcome, the action should be put in the context of broader goals for adaptation and resilience goals, and all actions should be considered together for their collective effect on building climate resilience as a whole.
4. **Climate resilience is measured through relevant, flexible, and comprehensive indicators and metrics.** Given the complexity of resilience and the difficulty in establishing causality between a resilience action and outcome, it is important to choose a variety of indicators and metrics that capture various contributions to climate resilience.

State of the States: How Others Are Measuring Climate Resilience

As an emerging practice, the process of measuring climate resilience is still being developed in the context of state planning. Although many states have plans for climate resilience, most plans do not include indicators or metrics for measuring progress or other mechanisms to show how investments in climate resilience translate to outcomes. Approaches taken by states thus far vary from simple processes that indicate the status of proposed actions to more sophisticated approaches that identify indicators and metrics for the outcomes that the resilience strategy is designed to achieve. This varied state of practice reflects the complexities of measuring climate resilience, as well as the capacity needed to collect data and report on indicators and metrics.

Informing Washington's Integrated Climate Resilience Strategy

Washington state is ensuring a more transparent resilience planning process that will enable investments to be more clearly connected to climate resilience outcomes by emphasizing implementation and measurability in the update to Washington's Climate Resilience Strategy. There is no one-size fits all approach to measure climate resilience outcomes and show how investments translate to these outcomes. The proposed approach in the update to Washington's Climate Resilience Strategy is being developed in close collaboration with the interagency climate resilience team, is guided by reporting frequency requirements outlined in RCW 70A.05.010 and incorporates best practice from literature and lessons from other states.

1. Introduction

In RCW 70A.05.010, Development of an integrated climate change response strategy, the Washington legislature requested that the Climate Impacts Group at the University of Washington "examine existing best practices and new methods that could be used to measure and evaluate climate change resilience for the purpose of better understanding and tracking how investments made in climate change resilience translate into outcomes."

This report responds to the legislature's request by detailing best practices for measuring climate resilience in support of effective climate adaptation. The information presented here is the product of three sources: 1) a comprehensive review of scientific and gray literature, 2) a review of current climate resilience plans of all states, and 3) ongoing collaboration with the Department of Ecology and the interagency team tasked with the update of the Climate Resilience Strategy for Washington State.

Climate resilience measurement is an emerging practice; there is no one-size fits all approach to tracking how investments made in climate change resilience translate into outcomes. In this report, we review the complexities of measuring and evaluating climate resilience and highlight best practices from the literature and climate plans of other states and cities to help address those complexities. We describe the current proposed structure to measure and track progress on climate resilience for Washington state and demonstrate how this approach incorporates best practices from the literature and other states.

Climate resilience measurement is an emerging practice; there is no one-size fits all approach to tracking how investments made in climate change resilience translate into outcomes.

2. Why Measure and Evaluate Climate Resilience?

For governments to understand if investments are moving the needle on climate resilience, goals, strategies, and actions must be monitored, measured, and evaluated to determine effectiveness at contributing to desired outcomes for resilience. Quantifying the benefits of investments by measuring and evaluating efforts to build climate resilience can also help governments to:

- communicate a vision of and progress toward success;
- make strategic decisions and align plans;
- justify investments to taxpayers;
- demonstrate accountability;
- support learning; and
- improve effectiveness.

Key Terminology: Climate Resilience

Climate resilience is the ongoing process of anticipating, preparing for and adapting to changes in climate and minimizing negative impacts to natural systems, infrastructure, and communities. For natural systems, increasing climate resilience involves restoring and increasing the health, function, and integrity of ecosystems, while improving their ability to absorb and recover from climate-affected disturbances. For communities, increasing climate resilience means enhancing their ability to understand, prevent, adapt, and recover from climate impacts to people and infrastructure. (RCW 70A.65.010)

Making progress towards a more climate resilient future entails a range of actions across regulation, policy, funding, communication and education, design, planning, project implementation, monitoring and evaluation. This requires a holistic approach that recognizes the interconnectedness of societal wellbeing, the economy and natural systems, and emphasizes the need for a "multi-dimensional approach to enhance communities' social, human, natural, physical, and financial capacities to cope with and recover from the impacts of climate change."[3]

Effectively measuring climate resilience is an emerging practice and one that has proven especially difficult. Unlike measuring and tracking progress on climate change mitigation, which generally involves tracking progress on greenhouse gas emissions reduction targets, there are no universal metrics of resilience success. Measuring climate resilience is a complex process that involves attempting to document the causal relationship between changes made to social and natural systems and the increased ability of those systems to anticipate, prepare for, adapt to, and recover from the negative impacts of climate change. Measuring climate resilience with indicators and metrics can show what successful adaptation to climate change looks like and if strategies and actions are moving the

> **There are no universal metrics of resilience success.**

state in the right direction. Many frameworks have been developed at different scales that pose various resilience indicators, (e.g. ARUP's City Resilience Index[4], UNDP Community-Based Resilience Analysis[5], National Climate Resilience Framework[6]), but common challenges have arisen at the international, national, state, and local levels that have prevented the smooth implementation of climate resilience measurement.

Examples and descriptions of existing resilience frameworks

Framework	Description
ARUP's City Resilience Index	Assesses resilience writ large for a city. Composed of 52 indicators intended to reflect the overall capacity of a city (individuals, communities, institutions, businesses, and systems) to 'survive, adapt and thrive' in the face of chronic stresses and acute shocks. Indicators are assessed through responses to 156 questions which combine quantitative and qualitative data and are then aggregated and presented in relation to 12 resilience goals.
UNDP Community-Based Resilience Analysis (CoBRA)	An analytical tool developed to identify indicators to measure resilience at the community scale. Largely qualitative and based on understanding resilience from a community perspective (via participatory qualitative approaches (e.g. focus group discussions and interviews). Indicators of resilience are defined by the community.
U.S. National Climate Resilience Framework	To guide the United States' approach to climate resilience, in June 2023 President Biden directed the creation of a first-ever National Climate Resilience Framework to identify key values, priorities, and objectives to help expand and accelerate nationally comprehensive, locally tailored, and community-driven resilience strategies. Although no indicators of resilience are detailed, the plan recommends that federal agencies set targets and indicators to measure climate adaptation and resilience progress.

3. Complexities of Measuring Climate Resilience

In this section, we outline the complexities of measuring climate resilience that have challenged nations, states, and cities since attempts to measure climate resilience began.

Complexities of measuring climate resilience:

1. Distinguishing between resilience and climate resilience
2. Climate adaptation doesn't always result in resilience; resilience doesn't always result in climate adaptation
3. Climate change is global; climate impacts, resilience, and adaptation are local
4. Resilience is a continuous process rather than a discrete outcome
5. Difficulty and limitation of establishing and measuring avoided loss

3.1 Distinguishing between resilience and climate resilience

A primary challenge of measuring climate resilience is distinguishing it from resilience more generally. The lack of clarity in definition complicates efforts to determine and measure the overall benefit of climate resilience actions. Climate resilience is a subset of social-ecological resilience that refers specifically to the capacity of interconnected social, environmental, and economic systems to *cope with*, *respond to*, and *recover from* hazardous climate change related events. Resilience is a broader term with different definitions depending on the field. Ecological science uses the term resilience to describe an ecosystem's ability to *maintain its functioning* in the face of change.[7] In social sciences, the term refers to the ability of an individual, group, or community to *cope with* and *recover from* disturbances or shocks as a result of social (e.g. economic recessions), or environmental (e.g. flooding) change. The ability an individual, group, or community has to recover from disturbances (their adaptive capacity) is determined by various social factors including historical, cultural, and political practices, power relations, social identities, and economic disparities.[8] [9]

These ideas of resilience converge under the concept of 'social-ecological systems' which recognizes the linked nature of humans and the environment to inform more sustainable development and defines resilience as "the capacity to *adapt* or *transform* in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human well-being".[10]

This ambiguity in the definition of resilience complicates measuring climate resilience outcomes because climate resilience actions almost always increase resilience more generally. Not accounting for those broader resilience outcomes undersells the positive impacts of climate resilience actions.

Separating climate resilience from resilience more broadly is difficult as resilience (and climate resilience) are both often determined by an individual, group, or community's social, political, and economic status.[11] Climate change impacts (e.g. increased frequency of high intensity precipitation events) will intersect with existing social, political, environmental, and economic development issues (e.g. economically disadvantaged households living in floodplains) to create more frequent disasters and severe impacts.

Increasing climate resilience (and decreasing vulnerability) is related to reducing the structural inequalities rooted in social, political, and economic systems that put people and infrastructure in harm's way and exacerbate disruptions to critical ecosystem functions.

3.2 Climate adaptation doesn't always result in resilience; resilience doesn't always result in climate adaptation

Climate adaptation, climate resilience, and resilience are often used interchangeably in the literature and policy. This can cause confusion when funding and evaluating efforts intended to increase climate resilience as initiatives that seek to increase resilience more broadly might not contribute to climate change adaptation. Adaptation actions can benefit climate resilience and resilience more broadly, but efforts to build resilience don't always lead to climate adaptation. For example, decisions about relocating infrastructure based on only historical flood frequency and extent might increase short-term resilience to flood risk, but without consideration of increases in flood extent and frequency with climate change, decision makers risk relocating infrastructure into future flood zones. Conversely, climate adaptation doesn't always build resilience, and adaptation actions can even undermine resilience efforts.[12] One example of this is sunk-cost effects; investments in past adaptation efforts are prioritized

Key Terminology: Adaptation

Climate adaptation: The process of preparing for, and coping with, the impacts of climate change.

Maladaptation (climate): Occurs when actions are taken that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence. (NCA5)

over new opportunities or innovations.[13] For example, investments in shoreline hardening might result in a reluctance to embrace nature-based solutions later, which could be a more important and effective practice for building resilience of the floodplain in the long term. Clarifying terminology and intended outcomes of the action can help ensure that climate resilience is indeed an outcome of the action. This risk of actions not resulting in intended outcomes can be reduced by using monitoring and evaluation practices to learn from and adjust actions, and by maintaining a diversity of adaptation solutions.[14]

What's the difference between climate change adaptation and resilience?

The terms *climate change adaptation* and *resilience* are often used interchangeably in policy and academic discourse. The terms are complementary, but there are important distinctions between them. Climate adaptation refers to specific *processes* or *actions* that alters a social or natural system to accommodate changes in the climate. These processes or actions may or may not enhance resilience for that system. Climate resilience refers to the capacity of interconnected social, environmental, and economic systems to *cope with*, *respond to*, and *recover from* climate-related shocks and stresses. In practice, distinguishing between these two terms is more difficult.

Adaptation can happen over short or long timeframes, be transformative or incremental, and include individual actions or broad programs or strategies. Adaptation is often considered to be a part of climate resilience. However, climate resilience can include more holistic systematic changes to enhance capacity (social, natural, financial, physical) to cope with, adapt to, or transform in the face of changes to the climate. Building climate resilience therefore entails a range of actions across policy and planning realms, infrastructure, government services, education, communication etc., to enhance the capacity of systems to cope with and recover from the impacts of climate change. Resilience considerations can enhance adaptation actions or projects by encouraging a more holistic approach to addressing climate impacts.

3.3 Climate change is global; climate impacts, resilience, and adaptation are local

Standardized practices and indicators of climate resilience have not been developed because climate adaptation is an inherently local process requiring tailored approaches to the local context. Climate resilience goals, strategies, and actions are most effective when they account for the specifics of the context in which they will be implemented. Because of this, governments that are identifying local goals for climate resilience must also develop tailored approaches to define indicators and metrics for measuring climate resilience that are specific to those local goals.[15] This makes it difficult to use standard practices and metrics based on other governments or regions.

3.4 Climate resilience is a continuous process rather than a discrete outcome

Climate resilience is a moving target based on the dynamic needs of social-ecological systems in a changing climate – this makes attribution (connecting an investment to a climate resilience outcome) especially challenging. Results of climate resilience and adaptation actions manifest over long time frames. It is likely that over the course of implementing an action, the social-ecological system will change, and new actions will be implemented at various scales (e.g. global, national, regional, local), so attributing an investment in the original action *as the cause of* a climate resilience outcome will become difficult or nearly impossible. It is more feasible to demonstrate how an action *contributes to* climate resilience goals overall.

3.5 Difficulty and limitations of establishing avoided loss

Avoided loss is often considered the most straight forward measurement of climate resilience outcomes (i.e. how much worse climate impacts would have been without intervention). However, not only is it difficult to establish due to the long timeframes and uncertainties associated with climate change impacts, but it also underestimates resilience outcomes by failing to account for the co-benefits associated with investments in climate resilience.[16]

4. Measuring and Evaluating Climate Resilience: Best Practices from the Literature

Despite the challenges of measuring and evaluating climate resilience, it is necessary to measure how investments in climate resilience are contributing to resilience outcomes to understand if strategies and actions are moving the state in the right direction. As the concept of climate resilience has advanced in practice, substantial effort has been invested to understand how to define resilience and adaptation success, and how to measure it most effectively. In this section we describe the best practices from the scientific and gray literature for measuring climate resilience outcomes.

Best Practices for Measuring Climate Resilience:

1. Consider the triple dividends of resilience.
2. Design climate resilience strategies and actions with intentional co-benefits.
3. Structure outcomes of strategies and actions as building blocks of climate resilience.
4. Measure climate resilience through relevant, flexible, and comprehensive indicators and metrics.

4.1 Consider the triple dividends of resilience

Using 'avoided loss' (direct and indirect damage to infrastructure and avoided deaths) as the primary metric to measure climate resilience and adaptation success results in an underinvestment in climate resilience. Despite growing awareness of wide-spread losses associated with climate change impacts and evidence that investment in adaptation and risk reduction provides substantial savings in terms of avoided loss, there remains a deficit in investment for pre-event disaster risk reduction and climate change adaptation.[17] The National Oceanic and Atmospheric Administration estimates that for every $1 spent on risk reduction (also called hazard mitigation), $13 is saved in future costs.[18] This lack of investment in adaptation and climate resilience is partially due to uncertainty in future climate impacts, but also a hesitancy to allocate public funds towards preventative measures that are often considered 'sunk costs' in the absence of disaster or acute climate impacts.

Avoiding loss is an important outcome of investing in climate resilience, but it is not the only outcome to consider when making decisions about investments and quantifying the benefits of those investments. The three principal categories of benefit derived from investment in resilience are referred to as the 'triple dividends of resilience', which are 1) saved lives and avoided losses, 2) stimulated economic benefits as a result of reduced disaster risk, and 3) broader social, environmental, and governance co-benefits.[19] [20] Considering all three dividends when measuring investments in climate resilience will generate a more complete estimate of the benefits to society, whereas considering only avoided losses will underestimate return on investment.

Dividend 1: Saving lives, avoiding losses, and recovering after a climate-related disaster. Avoided losses are often the primary driver for investing in climate resilience and are the most obvious benefits from those investments. However, avoided losses are not easy to measure without a climate-related disaster event. Additionally, uncertainty surrounding when and where a disaster will strike makes it difficult to decide when and where to invest in resilience actions. This uncertainty also makes it difficult to show outcomes related to investments. Dividends 2 & 3 offer more immediate benefits related to resilience investments that can also be considered when determining outcomes.

Dividend 2: Stimulated economic benefits as a result of increased climate resilience. Evidence suggests that the mere possibility of a disaster has real impacts on present-day decisions and economic growth. In other words, the risk of climate impacts and future disasters loom as an ever-present background risk that impacts people's decisions.[21] This results in risk aversion, reduced entrepreneurship, and shortened planning horizons for individuals and businesses, ultimately stymying economic growth. Increasing climate resilience, especially for overburdened communities and vulnerable populations, can therefore allow these groups increased opportunity to build financial stability and capacity, and engage in long-term planning and investments. These benefits exist even in the absence of acute climate impacts.

Dividend 3: Broader social, environmental, and governance co-benefits. Investments in climate resilience almost always result in ancillary social, environmental, and governance co-benefits. This is because most climate resilience investments are not solely designed to reduce climate-related disaster impacts, but also aim to increase resilience of broader economic, natural, or social systems. For example, climate resilience actions intended to address wildfire risk can also have positive impacts on community health and local economies.

4.2 Design climate resilience strategies and actions with intentional co-benefits

Investments in climate change resilience will almost always have co-benefits; considering these co-benefits provides a more complete accounting of the value of the investment. Designing multi-purpose climate resilience strategies and actions with co-benefits in mind intentionally helps to ensure greater outcomes from investments. Ancillary impacts of climate change adaptation can be either positive (co-benefits), or negative (maladaptation), and can also include cascading effects (such as those described above in dividend 2). Co-benefits can be considered the 'spillover' effects of the investment in resilience of social, environmental, and economic systems.[22] Co-benefits can include positive impacts on health and well-being,

biodiversity, reductions of greenhouse gas emissions, air-quality, water and resource management, etc.

When investments in climate resilience are intentional about co-benefits from the beginning, more value will be gained from the investments. Setting guidelines, as has been done through the principles outlined in RCW 70A.05.010, for the co-benefits that are desired to be achieved through climate resilience actions can ensure that those actions contribute to broader resilience objectives (e.g. public health, environmental justice, habitat restoration). Investments ultimately save money by being multi-purpose.[23] Consideration of the values of these co-benefits creates a more complete accounting of the return on investment.

When investments in climate resilience are intentional about co-benefits from the beginning, more value will be gained from the investments.

RCW 70A.05.010 requires that the updated Climate Resilience Strategy be guided by the following principles:

- Prioritize actions that both reduce greenhouse gas emissions and build climate preparedness.
- Protect the state's most overburdened communities and vulnerable populations and provide more equitable outcomes.
- Prioritize actions that deploy natural solutions, restore habitat, or reduce stressors that exacerbate climate impacts.
- Specifically, prioritized actions must include those related to drought resilience, flood risk mitigation, forest health, urban heat islands and the impacts of the built environment on the natural environment, Puget Sound health, and mitigating expected impacts on outdoor recreation opportunities.
- Prioritize actions that promote human health.
- Consider flexible and adaptive approaches for preparing for uncertain climate impacts, where relevant.
- Address the risk in each geographic region of the state with appropriate scope, scale, and urgency.

4.3 Structure outcomes of strategies and actions as building blocks of climate resilience

Rather than trying to directly connect a climate resilience action to a discrete outcome (e.g. climate resilience), best practice from the literature is to put the action in the context of broader goals for adaptation and resilience.[24] Determining the actual impact of climate resilience actions is difficult to do because these impacts are often obscure and emerge in complex systems over a long time. Also, because resilience is multi-dimensional and the aggregate of different types of capital (social, natural, financial, political, etc.), actions are rarely able to increase capacity across all these dimensions. Rather, it is likely that an action will fit in as a building block of climate resilience.

4.4 Measure climate resilience with relevant, flexible, and comprehensive indicators and metrics

An effective way to understand if investments are achieving desired outcomes is to measure progress towards climate resilience with indicators and metrics. Indicators and metrics can communicate a vision of and progress toward adaptation success, support strategic decisions, align plans, justify investments to taxpayers, demonstrate accountability, support learning, and improve effectiveness. No one set of indicators and metrics can fulfill these different purposes and selecting a reasonable number of indicators and metrics that are representative of various climate resilience goals can be difficult.

Key Terminology: Indicators and Metrics

Indicator: A quality or trait that serves as a sign that a particular set of adaptation goals (strategies or actions) are yielding the desired results or making progress in the right direction.

Metric: A variable that can be measured (quantitative) or tracked (qualitative) that represents the indicator.

Indicators and metrics are most effective at measuring climate resilience when they:

- are grounded in the appropriate local context;
- incorporate flexibility;
- represent capacity, process, and outcomes associated with climate resilience; and
- are comprehensive but reasonable in scope.

Key Terminology: Types of Indicators and Metrics

Outcome Indicator: Indicative of the extent to which the desired future resilient state is being achieved.

- More direct indicator that resilience goals are being achieved
- Often take long time frames to achieve
- Often lack specific data to measure indicators
- Can be difficult to measure in the absence of extreme events
- Often attempt to measure the absence of something, such as a failure in the system

Process Indicator: Indicative of the progress being made towards the desired resilience goal, such as what is being done or spent. Process actions do not necessarily equal resilience or adaptation success in terms of achieving goals but do demonstrate accountability and are useful intermediary measures when outcomes are often not seen for many years.

- Process oriented
- Relatively easy to measure and track
- Show progress and contribute to learning

Capacity Indicator: Indicative of the capacity and resources necessary to make progress towards or achieve a resilience goal.

- Input oriented
- Show enabling conditions (social, technical, human, financial etc. capacities)

Quantitative Metric: A variable that can be counted or measured in numerical values.

- Relatively easy to measure (if data is available)
- Only provides a snapshot in time of the indicator and climate resilience

Qualitative Metric: A variable that can be tracked that helps to capture descriptive data.

- Contributes to a more complete story of the indicator and climate resilience
- Contains insights into the progress that is being made toward climate resilience goals
- Often requires more capacity and time to track

Ground indicators and metrics in the appropriate local context

Recognizing that climate change is global, but adaptation is local, actions to increase resilience will be most effective when tailored to the local context. Measuring climate resilience progress and outcomes will also be most effective when indicators and metrics are tailored to the goals, strategies, and actions designed to increase resilience for the given context, as opposed to standard indicators taken from other frameworks for other contexts. Defining resilience goals, strategies, actions, as well as an appropriate measurement framework will depend on the context, sectors, and people involved in the planning process. One way to ensure that indicators and metrics are grounded in the local context is to first define goals collectively for resilience, and then relate indicators and metrics to those goals.[25] Additionally, identifying indicators of those goals in conjunction with the development of specific strategies and actions can help ensure cohesion across the measurement framework.

Incorporate flexibility

Given that social-ecological systems are constantly changing, and climate resilience priorities are likely to change as well, incorporating flexibility into the measurement framework can ensure that indicators and metrics are responsive to evolving conditions. This can help prevent processes from becoming entrenched in measuring unhelpful indicators that don't contribute to learning about desired climate resilience outcomes.

Represent capacity, process, and outcomes associated with climate resilience

Capacity, process, and outcome indicators, when used together, can help paint a more comprehensive picture of climate resilience. [26] [27] Outcome indicators are essential to understand if the desired future state of climate resilience is being achieved, but they often manifest over a long time and can be unsatisfying when trying to determine how investments are 'moving the needle.' A measurement framework that includes indicators of the processes and capacity necessary to build climate resilience can help show progress towards resilience outcomes despite the challenges of tracking climate resilience as a discrete outcome.[28] [29] Tracking and evaluating progress towards climate resilience through the processes that are established (e.g. planning, engagement, decision-making) allows for near-term quantification of how investments are leading to outcomes.[30] Another way to demonstrate near-term

Developing a complete understanding of the progress towards a climate-resilient future will require indicators that can describe the capacity and process needed to achieve resilience, as well as indicators that capture outcomes that describe what it looks like to achieve goals for climate resilience.

return on investment is to measure and track capacity indicators.[31] Capacity indicators show that the conditions (funding, human capacity, knowledge) are being established to enable implementation of climate resilience actions.

For all indicators, best practice is to use both quantitative and qualitative metrics to track progress. These complementary metrics create a more complete picture of the indicator and contribute to learning that can inform the revision of indicators over time if necessary. Similarly, using a diversity of indicators meant to capture data at different points in the process of building climate resilience can also prevent entrenching measurement of an indicator that turns out not to be useful later.

Develop comprehensive indicators that are reasonable in scope

The need for a variety of indicators and metrics to paint the picture of climate resilience is clear, but this presents a practical challenge associated with measurement scope. Best practice for identifying indicators and metrics is to consider data availability and limitations. Will indicators and metrics rely on existing data, or will they require the collection of new data that might not yet be available and will take time and capacity to create? Implications for staff capacity and time needed to track and measure each indicator or metric should be considered. A small list of thoughtfully chosen indicators and a reasonable number of metrics is often more effective for demonstrating and evaluating progress than a long list.

5. State of the States: How Others Are Measuring Climate Resilience

State climate resilience plans developed in the last five years place a greater emphasis on defining actions that are specific and measurable. Increasingly, state plans explicitly identify the need for a governance structure, mechanisms for implementation, and a process to track and report progress. However, details on these processes are rarely prescribed in plans, rather the plans often identify the need for an implementation plan that includes indicators and metrics and a process for tracking and reporting. This state of practice reflects the complexities of measuring climate resilience outlined in the previous sections, as well as the capacity required to collect data and report on indicators and metrics.

> **Twenty-three states in the nation have a plan for climate resilience, yet most plans do not include indicators or metrics to measure progress or other mechanisms to show how investments in climate resilience translate to outcomes.**

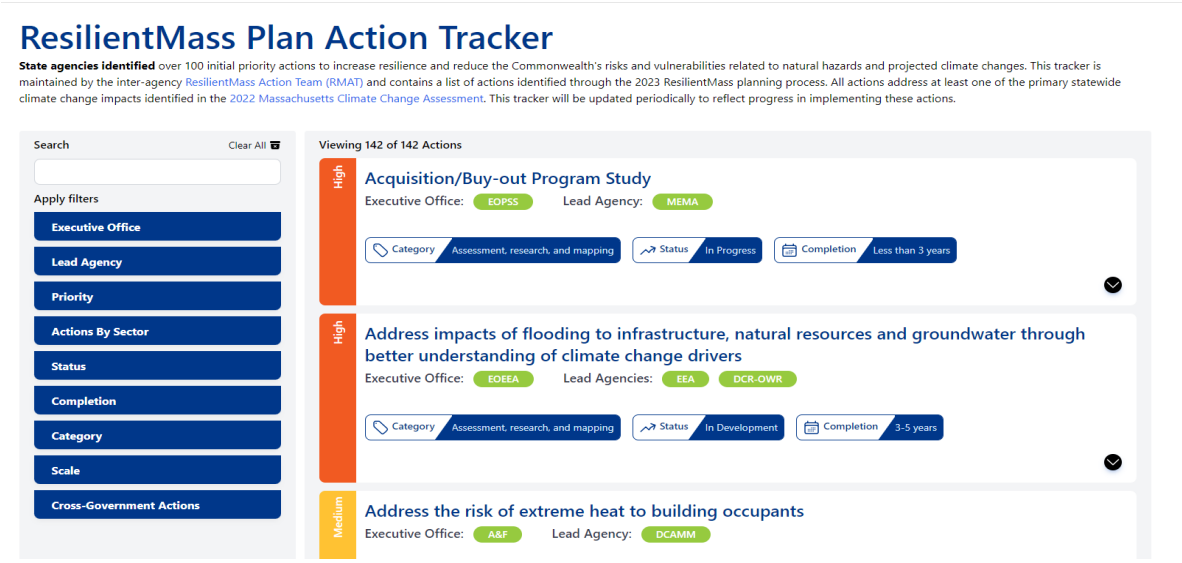
Of the few states and municipalities that have developed processes and structures for measuring climate resilience outcomes, approaches are varied, and all require resources and support from effective governance structures. The approaches vary from simple processes that track the status of proposed actions to more sophisticated approaches that identify indicators and metrics for the goals and outcomes that the resilience strategy is designed to achieve. Most approaches currently being implemented are simplistic and in the early stages of measuring resilience outcomes. One theme identified in state plans is the need for resources to support the effort required to track, report and evaluate actions. A second theme is that the governance structure for implementing the climate plan is important for enabling effective tracking, measurement, and reporting.

5.1 Case studies: Approaches to Measuring Resilience by Other States

ResilientMass Plan Action Tracker

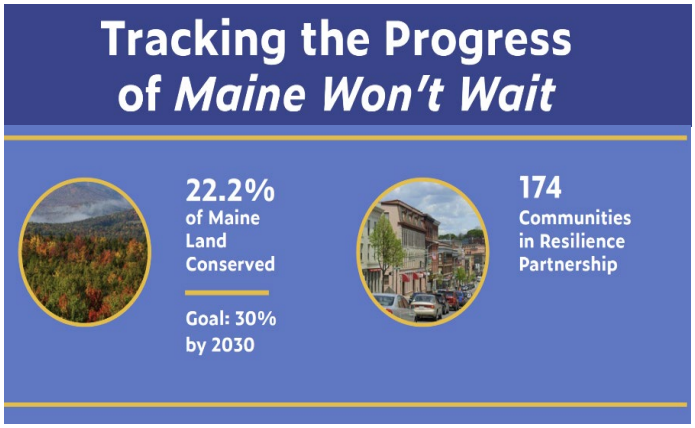
Massachusetts developed the ResilientMass Plan Action Tracker, an online dashboard that tracks over 100 priority resilience actions to address the climate risks described in the 2022 Massachusetts Climate Change Assessment.[32] The dashboard is periodically updated to reflect the status of each action and the expected timeline for completion. This approach increases

transparency and accountability because it requires continuous reporting of the action status. However, this approach is limited in its ability to demonstrate how individual actions contribute to broader resilience goals and outcomes.



Maine Won't Wait - A Four-Year Plan for Climate Action

To track implementation of Maine Won't Wait, the state's four-year climate action plan, the state developed an online dashboard to track numerical targets and report success stories qualitatively.[33] The purpose of the dashboard is to inform the public and identify whether adjustments, enhancements or replacements to policies are needed to achieve resilience objectives. The expectation is that the dashboard will be expanded over time as investments are realized, enabling more outcomes to be tracked. Although most of the goals in Maine's climate action plan focus on targets for reducing greenhouse gas emissions, some specifically measure resilience outcomes – the percentage of land conserved and the number of communities in resilient partnerships. By defining indicators and metrics (quantitative or qualitative), this framework provides a more complete picture of how strategies and actions are contributing to broader resilience outcomes and show progress over time as more investments are made in resilience.



Municipal Approaches to Measuring Resilience Outcomes

CRDC FOCAL AREA	OVERARCHING GOAL	OUTPUT INDICATOR	OUTCOME INDICATOR	PERFORMANCE STANDARD
TRANSPORTATION AND UTILITIES	Improve transportation and utility infrastructure to maintain viability during periods of extreme heat, severe weather, and flooding.	Number of transportation and utility projects that specifically incorporate climate projections into planned or implemented designs and operations.	Estimated costs saved through adaptive measures, including greening, hardening, retrofitting, or relocating utility and transportation assets.	Setting a minimum time by which transportation or utilities assets should be expected to return to normal functionality after a severe weather event reasonably expected based on climate projections.
BUILDINGS AND DEVELOPMENT	Retrofit existing buildings and design new buildings and development projects to withstand climate change impacts.	Number of buildings that specifically incorporate climate projections into planned or implemented designs and operations Number of critical facilities designed to withstand increased risks due to climate change.	Estimated costs saved through integrating climate risks into building or development design decisions. Percentage of residents living in buildings designed to withstand reasonably expected climate hazards.	Resilient building performance standards, such as requiring all new buildings to maintain thermal comfort levels without power on a 95 degree Fahrenheit day for 12 hours.
NEIGHBORHOODS AND COMMUNITIES	Make neighborhoods and communities safer and more prepared by strengthening community, social, and economic resilience.	Proportion of District residents living within a 10-minute walk from a resilience hub The percent of tree canopy and/or impervious surface coverage in the most heat-sensitive areas.	Reduced number of ambulance dispatch calls or hospital admissions during severe weather events of similar magnitudes. Reductions in UHI temperature differentials after installing cooling infrastructure (e.g., cool roofs and shade trees).	Setting specific standards, such as ensuring all evacuation routes stay operational if 14 inches of rain falls in a 24 hour period.

Climate Ready DC

Several municipalities have more developed processes for measuring and evaluating progress towards climate resilience outcomes. For example, the District of Columbia developed Climate Ready DC with a measurement framework that includes goals, indicators, and performance standards for four focal areas, or sectors.[34] Each sector has an overarching goal with one *output* and one *outcome* indicator. The *output* indicators are intended to monitor progress towards the overarching resilience goal. The *outcome* indicators will be tested and refined as data is collected. Progress updates are made through annual reporting.

Climate Budgeting in New York

New York City is the first city in the nation to pilot an innovative approach to integrate targets from the city's Climate Action Plan directly into the financial budgeting process of the city. Within the city's budget decision-making process, the city proposes, adopts, implements, monitors, and reports on measures to meet short-term targets for greenhouse gas emissions reductions.[35] Each action tracked through the budgeting process includes estimated emissions reductions along with the costs and financing required. This enables a more direct accounting of how near-term spending contributes to meeting long-term emissions reductions targets across all city agencies and creates a mechanism to track the broader impact of the city's budget on climate change.

6. Informing Washington State's Integrated Climate Resilience Strategy

An emphasis on implementation and measurability in the update to Washington's Climate Resilience Strategy will increase transparency and enable investments to be more clearly connected to climate resilience outcomes. Furthermore, by specifying principles to guide the development of the strategy, the legislation ensures that the actions and strategies included in the plan are multi-purpose and produce co-benefits, increasing the potential for realizing all three dividends of resilience: avoided losses, stimulated economic benefits, and broader social, environmental, and governance related co-benefits.

Performance measurement for climate resilience is an emerging practice, especially at the state level. There is no one-size fits all approach to measure and determine how investments translate to climate resilience outcomes. Best practices from the literature and lessons from other states are being applied to a measurement framework for the update of Washington's Climate Resilience Strategy. These practices are:

- a governance structure developed to support accountability, coordination implementation, tracking, and reporting on climate resilience strategies and actions;
- strategies and actions that are designed for implementation;
- consideration of co-benefits, detailed by the guiding principles, to ensure actions to build climate resilience also contribute to broader resilience goals (e.g. public health, environmental justice, habitat restoration); and
- an adaptive and flexible measurement framework to track and measure capacity that enables actions, processes for implementing resilience actions, and climate resilience outcomes.

The approach described below has been guided by requirements outlined in RCW 70A.05.010 regarding reporting frequency and developed in close collaboration with the Department of Ecology and the interagency climate resilience team tasked with updating the Climate Resilience Strategy.

RCW 70A.05.010 Update & Reporting Frequency:
"The department of ecology shall update the climate response strategy every four years and provide interim biennial work plans to the governor's office that report on implementation progress and summarize agency needs and priorities for biennial budget planning processes starting by September 30, 2025.

"Agencies responsible for implementing actions in the updated strategy shall provide information needed for reporting to the department of ecology by August 15th of odd-numbered years starting in 2025. Agencies may identify and include any resources needed to carry out duties under RCW 70A.05.040."

The Climate Resilience Strategy is still in development (*to be completed in September 2024*). Here we describe the draft structure of the strategy to provide context for the currently proposed measurement framework described below.[1] This proposed framework will continue to evolve and change as work continues to refine the climate resilience strategy over the next several months, including as a result of input received through outreach and engagement activities.

The Climate Resilience Strategy has climate resilience goals, strategies, and actions.

Goals outline an overall vision for climate resilience for three broad areas: 1) communities, 2) infrastructure, and 3) natural and working lands. A fourth goal, governance, outlines *how* the state will increase statewide climate resilience through the strategy.

Strategies are high-level cross-agency priorities designed to encompass the diversity of actions that contribute to climate resilience for a similar hazard or are accomplished through a similar approach.

Actions, guided by the principles outlined for the strategy, contribute to one or more of the climate resilience goals and address one or more of the climate hazards facing the state. Actions reflect agency and cross-agency priorities for climate resilience.

The current proposed measurement framework defines capacity, process, and outcome indicators at the goal level (*see Key Terminology: Types of Indicators and Metrics above*). These indicators will be measured by one quantitative metric and tracked by one qualitative metric. Outcome indicators will be measured every four years because they often require longer time frames to show results. Process and capacity indicators will be measured every two years because they show near-term progress and can help guide updates to the strategy and funding requests. The data for the

[1] This framework is subject to changes based on additional feedback from the public review period, and additional work done by the interagency climate resilience team between June 1, 2024 and finalization of the strategy in September 2024.

metrics associated with each indicator will include data from the results of actions that have been associated with the indicators. This structure has been proposed to provide a comprehensive view of how the actions are collectively contributing to the climate resilience goals. Strategies will not be measured but will be reviewed every four years in line with the update to the strategy. Further, action status (completed, in progress, not yet started) and funding status (received state or federal funding to implement, didn't require additional funding) will be reported on by lead agencies for the actions every two years. An example to illustrate this approach for a given goal, indicator, and set of actions is provided below.

This proposed measurement framework for Washington's Climate Resilience Strategy will take time and capacity to establish and implement. Once established, initial measurements will contribute to setting a baseline for the indicators against which future measurements can be compared. This approach to measuring progress towards climate resilience will need to be adaptively managed to ensure that the appropriate metrics are being measured and that no unintended consequences are occurring because of the framework.

Proposed Measurement Framework for Washington's Climate Resilience Strategy

Level of Strategy	Measurement Approach	Structure and Process	Recommendations and Justification
Goal	Outcome, process, and capacity indicators Quantitative and qualitative metrics	Structure • Outcome and process indicators are defined for each goal. • Capacity indicators are defined only for the governance goal. • Quantitative and qualitative metrics measure and track progress for each indicator under the goals. Process • The ICR core staff will combine the information reported from each agency and action to report on the metric(s) and show progress made for each capacity and process indicator every two years and every outcome indicator every four years.	This approach to measuring climate resilience progress will provide a comprehensive view of how the actions are collectively contributing to the resilience goals. Measuring two metrics per indicator (when possible, one quantitative and one qualitative) will help create a more complete picture of progress for an indicator and maintain a manageable number of metrics.
Strategy	No formal measurement	Structure • Strategies are designed to encompass the diversity of actions that contribute to resilience for a similar hazard or with a similar approach. Process • The core staff and ICR coordinating committee assess the strategies every four years through the update process to determine if these are still the priority strategies.	Indicators and metrics for the strategies could also be developed and tracked to show progress on the strategies. We are not recommending this approach to avoid creating an unreasonable number of metrics and because the strategies are high-level. The four-year review of the strategies could include interviews with agency staff, case studies etc., and reporting on success stories and challenges associated with actions.

Action	Status reporting *(not yet started, in progress, completed)* Funding status *(received state or federal funding to implement, didn't require additional funding*) Action data contributes to the Goal level indicators and metrics	Structure • Actions have a lead agency, participating agencies, and timeframe. • Individual actions contribute to at least one indicator/metric at the goal level and often more than one. Process • Lead agency reports action and funding status to Ecology climate resilience core staff every two years. • All agencies contribute information for the capacity indicator metrics every two years. • Participating agencies contribute information to the process indicator metrics for the action every two years. • All relevant agencies contribute information for the outcome indicator metrics every four years.	The process shows how multiple actions collectively contribute to the climate resilience goals. Outcome indicators are more long-term, so we recommend a less frequent reporting period. Process and capacity indicators show near-term progress, so we recommend a more frequent reporting period.

Example of measurement framework for a given goal, indicator, and set of actions:

Goal 3: Natural and Working Lands (N&WL): *Protect, restore, and adaptively manage natural systems and working lands so they can provide continued and enhanced ecological, cultural, social, and economic benefits under current and future climate impacts.*

N&WL Outcome Indicator #2 – Restored and resilient species and habitat exist and are connected across the landscape.		
Quantitative Metric	Qualitative Metric	
# of acres of habitat restored	Story of restored habitat because of the actions	
Connected Actions		
9.INTER9 Increasing habitat connectivity for Washington's wildlife		
9.INTER10 Interagency Shrubsteppe Resilience Implementation		
Reporting: What	**Who**	**Timeframe**
# of acres restored	All agencies conducting habitat restoration	Every four years
# of acres restored by action Stories of restored habitat	Interagency action leads	Every four years

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Appendix C: Agency Climate Resilience Activities Summary

Agency Climate Resilience Activities Summary

Purpose

This document provides a summary of each agency's current climate resilience priorities, plans, and actions following the requirements for the Climate Resilience Strategy outlined in RCW 70A.05. The document is organized around major climate stressors facing Washington and outlines the tools and approaches agencies are currently using to prepare for, respond to, and recover from climate impacts. This document will be used to identify gaps in the approach of state government to build climate resilience and to subsequently inform the development of strategies and actions to include in the State's updated 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:

- Water Availability and Drought
- Flooding
- Extreme Heat
- Marine and Coastal Changes
- Wildfire and Smoke

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.

Water Availability and Drought

Stressor Description

Snow Water Equivalent 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: Spring snowpack is projected to decrease faster than it already has in the 20th century, with the rate of decline increasing (RCP 8.5), relative to the end of the 20th century.

Geographic Variability of Projected Change: Climate projections show that few areas outside of the high elevations in the North Cascades and Olympic Mountains will have April 1 snowpack by the 2080s (RCP 8.5).

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 snow and ice that is available to melt and contribute to runoff in summer. Historically, eastern Washington experiences little late summer runoff.

Projected Change: Late summer runoff is projected to decrease across the state (RCP 8.5), relative to the end of the 20th century.

Geographic Variability of Projected Change: Projected decreases in summer runoff are largest in the Cascade and Olympic Mountains where snow melt supplies runoff in late summer historically. 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 also 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 small increases in late summer runoff, possibly associated with more summer precipitation, but uncertainty in the precipitation projections is high.

Current and Ongoing State Agency Actions

Nearly all agencies involved in the update to the state's Climate Resilience Strategy 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 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 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.

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 substantially 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 (RCP 8.5), relative to the end of the 20th century.

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 and Department of Health 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 impact from events like flooding and severe storms on energy infrastructure and distribution systems. This work includes state-wide plans, an energy restoration prioritization, and communication plans with energy partners. 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 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

Summer maximum temperatures

Historical Conditions: Summer maximum temperature is higher in eastern Washington and lower in the Cascade Mountains, Olympic Mountains, and outer coast. Statewide summer maximum temperature has increased.

Projected Change: Summer maximum temperature is projected to increase (RCP 8.5), relative to the end of the 20th century.

Geographic Variability of Projected Change: The projected increase in summer maximum temperature is expected to be greatest in the Puget Sound Region, Central Washington, and Eastern Washington and slightly less along the outer coast 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. As temperatures rise and more households and businesses use air conditioning, the Department of Commerce is advancing policies, plans, and procedures to project expected future energy demands to ensure adequate resources are available at the right times. The Department of Agriculture is 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.

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,

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 because of land subsidence. 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 relative to the 1991 - 2009 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.
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.

Wildfire and Smoke

Stressor Description

Wildfire likelihood - the likelihood that a given year in each 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 central 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: With climate change, the likelihood of wildfire conditions is expected to increase in some areas of the state (RCP 8.5).

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 and southwestern Washington. In eastern Washington, wildfire conditions are projected to increase in a ring around the Columbia Basin. 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.