Connecting Climate Resilience, Equity, and Infrastructure

Washington State Department of Commerce

IACC Annual Conference 2024

Session hosted by the Public Works Board

OCTOBER 23, 2024

v1.5

Introductions

Intros

- Panelists
  - Carlie Stowe, Climate Impacts Group at the University of Washington
  - Maria Jawad, Public Works Board
  - Jen Hennessey, Washington Department of Ecology
- What role does your organization play in climate resilience work?
- What do you think equity has to do with infrastructure?

Climate Change and Infrastructure in Washington State

Carlie Stowe, Climate Resilience Specialist | stowec@uw.edu

Rainier from White River Valley

The Climate Impacts Group builds climate resilience by advancing understanding of climate risks & enabling science-based action to manage those risks.

We are widely recognized for scientific discovery, as an experienced creator of impartial & actionable science and as a catalyst for building regional climate resilience.

Climate Change and Infrastructure in Washington State

1. **Climate change stressors and impacts to Washington State**

1. **Risks to infrastructure**

Key Climate Stressors considered in Washington's Resilience Strategy

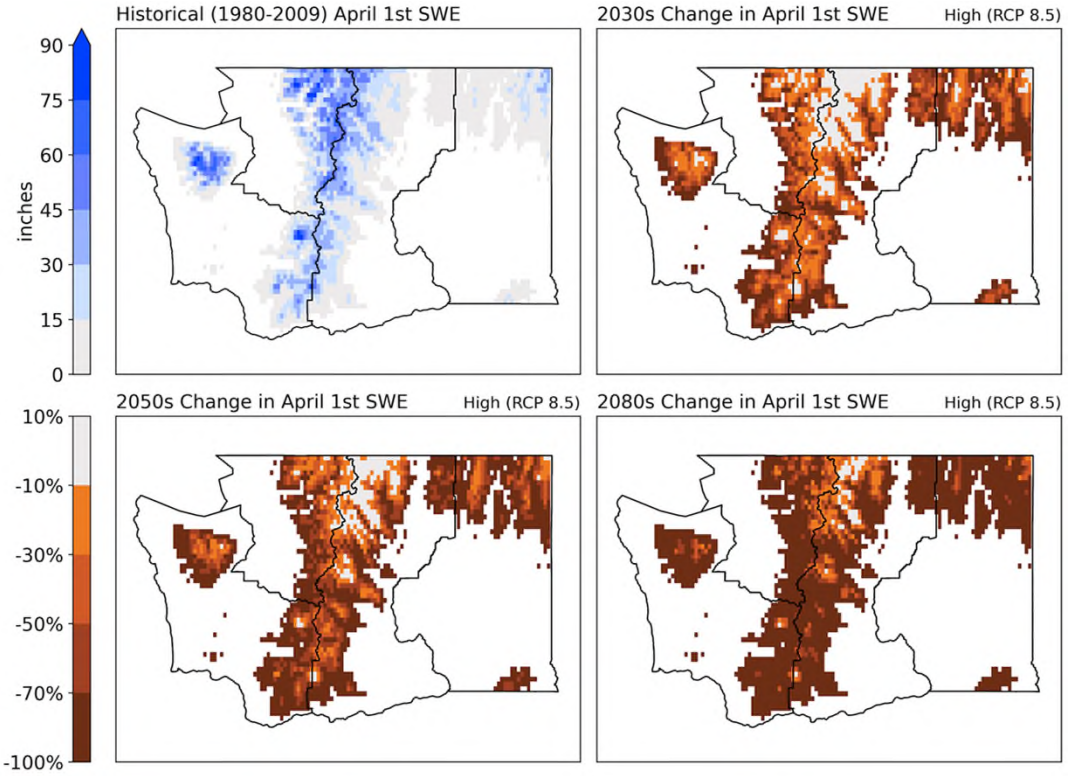
The effects of climate change will be felt first and worst by communities with environmental justice concerns, including Tribes, people of color, low-income individuals, and other vulnerable or overburdened populations.

Reduced Water Availability & Drought: Snow Drought

Historical: In the Cascades, spring snowpack has declined by about 25% since 1950. [1]

Projected: By the end of the century, Washington's spring snowpack is projected to decrease by about 40-60% on average. [2, 3]

Potential impacts: Declines in spring snowpack are expected to decrease water supply in summer and winter outdoor recreation opportunities with adverse effects on communities, ecosystems, and agriculture. [4]



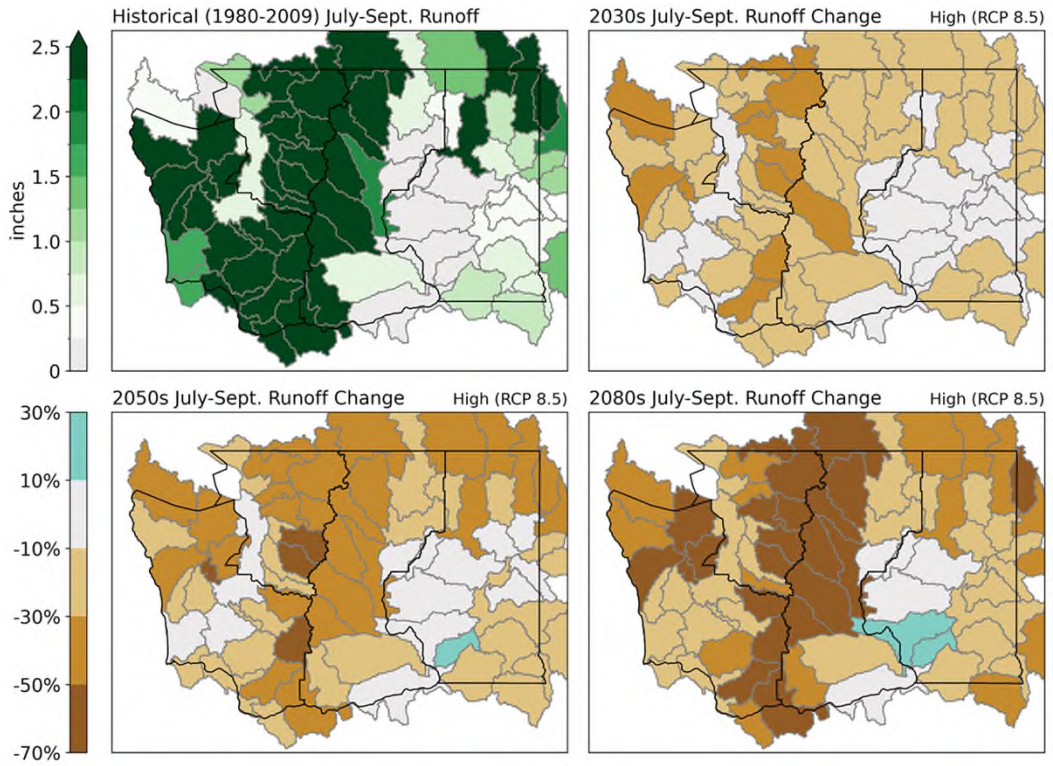
Modeled historical and future projected change in spring snowpack *(based on a high greenhouse gas scenario, relative to 1980-2009).* **Data Source:** RMJOC-II Hydrologic Projections[3] *(data available on request).*

Reduced Water Availability & Drought: Hydrologic Drought

Historical: There has been no significant observed trend in late summer runoff.

Projected: By the end of the century, late summer runoff is projected to decline by 7-14% on average. [5]

Potential Impacts: Less runoff in summer will reduce water available for irrigation, residential and municipal use, streamflow, and ecosystems. [4]



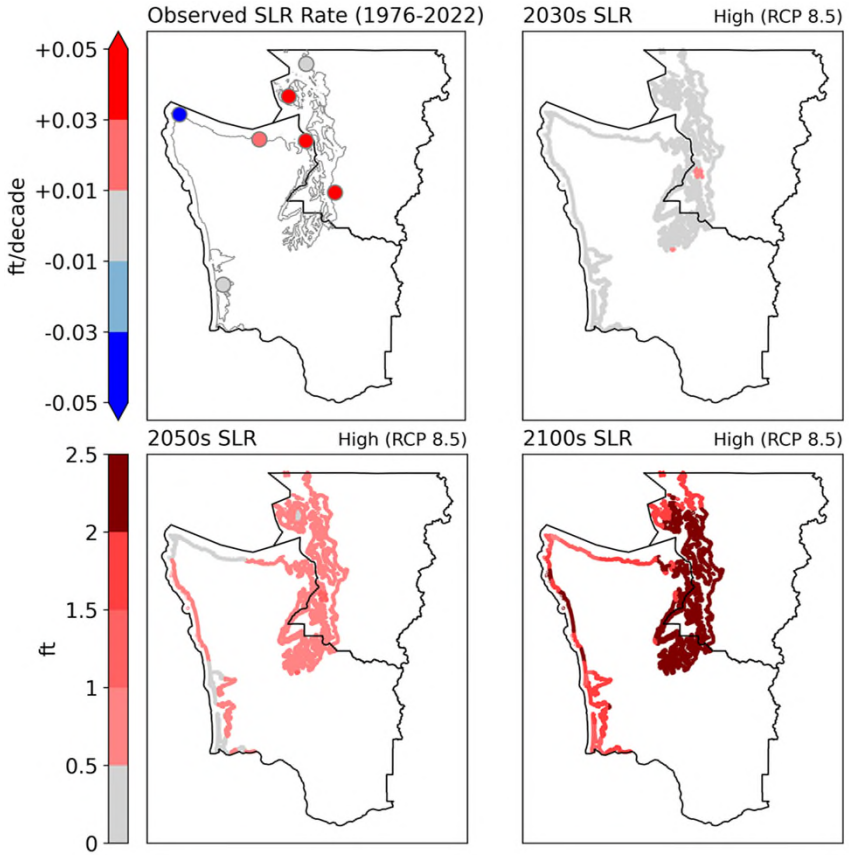
Modeled historical and future projected change in late summer runoff *(averaged for each 8-digit Hydrologic Unit Code, or HUC, based on a high greenhouse gas scenario, relative to 1980-2009).* **Data Source:** RMJOC-II Hydrologic Projections[6] *(data available by request)*.

Sea Level Rise

Historical: Washington's coasts have experienced different rates of sea level rise due to the state's active geology.

Projected: By the end of the century, sea level rise will increase to about 1.5 - 2.5 ft, on average. [6]

Potential Impacts: Coastal flooding of infrastructure and communities, and damage to coastal habitats that are adapted to specific tidal levels. [4]



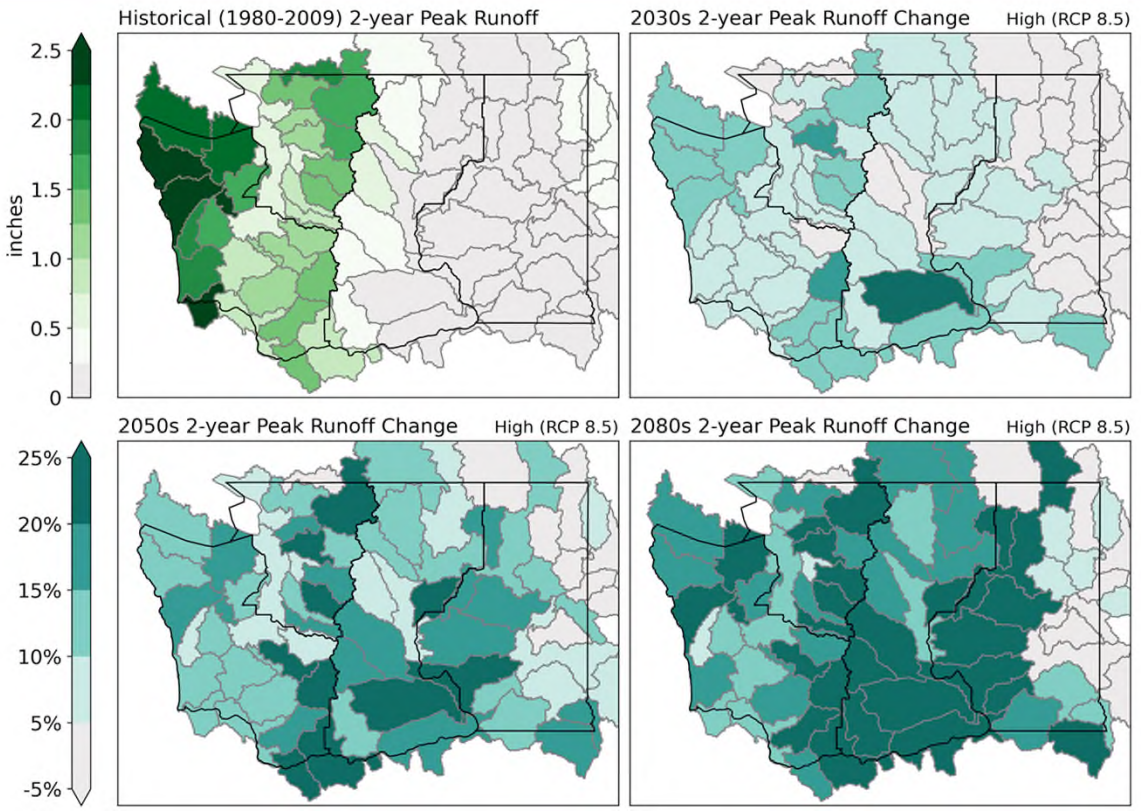
Observed historical and projected sea level rise. *(Historical trend from 1976-2022 and projected future sea level rise, or SLR, with a 50% likelihood for 2100 relative to 2000, based on a high greenhouse gas scenario.)* **Data Source:** Projected Sea Level Rise for Washington State[10] (data available by request).

Flooding

Historical: Due to high year-to-year variability, there has been no significant observed trend in extreme precipitation or 2-year peak runoff. [7]

Projected: By the end of the century, the biggest daily events will bring 20% more precipitation, and the 2-year flood is projected to bring 14-15% more water, on average. [8, 2]

Potential Impacts: Larger peak flow events are expected to contribute to flooding and associated damage for communities, ecosystems, and infrastructure. [4]



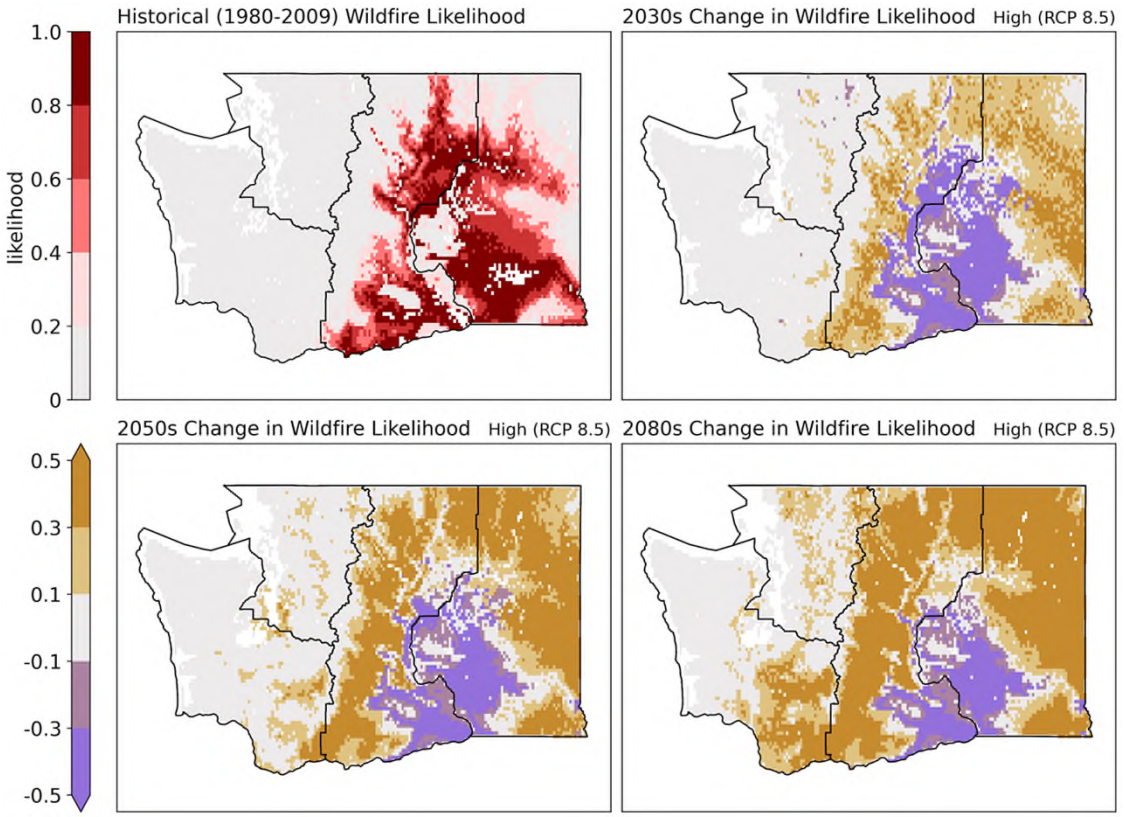
Modeled historical and future projected change in the magnitude of extreme precipitation events *(based on a high greenhouse gas scenario, relative to 1980-2009).* **Data Source:** RMJOC Hydrologic Projections (data available by request).

Wildfire & Smoke

Historical: Wildfire smoke was more common over the last decade, compared to the decade before.

Projected: The likelihood of wildfire conditions is projected to increase for most of the state due to summer drying associated with snowpack loss and projected declines in summer precipitation.[9]

Potential Impacts: Increasing wildfire activity threatens infrastructure and communities, reduces air quality, and increases landslides and erosion in the subsequent wet seasons.[4]



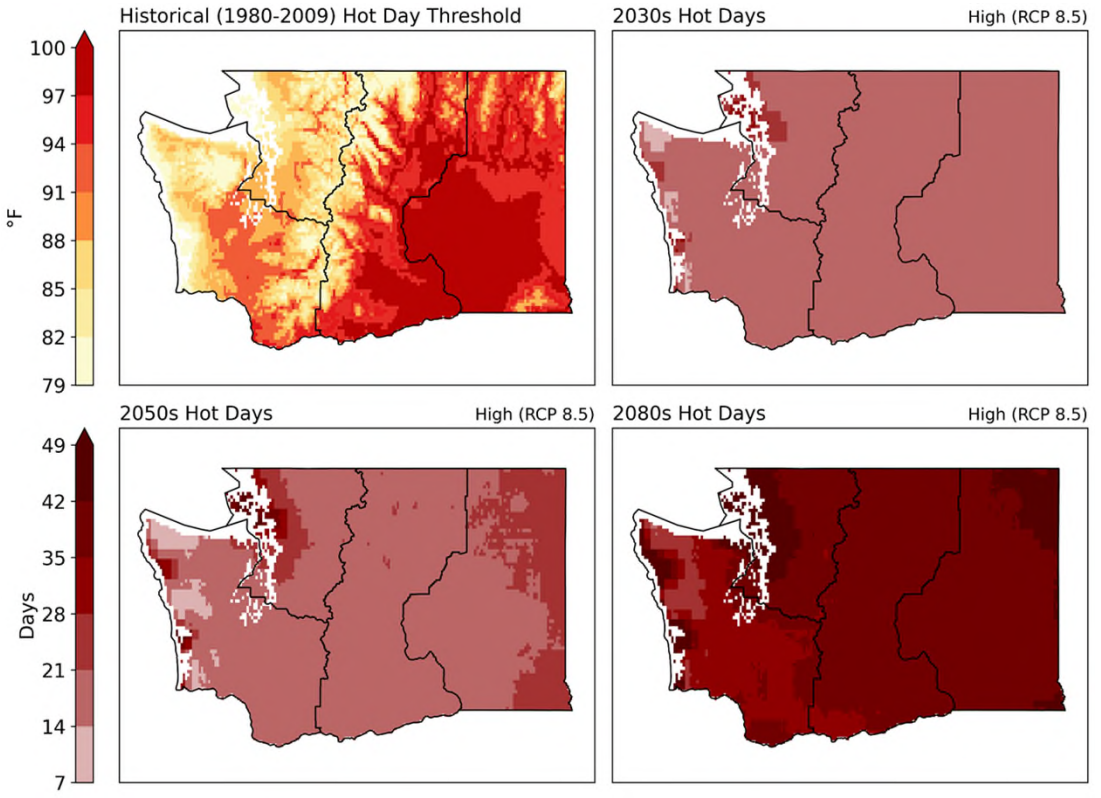
Modeled historical and projected change in the likelihood of wildfire conditions. *(Based on a high greenhouse gas scenario, relative to 1980-2009.)* **Data Source:** Projected major fire and vegetation changes in the Pacific Northwest.

Extreme Heat

Historical: Since the beginning of the 20th century, temperatures in the state have risen almost 2°F. Between 2015 and 2020 the number of hot days have been above average in Eastern and Western Washington. [1]

Projected: By the end of the century different regions in Washington are projected to have 11 to 127 hot days per year, compared to about 1 day per year in the past. [2]

Potential Impacts: More hot days are expected to increase public health emergencies, concentrations of some air pollutants such as ozone, and heat stress of livestock and crops. [4]



Modeled historical and future projected average number of hot days *(based on a high greenhouse gas scenario, relative to 1980-2009).* **Data Source:** MACAv2-METDATA[2] *(data available by request).*

Impacts to Infrastructure

Water Availability & Drought

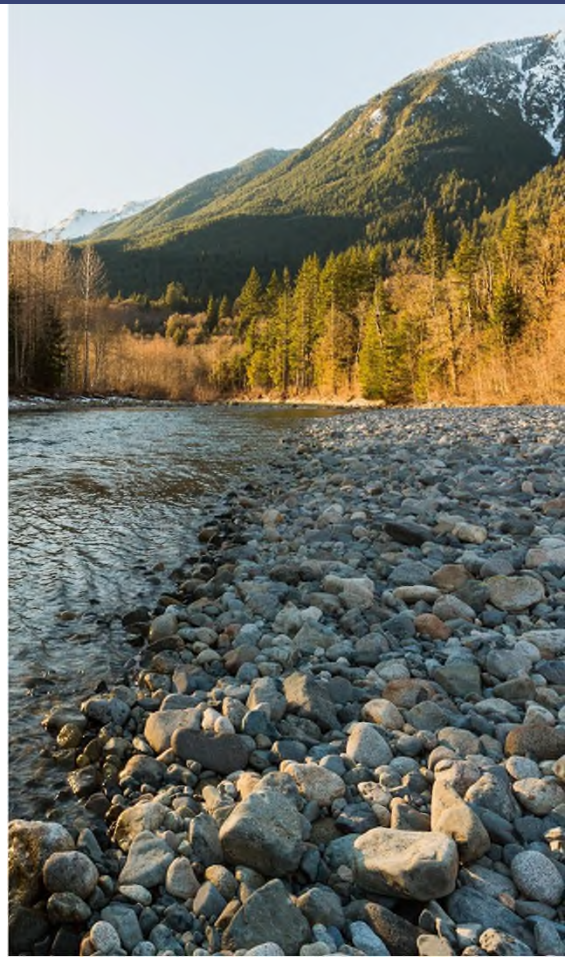
Potential impacts to infrastructure:

- Competition between water dependent sectors
- Impacts to hydroelectric power supply
- Degradation of water quality

Water Availability & Drought

Impacts depend on magnitude of changes and management flexibility:

- *Yakima:* Water curtailments for junior users increase from 14% to 68% of years, by the 2080s. *(Vano et al. 2010a)*
- *Statewide:* Increased summer hydropower demand due to A/C use and population growth. *(Hamlet et al. 2010)*
- *Everett, Tacoma:* Water supply reliability remains high even with changes in demand *(Vano et al. 2010b)*
- *Seattle:* High water supply reliability except for demand increases > ~25% *(Vano et al. 2010b)*



Sea Level Rise

Potential impacts to infrastructure:

- Increased severity of shoreline and coastal bluff erosion, storm surge, flooding, and saltwater intrusion
- More than 14,000 homes and structures (with a current value of over $8 billion) may be exposed to coastal flooding by 2050. [10]

Increased Precipitation & Flooding

Potential impacts to infrastructure:

- Damaged and closed roads
- Increased scour under bridges
- Overwhelm to stormwater and wastewater facilities
- Overwhelm of drainage structures
- Damage to energy equipment, residential properties, agricultural sites, most physical infrastructure
- Increased risk of landslides and slope failures
- Higher maintenance costs

http://www.skagitclimatescience.org/events/educational resources/

Today's 100-year floods projected to become a 22-year event by 2100, on average

http://www.skagitclimatescience.org/events/educational resources/

Extreme Heat

Potential impacts to infrastructure:

- Heat related buckling of pavements and rails
- Traffic-related rutting of pavements
- Thermal expansion of bridge joints.
- Increased demand on energy sector

Extreme Heat

WSDOT Traffic
@wsdot_traffic · **Follow**

Here's an example of how heat is causing some road pavement to buckle. Our crews are hard at work this morning fixing SR 544 in Whatcom County, trying to get it back open by afternoon.

WSDOT North @wsdot_north
Replying to @wsdot_north
Here's a look at the work happening on SR 544, milepost 7 near Everson. Crews are working on repairs and have the highway closed at this time.

9:07 AM · Jun 28, 2021

444 Reply Copy link

WSDOT Traffic
@wsdot_traffic · **Follow**

Replying to @wsdot_traffic
Heat = expansion. Here's a look at a concrete panel that popped up on NB I-5 at I-405 in Tukwila. Crews are removing the damaged panel and filling it back in. No estimated time for getting these lanes and ramp back open. Fortunately, not much of a backup at the moment.

5:52 PM · Jun 27, 2021

120 Reply Copy link

Read 7 replies

Wildfire & Smoke

Potential impacts to infrastructure:

- Disruption of transportation, communications, power services, and water supply
- Destruction to homes and structures and critical infrastructure

- From 2014-2019, WA spent $150 million annually fighting wildfires (only 9% of this went to suppression)

- More than 1,100 homes have been destroyed by wildfire this decade

Climate impacts to infrastructure will depend on . . .

- ***The magnitude of the changes (dependent on our ability to curb greenhouse gas emissions)***

- ***Management flexibility (including the design and siting decisions we make)***

Tools & Resources

Climate Mapping for a Resilient Washington

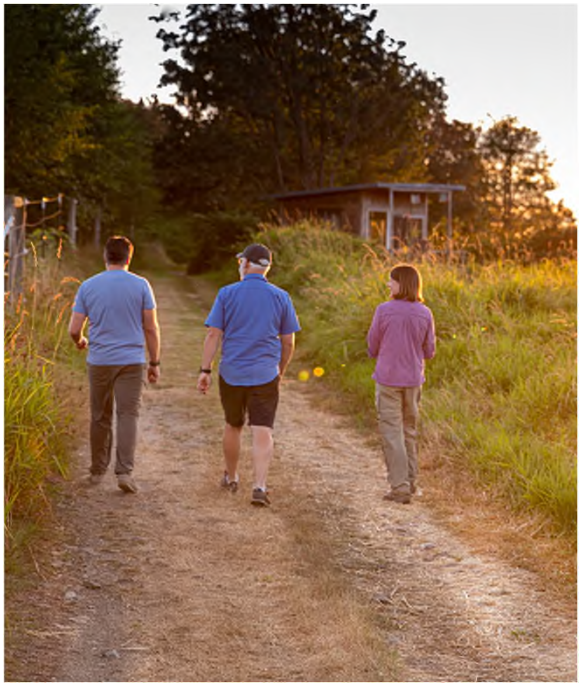
- This web application is a curation of existing data sources for projected changes in the climate and related hazards in Washington state.

Heavy Precipitation Projections for use in Stormwater Planning

- The purpose of this tool is to visualize projected changes in heavy rainfall events across the Pacific Northwest.

Climate Robust Culvert Design

- This culvert design tool aims to help engineers, managers, regulators and other interested parties explore the impacts of climate change on culvert design and fish passage.



Thank you!

Carlie Stowe, Climate Resilience Specialist | stowec@uw.edu

Scenarios, References, & Data Requests

Climate Scenarios

- All summaries of climate projections show changes for a high scenario of greenhouse gas scenario, RCP 8.5, a scenario for which greenhouse gas emissions continue to rise throughout the 21st century. A single scenario is shown in these summaries for simplicity. Results for lower scenarios show lower magnitudes of change, primarily after 2050 when future projections begin to diverge due to different greenhouse gas scenarios. Best practice when using climate projections is to view multiple scenarios and consider whether differences among the scenarios would affect the decision being made. Data for additional scenarios is available upon request.

  With the release of the Fifth National Climate Assessment, updated projections of future temperature and precipitation are available for the United States. These updated projections are based on new scenarios of greenhouse gases and are shown in the annual temperature and precipitation projections for the 21st century. More information on these projections is available from the Fifth National Climate Assessment.

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9. T. Sheehan, D. Bachelet, K. Ferschweiler. 2015 Projected major fire and vegetation changes in the Pacific Northwest of the conterminous United States under selected CMIP5 climate futures, Ecological Modelling, 317, 16-29. https://doi.org/10.1016/j.ecolmodel.2015.08.023
10. Miller, I., Faghin, N., and Fishman, S. 2022. Sea Level Rise and Management Options for Washington's shorelines. A collaboration of Washington Sea Grant and the Washington Department of Ecology. Prepared for theWashington Coastal Resilience Project.
11. https://app.leg.wa.gov/RCW/default.aspx?cite=76.04.505#:~:text=(8)%20Wildfires%20inflict%20huge%20costs,were%20more%20than%20%24172%20million.

Data Requests

For the data used to create these climate summaries, contact the Climate Impacts Group by completing this online data request and we will respond to your request.

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PUBLIC WORKS BOARD
INFRASTRUCTURE IS FUNDAMENTAL

Strategic Goals:

1. Climate Resiliency

PWB's investments are sustainable and designed to withstand changes in climate conditions.

2. Equity

PWB programs serve diverse needs to build a safer, more accessible, and more resilient Washington.

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- FY24 Unscored Question
  - How does the project address environmental impacts due to climate change?
    - Applicants needed more context for what “climate resilience” looks like and why it matters for PWB

- FY25 Unscored Questions
  - What potential climate change impacts did your jurisdiction consider when selecting and designing this project?
  - How does your jurisdiction plan to address or mitigate impacts that climate change may have on this asset?
    - Still assessing this round of questions.

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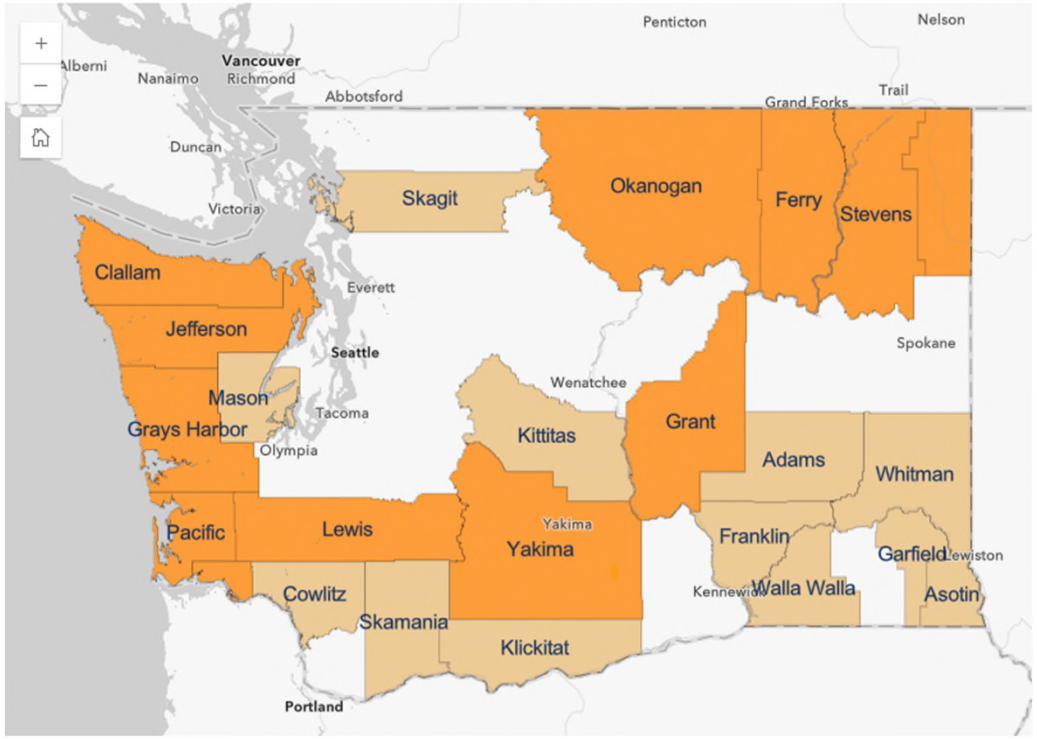
Hardship Policy

- Unemployment at County level
- MHI at County, City, Census Tract, or Place level
- Affordability Index or Debt Service Coverage Ratio

PWB Hardship Status for Counties

- Severely Distressed
- Distressed

PWB Traditional Hardship Status Fiscal Year 2025 Map



Use of Grants

- Up to 25% grants for Distressed with $1,000,000 cap
- Up to 50% grants for Severely Distressed with $2,000,000 cap

Reduced Interest

- 80% of standard interest rate for Distressed
- 50% of standard interest rate for Severely Distressed

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Fiscal Year 2024

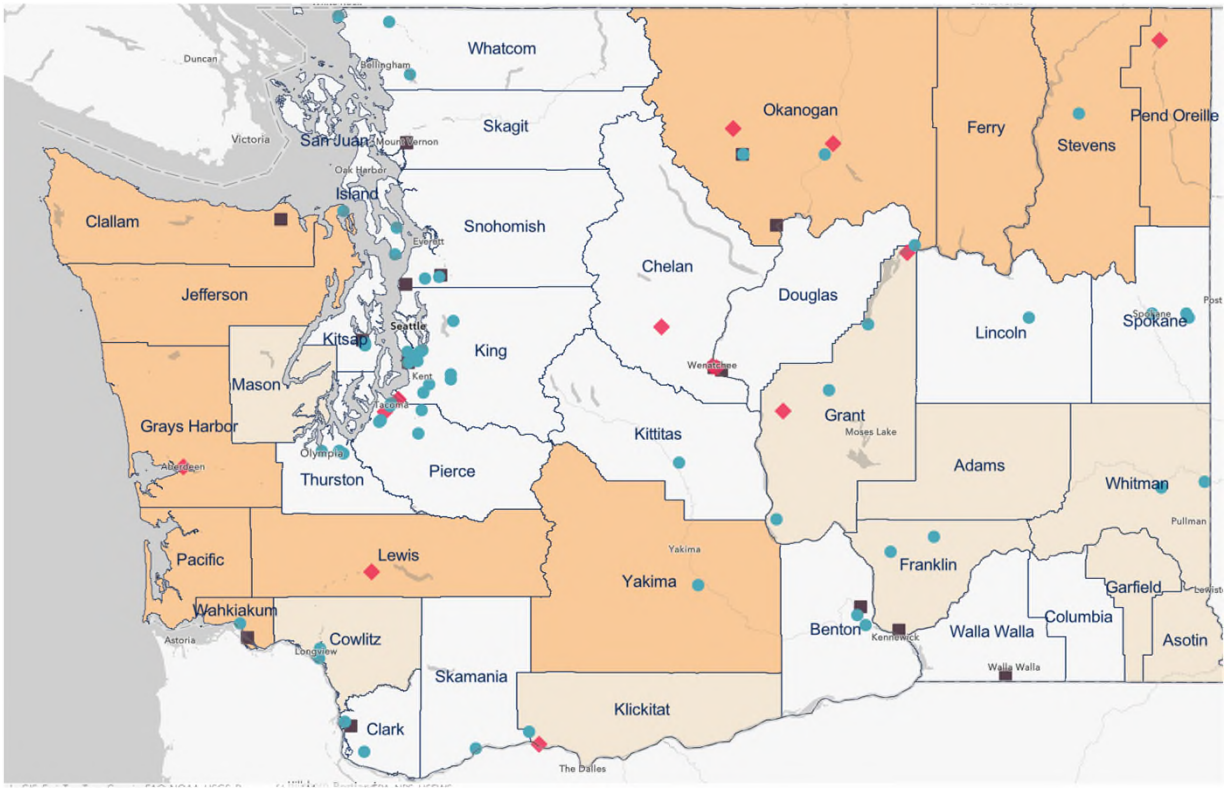
62 Construction

16 Preconstruction

13 Emergency

PWB Hardship Status for Counties

- Severely Distressed
- Distressed
- Non-distressed



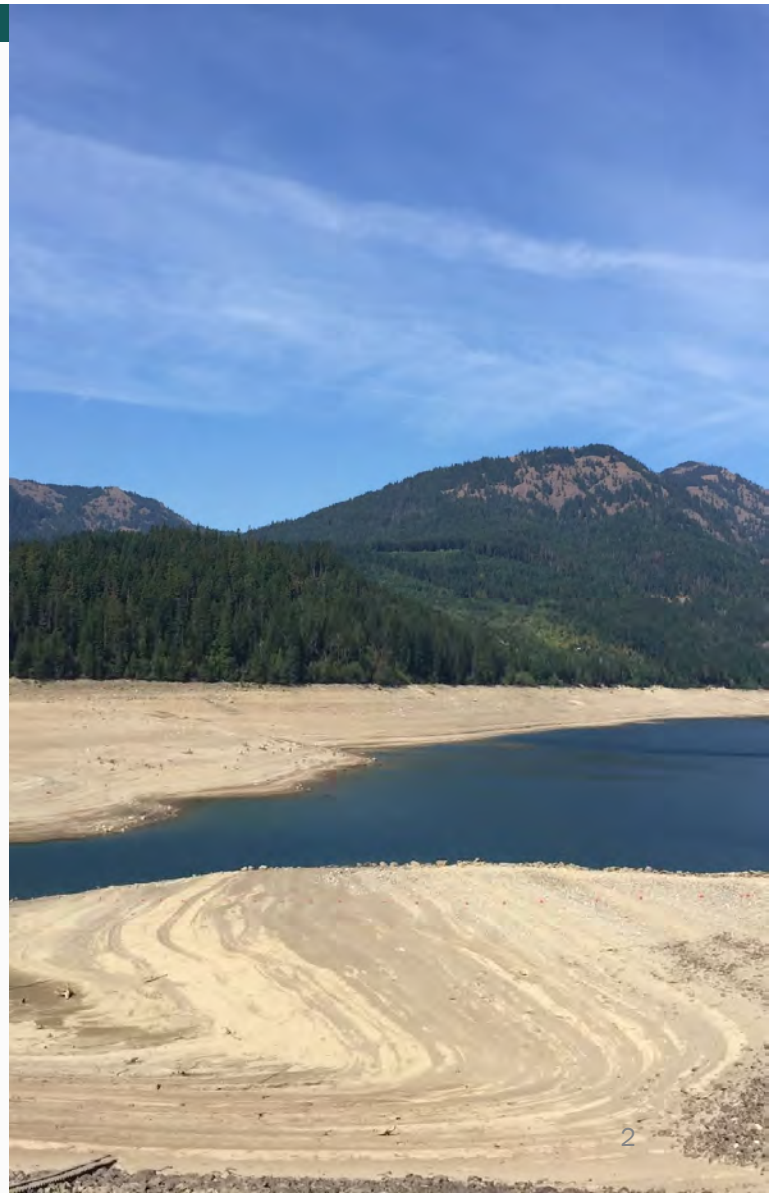
Washington State Climate Resilience Strategy

Jennifer Hennessey, Special Assistant to the Director

October 23, 2024

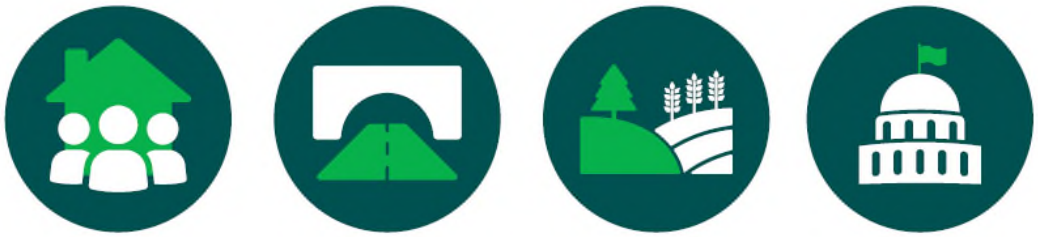
What does the strategy do?

- Outlines 8 strategies to focus agency efforts.
- Identifies clear, specific actions that agencies will take.
- Establishes shared goals for communities, infrastructure, and natural and working lands.



Key climate stressors

Climate strategy goals



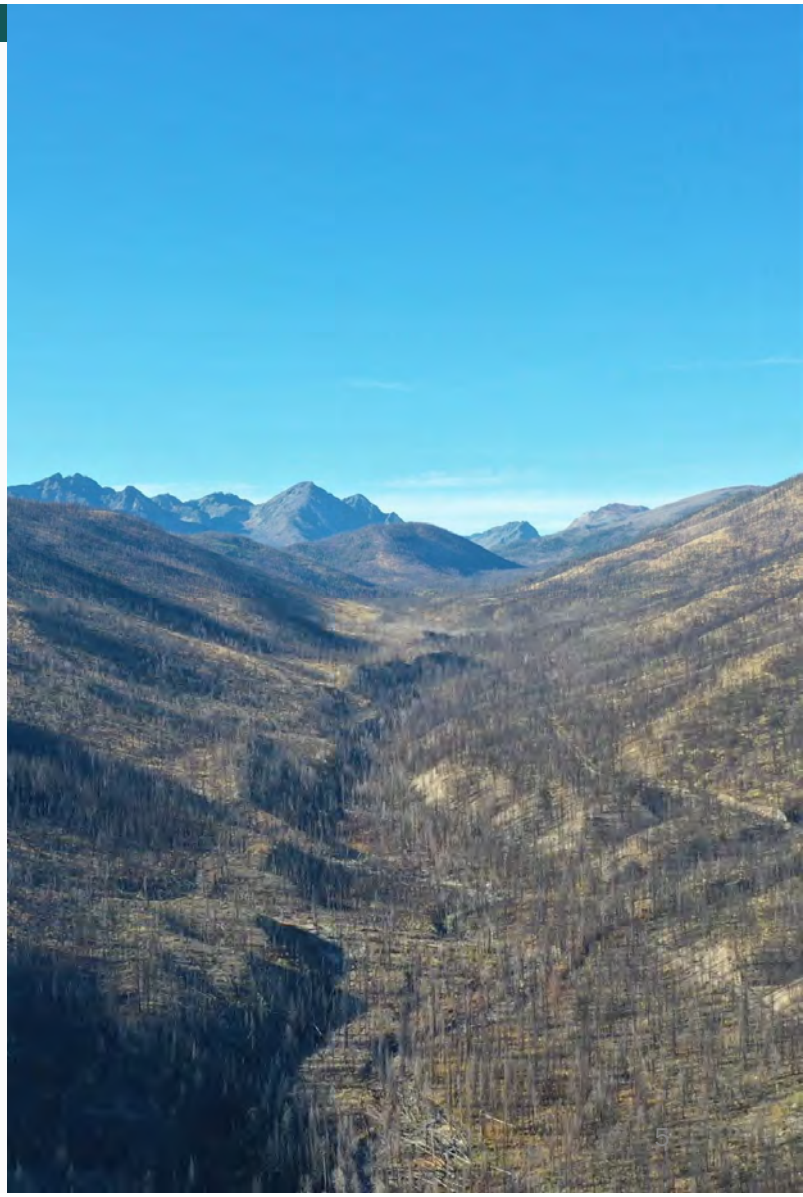
Infrastructure Goal

Advance and modify infrastructure that supports natural systems, considers the needs of vulnerable communities, and provides consistent, safe, and reliable services that withstand disruptions and risks from climate impacts.

Infrastructure actions

- State owned or managed assets
- Climate guidance for state-funded infrastructure*
- Energy security & resilience planning

**Partnership with SYNC agencies and entities.*



Strategy 1

Governance

Actions:

- Interagency coordinating council.
- Outreach and engagement.
- Progress reporting.

Strategy 2

Hazards and emergencies

Actions:

- Respond to extreme heat and smoke.
- Minimize wildfire risk.
- Hazard planning.

Strategy 3

Support Tribes and local gov.

Actions:

- Accelerate nature-based projects.
- Capacity support.
- Data and tools.

Strategy 4

Working lands

Actions:

- Agricultural viability.
- Technical support and data.
- Incentives.

Strategy 5

Reduce pollution

Actions:

- Reduce smoke pollution.
- Improve water quality.

Strategy 6

Water

Actions:

- Implement multi-benefit water plans.
- Improve the efficiency of water use.
- Enhance water data.

Strategy 7

Infrastructure

Actions:

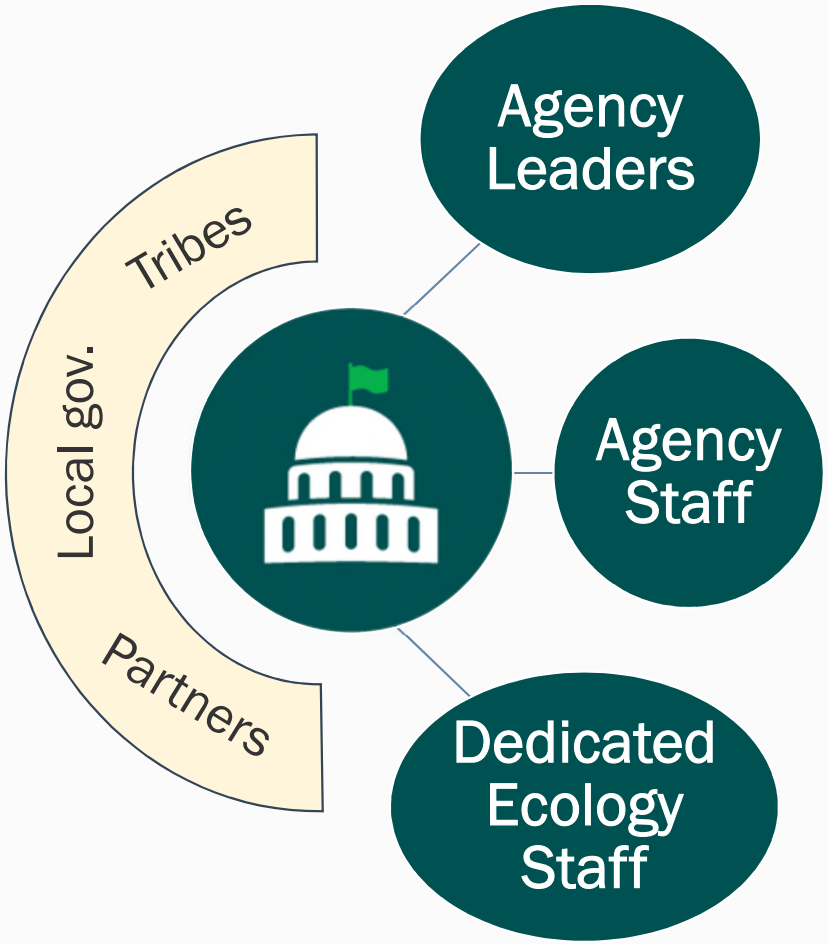
- State-owned assets.
- Energy security and reliability.
- Climate-informed decision making.

Strategy 8

Ecosystems and habitats

Actions:

- Species and habitat management.
- Puget Sound resilience.



Interagency council:

- Direction and guidance
- Emerging needs and priorities

- Action implementation
- Adaptive management
- Interagency collaboration

- Coordination and facilitation
- Outreach and engagement
- Monitoring and progress reporting
- Communication

Funding options

- State infrastructure grant programs
- Planning grants
- Other capital grant programs

Resource:

FundHub.WA.gov

What's next?

- Outreach and engagement with partners.
- Coordination with agencies on actions and metrics.
- Request legislation and decision packages.

Thank you

Read the strategy:

ecy.wa.gov/climate-strategy

Thank you!

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WA Climate Resilience Strategy

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