

Potential Effects of Climate Change on Small Central Washington Streams

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Upper Columbia Science Seminar

Leavenworth, WA

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Powering our way of life.



• Photo: Spokesman Review



HOME | ESSENTIAL CLIMATE VARIABLES (ECV) | GEOSPATIAL INFORMATION | DRIVERS | PRESSURES | STATES | IMPACTS | RESPONSES

CO₂: Atmospheric Concentration
↑ 420.99 parts per million

CO₂: Concentration Increase (12 Months)
↑ 1.85 parts per million

Yearly Global Temperature Anomaly
↑ 0.85 °C

Monthly Global Temperature Anomaly
↑ 0.88 °C

Arctic Sea Ice Extent (Daily)
↓ 0.87 million km²

Global Mean Sea Level Change (Three-monthly)
↑ 69.27 millimeters since 1992

Change in Glacier Mass (Yearly)
↓ 0.77 m w.e.

IPCC Sixth Assessment Report
Impacts, Adaptation and Vulnerability

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ipcc



Climate Change 2022: Impacts, Adaptation and Vulnerability

The Working Group II contribution to the IPCC Sixth Assessment Report assesses the impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels. It also reviews vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change.

Summary for Policymakers

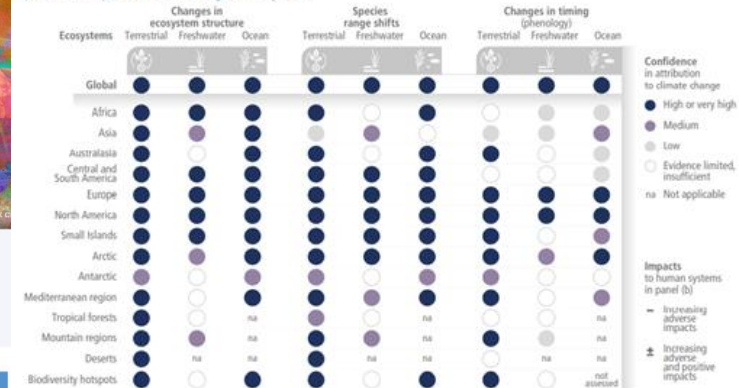
Technical Summary

Full Report

Summary for Policymakers

Impacts of climate change are observed in many ecosystems and human systems worldwide

(a) Observed impacts of climate change on ecosystems



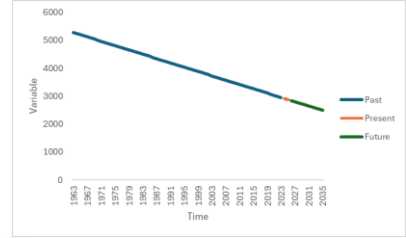
Projections for Snow Dominated Systems in Northern Latitudes

- Increased summer air temperatures
- Transition from snow to rain during winter
- Earlier and more variable winter/spring runoff
- Longer, hotter, lower summer stream discharge

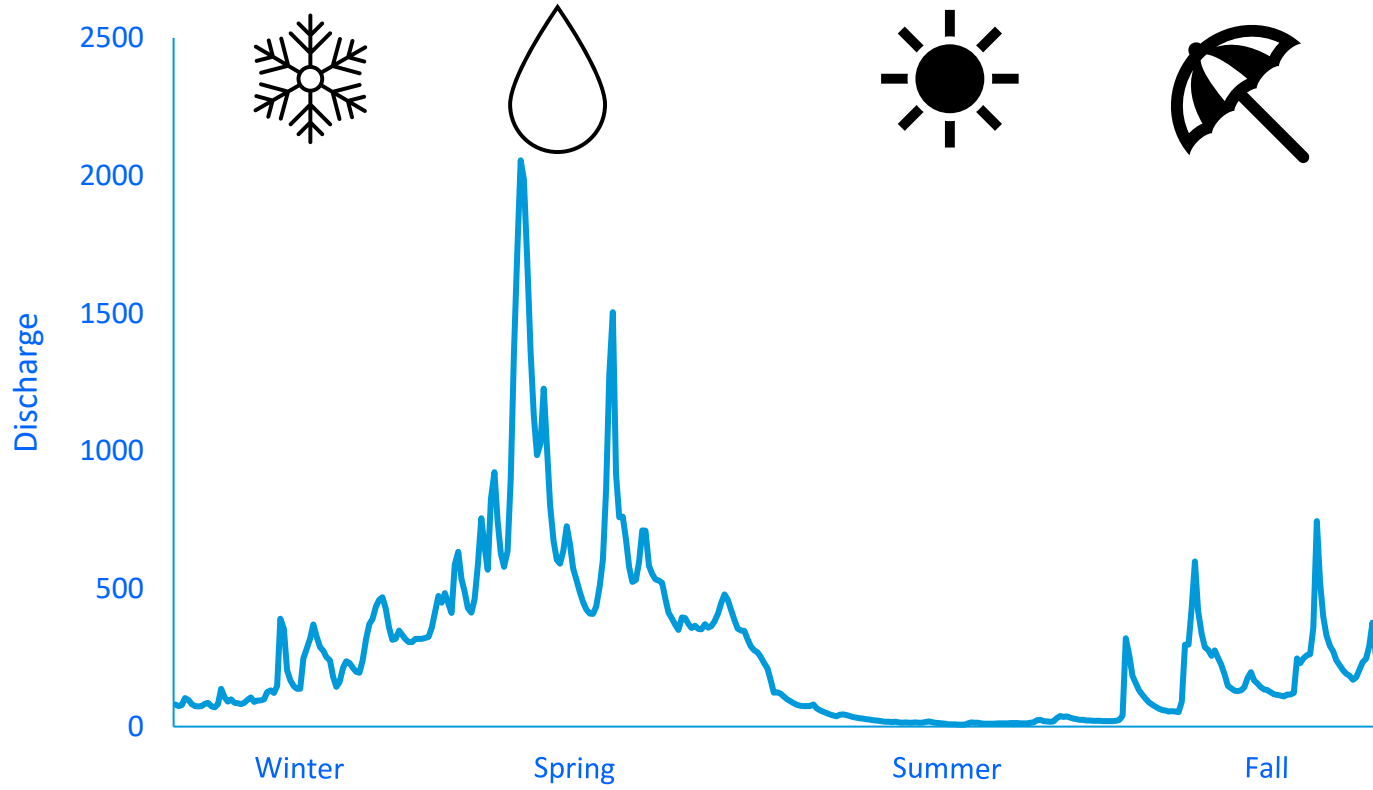


Trends in indicator variables

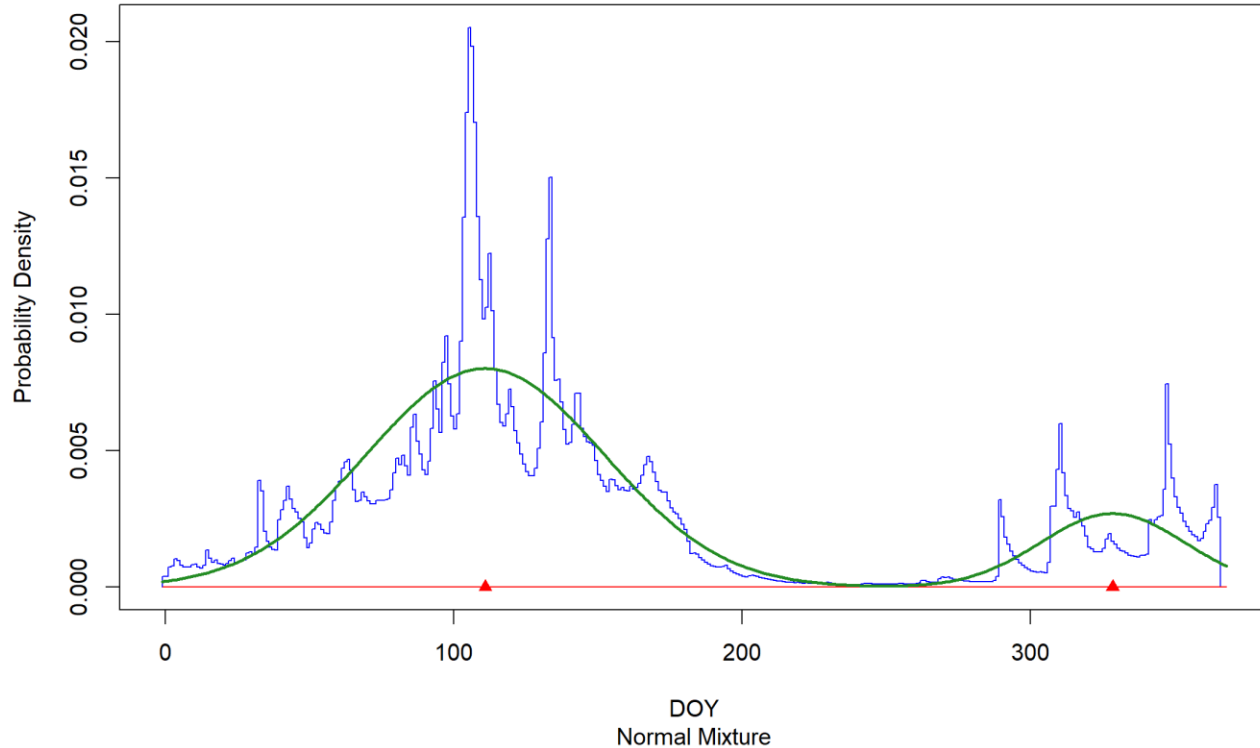
- Moisture in snowpack
- Timing of spring runoff
- Timing of fall runoff
- Duration of summer baseflows
- Summer stream discharge levels
- Summer water temperatures



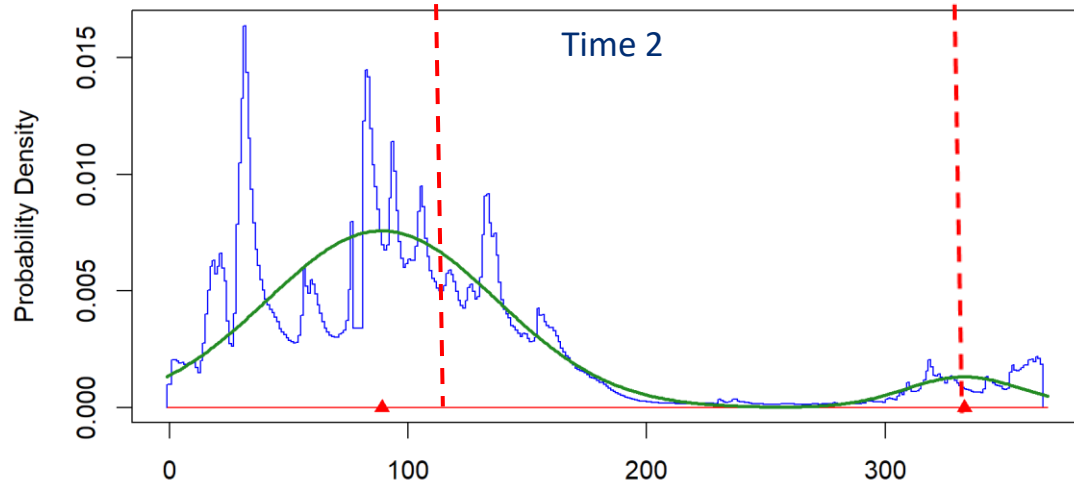
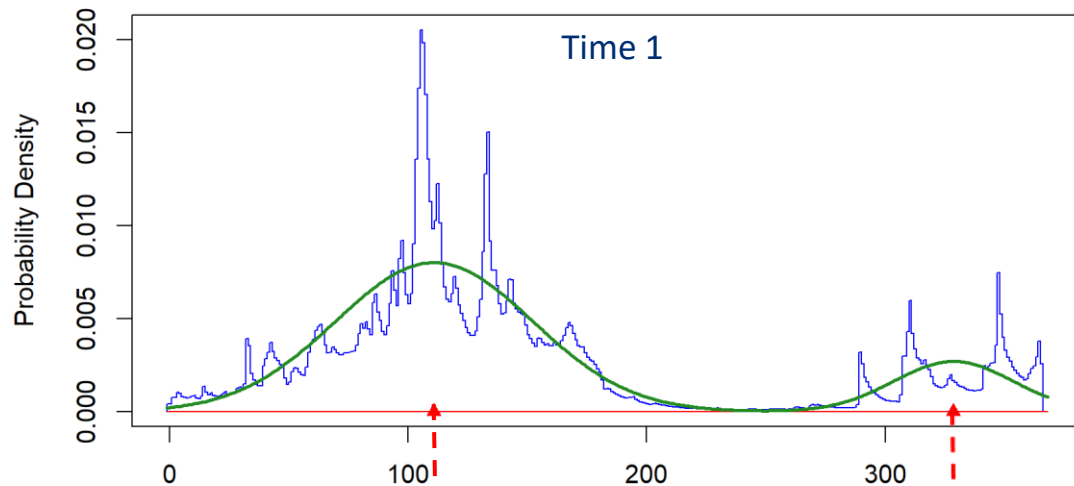
Typical snow dominated hydrograph



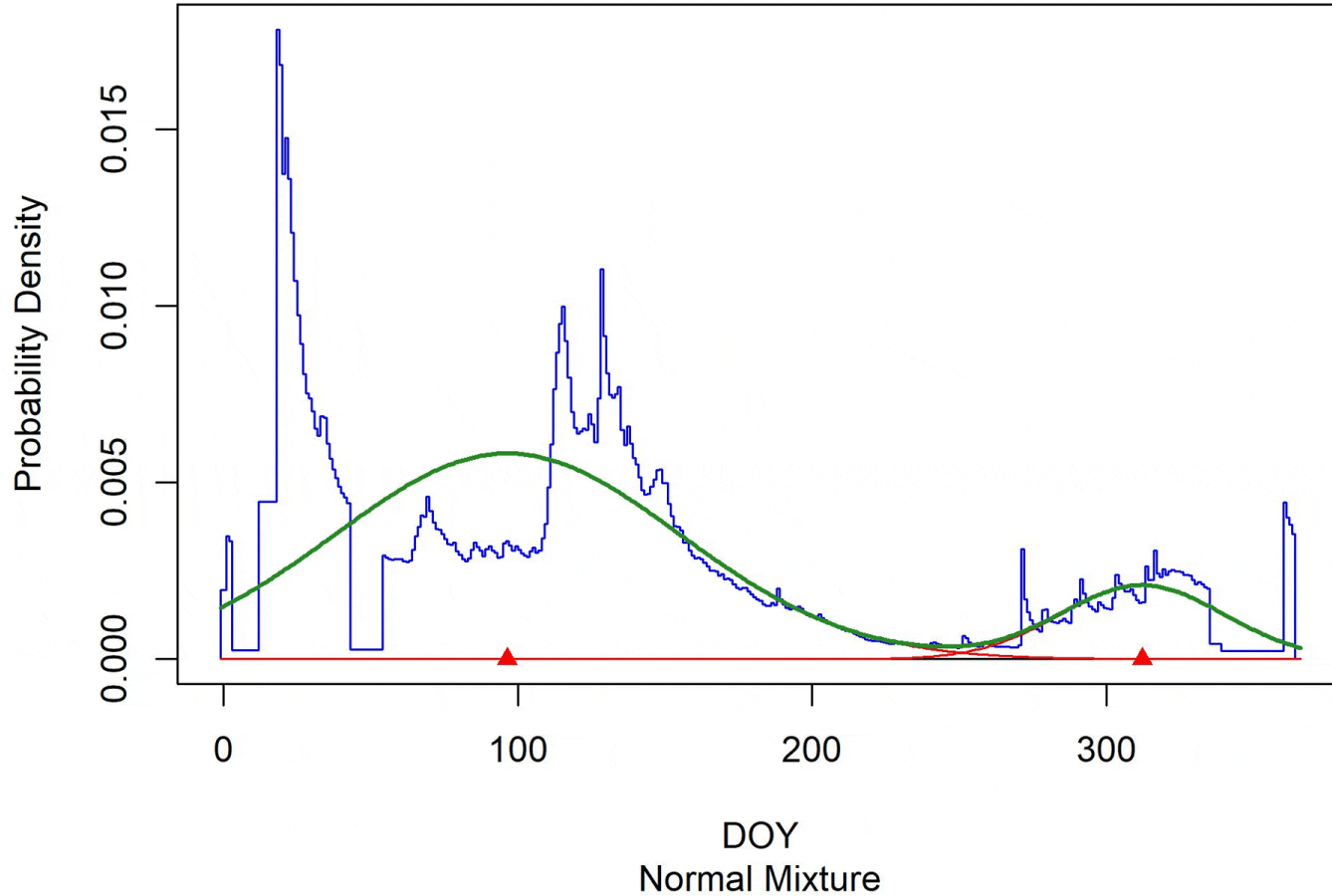
Timing of annual discharge events



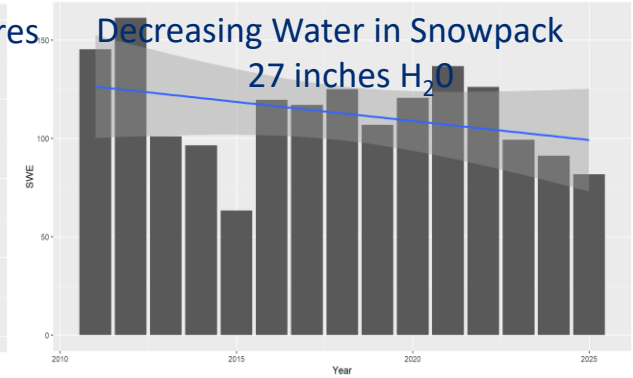
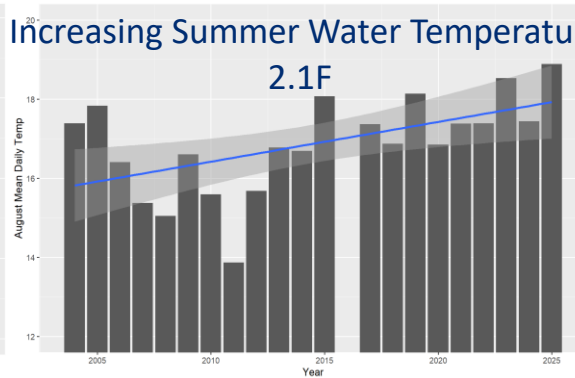
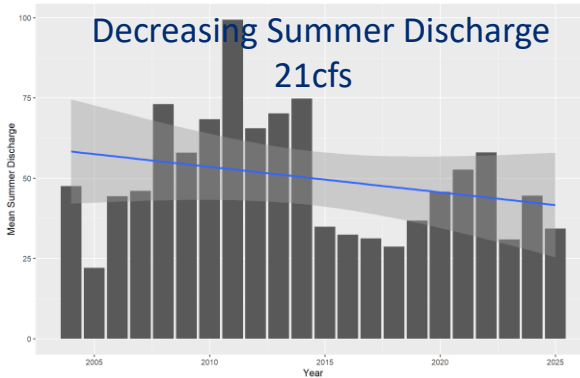
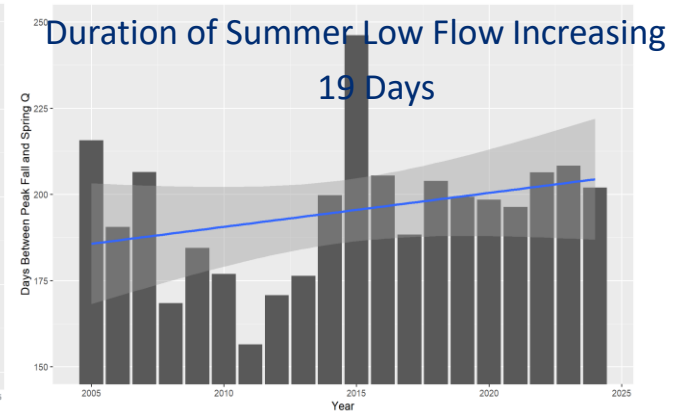
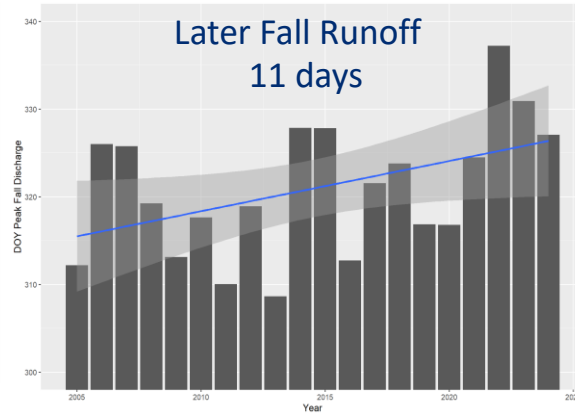
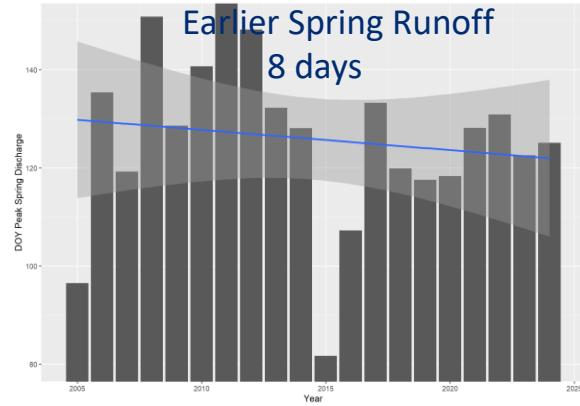
Compare trends in the timing of seasonal runoff patterns across years



Case Study: Nason Creek (2005-2025)

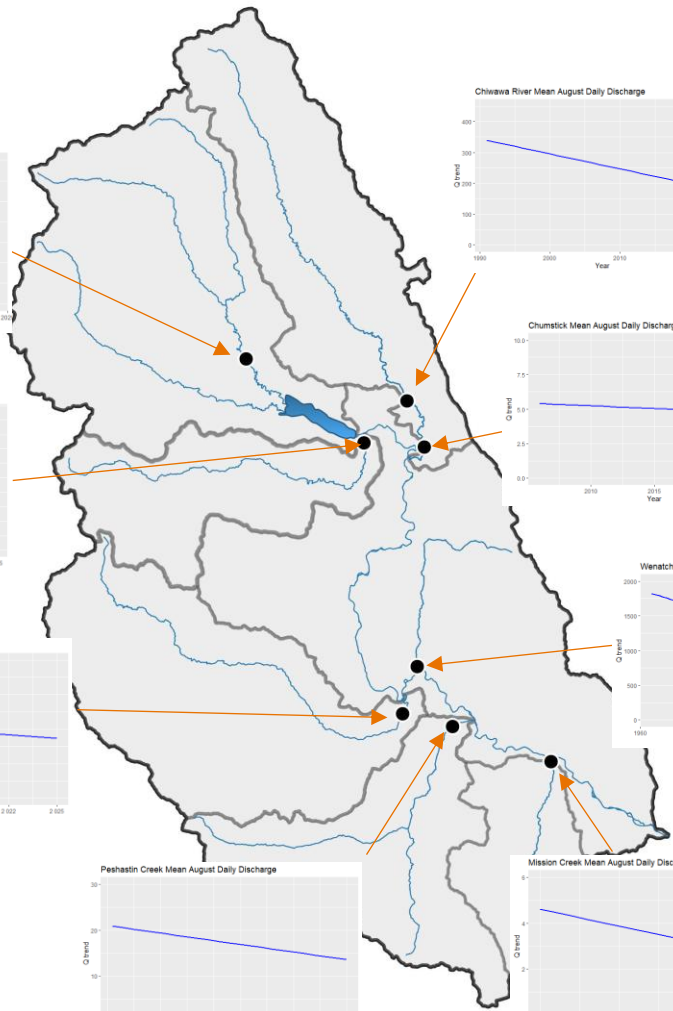
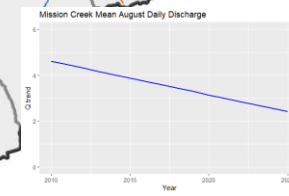
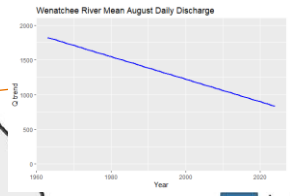
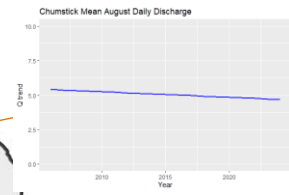
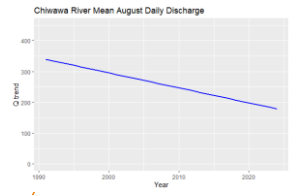
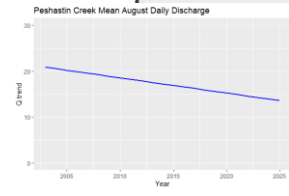
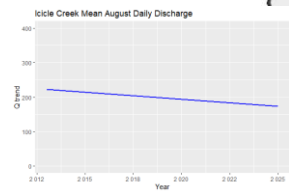
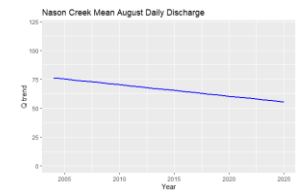
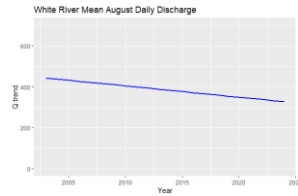


Nason Creek - results

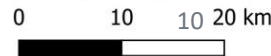


Basin-wide trends in mean August discharge

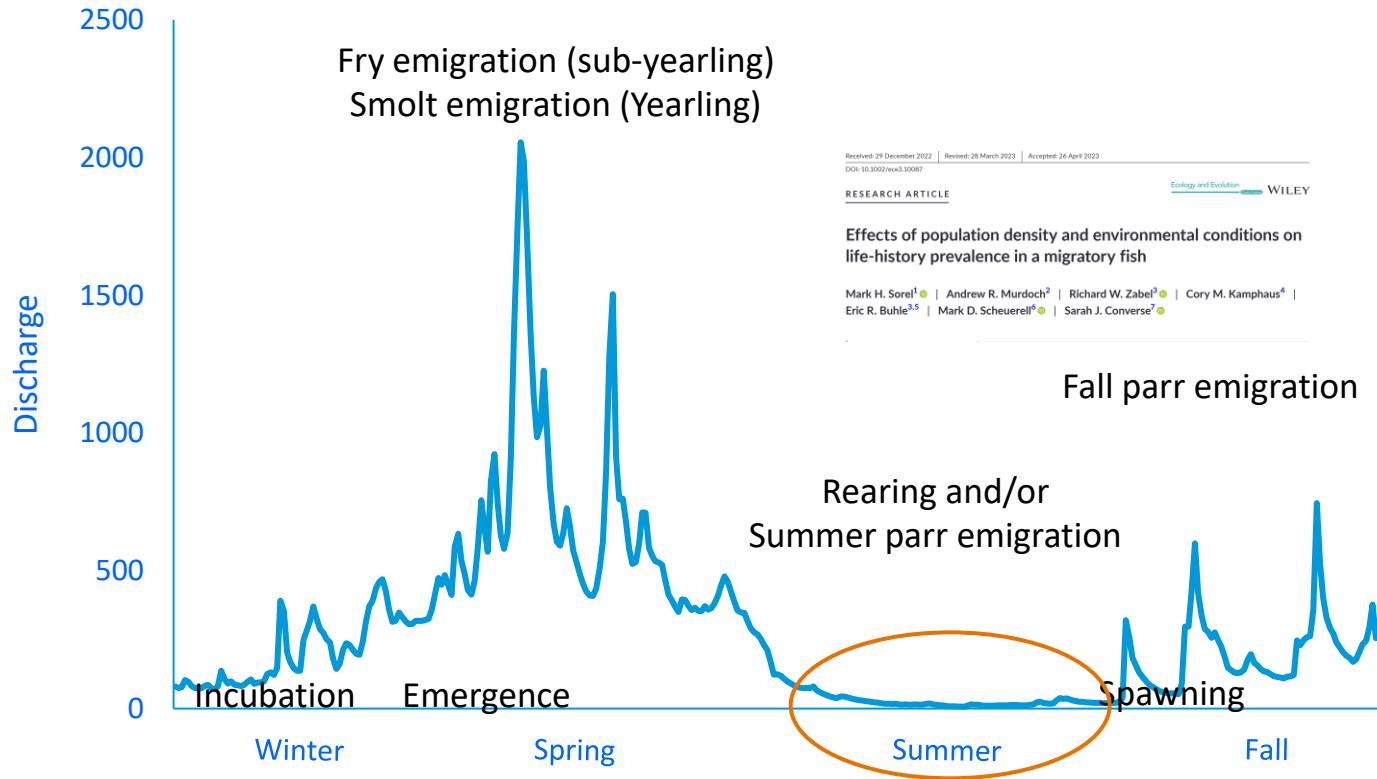
Stream	Slope
Chiwawa River	-4.86
Chumstick Creek	-0.05
White River	-3.40
Nason Creek	-1.00
Icicle Creek	-4.04
Peshastin Creek	-0.33
Mission Creek	-0.15
Wenatchee River	-16.23



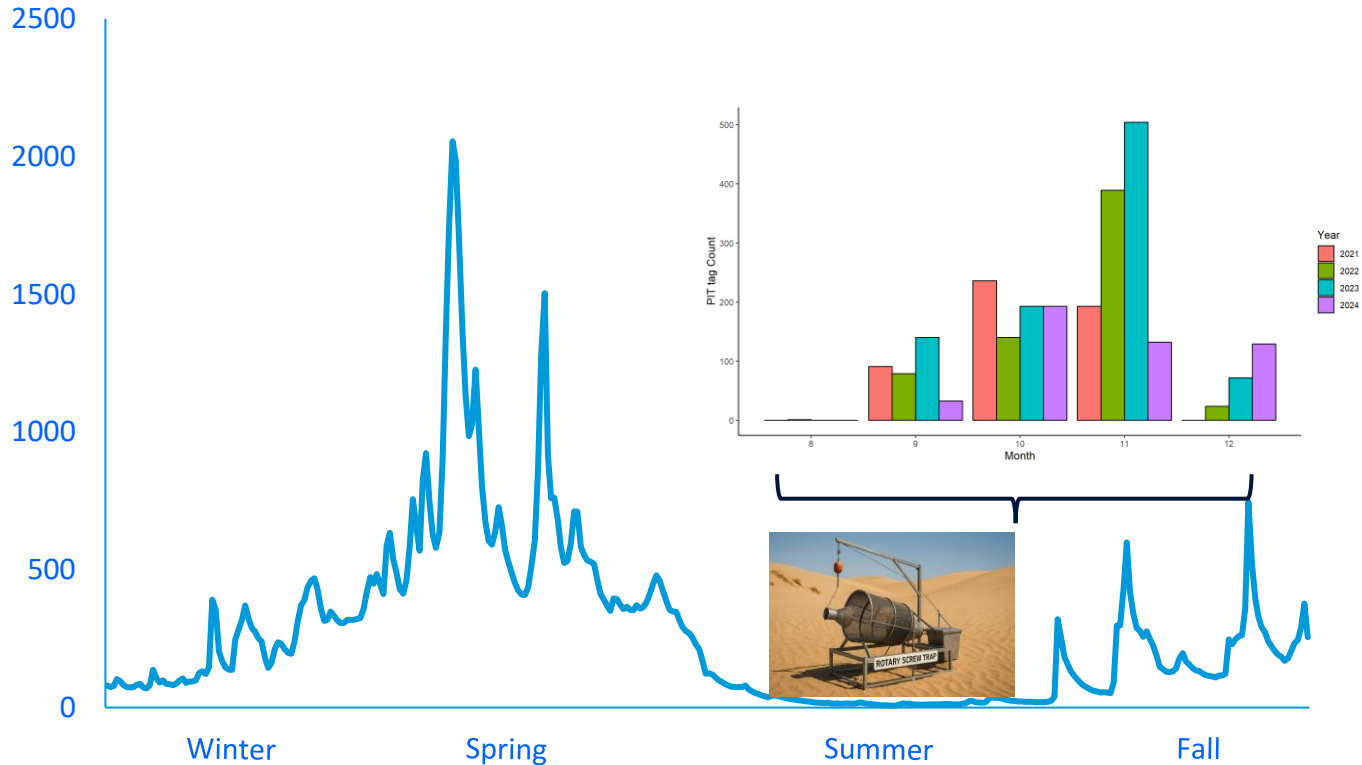
- Lake Wenatchee
- Gauging Station
- Stream
- Watershed



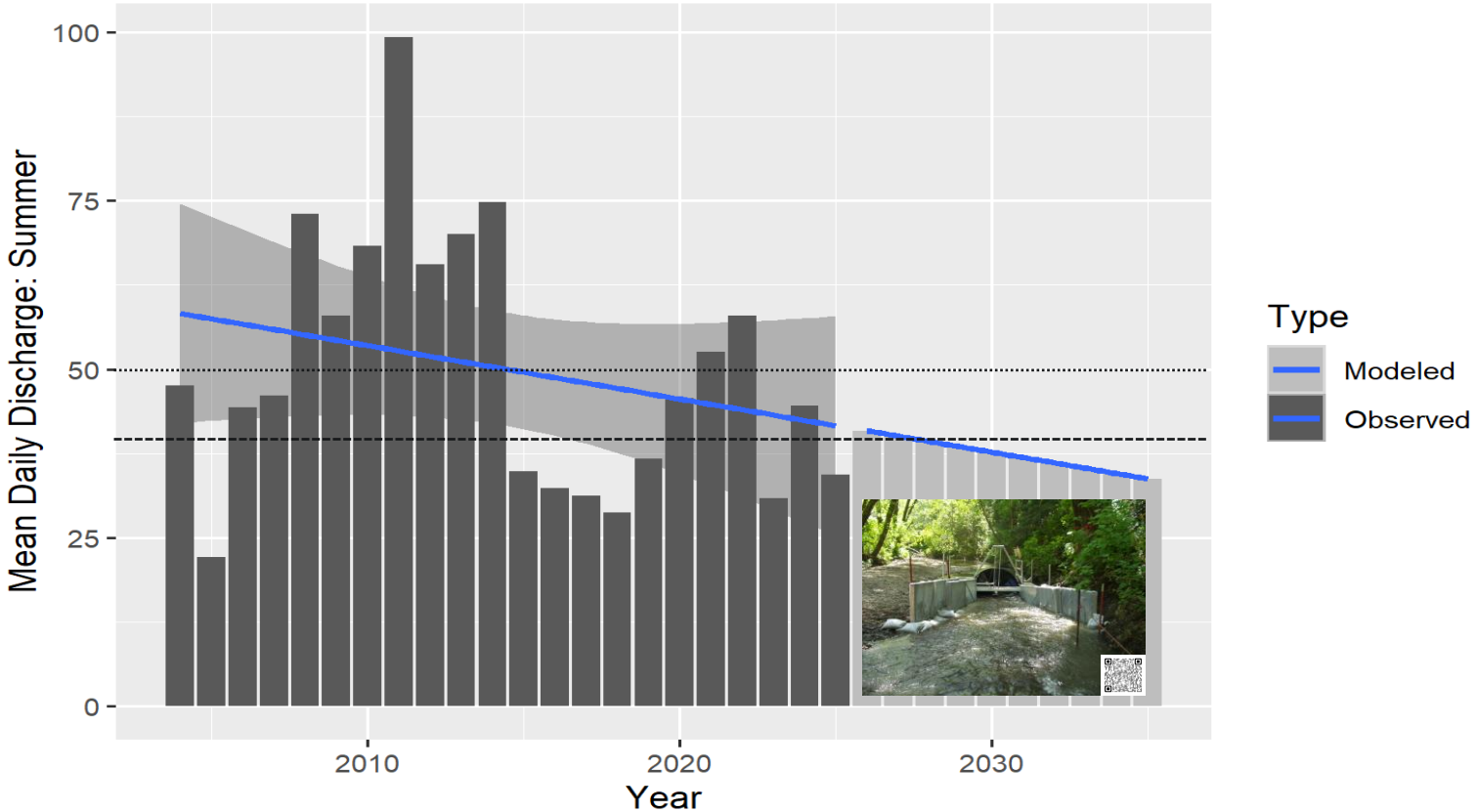
Spring Chinook life stage interactions with the hydrograph



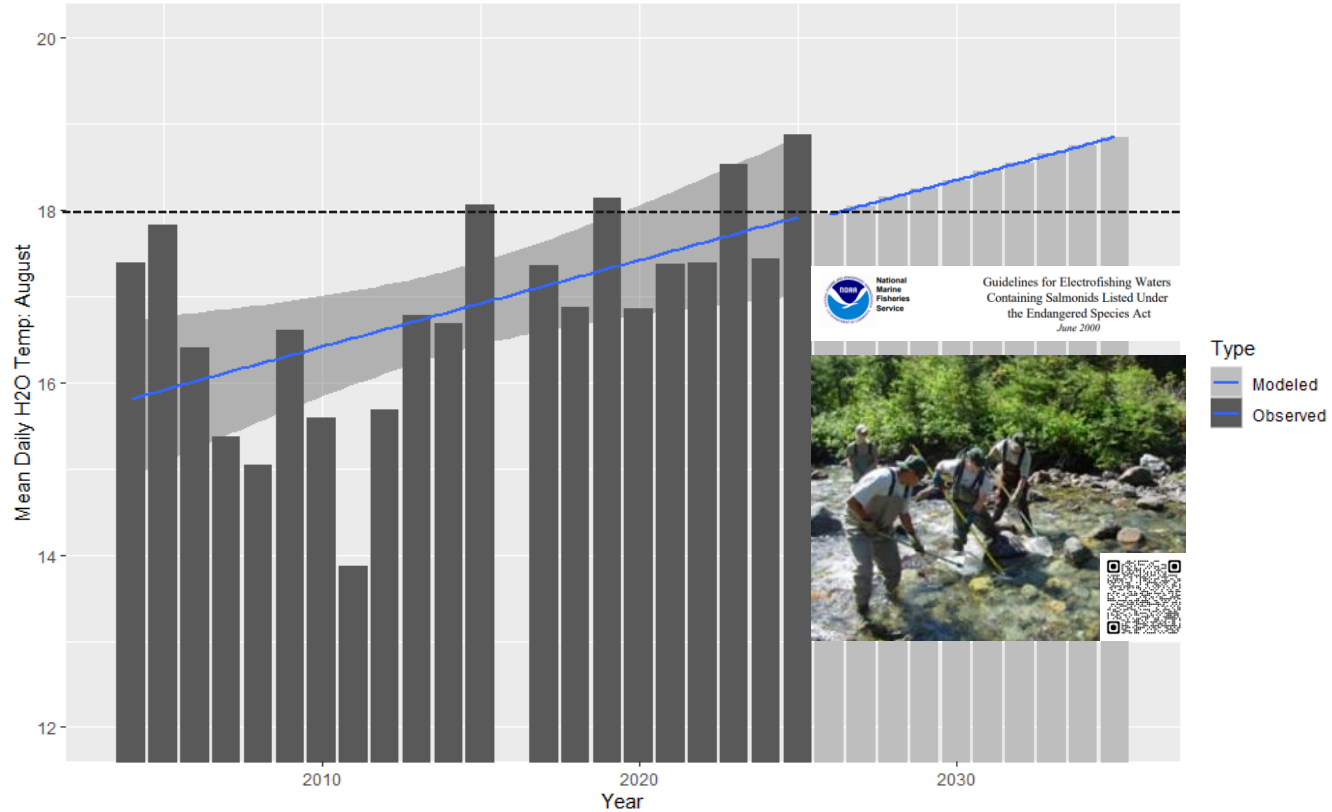
Chinook Salmon summer/fall emigration



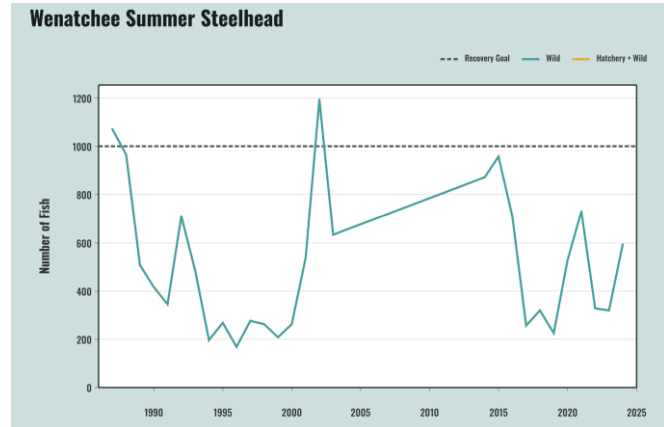
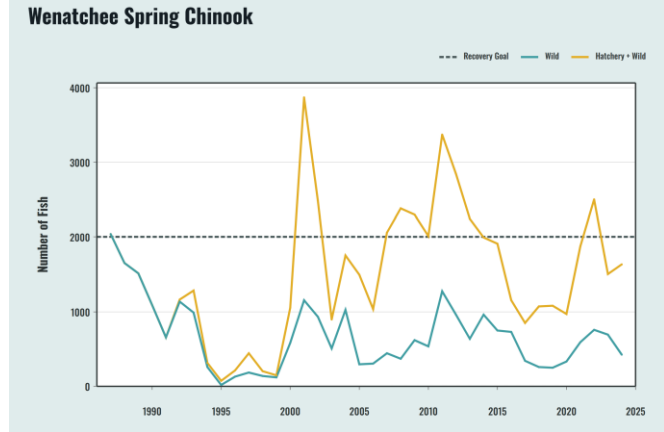
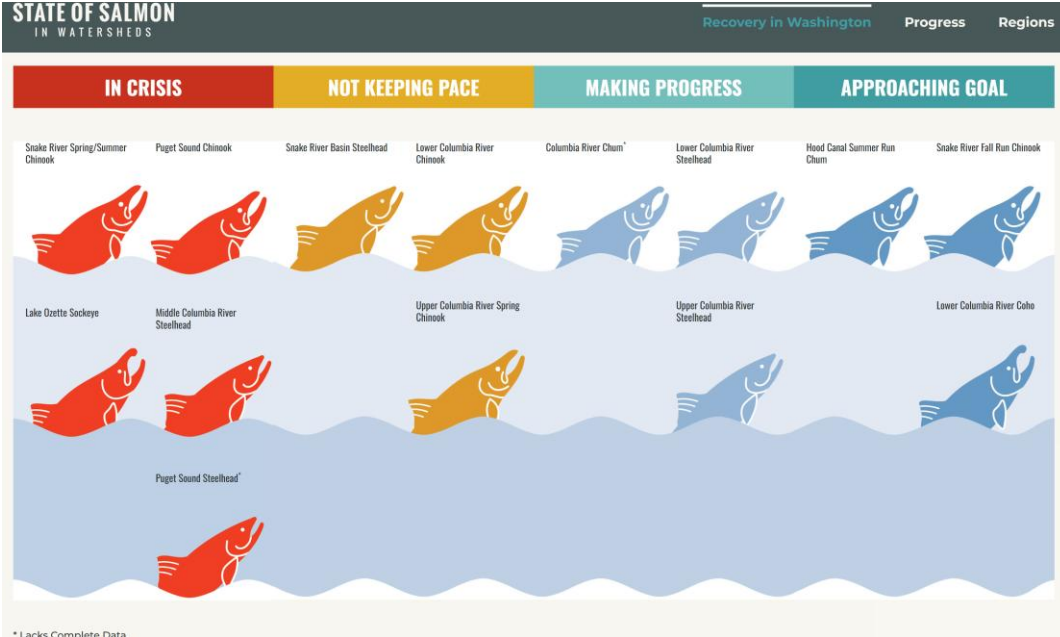
Flow dependent sampling



Temperature constraints on sampling



State of the salmon



Summary

- Spring runoff trending earlier in central Washington streams
- Fall rains occurring later each year leading to later fall runoff
- Summer baseflow conditions becoming longer each year
- Mean August discharge is generally decreasing
- Simple linear models suggest longer, lower, and warmer, baseflow stream conditions likely throughout the region (consistent with IPCC predictions)
- Climate change is likely to impact both fish and fisheries practitioners
- Common fish sampling methods will likely be impacted by the shifting hydrograph and increased temperatures
- Start thinking now about creative solutions for climate related sampling challenges ahead