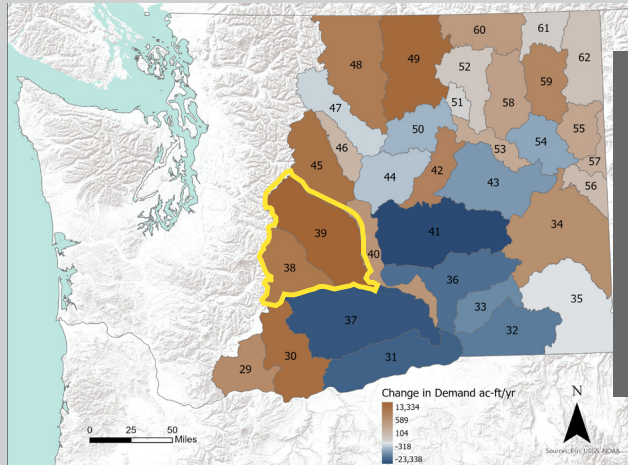


KEY FINDING 4

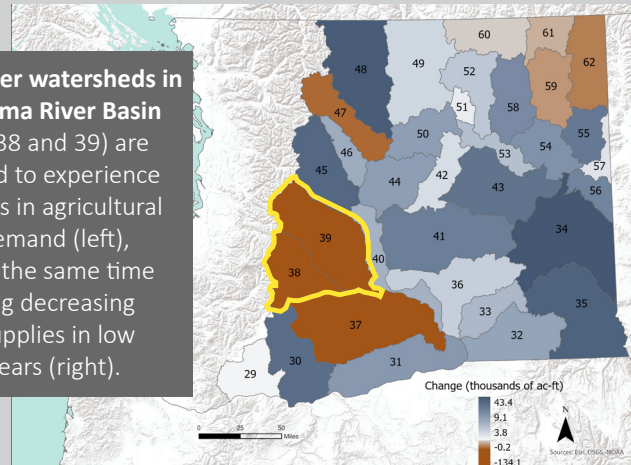
Local increases in out-of-stream demands are expected, converging with local decreases in water supply, such as in the Yakima River Basin.

CHANGES IN AGRICULTURAL DEMAND

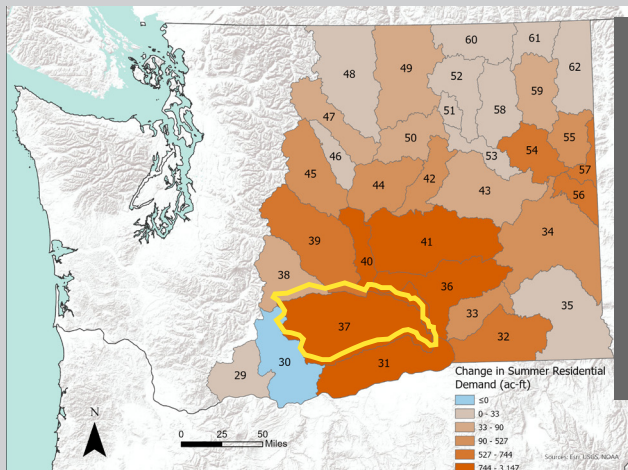


The upper watersheds in the Yakima River Basin (WRIs 38 and 39) are expected to experience increases in agricultural water demand (left), while at the same time expecting decreasing water supplies in low supply years (right).

CHANGES IN LOW FLOW YEAR SUPPLY

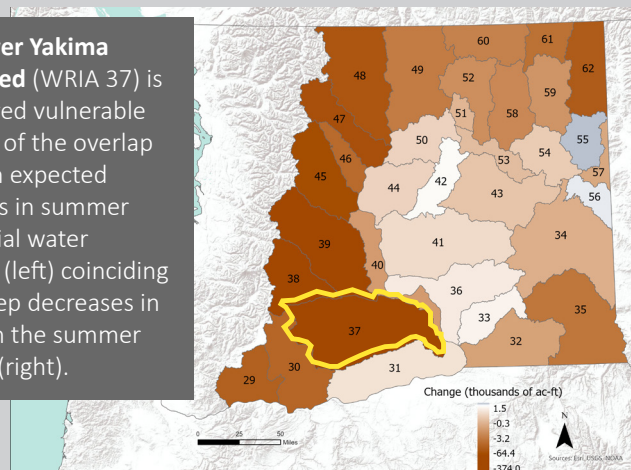


CHANGES IN SUMMER RESIDENTIAL CONSUMPTIVE USE



The Lower Yakima watershed (WRIA 37) is considered vulnerable because of the overlap between expected increases in summer residential water demand (left) coinciding with steep decreases in supply in the summer months (right).

CHANGES IN SUMMER WATER SUPPLY



Expected change in agricultural water demand (top left), annual surface water supply during low flow years (top right), residential consumptive use during the summer months (June, July, August; bottom left), and summer surface water supply (bottom right) between the historical (generally 1986-2015; 2020 for residential consumptive use) and forecast (2040) time periods, by WRIA.

CONCLUSION

Changes in water supplies and demands across eastern Washington by 2040s are expected to be characterized by:

KEY FINDING 1

Earlier surface water supplies

KEY FINDING 2

Possible increases in out-of-stream and instream demands

KEY FINDING 3

Declining groundwater levels

KEY FINDING 4

Unique combinations of changes in supplies and demands in each watershed

The unique convergence of water supply and demand changes in each watershed define the vulnerabilities that will become more prominent in the future. These vulnerabilities will express themselves in increased frequency of deficits in the summer and in low flow years. We need to understand the nature of these expected changes in each watershed to help Washingtonians prepare for the future, and develop strategies to adapt and modernize water delivery infrastructure to address these vulnerabilities.

NEXT STEPS

While this Forecast continues to inform OCR's water development decisions, we look forward to improving our understanding through future Forecasts. Declining groundwater trends point to the need to better integrate surface-groundwater interactions. We are also exploring approaches that can more directly leverage the power of our integrated modeling platform to inform a range of water management and policy decisions, helping Washingtonians evaluate how best to achieve their visions for a future that is resilient to a changing climate.

COLUMBIA RIVER BASIN

2021 LONG-TERM WATER SUPPLY & DEMAND FORECAST

Water supply delivery systems in the Columbia River Basin were built to reliably deliver water under 20th century conditions. As the climate changes, regional population grows, and agriculture responds to these and other changes, the timing and quantity of water supplies and demands are shifting.

The 2021 Forecast provides a system-wide, quantitative assessment of how future environmental and economic conditions and human responses are likely to influence water supplies and demands over the next 20 years. This Forecast tells the story of eastern Washington's water future.

In collaboration with the Washington Department of Ecology's Office of Columbia River, Washington State University and its partners applied a range of methods to quantify expected changes in water supplies and demands by 2040. We used integrated hydrological, crop production, and river operations computer models to evaluate expected changes in surface water supply and agricultural water demand, given a range of possible climate change, crop production, and water capacity futures. We estimated expected changes in residential water demand based on population growth projections and explored potential changes in hydropower production to meet projected electricity needs. We also evaluated trends in groundwater levels in different aquifer layers across eastern Washington.

This 2021 Forecast provides a greater understanding of when and where eastern Washington State will face future vulnerabilities, providing decision makers and water managers with the information they need to address future water supply and water management challenges, including investments in water supply projects that support the future needs of Washington's water users. Such planning and investments are key elements of eastern Washingtonian's efforts to enhance the resilience of the Columbia River system and of our communities.

The Forecast Legislative Report is available at: <https://apps.ecology.wa.gov/publications/SummaryPages/2112006.html>

THE OFFICE OF COLUMBIA RIVER



Water for Families, Farms, and Fish

VISION

Preserve and enhance the standard of living for the people of Washington by strengthening the state's economy, and restoring and protecting the Columbia Basin's unique natural environment.

MISSION

Aggressively pursue development of water supplies to benefit both instream and out-of-stream uses.

AUTHORIZING STATUTE

RCW 90.90.040(1) To support the development of new water supplies in the Columbia river and to protect instream flow, the department of ecology shall work with all interested parties, including interested county legislative authorities and watershed planning groups in the Columbia river basin, and affected tribal governments, to develop a long-term water supply and demand forecast by November 15, 2006, and shall update the report every five years thereafter.

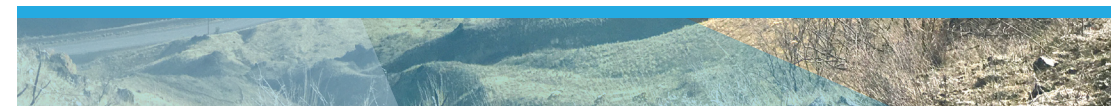
OFFICE OF COLUMBIA RIVER

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Phone: 509-545-4241

ADA ACCOMODATIONS

To request an ADA accommodation, contact Ecology by phone at 509-454-4241 or email at Jennifer.stephens@ecy.wa.gov, or visit <https://ecology.wa.gov/accessibility>. For Relay Service or TTY call 711 or 877-833-6341.

Publication No. 21-12-012
August 2022



Expected Changes that Affect Water Supplies and Demands

CLIMATE CHANGE

By the 2040s, Washington can expect:

- Higher temperatures
- Wetter, warmer winters
- More rain and less snow
- Reduced snowpack, especially at low and mid elevations
- Earlier snowmelt
- Warmer, drier summers, deeper droughts
- Greater heat stress
- More frequent extreme weather events

POPULATION GROWTH

By the 2040s, Washington can expect:

- 17% higher population across the state
- Stable fertility rates and increasing mortality rates (as baby boomers age)
- Over two-thirds of the state's population increase are due to net migration into the state
- 13% higher population across eastern Washington

TRENDS IN AGRICULTURE

By the 2040s, Washington can expect:

- Longer growing season
- Greater rate of accumulation of growing degree days
- Increased photosynthesis in many crops
- Earlier planting dates
- Earlier flowering in tree fruit and specialty crops
- More frequent heat stress events in summer

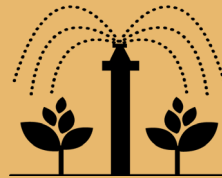
Water Use or Demand Currently Unmet During Drought Years



MAINSTEM
13.4
MILLION AC-FT



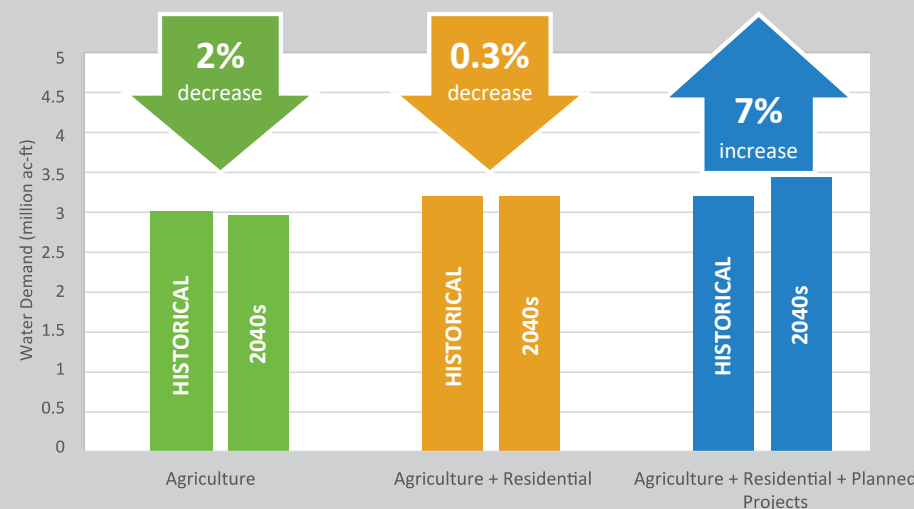
TRIBUTARIES
27-655
THOUSAND AC-FT



**INTERRUPTIBLE
WATER RIGHTS**
13.4
THOUSAND AC-FT

KEY FINDING 2

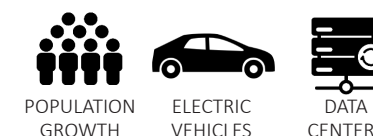
Future changes in population and in agriculture in eastern Washington could lead to increases in instream and out-of-stream demands for water.



Estimated historical (1986-2015) out-of-stream water demands compared to expected demands by 2040 in the Washington portion of the Columbia River Basin. We evaluated changes in agricultural demands (green), both agricultural and residential demands (orange), and agricultural and residential demands accounting for additional water expected to be made available for out-of-stream uses through planned water development projects (blue).

Expected Changes in Other Demands by 2040s

HYDROPOWER
+5-34%



TRIBUTARY LOW FLOWS:
7Q10* changes up to

-15.6 cfs

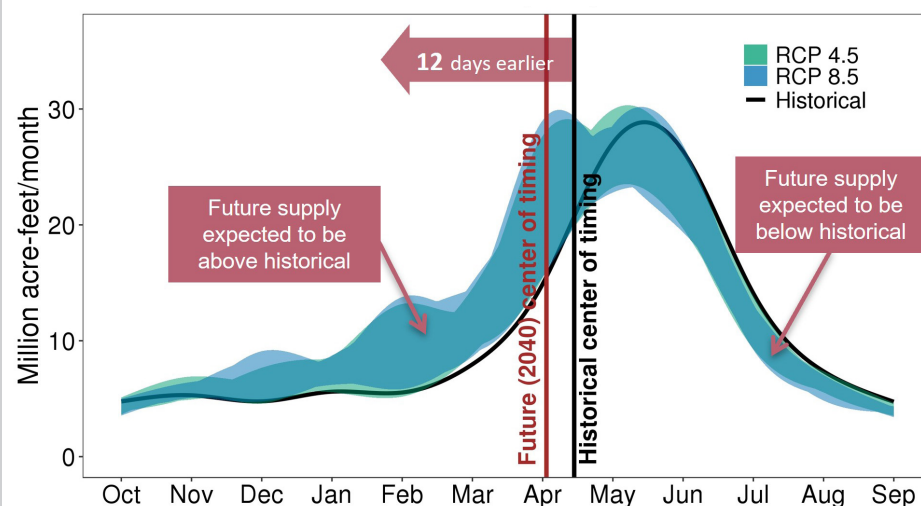


* a common, low-flow metric

KEY FINDING 1

The timing of surface water supplies is shifting earlier in the season, especially in the snowmelt-dominated Cascades watersheds.

Columbia River Basin



LEFT PANEL: Expected change in timing of water supply in the Columbia River Basin. The water supply timing in the historical (1986-2015) and forecast (2040) time periods was calculated using a center of timing approach, and was quantified at Bonneville Dam. Historical supply for a median (50th percentile) supply year is shown in the black line, and the range of possible future (2040) supplies under two different greenhouse gas emissions scenarios are shown in the blue and green, which mostly overlap each other.

Eastern Washington ANNUAL WATER SUPPLY

HISTORICAL (1986-2015) 2040s (2026-2055)



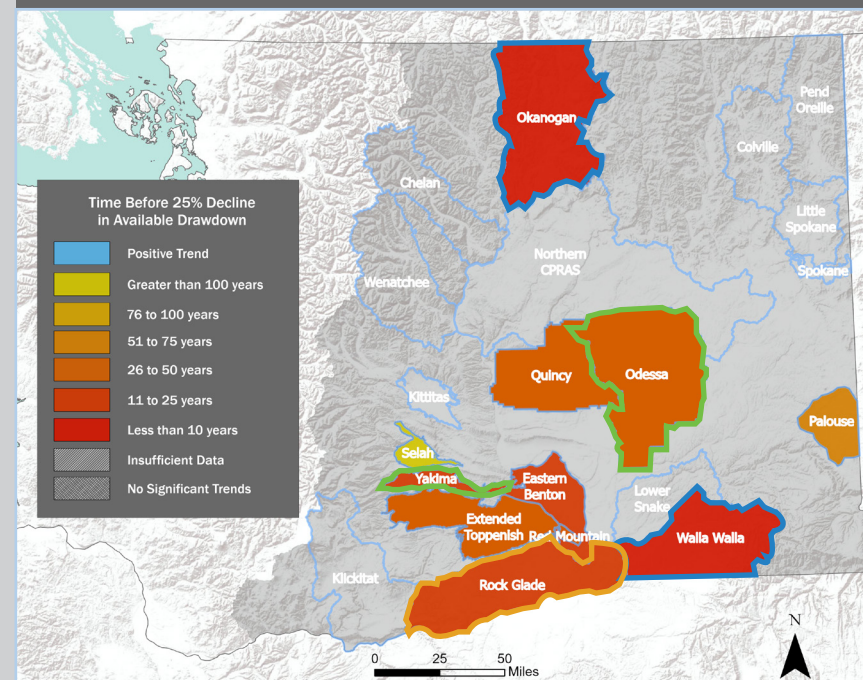
EXPECTED CHANGES BY 2040



KEY FINDING 3

Groundwater levels are declining in most aquifer layers and groundwater subareas across eastern Washington.

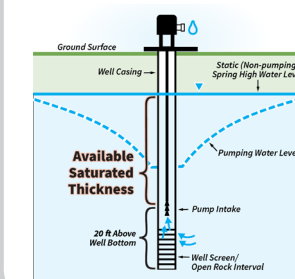
TIME TO AN EXPECTED 25% DECLINE IN AVAILABLE SATURATED THICKNESS IN AT LEAST ONE AQUIFER LAYER



The **Okanogan and Walla Walla subareas** are expected to see significant reductions in available saturated thickness within 10 years, with the Okanogan also experiencing significant increases in agricultural water demand.

The **Rock-Glade subarea** is expected to see decreases in agricultural water demand, but is expected to experience some of the largest increases in residential consumptive water use in some places.

The **Yakima and Odessa subareas** are expected to see reductions in available saturated thickness within 10-50 years, and some of the largest increases in summer residential consumptive use.



For an individual well, available saturated thickness is estimated as the difference between the depth to the spring high water level and the depth to that well's pump intake.