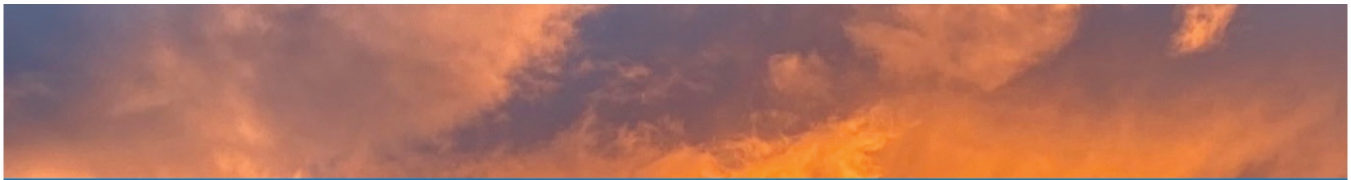


Fact Sheet

February 2021

# Preparing for a resilient Columbia River hydropower system

## Armed with the latest climate change data, BPA is better able to prepare for the operational impacts of environmental changes and provide reliable power to the Pacific Northwest.

BPA and its partners have been studying climate change and carefully monitoring regional environmental changes for over a decade. The agency uses its latest climate change data to help river managers make informed, prudent and scientifically based decisions.

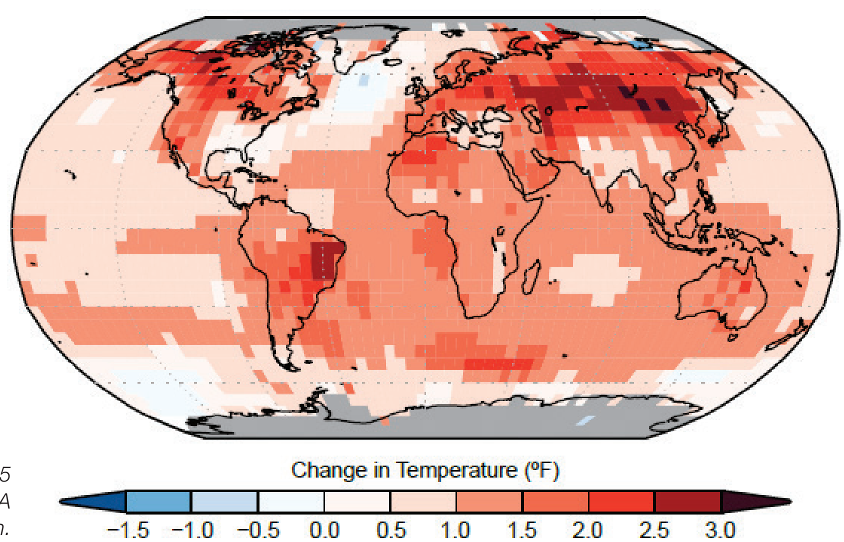
This research, along with recent trends in temperatures and streamflows, is giving BPA a better understanding of the potential range of impacts that climate change may bring to the Columbia River Basin. Using that data, river operators can better plan for and maintain the reliability of the federal Columbia River system as climate change impacts increase over time.

## Summary of research

Regional climate change is already underway. Northwest temperatures have warmed approximately 1.5 degrees Fahrenheit over the last 50 years, and this warming pattern is nearly certain to continue over the next several decades. This warming appears to be causing small changes in streamflow runoff patterns, with somewhat higher winter flows, slightly earlier spring runoff and slightly lower summer flows since the 1980s.

Studies also show regional warming will likely cause more precipitation to fall as rain in the winter rather than snow, and over time this will affect Columbia River Basin flood risk management, power generation and fish protection efforts.

### SURFACE TEMPERATURE CHANGE




*Surface temperature change for the period 1986–2015 relative to 1901–1960. Graphic is courtesy of the NOAA National Centers for Environmental Information.*

# Federal agencies study climate change

The most recent climate change study, published in August 2020, concluded a two-part, joint initiative that began in 2013 with scientists from BPA, the U.S. Army Corps of Engineers, Bureau of Reclamation, University of Washington and Oregon State University.

BPA and its partners completed the studies under the review of the River Management Joint Operating Committee (RMJOC), a water management group comprised of the three federal agencies, and with technical input from many other research partners and stakeholders.

The initiative called for the development of common and consistent climate change data for use in the three federal agencies' long-term planning and operations of the Columbia River System. The initiative culminated in two summary reports, published in 2018 and August 2020, respectively. The reports identify how climate change will likely affect hydrology and water supplies in the Columbia River Basin over the next five decades. They also identify examples of how climate change may affect the future operation of the Columbia River, its reservoirs and tributaries.

Since the completion of the project, BPA, with the assistance of regional partners under the Pacific Northwest Coordination Agreement (PNCA), also completed a routine, once-in-10-year update to the streamflow records used for long-term hydropower planning. These records, known as Modified Streamflows because they are adjusted to current irrigation levels across the region, were published in October 2020. These records also suggest that runoff patterns have begun to change in the past 30 to 40 years, consistent with projections from the RMJOC-sponsored studies.

# Findings

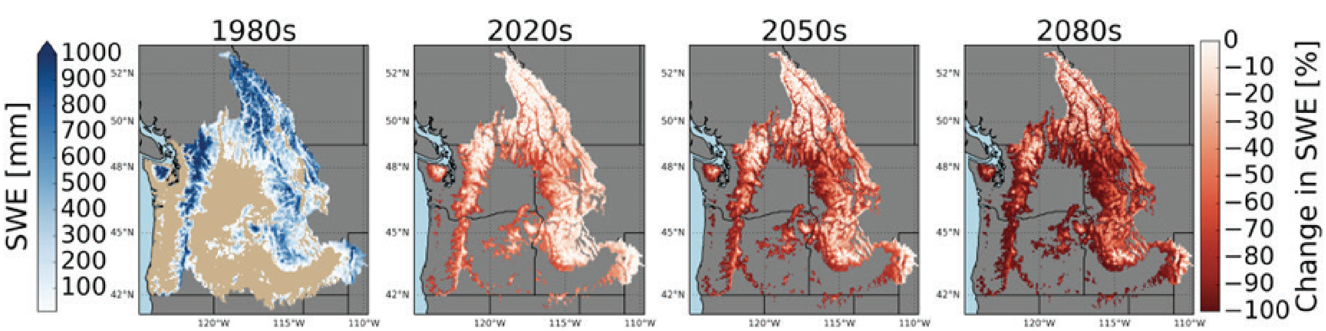
The most recent research findings provide context for regional stakeholders as to how resilient the current operations of the reservoir system will be under a warming climate. While the report delivers benefits for long-term planning within the Columbia River Basin specifically, it also delivers general approaches and lessons learned that can support assessing impacts to other large, multipurpose reservoir systems.

The findings of the second study also reveal that the effects of climate change are already occurring in the Pacific Northwest with more pronounced effects likely occurring through the 2049 timeframe.

**Warming temperatures:** Northwest temperatures are expected to rise another 1 to 4 degrees Fahrenheit by the 2030s, and 3 to 10 degrees by the 2070s. Warming is likely to be the greatest in the interior regions of the Columbia River Basin and less pronounced along the coast.

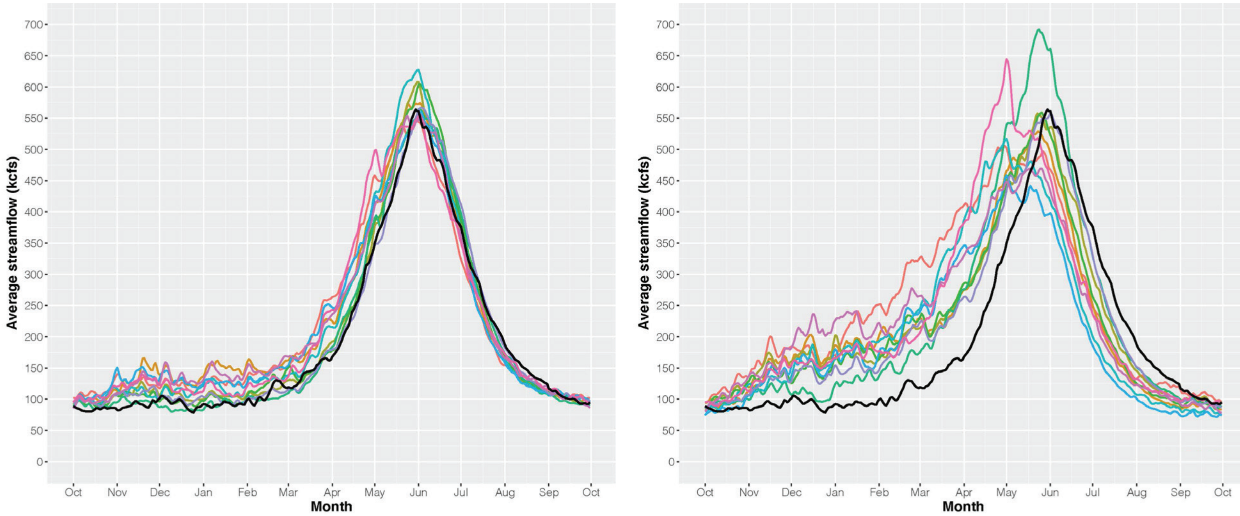
**Precipitation:** Precipitation trends are more uncertain, but a general upward trend is likely for the rest of the 21$^{st}$ century, particularly in the winter months. Already dry summers could become drier.

## SNOW WATER EQUIVALENTS




*By the 2020s, average April 1 snow water equivalents (the amount of water snowpacks include) are projected to be between 10 and 60% lower in the Cascades, coastal mountains, and lower portions of the Clearwater and Spokane basins in central Idaho and eastern Washington. By the 2050s, the hydrological model simulations indicate decreases of more than 70% in these same areas, and a 90% decrease by the 2080s.*

## STREAMFLOW PROJECTIONS




*Average streamflows (in thousands of cubic feet per second) at The Dalles, Oregon. Black line is the historical average (1976–2005). Colored lines represent various climate model projections. Left is for the 2030s (2020–2049). Right is for the 2070s (2060–2089).*

---

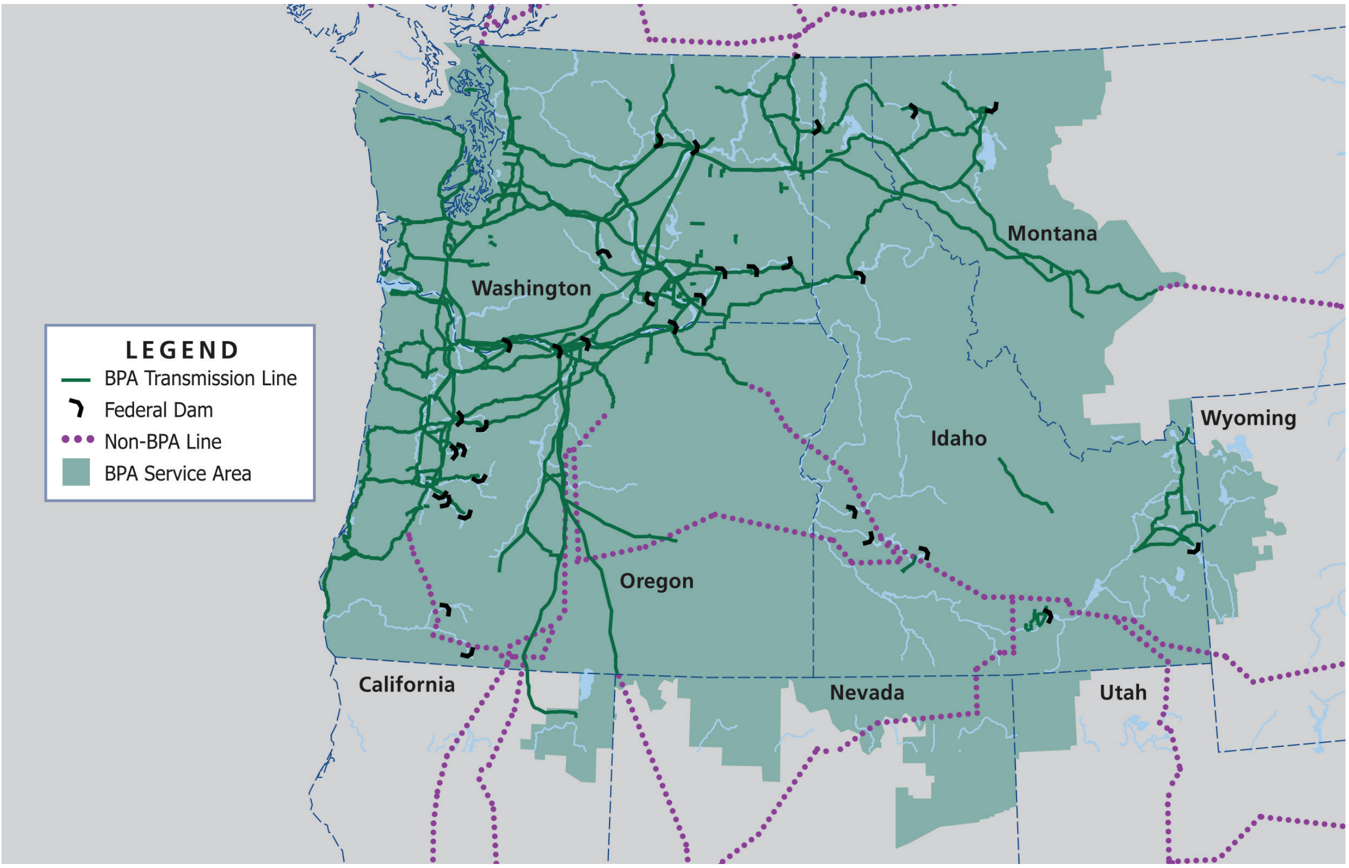
**Annual winter snowpack:** Average annual winter snowpack is likely to decline over time as more winter precipitation falls as rain instead of snow, especially on the U.S. side of the Columbia River Basin.

**Streamflows:** By the 2030s, higher average fall and winter flows, earlier peak spring runoff, and longer periods of low summer flows are very likely. The earliest and greatest streamflow changes are likely to occur in the Snake River Basin, although that is also the basin with the greatest modeling and forecast uncertainty.

**Flood risk management:** The spring snowmelt runoff is projected to peak at The Dalles Dam approximately two weeks earlier for the 2030s and about a month earlier for the 2070s. The future projections indicate a potential overall increase in flood risk in the Columbia River Basin for both spring (April–May) and winter (November–March). Shifts in runoff volume, timing and variability in the spring could stress the reservoir system. The greatest identified change in future flood risk is from increased winter flood volumes throughout the Columbia River Basin, most notably in the lower Columbia River. Projected increases in winter flood risk are primarily linked to increasing flows from the Columbia mainstem. Projected increases in inflow from the Willamette River during winter events further exacerbate this increase in flooding.

**Fish:** The projections indicate increased spring flows in the 2030s and the 2070s. The frequency of meeting spring fish and habitat-based flow and spill objectives is projected to increase. However, meeting biological flow and spill targets will likely be more difficult in the summertime, particularly in August and September. Lower flow increases the reliance on stored water, particularly in the tributary basins.

**Energy consumption:** Based on the most recent RMJOC study results, BPA is also looking at the impacts of climate change on energy consumption. Although other factors, such as population increase and electrification, are much larger drivers for future energy consumption in the region, higher temperatures in the summer will result in more energy use to cool homes and businesses. Warmer temperatures in the winter will reduce energy use for heating. Although these temperatures are not enough on their own to transition the Pacific Northwest from a winter-peaking system to a summer peaking, the seasonal demand for federal power in the 2020s through the 2040s could shift. Power demand could increase an average of 4.4% in July and August and decrease an average of 2.2% in December through February as a result of climate-change driven temperature increases.




*Site map showing the Columbia River Basin with the sub-basins, large dams, and major tributaries (regions) noted.*

**Recent streamflow trends:** Based on the 2020 Modified Flows study, initial analyses suggest average winter and early spring streamflows have trended higher since the 1980s, with slightly lower summer flows and a slightly earlier trend in peak spring flows. These trends appear to be consistent with the RMJOC climate change studies and other regional climate change projections.

# Conclusion

BPA scientists and their partners have spent years studying climate change with a commitment to carefully monitor regional environmental changes. This research is giving BPA a better understanding of the potential range of possible streamflows and temperature changes that climate change may bring to the Columbia River Basin. The water management options available to the Federal Columbia River Power System reservoirs and the ability to use the generating capabilities of FCRPS hydro facilities will only become more important to the region as we manage these changes. Through this climate change data, river operators are now planning for a resilient, reliable Columbia River hydropower system.

## FOR MORE INFORMATION

Visit BPA's climate change page for access to the climate change studies, or go to BPA's historical streamflow data page.