



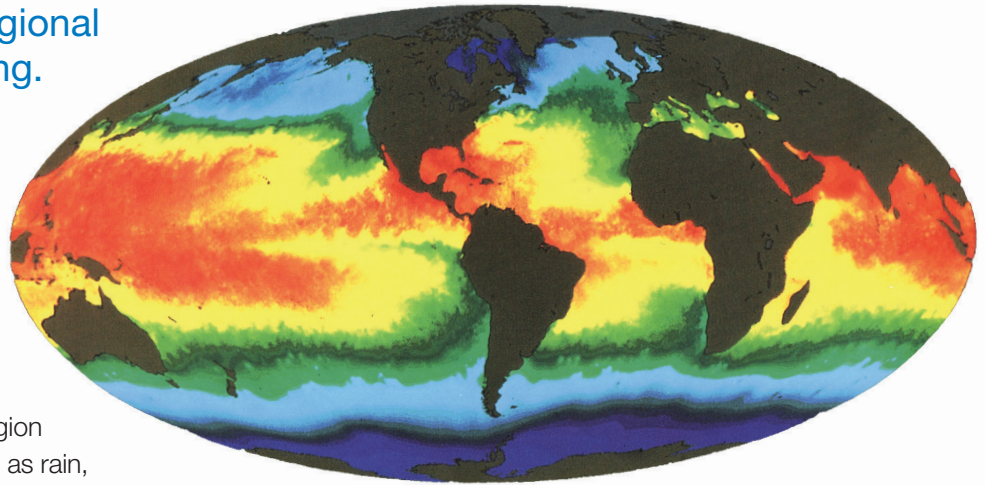
Fact Sheet

May 2014

BPA prepares for a changing climate

Evidence of global and regional climate change is mounting.

The recently released National Climate Assessment confirmed what a joint study by BPA, the U.S. Army Corps of Engineers and the Bureau of Reclamation found in 2011: that Northwest temperatures are expected to rise 1 to 3 degrees Fahrenheit by the 2020s, and 2 to 5 degrees by the 2040s. Warmer temperatures in the region will likely cause more precipitation to fall as rain, rather than snow, during the winter. Instead of storing water as snow in the mountains to melt through the spring and summer, the region is likely to experience an increase in river flows in the winter and early spring, coupled with a reduction in the summer when streamflows are already low. Such a shift would affect Columbia River Basin flood risk management, power generation and fish protection efforts.



Global Sea Surface Temperature maps like this help us understand how Earth is warming both generally and as part of events such as El Niño.

identified how climate change could affect hydrology and water supplies in the Columbia River Basin. It also identified some examples of how climate change could affect future operation of the Columbia River and its tributaries.

Federal agencies study climate change

Between 2008 and 2011, BPA, the Corps of Engineers and Bureau of Reclamation conducted an extensive climate change study. That work was done under the auspices of the River Management Joint Operating Committee, a water management group comprised of the three federal agencies. The initiative called for the development of common and consistent climate-change data for use in the three agencies' long-term planning. That initiative culminated in a summary report that

Summary of key findings

To differentiate from current climate studies underway, the initial research conducted under the guidance of the River Management Joint Operating Committee is known as RMJOC-I. That first look at regional climate change effects yielded a number of enlightening results:

TEMPERATURE Northwest temperatures are expected to rise 1 to 3 degrees Fahrenheit by the 2020s, and 2 to 5 degrees by the 2040s.



PRECIPITATION Overall annual precipitation changes in the study were minimal. However, some of the models showed large seasonal changes, including more extreme wet and dry periods, some wetter falls and winters, and some drier summers.

SNOWPACK More winter precipitation would fall as rain instead of snow, producing more runoff in the winter, earlier runoff in the spring and less water in the summer.

ANNUAL WATER RUNOFF The runoff volume from January through April is projected to exceed normal flows at The Dalles Dam by 20 to 85 percent. The June through August runoff declines, varying between 65 and 95 percent of normal flows at The Dalles Dam. Normal flow, or the historical reference climate period, is the average of flows from 1970 to 1999.

Higher flows from January through April would generate more hydropower and produce more spill at most dams. Hydropower production would then decline at the same time increased temperatures drive greater summer power use.

FLOOD RISK MANAGEMENT Flood risk management procedures will need to anticipate that runoff may come weeks earlier, shifting the peak runoff from April through August to March through July. Earlier releases of water from reservoirs at the flood risk management projects may be needed to capture the early runoff. Impacts to the timing of federal hydro system operations could also affect other spring and summer objectives such as flows for fish and other ecosystem functions.

ENERGY CONSUMPTION Although population increase is a much larger driver for future energy demands 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. BPA estimates that the demand for federal power in the 2020s due to climate change could increase 1 to 3 percent in July and decrease 3 to 4 percent in December.

FISH The increase in streamflows from January through April would result in higher generation and increased spill at most dams. Reduced flows during July and August

might impact the federal agencies' ability to meet future Biological Opinion objectives, including flow management.

Building on the foundation

In the fall of 2013, the Intergovernmental Panel on Climate Change published a new series of new Global Climate Models that reflect the latest climate-change science. In response to this wealth of new data, BPA's Technology Innovation group co-funded two projects that take advantage of these new climate models and are helping the region build on the efforts from the previous joint study.

While BPA is providing funding and staff support for these studies, the Corps and Reclamation are also contributing staff time and expertise for analysis and interpretation. The three agencies recently signed an Memorandum of Understanding committing them to the effort through 2017.

How do the new studies differ?

These new climate-change hydrologic data sets are being produced principally by researchers from the University of Washington and Portland State University. These two new research studies differ both from each other, and from the original joint study in 2011. However, they both build on the lessons learned from the late 2000s by using finer timescales (daily instead of monthly), improved downscaling methods, and using three different hydrologic models instead of just one. As a result, these research projects will produce many more possible scenarios. The 2011 joint study yielded 19 separate streamflow scenarios, but these new efforts will produce dozens, perhaps over 100. Finally, the UW study includes glacial changes — an important detail that was studied only indirectly in the previous study.

Some of the differences between the research studies could benefit not just the region, but the global climate-change research community. The complex ways in which both projects will use the newest Global Climate Models, downscale the data into more usable forms via streamflow forecasting models, and tune the hydrologic models themselves, will differ at each step in the modeling process. The hope is that this part of the research will

Columbia River Basin



not only give us a better understanding of the potential range of possible streamflows that climate change may bring to the Columbia River Basin, but will also help researchers understand whether the uncertainties are caused by climate change itself, or caused by the tools, models and methods that scientists are using.

Putting new climate-change data to use

New climate-change data will help river managers make informed, prudent, scientifically-based decisions. Affording them a greater ability to avoid correcting for the wrong thing, or “correcting” in the wrong direction.

The 2014 water year has provided a good example of the uncertainty that river operators must contend with, and the benefits of not only sound modeling but also a good understanding of uncertainties. As the winter began, increasing drought signals in the basin prompted BPA and its partners to steel themselves for a low water year and they began to manage the river appropriately. However, in early February, BPA’s weather and streamflow forecasting team started to see reliable signals of rapidly improving water conditions in the basin. As their confidence grew and the snow began to pile up in the mountains, river operators shifted their management strategy to accommodate more water. More water is generally good for power production, but a hydroelectric system poised for a very dry period that turns out to be a wetter one could result in prolonged oversupply problems, or in the extreme, serious flooding concerns. More accurate streamflow modeling gave managers more time to prepare and adjust to the changing conditions.

Climate change is a consideration in much of BPA’s work, as well as that of its partners. In addition to its potential effects on power production, irrigation and flood risk mitigation, it is directly relevant to the future of the Columbia River Treaty and to fish and wildlife protection. Consideration of climate change is also required for National Environmental Policy Act analyses of large capital projects by BPA business lines such as Transmission Services. Completing this new round of research also responds to Executive Order 13653, signed in 2013. The order requires all federal agencies to develop science-based actions to increase their resiliency to the effects of global climate change.

Later this decade, the three federal agencies will not only integrate the new climate-change data into their ongoing modeling and planning efforts, but the study results also will be available for others in the region or farther afield to use. For example, The Columbia River Intertribal Fish Commission and the Northwest Power and Conservation Council are both using the products of the previous joint study in their planning and collaboration efforts. They and other researchers and stakeholders in the region will also be able to benefit from the new study results, due in 2015 to 2016.

BPA’s Technology Innovation group funds a wide range of promising projects that span BPA’s business needs. In addition to the two climate-focused Technology Innovation projects highlighted here, others in the portfolio address climate change indirectly through their potential to reduce the need for additional power generation.