Climate Change & Washington Metropolitan Area Water Supply

ICPRB Study Assesses Potential Impact

A WIDE RANGE OF EVIDENCE INDICATES that the earth has been warming over the past century, causing glaciers and sea ice to melt in many parts of the world, sea levels to rise, and patterns of precipitation to change. Most scientists agree that these trends are likely to continue and to accelerate due to increasing levels of carbon dioxide and other "greenhouse" gases in the atmosphere. Likely changes in temperatures and precipitation will affect the availability, use, and management of water resources.

To investigate the potential impact of climate change on area water supplies, the Section for Cooperative Water Supply Operations on the Potomac of the Interstate Commission on the Potomac River Basin (ICPRB) conducted the *2010 Washington Metropolitan Area Water Supply Reliability Study – Part 2: Potential Impacts of Climate Change*, the third in a series of climate change assessments funded by the area's three main water suppliers: Fairfax Water, Washington Aqueduct, and Washington Suburban Sanitary Commission. These suppliers provide water to the over 4.3 million people living in the region.

The Washington metropolitan area obtains more than 75% of its water from the Potomac River. Though it's uncertain whether precipitation will increase or decrease in our region, study results indicate that higher temperatures may raise rates of evapotranspiration (evaporation from the ground and other surfaces and transpiration by plants) to a significant degree. Higher evapotranspiration rates tend to reduce the amount of precipitation which infiltrates into the ground and reaches groundwater aquifers and decrease flows in the Potomac River and the streams that replenish water supply reservoirs.

Simulations of future stream flows conducted for this study produced a wide range of results (Figure 1). The impact of projected changes in temperature and stream flows on the region's water supply system ranges from minor to major. According to this study's worst-case scenarios, if no changes were made to the current water supply system, a moderate drought occurring in 2040 could cause the imposition of mandatory water use restrictions, nearly empty reservoirs, and extremely low flows in the Potomac River below Little Falls dam, just downstream of the area's water supply intakes.

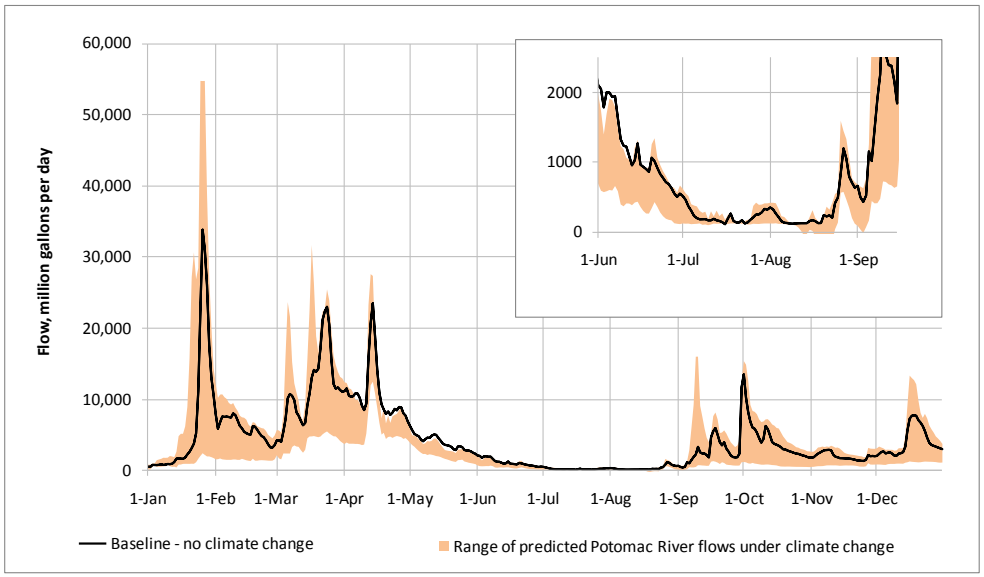

Figure 1 - Projected Potomac River flows downstream of Little Falls dam: *Late summer flows could fall severely in the event of a moderate drought in 2040 (see inset) if no changes were made to the current water supply system.*

Potential Impacts in 2040

According to this study's results, a Potomac River basin altered by climate change could experience:

- **Average temperature increases of 1.4 to 4.1° F (0.7 to 2.3° C)***
- **Precipitation increases or decreases**
- **Higher evapotranspiration rates causing average stream flows to decrease as much as 35 percent**
- **A rise in summertime water demand due to increases in outdoor use**

Projected impacts of climate change on regional water supplies range from minor to major. In worst-case scenarios, with no changes to the current water supply system, a moderate drought in 2040 could cause:

- **Mandatory restrictions on water use**
- **Depleted reservoirs**
- **Inability to maintain environmental flow-bys in the Potomac River**

**compared to this study's 1988-99 baseline period*

Options to address climate change

The area's water suppliers are committed to funding structural and other system changes if assessments determine there is a need. Potential options to increase water availability during future droughts are:

- **Use of the Potomac and Occoquan estuaries as supplies**
- **Use of retired quarries to store water**
- **Improvements in system efficiency and operational flexibility**

Impacts of climate change will be felt not just locally, but in communities throughout the basin. ICPRB's proposed ***Potomac Basin Comprehensive Water Resources Plan*** will provide a guide for managing shared resources in an uncertain future.

Interstate Commission on the Potomac River Basin ● Section for Cooperative Water Supply Operations on the Potomac
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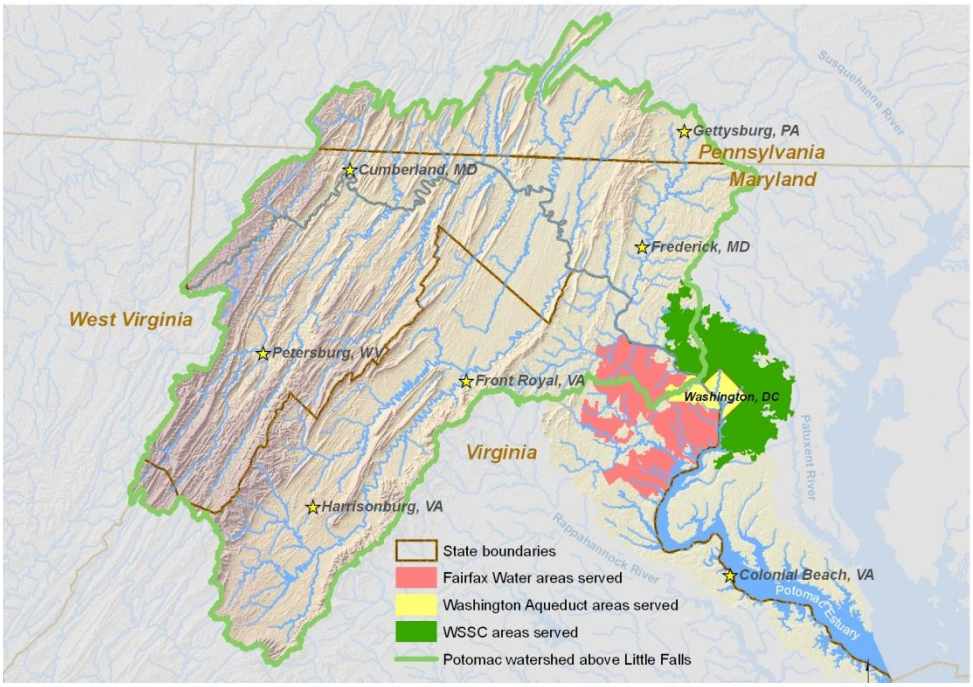

Figure 2 - Map of the Potomac River Basin: *showing watershed area above Little Falls dam and showing areas served by the three main water suppliers.*

Approach

This study is based on results from six different global climate models under three scenarios for future emissions of greenhouse gases. This provided 18 climate change scenarios for the Potomac River basin for the year 2040, that is, 18 separate projections of how future temperatures, precipitation, and stream flows might be altered by climate change. Estimates were also made of changes in water demand.

The study benefited from information, data, and models from several organizations. The National Research Program of the US Geological Survey (USGS) "downscaled" the 18 global climate projections to the Potomac River basin as part of a separate project being conducted by the Chesapeake Bay Program Office and the USGS's Virginia Water Science Center. The Bay Program's Phase 5 Watershed Model was used to estimate the impact of changing climate on Potomac basin stream flows. Finally, ICPRB's Potomac Reservoir and River Simulation Model was used to evaluate what impact changing temperature, precipitation, and stream flows could have on the reliability of the Washington metropolitan area's water supply system.

Limitations and Uncertainties

Projections of future climate are subject to considerable uncertainty, since global climate models cannot capture the full complexity of the earth's inter-related land, water, and atmospheric systems. Though it is predicted that precipitation will increase on a global scale, in many areas, including the Potomac River basin, models differ on whether precipitation will increase or decrease. Watershed models are used to simulate the effect of a changing climate on stream flows, adding additional uncertainty.

Finally, though it's believed that as the earth warms, the variability of climate is likely to increase, with extreme weather events becoming more frequent and more intense, this change is not well-represented by most currently available global model output. This study uses the historical variability in temperature and precipitation from a relatively short time period to represent potential future variability. This historical period includes a moderate drought, but does not capture the full range of conditions that could be experienced in 2040 under an altered climate, such as the occurrence of a severe long-term drought similar to the drought of 1930.

Washington Metropolitan Area Water Supply System

The Washington, D.C., metropolitan area has a unique cooperative system of water supply management based on a set of agreements signed more than 30 years ago. This arrangement helps optimize use of available resources during periods of drought. Current system resources consist of the Potomac River, the Occoquan and Patuxent reservoirs, and additional upstream reservoirs that can release water to augment Potomac River flows during droughts: Jennings Randolph, Savage, and Little Seneca. The main area water suppliers are:

Washington Aqueduct (a Division of the US Army Corps of Engineers), serving the District of Columbia via the D.C. Water and Sewer Authority (DC Water) and parts of northern Virginia

Washington Suburban Sanitary Commission (WSSC), serving Montgomery and Prince George's counties and providing wholesale water to other suppliers in Maryland

Fairfax Water, serving Fairfax County and providing wholesale water to other suppliers in northern Virginia

About ICPRB and CO-OP

The Interstate Commission on the Potomac River Basin (ICPRB) was created in 1940 with authorization from Congress. It is composed of commissioners representing the federal government, the states of Maryland, Pennsylvania, Virginia, and West Virginia, and the District of Columbia. ICPRB's mission is to enhance, protect, and conserve the water and associated land resources of the Potomac River basin and its tributaries through regional and interstate cooperation.

ICPRB's Section for Cooperative Water Supply Operations on the Potomac River (CO-OP) was created in 1979 to serve as a cooperative technical center for coordination of regional reservoir and water supply operations during droughts, for the purpose of enhancing water supply reliability and recreational opportunities and protecting water quality and aquatic ecosystems.

The full report can be downloaded from our website at www.potomacriver.org

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