Vulnerabilities of water availability and agriculture from climate change in the Yakima River Basin, Washington

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Projections of a warming world due to global climate change are well documented and were summarized in 2007 in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. For the Yakima River Basin, global climate models project a warming over the next 90 years, as much as 3° Celsius, that can have large effects on water availability and agriculture. The hydrologic system in the basin is very sensitive to such temperature increases. Indeed, snowpack is vulnerable to temperature increases ranging from 1° to 2° Celsius, with a 59 percent decrease in snowpack calculated with a 2° Celsius increase. Potential future changes in the hydrologic system will be additive to existing historical trends and will make management of water in the basin for both instream (fish habitat) and out of stream uses increasingly more complex. Observed data suggest that groundwater in some areas may no longer be a reliable supplemental source for water under a warming climate. Climate change scenarios also indicate that groundwater recharge to the aquifer system is sensitive to increasing temperatures. Furthermore, increasing temperatures will increase crop-water demand and likely result in less water leaving the root zone in agricultural areas, thereby decreasing recharge to the groundwater system. Together, historical trends and potential future effects of climate change indicate significant vulnerabilities in water availability, agriculture, and fish habitat in the Yakima River Basin.