Aspects of Groundwater in the Yakima River Basin

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Surface water in the Yakima River Basin is fully appropriated and there are increasing demands for water for municipal, fisheries, agricultural, industrial, and recreational uses. These demands must be met by groundwater withdrawals and/or by changes in the way water resources are allocated and used. An integrated understanding of the groundwater flow system and its relation to the surface-water resources is needed in order to implement most water-resources management strategies in the basin.

The U.S. Geological Survey began a cooperative effort with Bureau of Reclamation, the Yakama Nation, and Washington State Department of Ecology to obtain an understanding of the Yakima River Basin aquifer system. Under this program, a variety of approaches and analytic tools have been developed to address the issues of water management under existing conditions, future growth scenarios, and potential regional climate change, including a comprehensive assessment of groundwater.

The comprehensive assessment of groundwater included a generalized, mean annual water budget to provide an overview of the magnitude of the various budget components and information important for understanding the framework of the groundwater system in the basin. Process-based models that compute distributed water budgets on a watershed scale were employed to estimate recharge, and groundwater pumpage from the aquifer system was estimated for 8 categories of use. Hydrogeologic units were defined and mapped. Hydraulic characteristics were estimated to provide a range of values for the hydrogeologic units. The hydrogeologic framework was then integrated into a regional groundwater model.

Trends in groundwater levels were analyzed and mapped; in some areas, groundwater pumping has caused water-level declines of more than 300 ft. The depth to and elevation of the water table was mapped for the structural basins and areas outside the basins where there were sufficient data. The assessment of river-aquifer exchanges was accomplished using isotope data, seepage investigations, mini-piezometer data, groundwater levels and temperature data, and thermal profiles.

In combination, these approaches identify groundwater movement in the aquifer system and may lead to a way to accommodate municipal, agricultural and ecological needs of the basin within the physical limitations of the hydrologic system.