

FORWARD

Washington's limited water resources, competing demands for instream and out-of-stream demands for these water resources, and potential drought or climate changes require the exploration of new innovative approaches to water resource management. Managing surface water and groundwater resources conjunctively can provide an opportunity to improve or ensure adequate stream habitat during critical low-flow periods for threatened and endangered species. This approach has been implemented in Great Britain and at several locations in the United States with success. However, the use of this management tool is still in the early stages of development and the quantitative benefits of streamflow enhancement are still being evaluated. At this stage, site-specific evaluations are required for implementation and the identification of areas with the potential to benefit from streamflow enhancement. This report discusses the evaluation of what could be considered a new "tool" in the toolbox for water resource management in the state of Washington.

To evaluate the use of this new tool in the state of Washington, the East King County Regional Water Association (EKCRWA) studied the feasibility of using groundwater to enhance streamflows in the Snoqualmie River with a grant from the Washington State Department of Ecology (WDOE). The EKCRWA is an association of water utilities in east King County that administers the East King County Critical Water Supply Service Area under the Public Water System Coordination Act (Revised Code of Washington [RCW] 70.116). One function of the EKCRWA is to identify present and future regional municipal water demands and potential regional municipal water supply sources in the Critical Water Supply Service Area.

The EKCRWA has been studying the upper Snoqualmie River Basin groundwater system in Water Resource Inventory Area (WRIA) 7 for approximately 10 years. The EKCRWA first considered using the deeper Snoqualmie Aquifer directly as a regional municipal water supply source and then evaluated the enhancement of the Snoqualmie River by using the Snoqualmie River to convey Snoqualmie Aquifer groundwater to downstream extraction points. Technical investigations during this time included geophysical investigations, exploratory drilling, pump testing, and groundwater elevation monitoring. The city of North Bend has also been studying the groundwater system and potential mitigation opportunities in the upper Snoqualmie River Basin under a grant from WDOE. The EKCRWA and the city of North Bend have partnered to facilitate the exchange of information about the basin.

Various municipal water demand studies conducted during the 1980s and 1990s indicated a projected future shortfall between anticipated water demand and available supply for many communities in east King County. The EKCRWA's investigation for a potential water supply source focused on the

Snoqualmie Aquifer Regional Water Supply Project (Project). The Project was initially considered as a conventional well field supply and pipeline, delivering groundwater from the upper Snoqualmie Valley to the regional supply system. An exploration program was then undertaken to evaluate the hydrogeology of the watershed, and a joint water right application was filed by the EKCRWA and the Seattle Water Department (now Seattle Public Utilities) to withdraw 60 million gallons per day (mgd) from the upper Snoqualmie Basin.

To minimize potential impacts to sensitive premier salmon habitat sections of the Snoqualmie River, EKCRWA explored the potential to conjunctively manage surface and groundwater in the Snoqualmie Basin. The Snoqualmie River from below Snoqualmie Falls to the vicinity of the city of Duvall has some of the most valuable habitat for salmonid species in the Snoqualmie River Basin, and supports chinook and bulltrout, which are listed as threatened under the Endangered Species Act (ESA). This proposed conjunctive approach would use the Snoqualmie River to transport the groundwater from the well field in the upper Middle- and South Fork basins to the withdrawal point near Duvall where the water would be withdrawn, treated, and introduced into the existing or additional regional water distribution system. Preliminary evaluations of this proposed conjunctive use approach indicated a potential enhancement of this important habitat section of the Snoqualmie River during periods of low instream flow. Based on extensive completed studies, the upper Snoqualmie Basin was seen as an ideal “test bed” to evaluate potential opportunities for seasonal river enhancement using water from the deeper aquifer system present in this portion of the basin.

Instream and out-of-stream demands in the Snoqualmie Watershed and elsewhere continue to put pressure on water supplies in Puget Sound. Endangered species listings for fish and other aquatic species have led to the development of salmon recovery programs for the past decade. Salmon recovery programs have prompted the investigation of new approaches to water resource management that enhance flows during low-flow periods. Significant time and resources have been invested for salmon recovery efforts in Washington State. A better understanding of how storage and conjunctive surface and groundwater use can be applied as possible management tools to enhance or maintain streamflows during times of low flows such as droughts or future climate change scenarios would help maintain these valuable resources.

Understanding the benefits and limitations of potential water management tools will enable water resource managers to plan for unknown changes in streamflows that can impact surface and groundwater resources. For example, future climate change or drought could severely impact river/streamflows and salmon critical habitat. Research of the impacts of climate change on water resources in the Pacific Northwest indicates that predictions of increased temperature and potentially different precipitation patterns during the next 50 years could result in reduced snowpacks, earlier snow melt, increased flood potential and lower summer flows (Hamlet et al., 2001). Future water

resource management in Washington State could require significant additional storage, such as off-channel storage to mitigate potential changes to natural snowpack storage. New tools, such as river enhancement with groundwater, could provide an additional approach to provide “storage” and augment lower summer flows or drought-impacted flows.

The complexity of Washington State water laws, combined with scientific uncertainty regarding stream-aquifer interactions and associated watershed linkages, has created a challenge to integrated management of surface and groundwater systems. However, the fundamental properties of aquifer systems and their natural capacity to store water offer a good approach to managing water resources that contributes to the restoration of streams. The application of the streamflow augmentation using groundwater concept in the upper Snoqualmie Basin contributes to an understanding of how to sustain valuable habitat downstream.

This report includes the results of the feasibility analysis of using groundwater to augment streamflows in the upper Snoqualmie River Basin. In addition, this report includes the results of the technical analyses completed by EKRWA and others during the past 10 years and a groundwater model of the aquifer and stream system in the basin. It also includes a summary of case studies, describes typical groundwater/surface water settings where the streamflow augmentation concept using groundwater can best be applied, and identifies basins where flow augmentation schemes could be applied in Washington State. Water resource managers in the state can use this report to guide the evaluation of streamflow augmentation as a potential tool to supply surface water during critical low-flow periods.