

Seeking Water Security: Harvesting Glacial Meltwater and Early Snowmelt with Managed Aquifer Recharge

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Abstract

In response to global warming some mountain glaciers are melting at accelerated rates. In addition certain mountain snowpacks are melting earlier than normal, often disrupting local and regional water storage and distribution systems. These two processes are not unique to any one locale but are occurring around the globe: the Andes, Himalayas, Rocky Mountains and Alps. Some permanent glaciers are shrinking *en route* to extinction. In the USA the best example of this is Glacier National Park in Montana, which could be glacier-free by the mid-21st century. In western Oregon and Washington some of the highest elevations in the Cascade Range are losing permanent glaciers. Early snowmelt in the Cascades and elsewhere has the potential for harvesting via underground storage.

In temperate regions glaciers and snowpack provide humanity and natural ecosystems with 'free storage' of freshwater and parcel out water to maintain and replenish freshwater supplies. In the warm season, glacial meltwater nourishes lower elevation ecosystems and human settlements and recharges aquifers. Replenishment of the glacier normally occurs during the cooler seasons; the cycle then repeats itself. Ideally, one would like a balance: the glacial ice melting in the summer would be replaced by cold weather precipitation. When the melting exceeds the replenishment, the equilibrium is destroyed. The volume of the glacier shrinks, and if the disequilibrium continues, the glacier will disappear entirely.

Managed Aquifer Recharge (MAR) could capture 'excess' meltwater – the amount coming out of storage that is available – before the glacier disappears altogether. Early snowmelt could also be captured. Such groundwater storage would not be a permanent, sustainable solution to freshwater shortages, but would provide time to permit the development of alternatives to ensure survival of ecosystems and humans alike.

Our presentation will: 1) explore some of the advantages and disadvantages of subsurface storage to salvage glacial meltwater and early snowmelt; 2) speculate where such schemes might work and would be needed; and 3) discuss a recent MAR project in the Yakima River basin in Washington, USA.