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Can aquifer recharge be increased by more frequent burning of forest cover?

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The city of Perth, Western Australia (pop. 1.7 million), depends on groundwater for the majority of its water supply. There has been a substantial shift in climate in the region since the mid-1970s with lower rainfall resulting in reduced runoff to dams and reduced recharge to aquifers. At the same time population has increased, water demand has increased four-fold since 1975, and groundwater dependence has risen from 5% in 1975 to about 70% of the reticulated supply and substantially more than this when self-supplied irrigation, almost entirely pumped from the local aquifer system, is included (CSIRO 2009). With the importance of the aquifer system to the local water supply a combined government programme (DoW 2008) was undertaken to assess options for protection of the resource and increasing recharge. This paper describes an experiment aimed at testing changes to recharge by modifying the fire regime in the native woodland. Prescribed burns are used on a rotating basis mainly to control fuel levels to protect against uncontrolled wildfires that may threaten lives and property and also result in extreme loss of environmental habitat. Two patches of woodland (each of area about 1 km2) were instrumented with piezometers, soil moisture monitoring and tubes to sample groundwater profiles. One patch was burned at the end of autumn 2008, and the sites were monitored for the following three seasons. Soil moisture fluxes estimated from monthly neutron moisture meter measurements, hydrograph analysis and groundwater chemistry profiling were combined with computer simulations of the vegetation recovery and evapotranspiration and infiltrating water to estimate changes to recharge following the fire. It was found that recharge increased in the first year after the burn but after that bush recovery appeared to reduce the recharge in the two patches to similar levels. Such findings raise issues over the potential increase in recharge and the impact on ecosystem function and biodiversity.

References:

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