

Meaning of recharge in the context of regional groundwater management framework: Alberta example

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ABSTRACT

Groundwater recharge is an important component of the hydrologic cycle linking atmospheric and soil processes with groundwater processes. However, a wide variety of views exists in the literature concerning the meaning of recharge in the context of groundwater management, ranging from having minimal influence to being fundamentally important. We suggest that the diverse viewpoints reflect different hydrological and geological settings, which influence how groundwater interacts with surface water and how different aquifers in a region interact with each other. For example, in an alluvial aquifer adjacent to a large river flowing through a dry region, the amount of recharge on uplands away from the river may have little relevance compared to induced infiltration of river water. In contrast, for aquifers relying on local recharge, the amount of recharge puts a major constraint on the permissible rate of groundwater extraction without causing environmental harms, such as the reduction of baseflow in local streams. In other cases, groundwater extraction from deep, confined aquifers may induce additional downward flow from shallower unconfined aquifers, thereby creating semantic arguments about whether recharge refers to inter-formational flows as well as water inputs to the water table. Using case study examples from Alberta and numerical model simulations, we will explore the meaning of recharge in the context of regional groundwater management framework. Our intent is to present a kernel of ideas for further thoughts and stimulate discussion among the group of hydrogeologists interested in regional groundwater flow system and water resources management.