

# 2025 DARCY LECTURE

University of Saskatchewan

## Grant Ferguson, Ph.D.

Hosted by:



COLLEGE OF SCIENCE

Hydrology &  
Atmospheric Sciences

THE UNIVERSITY OF ARIZONA  
COOPERATIVE EXTENSION

**WATER RESOURCES  
RESEARCH CENTER**



Date: Wednesday Feb. 5, 2025

Time: 12:00-12:50 pm

Location: ENR2 S107

### Living Fossils: Ancient Groundwaters in the Anthropocene

The bulk of groundwater on Earth is fossil, having been recharged more than 12,000 years ago. Past definitions classified these waters as nonrenewable because the aquifer systems containing them are not replenished on human timescales. Scrutiny of this definition suggests that it is overly simplistic and may result in preventing access to groundwater to improve water security in some cases or while failing to prevent excessive depletion in others. In many aquifers, groundwater residence times are long because of their large storage volumes; there is no reason to believe that using groundwater from large aquifers is less sustainable than using groundwater from smaller aquifers if recharge rates have not varied appreciably over time. In cases where past climates were much wetter, there has been concern that groundwater will not be replenished under current conditions. Examination of groundwater age distributions suggests that this situation is relatively uncommon. Substantial groundwater storage anomalies are unlikely to persist in areas containing fossil groundwater due to the differences between the rates of transport and hydraulic diffusion, except in very large regional aquifers. This difference in behaviour between storage and transport has been confirmed by recent studies using stable isotopes of noble gases to reconstruct past water table depths. Changes in storage associated with past climates appear to be smaller than those associated with anthropogenic depletion of groundwater, including cases where modern and fossil groundwaters have been extracted. The long response times of many groundwater systems allow them to mediate water and solute fluxes within the Earth system over long time periods. Their lack of sensitivity to current climate changes will make them a strategic resource, if used at appropriate rates.

Grant Ferguson is a professor of hydrogeology in the Department of Civil, Geological and Environmental Engineering at the University of Saskatchewan. He also holds a joint appointment in the School of Environment and Sustainability at the University of Saskatchewan and is an adjunct professor at the University of Arizona and University of Waterloo. Ferguson holds a B.Sc. from the University of Waterloo and a Ph.D. from the University of Manitoba. His research focuses on the hydrogeology of deep groundwater systems, paleohydrogeology, the hydrogeology of the Canadian Prairies and sustainable development of groundwater resources.

For more information, visit [groundwater.org/darcy](https://groundwater.org/darcy)

