

# Partnering to better understand Edmonton's Water Cycle and Groundwater

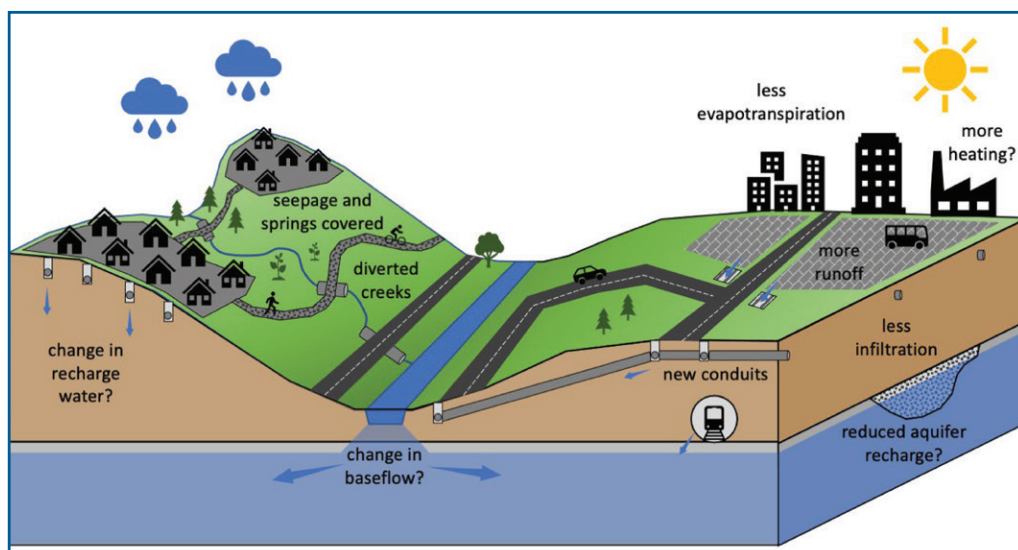
View from below the High Level Bridge. Photo credit: Bill Trout.

Dr. Brian Smerdon is a hydrogeologist and research associate at the University of Alberta who enjoys discovering and sharing the story of groundwater. Smerdon says he's been captivated by the movement of water through the earth and how groundwater interacts with surface water features such as lakes, rivers, and wetlands in a dynamic, interconnected water cycle.

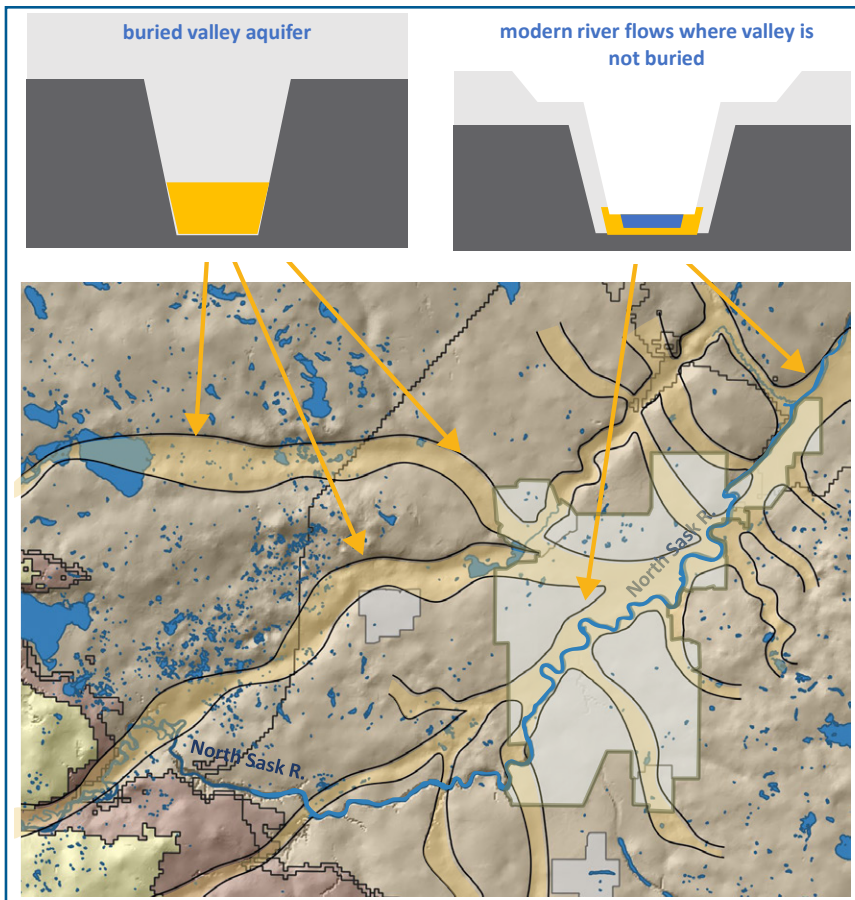
## North Saskatchewan River Groundwater Study

Smerdon is currently working with EPCOR to understand how groundwater connects with the North Saskatchewan River in the greater Edmonton area from Drayton Valley through the capital city's limits. This study allowed them to see the broad picture of where groundwater is coming from and moving to – and where it intersects and interacts with the North Saskatchewan River. Some of these interesting interactions include locating when and where groundwater sustains the river and encountering groundwater springs that contribute to tributary creeks. These interactions help understand a river that provides water for over one million people in the Edmonton region.

With this big picture of what happens as water infiltrates the surface, gets into the ground, and then eventually makes its way to lakes and rivers, the next question is how these interactions are impacted once they encounter an urban environment.



*Example of a water cycle with urban infrastructure and possible impacts on surface and subsurface hydrology. Graphic provided by B. Smerdon.*



A map showing the network of groundwater channels that run through the greater Edmonton region. Old river sand/gravel buried by glacial sediments can form productive aquifers that could provide potential water sources. Graphic provided by B. Smerdon.

## What we don't know: Edmonton's Urban Water Cycle

While the drainage of water through the city may be known from an engineering perspective, the role of the subsurface is not well understood from a holistic water cycle perspective. For example, what happens when you have a mosaic of non-permeable concrete and roads that speed up runoff mixed in with more permeable patches of parks, grass and forests that slow water movement? When our urban activities cause contaminants to enter the subsurface by mistake, where do they end up going? What restoration activities would help improve the health of urban creeks?

*"If we needed to use aquifers as an alternative water source, if for some reason, we couldn't use the river -- if it were very low or a spill had happened and it became inaccessible -- could we rely on or look at using an aquifer source instead?" ~ Dr. Brian Smerdon*

Smerdon says the next step would be to tie a lot of this information together in a 3D visualization or model. This model would provide a sense of best options or possibilities when considering how to align urban development and watershed protection. For example, if the City of Edmonton wanted to put in a more naturalized feature to slow down water before it enters the North Saskatchewan River, what location would have the ideal subsurface condition for it to work well? These are the kinds of questions they hope to better understand.

## Water Security, climate resilience, and hidden aquifers

As the realities of drought and land use impacts cause us to think more deeply about climate resilience, it seems timely to consider alternative water sources for the capital region.

Most of us have a picture of the river valley as it exists today, but many geologic valleys are covered over and buried by sediment, so they are not visible to us. These valleys are aquifers that Smerdon refers to as "buried sand and gravel tubes". Some of these deposits run beneath the oldest part of the city and their aquifers may be a source of drinking water. Smerdon says the question now is the age of the water in some of these aquifers and how readily the groundwater would be replenished if it was used.

Smerdon points out that "We're relying on a glacier that is melting slowly" to feed the river, so he asks, "If we needed to use aquifers as an alternative water source for some reason -- if the river couldn't be used because the water level was very low or a spill had happened and it became inaccessible -- could we rely on or look at using an aquifer source instead?"

This next phase of work to be done would be about taking what they know of the aquifers and beginning "to test how feasible it would be to extract water from them for some emergency use. We've done a little bit of work to look at the volumes that are there. It's a big city and the aquifers are not huge, so we'd like to explore that a little bit more just to see how feasible it would be." In the end, Smerdon says the hope is to "combine a lot of things that we know a little bit about into something that helps make informed decisions."