Groundwater Connections

A Community-Based Watershed Program for Sustainable Groundwater Management

June 3rd , 2010

Groundwater connections is a community-based watershed program for sustainable groundwater management. It has been developed as a partnership between Rocky View County and the University of Calgary and is funded by RBC.

This newsletter is to provide Rocky View County with updates on: research and educational aspects of the project; important concepts related to groundwater hydrology and sustainability in Rocky View County; and upcoming events relevant to the project!

Interactive Well Network Portal – Coming Soon!

Our interactive web portal will allow anyone with an internet connection to view approximate locations of wells within the Rocky View County monitoring network (image 1). It includes clickable well icons to visualize water level data over time (image 2). Additionally, the web portal allows for well owners participating in our monitoring network to upload their own water level measurements! The portal was developed by Dr. Steve Liang and his associates in the Department of Geomatics Engineering at the University of Calgary and is powered by Google Maps.

Image 1 shows the map interface. When a well location is clicked, a time series graph of water levels is displayed for that location (**image 2**). This data will be used to monitor groundwater levels to observe anomalies in the water table level and to ensure groundwater model accuracy (explanation on next page).

image (1)

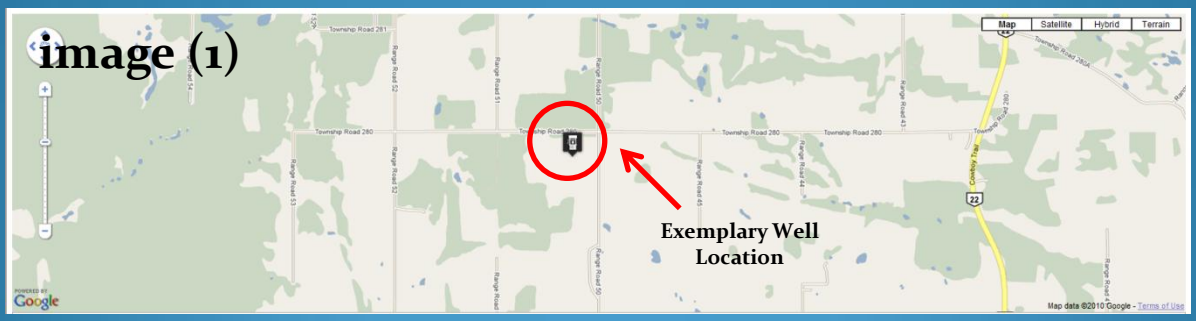
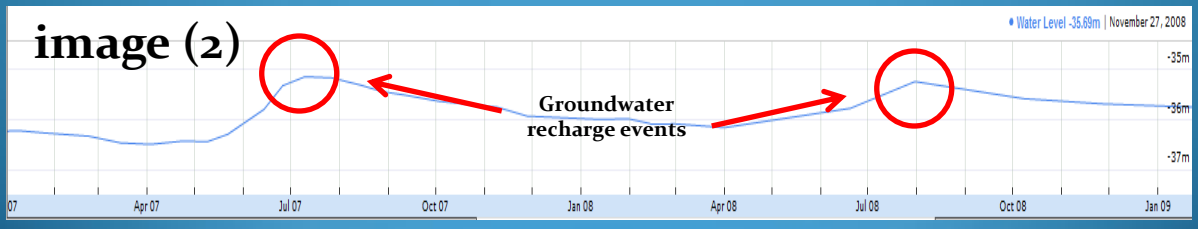
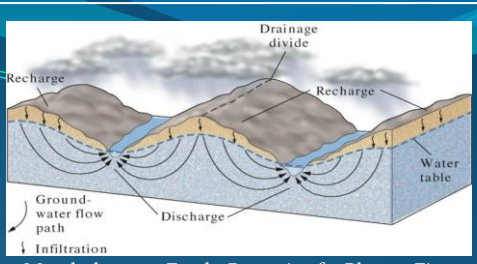


image (2)



What is the Water Table?

The Water Table is the surface of water in saturated rock or soil. Water under the water table is called groundwater. The shape of the water table is generally similar to the shape of the ground surface, but smoother.



Source: Marshak 2001, Earth: Portrait of a Planet, Fig. 19.11

The water table comes up to the ground surface in low areas such as gullies (see above). Because the water table in the stream bank is higher than the stream water level, groundwater slowly flows into streams. Without this steady groundwater input, streams would dry up during the hot and dry summers on the Prairies!

What Affects the Amount of Groundwater?

Geology

An **aquifer** is a geological feature below the surface that effectively stores and transmits groundwater. The main physical properties of an aquifer are **high porosity** (ability to store water) and **high hydraulic conductivity** (ability to transmit water). A major aquifer in Rocky View County is the **Paskapoo Aquifer System**, which consists of numerous small lenses or layers of fractured sandstone (see right).

An **aquitard** is a geological material that has low hydraulic conductivity, such as clay or solidified mud (mudstone). In the image on the left, sandstone aquifers (highlighted in green) are separated by mudstones that allows only a small amount of water to flow through (highlighted in red).

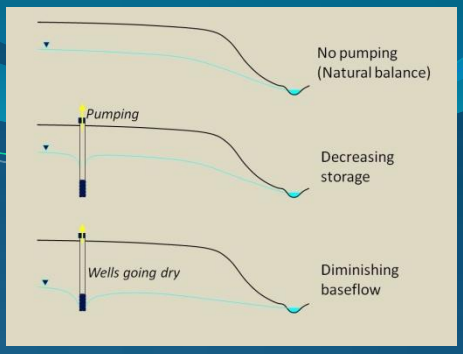
Groundwater Recharge

After the winter, snowmelt runoff flows along the frozen ground into depressions to form **snowmelt ponds** (see right). These ponds are the main source of **groundwater recharge** in Rocky View County.

Of the total yearly precipitation, only 0 to 10 % becomes groundwater. Most precipitation in Rocky View County is lost to **evaporation** or **used by plants**. Groundwater recharge is dependent on meteorological conditions (rain, snow, etc.).

Groundwater Pumping

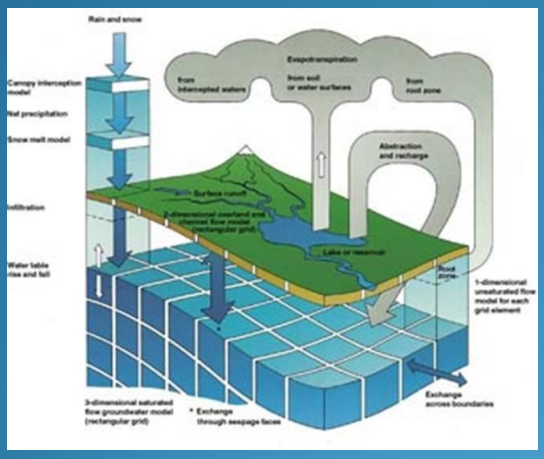
Groundwater extraction can have significant impacts on groundwater resources. The diagram (see right) illustrates how pumping can lower the water table (e.g., the amount of groundwater). This effect is magnified when multiple extraction wells are within close proximity to each other.



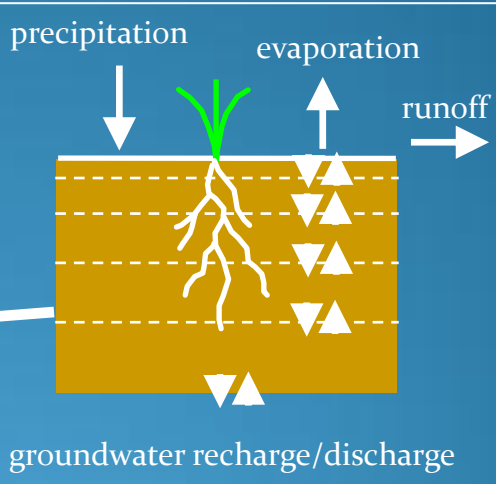
The Groundwater Model

If sustainable groundwater management practices are to be implemented in Rocky View County, it is necessary to develop a groundwater model that is based on sound science. Using advanced mathematical techniques and specialized software, a groundwater model allows us integrate the previously mentioned variables such as geology, meteorology, land-use and water-use to predict hydrological characteristics such as the water table elevation or steam discharge.

More specifically, we are going to develop a **groundwater flow model coupled with a soil water balance model**. The **soil water balance** (below right) component determines the amount of water that provides groundwater recharge, whereas the **groundwater flow model** (below left) serves to model the rate at which water flows through aquifers, the rate of discharge into streams and the amount of groundwater available at a given time and location.



Source: www.dhisoftware.com



With such a model, the effects of different scenarios such as variable weather patterns, increasing population or increasing commercial development can be simulated. Knowing the consequences of such scenarios allows for the optimal and sustainable management strategies to be implemented.

To assess the accuracy of the model is accurate, the data collected by well owners in the monitoring network will be compared to our modeled groundwater levels.

Upcoming Events

Beginning of July 2010 - Launch of the Interactive Web Portal

Beginning of August 2010 - Launch of the Project and Educational Website

On going throughout July and August - One-on-One Meetings with Well Monitoring Participants including a Web Portal Tutorial

Middle of September 2010 – Implementation of Groundwater Education Programs

Contact Us

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