

EDUCATIONAL OUTREACH

Earth Science for Society

Earth Science for Society is an event held in Calgary that provides both the general public and local schools the opportunity to learn more about Earth Science topics. This year our team was invited to participate and represent groundwater research in southern Alberta. We were able to educate students and community members about prairie hydrology and show them how groundwater flows, by using a sand tank groundwater flow model. The importance of our long-term monitoring program was highlighted by showing how groundwater flows and the potential impact wells can have on each other or on surface water bodies. The connection between groundwater and surface water was emphasized to show the complexity of the hydrologic system and the importance of understanding both surface water and groundwater and their interaction. A highlight for us was interacting with the students from Banded Peak School in Bragg Creek who attended Earth Science for Society as a class. These students live within the study area and it was interesting to interact with youth who understood water wells and are directly impacted by the research we are conducting.

The Earth Science for Society event was held in conjunction with the GeoConvention, which attracts delegates from around the world. It was interesting to interact with such a diverse group of people, who appeared to be interested in our community-based groundwater monitoring network. When members of the public and delegates came through the exhibits, they were fascinated not only by the groundwater flow model, but the Rocky View Well Watch web portal. It was exciting for our team to see the general interest in not only groundwater, but specifically our community based monitoring project.



Pictures of Chris Farrow (left) and Kathleen Little (right) interacting with Junior High students at Earth Science for Society.

EDUCATIONAL OUTREACH

Groundwater in the Classroom

One of the exciting aspects of the groundwater monitoring program is taking the scientific research out of the university and into the community. This process allows for an integrated educational research approach to be used; which includes community members collecting data, researchers analyzing the trends and the knowledge being adapted for use in our education system. This integration of people provides a unique approach to doing scientific research and education. Over the past six months, our main focus has been on the educational component.



Pictures of teachers participating in a permeability activity.

In January, four local teachers were selected to participate in a training program to assist in adapting local research into material that could be used in their Grade 8 science classes. This opportunity allowed teachers to work directly with Dr. Masaki Hayashi and Chris Farrow, a Master student working with Dr. Hayashi. The concept of this aspect of the project is to link leading scientists with teachers, in order to integrate local scientific research into classrooms and teach students what scientists actually do. Chris adapted scientific journal articles from a technical language into an easily accessible literature document for teachers. The teachers then assisted with reducing the complexity of the document to a Grade 8 comprehension for use in their classrooms. In addition, Chris and Kathleen developed four complimentary activities for teachers to use to enhance students learning of local groundwater processes.

The activities provide students with an opportunity to go on a field trip in northwest Calgary and see actual springs, complete a hands-on lab about porosity and permeability of different materials found throughout Rocky View County and browse the newly launched web portal to observe water level change from actual well sites. This means that the data you collect is being used by Grade 8 students to understand the importance of groundwater monitoring in Rocky View County. The teachers have been very excited about learning new material and being the student again. It is our goal to get our research out of the university and accessible to members of the community. We are very excited about our local research being integrated into Calgary Grade 8 classrooms!



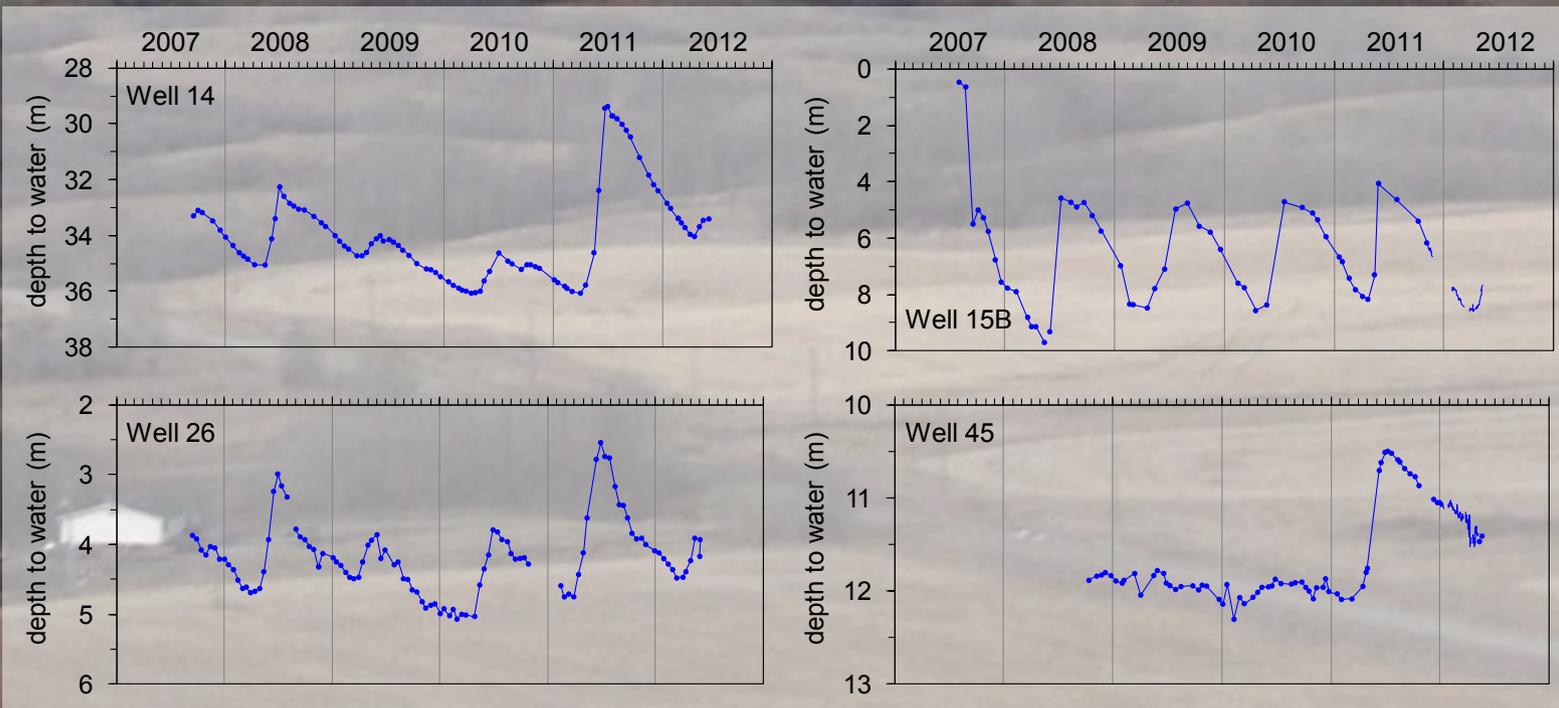
Teachers participating in a groundwater education workshop.

SCIENTIFIC FINDINGS

The Recharge Year - 2011

The way groundwater is stored in local aquifers is similar to your bank account. As the groundwater is withdrawn by pumping and lost to the natural discharge to springs and creeks, its balance (that is water level) goes down. Without periodical deposits (that is recharge), the water level in aquifers would steadily decrease. In Rocky View County and other areas in southern Alberta, the infiltration of snowmelt water normally provides the much needed groundwater recharge, which is sometimes supplemented by the infiltration of rain in unusually wet periods. Groundwater recharge is a very complex process depending on a variety of factors. Therefore, we have relatively large recharge in some years and very small or no recharge in other years. By monitoring water level for a long period, researchers can see the year-to-year variation of recharge and improve the understanding of the connection between the weather pattern and groundwater recharge. The graphs below show examples of water level changes in four wells in the Rocky View monitoring network (see the map on the left for locations). The water levels in Wells 14, 15B and 26 responded to snowmelt in all of the last five years. Well 45 indicated very little recharge in 2009 and 2010, and a large recharge in 2011. As you may recall, the spring of 2011 was very wet, which resulted in a particularly good recharge of the aquifers. Several other wells in Rocky View County had a pattern similar to Well 45.

Will 2012 be another good year for recharge? You can see it yourself by visiting Rocky View Well Watch web site (see the front page).



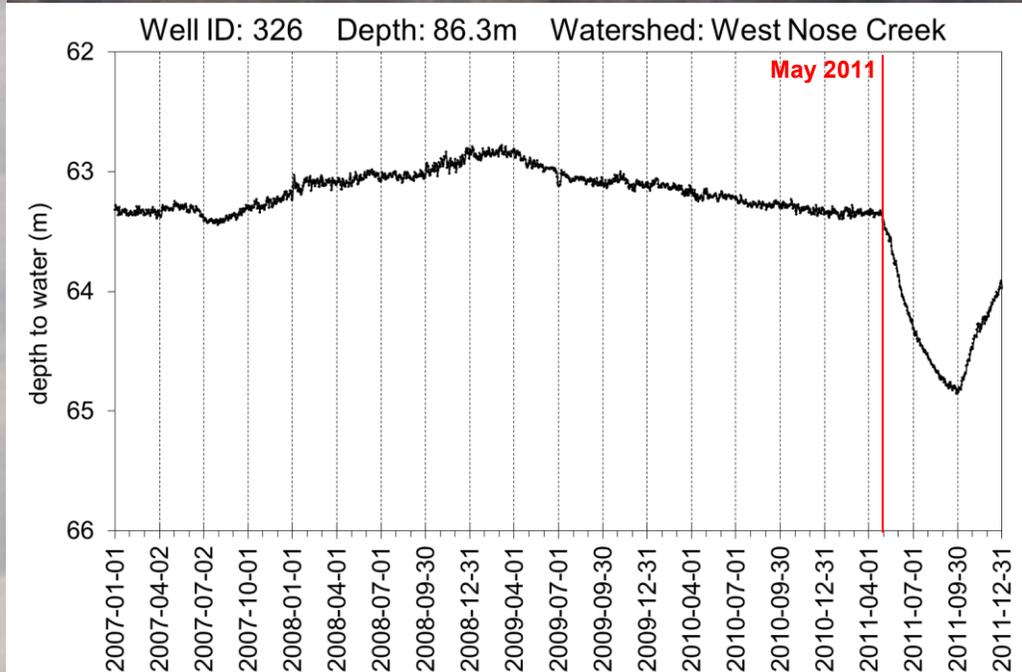
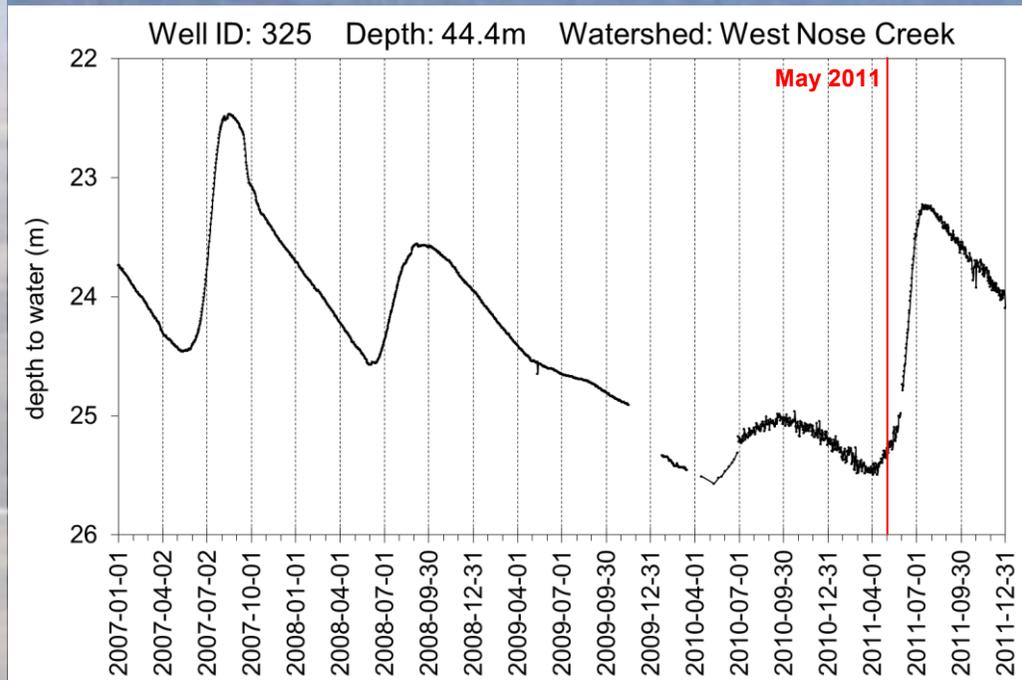
Above: Graphs showing the seasonal fluctuations in four participating wells. The increase in water level during 2011 shows the recharge that occurred in aquifers across the County.

SCIENTIFIC FINDINGS

The depths of an Aquifer

At one of our research sites, we are fortunate enough to have two observation wells located a few meters apart but at different depths. The observation wells are used for monitoring purposes without the impact of pumping for human or stock use. These wells showed two very different responses in water level during May to October 2011. The shallower well (Well 325) shows recharge occurred, with a steady increase in the water level over the summer months. In contrast, the deeper well, Well 326, showed a steady decline during the same time period. When wells are located in close proximity but at different depths, it can provide information on where the aquifers are located and any possible interaction between them.

An interesting thing to note about observation wells is that they are not in use for consumption, so the changes in water level reflect other activities occurring within the aquifer. Also, these wells are monitored with very sensitive pressure transducers that pick up small fluctuations in water level in response to barometric pressure fluctuations (the sensitive device was installed in Well 325 in July 2010). Well 326 is experiencing withdrawal or discharge of water from somewhere else within the connected aquifer; whereas Well 325 is experiencing recharge. These two processes, discharge and recharge, are the reason we monitor wells long term – the more information we have, the better we can understand the fluctuations in groundwater levels. The change over one year does not necessarily reflect the overall trend of the aquifer. For example, examining the data from Well 326, the water level has been relatively stable until May 2011, when there was a drawdown effect. Since groundwater involves complex processes, multiple years of data allows for trends to be determined, which provides a better understanding of the processes and impacts occurring in an aquifer.



Above: Water level graphs for Well 325 (44.4m deep) and Well 326 (86.3m deep) from January 2007 to December 2011. The red line shows May 2011.

COLLABORATION

Testing – Testing – 1 – 2 – 3

In last year's newsletter it was mentioned that four new Well Minder devices were installed in selected wells to test this new technology. We have continued our work with Agriculture Canada and have been continuing to test new versions of the Well Minder device. In testing these units, we are hoping to find an affordable technology that can be implemented within the well network to reduce the use of water level tapes. This would allow landowners to quickly determine the water level in their wells without having to remove the well cap, or even access the well itself. The Well Minder device can be stored in a shed, barn or pump house nearby for easier access during the winter months. The theory behind testing this type of device is to find a technology that is more user-friendly and reduces the risk of getting the well tape caught in either the power cable or pitless adaptor while taking a water level measurement. Currently the device measures in feet below top of casing; however, there is a possibility of adding a conversion to have the device display in meters.

In addition to the well minder, the University of Calgary has obtained a Well Watcher 1100 device to test as well. This device works by sending a sonic pulse down the well and determining the water level from below top of casing. We are currently testing this product in the lab with the help of a summer student. One of our tests will be putting the device into a walk-in freezer to see if the device, built in the southern United States, can handle the cold Canadian climate.

We are excited to be working towards finding a technology that would be easy and affordable for landowners to use to determine water levels in their well year round. Stay tuned for updates on how these devices perform!

Partnerships

The importance of water resources in the prairie region has gained a lot of attention over the past years, with a number of groups working on protecting and understanding local watershed systems. One area of interest is the Elbow River watershed, in particular the area around Bragg Creek. The team at the University of Calgary has been approached by both Alberta Environment and the Elbow River Watershed Partnership (ERWP) to assist with their research projects on groundwater in the Bragg Creek area. The ERWP is exploring the water quality in wells in the Bragg Creek area and was able to conduct tests on a few of our wells located in the area. To assist with this, we were able to provide the technical expertise to collect these samples. We have also been able to assist Alberta Environment with data for the model they are developing for groundwater in the Bragg Creek area. This model will increase awareness of the groundwater resources in the study area. Through the use of our web portal both groups are able to access the up to date water level data for all wells located in the Elbow River watershed. It is partnerships such as these that allow for the exchange of data and knowledge providing a deeper understanding of an area, which should translate to better water resource management.

What's Next?

Public launch of Rocky View Well Watch – A media release about our online web portal will be happening soon.

Identifying Locations – Our team needs very specific locations of each participating well. This information will be used in a numeric model, which will allow for better predictions of land-use and climate change on groundwater within the County.

Survey Feedback – Included with this newsletter is a survey for participating landowners. Please fill out the survey and return it to the University of Calgary. This information will assist in the improvement of the community-based groundwater monitoring network in Rocky View County and in other Alberta municipalities.

Web Site – Our team is currently working on developing a web site with information related to the community-based groundwater monitoring network in Rocky View to engage researchers, community members and educators.



Above: Picture of a Trimble GPS unit on top of a well. Our team is looking for permission to come and take a GPS point with this unit at each participating well. Please contact us for a site visit at your earliest convenience.

**CONTACT
US**

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