West Nose Creek Watershed Research News

UNIVERSITY OF CALGARY

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The West Nose Creek (WNC) watershed groundwater monitoring project started in the fall of 2004, and the first issue of Research News was published in December 2005. The project is coming to an end, and we will be contacting some of you to see if you are interested in participating in the monitoring program run by the MD of Rocky View. On this occasion, I would like to thank you very much for your cooperation during the past three and half years. The project was designed to observe the overall condition of groundwater in the watershed, not just individual wells. Such information is very important for rural groundwater management. When a new well is drilled for water supply, the well is pumped for a few hours to a few days, and the data are used to estimate how much water can be pumped over many years without drying up the well. The problem of this approach is that: 1) there is little scientific basis for using a short-term (few days) data to estimate long-term (say, 20 years) effects of pumping, 2) this method is for an individual well and as such, does not tell us much about the effect of having many wells in the neighbourhood. The watershed-scale monitoring will allow the community to observe the current condition and take necessary action when an excessive decline of groundwater level is detected, either as a result of over-pumping or extreme environmental conditions such as multi-year drought. It is also important to monitor the flow in the creek during low-flow periods (baseflow), because the baseflow is mainly fed by groundwater.

As you can see in this News, the data collected from your wells showed that groundwater in the bedrock aquifers (Paskapoo sandstones) responded to recharge events, but the response was different from year to year. The creek sustained baseflow during the periods of little rain, indicating a strong influence of groundwater. This information will help us understand how groundwater is stored and flows in the aquifers. The data will eventually be used to set up a groundwater model for the watershed and examine the effects of climate change and increased pumping in the future. Such a model will provide an alternative to the short-term testing of individual wells mentioned above. It is a very challenging task, but we see it as a necessary step towards the sustainable groundwater management in the West Nose Creek watershed and numerous other watersheds in southern Alberta. The methodology developed in the project is now applied to other watersheds within the MD of Rocky View. Your participation in the project provided the foundation for rural groundwater monitoring.

The project also gave us opportunities to train many students for their future career. Just to give you a few examples, Jaclyn Schmidt is now a water assessment specialist for Alberta Environment, Lisa Grieef is a regional hydrogeologist for Alberta Environment, Karen Miller is in a graduate school in sustainable development, and Nathan Green is planning to pursue a graduate school in hydrogeology. The experience in the West Nose Creek project definitely helped them understand the real groundwater issues in the region. Thank you again!

We would like to acknowledge the following for their funding and support:
Alberta Environment Climate Change Research User Group, Alberta Ingenuity Centre for Water Research, Canada-Alberta Water Supply Expansion Program, Environment Canada Science Horizons Program, Geological Survey of Canada, Natural Sciences and Engineering Research Council, Prairie Farm Rehabilitation Administration Rural Water Development Program and the Canadian Foundation of Climate and Atmospheric Sciences. We would also like to thank Tim Dietzler and Sheikh Ahmed from the MD of Rockyview.

Most of all, we'd like to thank the rural well owners and community members of the West Nose Creek Watershed.

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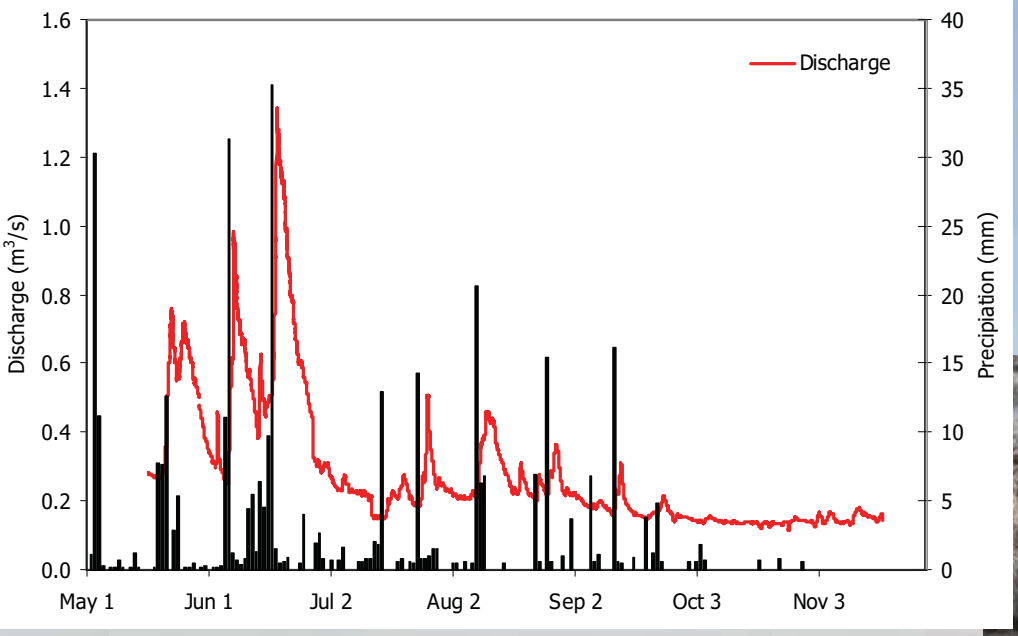
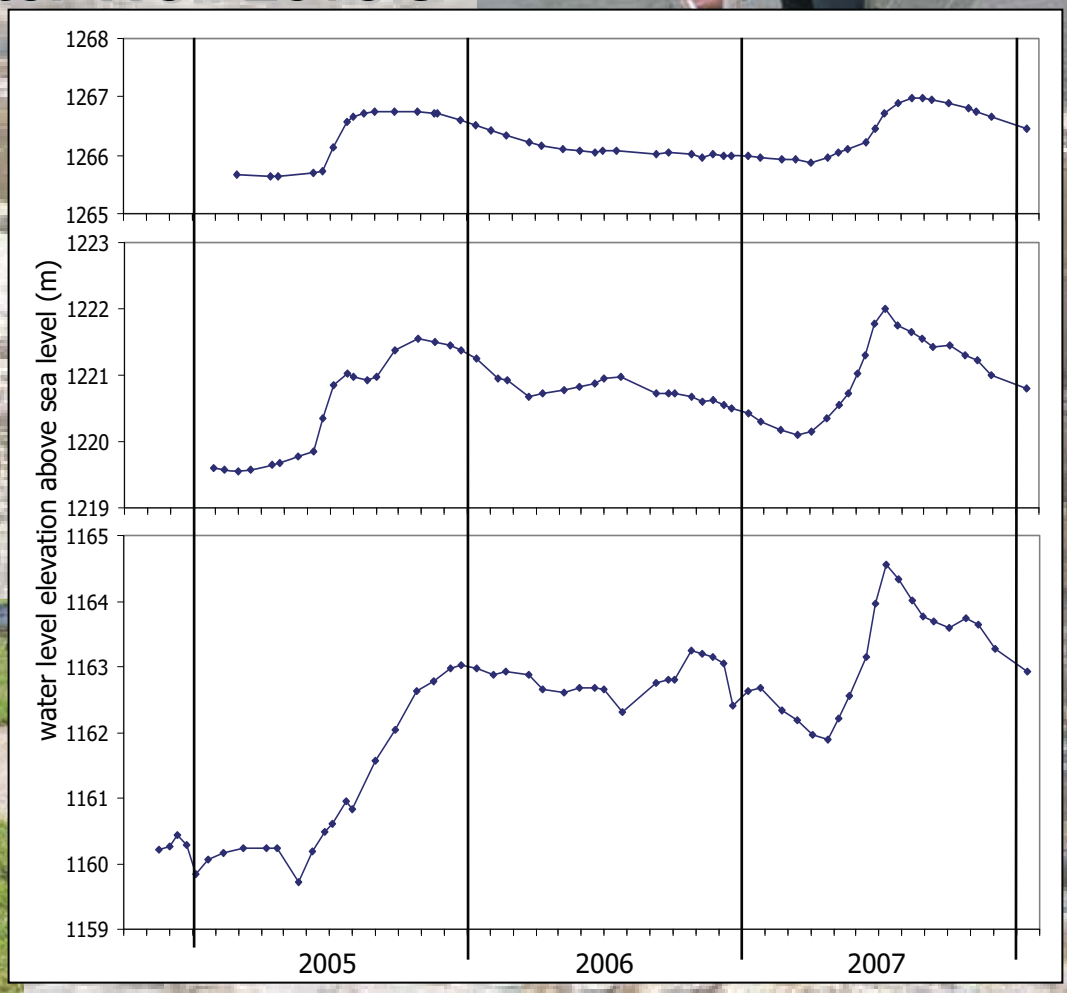
Creek Flow



The discharge graph of West Nose Creek, as measured at the bridge on Symon's Valley Road (Hwy 772). Precipitation as measured in the watershed is in black. Water levels and discharge rapidly increase during a rain storm, and slowly decrease after.

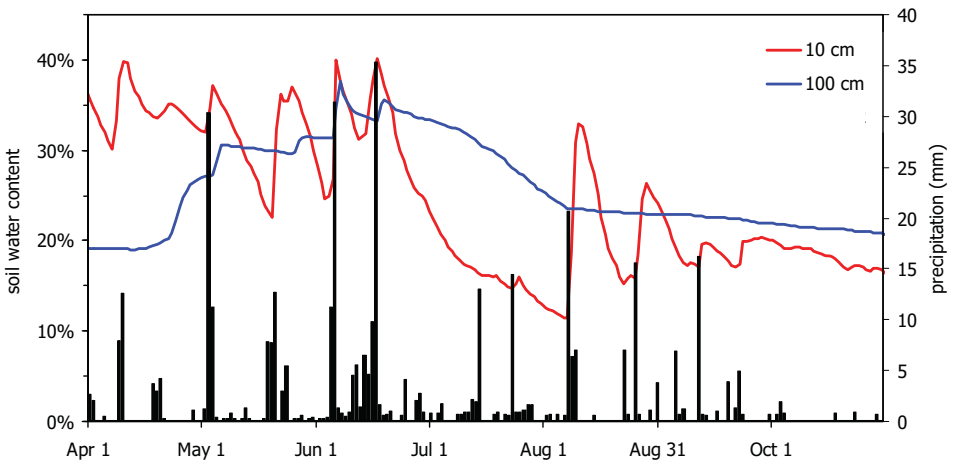
Water Well Levels

The water level graph of three typical wells in the watershed. Low water levels occur in late April to early May, before spring snow melt and precipitation recharge the aquifer. High water levels occur in late August before recharge of the aquifer stops. Water levels rose significantly in 2005 due to heavy spring and fall rains. A lack of snowmelt recharge may explain the stable or declining water levels in 2006, while significant snow melt in spring 2007 led to another increase in water levels.



The range of water levels measured in 80% of the wells in the Monitoring Network are within three meters of the static water level reported in the drilling record, regardless of the age of the well. This means that drilling records are still a reliable indicator of water level, and that groundwater levels have not changed significantly from when the wells were drilled.

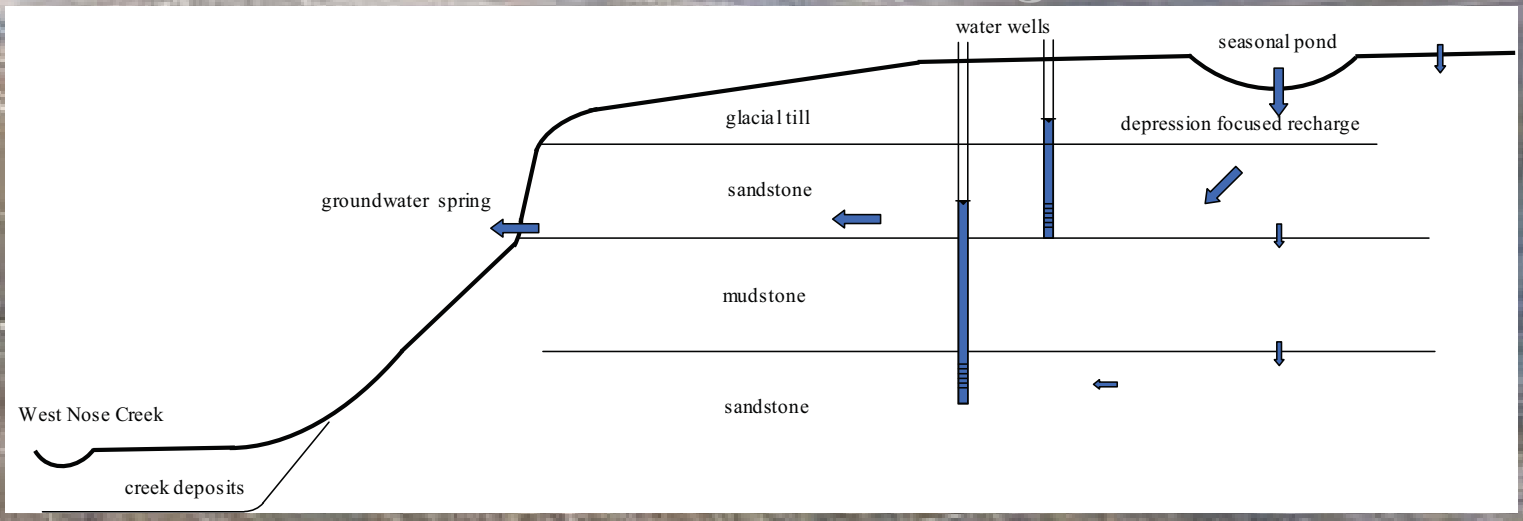
Soil Moisture



You may have heard someone say that the water pumped from your well was "recharged" in the Rocky Mountains. Actually, much of groundwater is recharged locally in the watershed by snowmelt and rain, so it is important to understand how this local water percolates down the soil and recharges the aquifer. We have a few soil monitoring sites in the area to study groundwater recharge.

For example, this diagram shows soil water data and precipitation at the Spy Hill site from 2007. The numbers are in volumetric content: 30 % means that 30 % of the soil volume is occupied by water and the rest is occupied by air and solid particles. At a shallow depth (10 cm), the soil wets and dries quickly with snowmelt and rain. The moisture travels down slowly to 100 cm, and eventually a very small amount moves past the root zone of crops and grasses, and becomes groundwater.

Groundwater Springs



In his undergraduate thesis research, Nathan Green found that many of the springs in the watershed share very similar characteristics. All are associated with outcrops of sandstone which occur on valley walls. These sandstone rocks are the same ones that many of the water wells in the area are completed in. During the "base flow" period of late summer and fall, when creek flow maintains a low, steady value, the flow of the springs in the watershed help to sustain the flow of the creek. Protecting these springs and ensuring the flow from them will help to ensure flow in the creek. Similar to how the water level in many wells gradually decreases through the fall and winter, so does the flow of groundwater springs. Monitoring the long term trends of local springs can be another tool used to help determine the health of the local aquifer.

Municipal District of Rocky View
Voluntary Groundwater Monitoring Project

Following the lead of the University of Calgary's Water Well Monitoring Network Pilot Project, over the past year, the Municipal District of Rocky View initiated a municipal-wide groundwater monitoring project. The purpose of the project is to:

- Assess and monitor the quantity of water within six watersheds in the MD

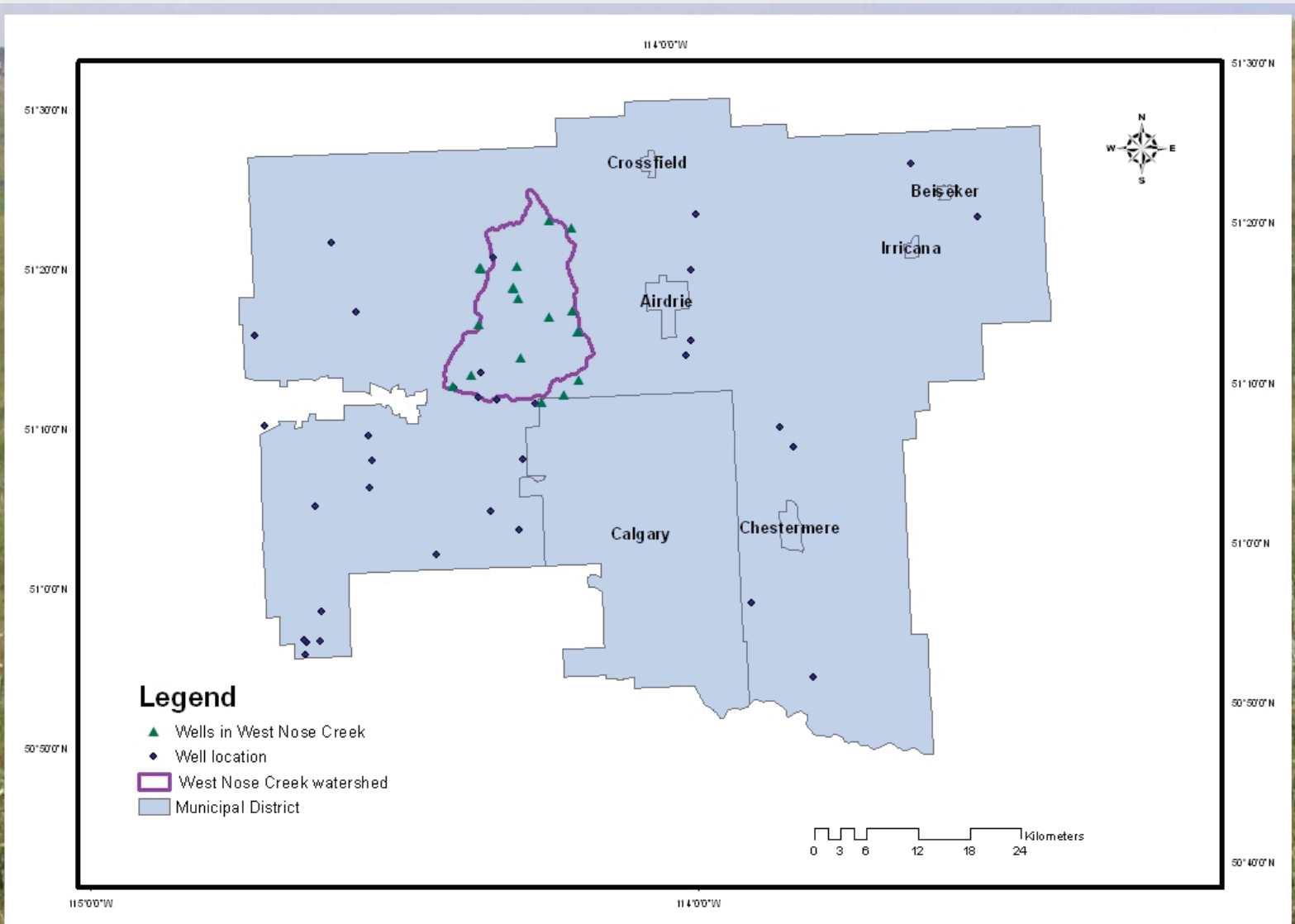
- Gather information on how surface water and groundwater resources interact with each other

- Gather information to assist in determining long term trends in groundwater response to climate changes

- Provide the Municipality with practical direction for achieving the vision in day to day planning, assessment and management of activities and developments that could affect or could be effected by the ground water in the MD

- Assist in long term planning for groundwater management and policy

As of the end of May, there are 38 participants who measure the water level in their well twice a month, using a water level meter supplied by the MD. A tutorial on how to use the water meter is provided by representatives from the MD.



The map shows the location of wells that are involved in the Municipal District's monitoring program (black dots), and those that were in the West Nose Creek watershed monitoring program (green triangles).