

# Groundwater interactions with soil moisture and surface water

*Garth van der Kamp  
Environment Canada*

[Blizzard, Saskatoon, January 10, 2007]

How to monitor changes of water storage in a complex hummocky prairie landscape ?

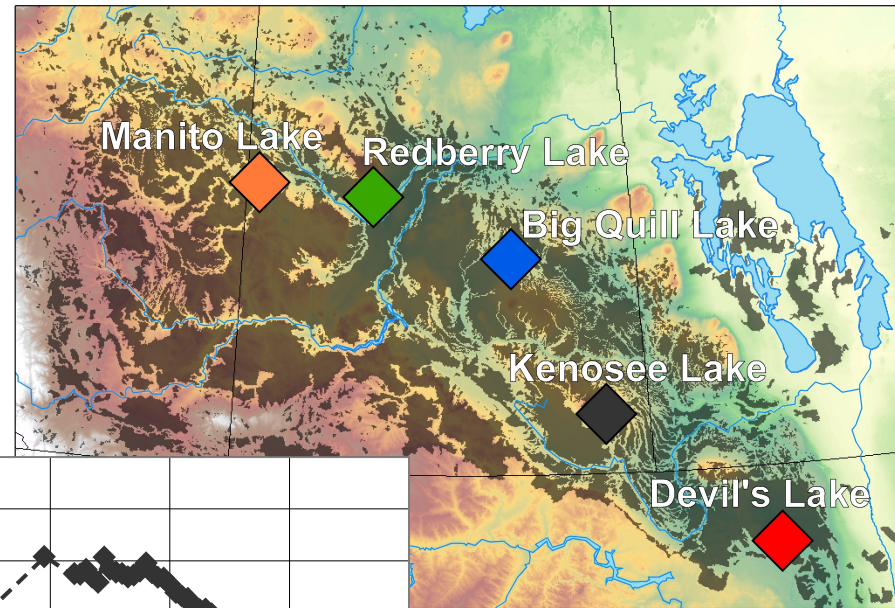
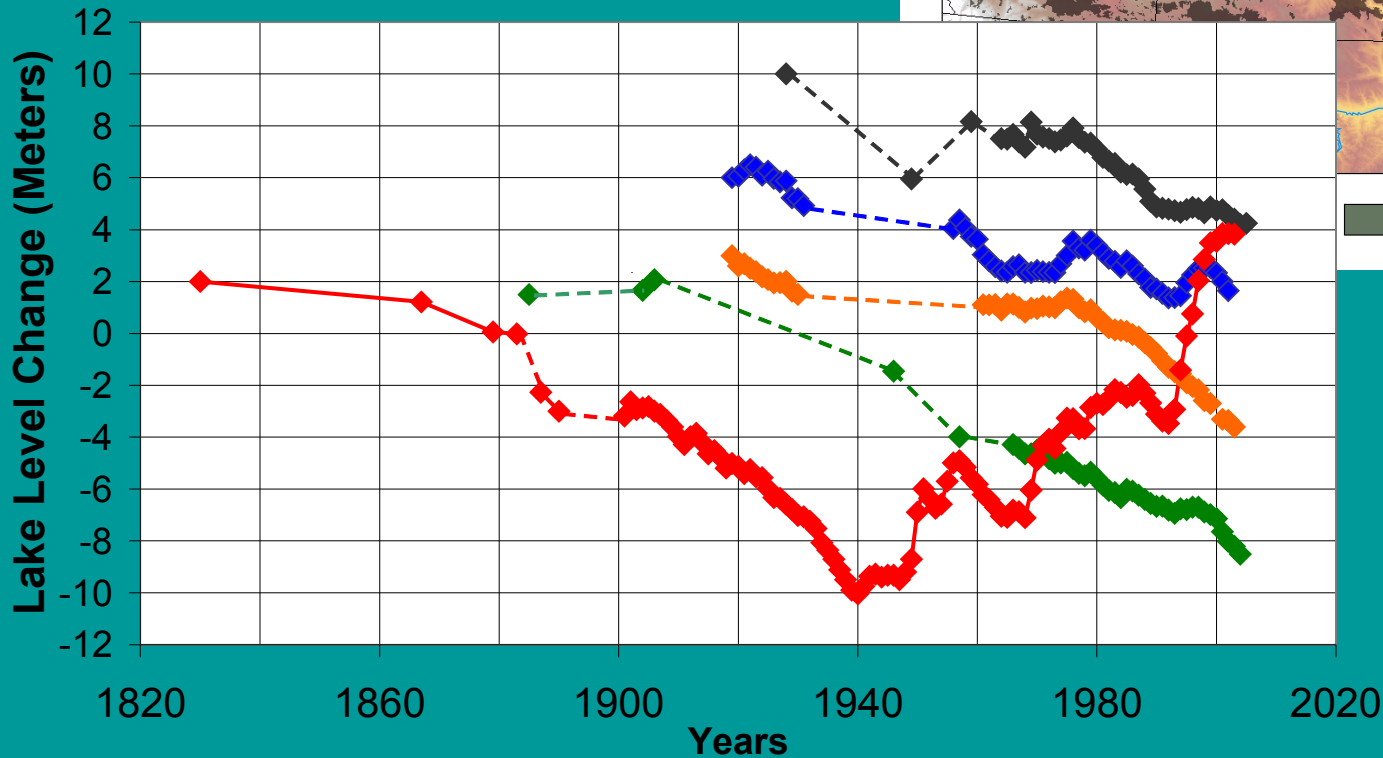


- snow surveys – continuous gauging and manual surveys
- soil moisture – local: TDR , Sentek tubes, etc.
- water levels in wetlands and lakes – manual measurements
- groundwater levels – water level records for shallow observation wells (with Dave Sauchyn, U of Regina).
- soil moisture –regional: geological weighing lysimeters (with Lee Barbour, U of Saskatchewan)

## Prairie lakes 1820 – 2004:

The water levels in Canadian prairie lakes have been falling while nearby Devil's Lake (ND) is rising since 1940:

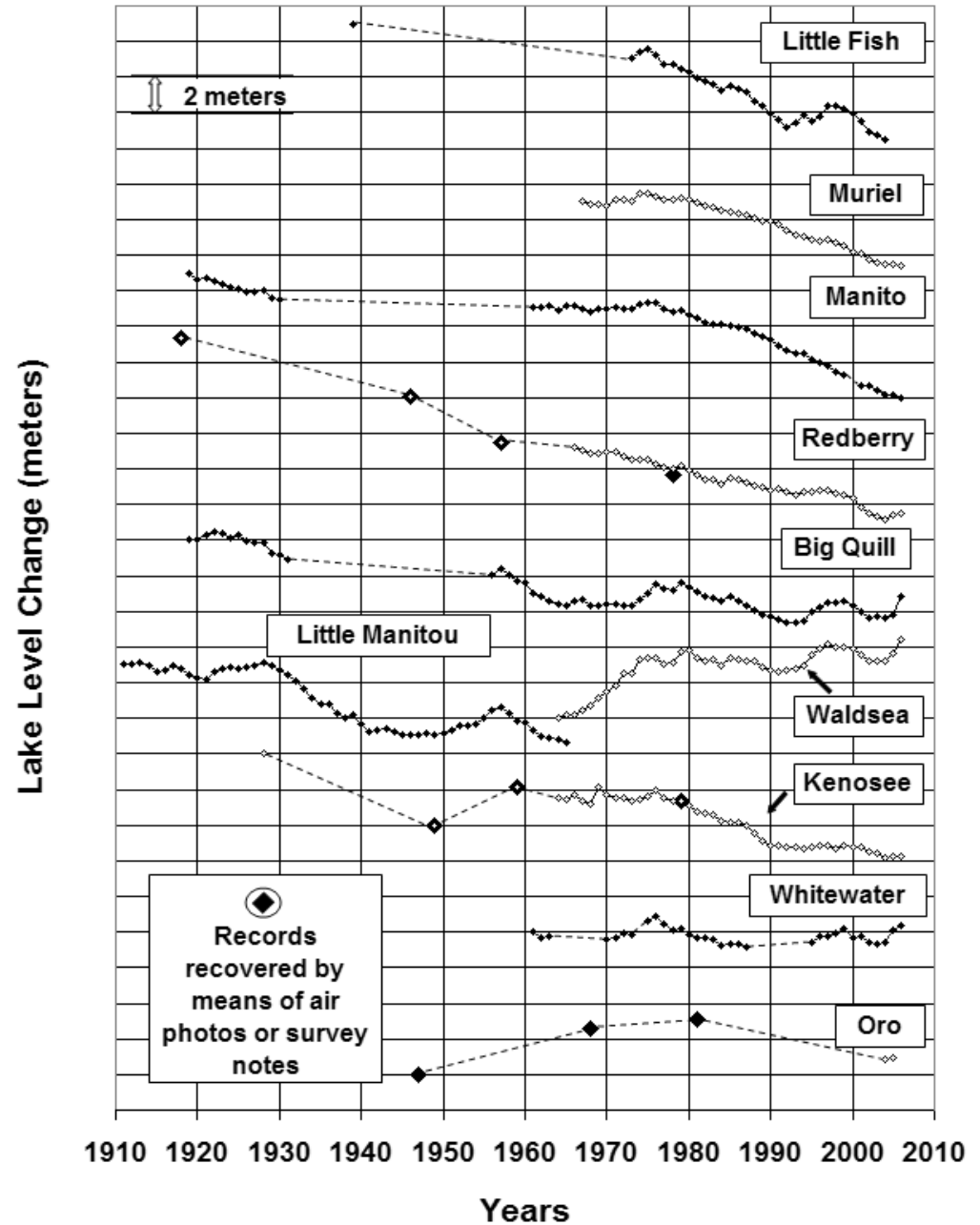
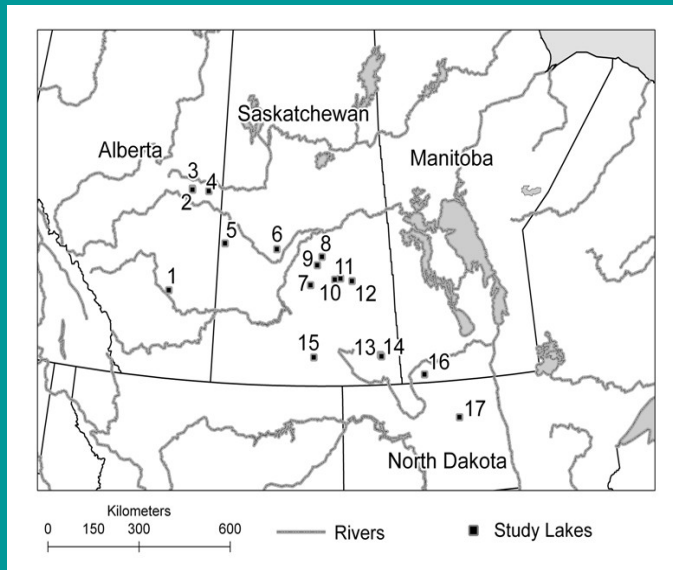
- Land-use change?
- Climate change?



Non Contributing Drainage Areas  
Drainage Data from the Prairie Farm Rehabilitation Administration (PFRA)

- ◆ Kenosee Lake (SK)
- ◆ Big Quill Lake (SK)
- ◆ Manito Lake (SK)
- ◆ Redberry Lake (SK)
- ◆ Devil's Lake (USA)

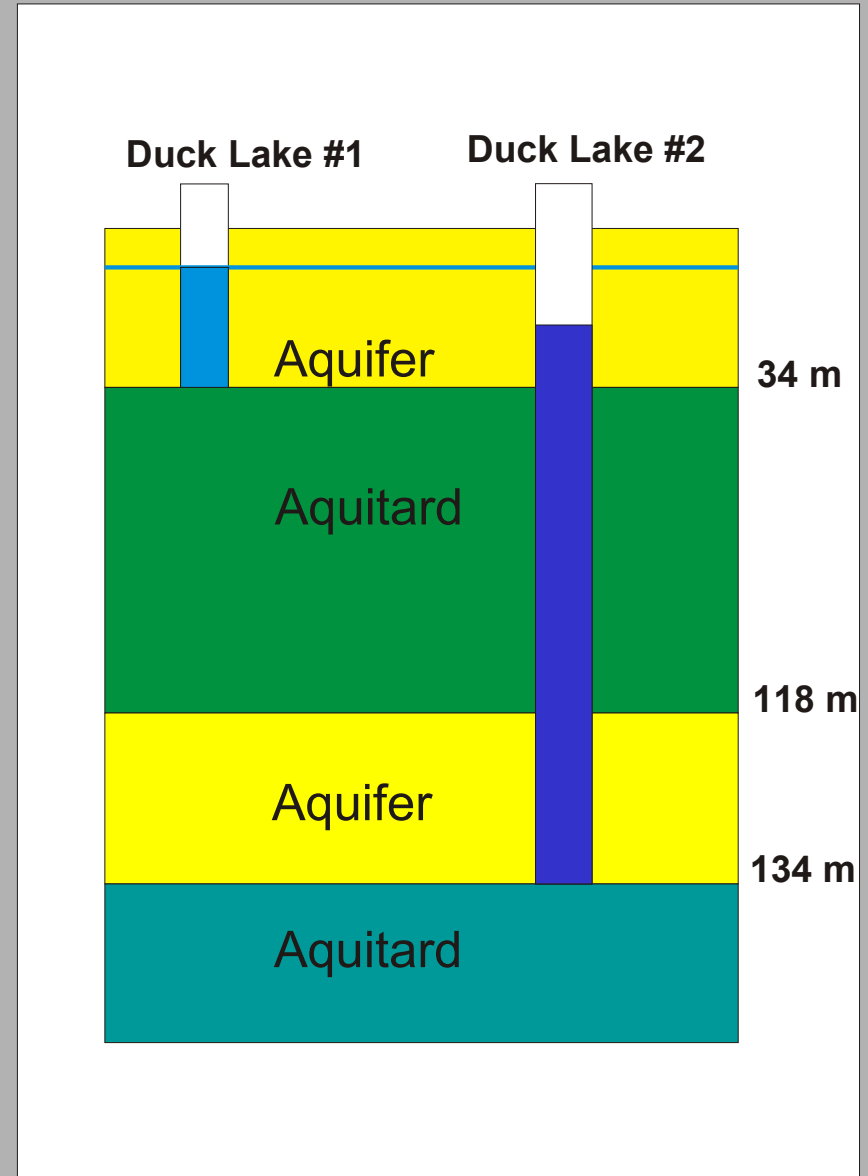
# Lake level changes in closed-basin prairie lakes, 1910-2006



# Duck Lake SK observation wells - observed water levels since 1964

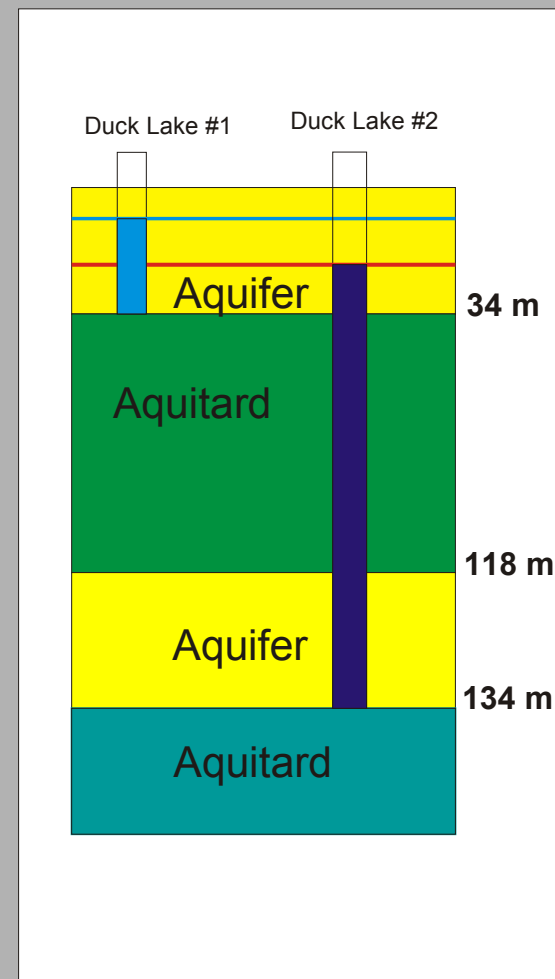
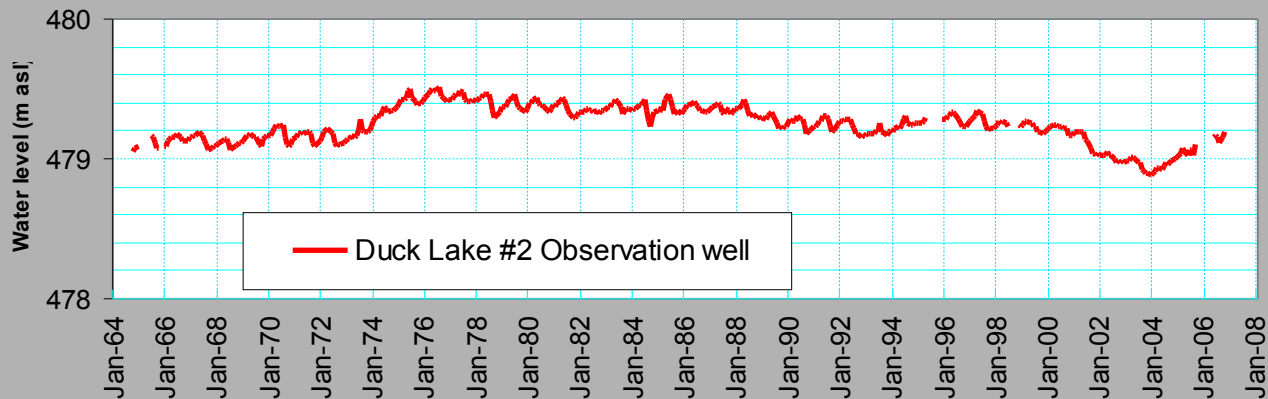
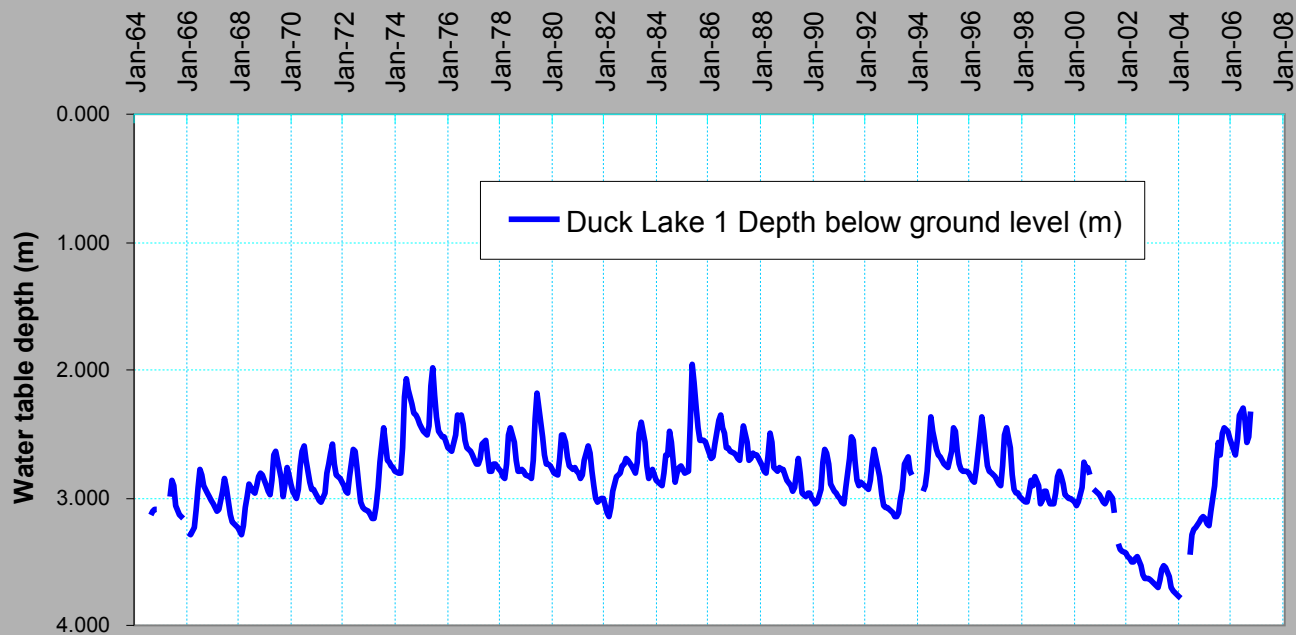


Spring of 2001 (looking south)



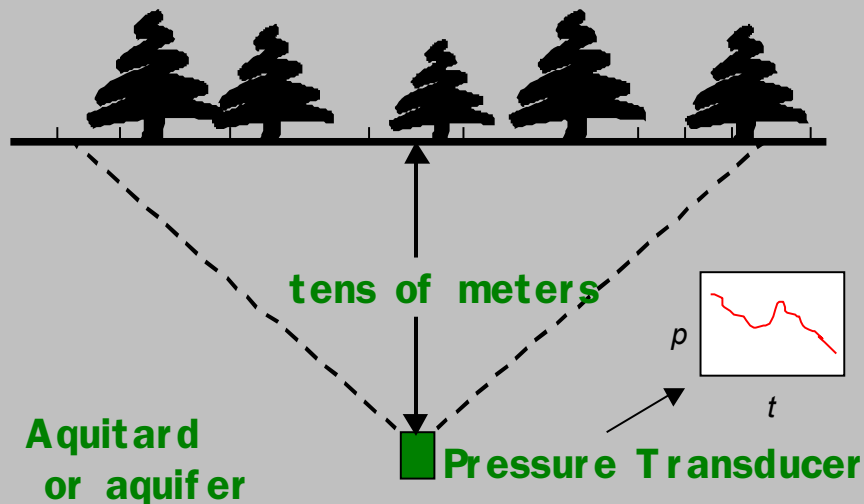
# Duck Lake SK Observation wells: water levels, 1964-2006

[Source: SK Watershed Authority, [www.swa.ca](http://www.swa.ca)]



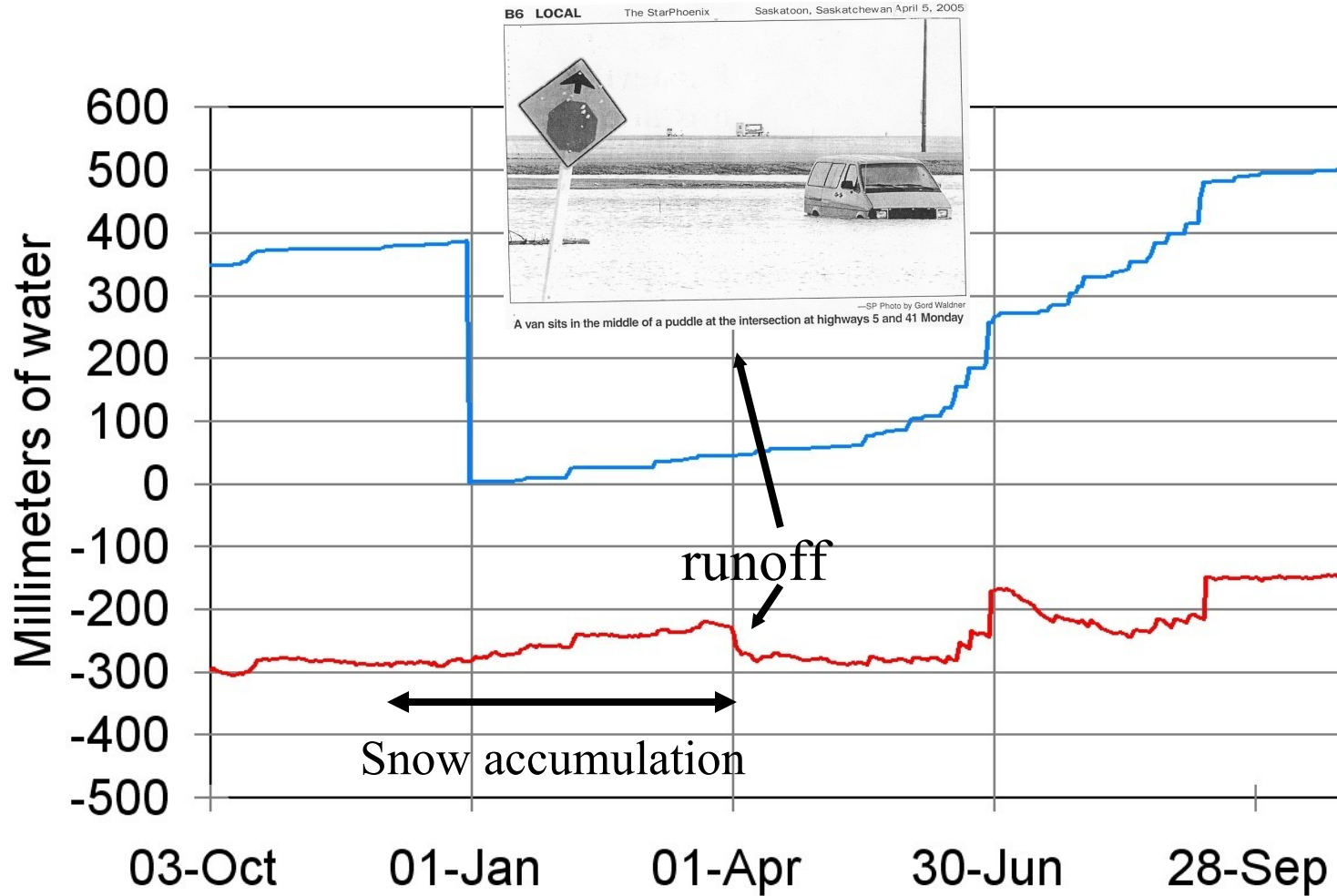
# Geological Weighing Lysimeter Concept

- Deep in thick, unfractured clay formations and in confined aquifers, changes in groundwater pressure are caused by changes in mass loading.
- Similar to conventional weighing lysimeters but on a much larger scale and with no significant disturbance of site.



# Geological weighing lysimeter - Kernen Farm SK

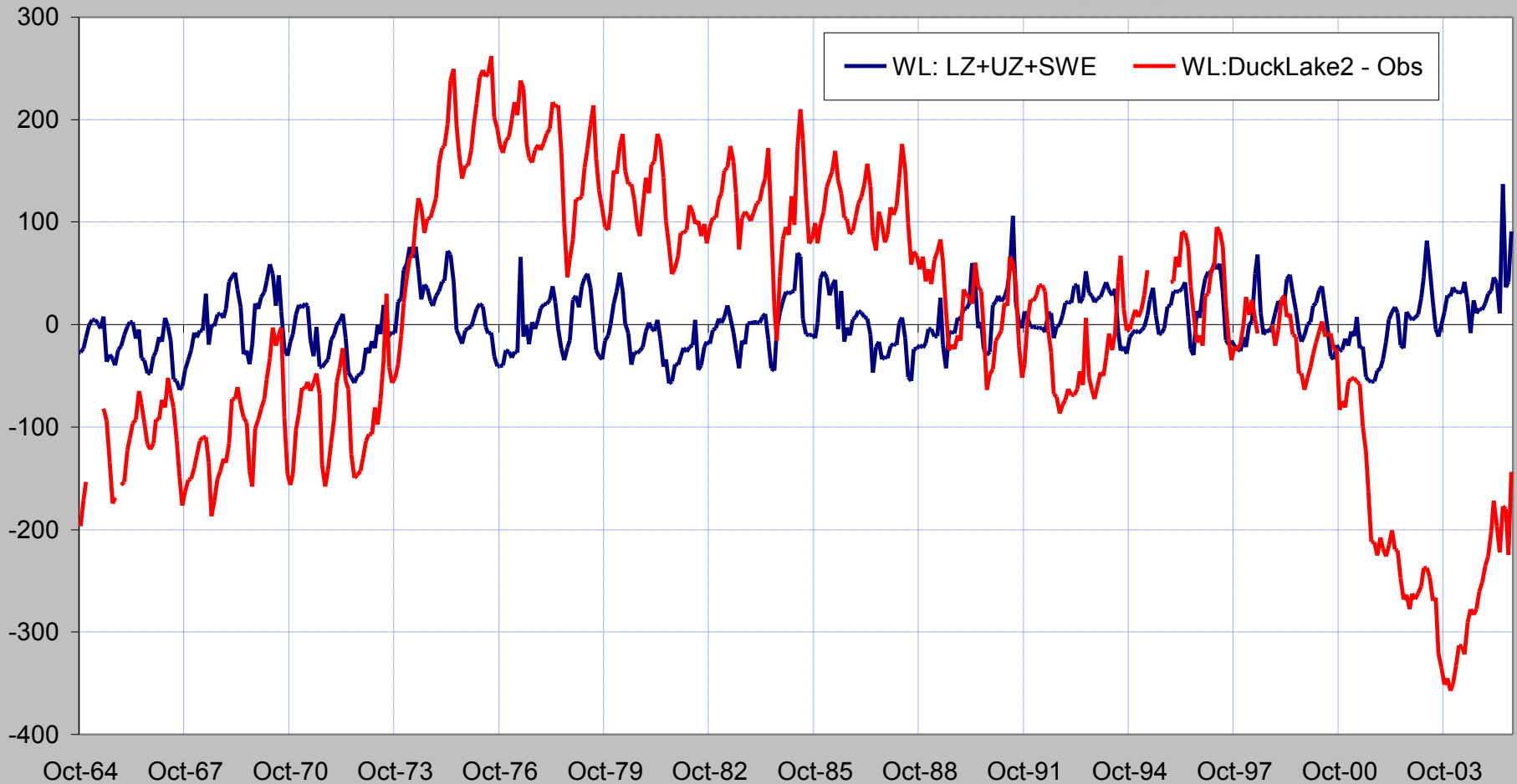
*vertical water balance and annual cumulative precipitation 2004-2005*





# DuckLake# 2 1964-2005 Vertical water balance: Observation well record vs Watflood model results

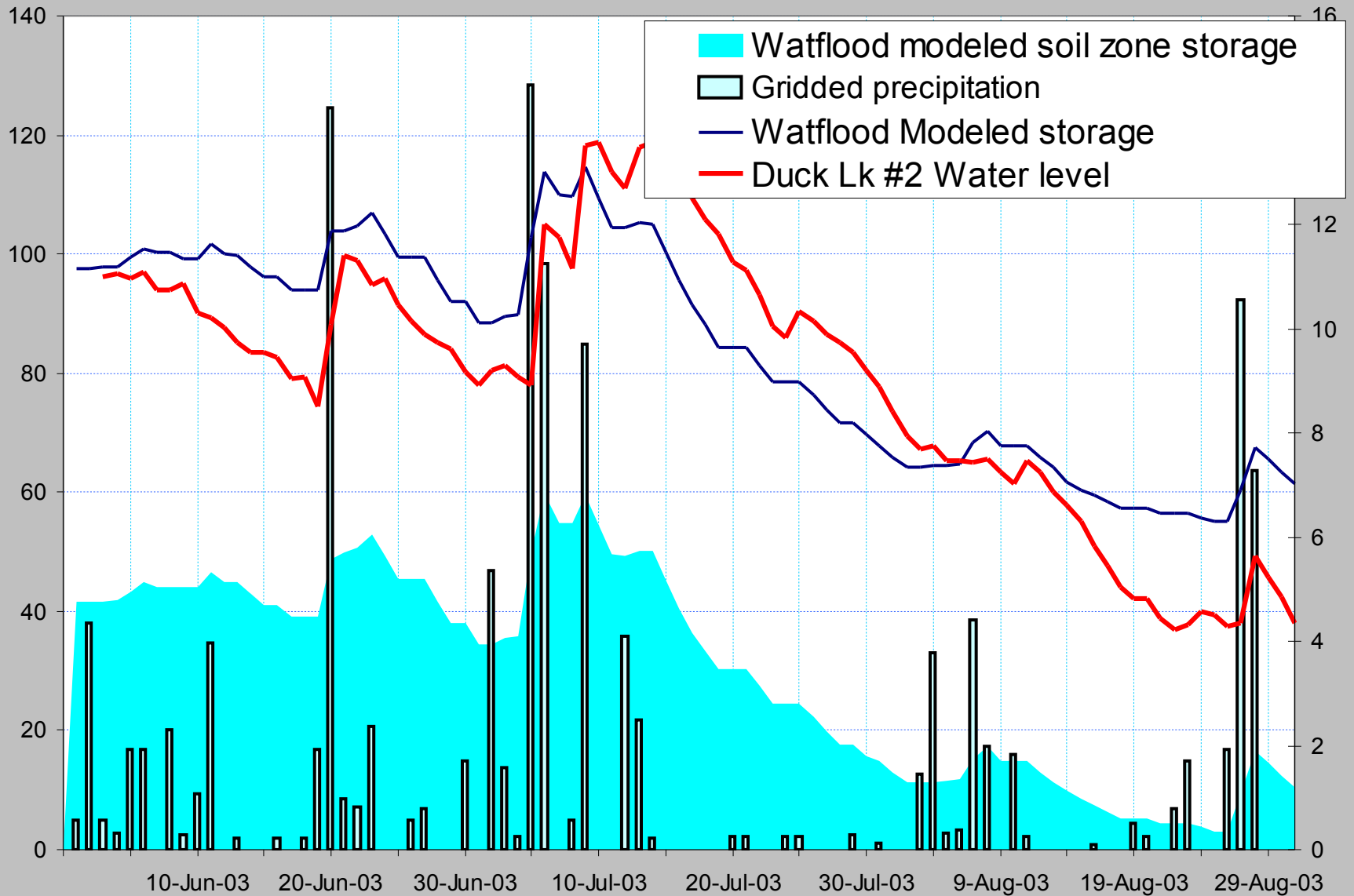
Water Level Variation at Duck Lake2 [mm]



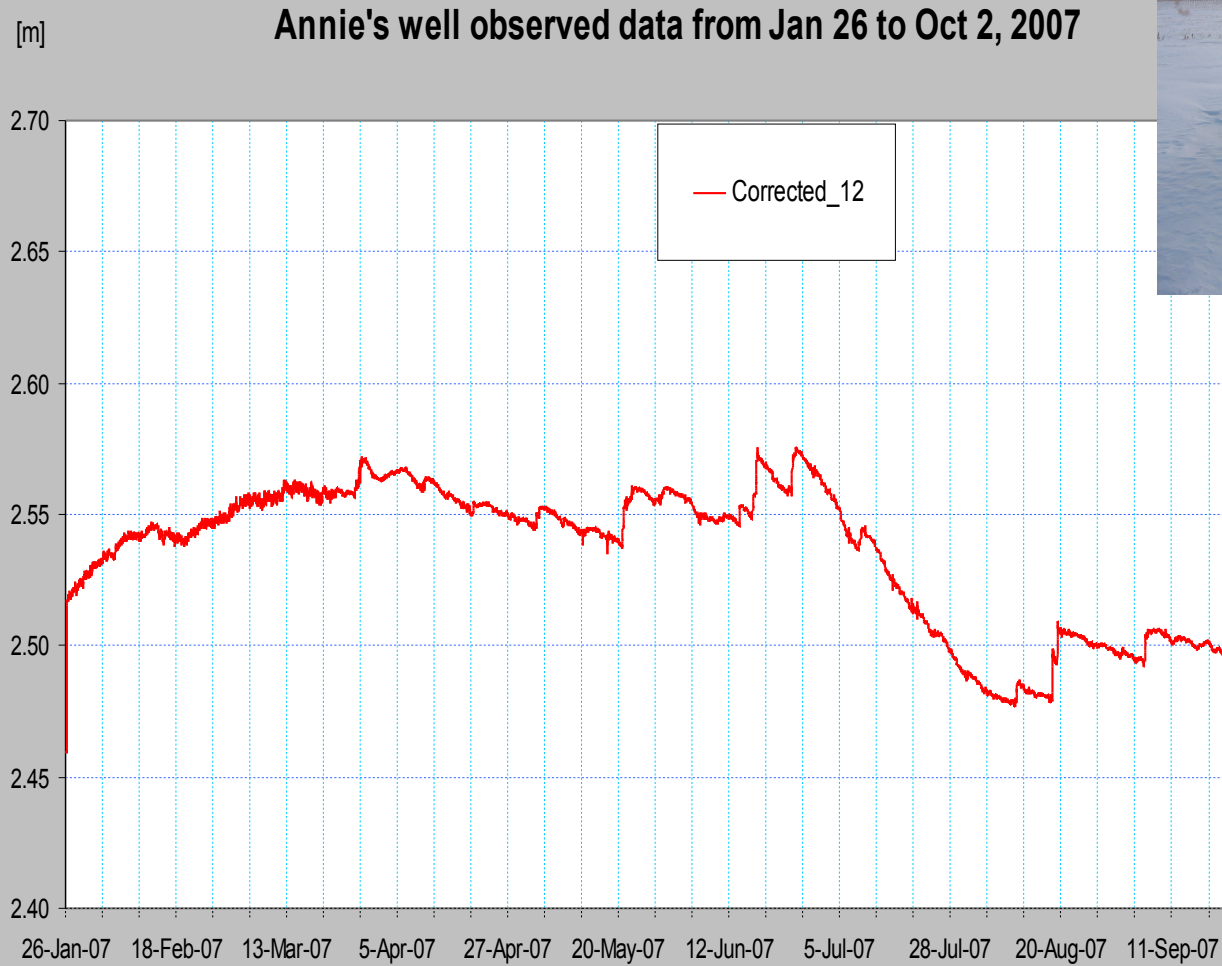
# Duck Lk # 2: June to August 2003, with modeled soil moisture

WL, UZ (mm)

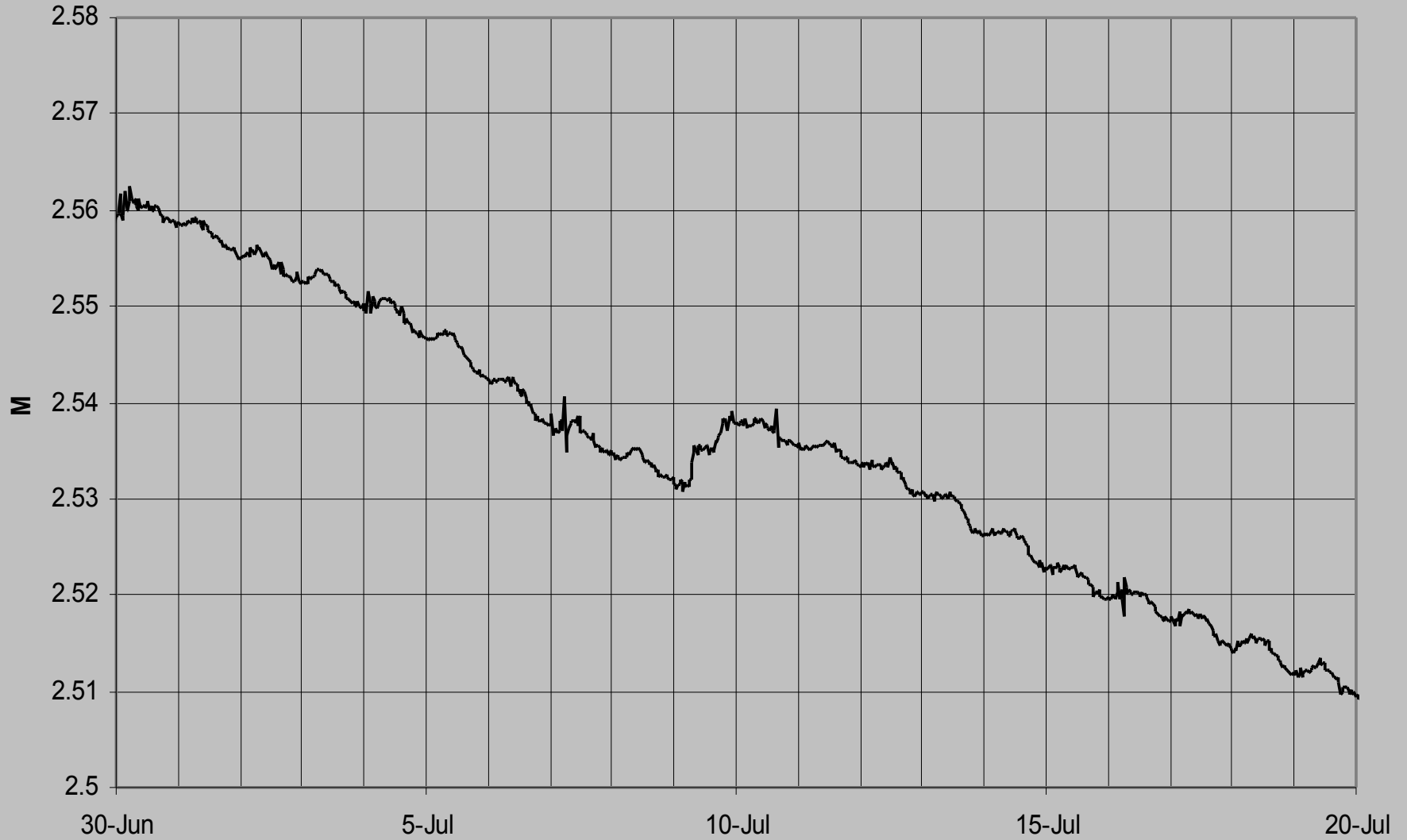
Precip (mm)



# Annie's well, near Outlook SK, Depth: 198 m



# Annie's Well, June 30 - July 20, 2007



Thank you !

