

# Hydrogeology of the Deep Confined Aquifer

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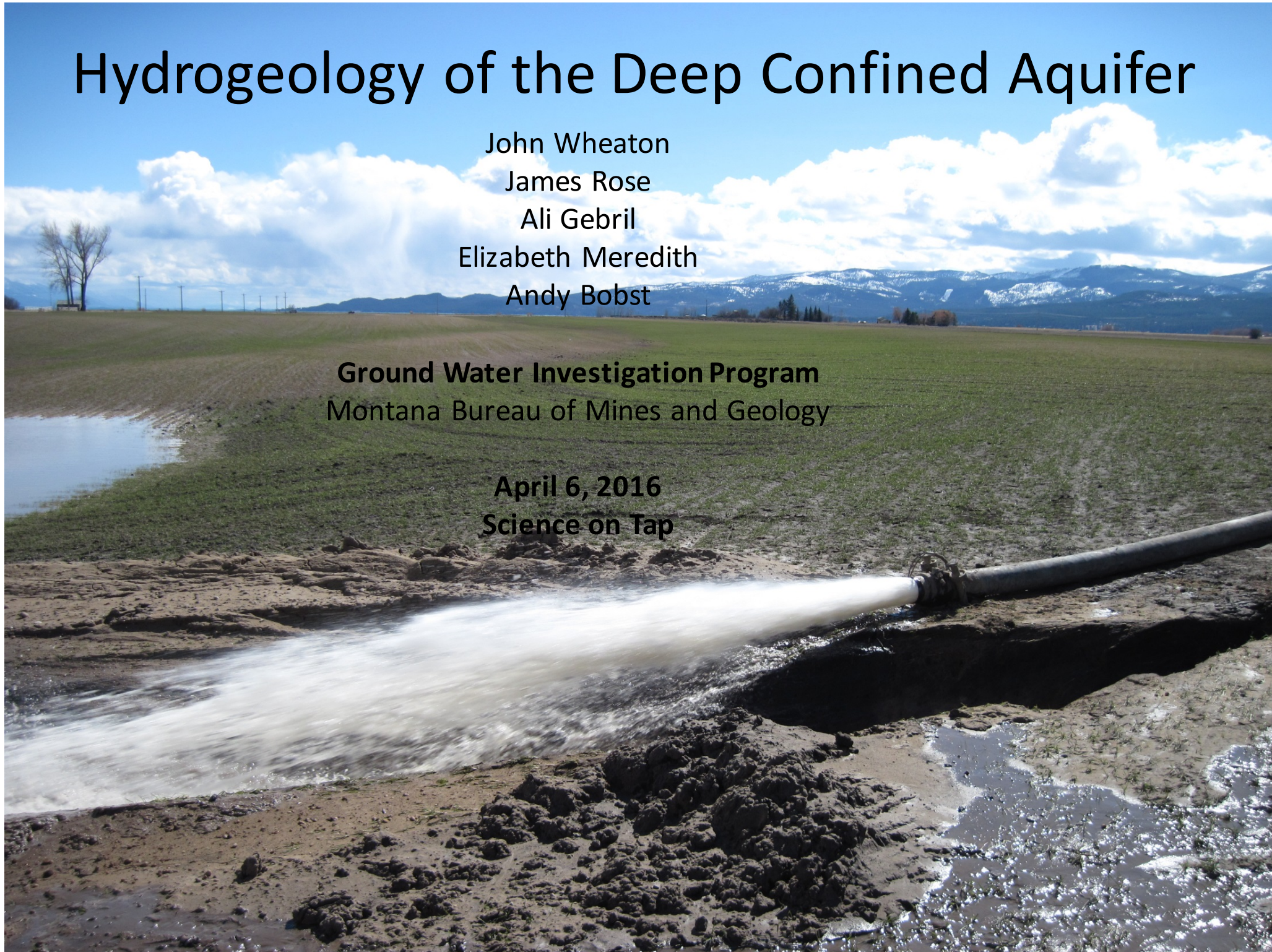
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**Science on Tap**



# First A little terminology

## **Water Table or Unconfined Aquifer**

Shallow

## **Confined Aquifer or Artesian**

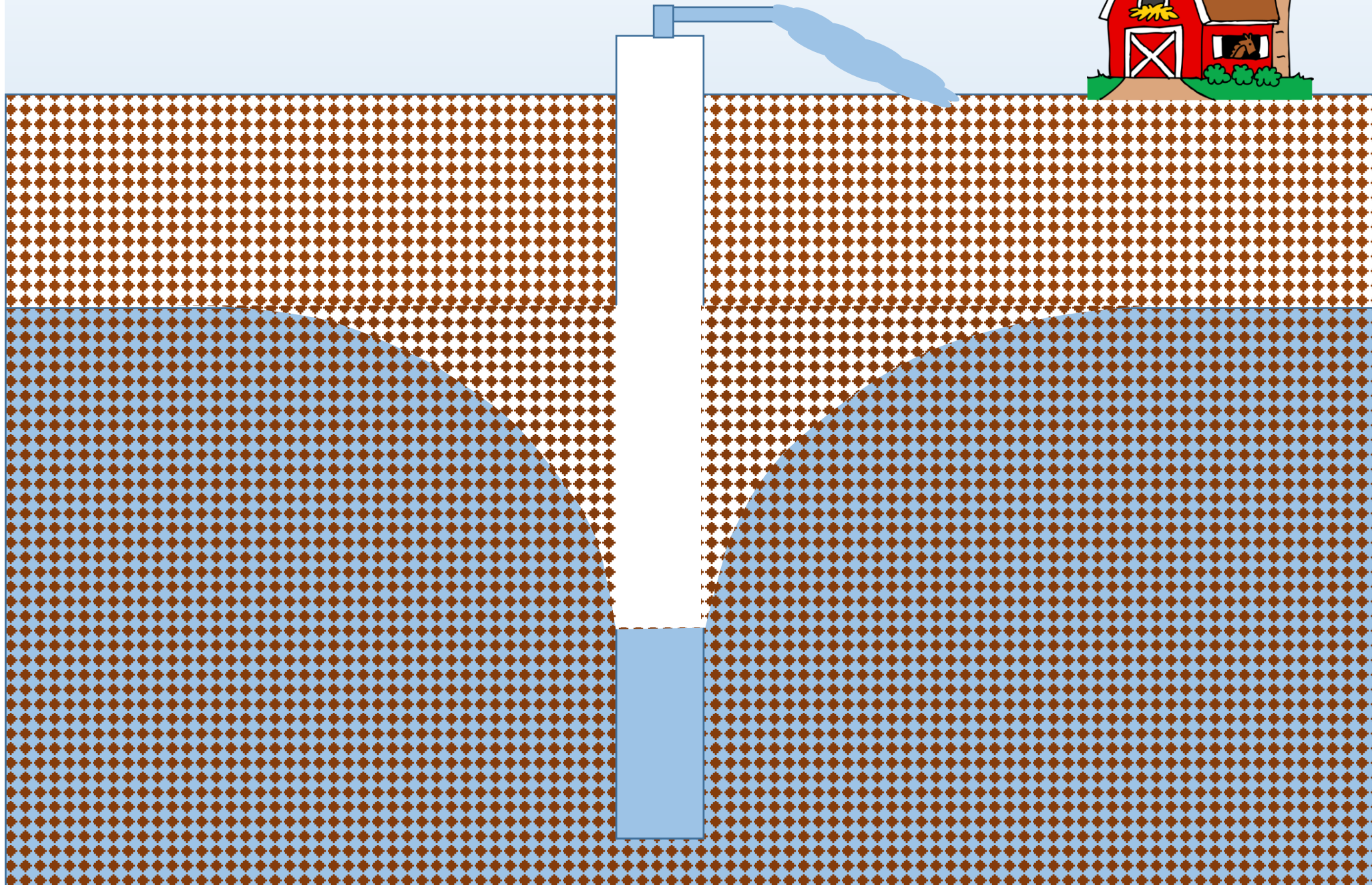
Deeper

Beneath a confining layer

**Flowing wells are special cases**

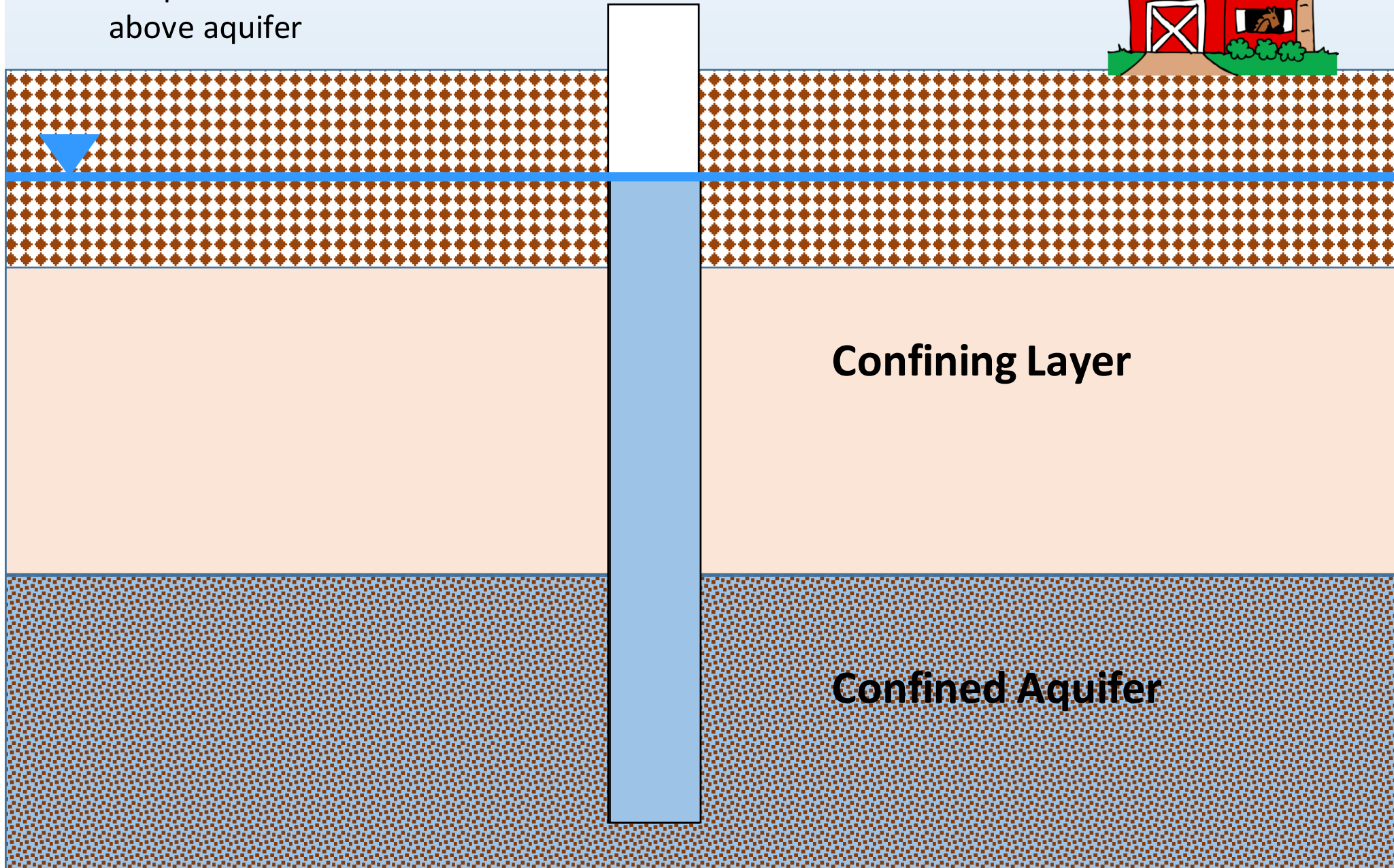
# Unconfined Aquifer (water table)

Water is drained from pores between sand and gravel cobbles



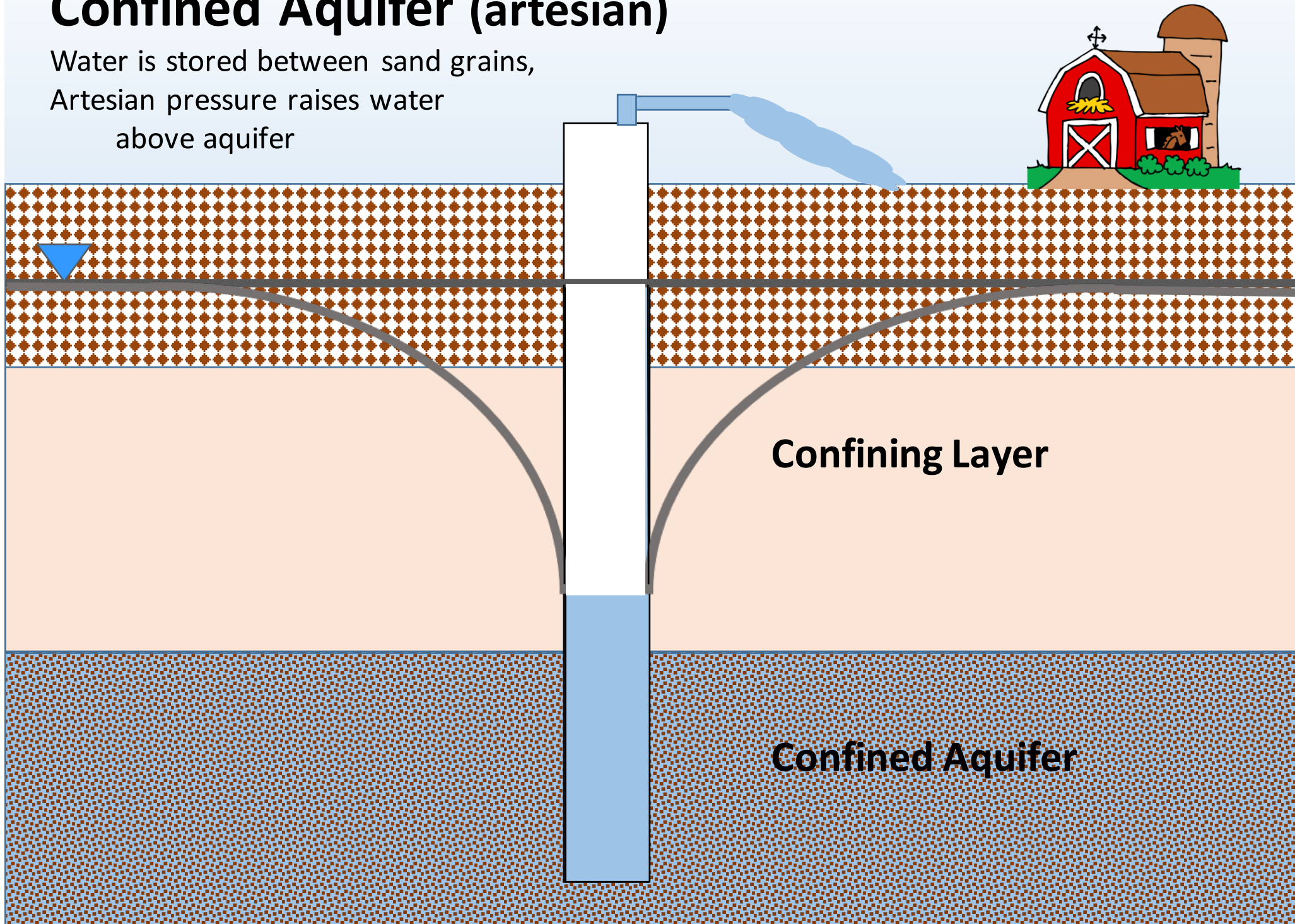
# Confined Aquifer (artesian)

Water is stored between sand grains,  
Artesian pressure raises water  
above aquifer



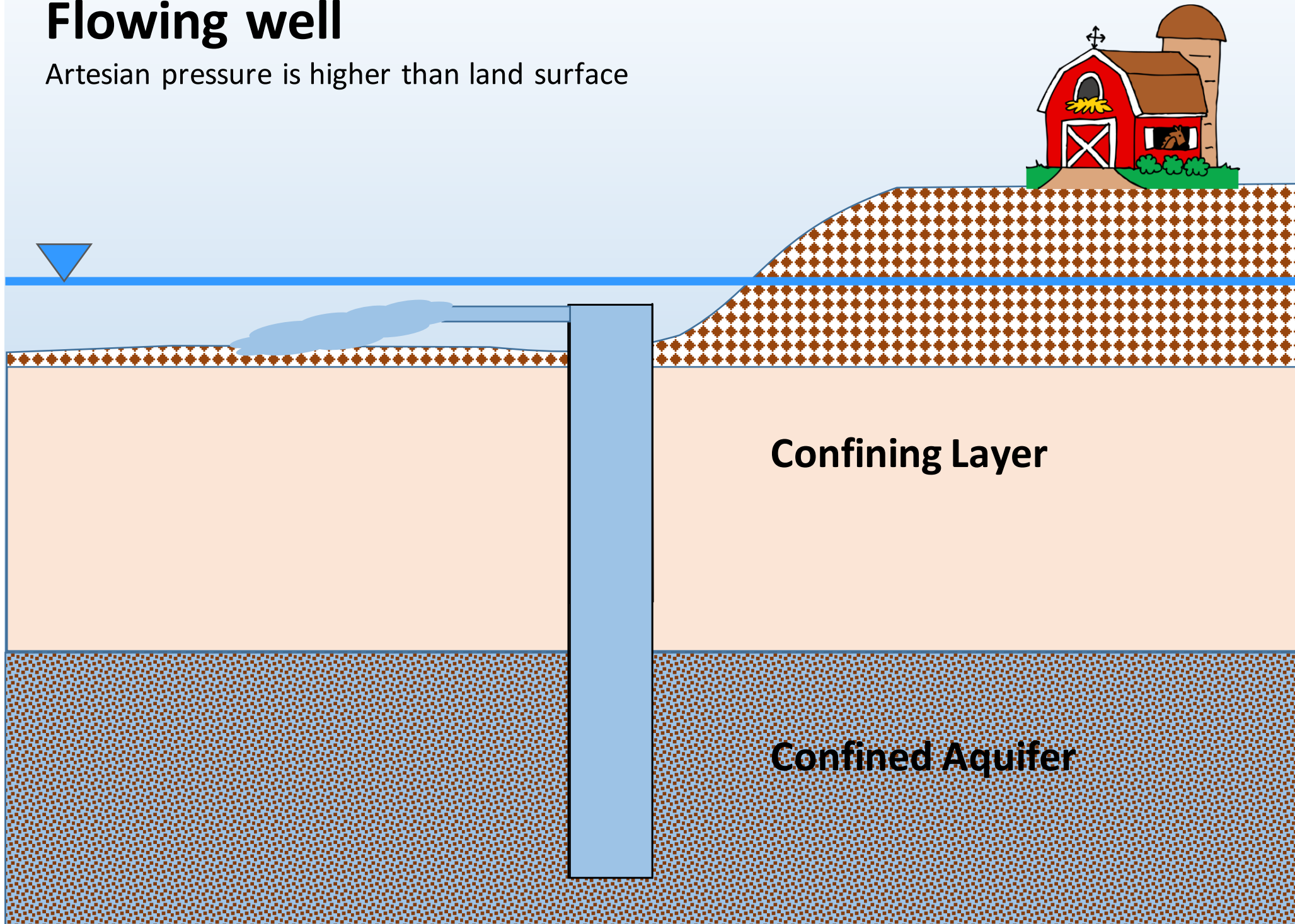
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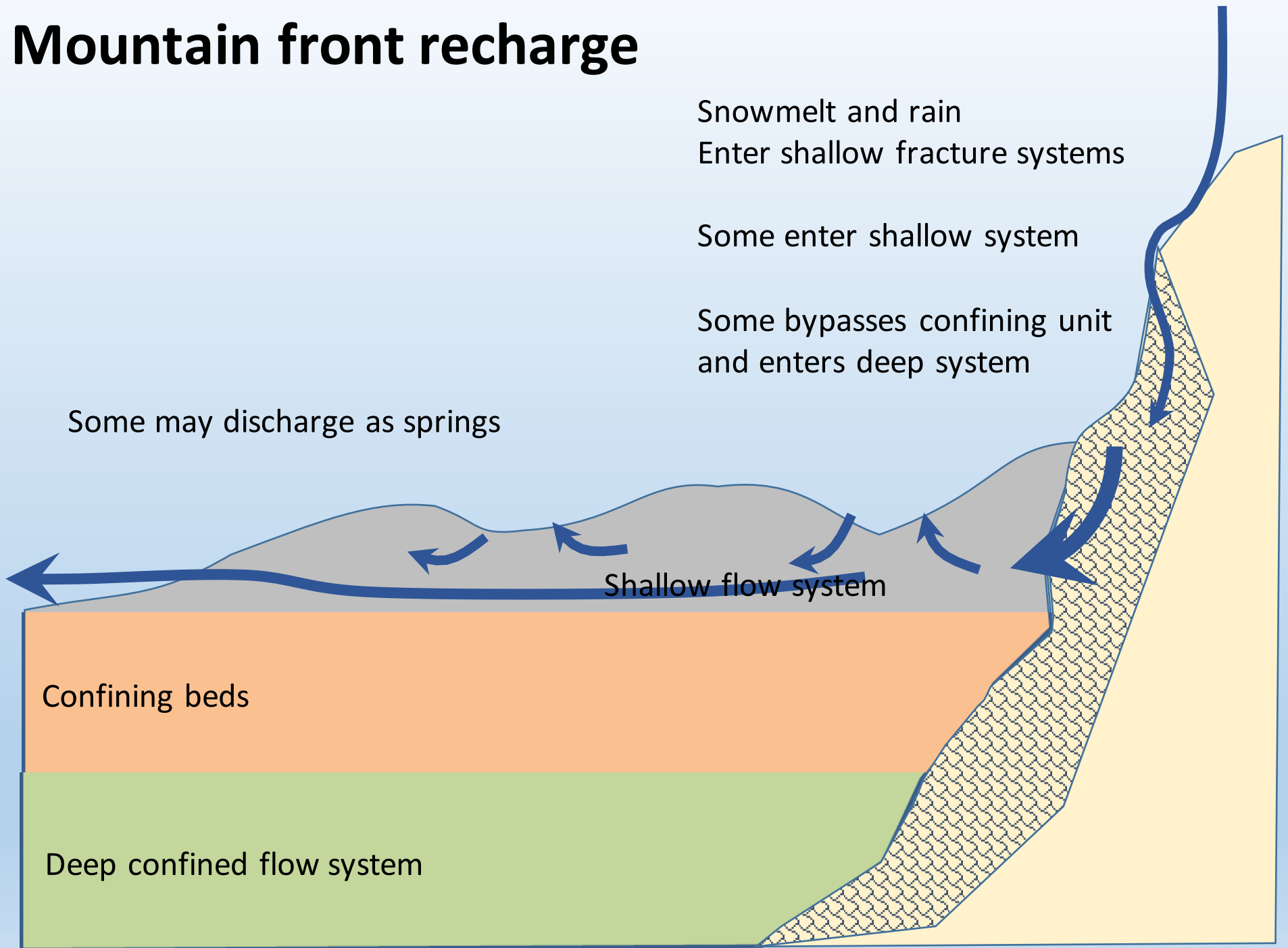


# Flowing well

Artesian pressure is higher than land surface



# Mountain front recharge









03/13/2012



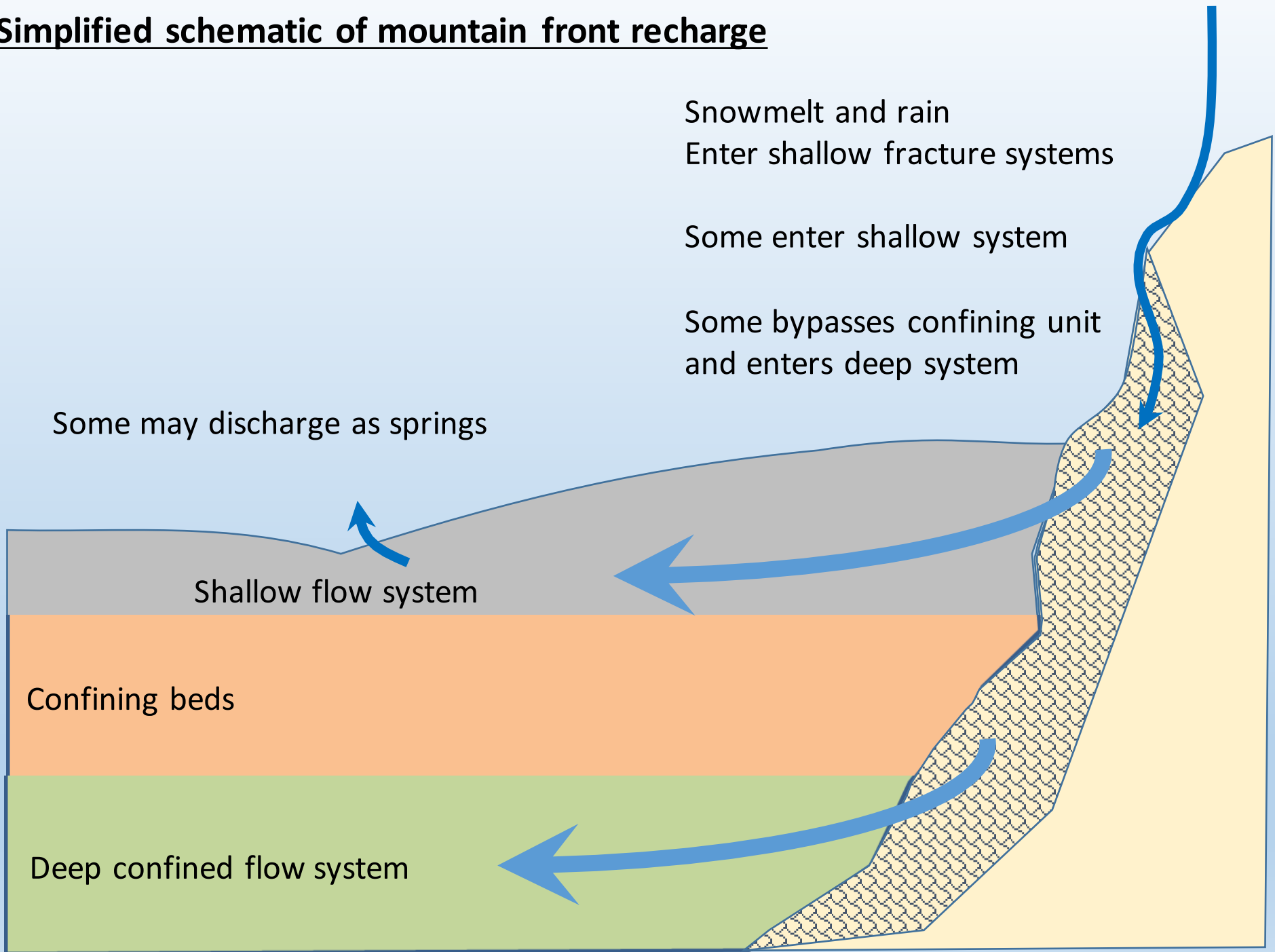
## Simplified schematic of mountain front recharge

Snowmelt and rain  
Enter shallow fracture systems

Some enter shallow system

Some bypasses confining unit  
and enters deep system

Some may discharge as springs



Shallow flow system

Confining beds

Deep confined flow system



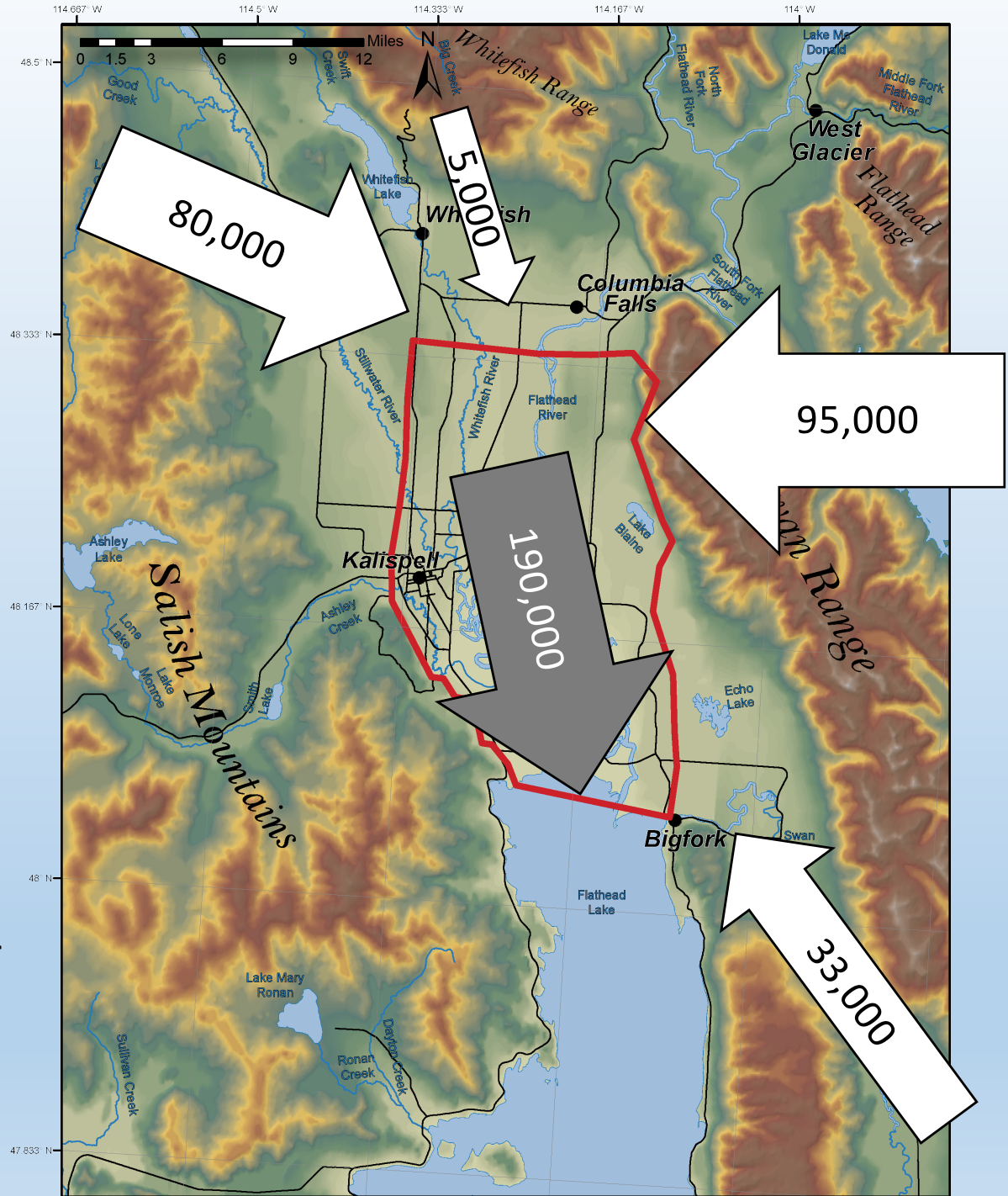
# Deep Aquifer Groundwater Budget (2011)

Values are approximate  
Based on statistical mean

Inflow = 213,000 acre-feet / year  
300 cfs

Pumping = 25,000 acre-feet / year  
32 cfs

Outflow = 189,000 acre-feet / year  
260 cfs



## One final comparison

Flathead River near Polson

Annual discharge, 2009 ----- **6,700,000 acre-feet**

Estimated Deep Aquifer water rights

Flathead Valley

Annual total, 2009 ----- **52,162 acre-feet**

Estimated Deep Aquifer Pumping

Flathead Valley

Annual total, 2010 ----- **17,484 to 35,234 acre-feet**

# Looking for the groundwater / surface water connection in Flathead Lake







