

The Basic Science of Ground-Water/Surface-Water Hydrology

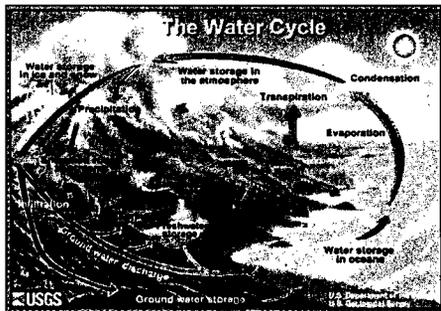
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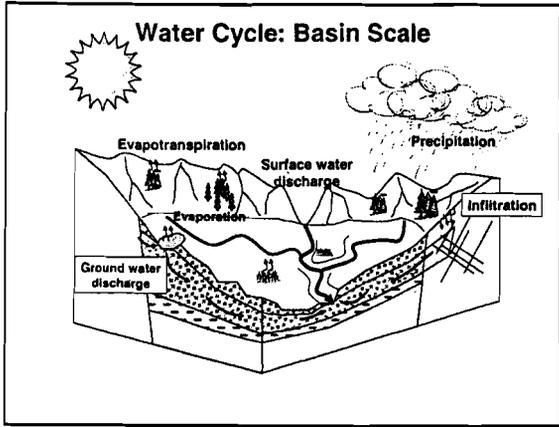


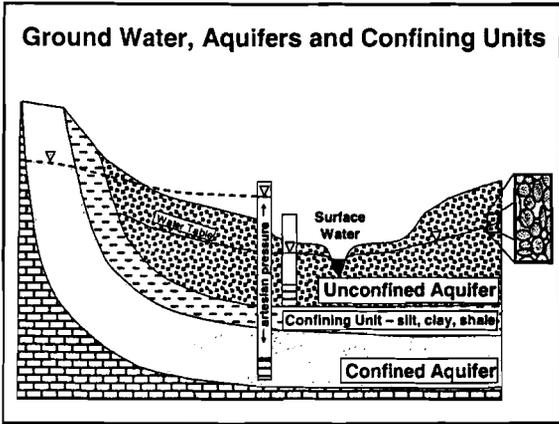
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Helena
March 10, 2004

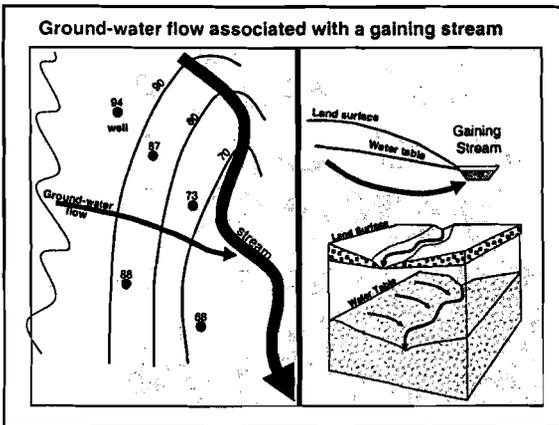
Essential Definitions

- **Aquifer:**
 - A permeable geologic unit that can **transmit** and **store** significant quantities of water.
- **Transmissivity:**
 - Capacity of the aquifer to transmit water
- **Storativity:**
 - Capacity of an aquifer to take in and release water

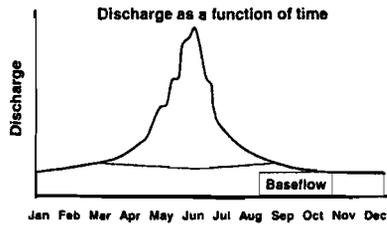






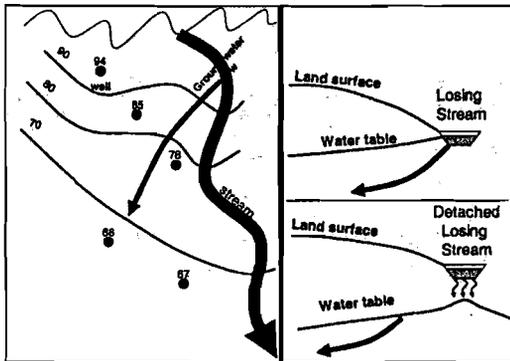


Seasonal Stream-Flow Hydrograph



- Major portion of flow ultimately derived from baseflow
 - On average, ground water ~ half of annual flow
 - In dry periods, ground water contributes almost all flow

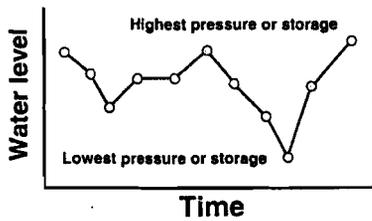
Ground-water flow associated with a losing stream



Ground-Water Hydrograph:

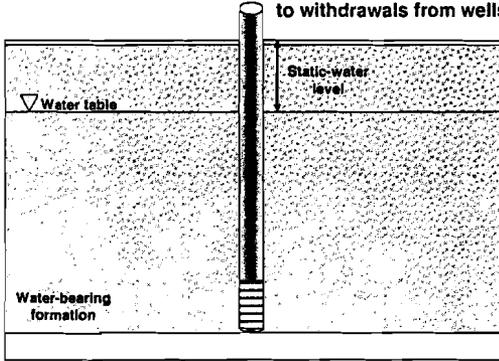
Water-level measurements vs. time

Aquifer storage or pressure vs. time

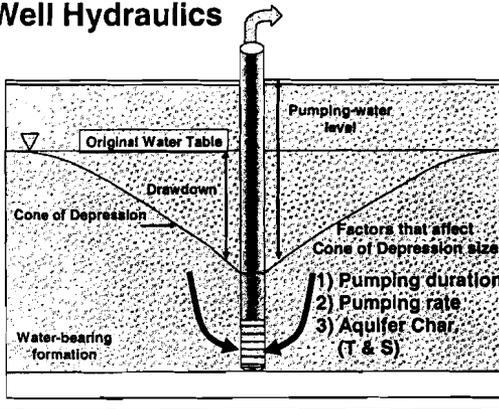


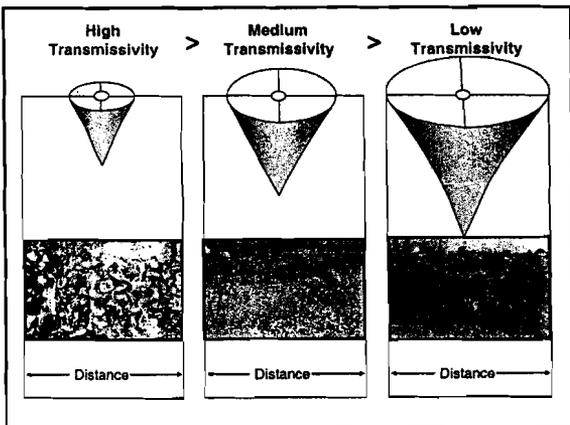
Well Hydraulics

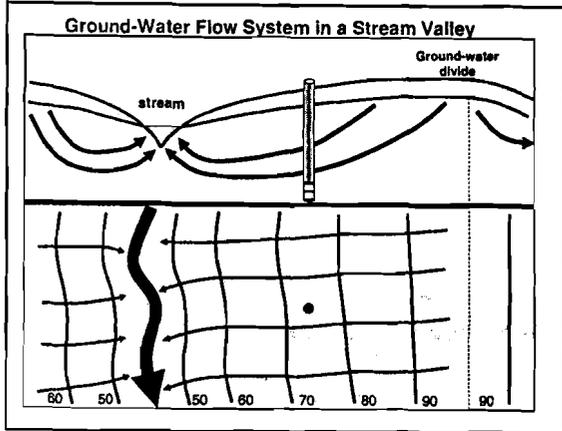
How do aquifers respond to withdrawals from wells?

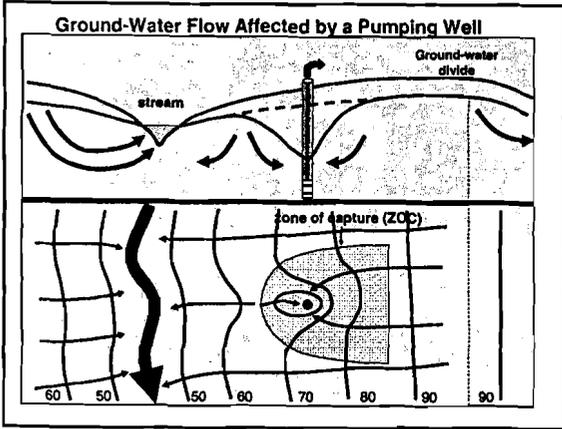


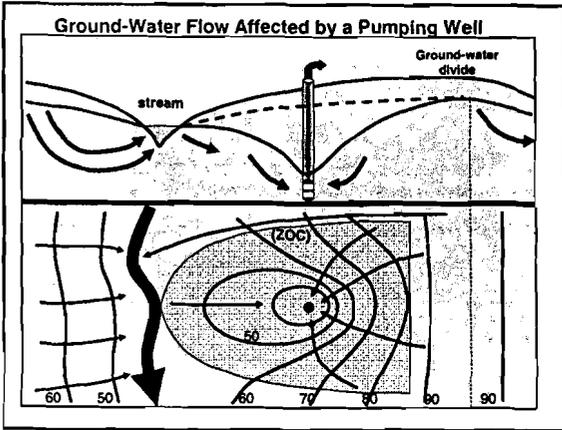
Well Hydraulics

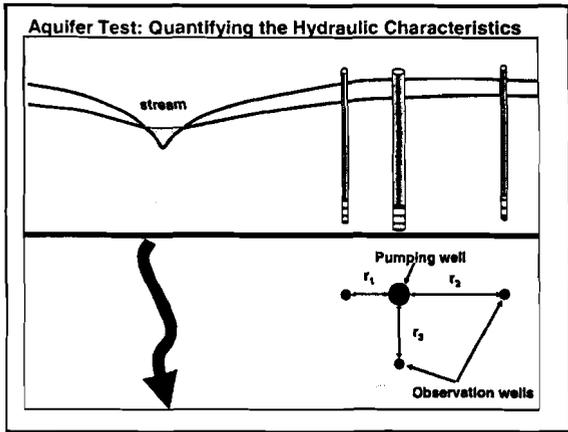


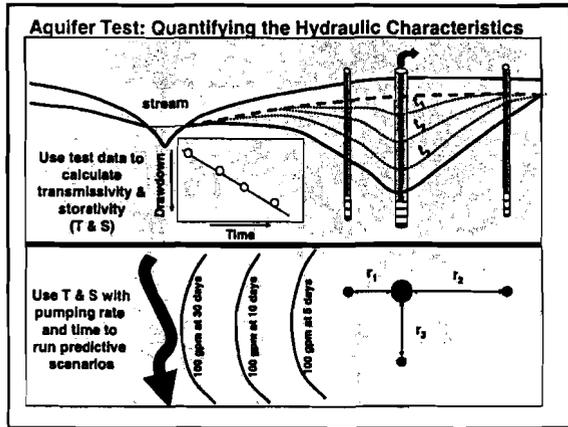












Quick Review

- Water is transferred between the atmosphere – surface - below ground
- Shallow ground water and surface water are typically interconnected
- Understanding the ground-water system requires data from wells
- Some western Montana examples

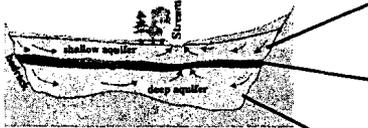
Northwestern Montana



Series of Intermontane Basins.

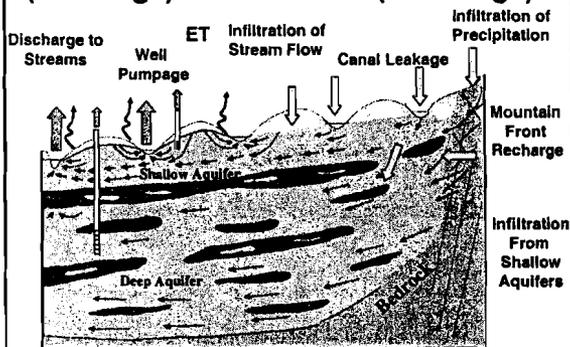
- The basins are structurally down dropped relative to the surrounding mountains.
- Mountains composed of "bedrock"
- Basins are filled with unconsolidated "basin fill" or "alluvium"

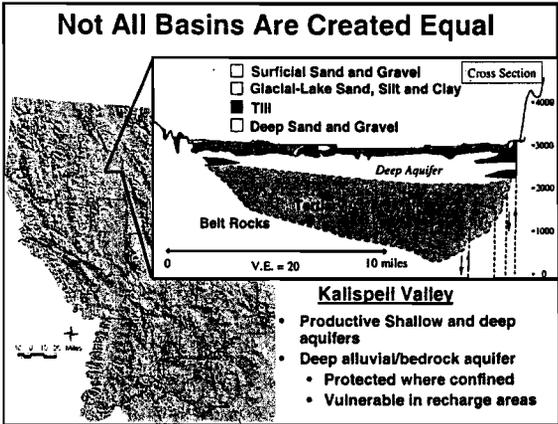
Alluvial Aquifers

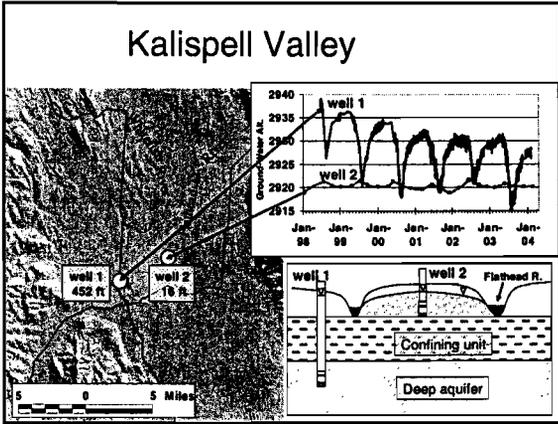


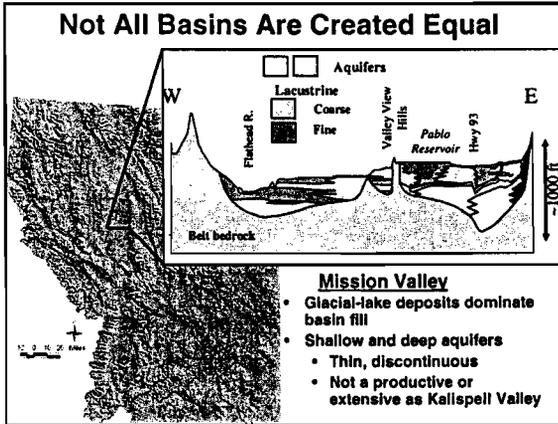
- Shallow and deep
- Generally contain abundant water
- Most utilized aquifers
- Shallow: hydraulically connected to streams
- Deep: confined or "artesian"

Where Does the Water Come From (Recharge) ... and Go To (Discharge)?

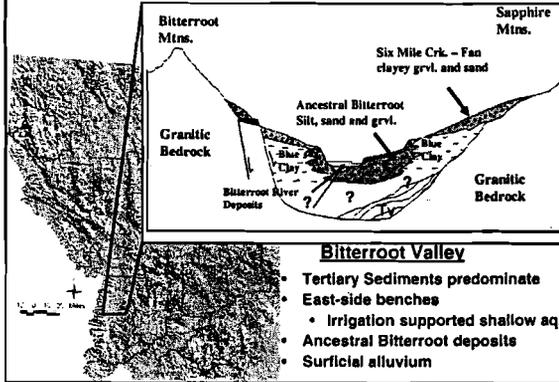




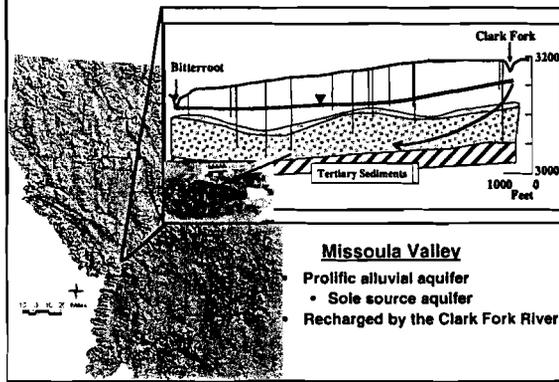




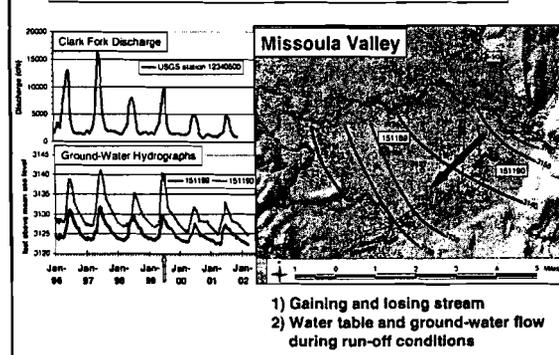
Not All Basins Are Created Equal



Not All Basins Are Created Equal



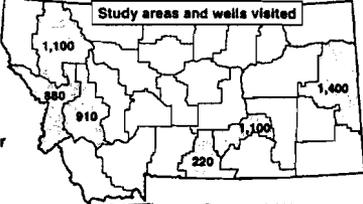
Ground Water/Surface Water Interaction



Summary

- To understand ground-water/surface-water interactions:
 - 1) Hydrogeologic Framework
 - can be complex
 - 2) Ground-Water level Information
 - **spatial**: assess ground-water flow
 - **temporal**: assess long and short-term storage changes
 - 3) Hydraulic Characteristics
 - aquifer test (T & S)
 - evaluate predictive scenarios

Ground-Water Characterization Areas
provides the basic framework for more detailed ground-water evaluations



Ground-Water Monitoring Network
850 wells state wide that are used to monitor water levels and water quality for the long term.

<http://mbmgwic.mtech.edu>

Contact Information:

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