GROUNDWATER MOVEMENT AND STORAGE

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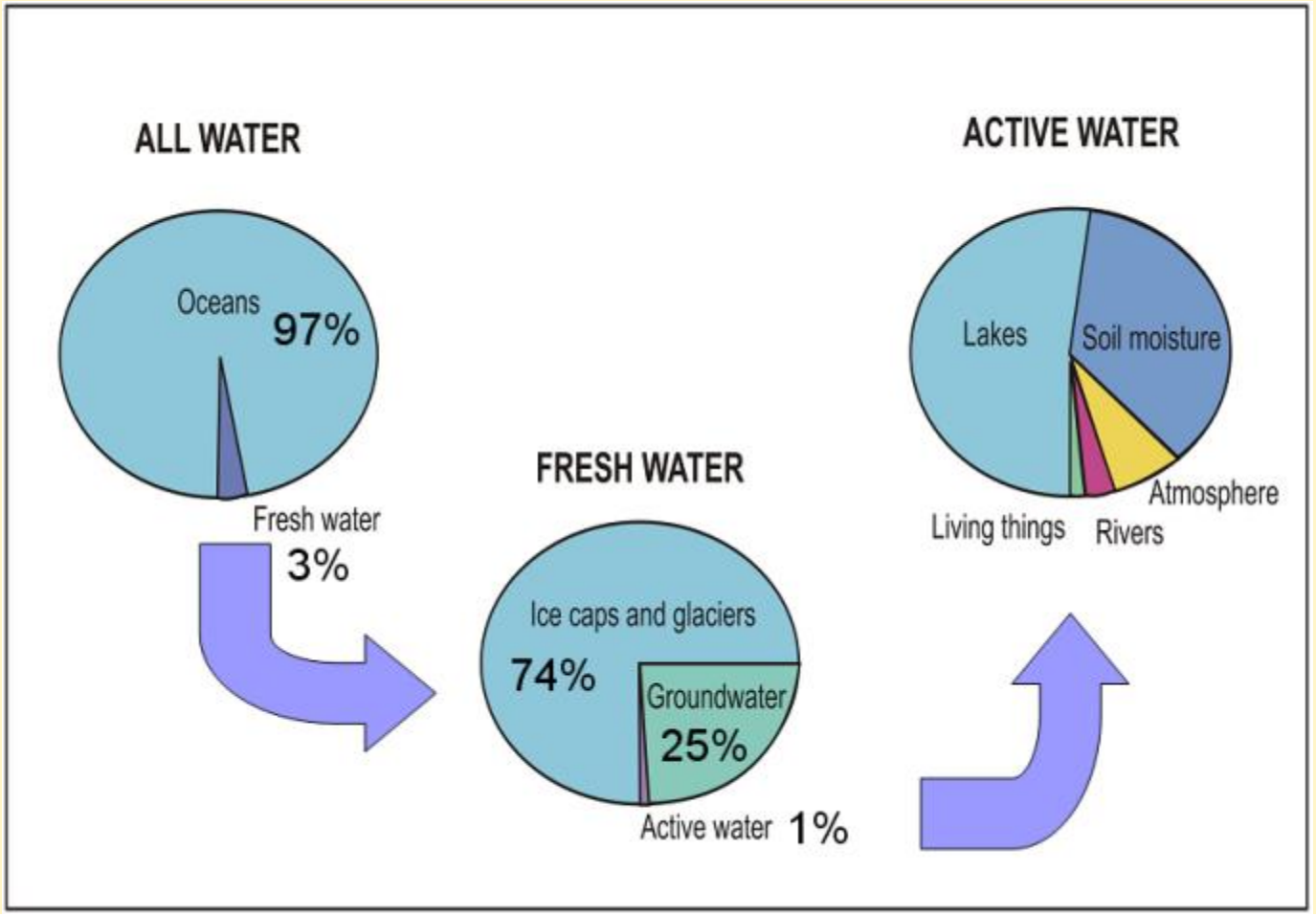
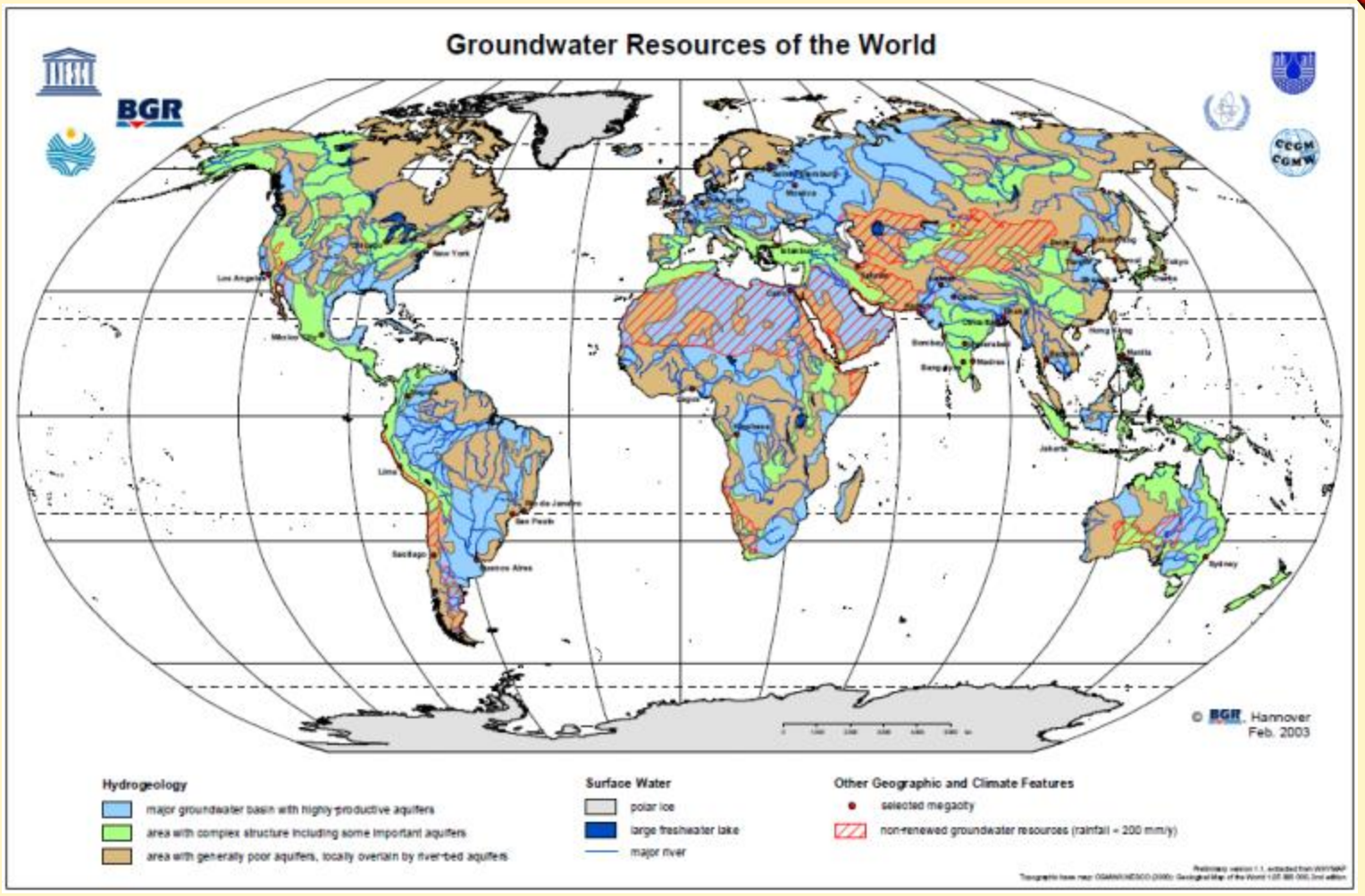
Overview of the Groundwater Resource

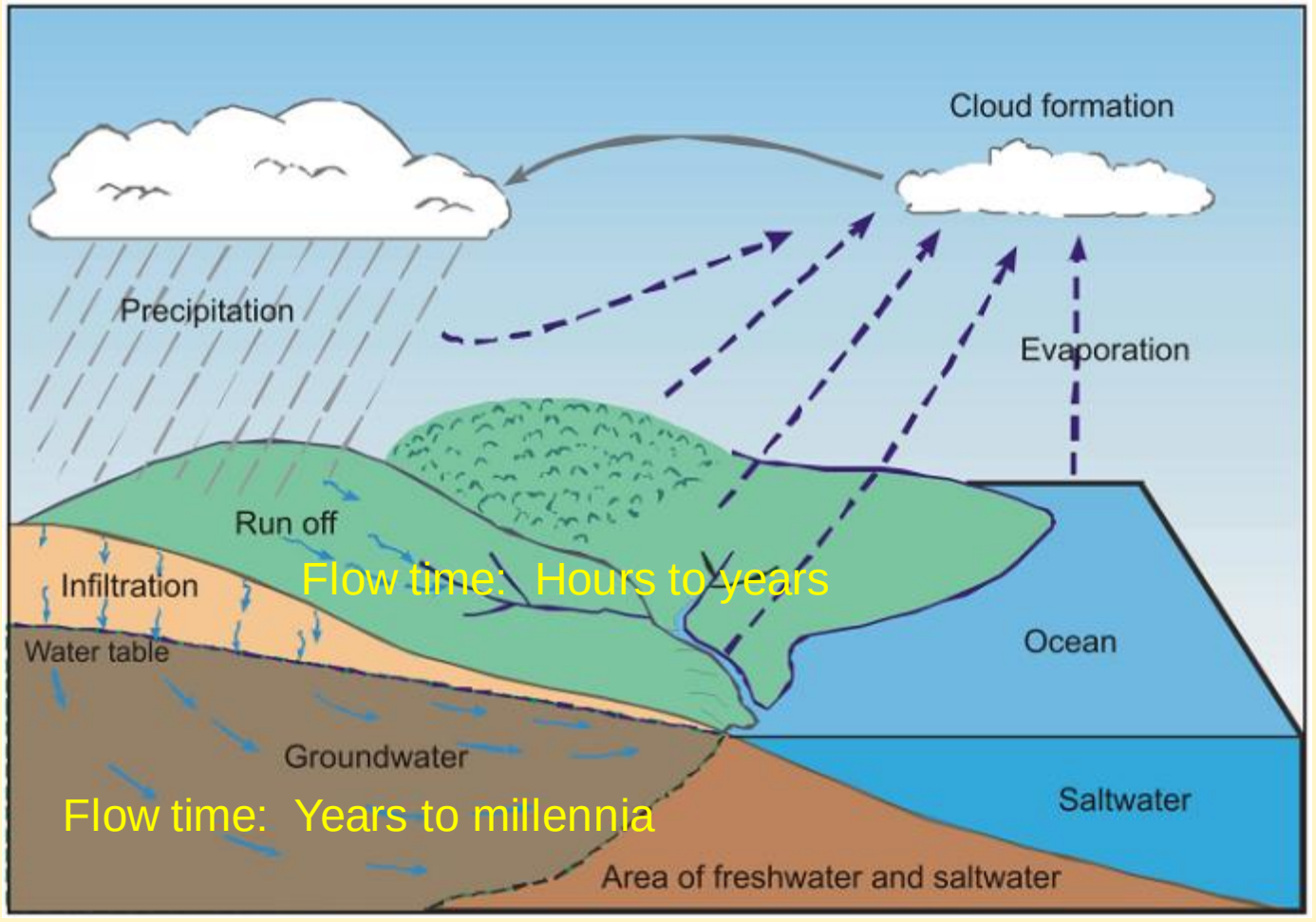


World Groundwater Resources



Source: http://www.whymap.org

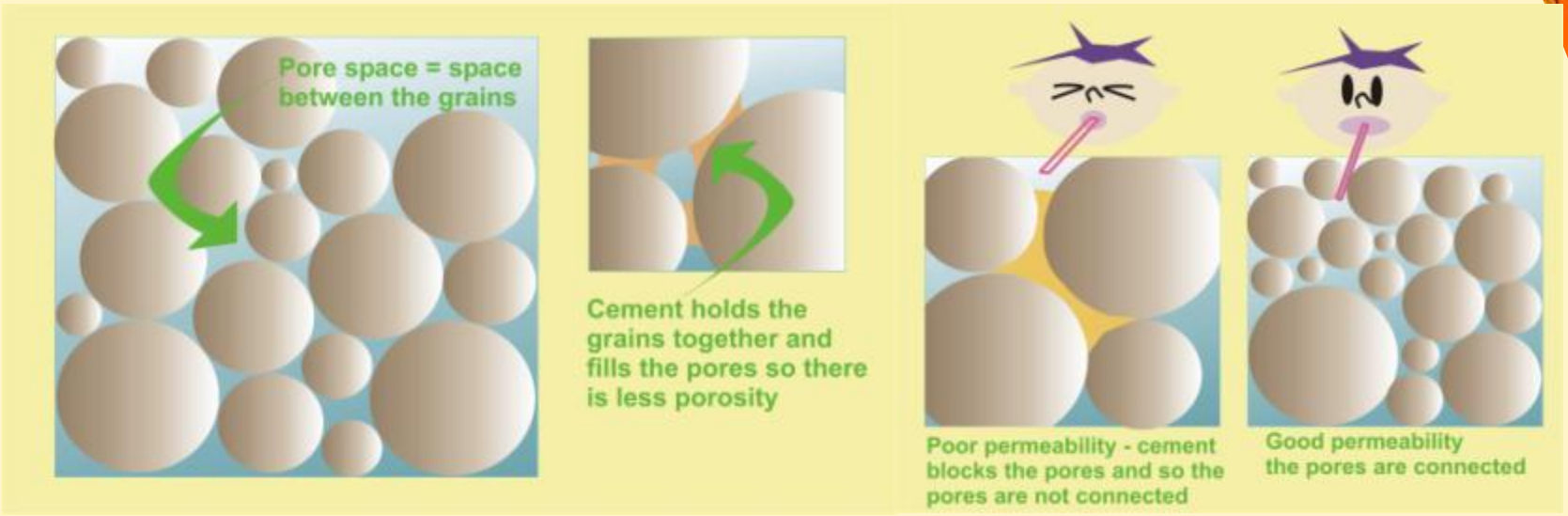
Groundwater Dynamics



FACTORS INFLUENCING GROUNDWATER MOVEMENT AND STORAGE

1.Porosity and Permeability

Porosity = the gaps between the soil and rock particles

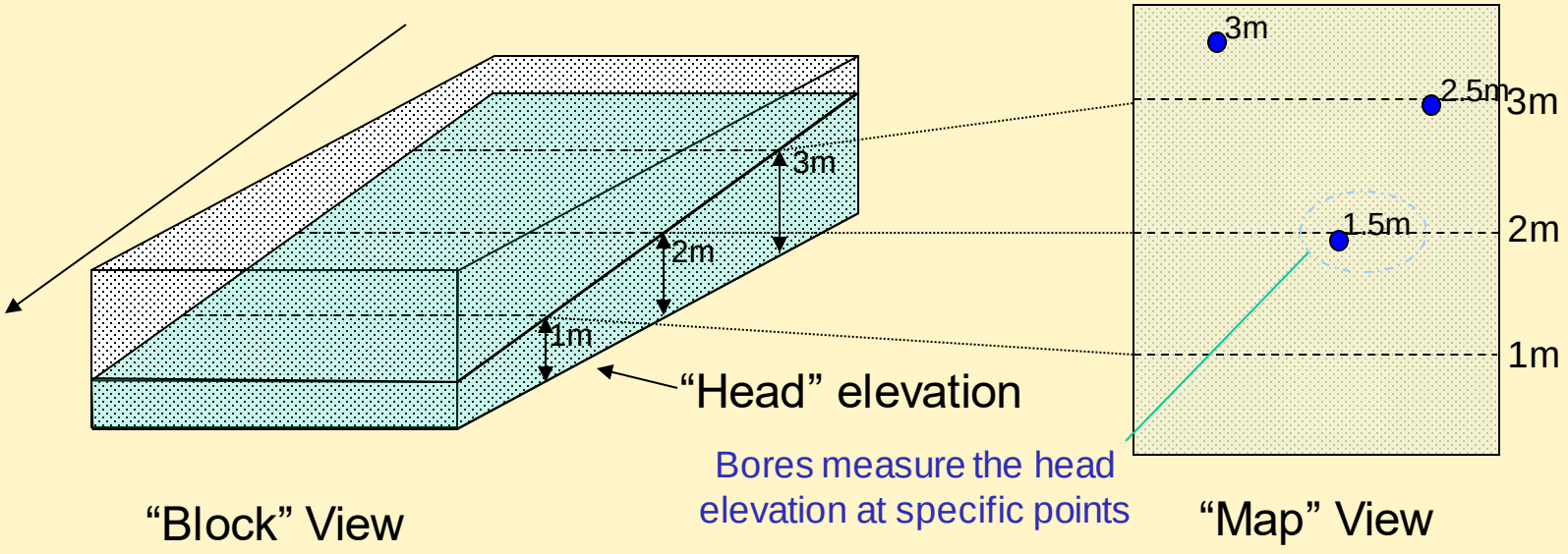


Permeability = how well the gaps are connected to allow water to move between them

2. Gradient

“Gradient” of the groundwater surface

“Contours” of the groundwater surface



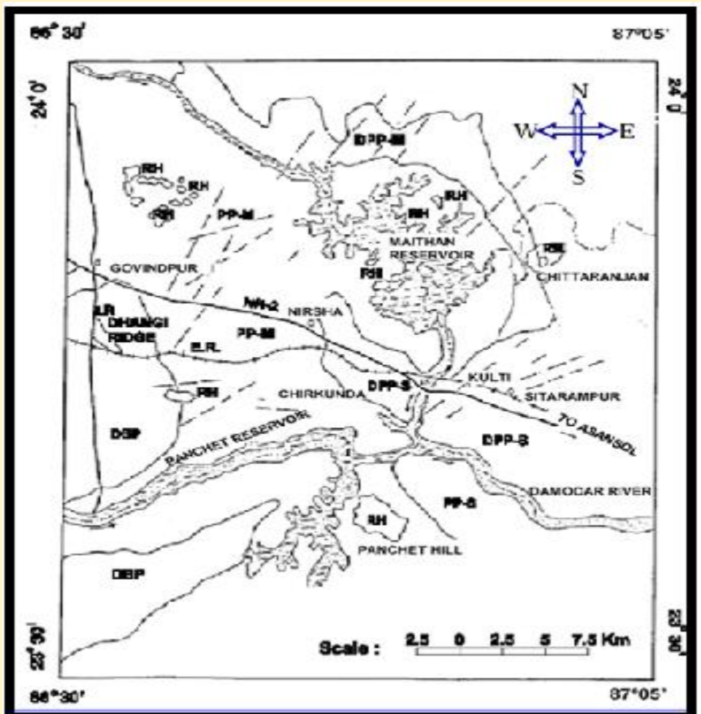
Groundwater flows from the higher “head” to the lower “head” – the hydraulic head of the system.

3. Aquifers and Aquitards

Aquifer: A layer of soil or rock that has relatively higher porosity and permeability than the surrounding layers, enabling usable quantities of water to be extracted.

Aquitard: A layer of soil or rock that has relatively lower porosity and/or permeability than the surrounding layers, limiting the movement of groundwater through it and the capacity to extract useable quantities of water.

Ground water in the ASANSOL-JAMURIA area occurs as shallow depth under water table condition within the weathered mantle, fractured zone of hard rock and narrow zone of unconsolidated sediment along major valleys. It can be seen that the thickness of top aquifers range from 2.1 m to 16.5 m and 6.7 m to 9.0 m below ground level in pre and post monsoon respectively.



Hydro-Geomorphological Map

Source:EIA report of Bhagawatispongeltd

Map Symbol	Geomorphic Unit	Lithology	Ground Water Prospect
LR	Linear Ridge	-	Poor
RH	Residual Hill	-	Poor
PP-S	Pediplain (Shallow)	Sedimentary Out Crop	Poor to Moderate
DPP- S	Dissected Pediplain (Shallow)	Sedimentary Out Crop	Poor to Moderate
PP – M	Pediplain (Moderate)	Metamorphic Out Crop	Moderate to Good
DPP – M	Dissected Pediplain (Moderate)	Metamorphic Out Crop	Moderate to Good
DBP	Dissected Burried Pediment	Metamorphic Out Crop	Good
	Lineaments		Good

Symbols of Different Settlements

Settlement	Road	River	Water bodies	Railway line	State Boundary	District Boundary
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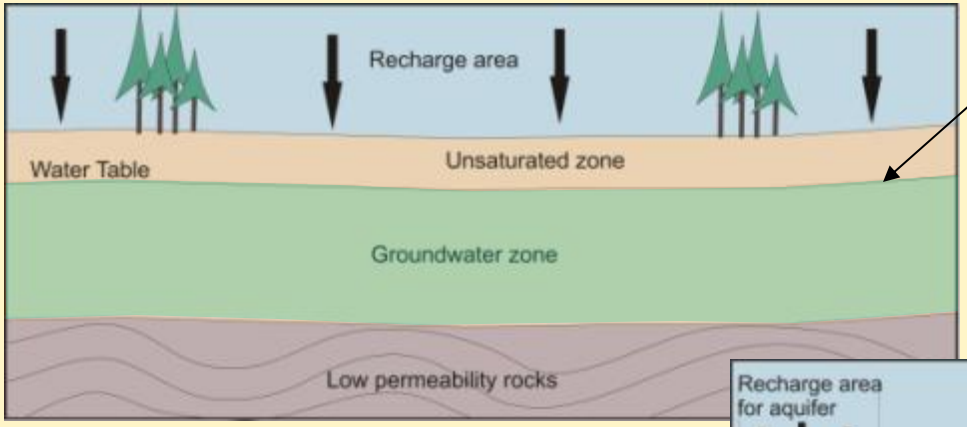
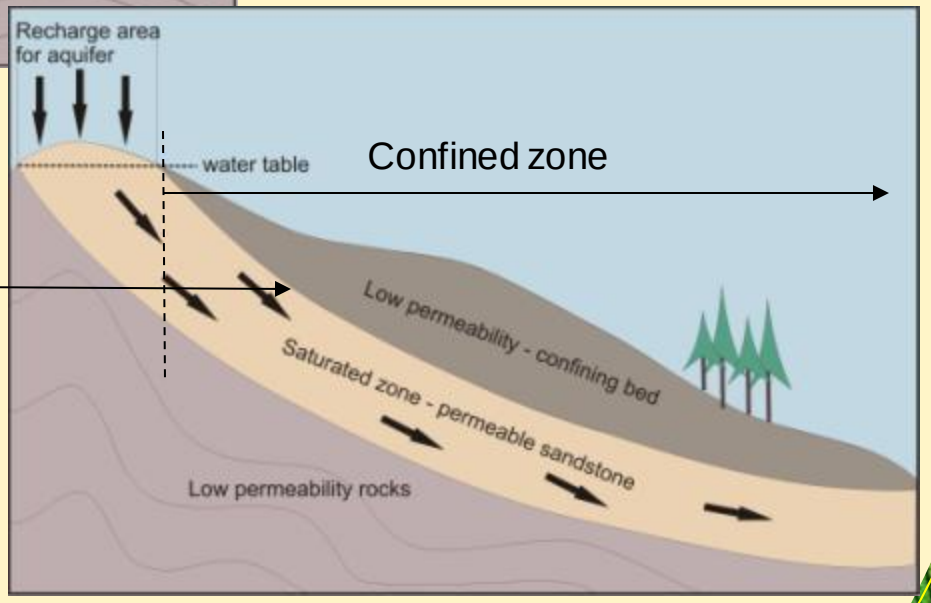
Confined and Unconfined Aquifers

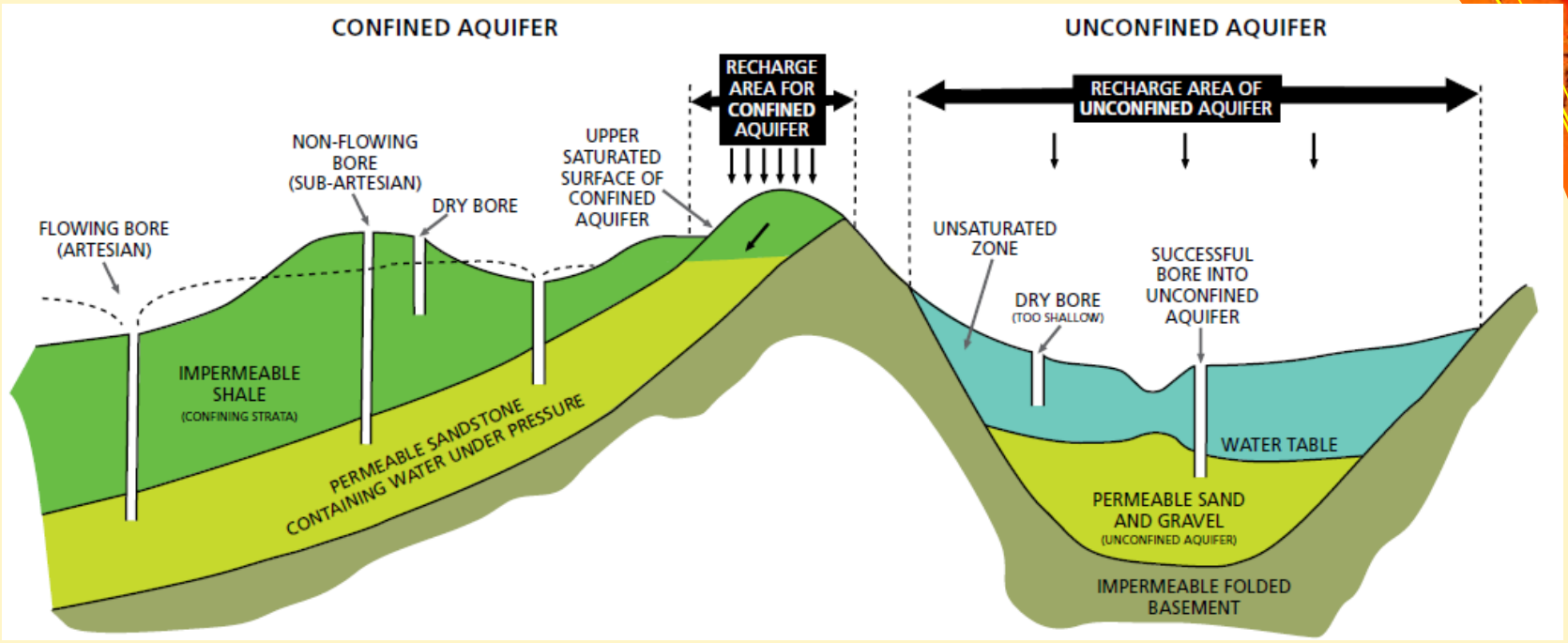


Unconfined: Surface of the groundwater (the watertable) is at the same pressure as the atmosphere.

Confined: The "surface" of the groundwater is constrained by an aquitard. It is under pressure. If the aquifer is tapped, the water level will rise up in response to the pressure. The distribution of pressure is called the **potentiometric** surface.

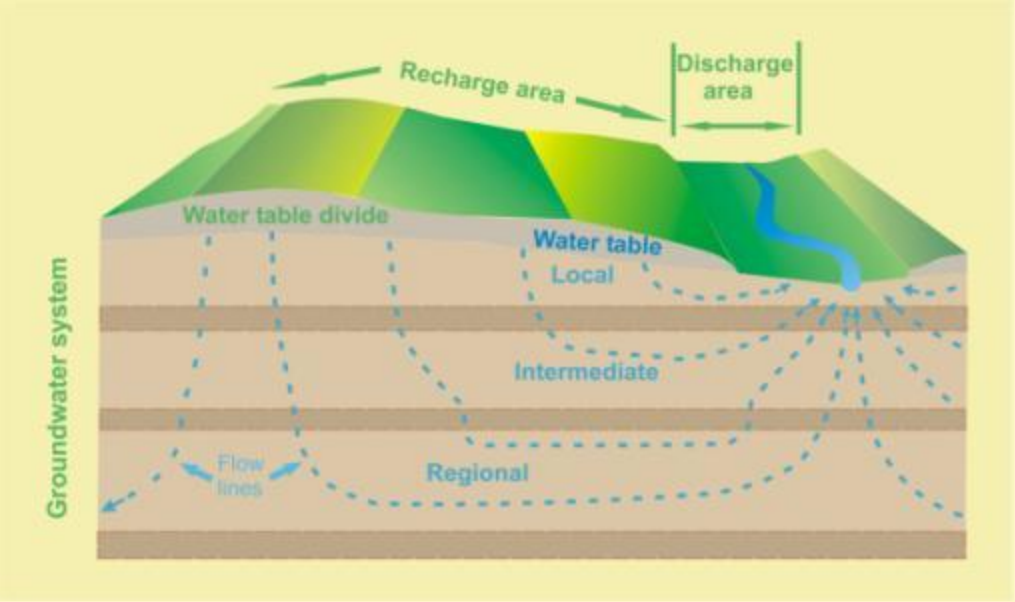


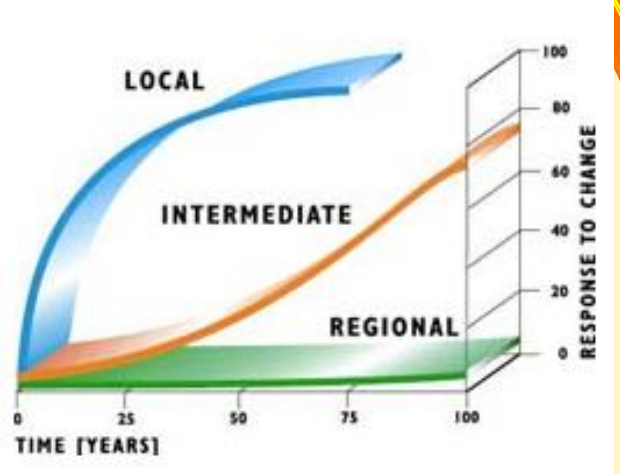
Multi-Aquifer Systems



Source: Groundwater Notes, Department of Sustainability and Environment.

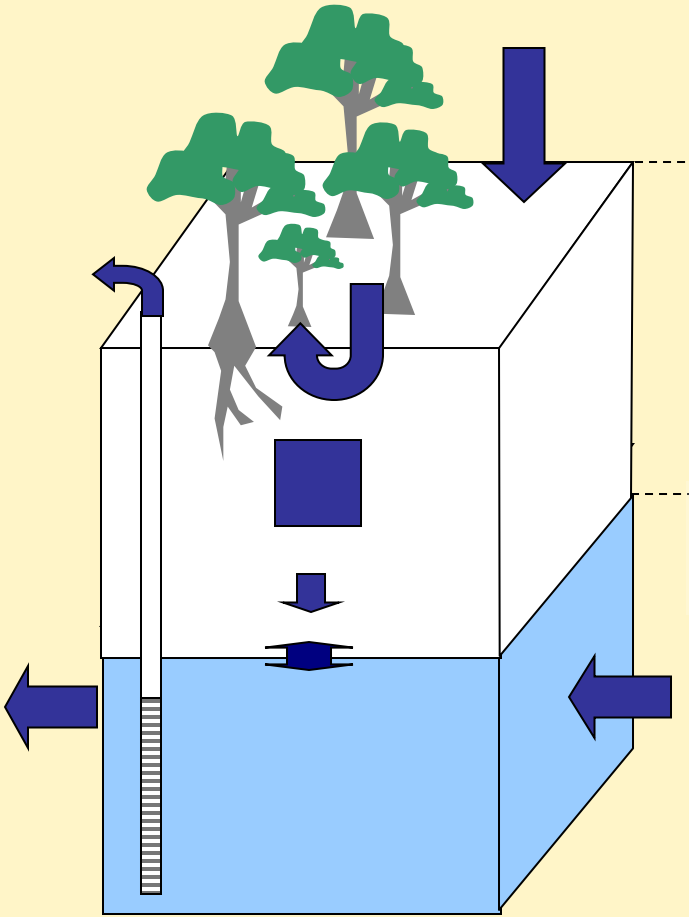
4. Scale of groundwater systems





- Local systems – recharge and discharge areas within 5km of each other
- Intermediate system – recharge and discharge areas within 50km of each other
- Regional system - recharge and discharge areas grater than 50km of each other

5. Saturated and Unsaturated zone



Water entering the soil

Water used from the soil

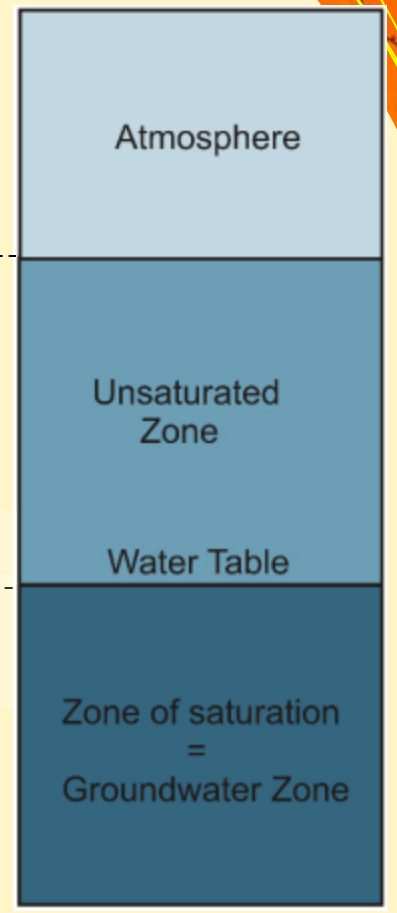
Soil storage (unsaturated zone)

Recharge

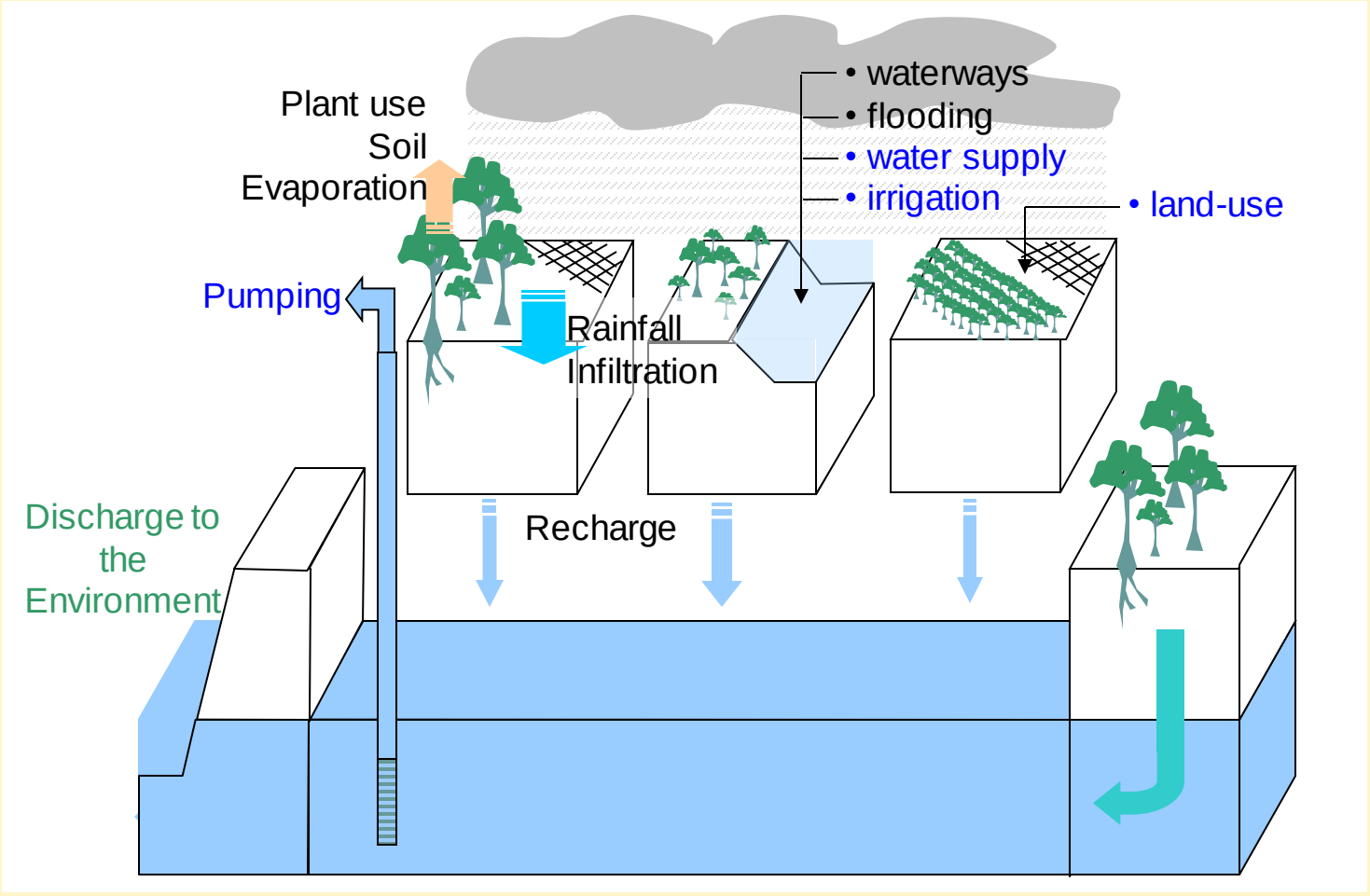
Change in saturated zone storage

Aquifer through-flow

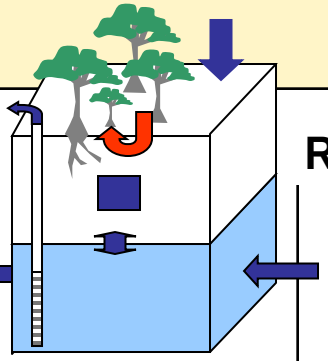
Groundwater Pumping



6. Recharge and Discharge

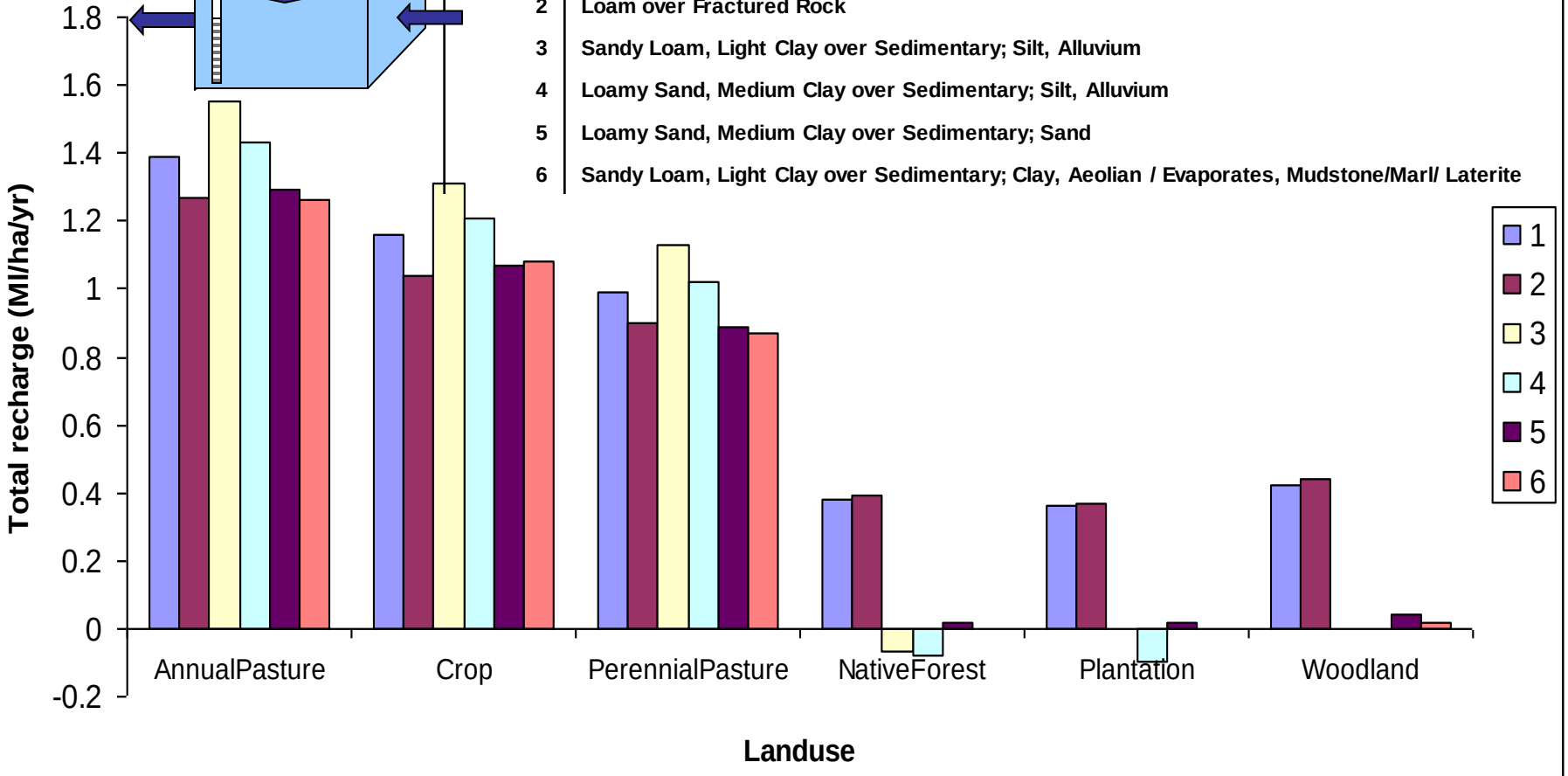


7. Landuse

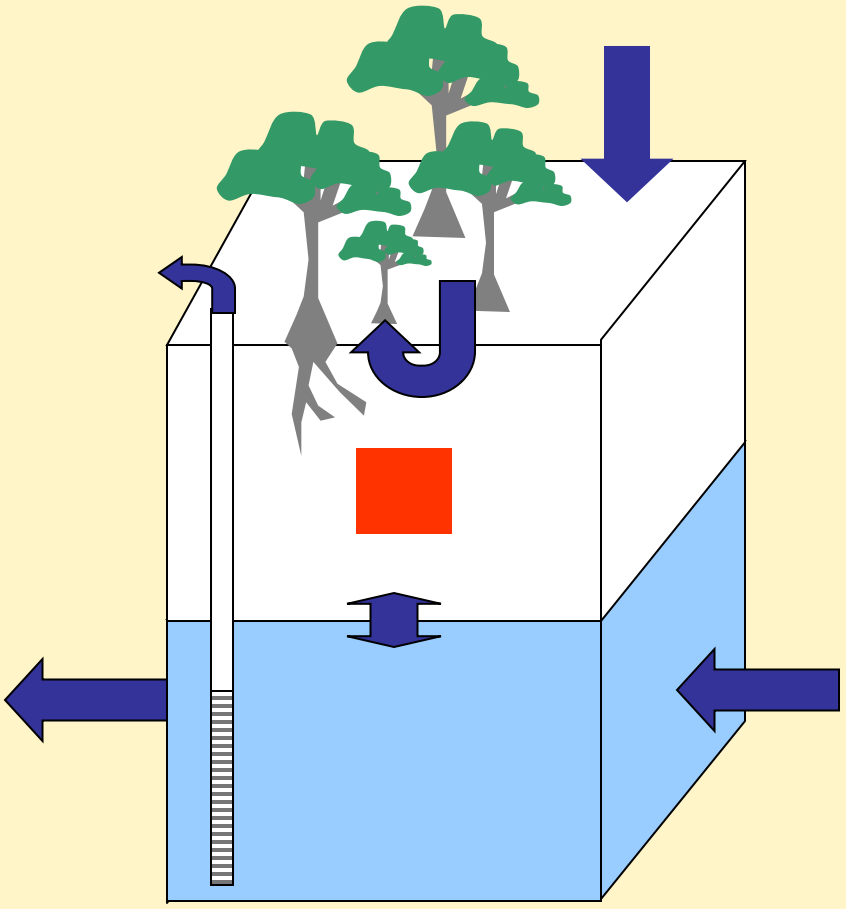


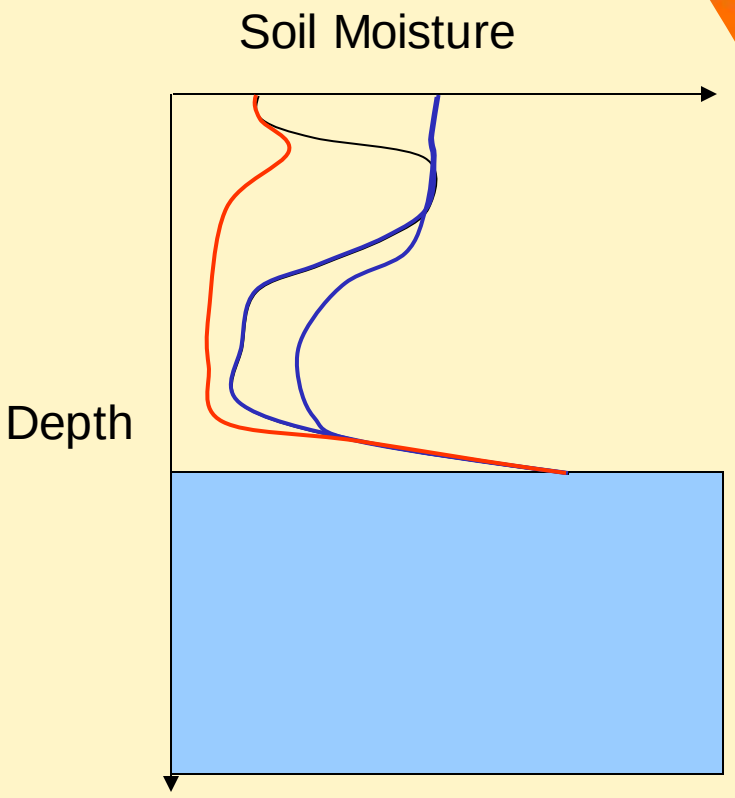
Recharge for six soils and Landuses

1	Sandy Loam, Light Clay over Fractured Rock; Basalt, Rhyolite, Rhyodacite, Ignimbrite
2	Loam over Fractured Rock
3	Sandy Loam, Light Clay over Sedimentary; Silt, Alluvium
4	Loamy Sand, Medium Clay over Sedimentary; Silt, Alluvium
5	Loamy Sand, Medium Clay over Sedimentary; Sand
6	Sandy Loam, Light Clay over Sedimentary; Clay, Aeolian / Evaporates, Mudstone/Marl/ Laterite

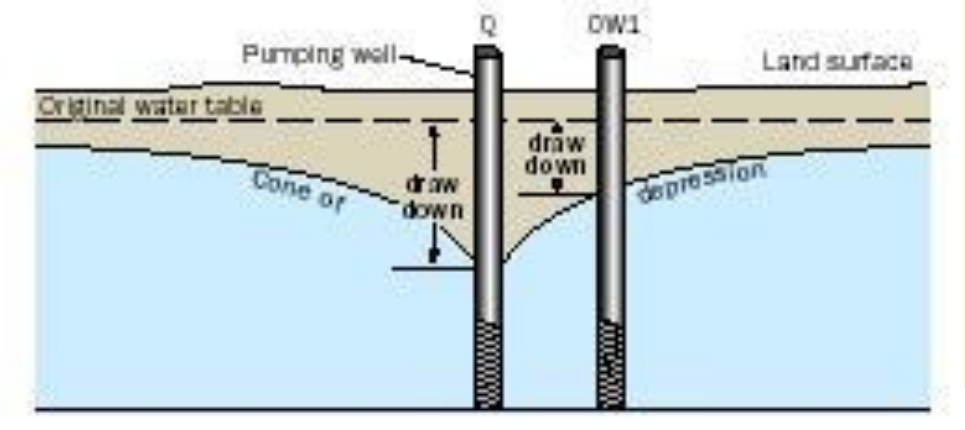


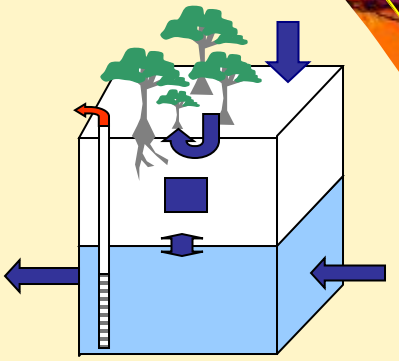
8. Unsaturated Zone Storage





9. Groundwater Pumping

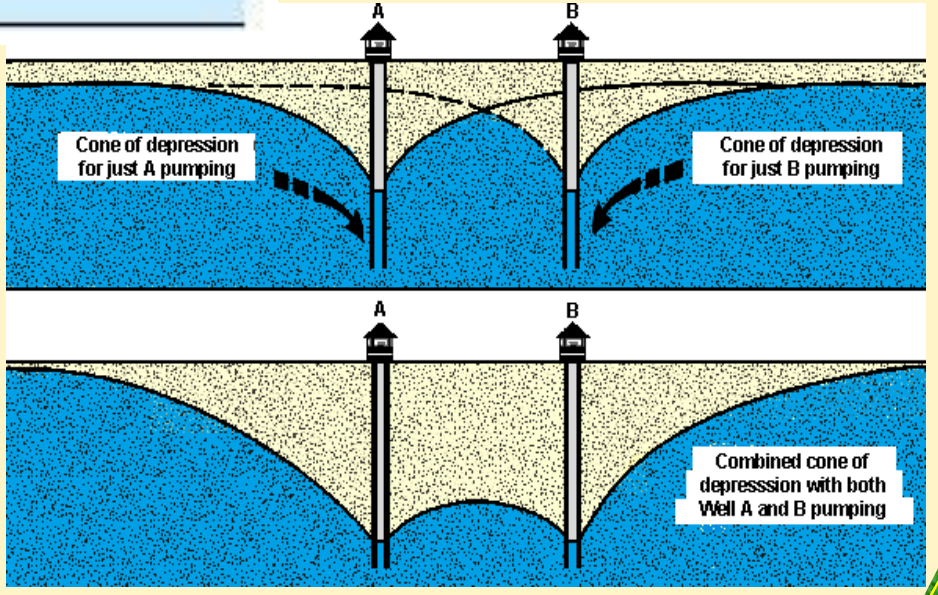




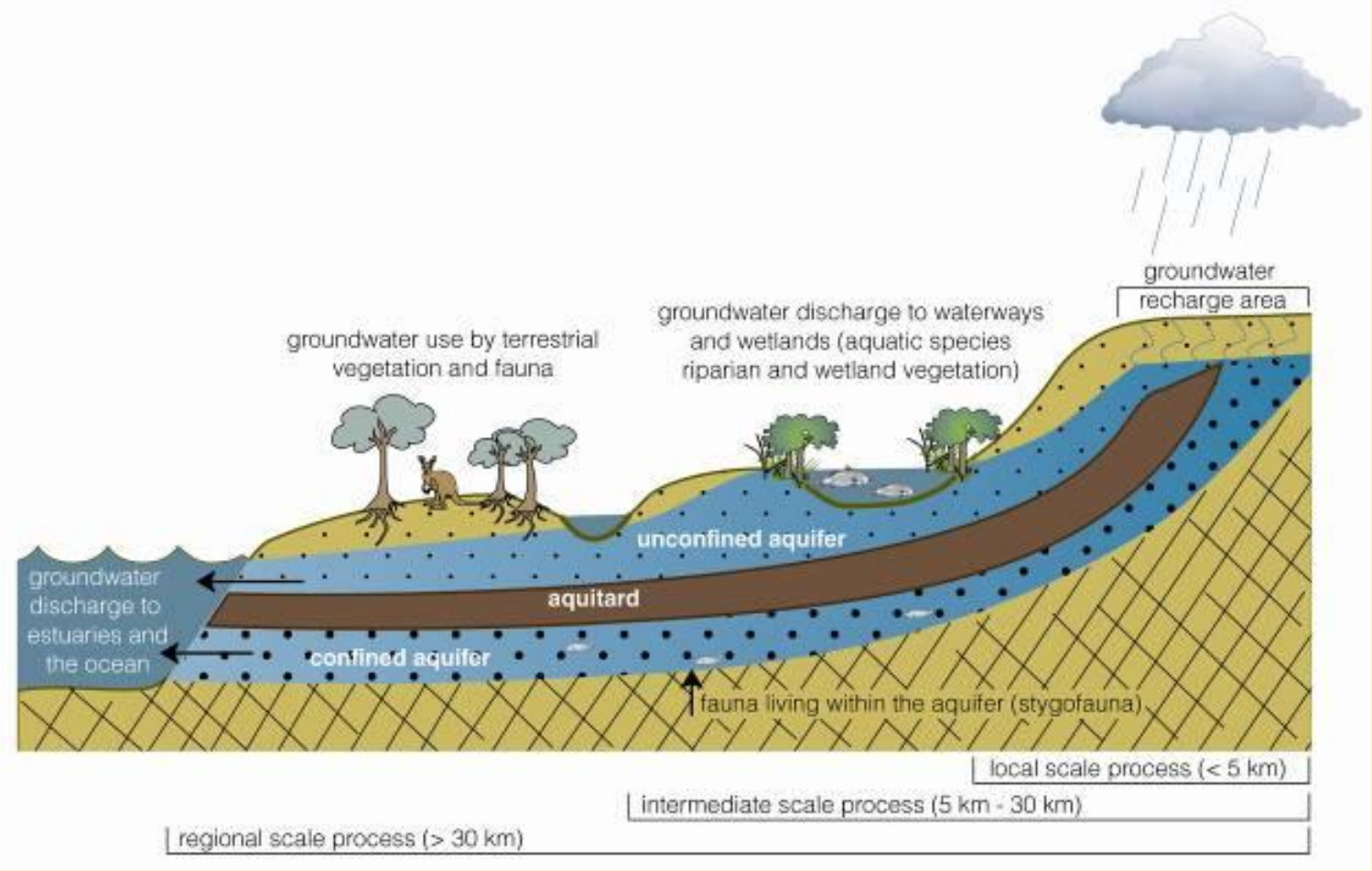
Takes water from storage by reducing level or pressure.

Changes flow patterns

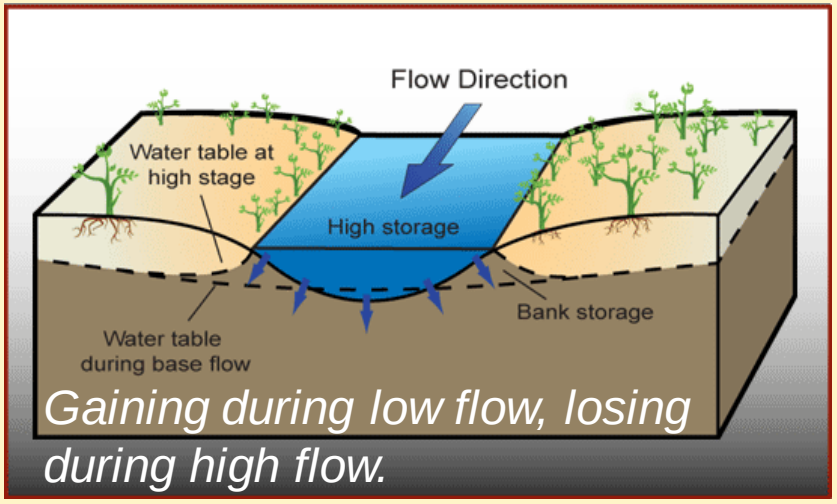
Changes recharge / discharge relationships



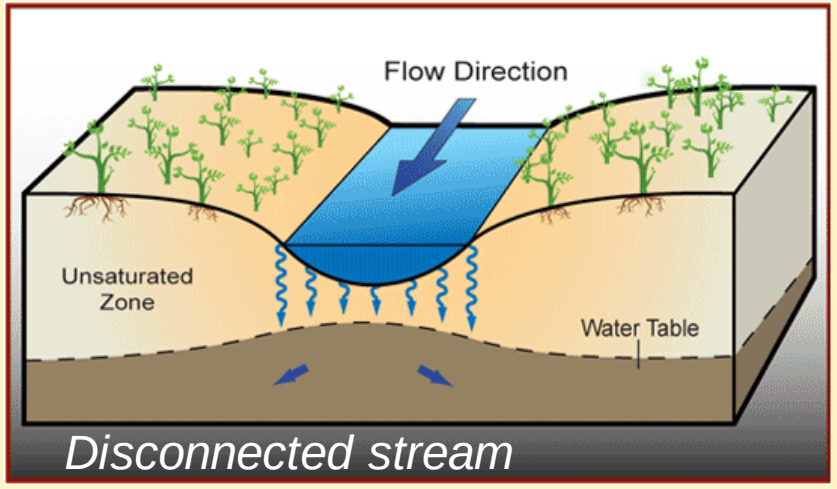
10. Groundwater Dependent Ecosystems



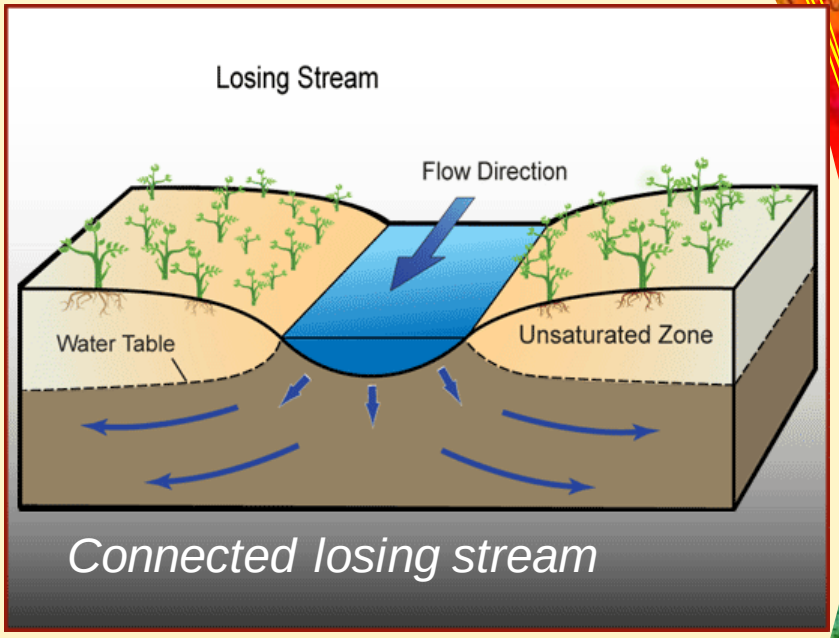
11. Groundwater and Waterways



Gaining during low flow, losing during high flow.



Disconnected stream



Connected losing stream

12. Mechanical Dispersion

Dispersivity is a function of the porous media