



Hydrology 101

(Why are streams wet?)

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What do headwaters look like around
here?

HEADWATERS?



HEADWATERS?



HEADWATERS?



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HEADWATERS?



HEADWATERS?

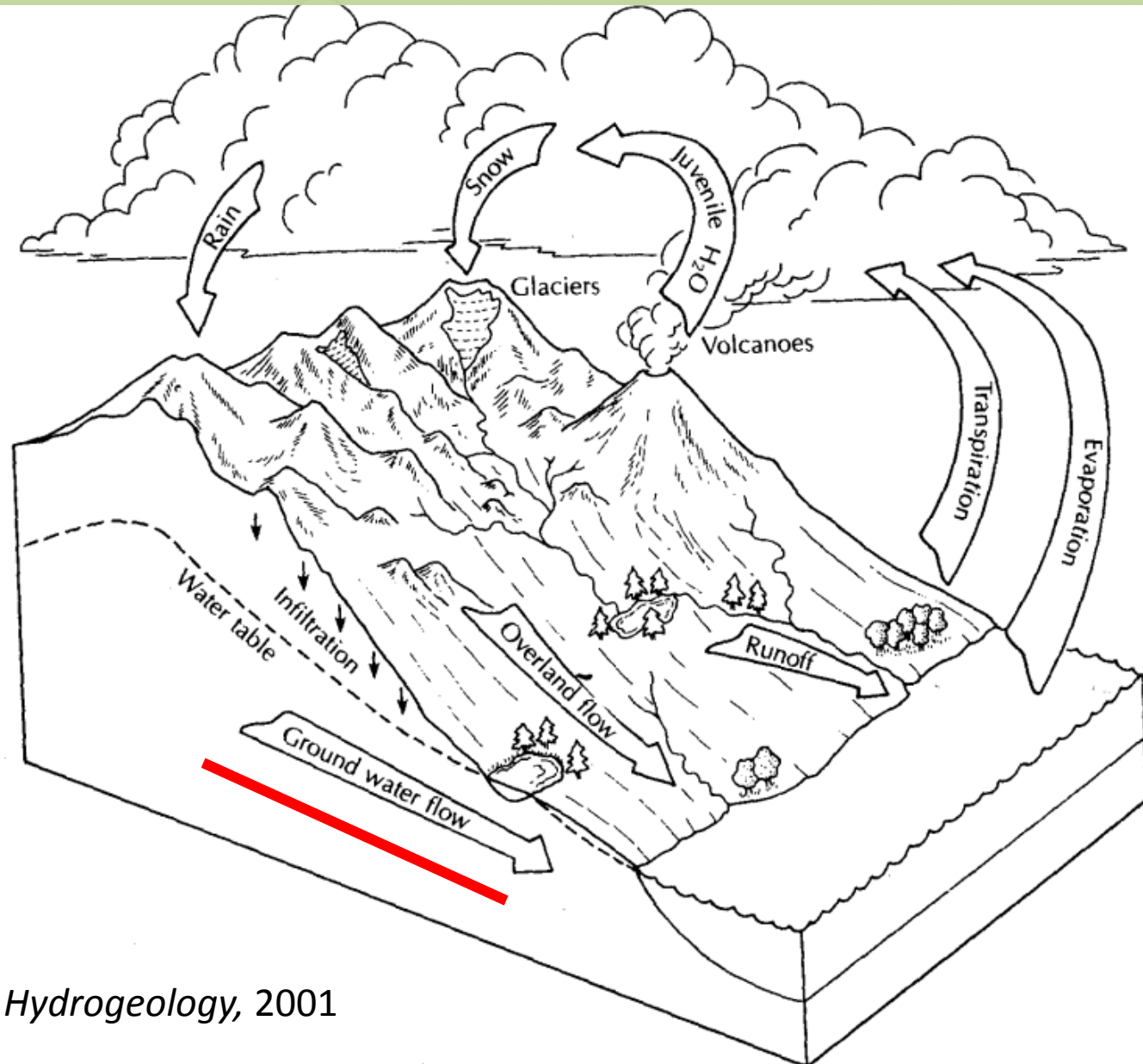




So, how are headwaters formed?



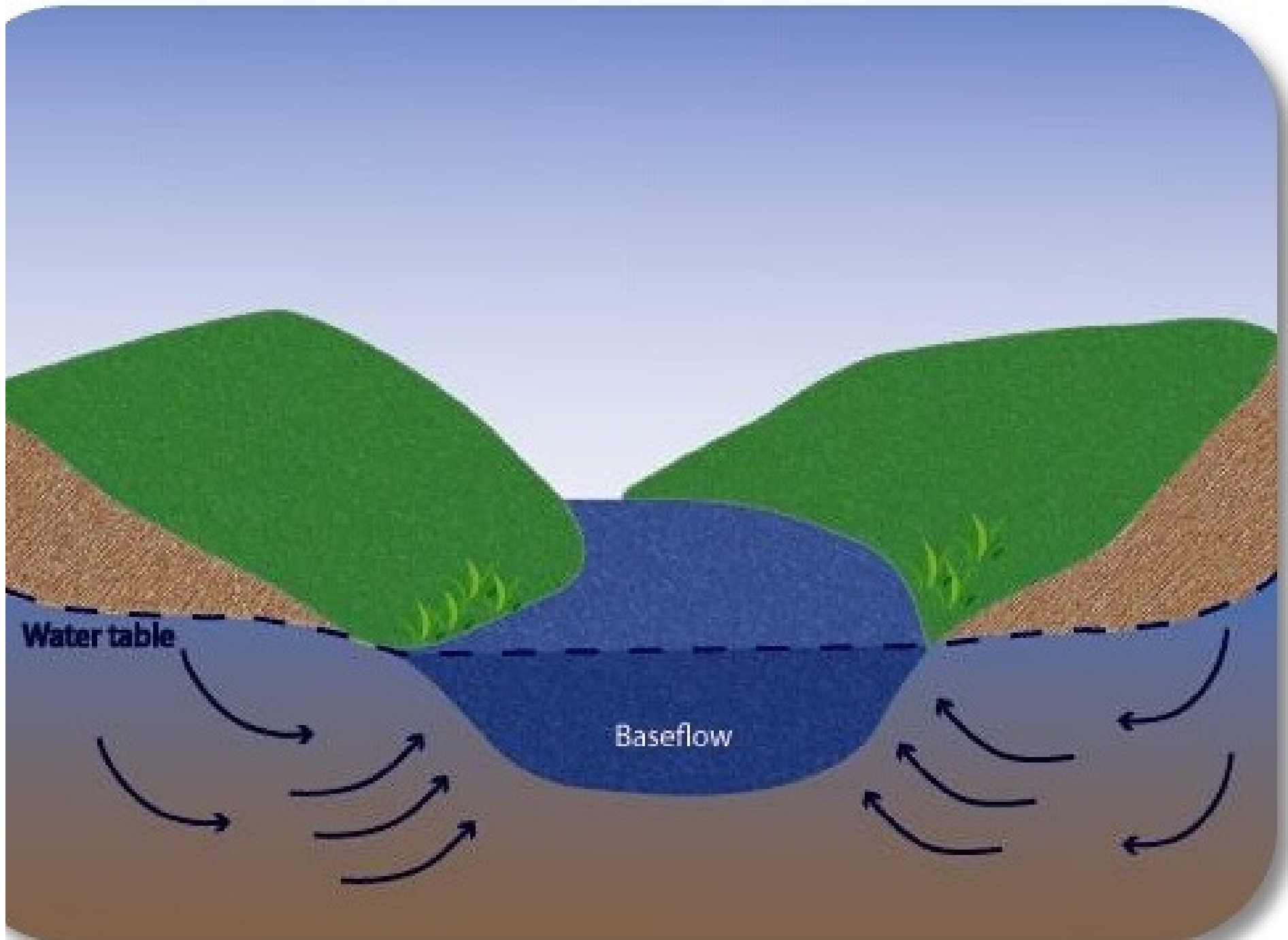
Water, Geology, and Climate shape the Earth



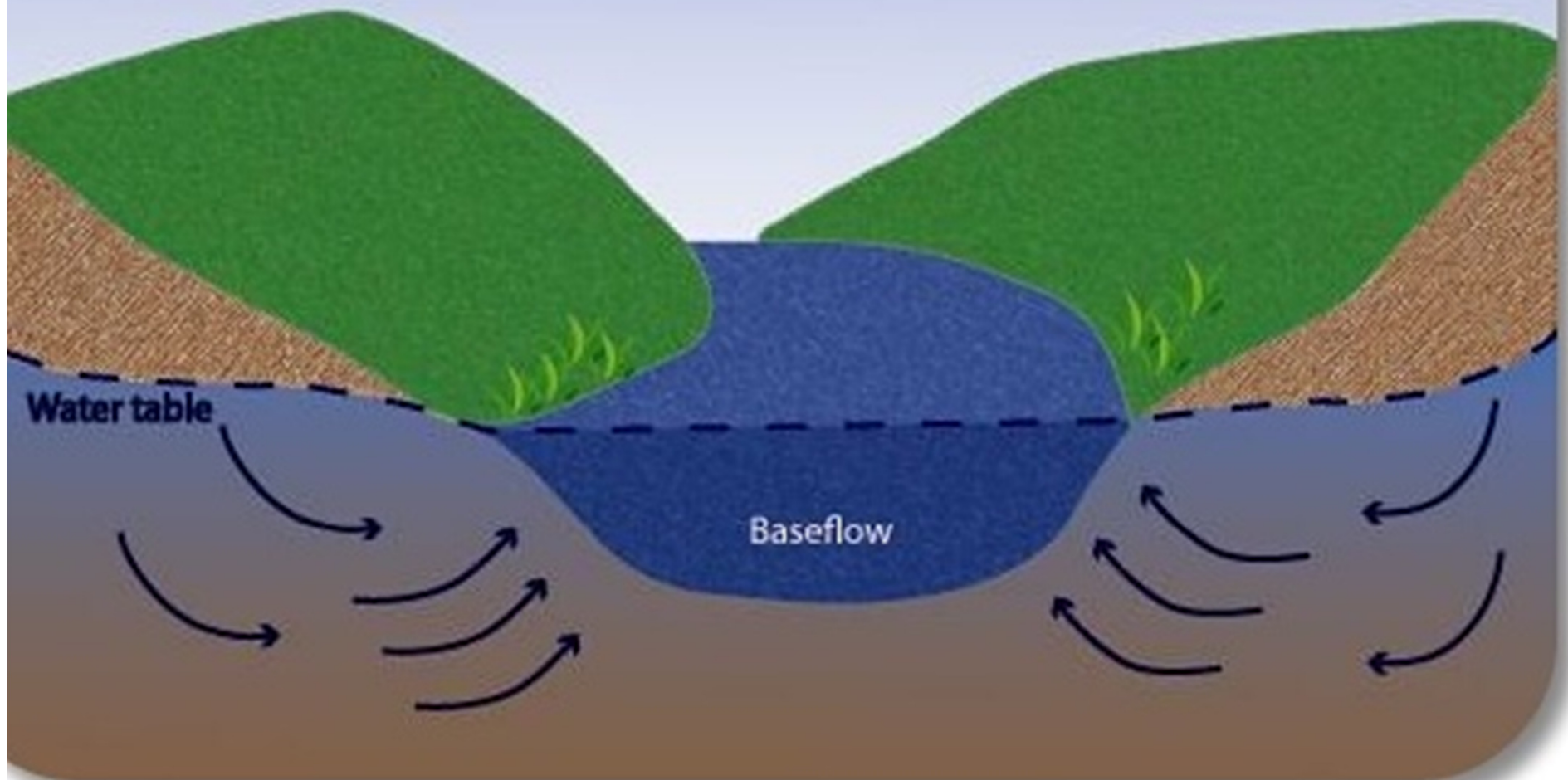
Fetter, *Applied Hydrogeology*, 2001

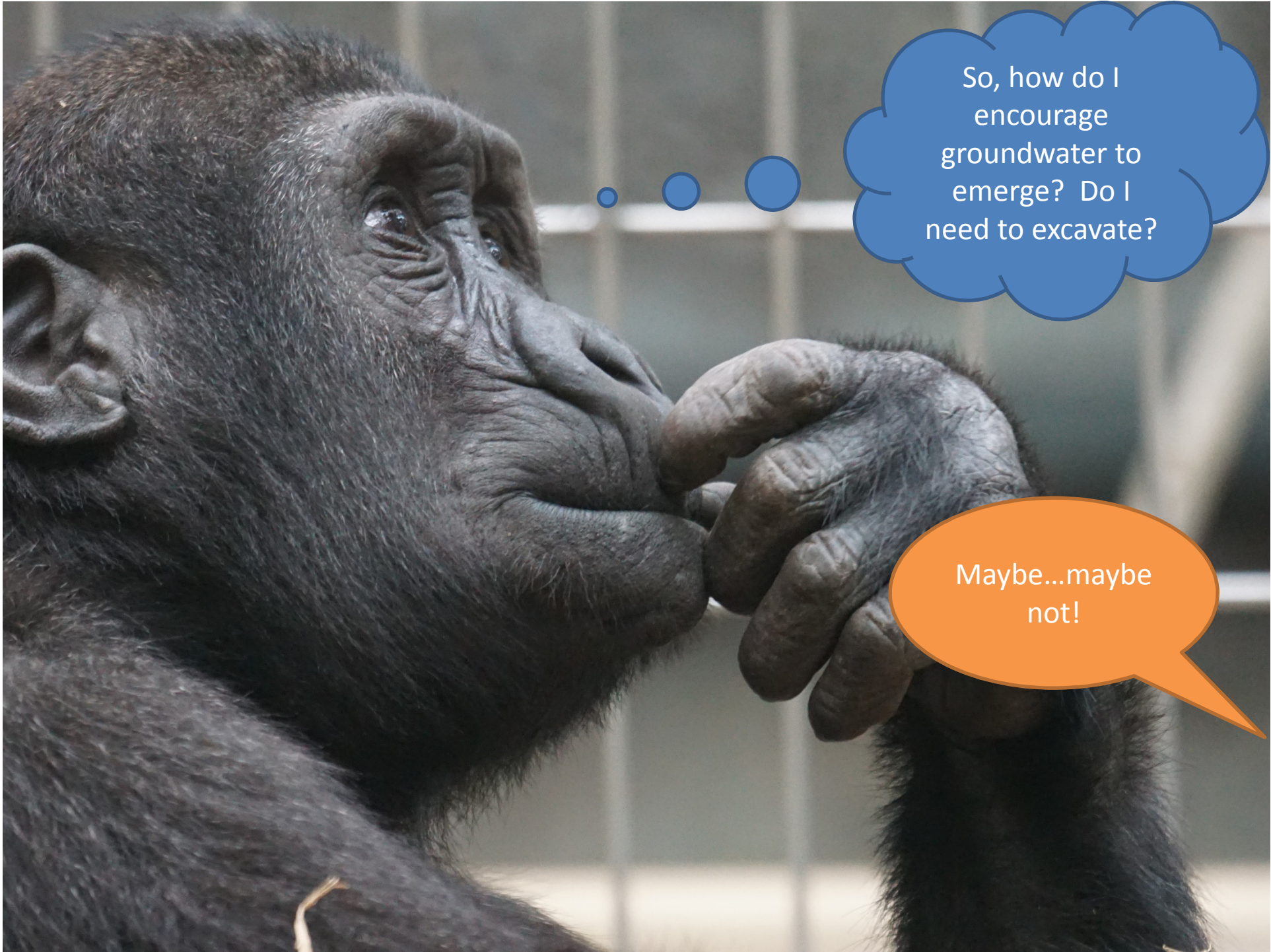
Water moves!

- 96% of the earth's *available* freshwater is stored in groundwater, rather than surface water.
- This groundwater is constantly moving because of gravity.
- Near-surface groundwater will surface whenever it can.



- “Effluent streams” – directly fed by the surrounding groundwater table (gaining)
- This is why streams flow when it’s not raining!
- The higher you go in the watershed, the greater the proportion of local groundwater to base flow
- So at our headwaters, on a sunny day, we are 100% groundwater



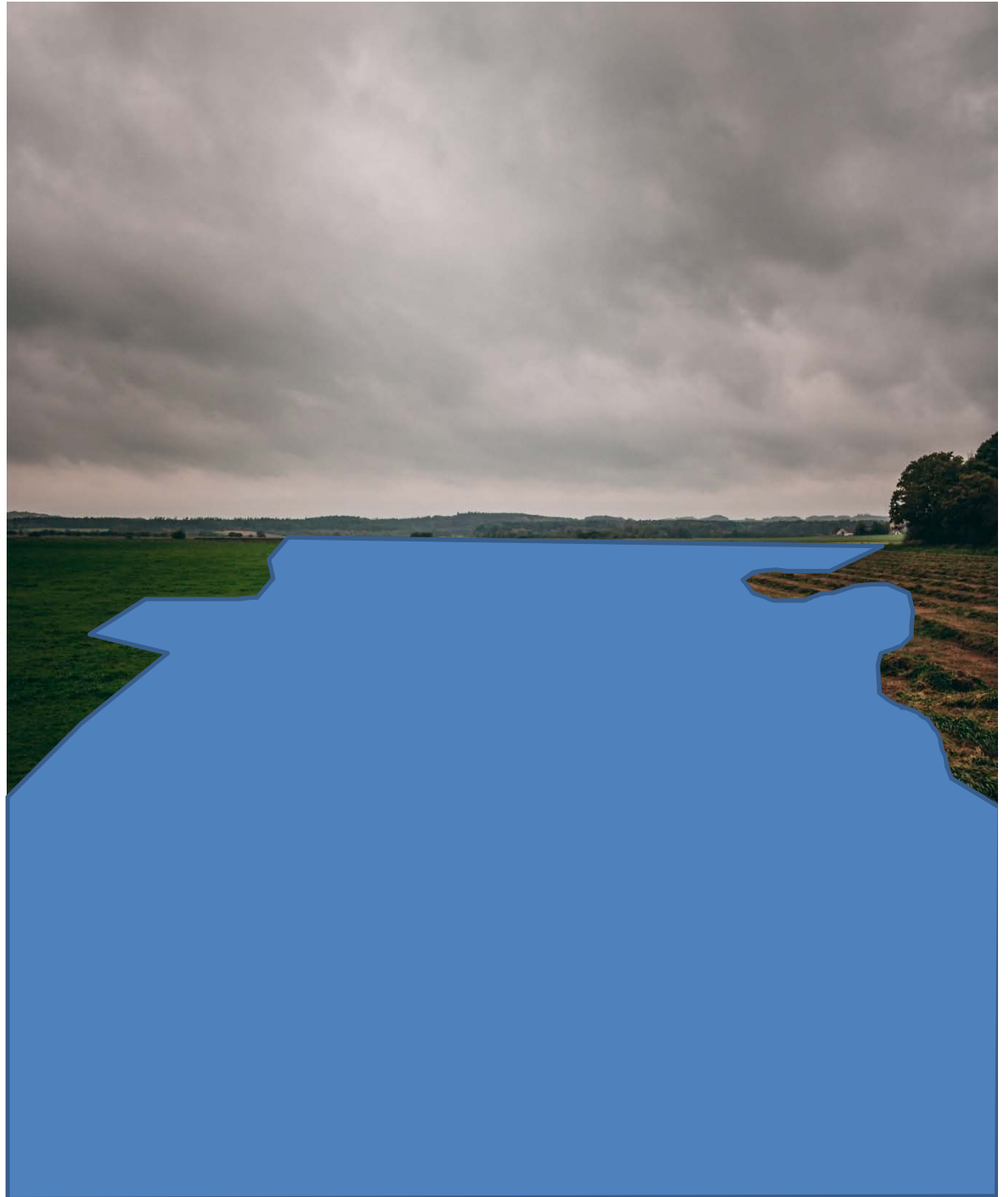


So, how do I encourage groundwater to emerge? Do I need to excavate?

Maybe...maybe not!

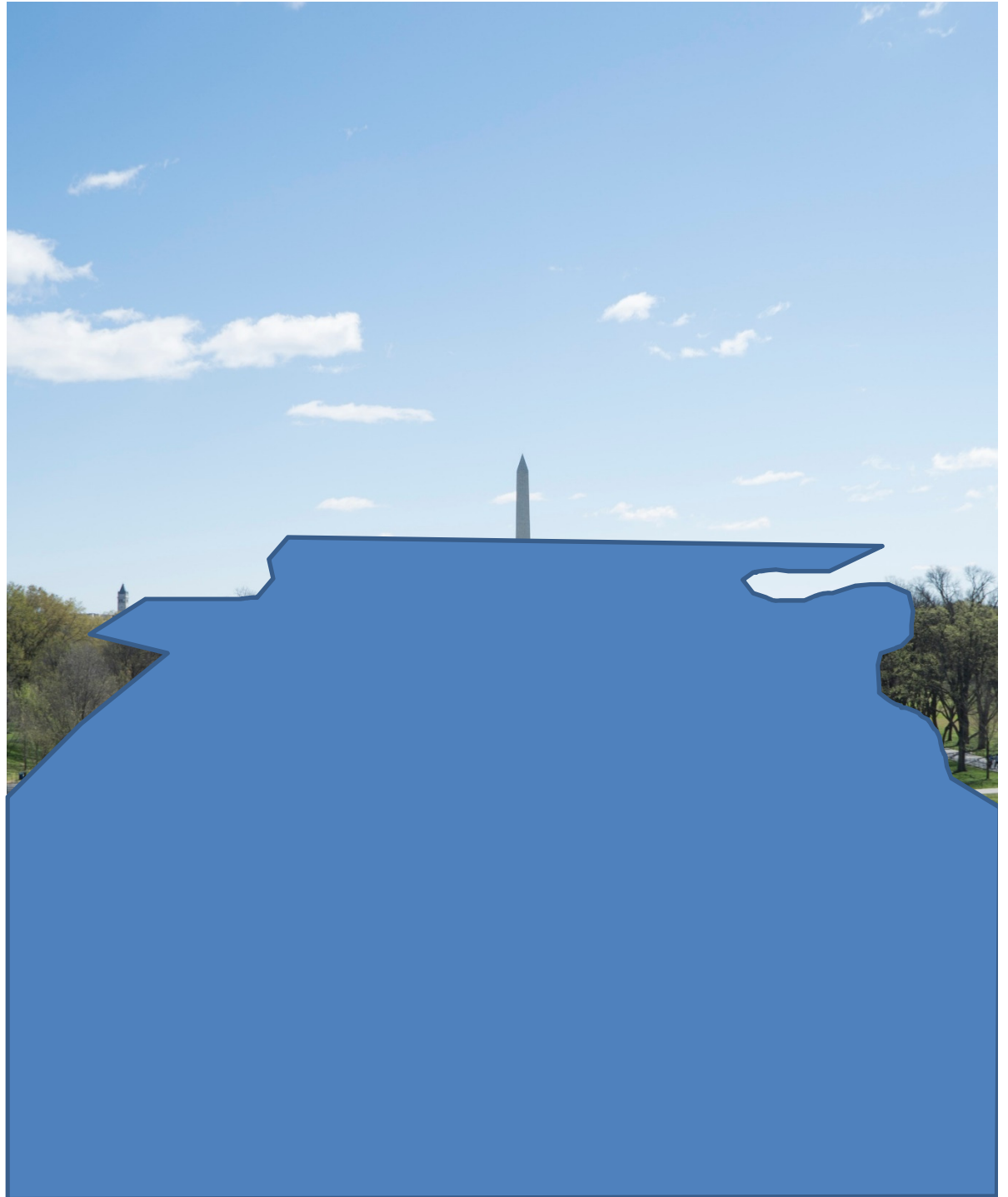
Groundwater moves!

- Groundwater closely follows surface grade
- Emerges at drastic changes in slope and low points in the landscape
- We've been manipulating groundwater for a long time! (usually in the wrong direction)



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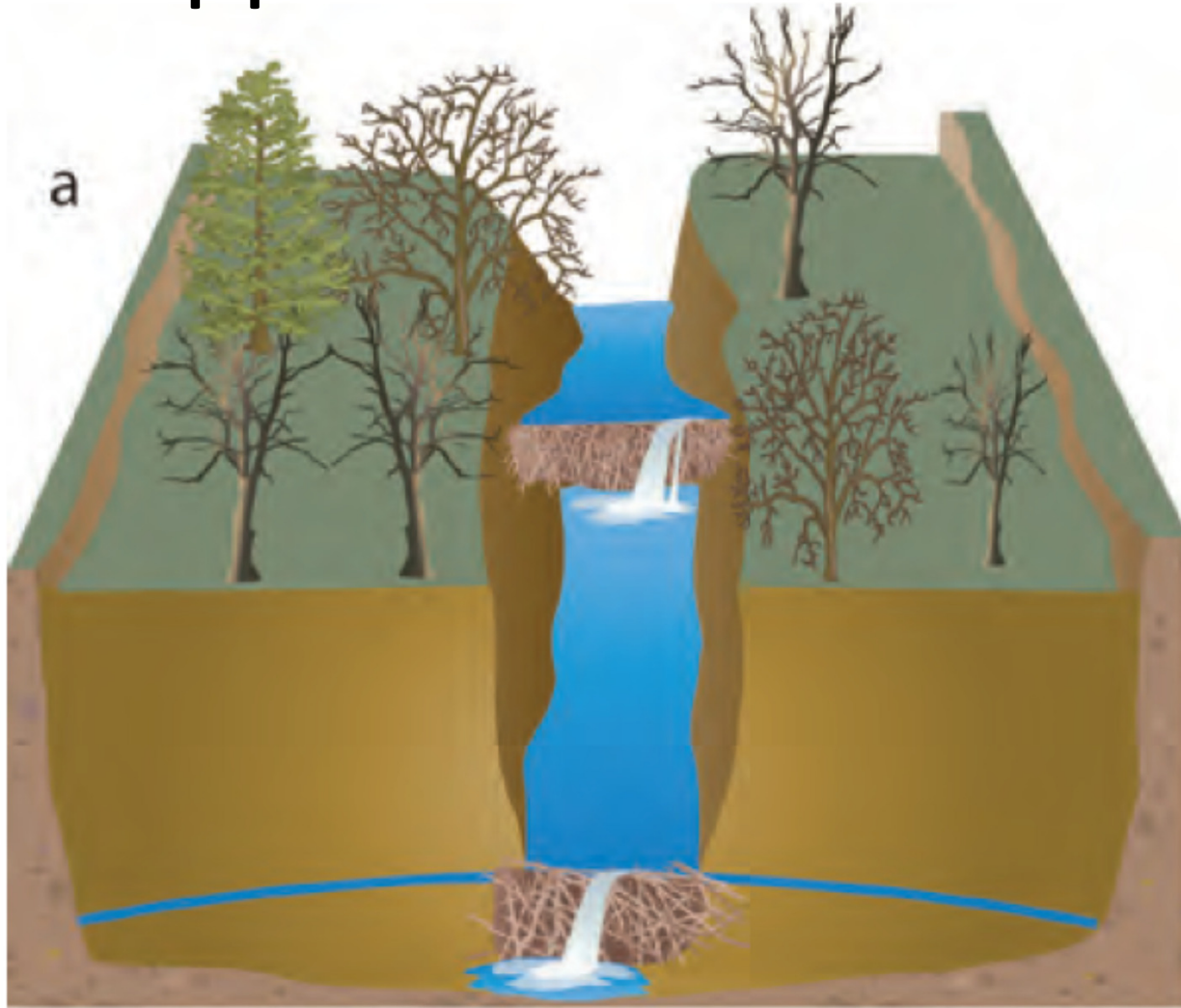
- But the opposite is also true!
- If we raise the lowest point in the landscape, groundwater will rise to meet it.
- This has been observed for centuries.



GROUNDWATER BOUNDARY

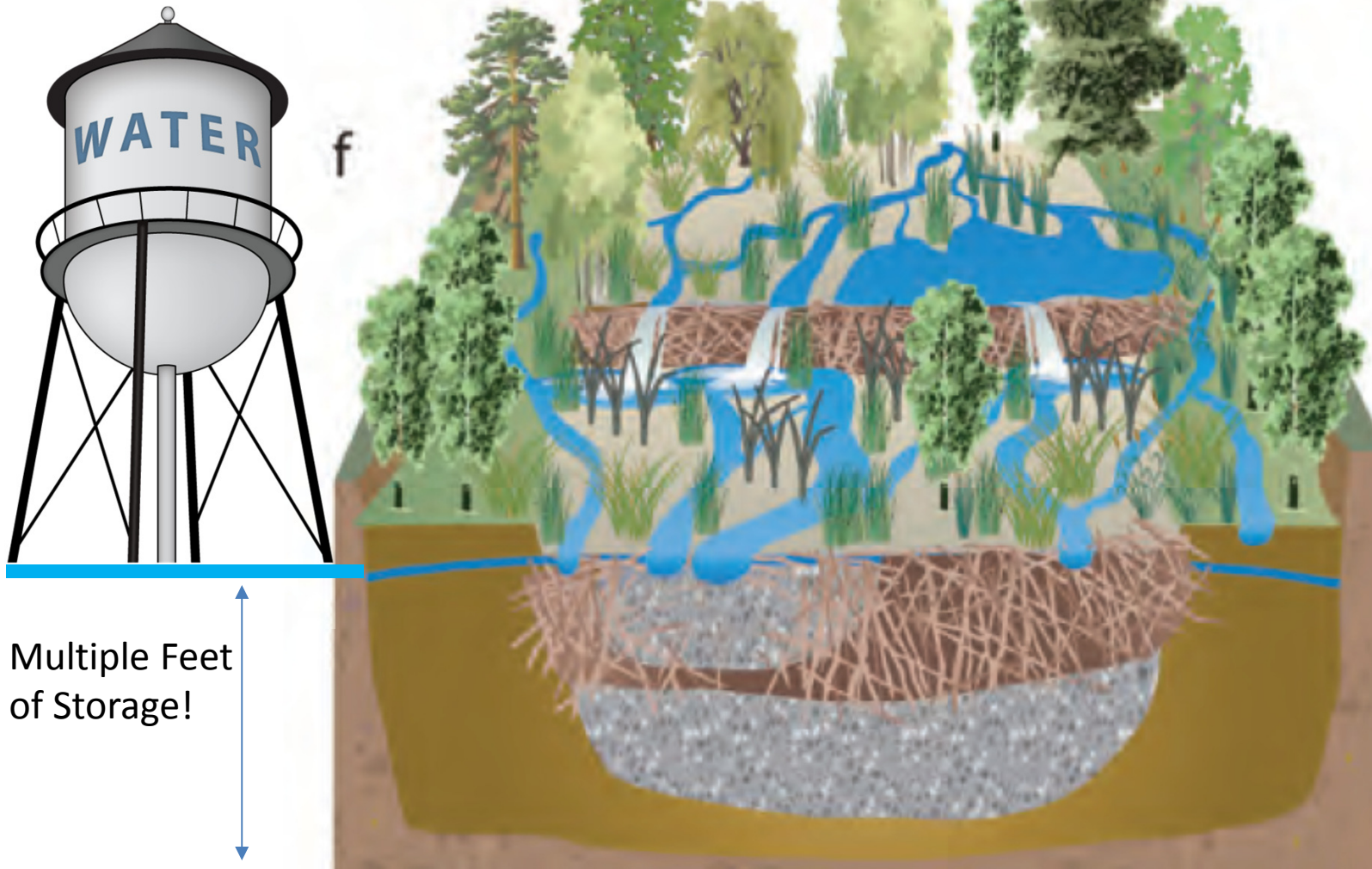


Happens in nature too!

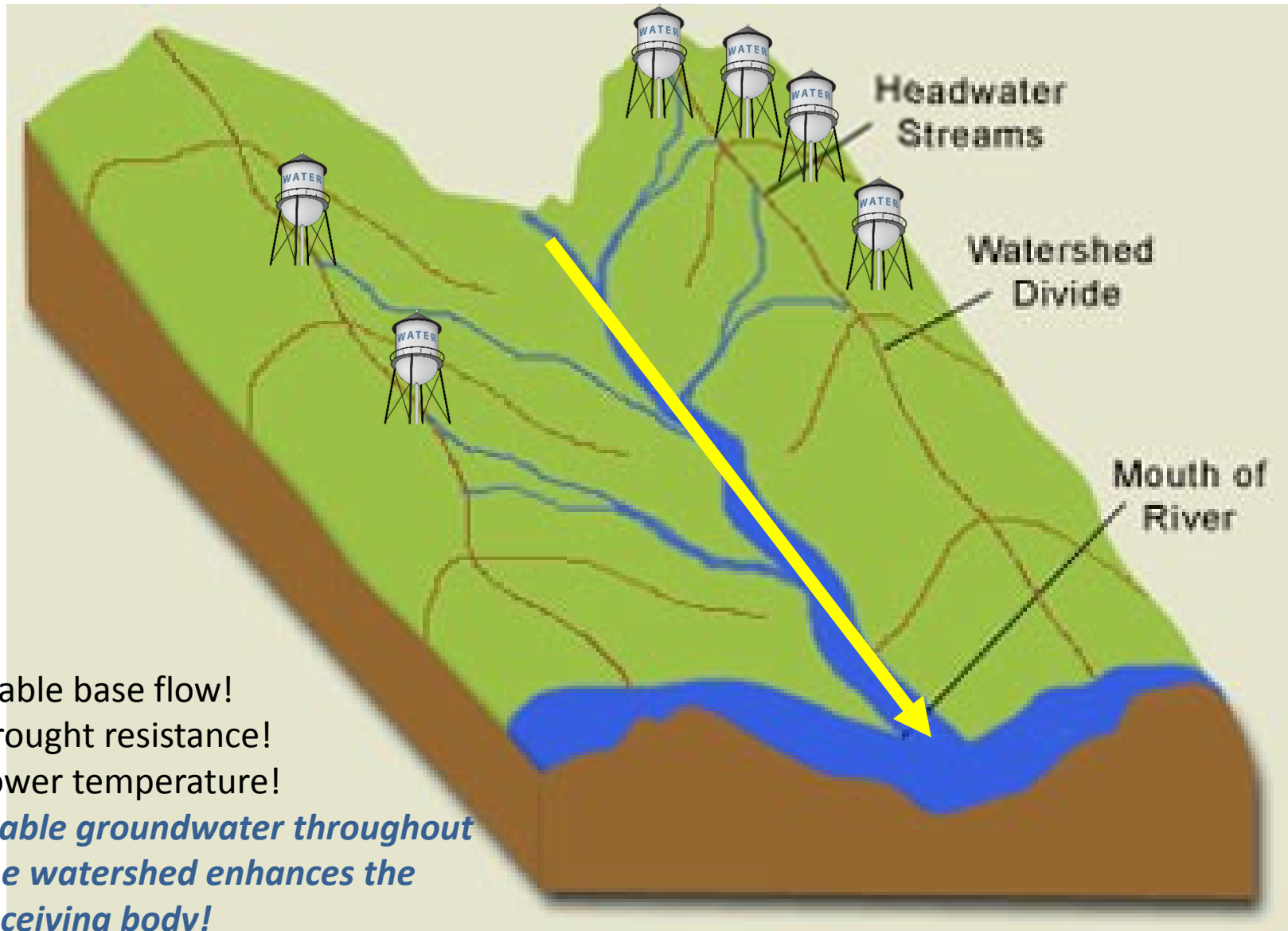


Source: Fitch, L. 2016. Caring for the Green Zone: Beaver – Our Watershed Partner. Lethbridge, Alberta: Cows and Fish – Alberta Riparian Habitat Management Society

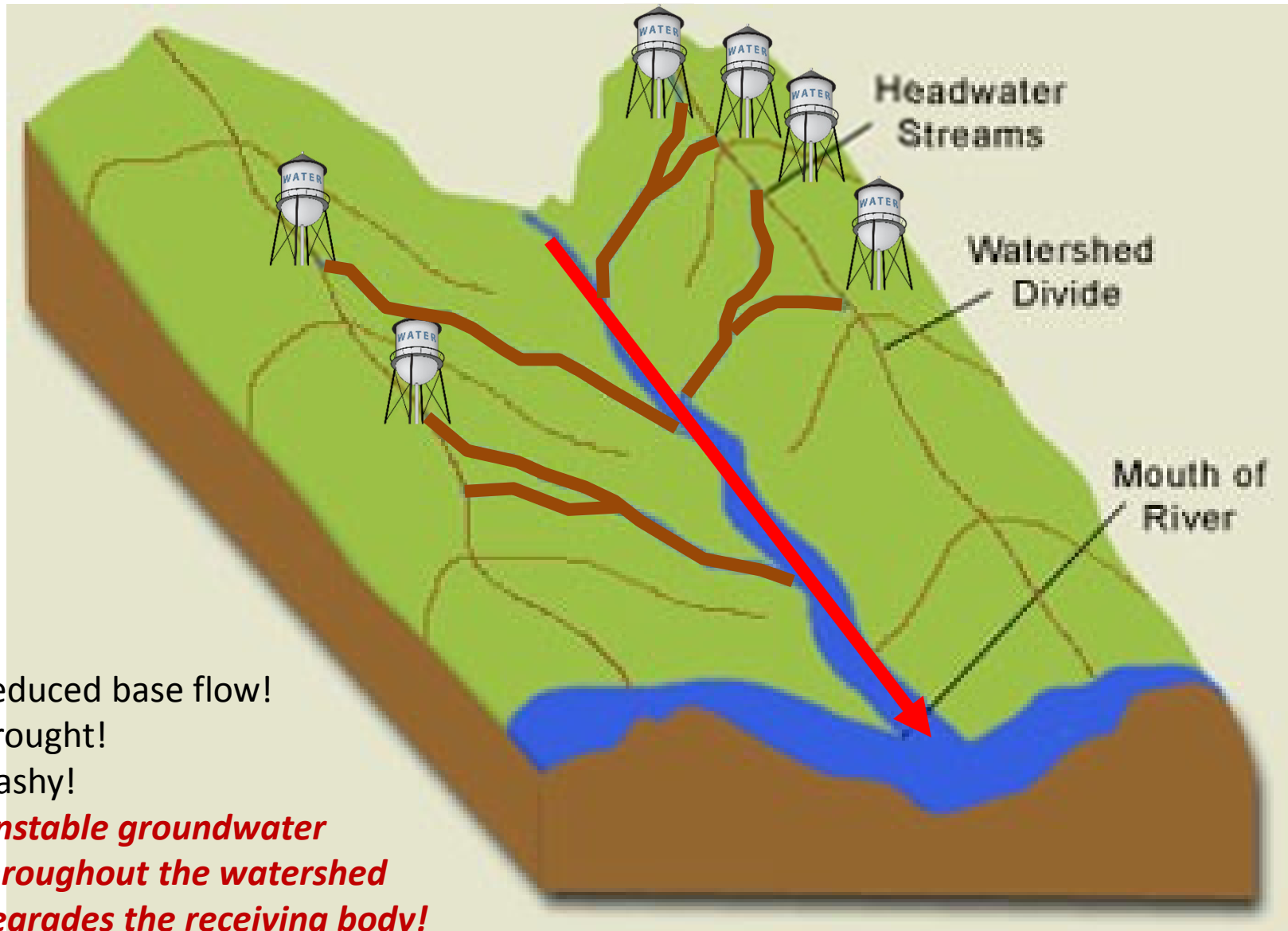
Happens in nature too!



In a healthy watershed...headwaters are dominated by groundwater!



In an unhealthy watershed...headwaters are dominated by surface runoff!

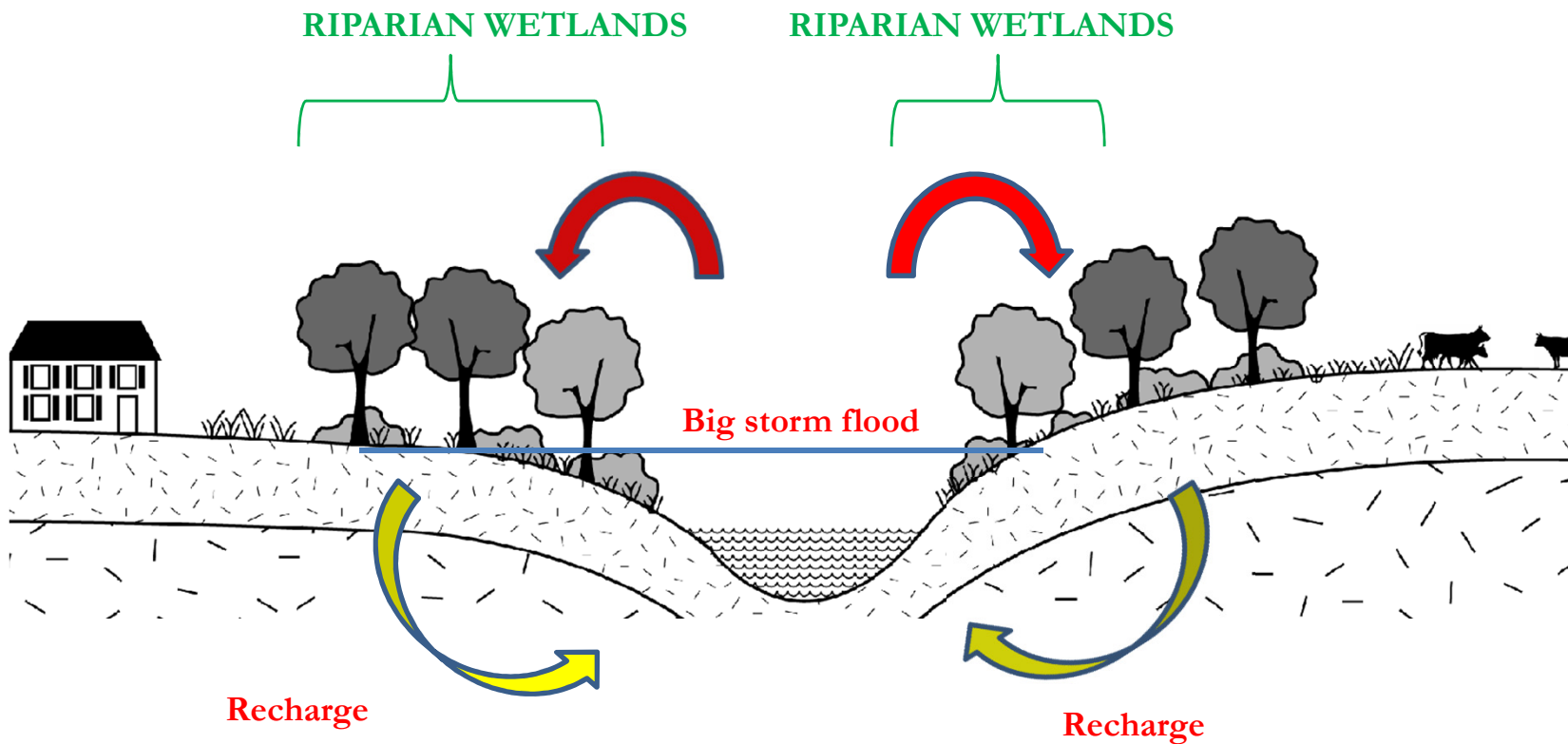


So how do we establish floodplain wetlands?

A lot of us were taught
backwards...

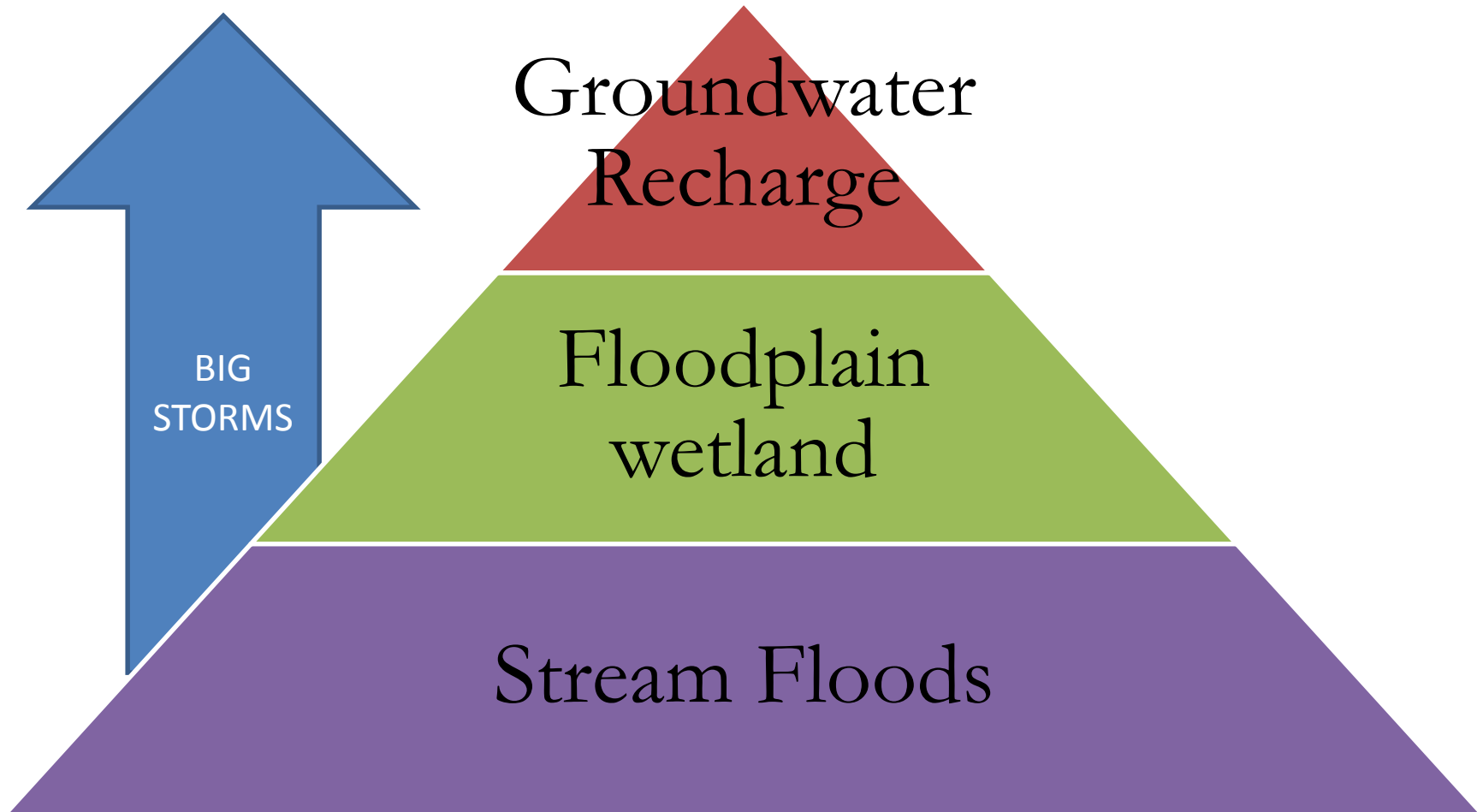


IT DOESN'T WORK THIS WAY

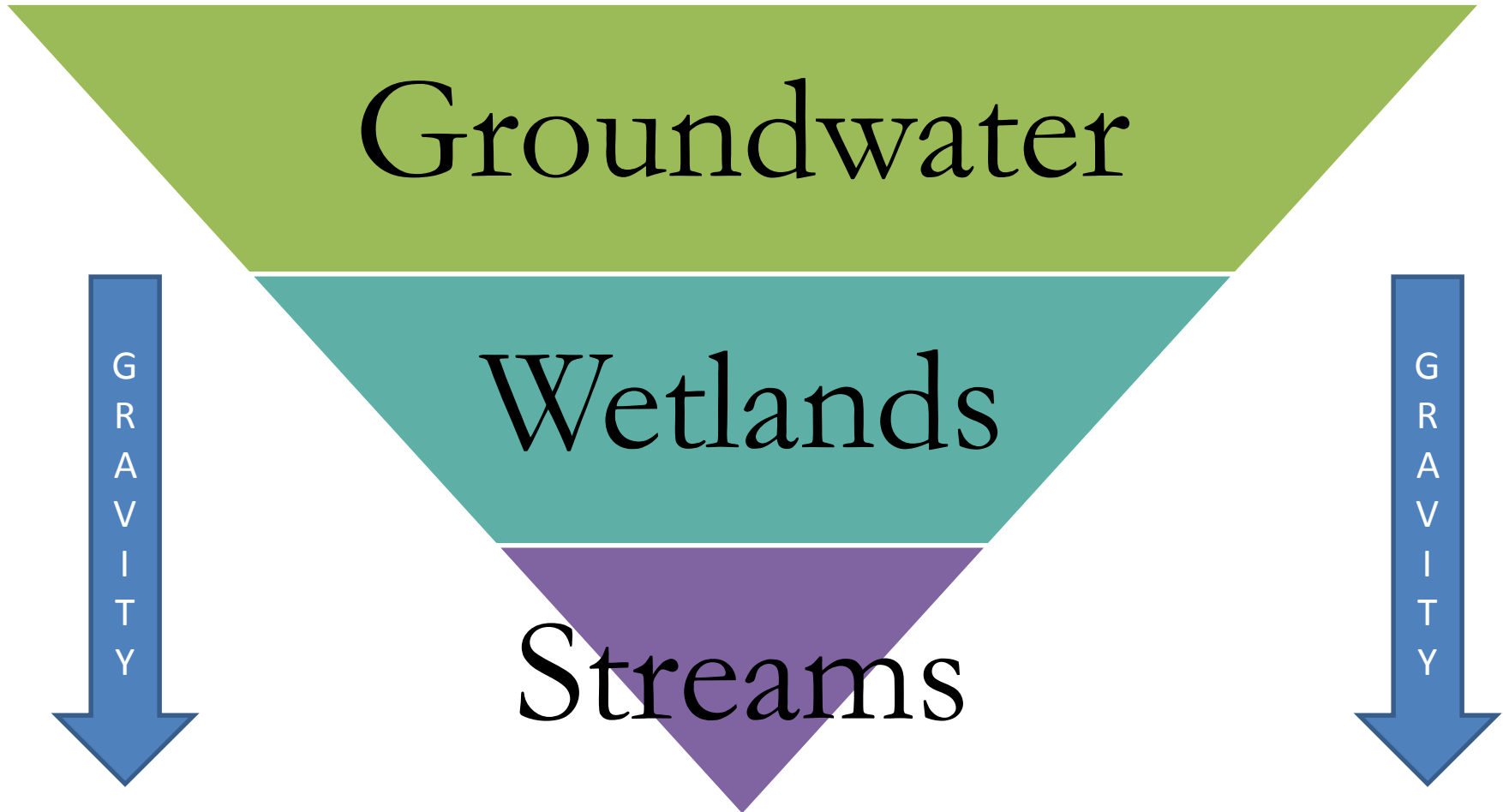


Surface streams are not the *source* of habitat in healthy systems.

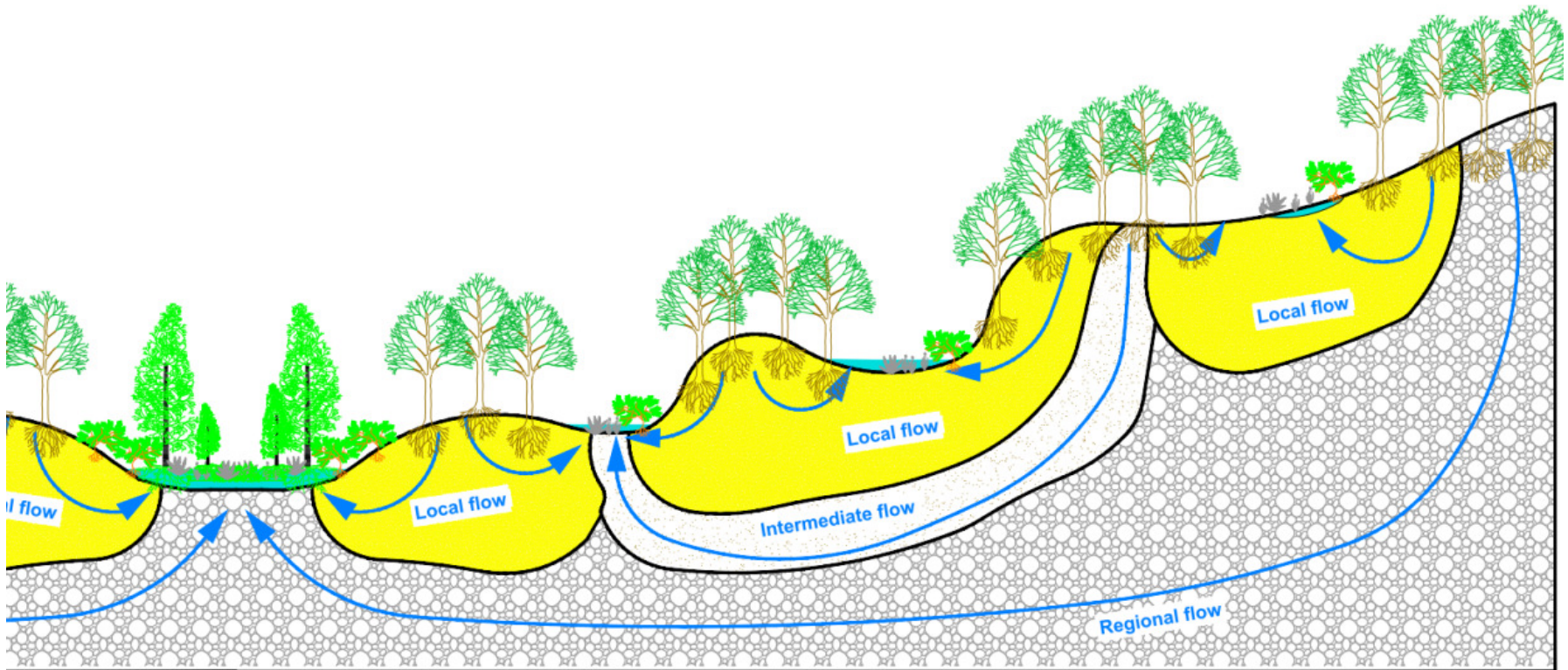
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IT WORKS THIS WAY



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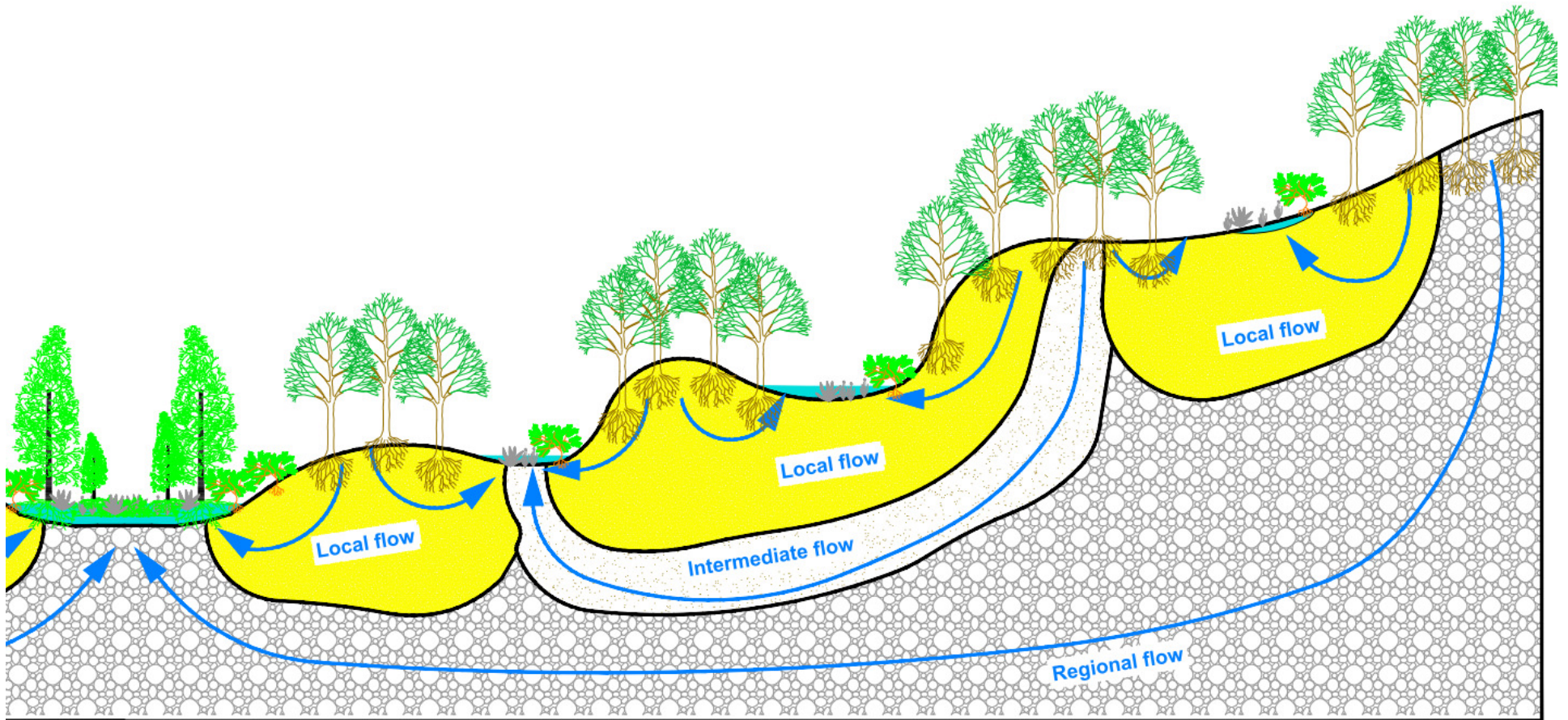
Stable groundwater is the *source* of habitat in healthy systems.

So, you want to build...



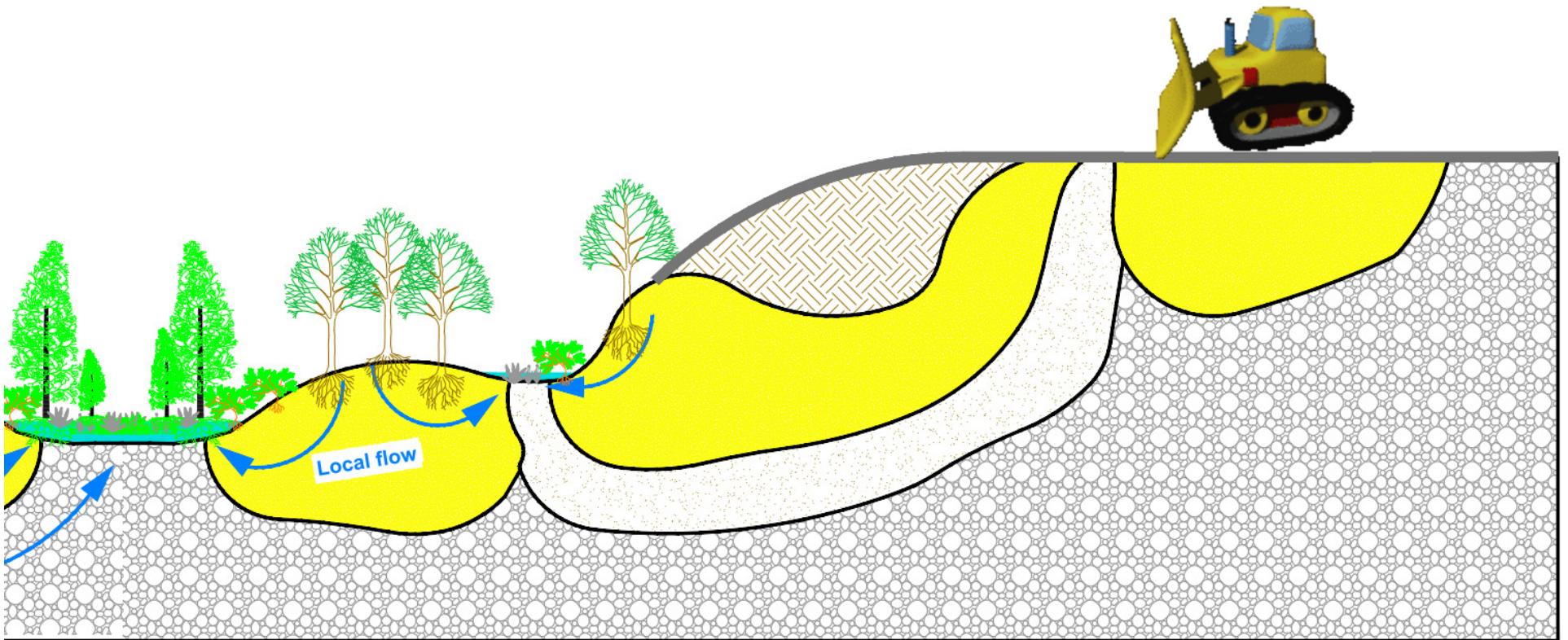
Where should we put the water?

We've found the perfect site for our business!

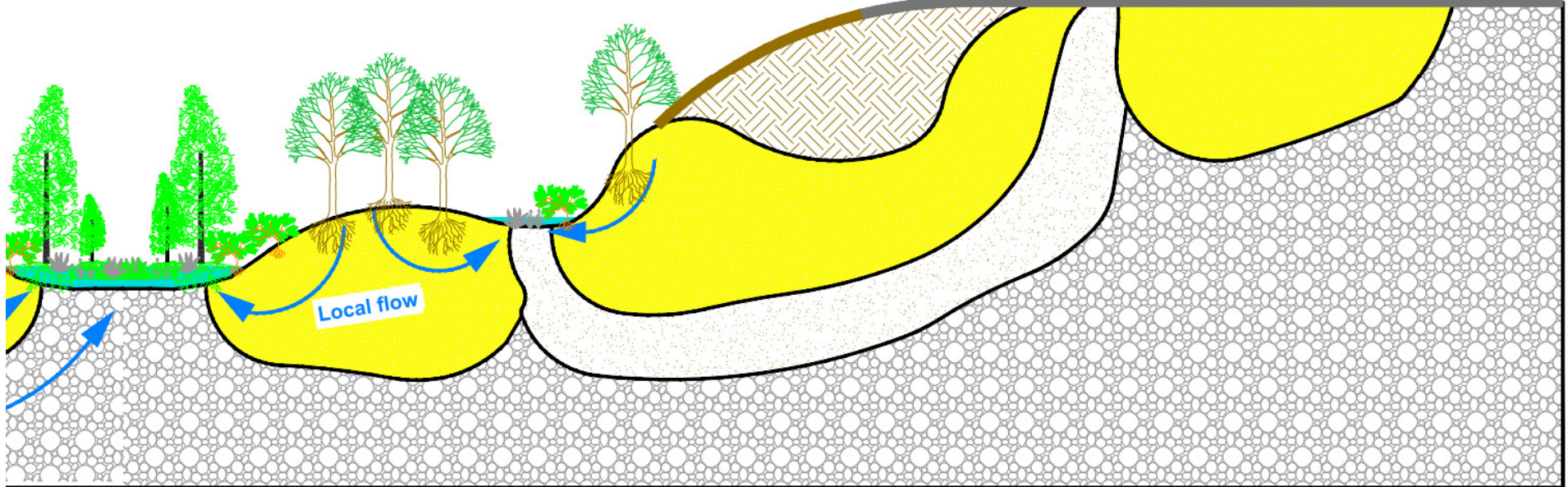


Step 1: Clear, grade, and pave the landscape

- Disconnect critical recharge locations



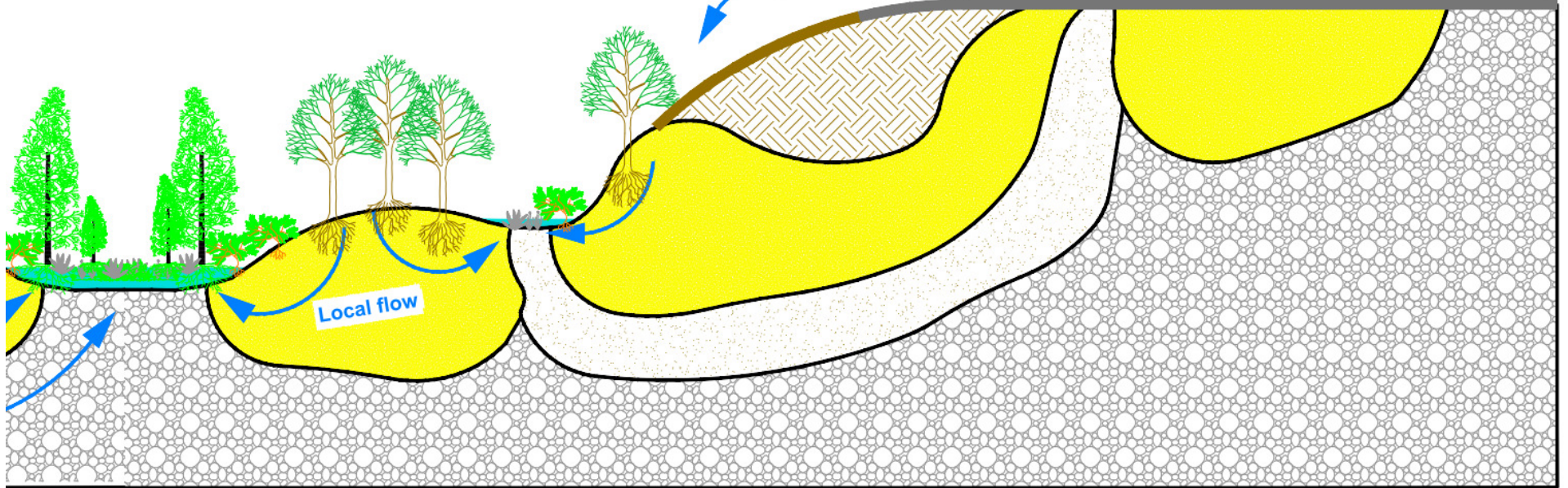
Step 2: Build your store



Step 3: Dump that runoff right at the property line

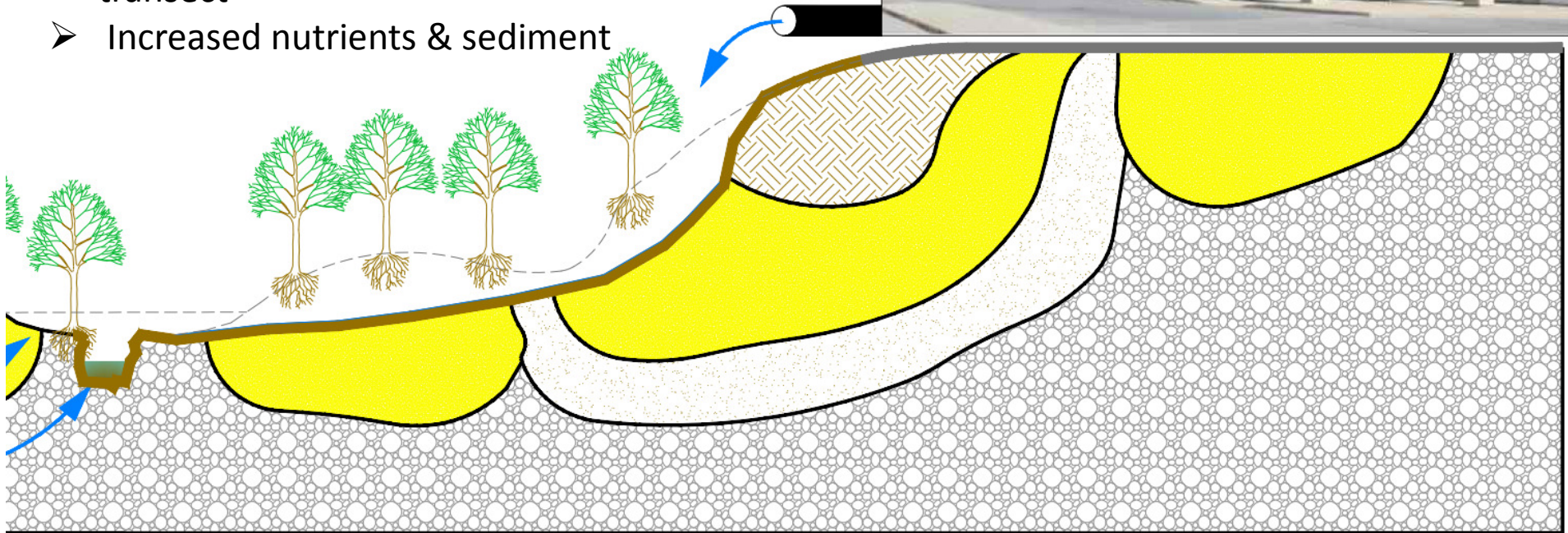
- Discharge concentrated flow to surface

Property Line



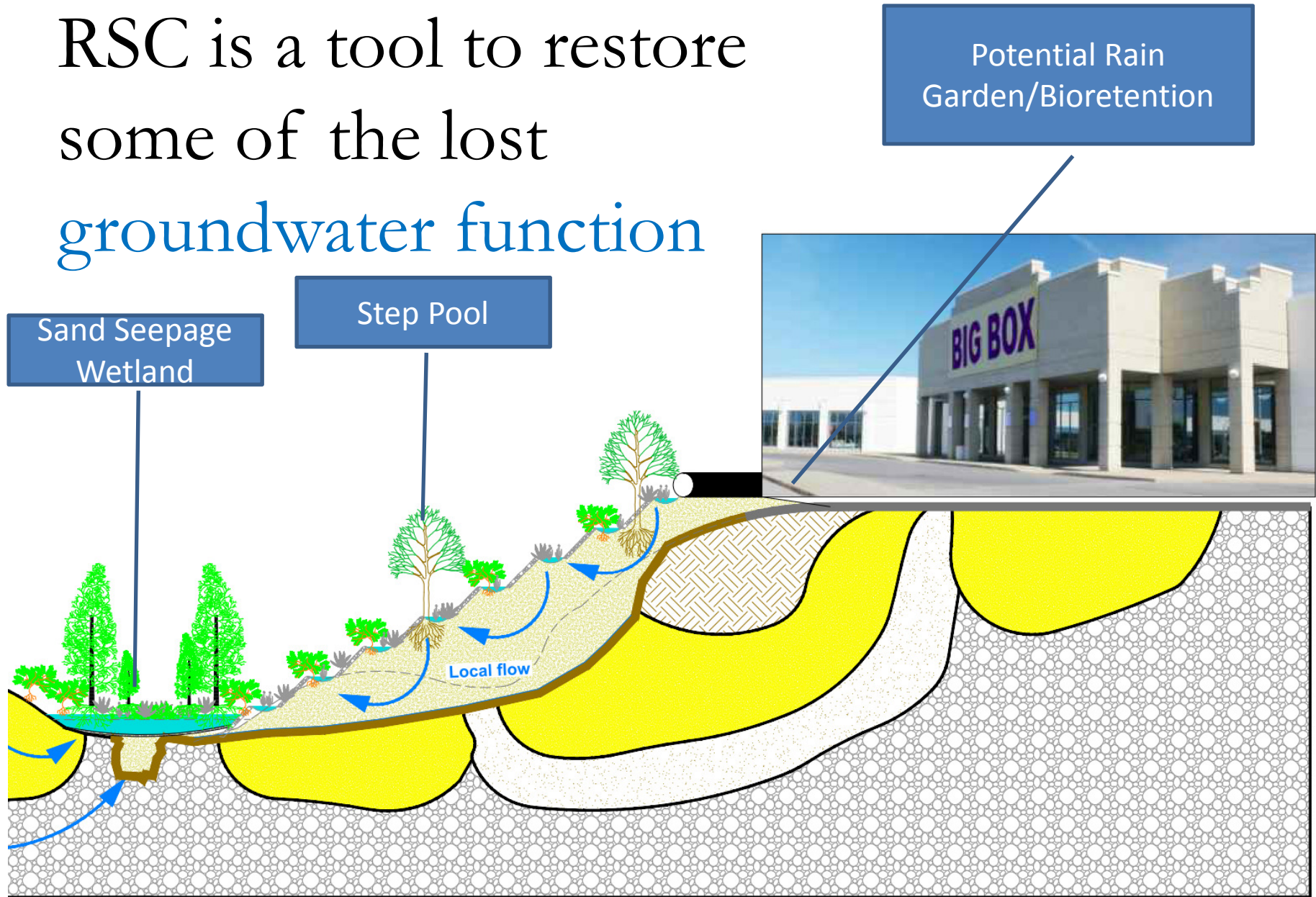
So....what happened?

- Sustainable groundwater lost
- Downstream wetland blown out, ditched, incised
- Downcutting starts at bottom of valley- forms gully to outfall
- Loss of habitat along entire transect
- Increased nutrients & sediment



Drier valley more closely resembles upland

RSC is a tool to restore some of the lost groundwater function



Thank you!