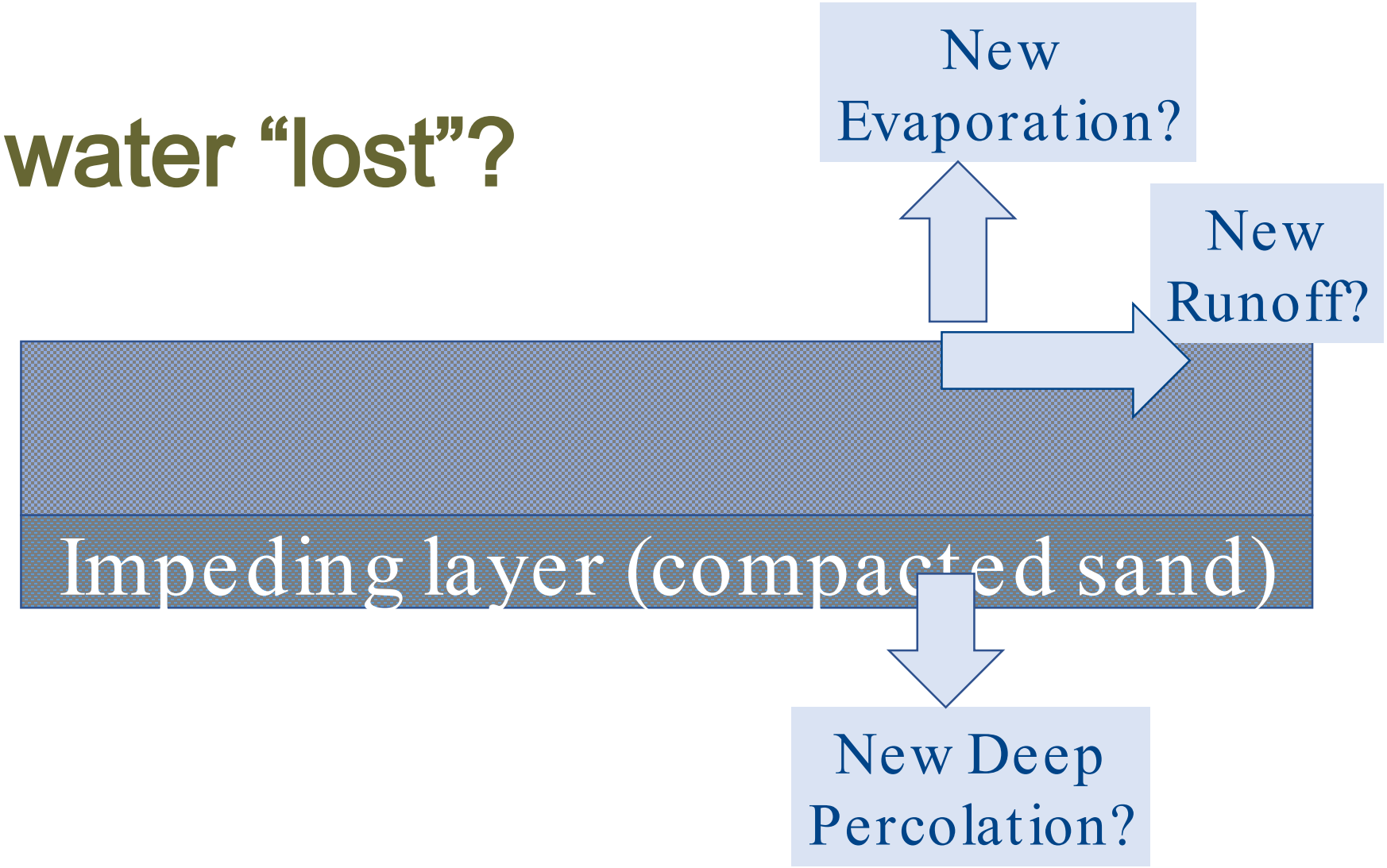
Waterlogging even in sandy areas!

“lost amount of water”

Impeding layer promotes waterlogging.

How is water “lost”?



Impacts of Sandy Soil Compaction to Vadose Zone Hydrology

Insight from 1D Soil Water Flow Models

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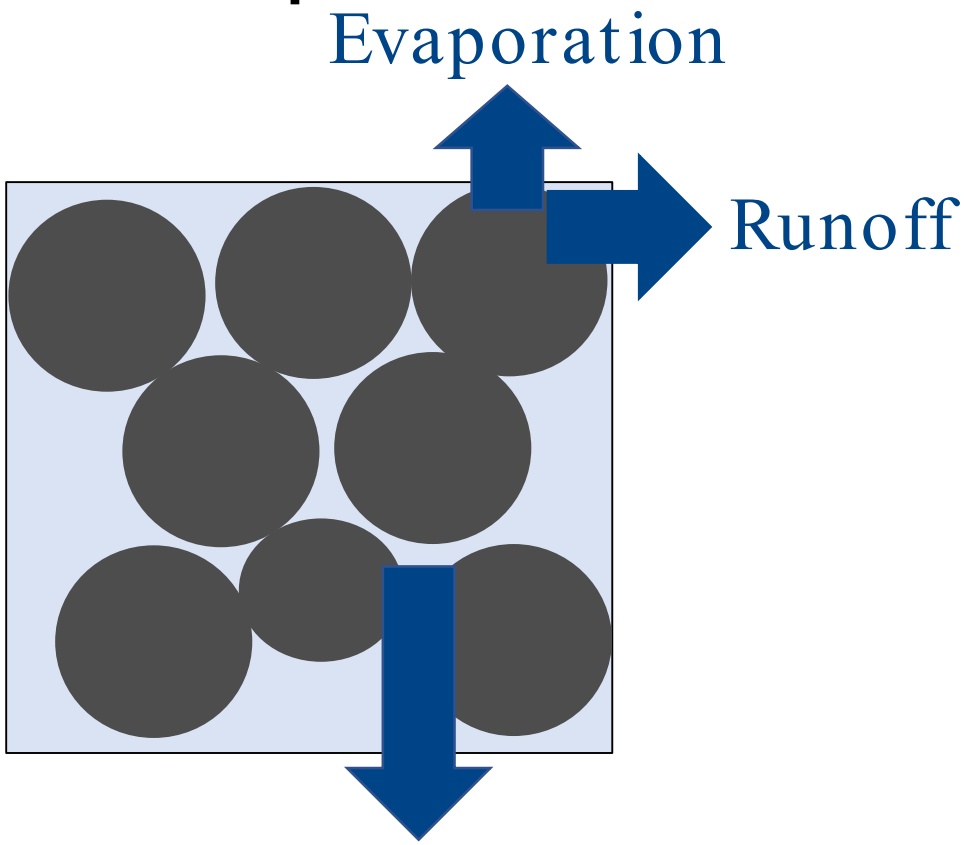
Jan Staes
Jan Vanderborght
Sarah Garré

Universiteit Antwerpen
KU LEUVEN
ILVO

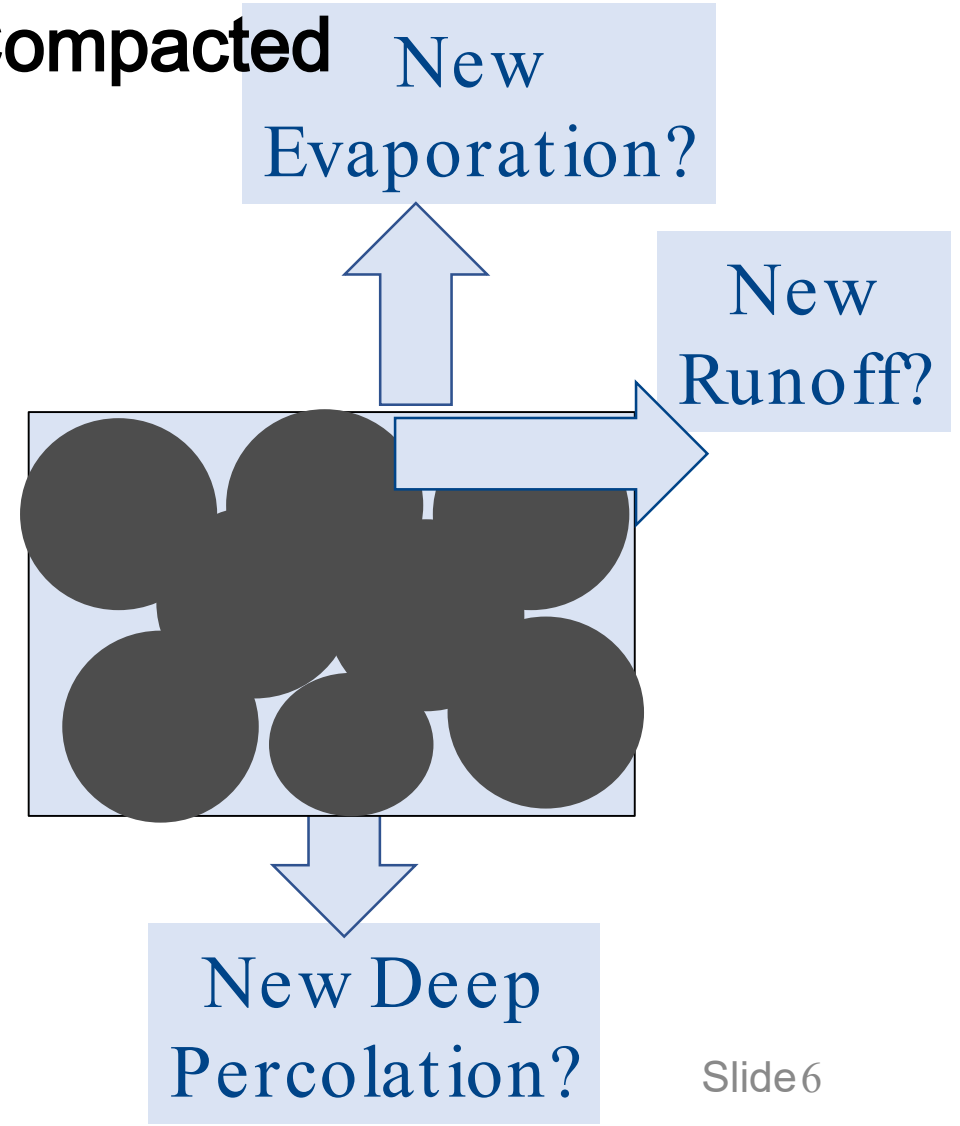
Research Question

For sandy soils:
How does the water budget change with compaction?

Non-compacted



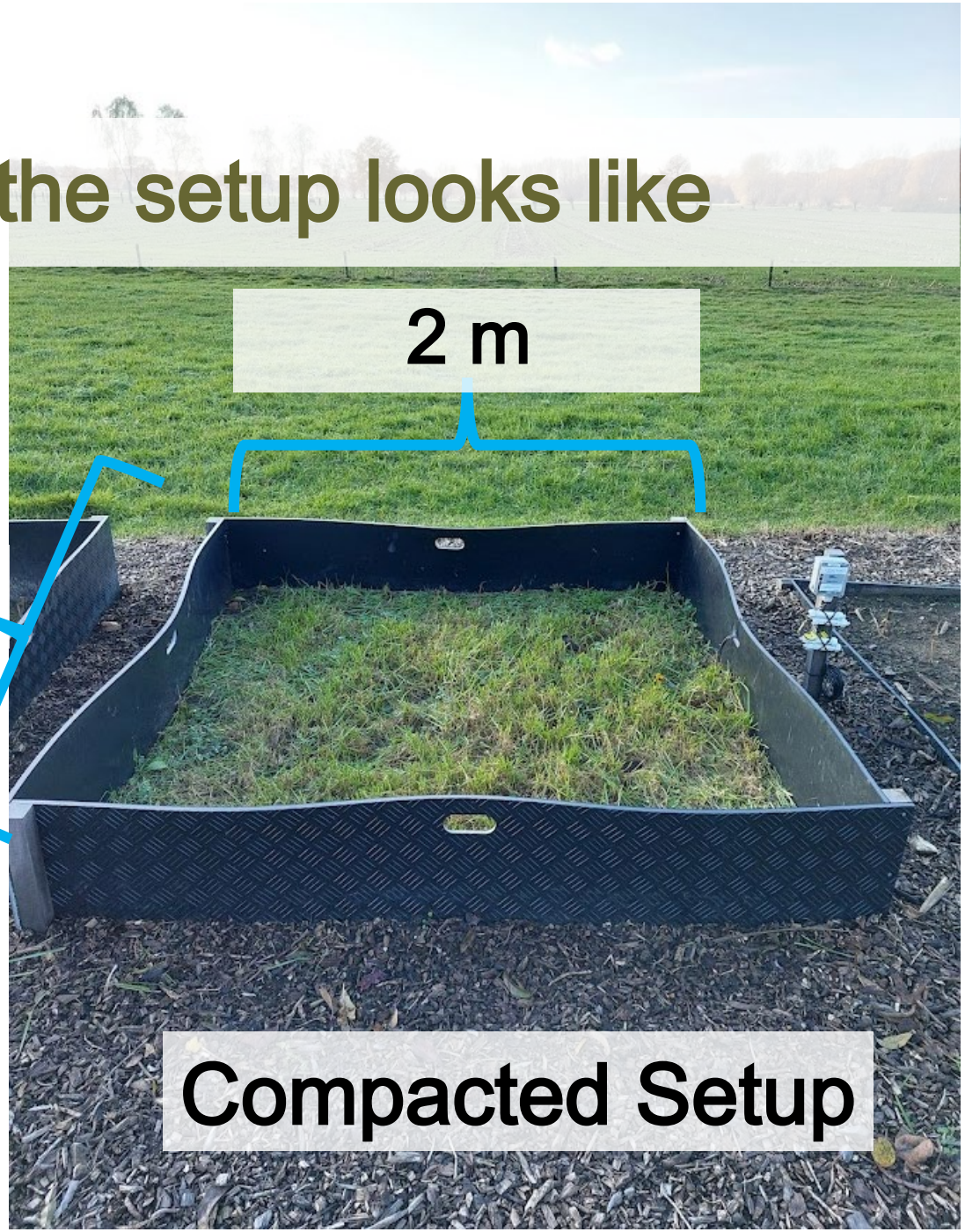
Compacted



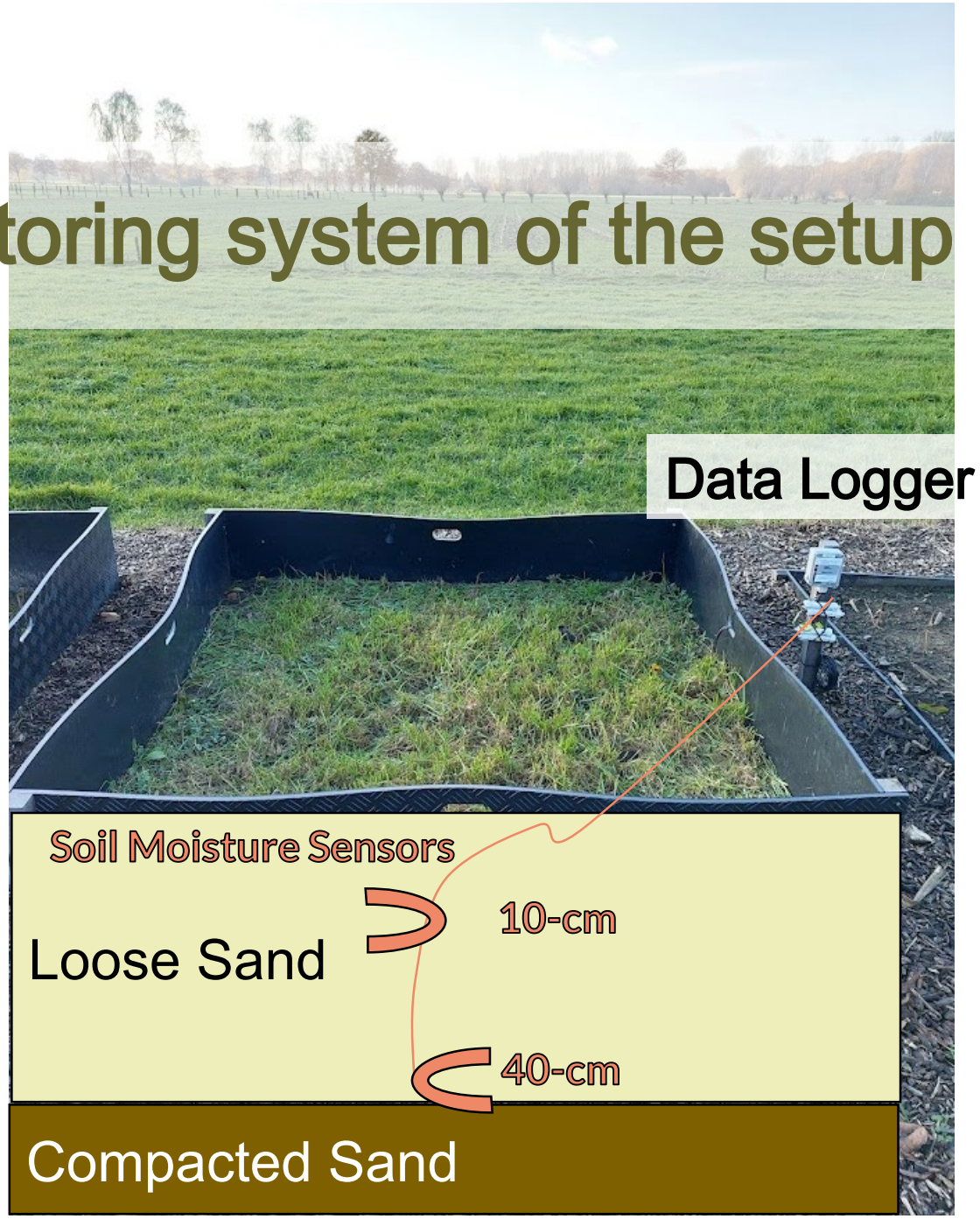
1st Step:

Monitor Experimental Setups

How the setup looks like



Monitoring system of the setup

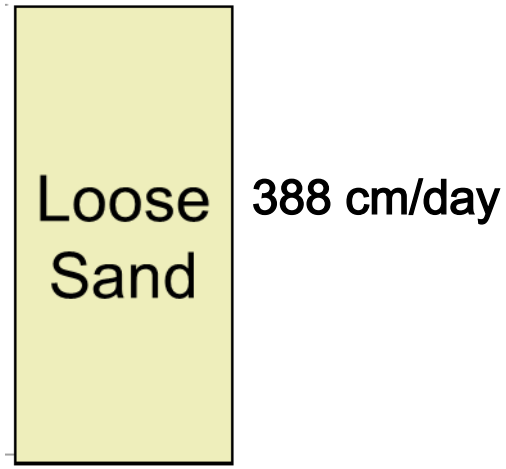


2nd Step:

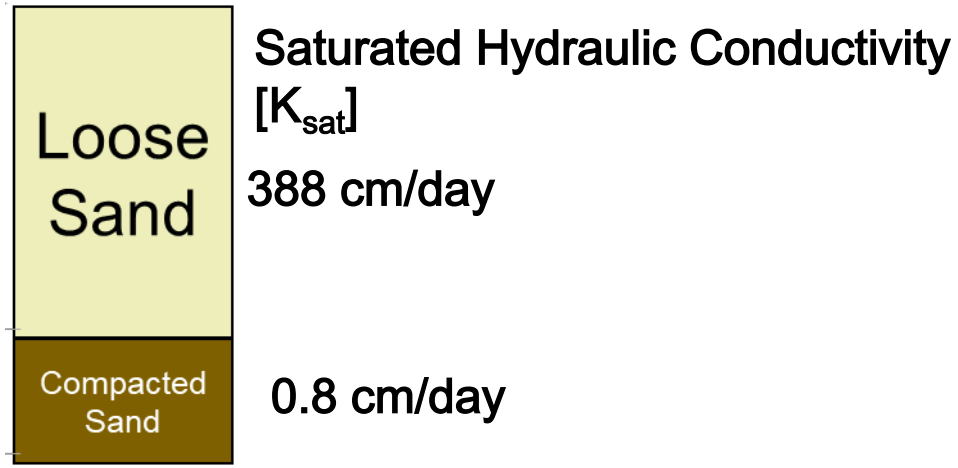
Perform 1D Soil Water Flow Modeling (HYDRUS)

Set up the Model Parameters

Non-compacted (Hypothetical)



Compacted (Real-world)



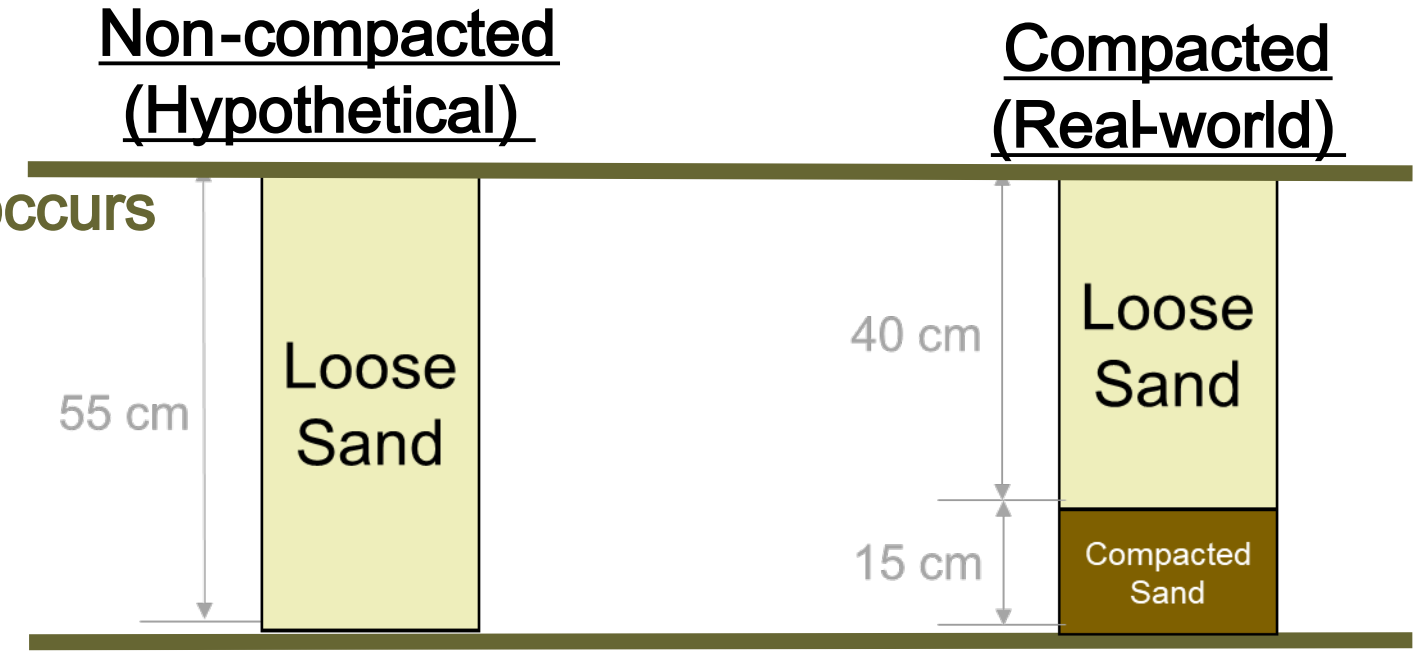
Set up the boundary conditions

Upper Boundary

Beyond saturation? runoff occurs

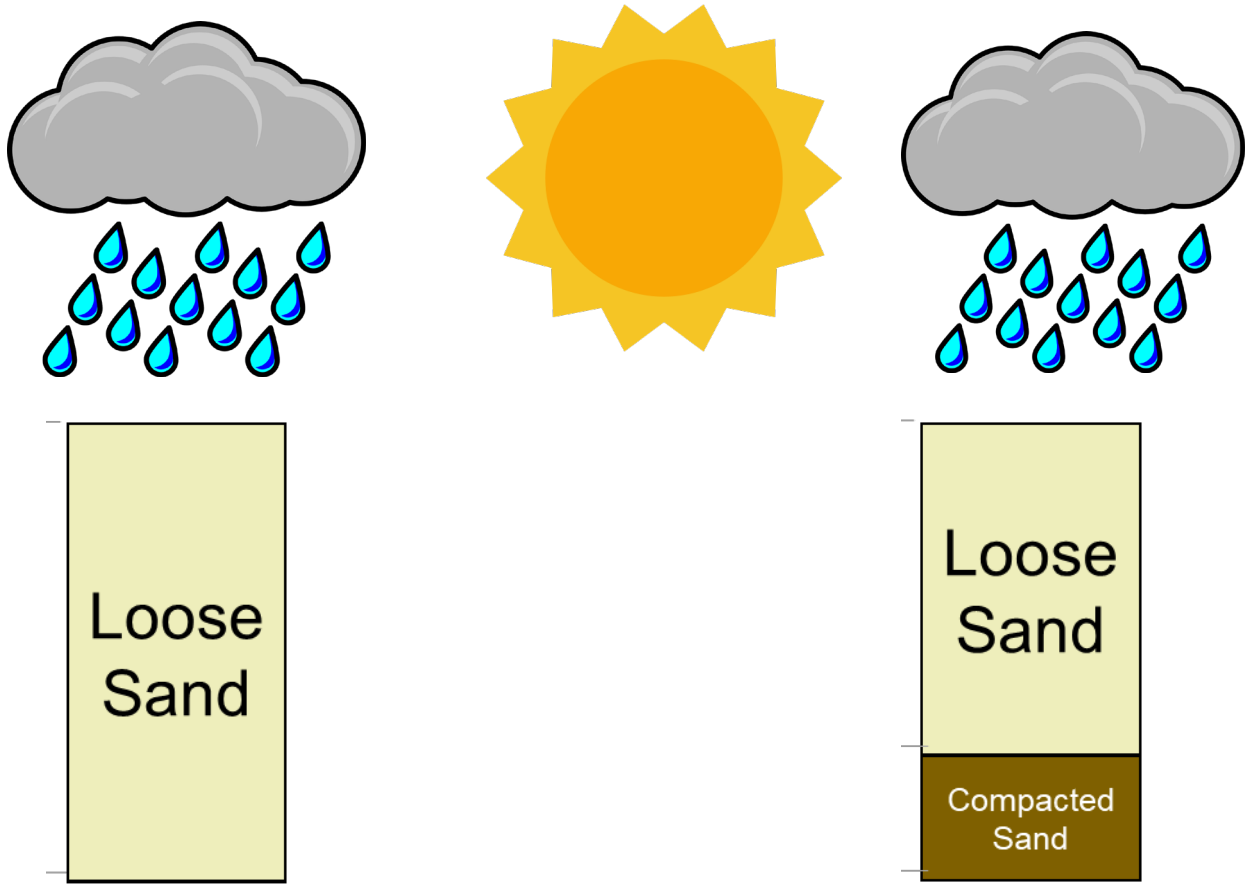
Lower Boundary:

Free Drainage

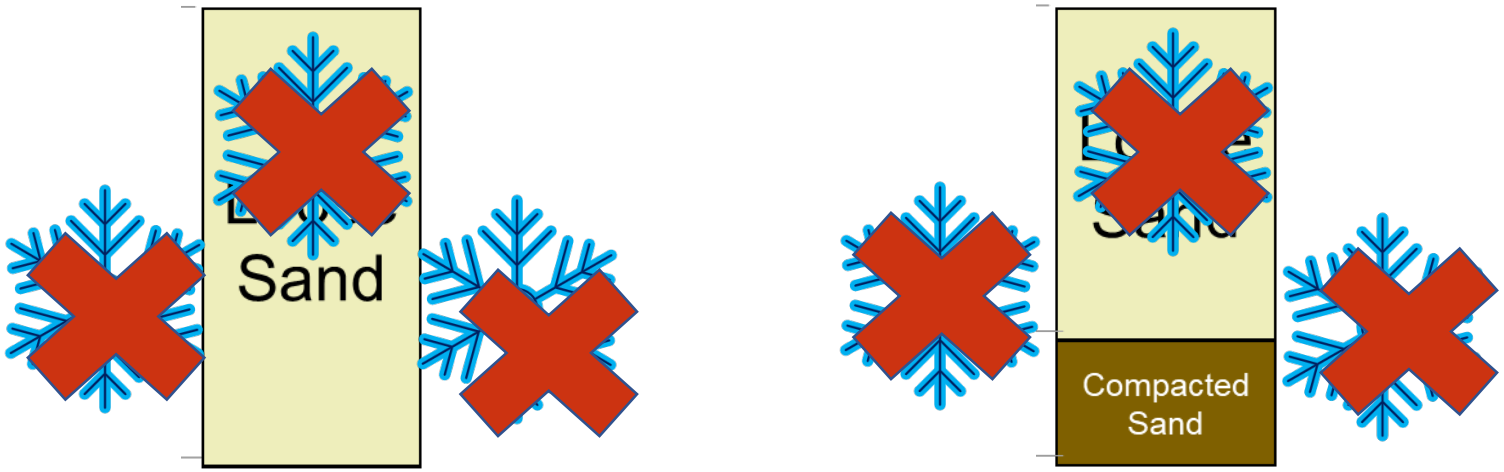


Water Table is deep

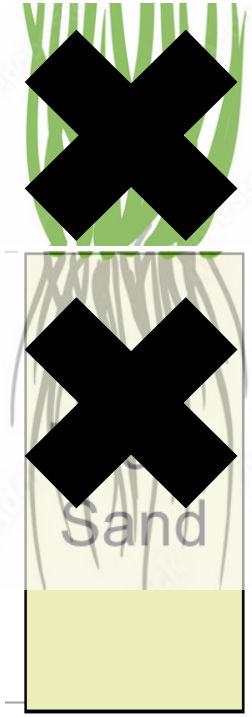
Simulate autumn and winter season (October to March)

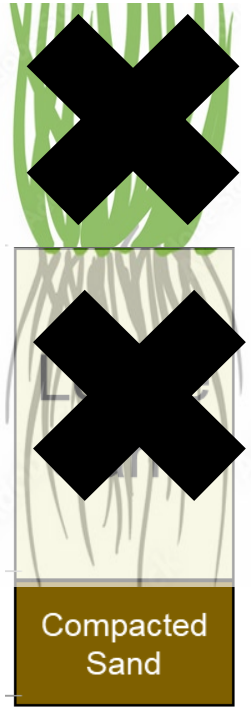


Neglect freezing events



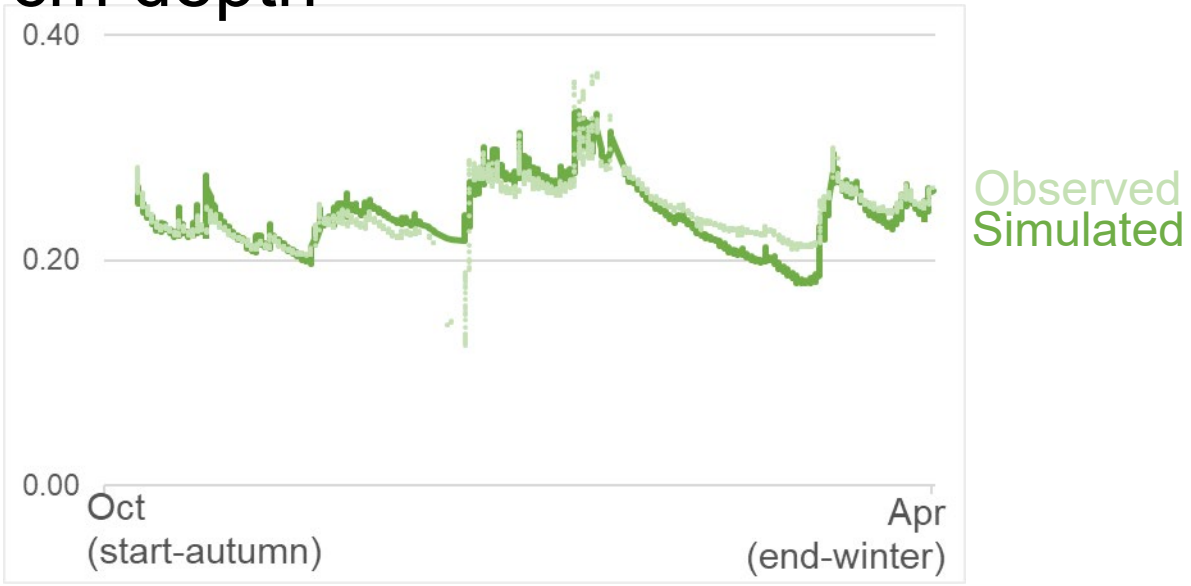
We neglect vegetation. Transpiration is minimal



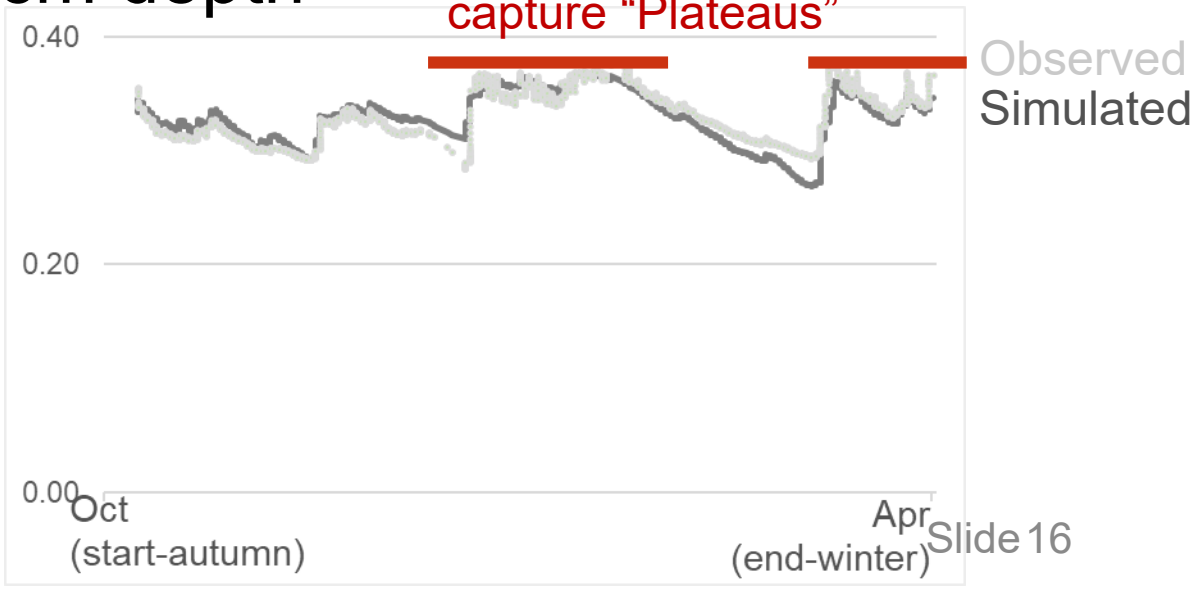


The “compacted” model simulates well

10 –cm depth

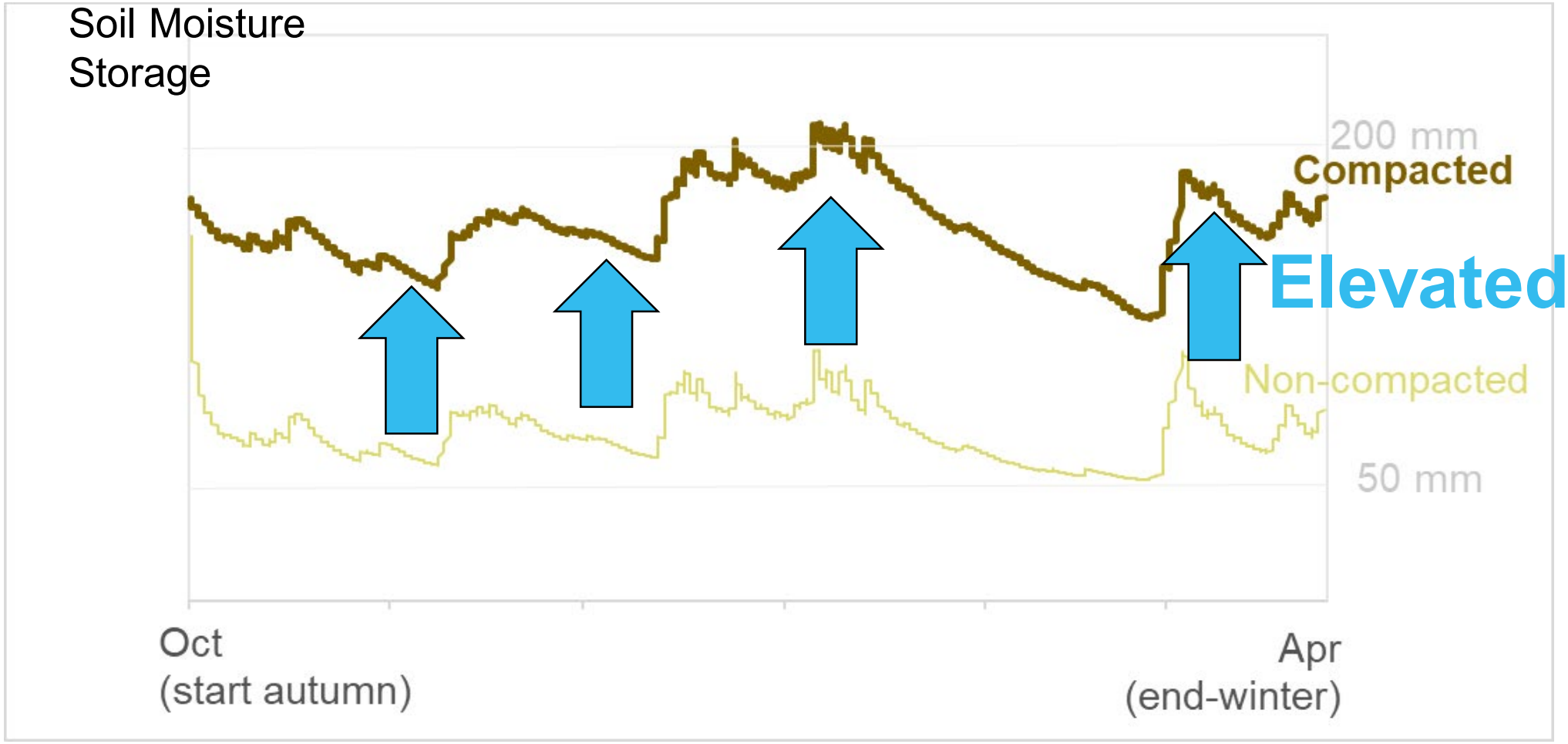


40 –cm depth



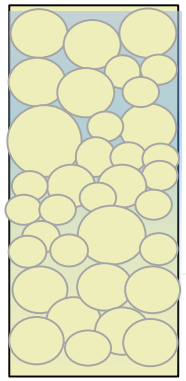
Results on Water Budgets

1. Compacted Setup has more stored water



Compacted setup has an impeding layer

Non-compacted setup

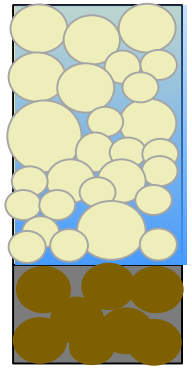


Sand

40 cm

Less water on shallow zone

Compacted setup



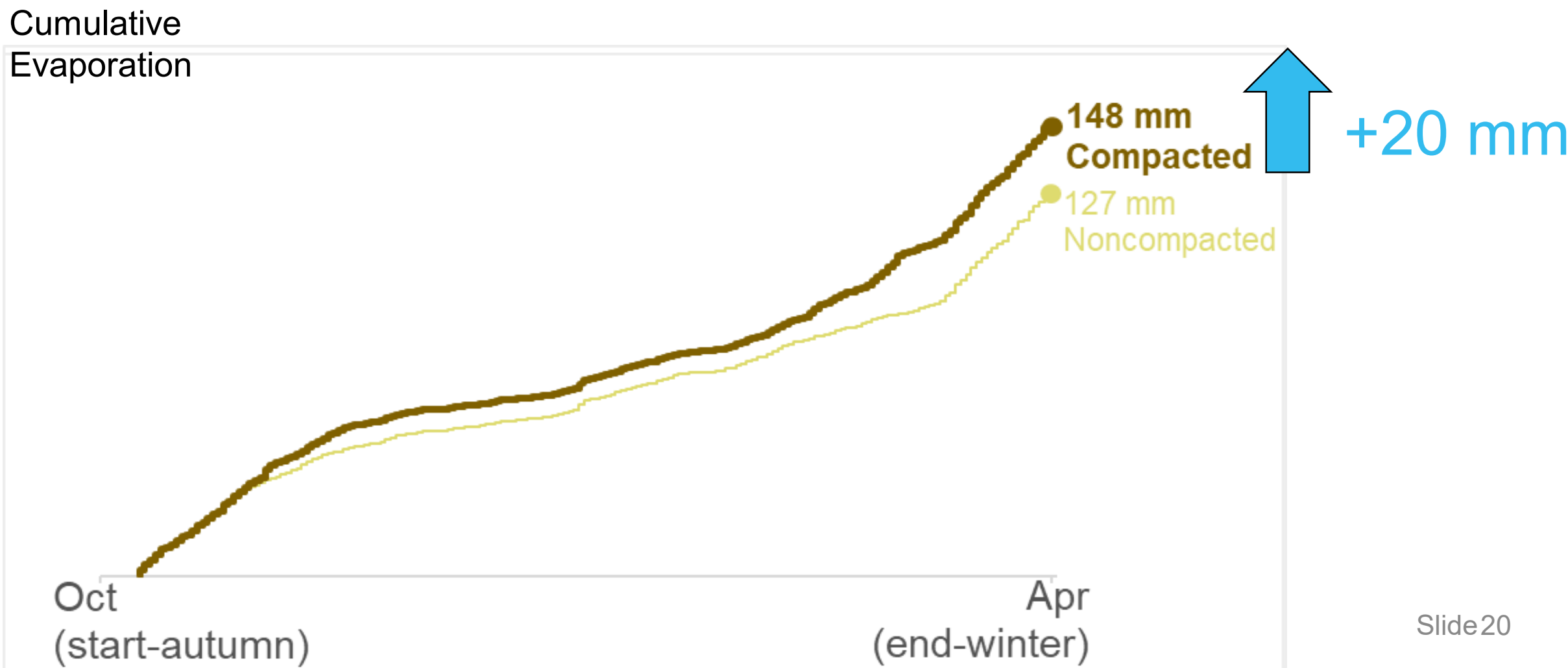
Sand

40 cm

Compact Sand

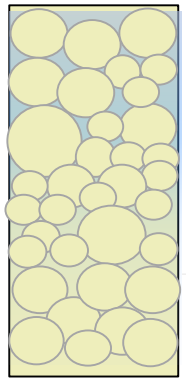
More water on shallow zone

2. Compacted setup has more evaporation



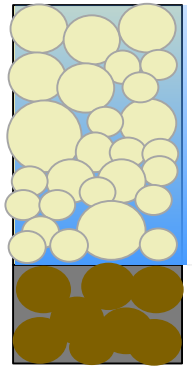
Compacted setup has more water prone to evaporate

Non-compacted setup



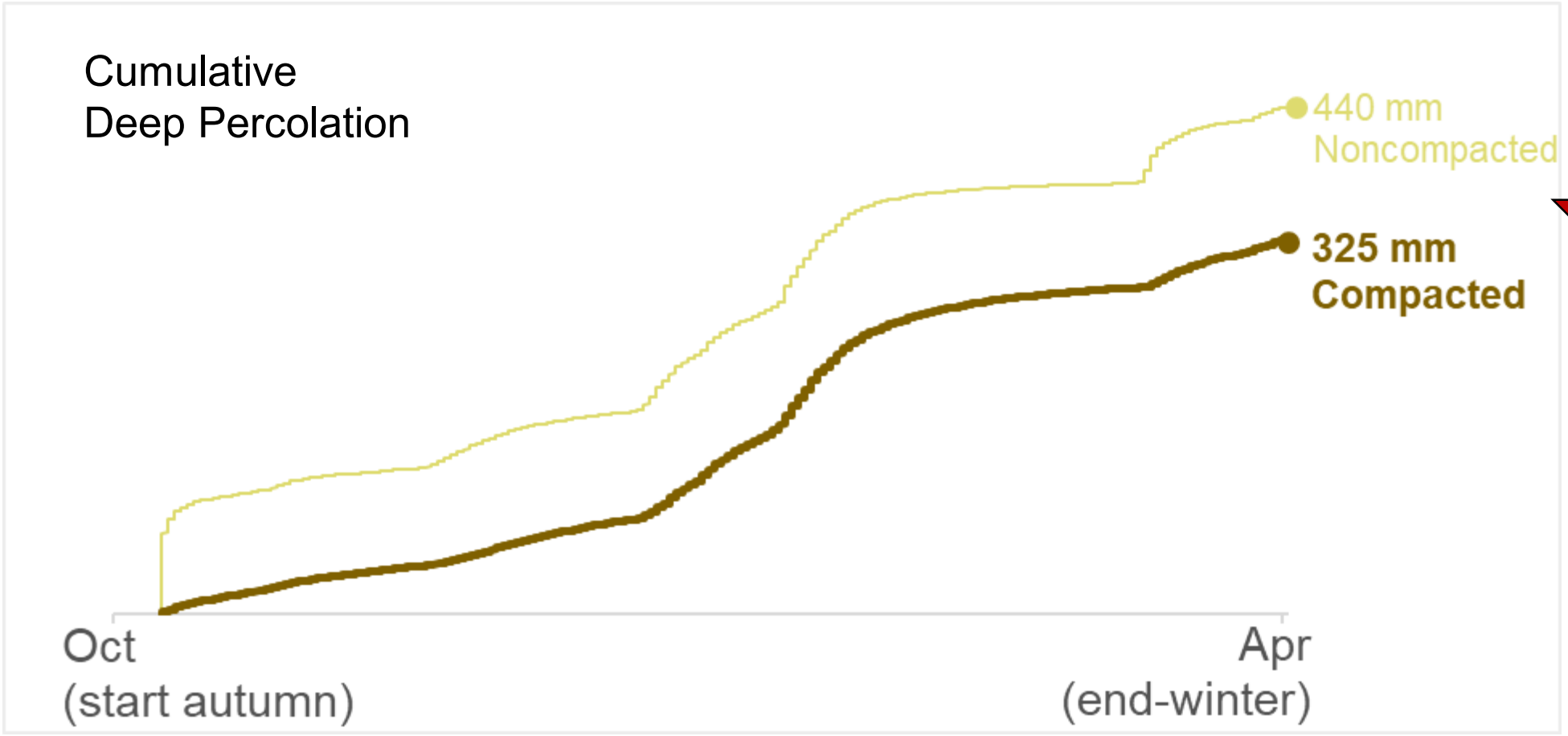
Less water on shallow zone

Compacted setup



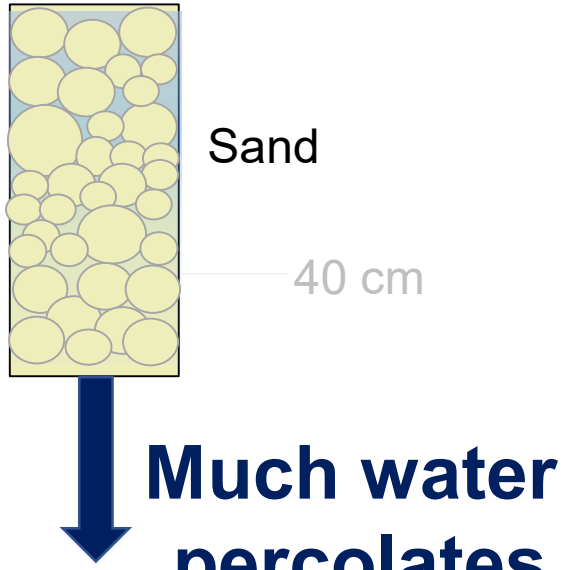
More water on shallow zone

3. Compacted setup has reduced percolation



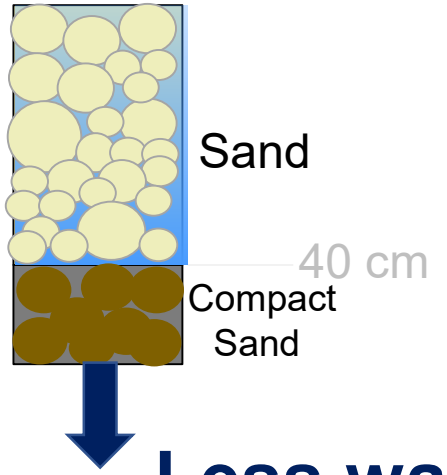
Compacted setup: less water percolates

Non-compacted setup



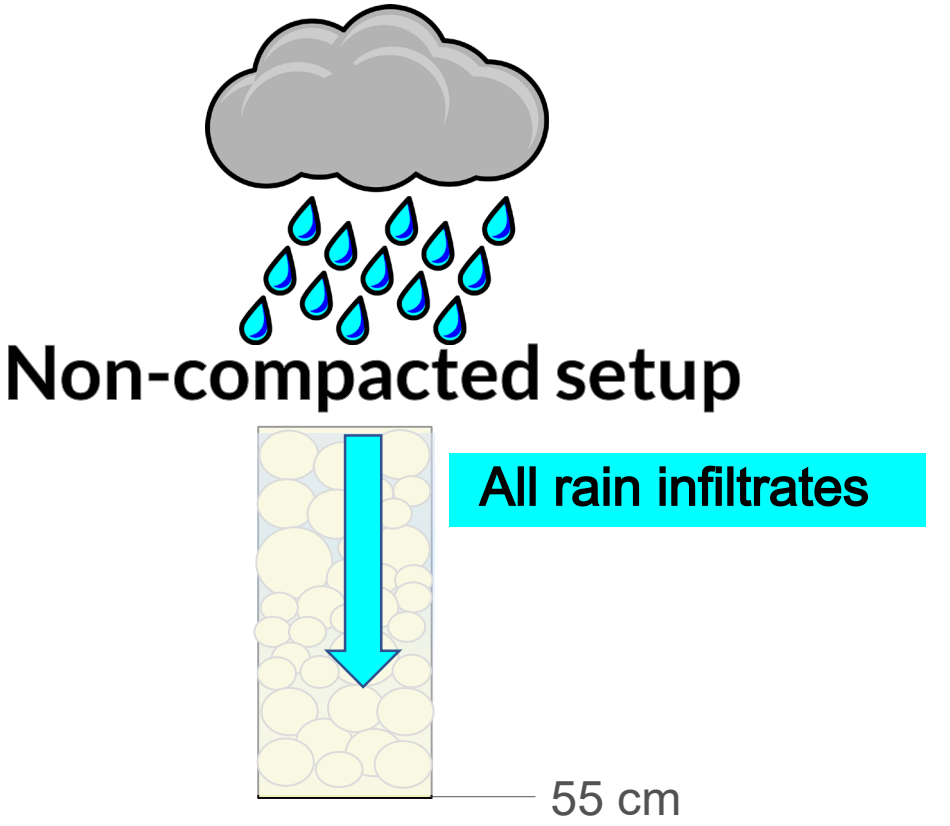
Much water percolates

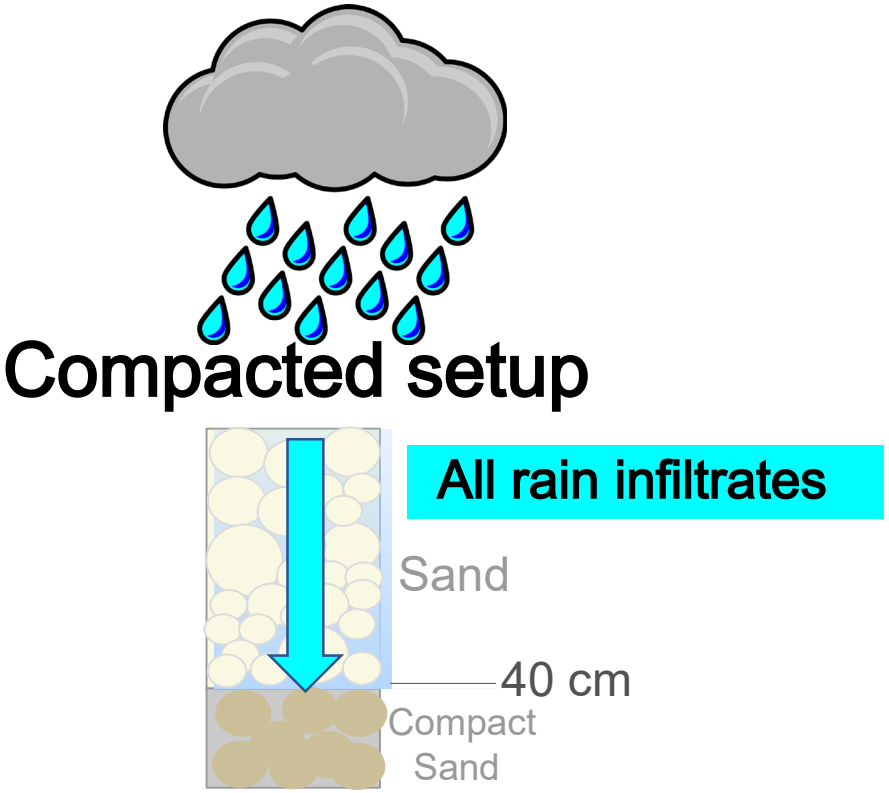
Compacted setup



Less water percolates

4. Both setups have no runoff.



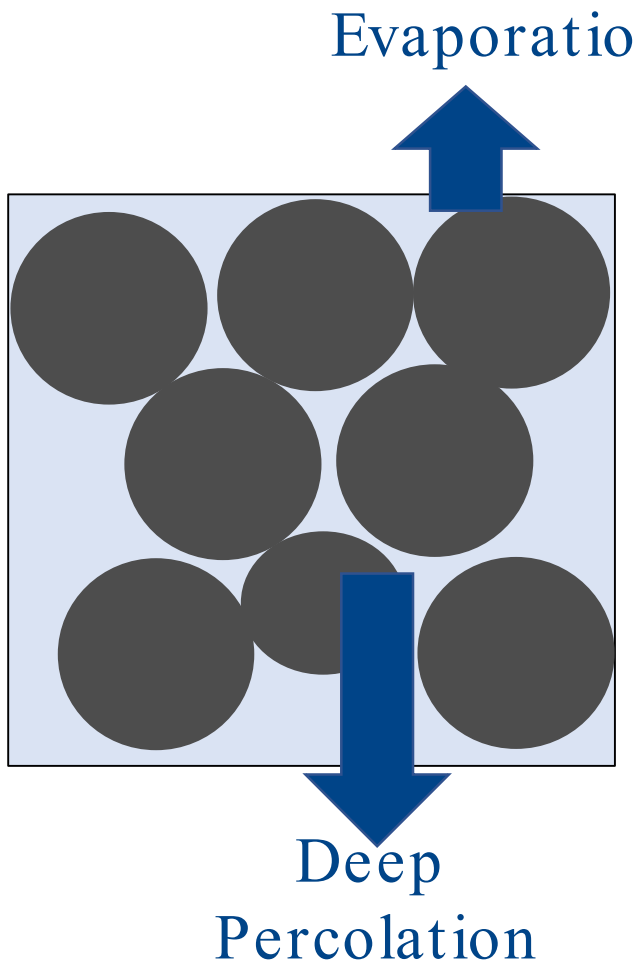


Loose layer is thick enough

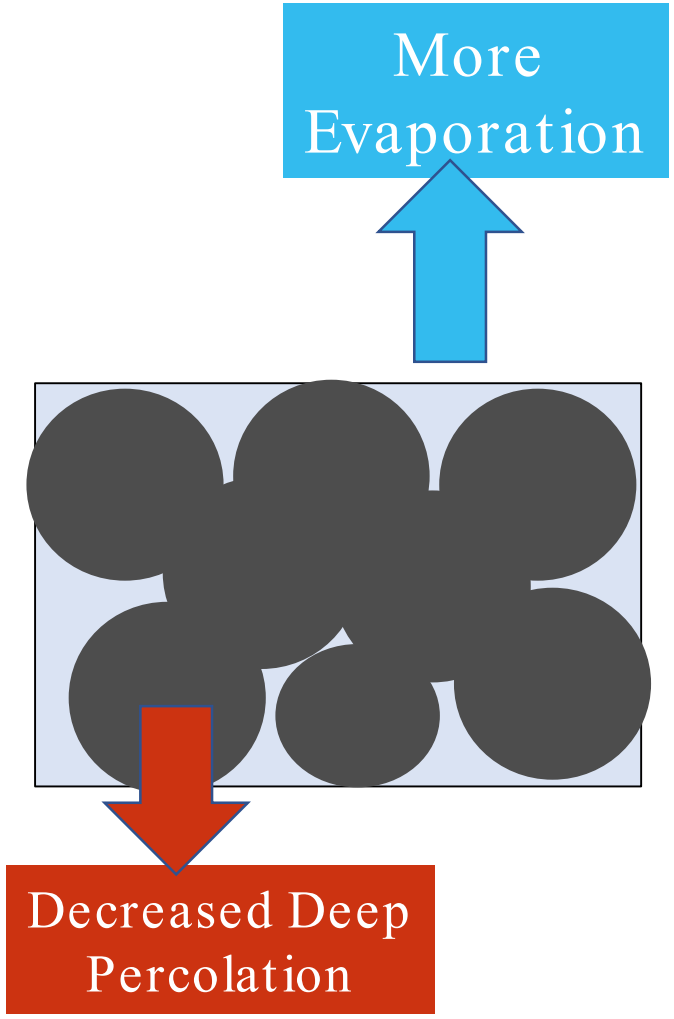
Conclusion

Even for sandy soils, compaction can influence water budget

Non-compacted

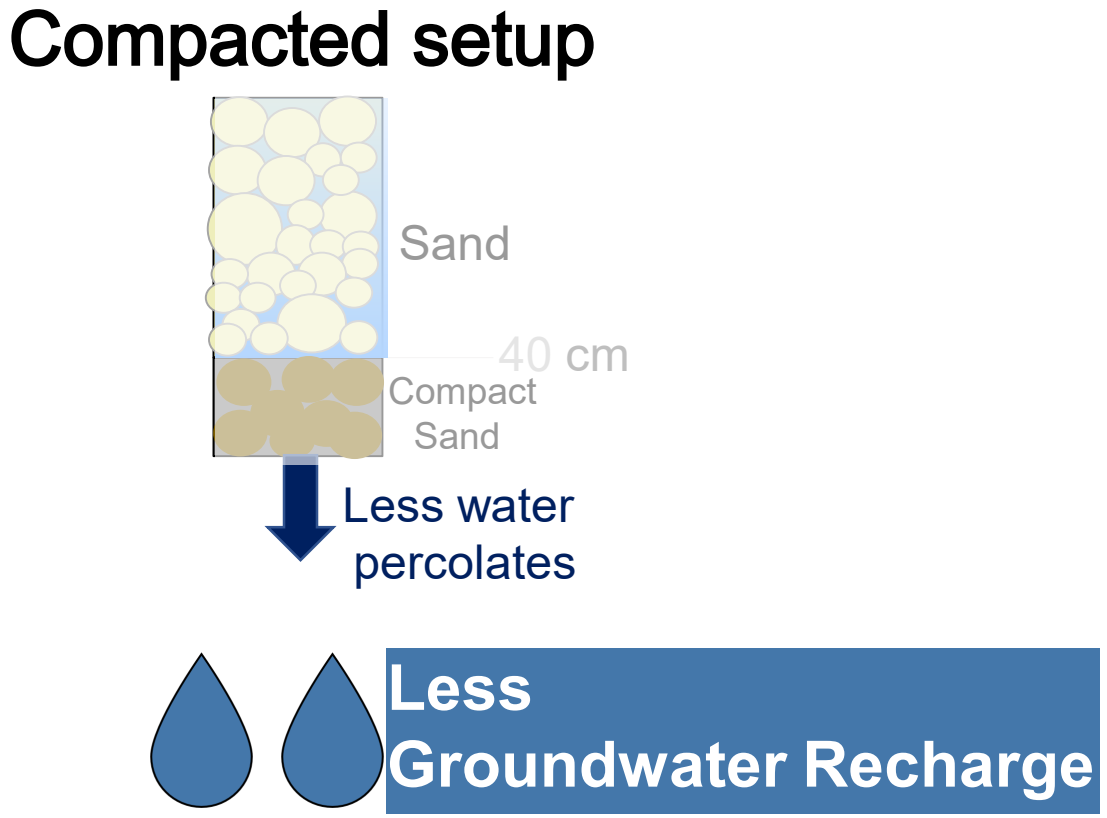


Compacted

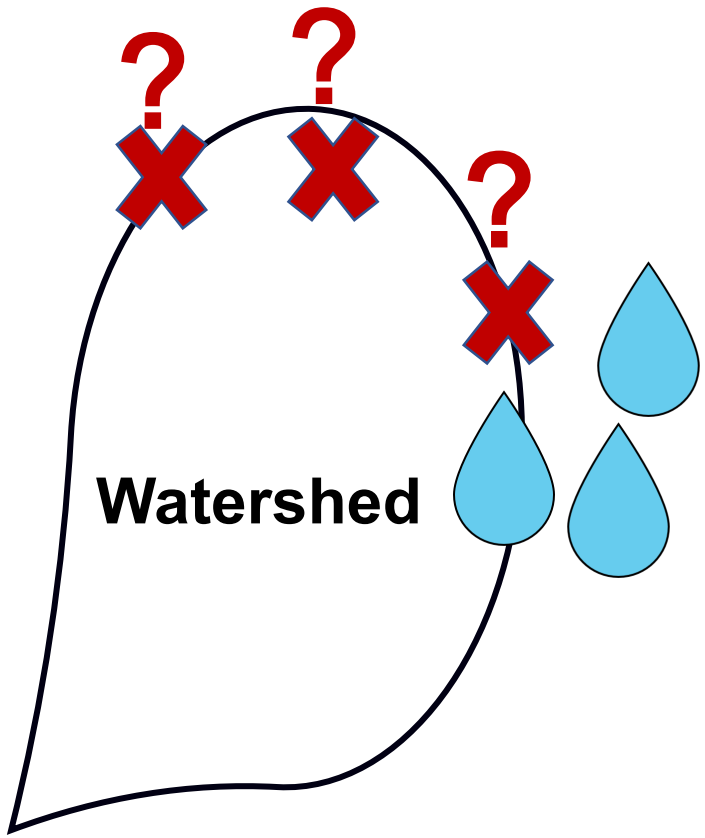


Implications

Compaction can reduce groundwater recharge?



De-compact to improve groundwater recharge?

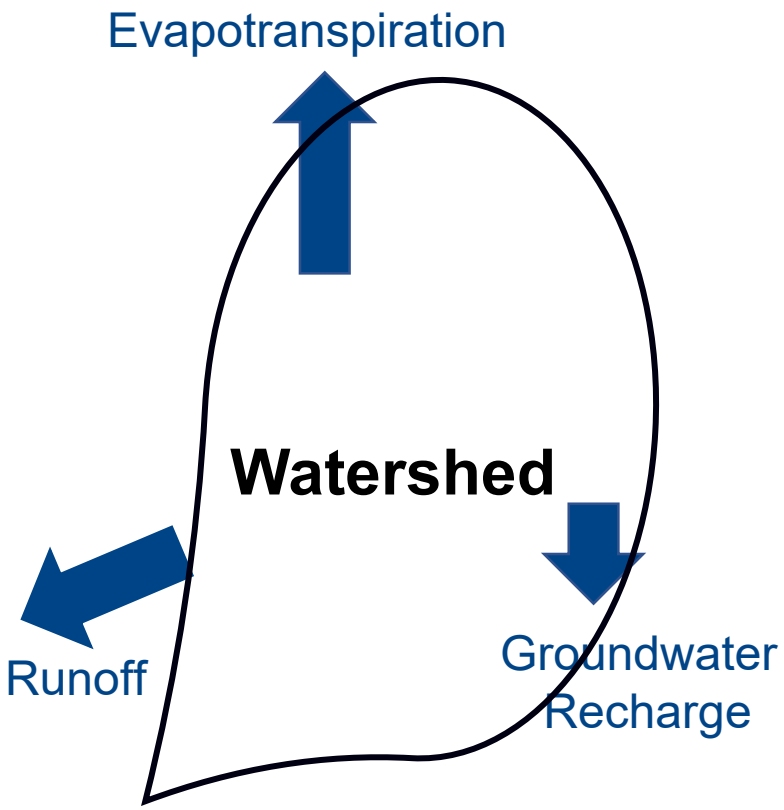


More groundwater recharge

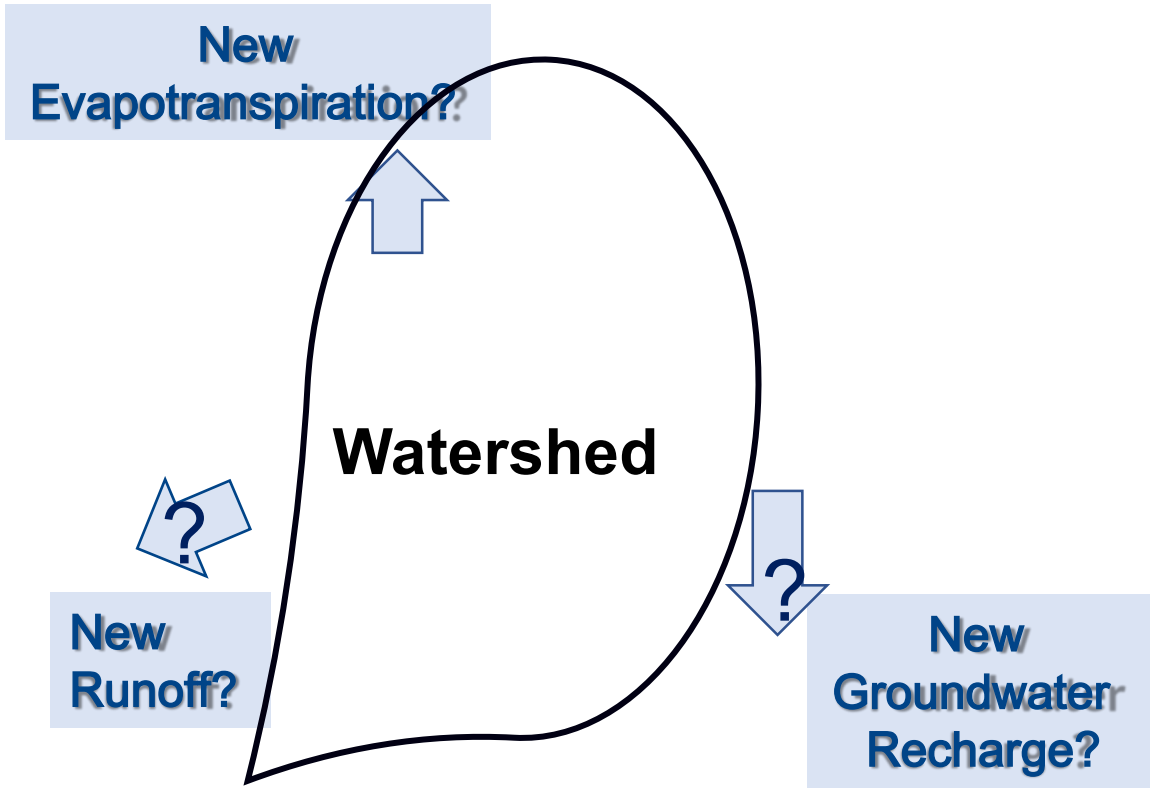
Outlook

Upscale impacts on watershed scale

With compacted fields



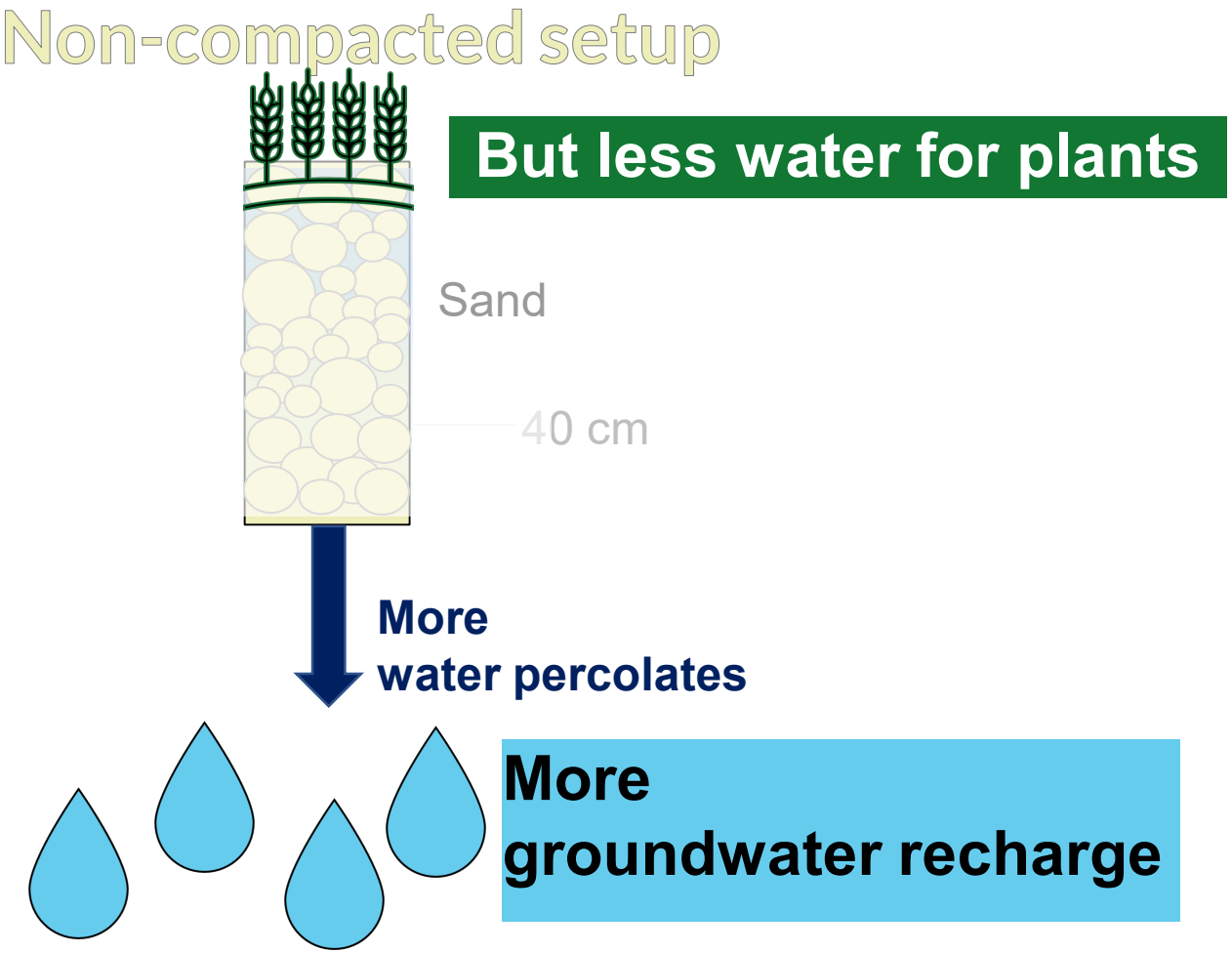
If we decompact?



Assess during spring and summer

Vegetation is important!

Assess trade-offs of de-compacting



Minimize water losses in infiltration zones.