

The role of 'unseen' water in managing NH water resources

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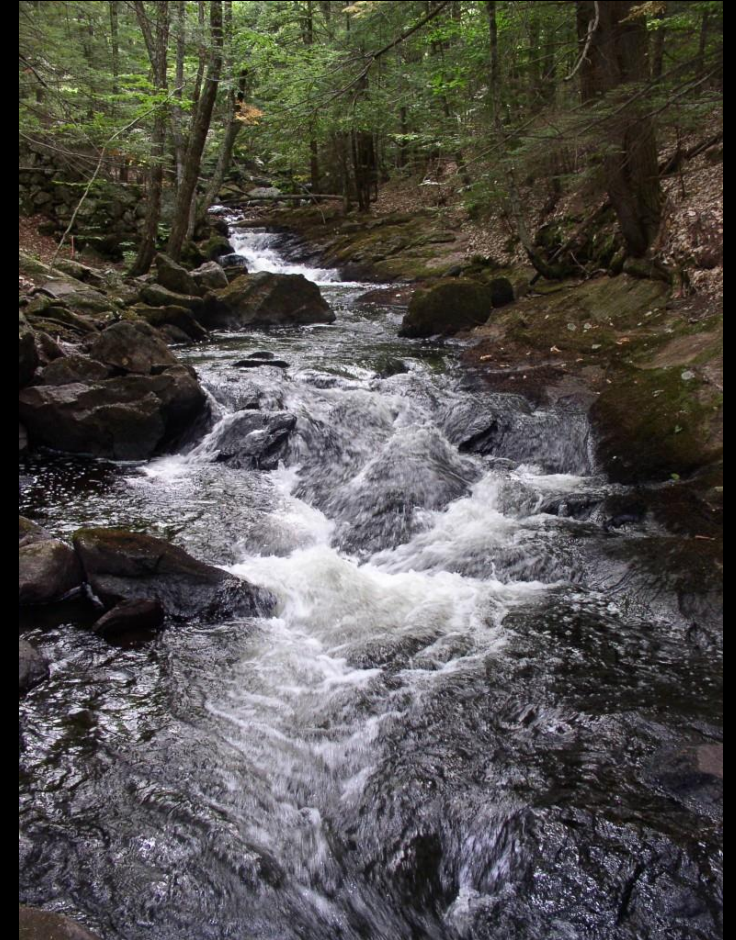
Northern Research Station - U.S. Forest Service



The charismatic waters of NH are critical.



Squam Lakes Association



Piscataqua Region Estuaries Partnership

The unseen waters are foundational.



Precipitation

Interception, Transpiration

Soil Evaporation,
Condensation

Throughfall

Infiltration



Increased Dampening of Hydrologic Response



Primary Changes (Vertical Flux)

Fog Deposition

Soil Evaporation

Interception

Transpiration

Infiltration

Secondary Changes (Storage)

Soil Moisture

Groundwater

Tertiary Changes (Lateral Flux)

Streamflow

Can greater attention on these unseen waters result in better water resources management?

Hypothetical objective: Stabilize soil water storage by stabilizing its controls.

How do we influence near-surface evaporation and condensation?

Can we manage this soil water storage capacity and behavior?

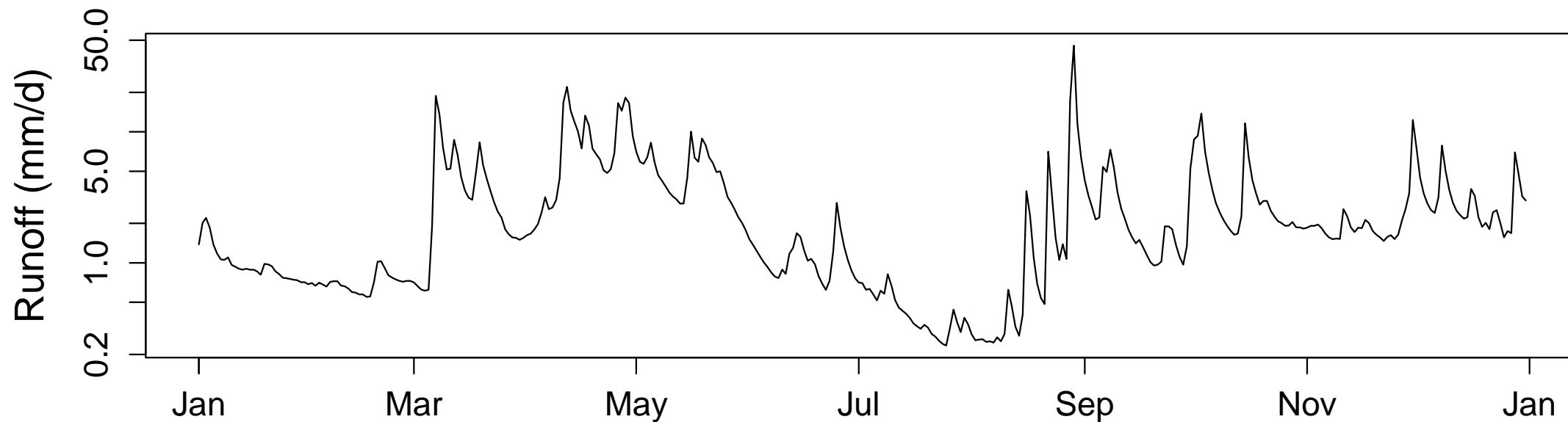
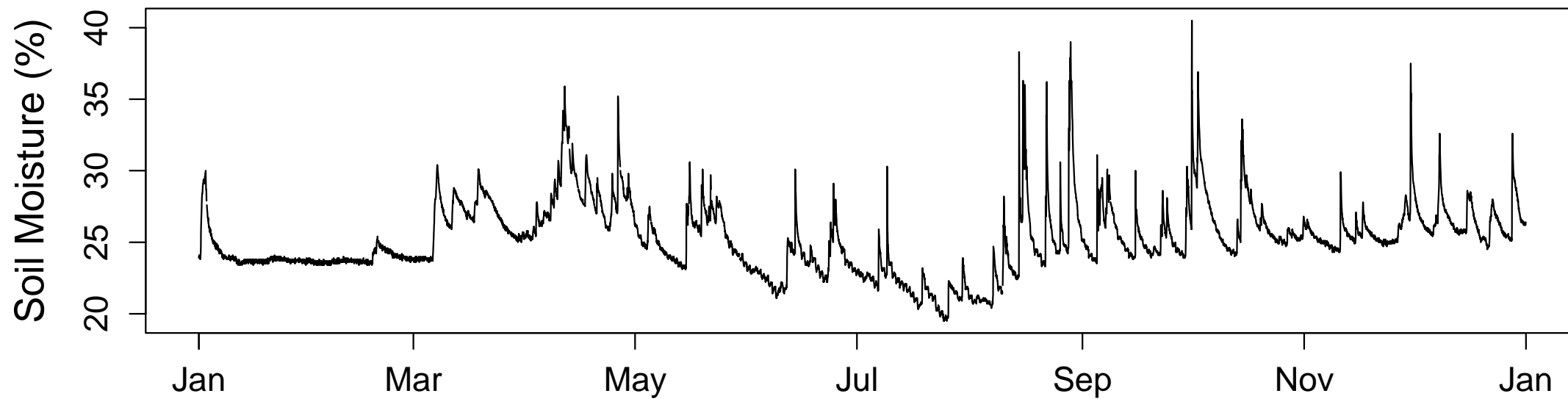
Franklin Falls Dam can hold the equivalent of 2.8 inches of water spread over 1000 mi².



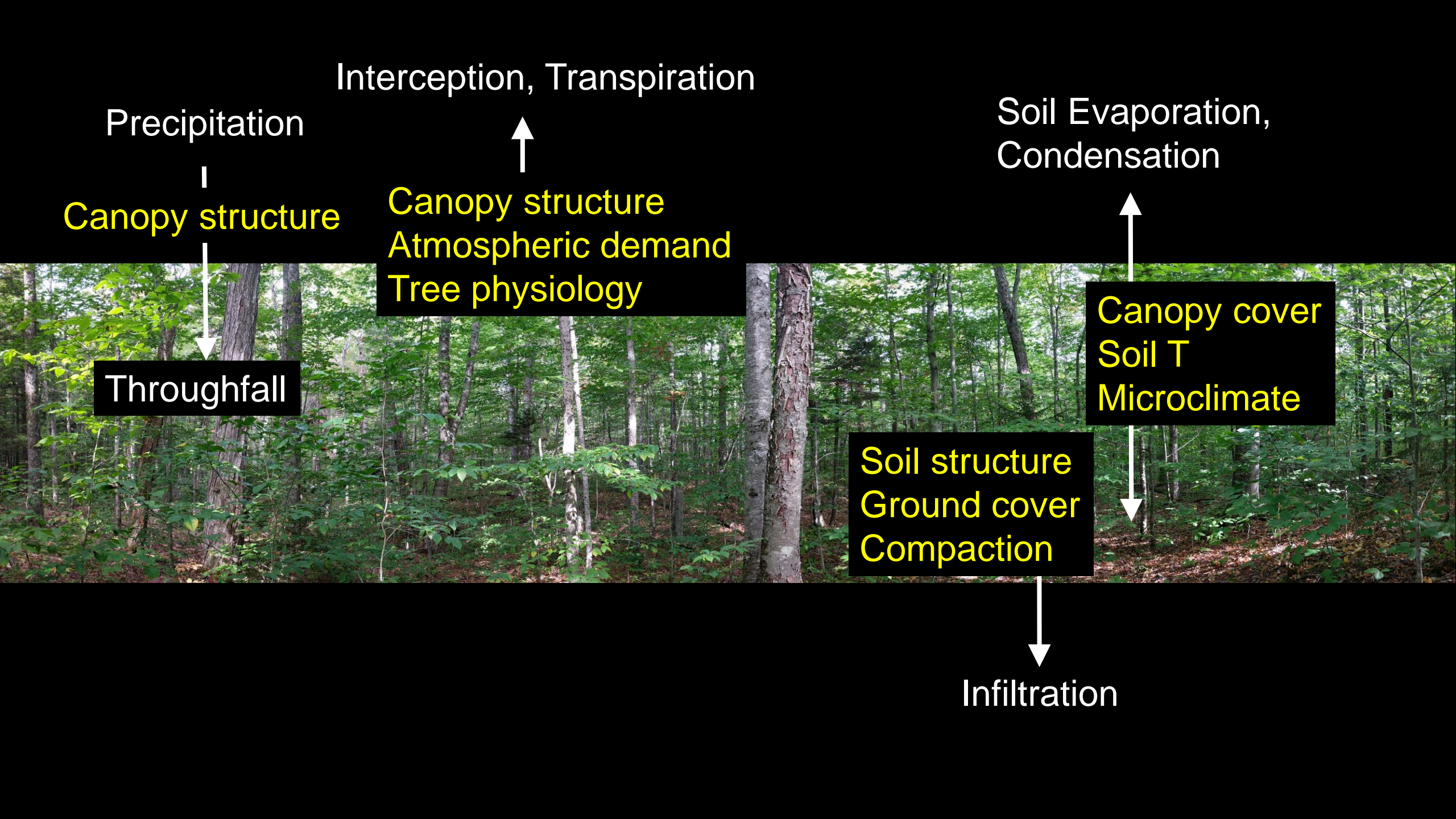
US Army Corp of Engineers, New England District

This White Mountains spodosol can hold 4 inches in its top 10 inches.

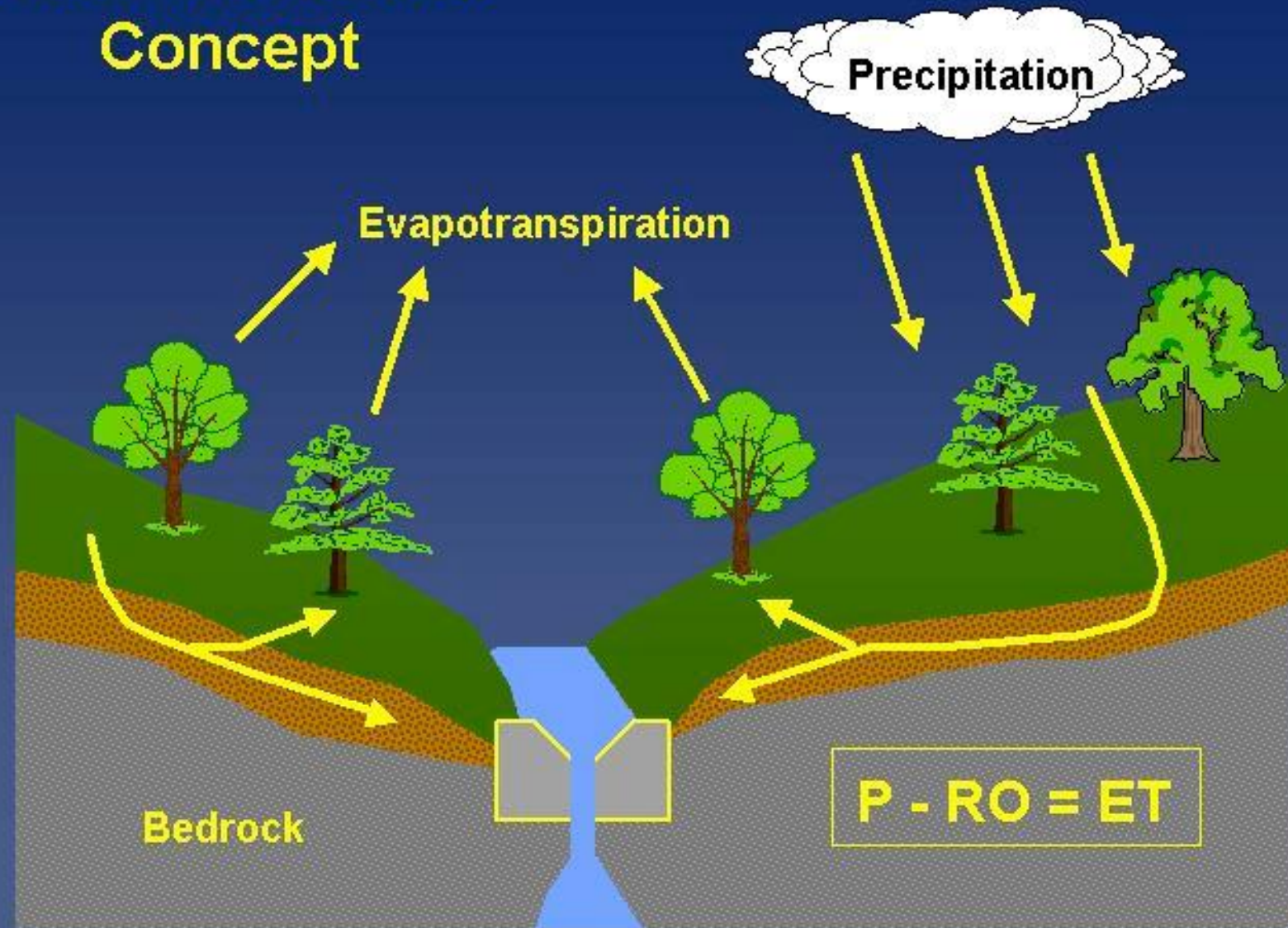




Data from NRCS SCAN site at Hubbard Brook and the USGS gage on the Pemigewasset River in Plymouth, NH

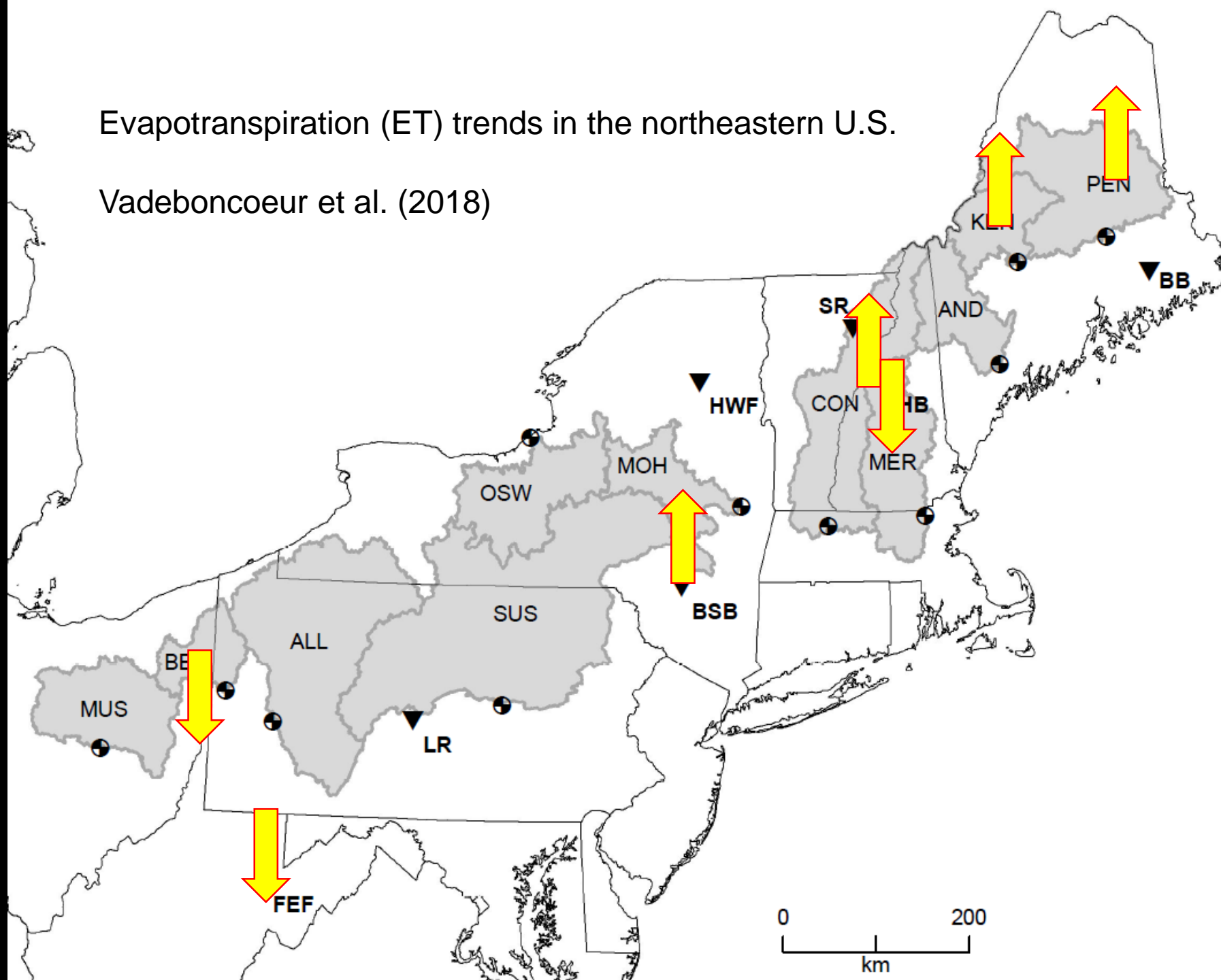


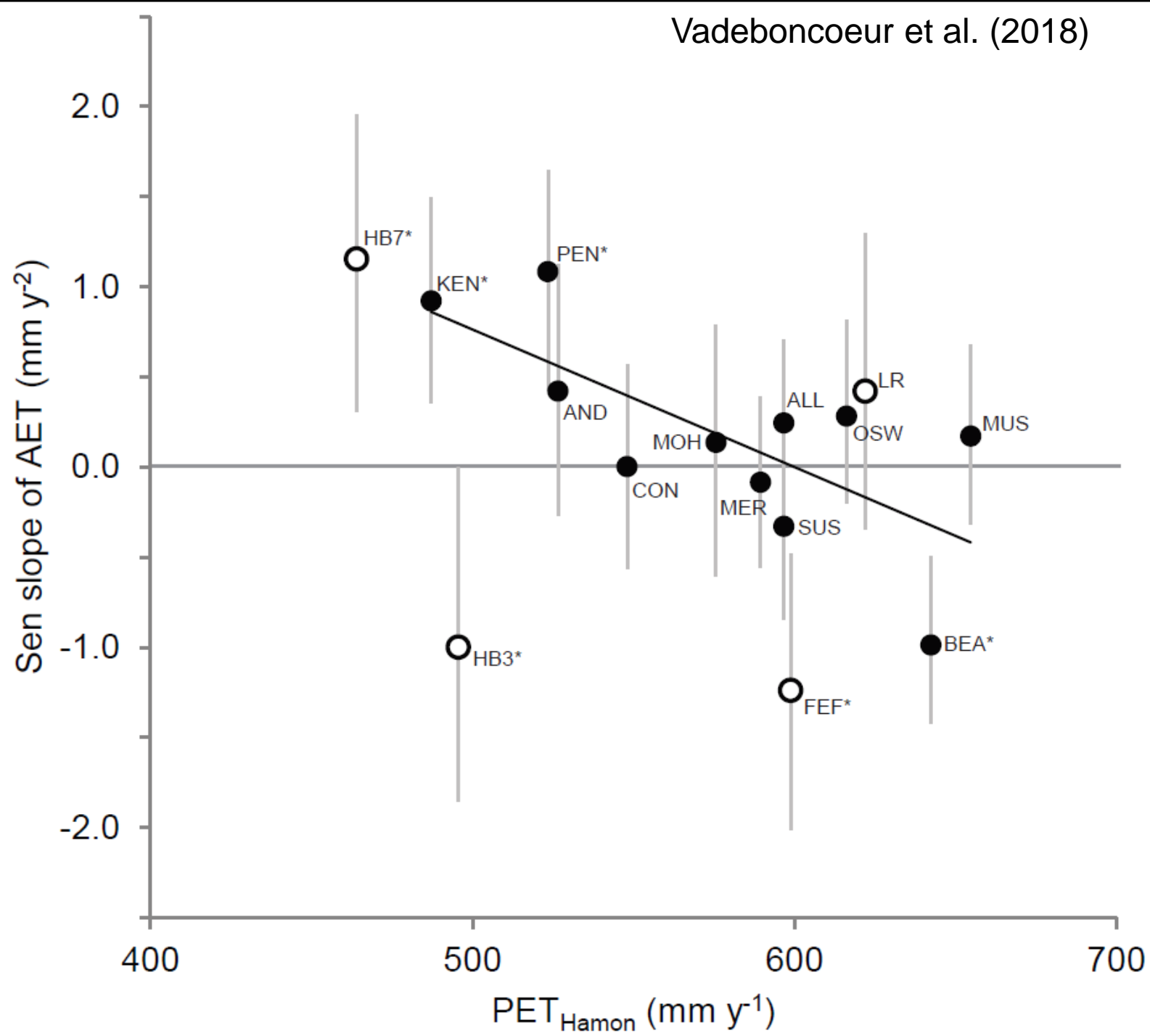
Small Watershed Concept



Evapotranspiration (ET) trends in the northeastern U.S.

Vadeboncoeur et al. (2018)





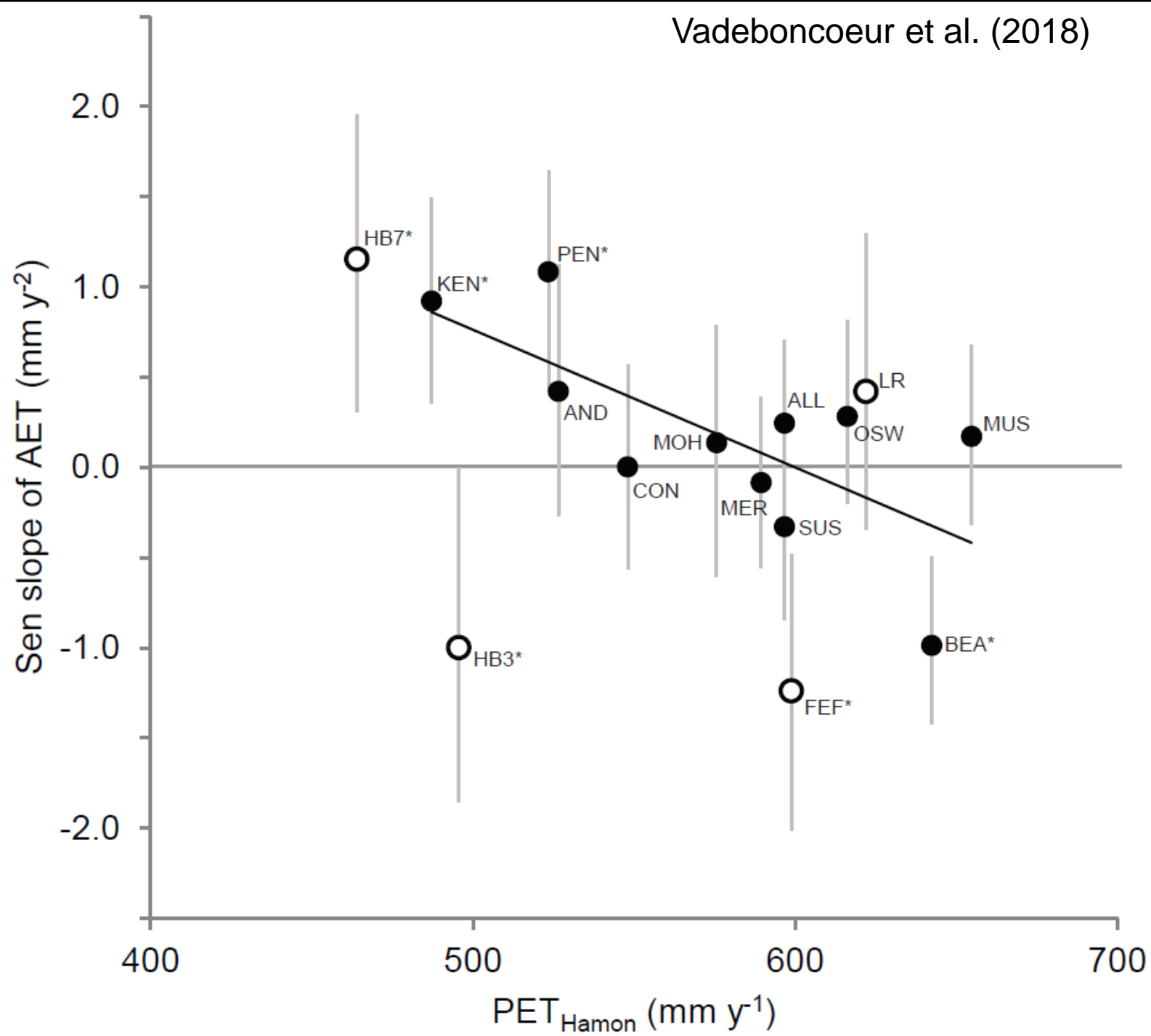
Regional flux towers can provide insights into drivers of evapotranspiration.

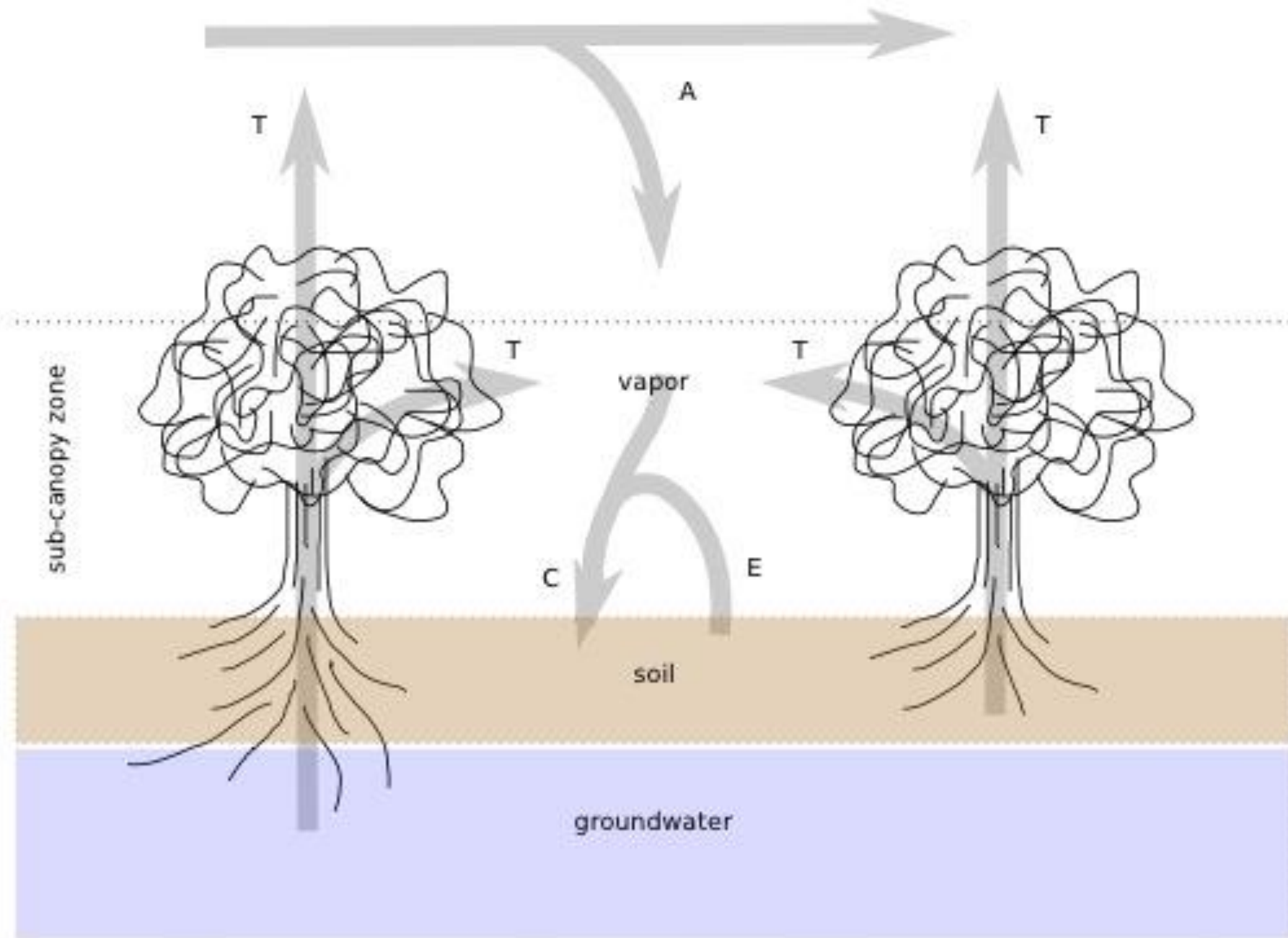


The controls we see from these towers:

1. Net radiation is the most important driver
2. Atmospheric demand (vapor pressure deficit)
3. Air T and photosynthesis are third

Can we manage any of these?

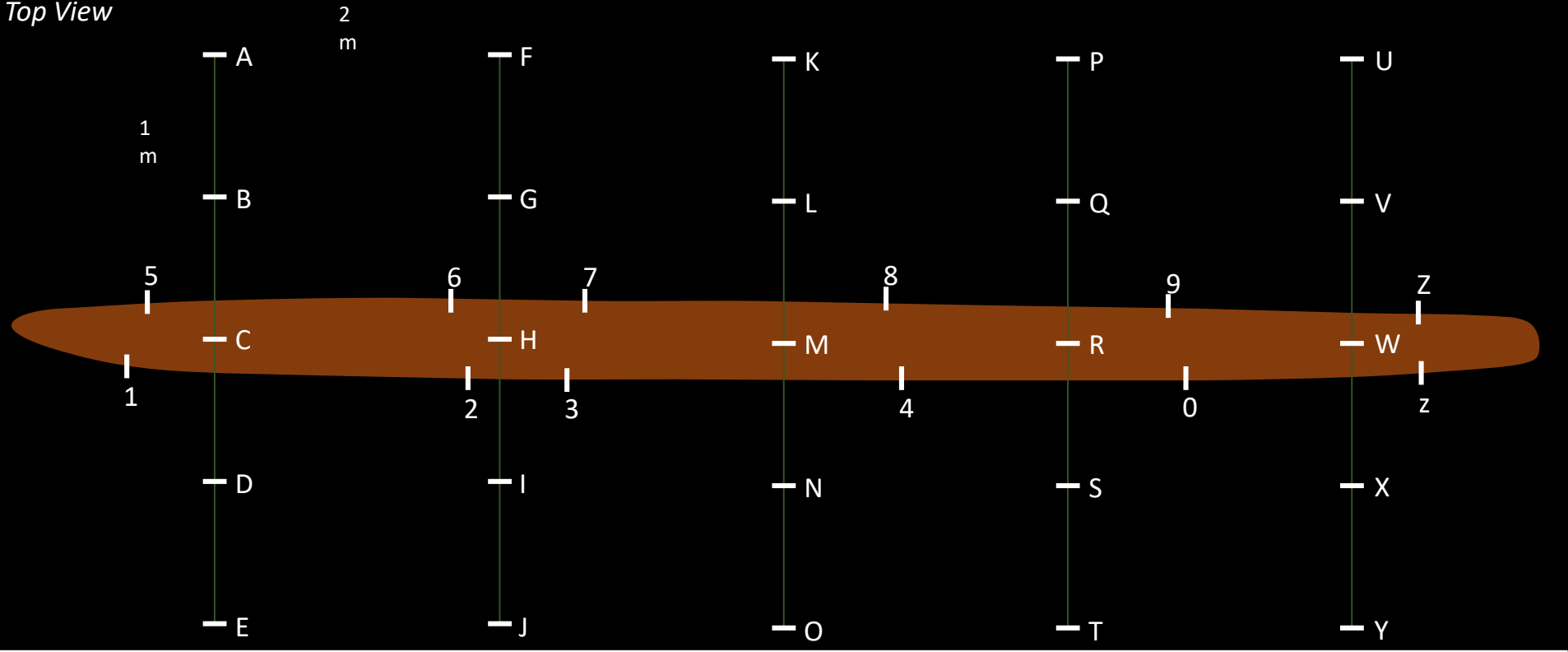




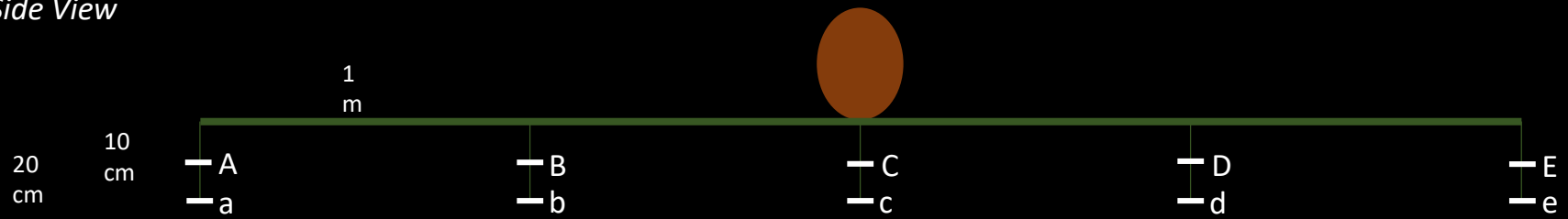
If a tree falls in the woods, how is surface moisture impacted?

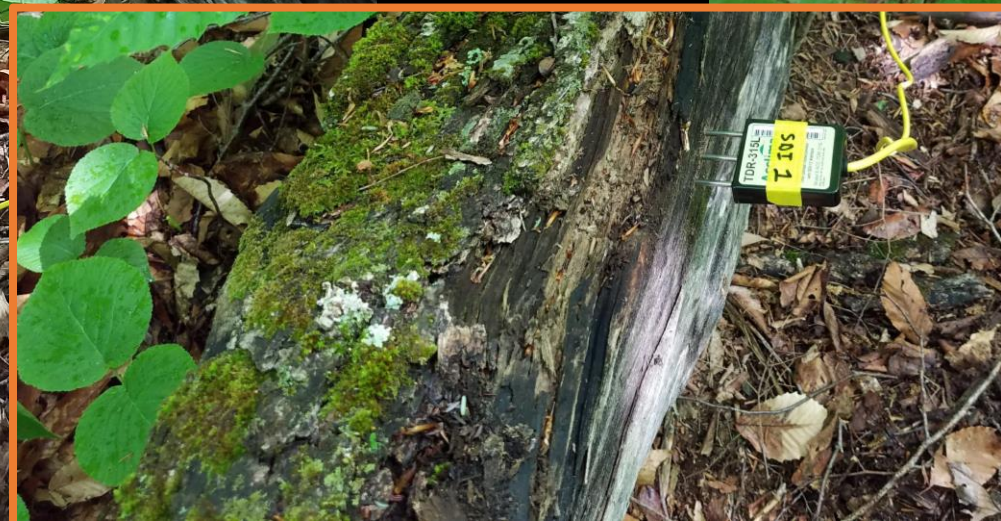


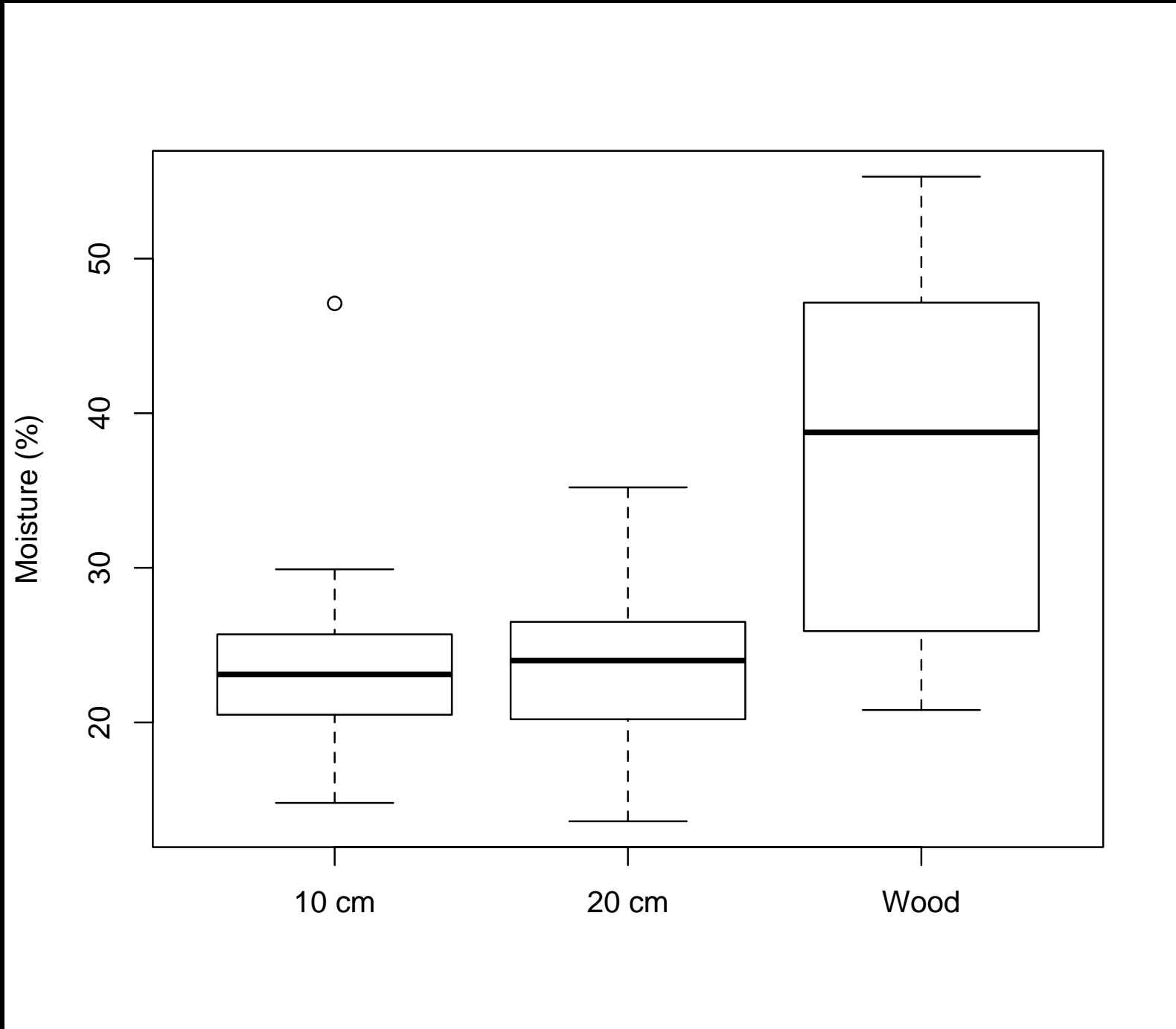
Top View



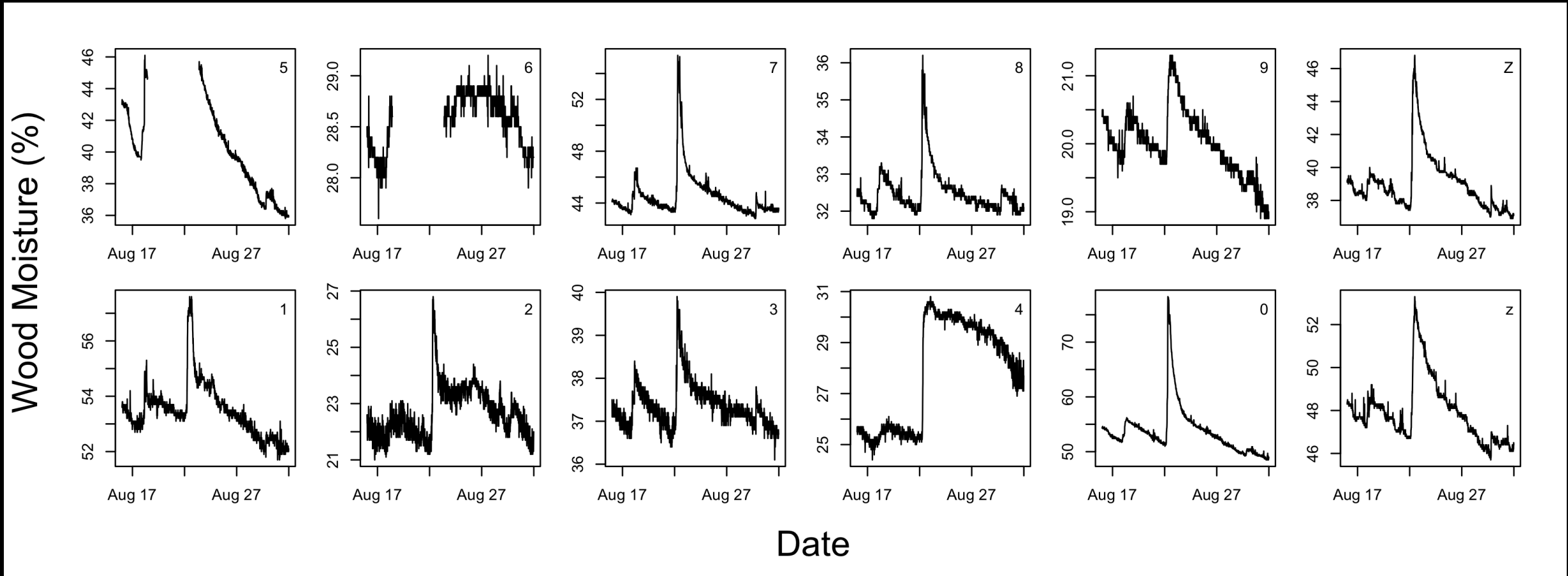
Side View







Wood moisture behaves like soil moisture.



Felling trees results in more surface storage, but it will take a lot of logs.

What is the impact on soil moisture?

Take home points:

- Unseen waters can be managed, but it is a long-term process.
 - Intact forests stabilize surface moisture conditions.
 - Controlling the soil water 'reservoir' means taking care of our landscapes.
- There is much more work to be done in tying this new understanding to management decisions.

Acknowledgments

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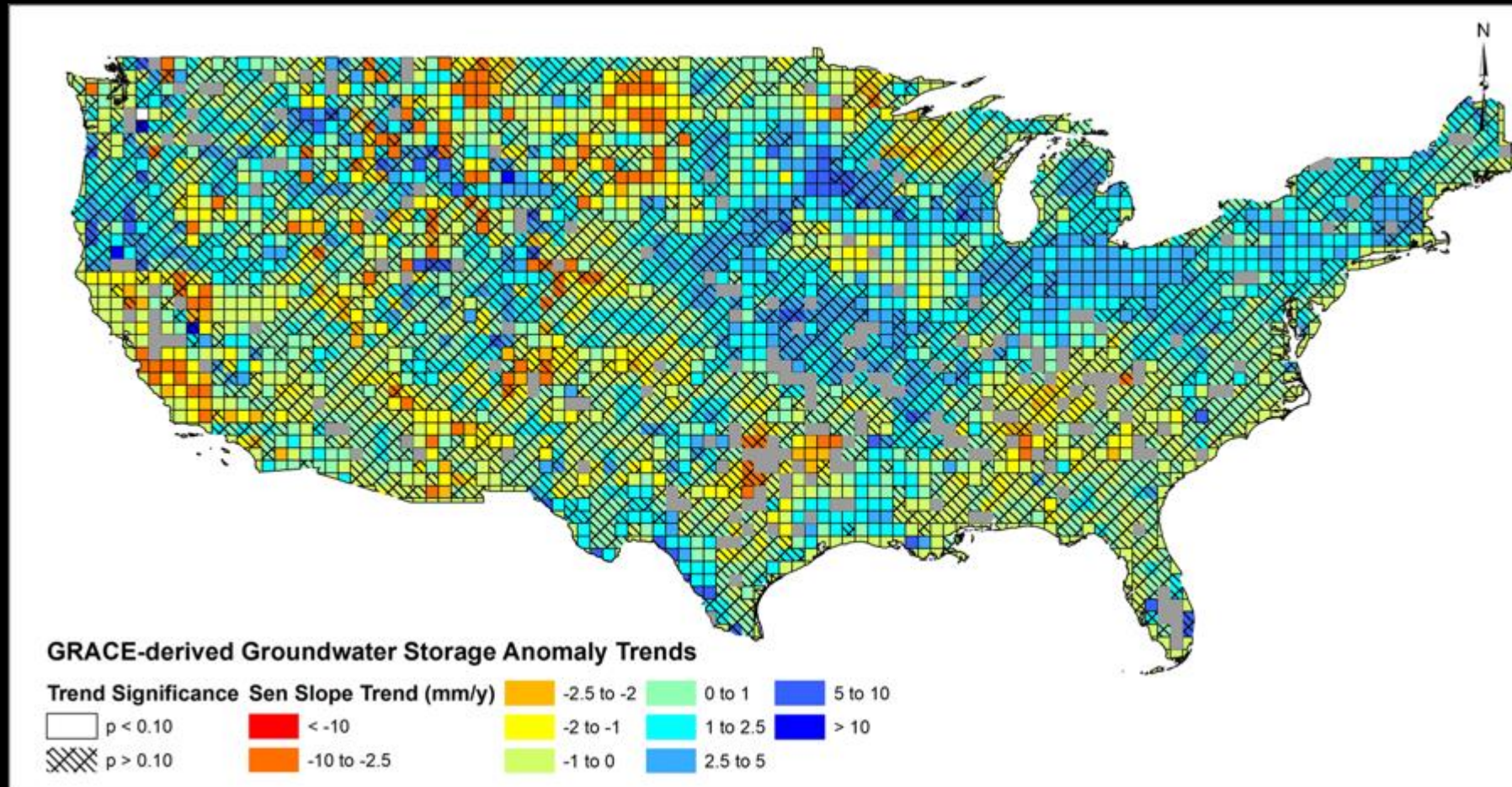
Dartmouth: David Lutz

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New Hampshire is getting heavier.



Thomas and Famiglietti. 2019. Identifying Climate-Induced Groundwater Depletion in GRACE Observations. Scientific Advances.