Influence of post-drought climate sensitivity deviations on secondary growth in European beech (Fagus sylvatica L.)

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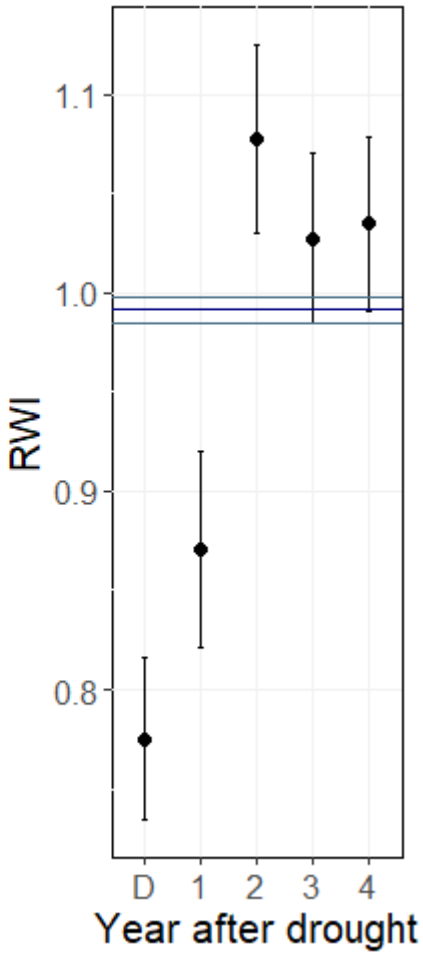
Post-drought effect...

...in secondary growth

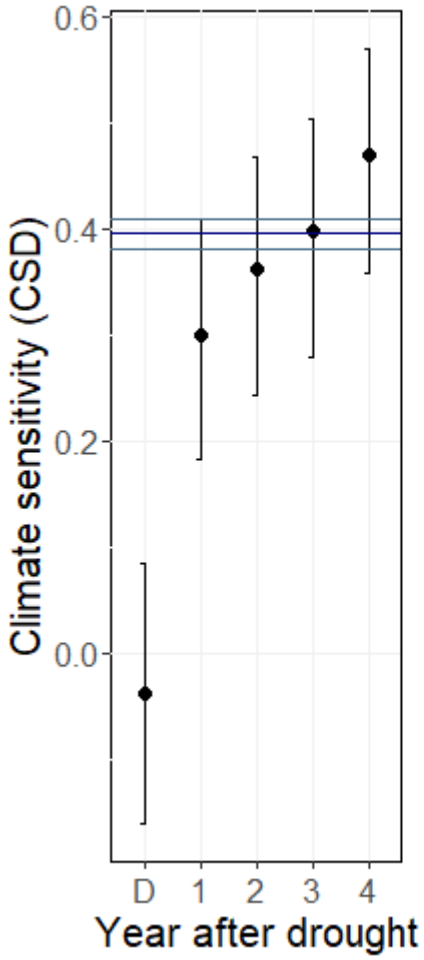
- Derived from **tree-ring** measurements (**RWI**)
- Loss of **woody biomass**
- **Frequently used metric** for quantifying drought impacts
- **End product** of many **internal mechanisms** which don't necessarily respond simultaneously

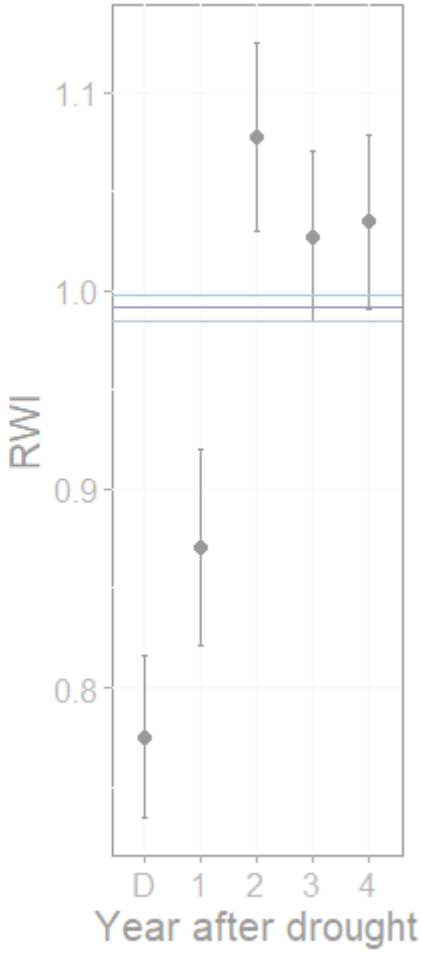


Post-drought effect...

...as climate sensitivity deviation (CSD)

- Change in a **functional relationship**
- **Reveals underlying mechanisms** not evident in secondary growth
- **Better understanding** of drought impacts



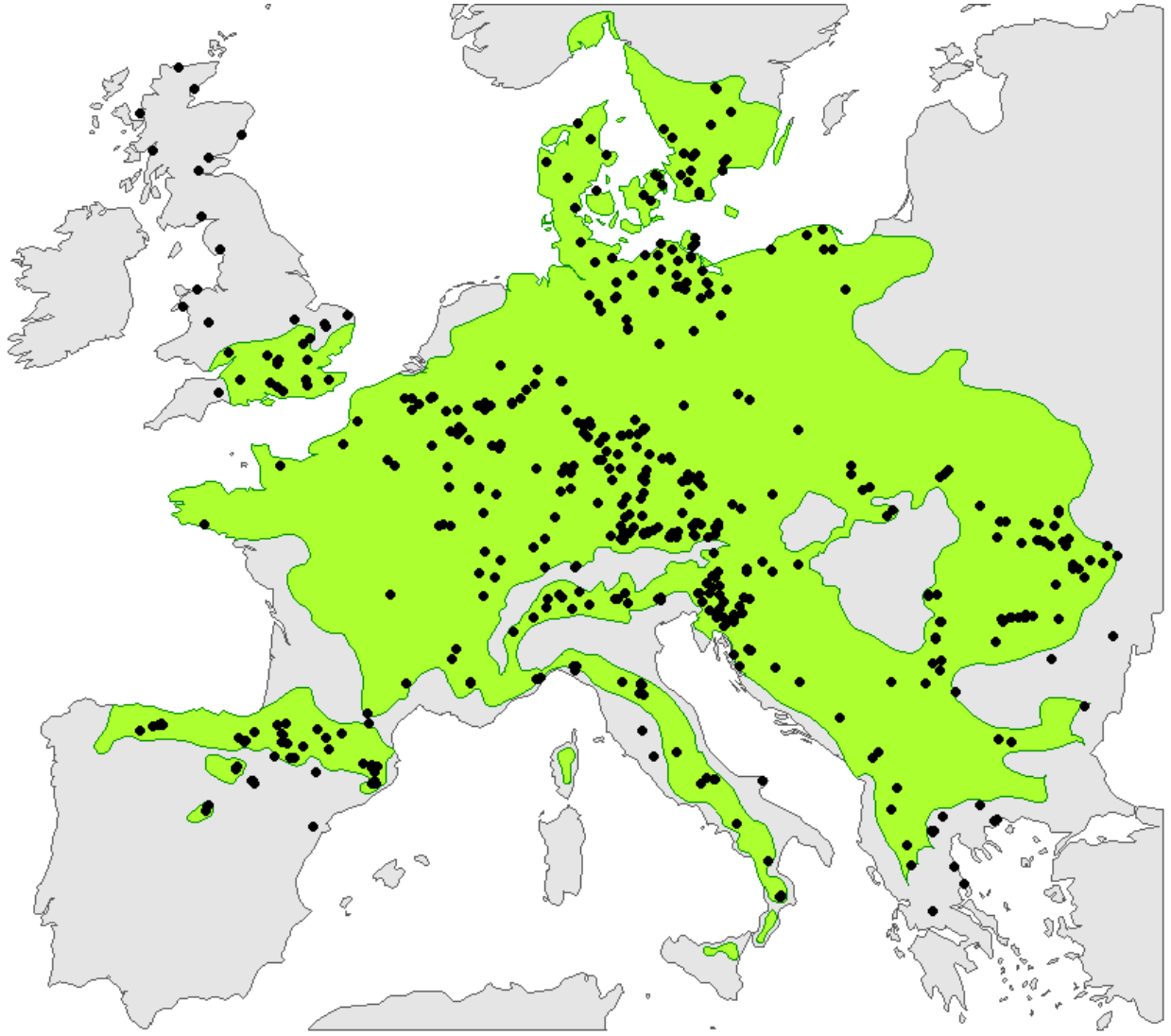


European beech (Fagus sylvatica L.)

- Prevalent across Europe
- Economically important

Tree-ring data

- From the European Beech Tree-Ring Network (EBTRN)
- 601 sites used

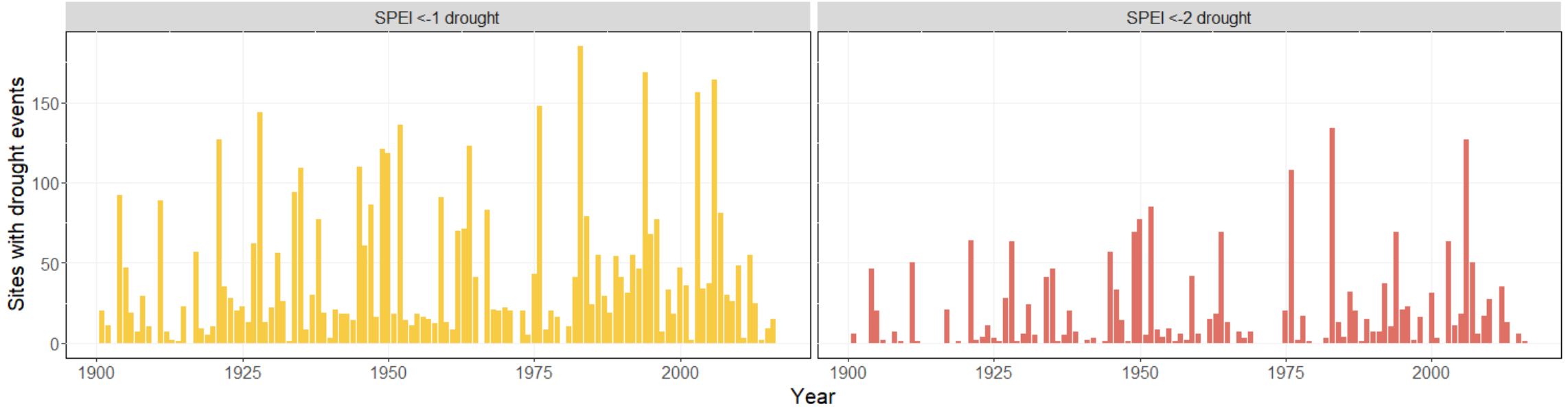


Climate data and drought events

- Drought index: **July-SPEI2** (June-July SPEI)
  - Only sites with significant positive correlation
- **Grouped** by SPEI sensitivity
  - 1) r < 0.3
  - 2) r = 0.3-0.5
  - 3) r > 0.5

Drought thresholds:

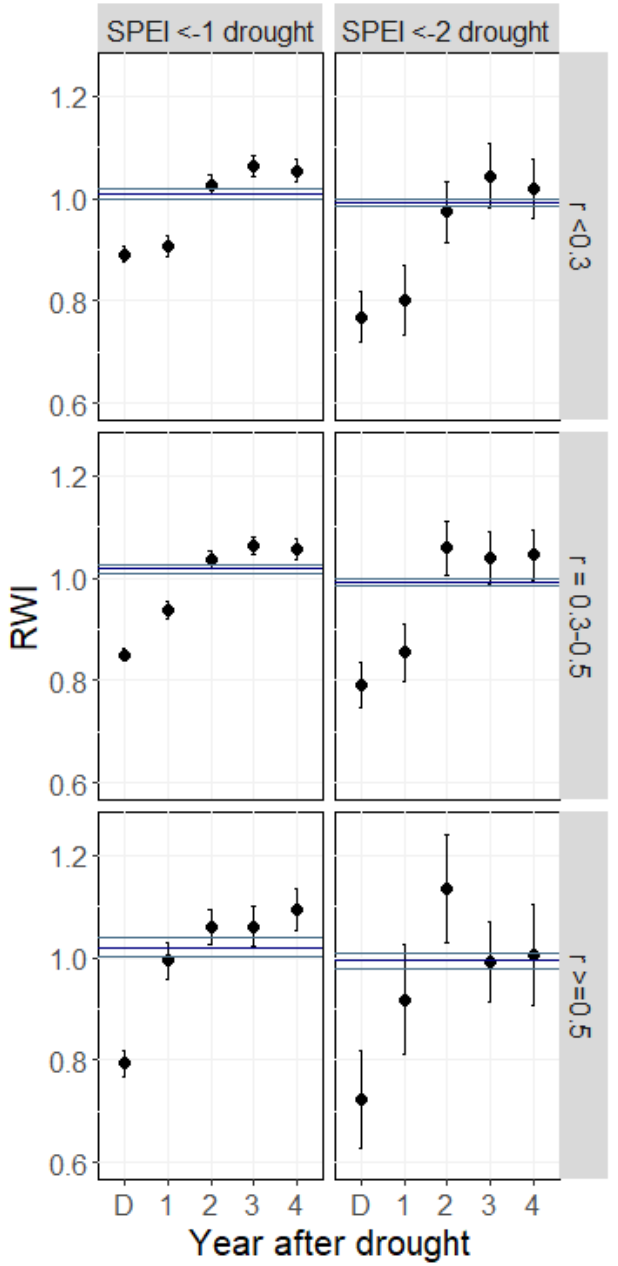
- SPEI <-2 for severe droughts
- SPEI <-1 for milder droughts
- + Climatic water balance < 0



Results

Secondary growth legacies

- Observable in both milder and more severe drought events
- Little difference across groups with varying SPEI sensitivity



Results

Secondary growth legacies

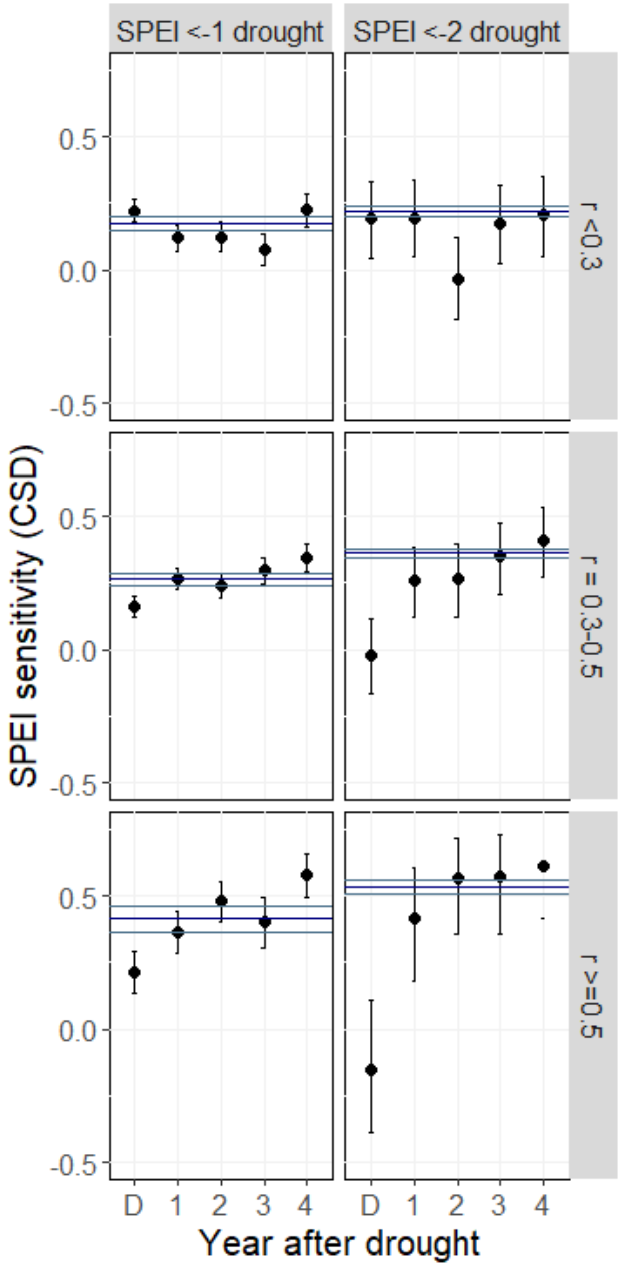
- Observable in both milder and more severe drought events
- Little difference across groups with varying SPEI sensitivity

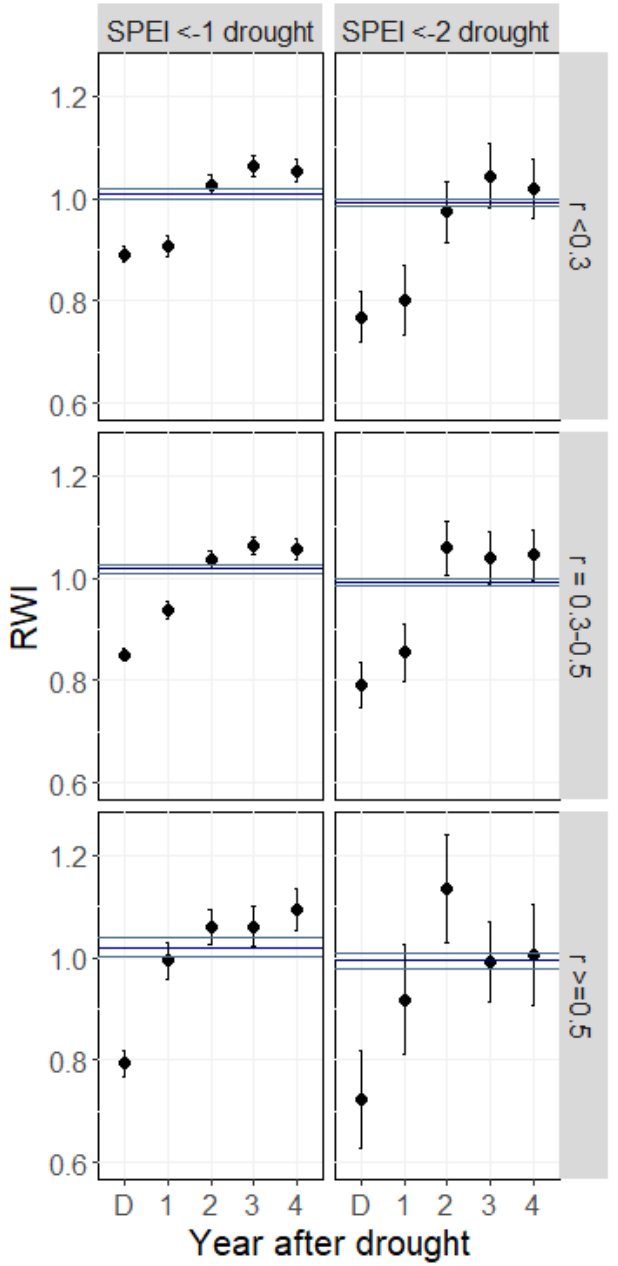
Climate sensitivity deviations (CSDs)

- More pronounced in severe droughts compared to milder droughts
- Increases in groups with increasing SPEI sensitivity

➡ CSD effects not detectable

in secondary growth legacies

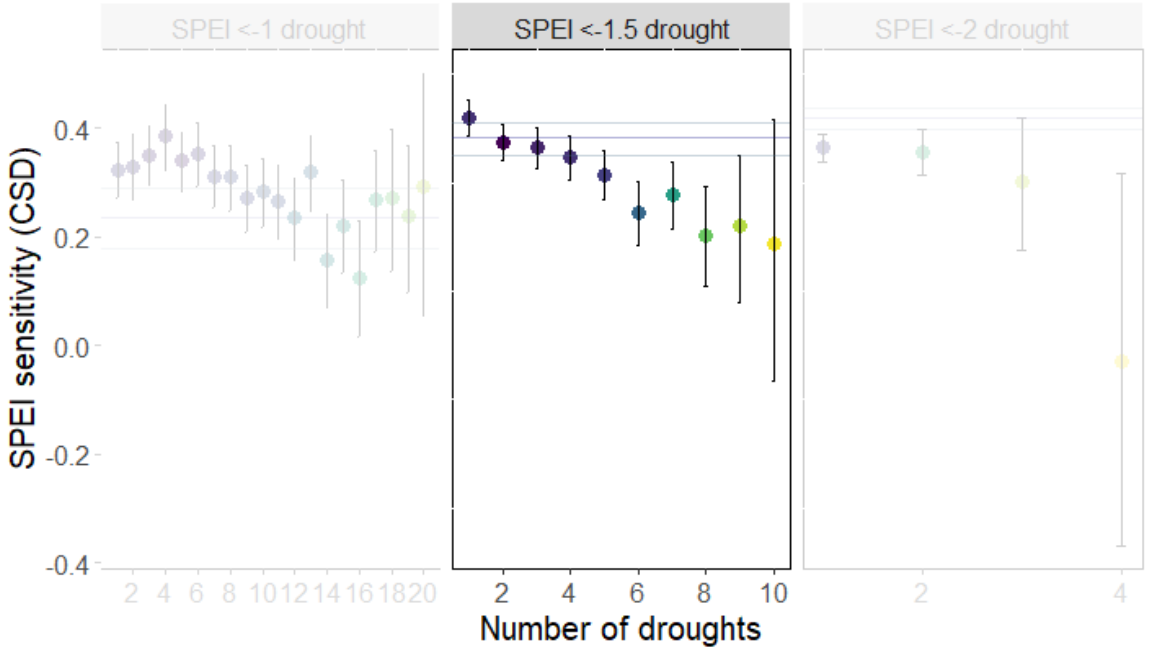


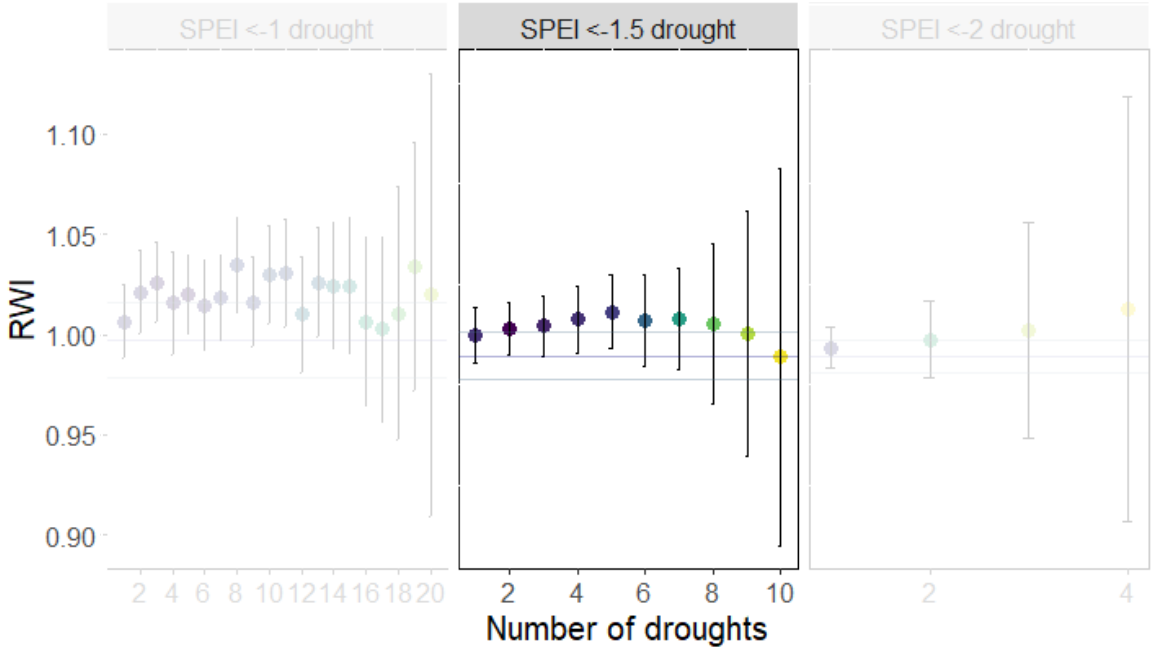


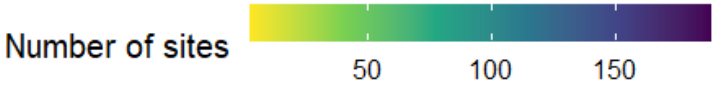
Results: Consecutive droughts

SPEI sensitivity decreases with consecutive drought events

No corresponding trend in secondary growth







Summary

- Climate sensitivity deviations (CSDs) reveal drought functional responses not discernable in post-drought secondary growth impacts

- However, negative trends in climate sensitivity after consecutive droughts occur without any corresponding change in secondary growth

- What is the implication of CSDs?
  - Impeded physiological function,
  - or drought adaptation?

Thank you for listening!

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