Soil Ecological Challenges for Forestry in the Bioeconomy

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Research Area Lignocellulose

Introduction and Questions

Forests can be a large and sustainable source of lignocellulose for the Bioeconomy. Yet removing more biomass limits deadwood, a crucial factor in forest biodiversity and nutrient cycling. Whether deadwood affects soil remains unknown, and as such we ask:

1) Does removing deadwood impact soil functioning? And...
2) If so, how?

Sites and Field Design

- 8 *Fagus sylvatica* forests (Fig. 1)
- 4 decomposing stems per stand
- Paired test and reference points (*Deadwood* & *Control*; Fig. 2)
- Top soil (0-10 cm)
- Differences tested with linear mixed effects models (random factors were site & stem)
- Calculation:
  Δ% = *Deadwood-Control / Control*

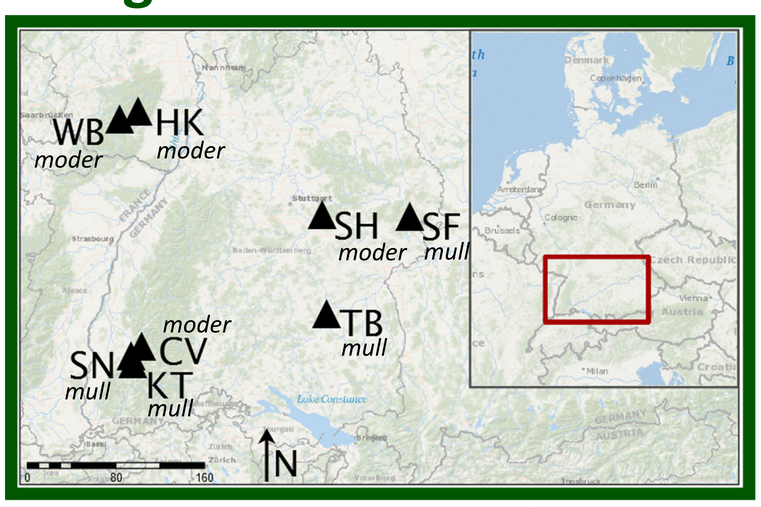


Figure 1: SW Germany & study sites (ArcGIS 2015).

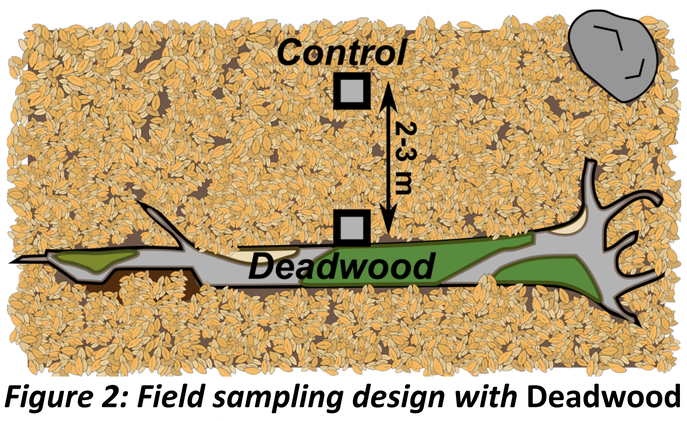


Figure 2: Field sampling design with* Deadwood *and* Control *points relative to lying beech stem.

Results

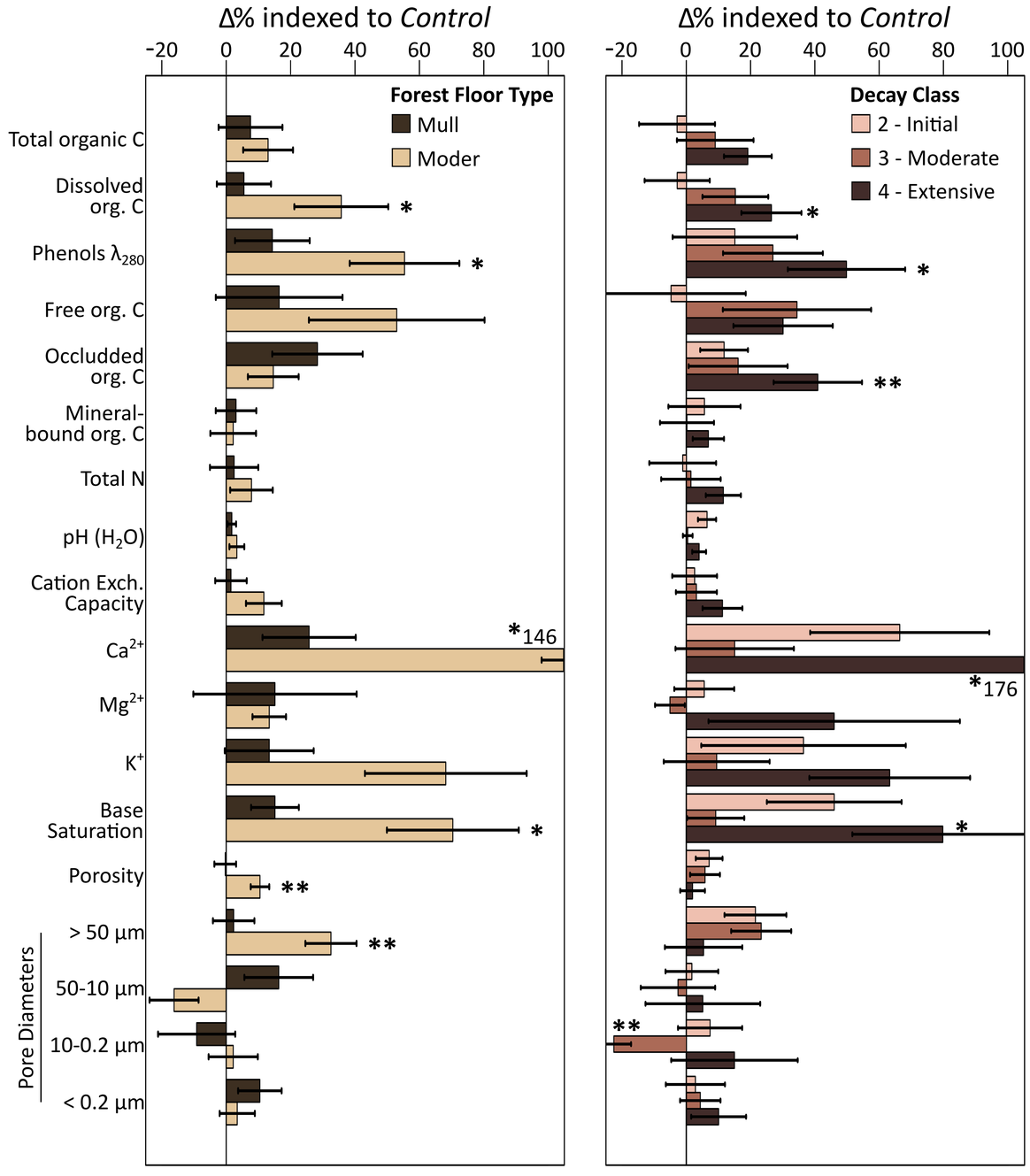
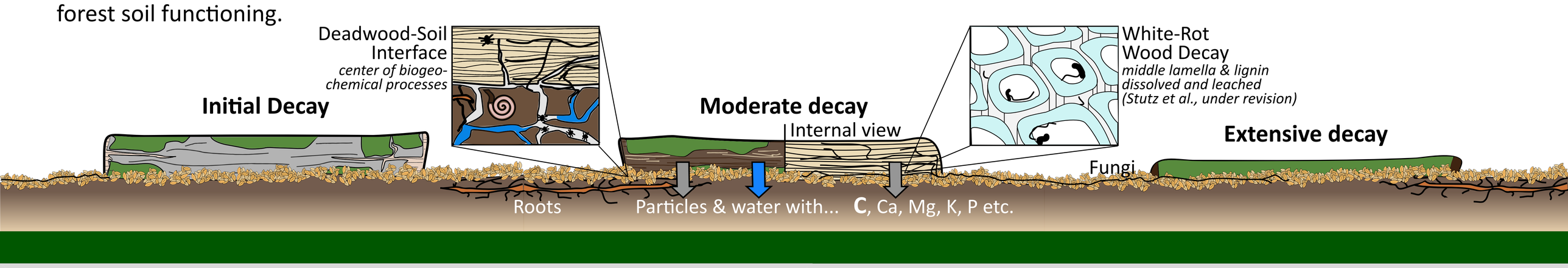


Figure 3: Mean relative difference (Δ%) in quality of soil organic matter, nutrients and pore structure between* Deadwood *and* Control *points. Significant differences are starred. Sites are grouped by forest floor type (biological activity; Left), and stems are grouped by extent of decay (Right).

Deadwood as "Hot-Spots" in Soil

Deadwood on cool, acidic soils (moder sites) or if severely decayed affect soil organic matter, cations & structure. These biogeochemical processes imply deadwood are "**hot-spots**" with larger effects on forest soil functioning.



Forest Management Outlook

- **Thresholds**: minimum amount, but how much?
- **Rotations**: various decay rates, but lasts how long?
- **Distribution**: spatial extent limited, so where?

Chair of Soil Ecology

Funded by

Baden-Württemberg
MINISTERIUM FÜR WISSENSCHAFT, FORSCHUNG UND KUNST

References & Acknowledgements

Stutz, K. P. *et al.* (under revision). Phenolic matter from deadwood can impact forest soil properties. *Geoderma.*

Laboratory technicians at the Chair of Soil Ecology, the *FVA Baden-Württemberg*, the *FAWF Rheinland Pfalz*, *ForstBW* and *Landesforsten RL.*