Ecosystem Services from Coppiced Forests:
Characterising functional trait distributions in the light of environmental change and land use legacies

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Leen Depauw, Sybryn Maes, Haben Blondeel, Emiel De Lombaerde, Dries Landuyt, Kris Verheyen
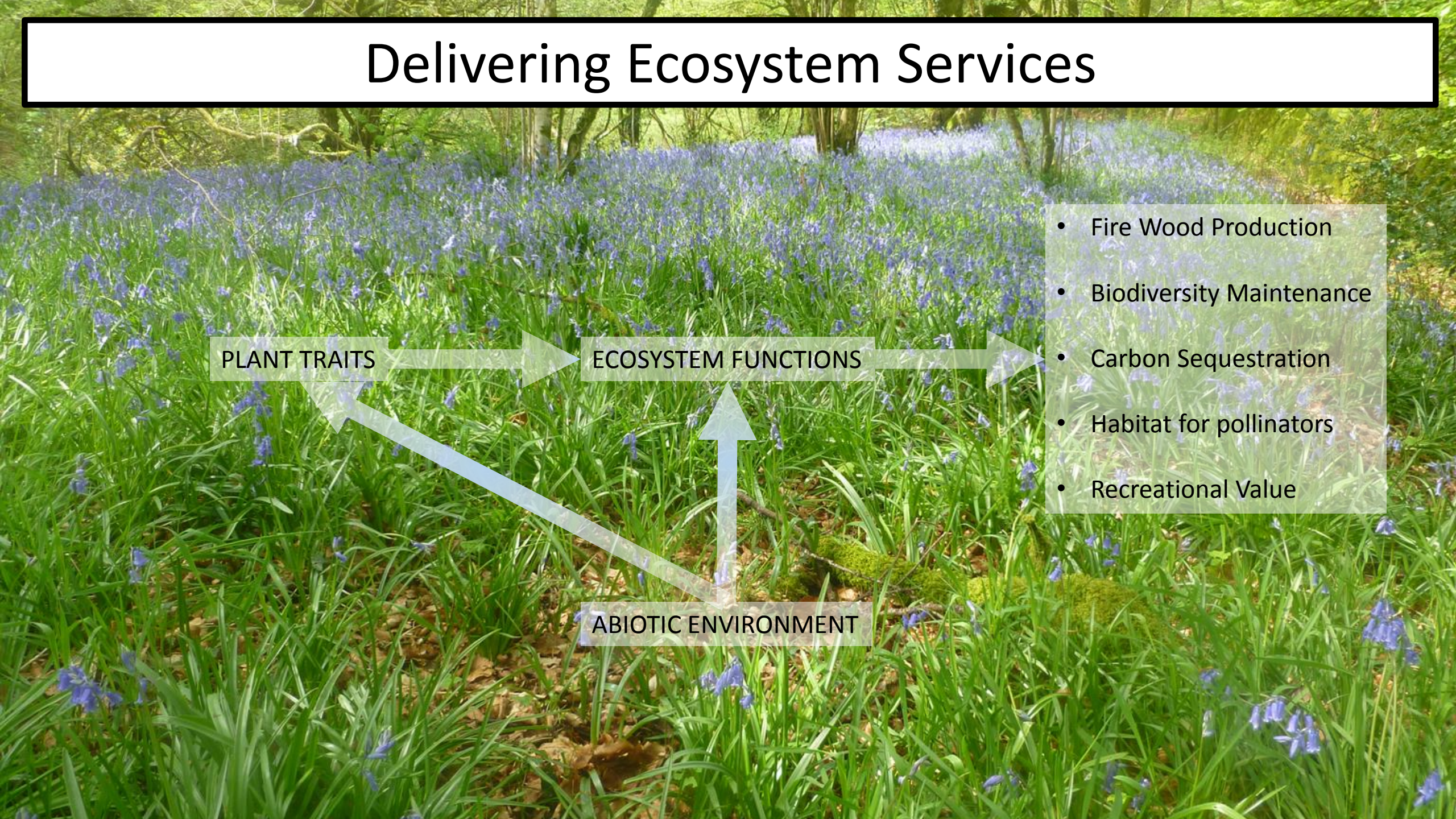*and the forestREplot network.*

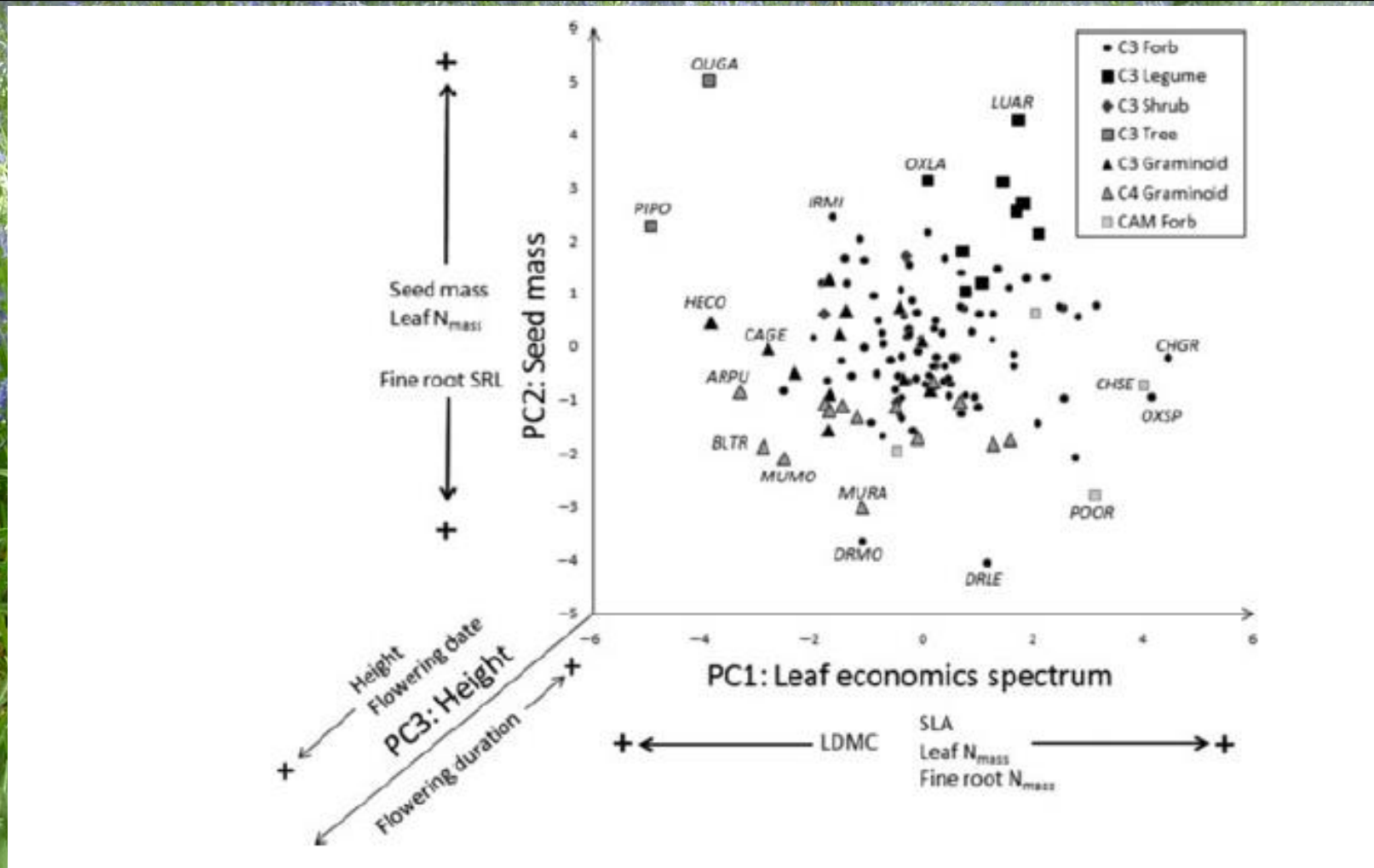# Delivering Ecosystem Services

PLANT TRAITS → ECOSYSTEM FUNCTIONS →
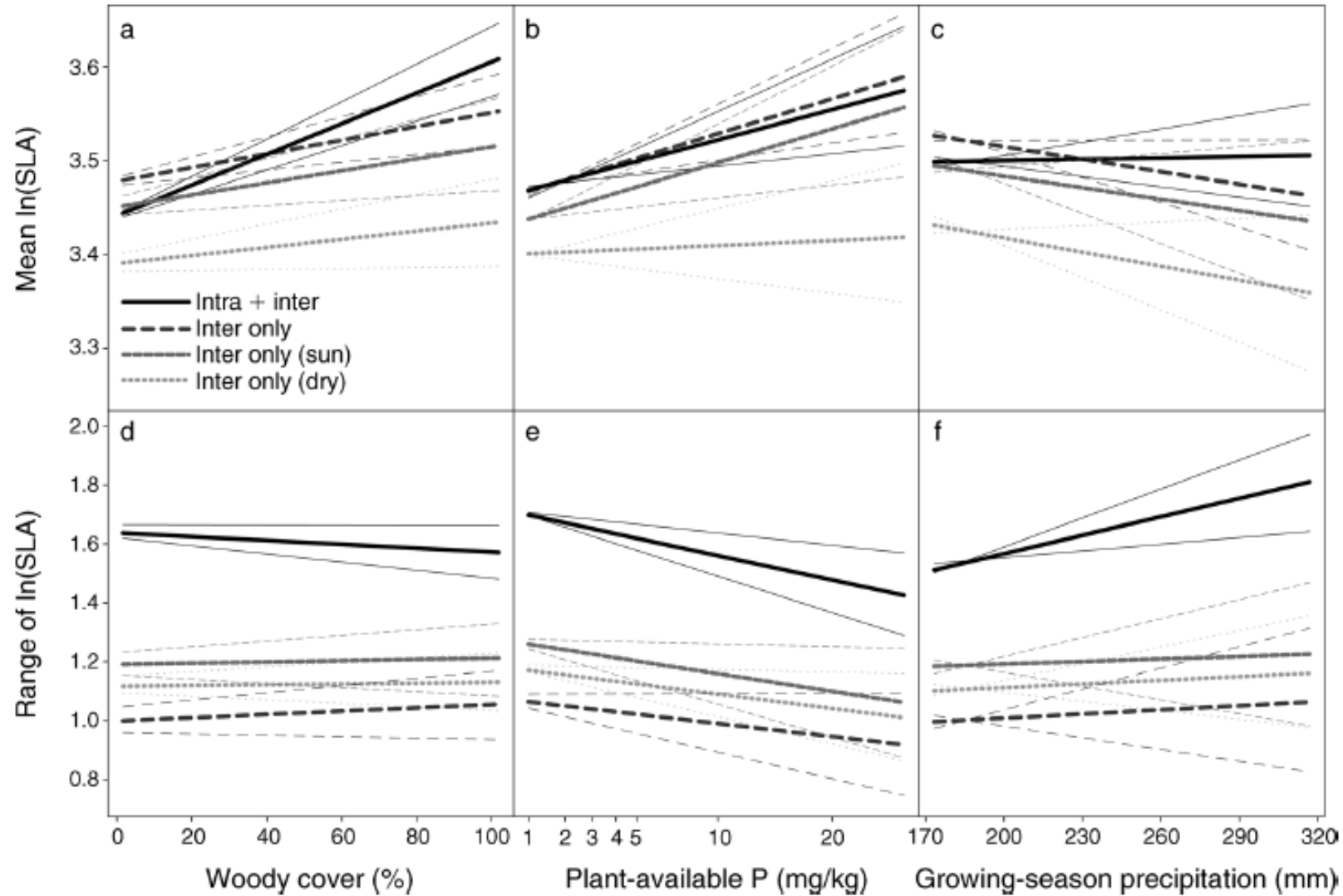
ABIOTIC ENVIRONMENT

- Fire Wood Production
- Biodiversity Maintenance
- Carbon Sequestration
- Habitat for pollinators
- Recreational Value

Fundamental Plant Traits:
A Bridge Between Ecosystem Composition and Function

Determinants of Plant Trait Distributions

Determinants of Plant Trait Distributions

- Contemporary Environmental Change

- Fundamental Community Processes
  - Drift
  - Speciation
  - Dispersal
  - Selection

Vellend (2010)

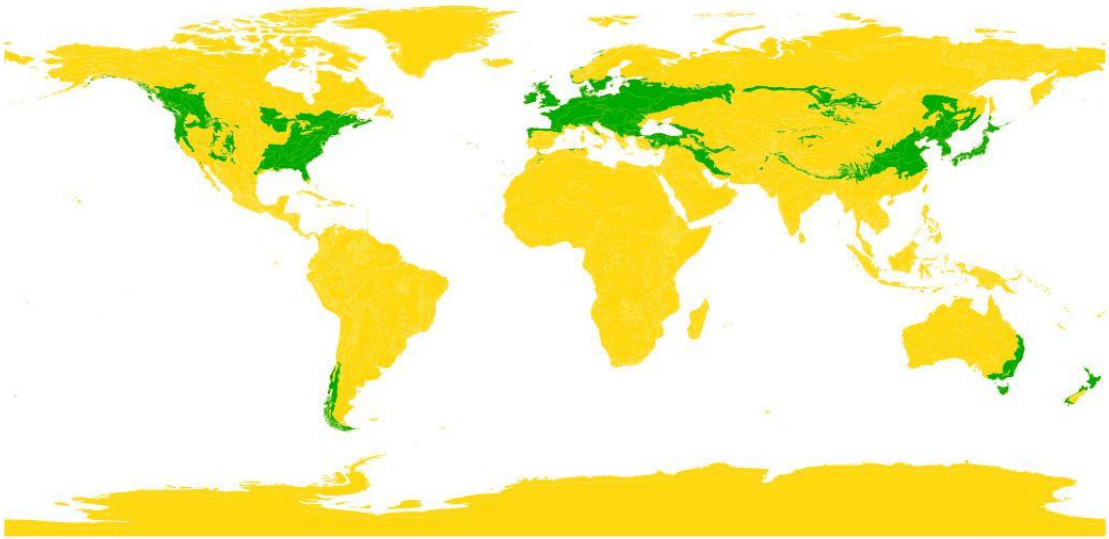RESOURCES and CONDITIONS

- Land Management Legacies

So…even were contemporary environmental change absent, communities would be on a 'TRAJECTORY OF CHANGE'
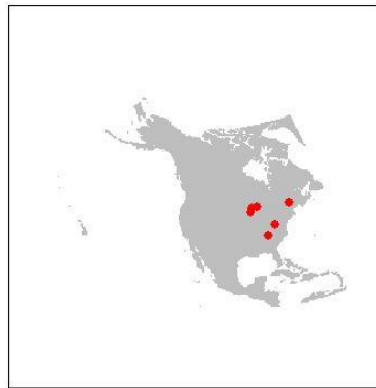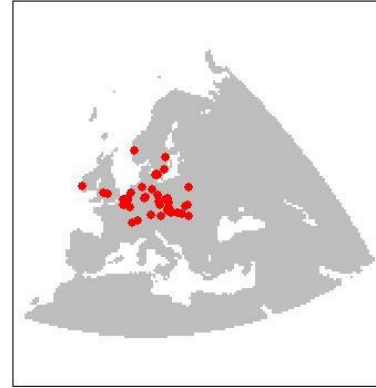
Understanding Trajectories of Change

The need for resurveys. Verheyen et al. in review.

ForestREplot Database

Olsen et al 2001 BioScience

www.forestreplot.ugent.be

ForestREplot: what it has already revealed…

(c)

RRN ± 95% C.I.

Increasing N deposition →
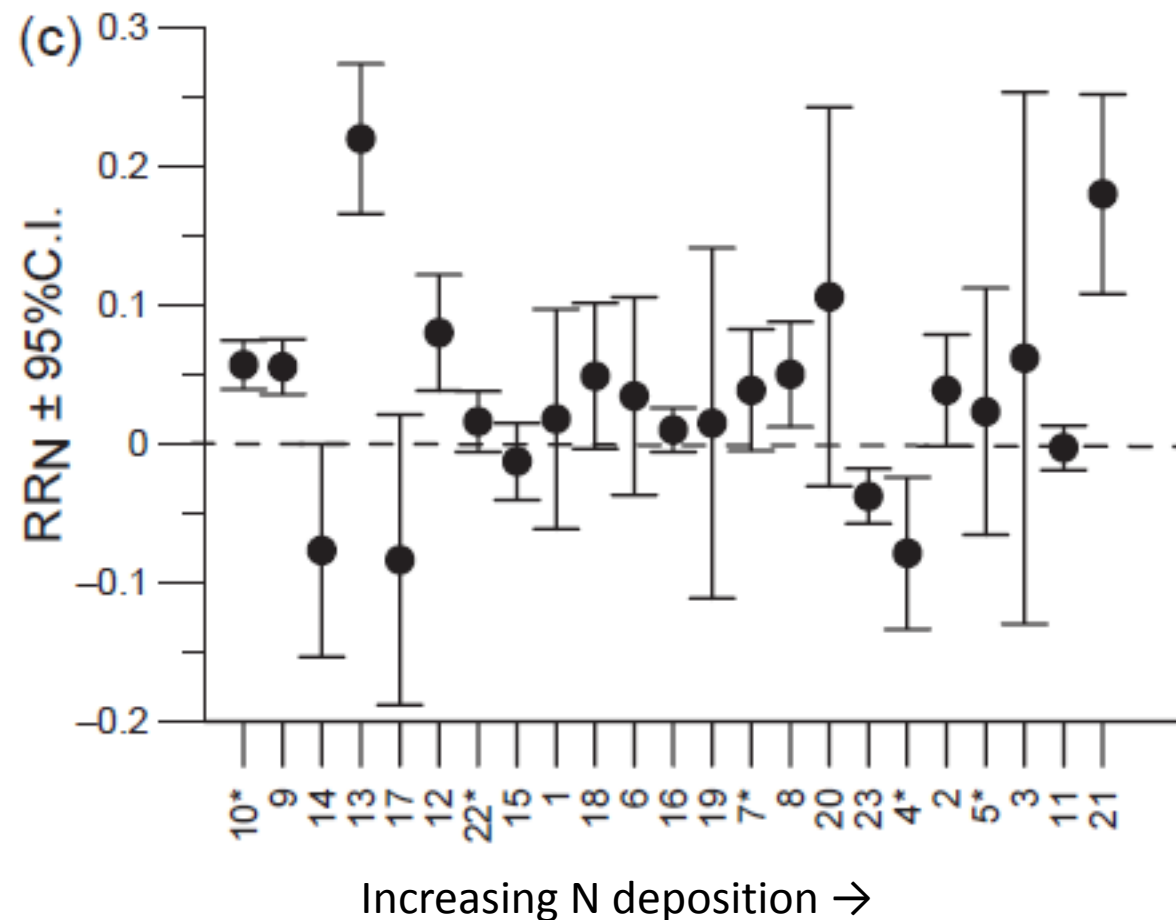
Significant increase in RR-Ellenberg N found between surveys

…but…

Related to changing light and overstorey composition, not N deposition.

In other words, a contemporary management effect.

Verheyen et al 2012 Journal of Ecology
Bernhardt-Römermann et al. 2015 Global Change Biology

ForestREplot: Characterising Land Management Legacy...

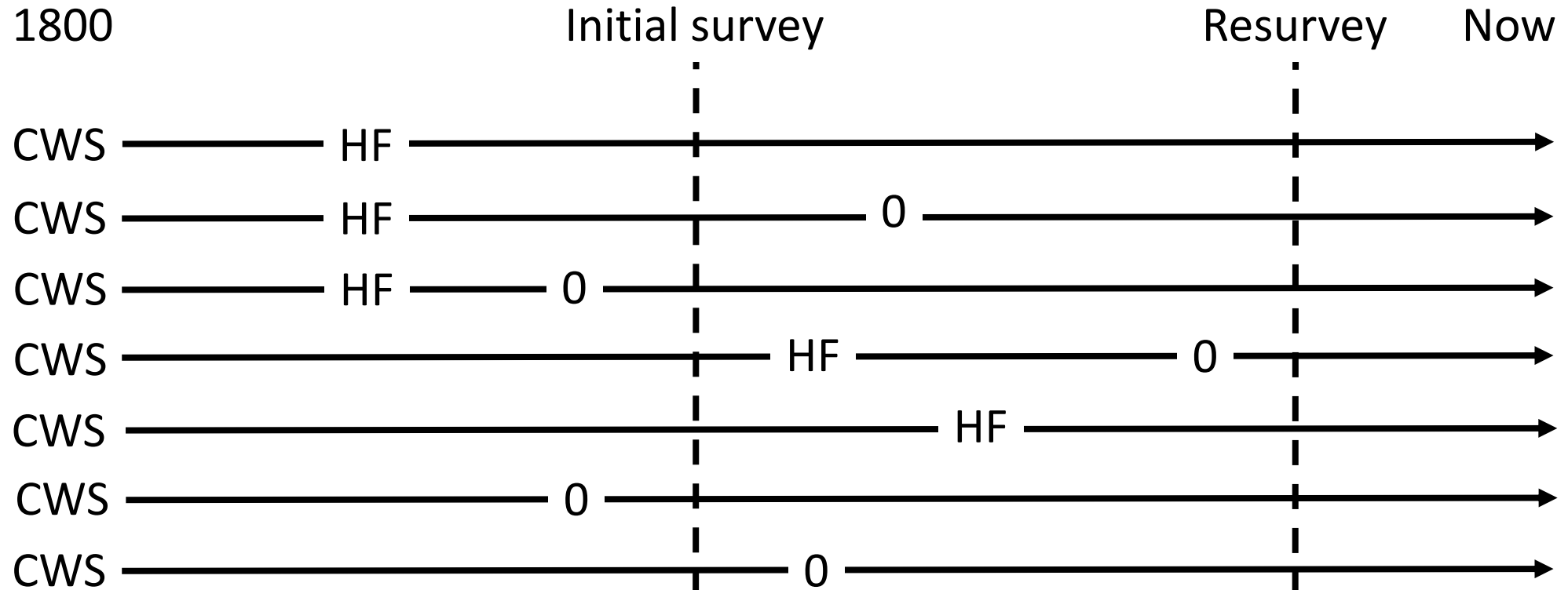# ForestREplot: Characterising Land Management Legacy

Management Trajectory since 1800	Number of sites	Number of plots
High Forest	10	159
Coppice / CWS to High Forest	14+3	687+69
Coppice / CWS to High Forest then zero management	14+3	365+163
Coppice / CWS to zero management	1+2	31+27
High Forest to zero management	6+4	75+119
Coppice / CWS throughout	0	0
Zero management throughout	0	0

Figures correct as of 15th June 2016; if after '+', (first) transition occurred after initial survey

Management legacies across environmental gradients
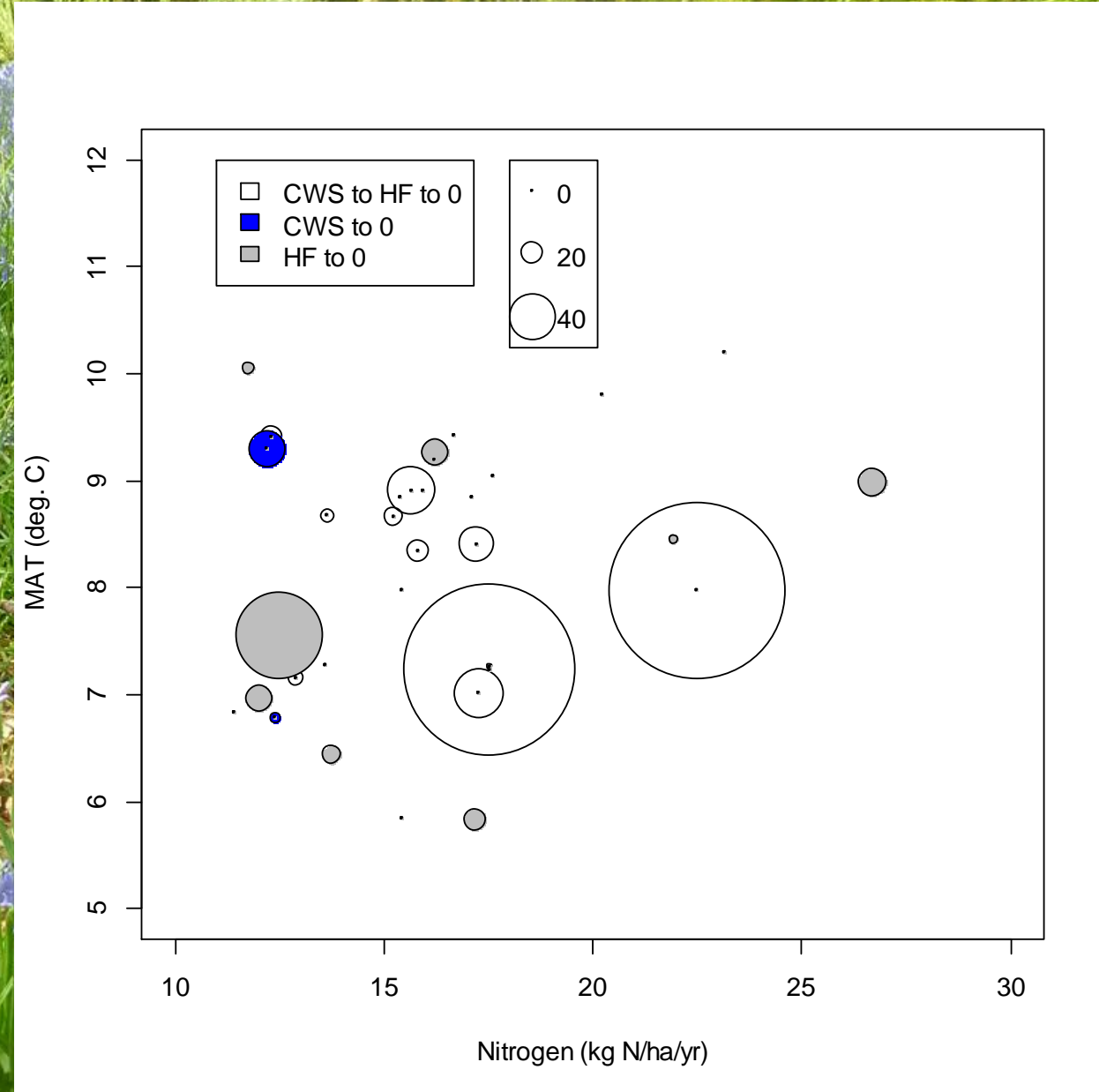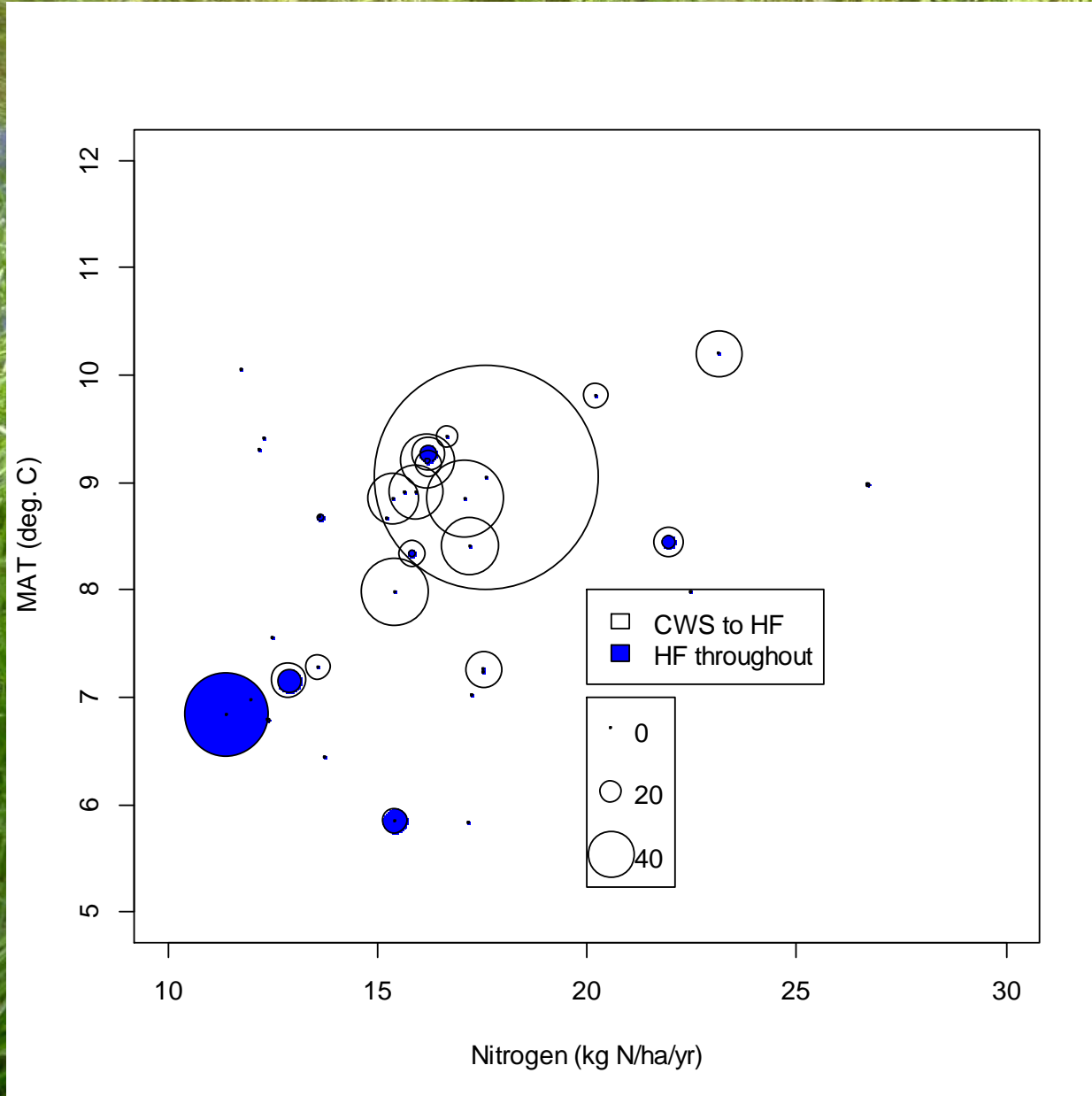
Memories within ForestREplot:
The Next Steps…

Importance

0

0   Increasing Time into the Past →
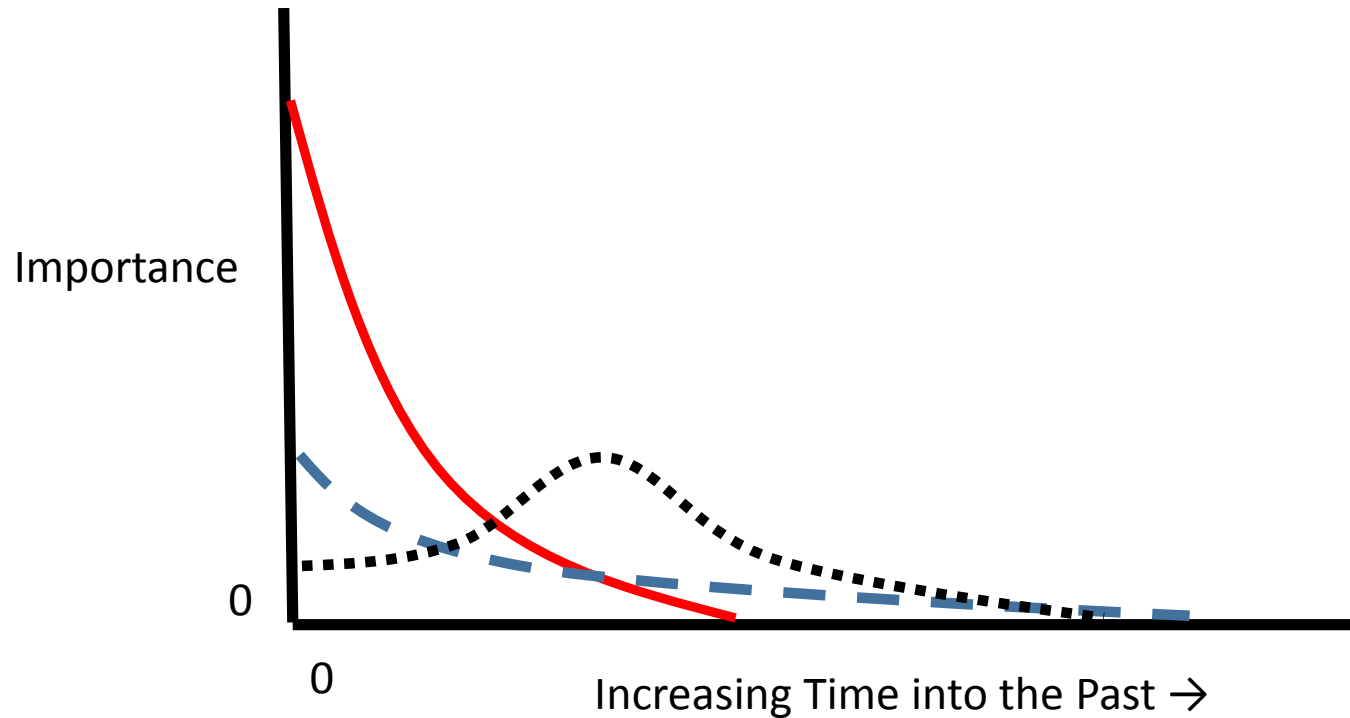
18-28% of additional variation in ecosystem properties could be explained by incorporating strength, length and temporal pattern of memory.
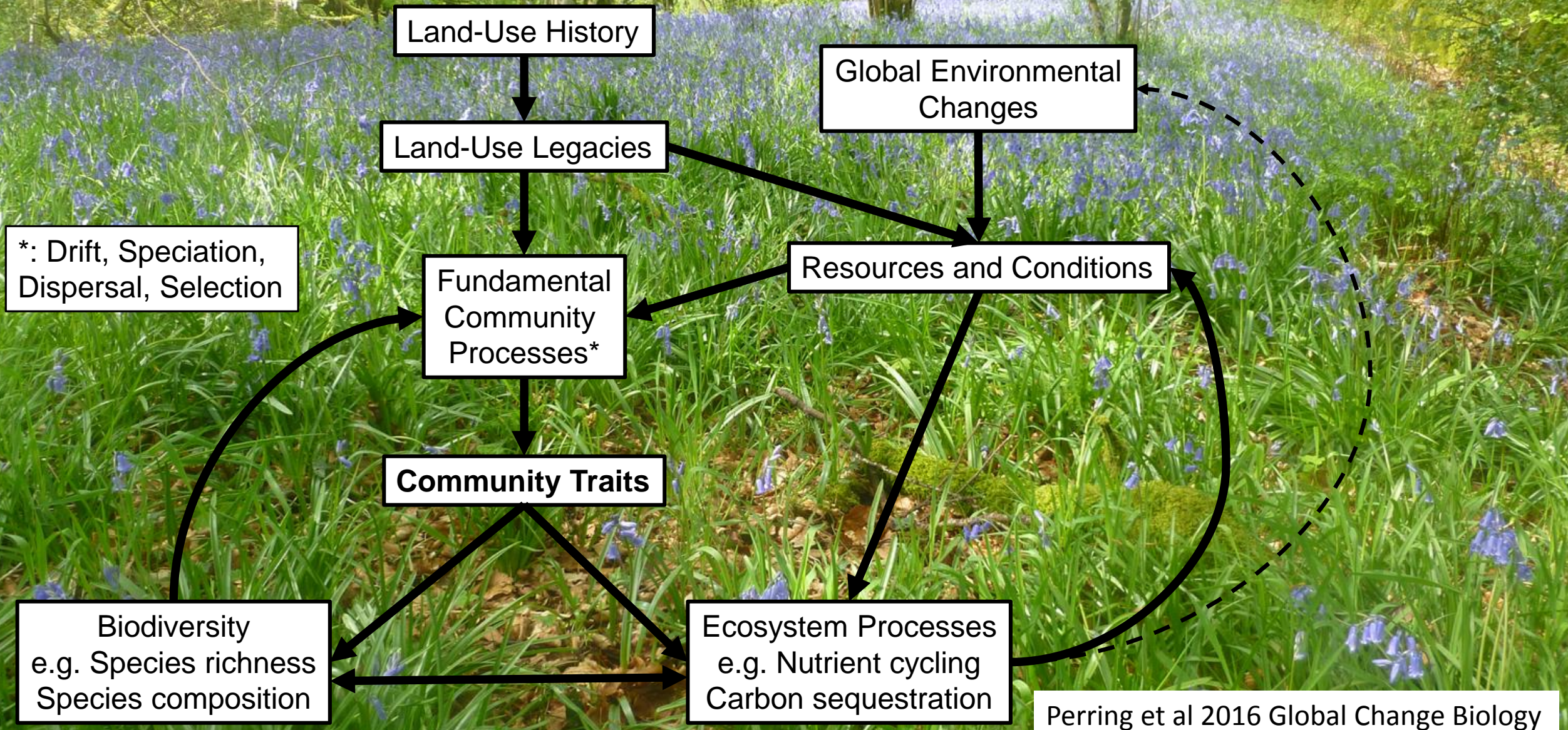
How do we translate this framework into characterising trait response in forestREplot data?

Ogle et al 2015 Ecology Letters

Synthesis

Land-Use History

Global Environmental Changes

Land-Use Legacies

*: Drift, Speciation, Dispersal, Selection

Resources and Conditions

Fundamental Community Processes*

Community Traits

Biodiversity
e.g. Species richness
Species composition

Ecosystem Processes
e.g. Nutrient cycling
Carbon sequestration

Perring et al 2016 Global Change Biology

Any Questions
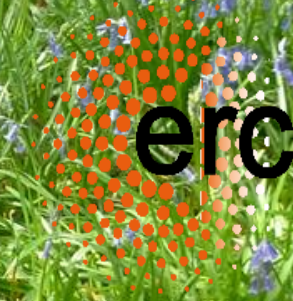
References

Bernhardt-Römermann, Baeten, Verheyen et al. 2015 Drivers of temporal changes in temperate forest plant diversity vary across spatial scales *Global Change Biology* **21**: 3726-3737

Dwyer, Hobbs & Mayfield 2014 Specific leaf area responses to environmental gradients through space and time *Ecology* **95**: 399-410

Laughlin, Leppert, Moore & Sieg 2010 A multi-trait test of the leaf-height-seed plant strategy scheme with 133 species from a pine forest flora *Functional Ecology* **24**: 493-501

Ogle, Barber, Barron-Gafford et al. 2015 Quantifying ecological memory in plant and ecosystem processes *Ecology Letters* **18**: 221-235

Perring, De Frenne, Verheyen et al. 2016 Global environmental change effects on ecosystems: the importance of land-use legacies *Global Change Biology* **22**: 1361-1371

Verheyen, Baeten, De Frenne et al. 2012 Driving factors behind the eutrophication signal in understorey plant communities of deciduous temperate forests *Journal of Ecology* **100**: 352-365