

Plant community response to environmental change depends upon land management legacies

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All contributors to forestREplot:

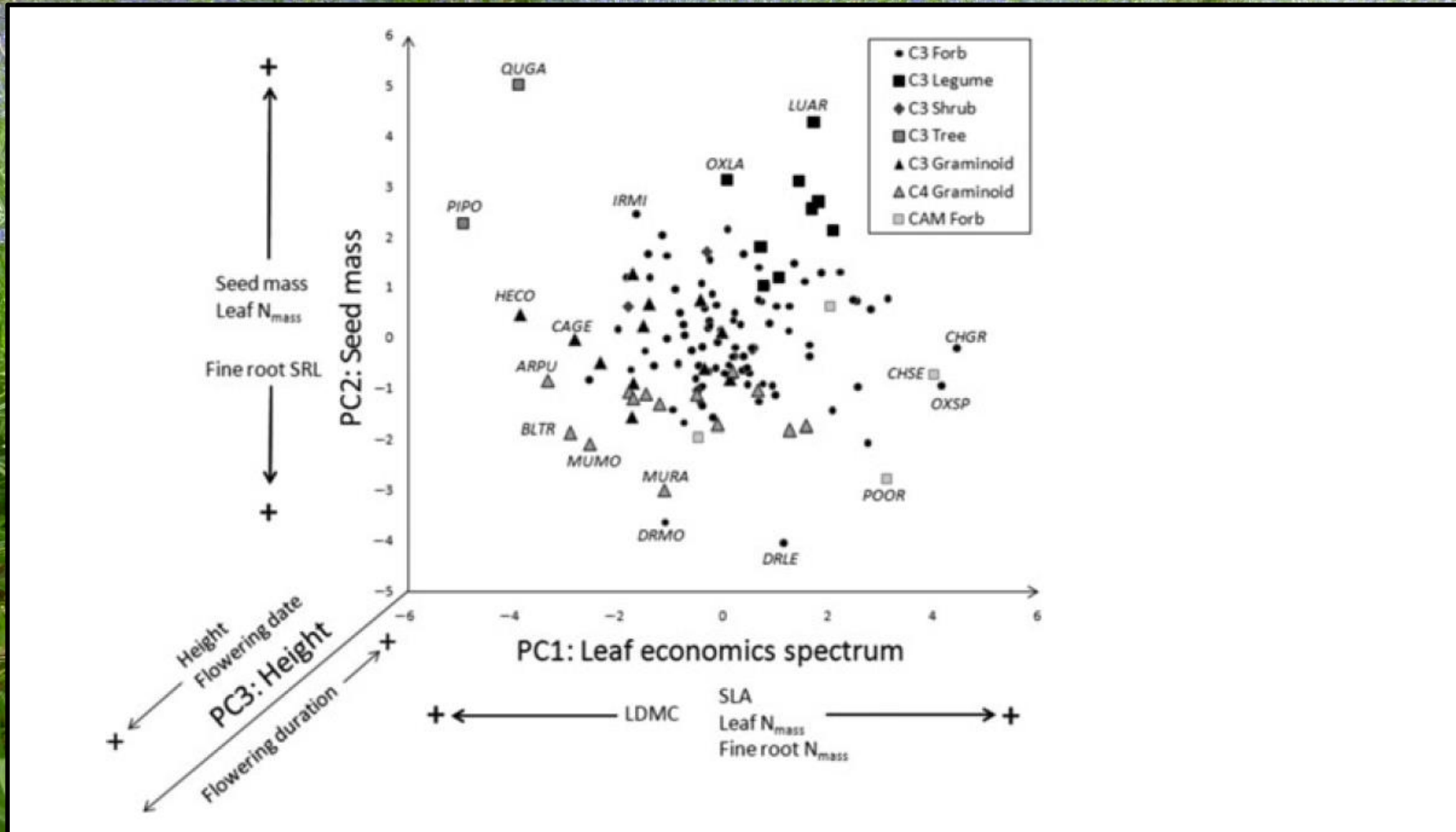
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Ghent University

The University of Western Australia



Measuring Plant Community Change: Using Functional Traits



Determinants of Plant Community Change

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

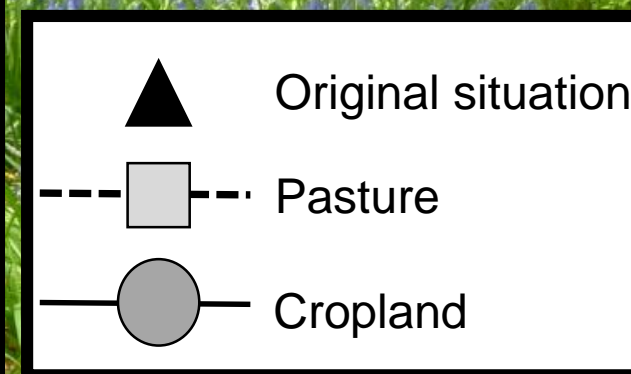
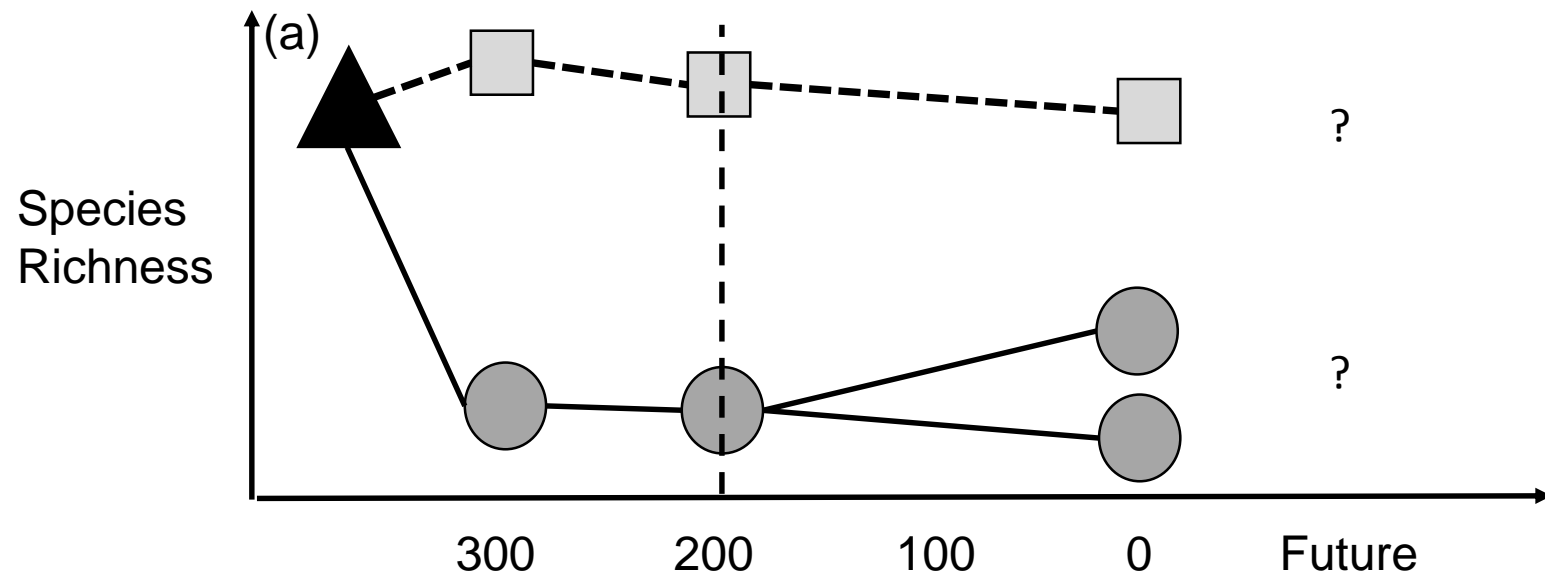
Vellend (2010)

- Contemporary Environmental Change

RESOURCES and CONDITIONS

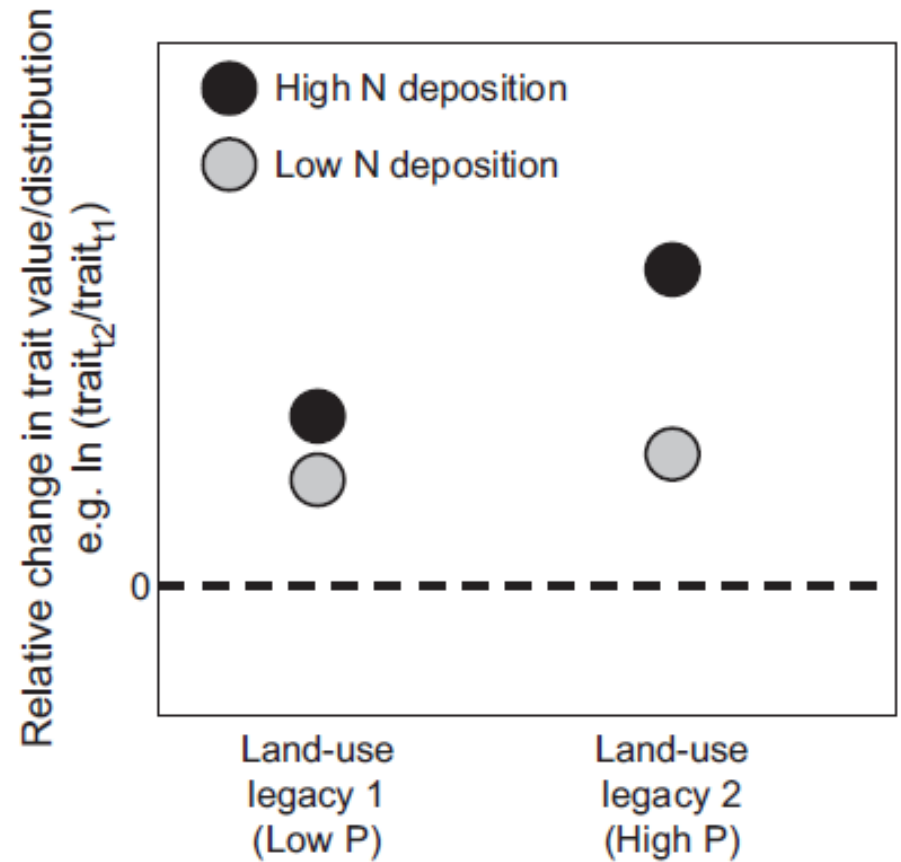
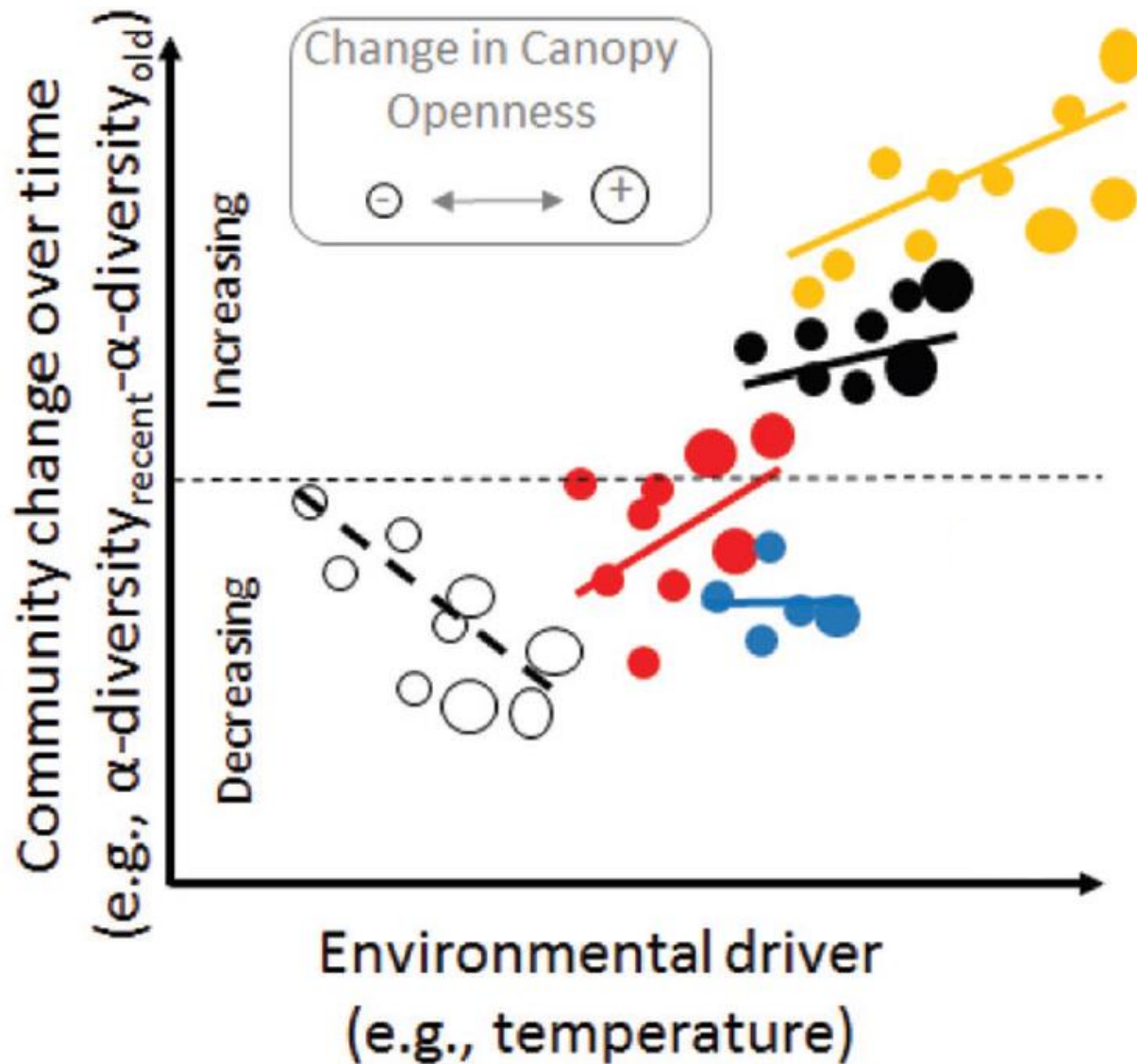
- Land Management Legacies

Trajectories of Plant Community Change: Expecting Interactions



Perring et al. 2016
Global Change Biology

Investigating Interactions: An Observational Method



Verheyen et al. 2017 *BioScience*

Perring et al. 2016 *Global Change Biology*

Deriving Forest Management Transitions (I)



Coppice with standards

Nutrient depleting
Species adapted to warmth / light

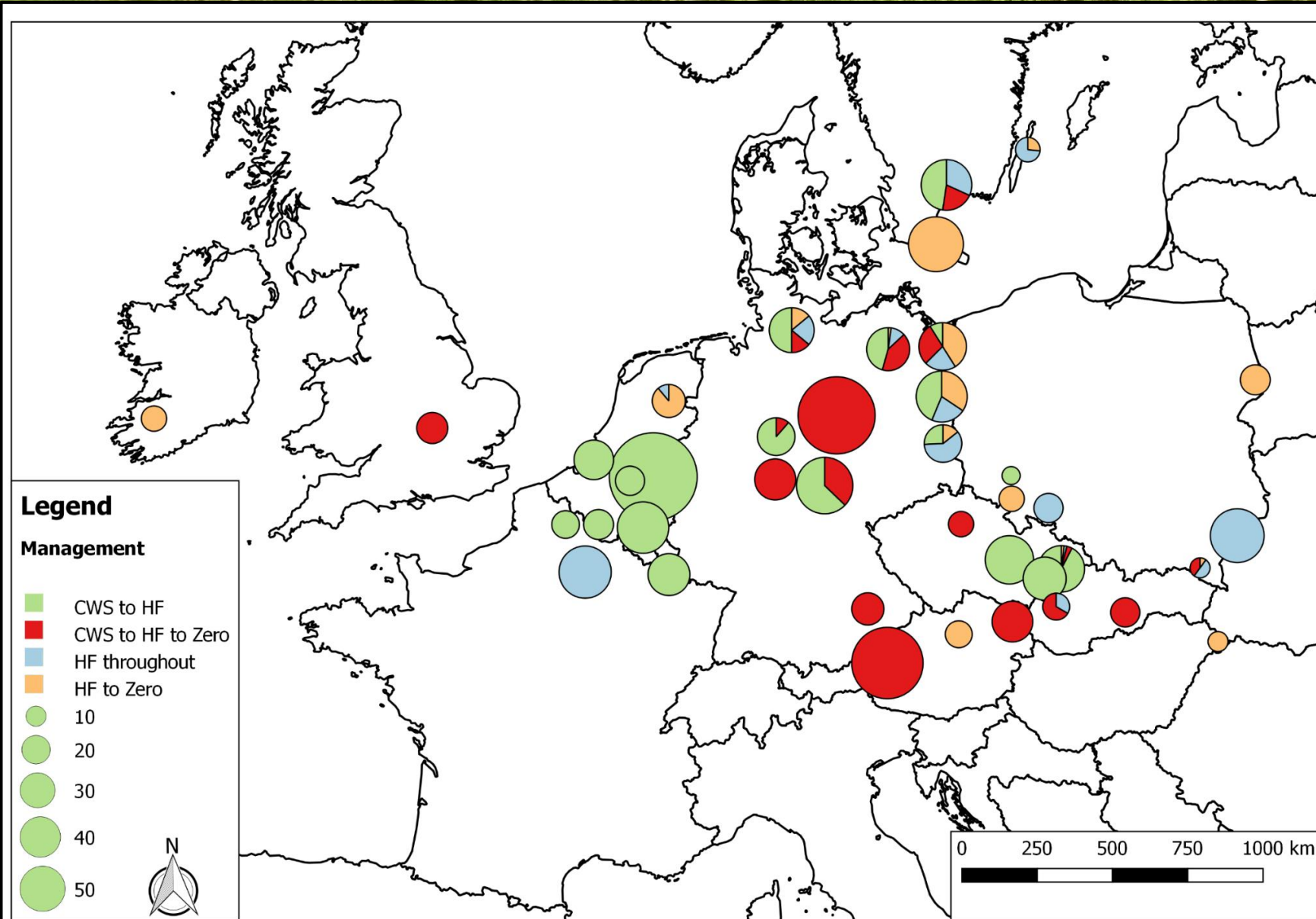
Photo credits: Guillaume Decocq



High forest

Nutrient retaining
Species adapted to shade / humidity

Deriving Forest Management Transitions (II)



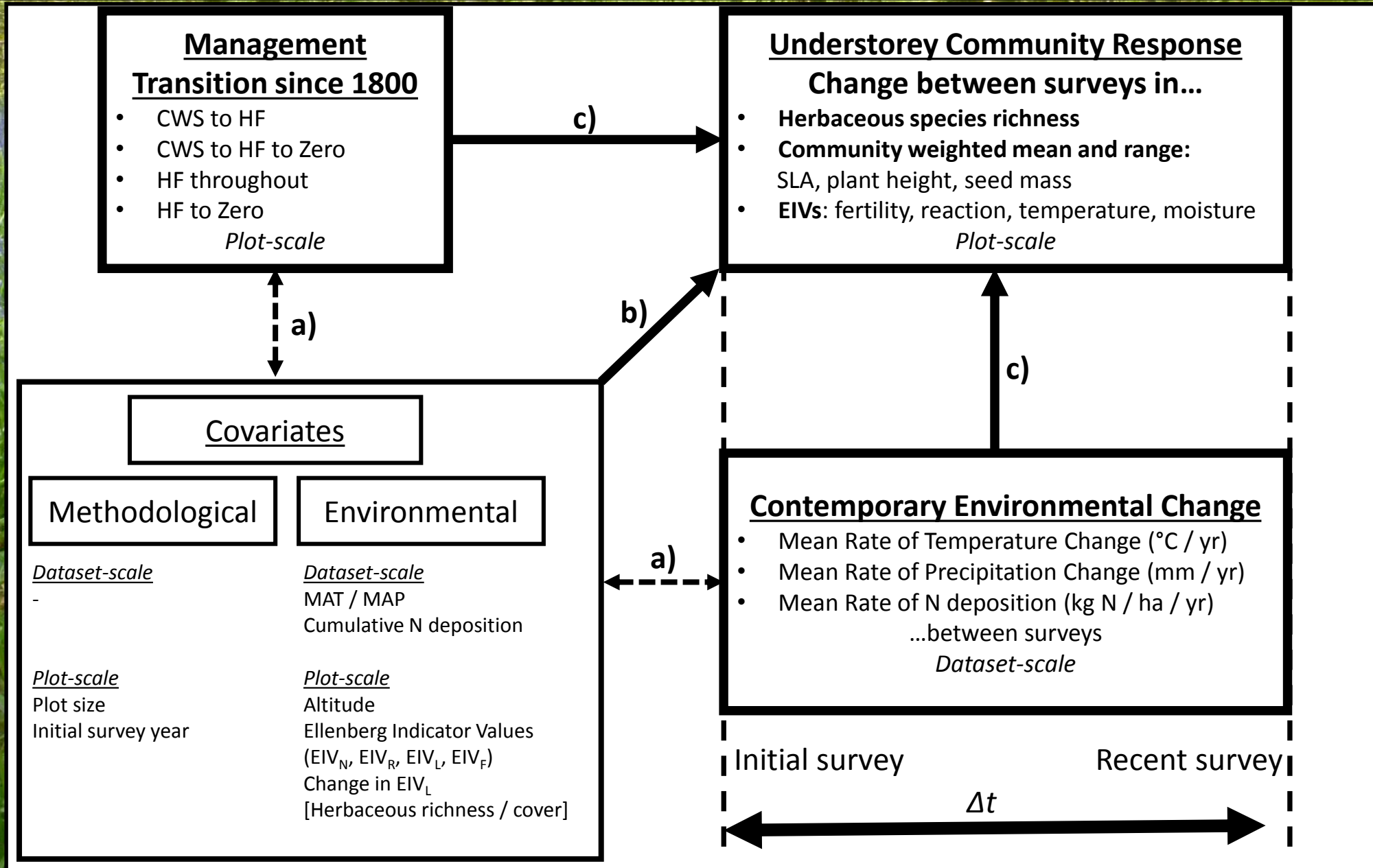
1814 plot pairs

40 European temperate
forest datasets

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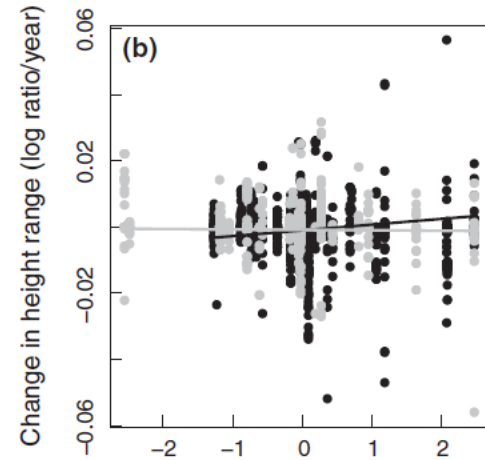
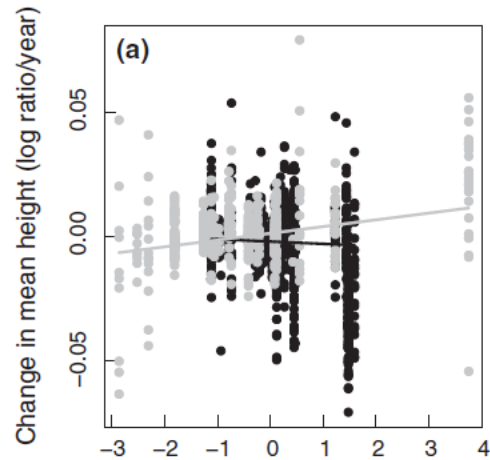
Perring et al. 2018
Global Change Biology

Testing Interactions: Analytical Approach

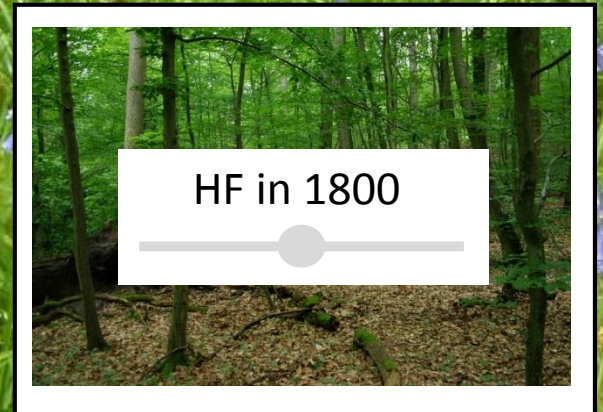
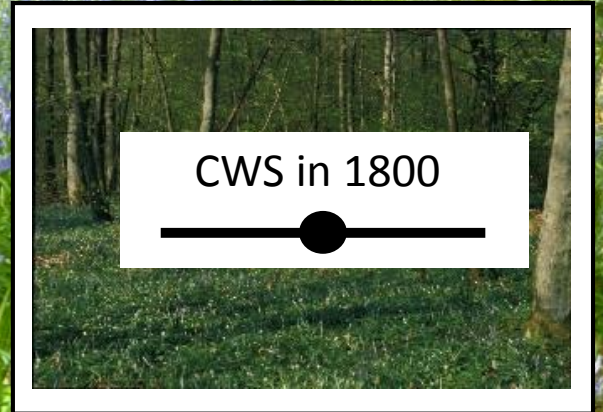
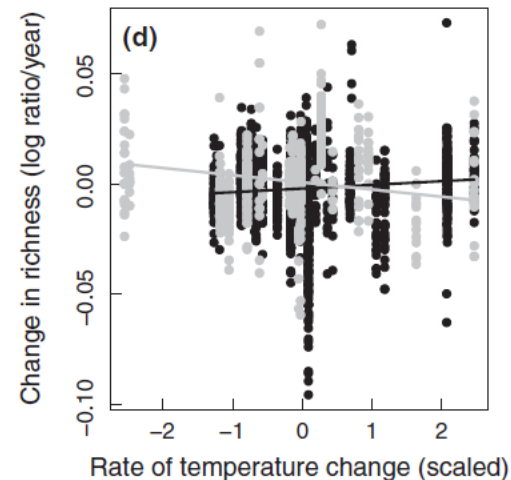
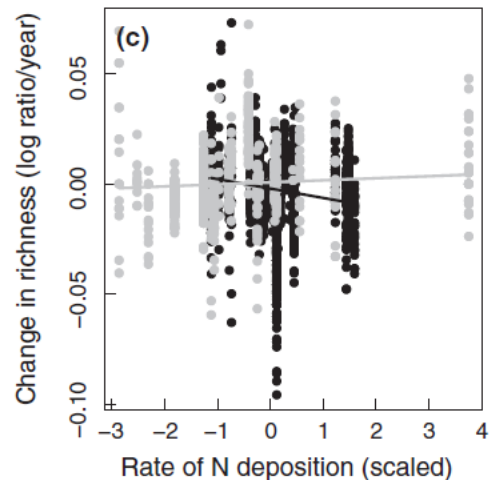


Height and Species Richness Response to Nitrogen Deposition and Temperature Change depends upon Management Legacy

Plant Height

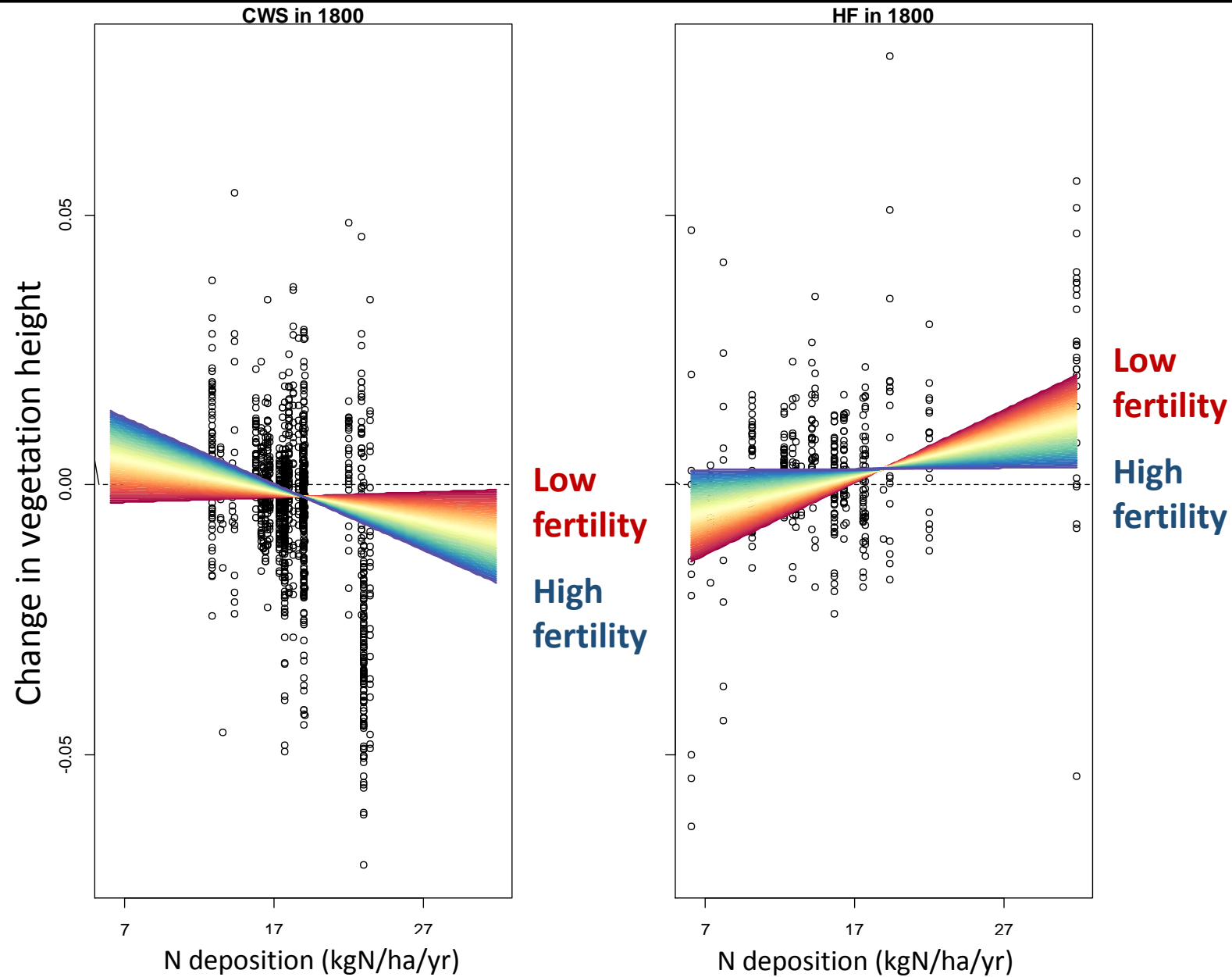


Species Richness



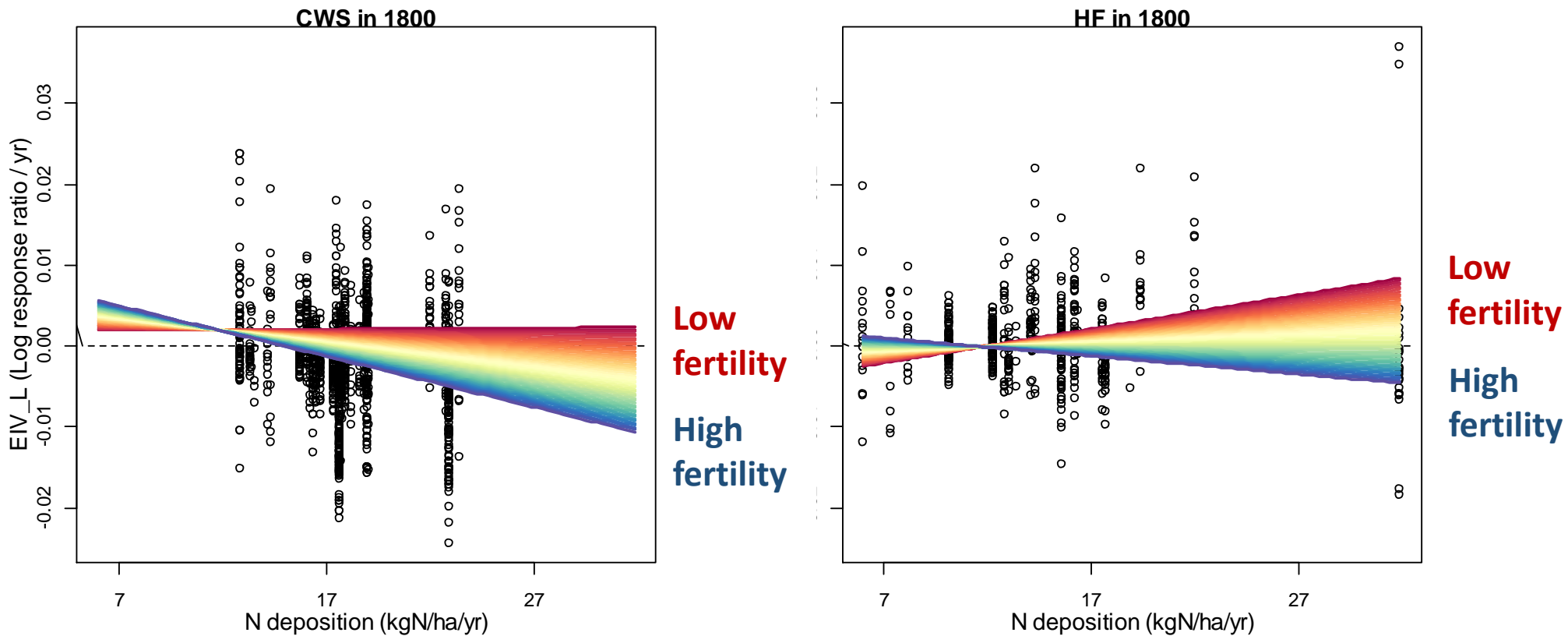
Perring et al. 2018
Global Change Biology

Context Dependency Extends to Initial Site Conditions



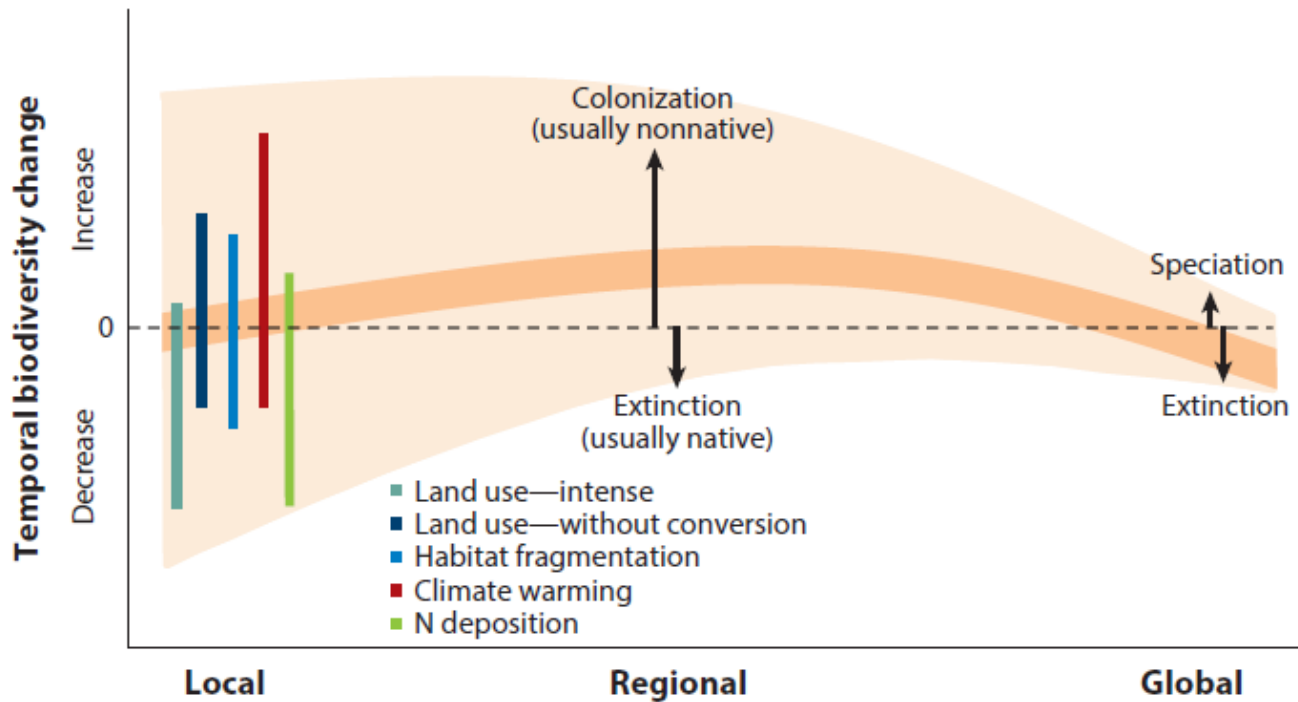
Perring et al.
in prep

Relationships to Ellenberg Indicator Values



The decline in vegetation height in former CWS forest is associated with EIV_L response: particularly in high fertility sites, relative cover of shade-adapted species is increasing with greater amounts of N deposition. In contrast, in former HF, and at high levels of N deposition, relative cover of light-demanding species increases.

Implications



Reconcile disparate local biodiversity changes

Vellend et al. 2017
Ann. Rev. Plant Biol.

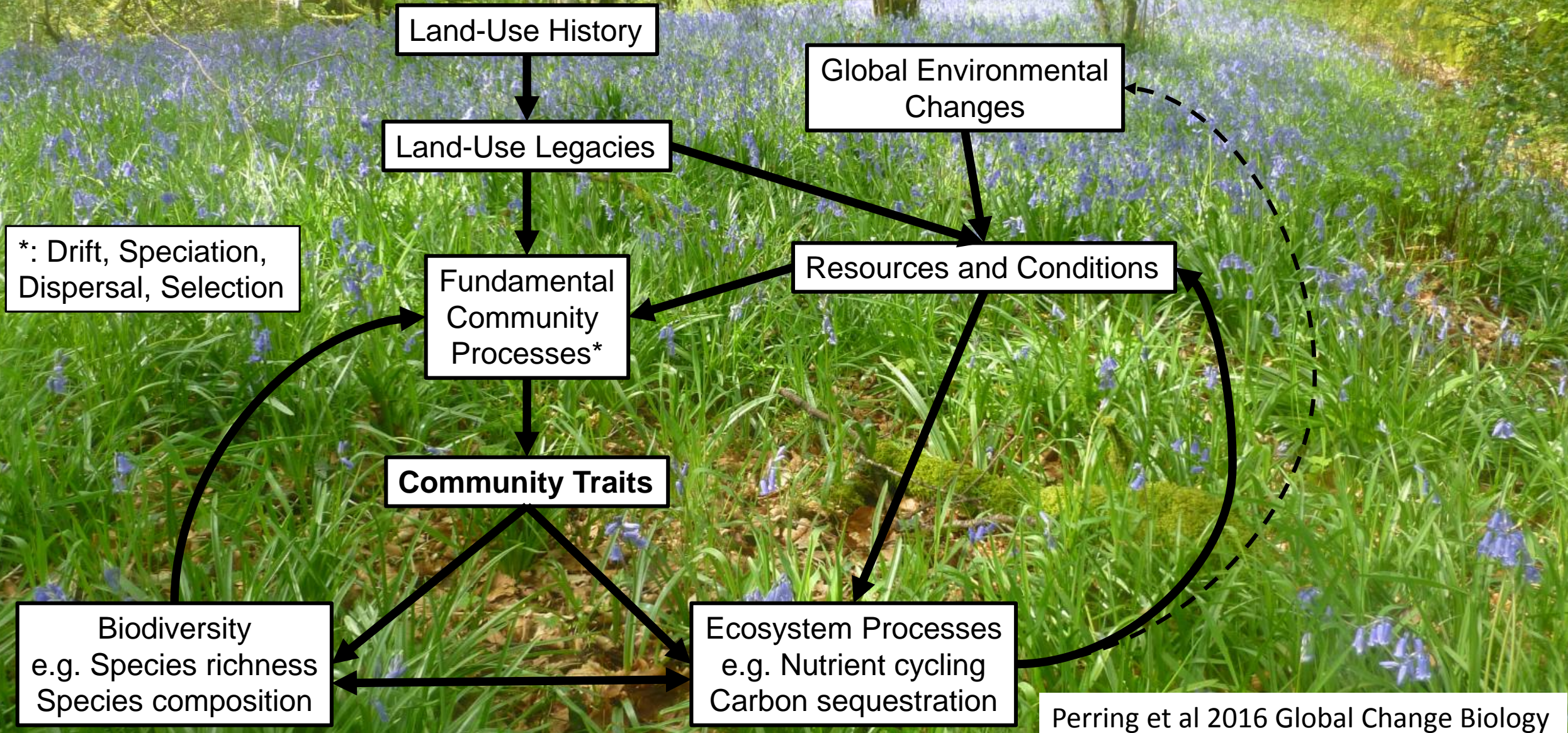
Taking account of legacies: Crucial for predicting community response to future environmental change



Questions?



Synthesis



Cited References

- Laughlin et al. 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
- Perring et al. 2016 Global environmental change effects on ecosystems: the importance of land-use legacies *Global Change Biology* 22: 1361-1371
- Perring et al. 2018 Global environmental change effects on plant community composition trajectories depend upon management legacies *Global Change Biology* 24: 1722-1740
- Vellend 2010 Conceptual synthesis in community ecology *The Quarterly Review of Biology* 85: 183-206
- Vellend et al. 2017 Plant biodiversity change across scales during the Anthropocene *Annual Review of Plant Biology* 68: 3.1-3.24
- Verheyen et al. 2017 Combining biodiversity resurveys across regions to advance global change research *BioScience* 67: 73-83