University of Zurich[UZH]

17th SWISS GEOSCIENCE MEETING 2019 FRIBOURG

SEARCHING HIGH AND LOW

Biodiversity and Ecosystem Functioning Across Local and Landscape Scales

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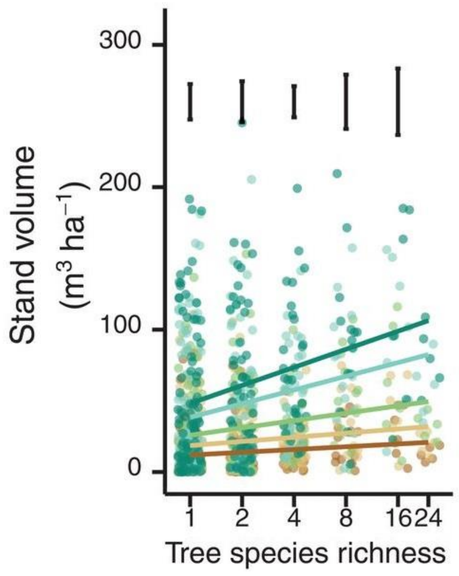
1: UZH, Dept. of Evolutionary Biology and Environmental Sciences. 2: University Research Priority Programme Global Change and Biodiversity. 3: ETHZ, Dept. of Environmental Systems Sciences. 4: Global Forest Biodiversity Initiative. 5: UZH, Dept. of Geography.

INTRODUCTION

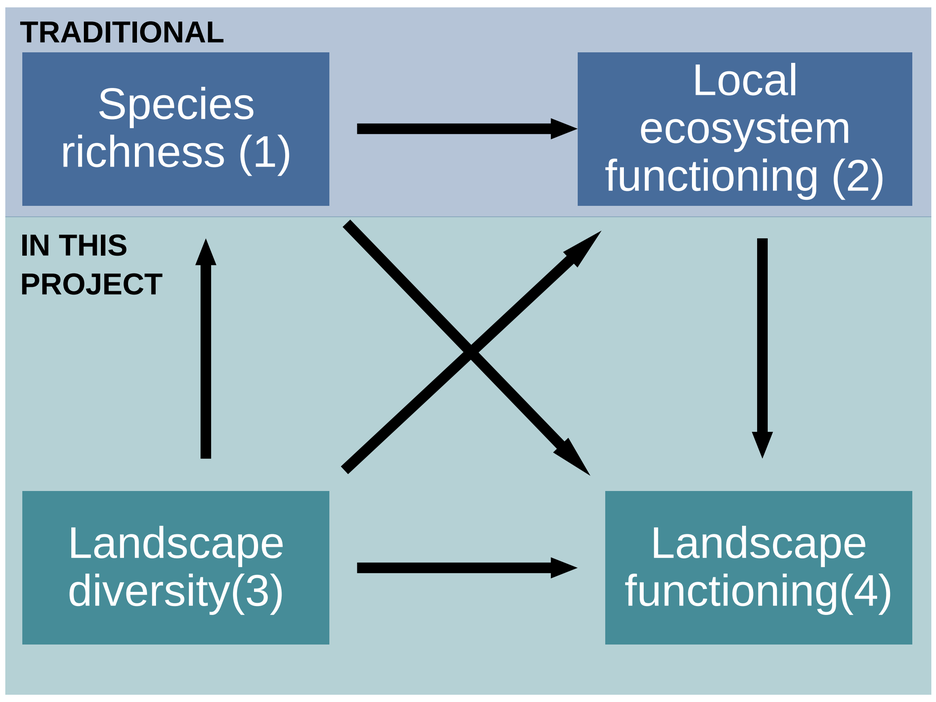
- Biodiversity and ecosystem functioning are positively linked at **local species scales,** but does this relationship extrapolate **to real-world landscapes?**

OBJECTIVES

- Compare **local tree species richness, biomass density**, **landscape richness**, and **productivity**
- Using a **quasi-experimental study design**, across wide abiotic gradients in North America.



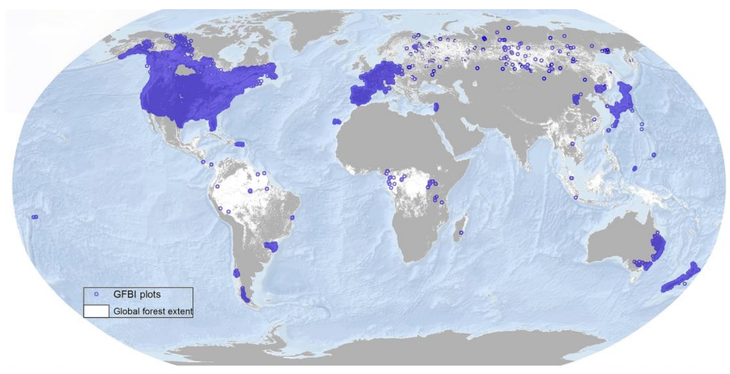
An example of a traditional approach to biodiversity-ecosystem functioning research. Adapted from Huang *et al.* 2018



METHODS

1 Local Tree Species Richness

- Number of tree species in a plot



Global Forest Biodiversity Initiative

People, Nature, World, Diversity

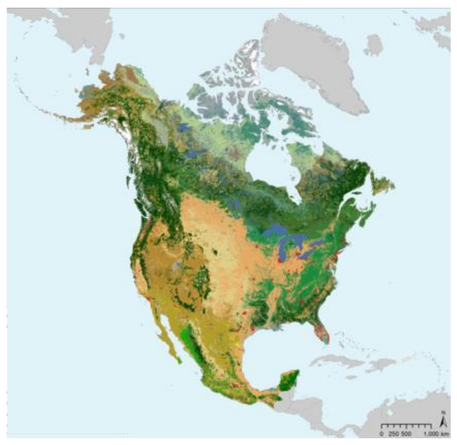
2 Ecosystem Functioning

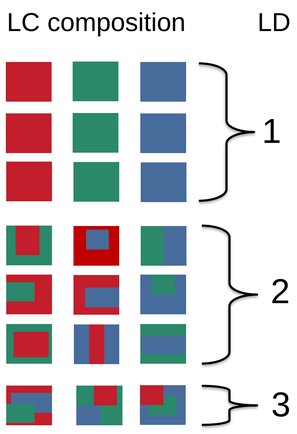
- Biomass density per hectare



3 Landscape Diversity (LD)

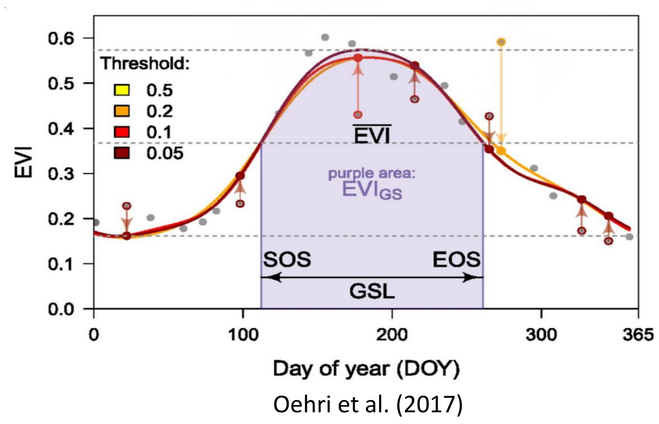
- Number of land cover(LC) types in a landscape





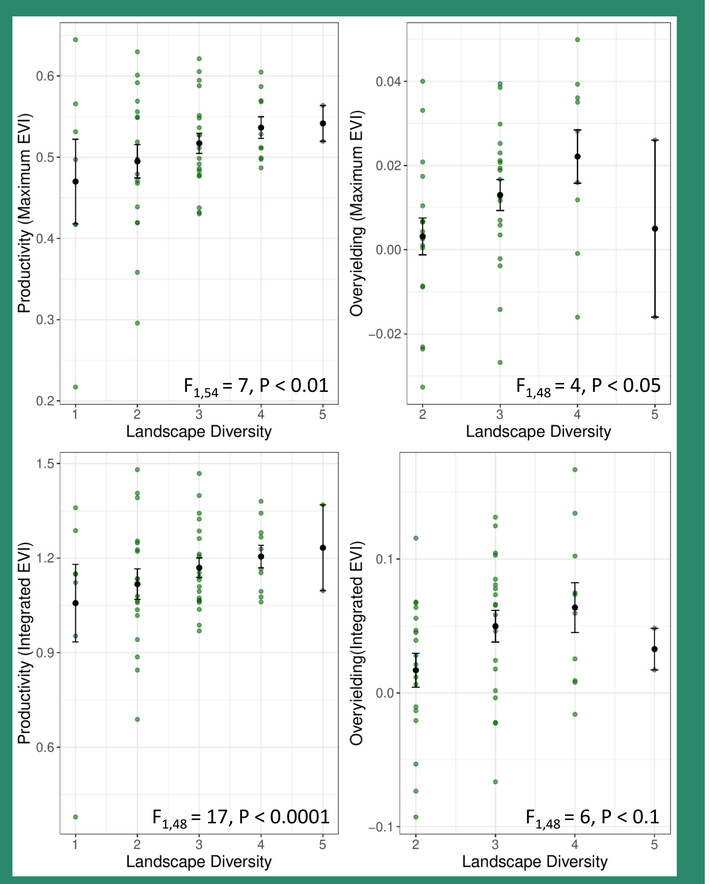
4 Landscape Functioning

- Productivity
- Growing season length



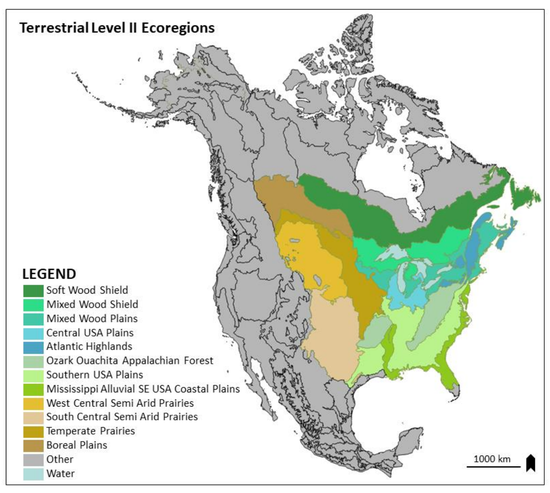
Oehri et al. (2017)

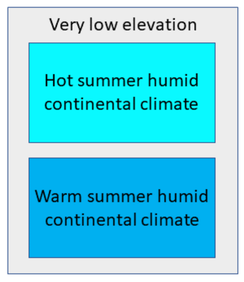
RESULTS



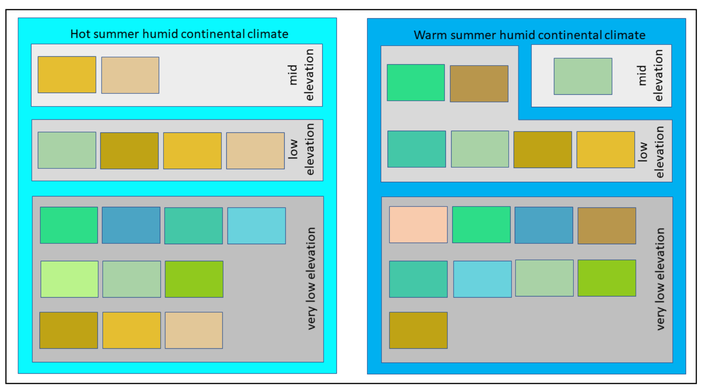
- Positive landscape diversity effects on landscape functioning across North America, after adjusting for the local biodiversity and biomass effects.
- Overyielding exhibited and increasing with landscape diversity ($F_{1,48} = 27$, $P < 0.0001$)

Decorrelation of large scale environmental factors





Blocking of GFBI subset, 1 100 plots.



Blocking of landscape dataset, 18 822 plots.

IMPLICATIONS...

- Biodiversity effects are evident in real-world meta ecosystems
- These novel behaviours must be acknowledged in the implementation of landscape and global-scale biodiversity management policies.

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Huang, Y., et al. (2018). Impacts of species richness on productivity in a large-scale subtropical forest experiment. Science. https://doi.org/10.1126/science.aat6405

Liang, J.; *et al*. (2016). Positive biodiversity-productivity relationship predominant in global forests. *Science*. 354. 10.1126/science.aaf8957.

Oehri, J., *et al.* (2017) Biodiversity promotes primary productivity and growing season lengthening at the landscape scale. *PNAS*, 114(38), 10160-10165.