

How landscape structure determines species frequencies - insights from a model

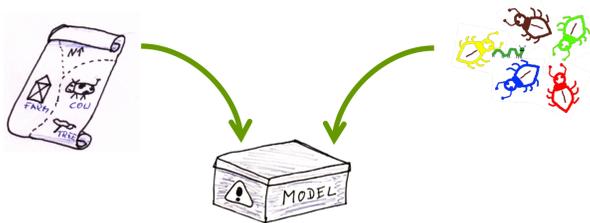
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Landscape & Biodiversity

- Biodiversity depends on **processes** acting at **many scales**
- Simulations allow for selective **manipulations** at different scales
- ... and for tracking their **effects on biodiversity**



Aim and Research Questions

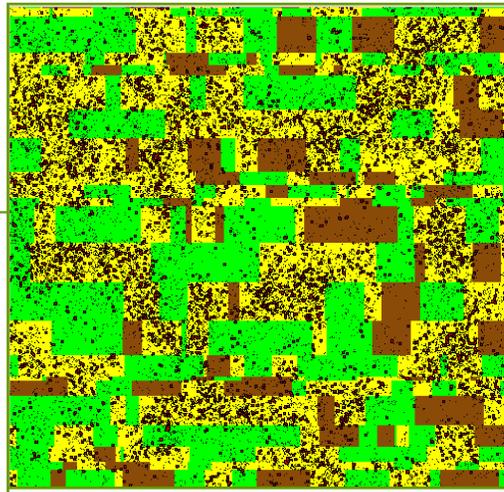
- **Simulation model:** biodiversity & habitat fragmentation
- Patch-scale **processes** → biodiversity **patterns**
- **Scale-dependence** of processes driving biodiversity
- **Functional** vs. **species** vs. **genetic** diversity?
- **Community** structure vs. temporal dynamics – Clements or Gleason?



Kick-off: Ground-beetle model

A: Landscape generator

- Grid of cells (25 m x 25 m), **three habitat types**
- Different ratios of habitat types
- Allows for habitat **fragmentation** & landscape **simplification**

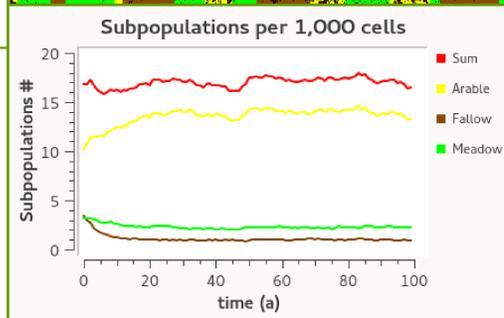


C: Artificial species

- Differ in **habitat preference**,
- **Dispersal** ability, and
- **Persistence** of local subpopulations

B: Population model

- **Metapopulation** model
- Short & long-distance dispersal
- Based on field data & expert knowledge



D: Planned simulations

- 21 species & 150 landscapes
- **Measures:** Species frequency, proportion of suitable habitat, probability of finding suitable habitat at a distance r

Next step: A multi-species model

- Stochastic **birth, death** and **dispersal** processes
- **Spatially** and **temporally explicit**
- Species **interactions**
- Different **trophic levels**
- Results to be compared with **actual field data**
- **Virtual ecologist**¹ data sampling approach

¹ Zurell D et al., 2010. The virtual ecologist approach: simulating data and observers. *Oikos*, 119(4), pp.622–635.

Some nuts to crack

- How big needs an artificial **species pool** to be?
- How to handle **rare species**?
- Model **species** diversity using **functional groups**?
- How to deal with **seasonality**?
- Better **fewer** species in **detail** or a **broader view** with many species?

