Strategies for adapting Bavarian forests to climate change based on the simulation of demographic processes

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The key components of BayForDemo

1.2. Connecting a demographic simulator to data

Demographic rates

Structure and composition

Dynamics

Geographic distribution

Regeneration
Growth
Mortality

Direct calibration
Integration of existing information

Tree rings
Experiments
Models of subprocesses

Prior
Posterior
Likelihood

Inverse calibration
Comparison of model and data

Forecasting
Quantification of uncertainty

modified following Hartig et al. (2012) J Biogeogr
Forest inventory datasets collected and homogenized plus European ICP data meta data layer
Forest regeneration – important but often not considered

- poorly represented in forest models
- seedlings and saplings are not simply small trees (extrapolation problem)
- large scale data on regeneration is inhomogeneous and often unexplored

- BUT: successful regeneration can be crucial particularly in a dynamically changing climate
- small trees can also be an early indicator of range shifts due to climate or management change
Hypervolumes of small and large tree occurrence

Two explanations for both volume change and shift:

(A) Temporal change in distribution.
(B) Ontogenetic change in filtering.
Ontogenetic effects

Hypothesis: As a species’ phenotype changes during its life time, the environmental filtering and thus the hypervolume of suitable environments changes.
Estimating occurrence change over 30 years depending on ontogeny

\[ \text{envpres} \sim \text{Normal}(\mu, \sigma) \]

\textit{Sorbus aucuparia}

- adults, \textit{time effect}
- recruits, \textit{time effect}


Soil C/N
Vielen Dank für die Aufmerksamkeit!