Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title:	Predicting stand productivity with the FORCEEPS model and testing diversity effects across European forests
Project ID:	164
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PROJECT DESCRIPTION

Biodiversity-ecosystem functioning (BEF) relationships have received great attention in the last decades, and this pattern is growing with climate change impacts on communities. Yet, many underlying mechanisms processes remain weakly understood, notably on the long-term, especially for forests (1). Although many experimental efforts have been led in the last years to depict such questions, carrying out such a study with adult trees in the long run appears quite difficult. To circumvent these difficulties, an alternative approach consists in relying on forest gap models (2,3).
Former results with gap models (2) have shown that mixed forests may be more productive than monospecific ones, and brought insights on the possible mechanisms. However, the range of conditions considered remain reduced. In this project, I would like to test these BEF-relationships in forests across Europe, using simulation carried out with the model ForCEEPS.
The ForCEEPS model is a classic gap model, taking into account competition for light and climatic constraints, predicting tree species composition, stand productivity and biomass over time. ForCEEPS notably allow to control, or not, for the tree density in the stand. The model can simulate a large number of species, from boreal to Mediterranean ecosystems. It has been validated on French forests (using RENECOFOR data) regarding stand productivity across 10-15 years (4). The main objectives of this project would thus be:

1- Validating the predictions of ForCEEPS on a larger range of conditions, ie. EU level.
2- Making simulations with various species richness, to establish BEF-relationships.
3- An extension of this work could be to repeat these simulations using climate change scenarios.

This study will be the first to test for BEF-relationships on such a scale. The ICP level II data are perfectly suited to run such an analysis, as they provide growth data over time for the same stands. Furthermore, if meteorological and soil data are available for quantifying drought stress, this may also help in assessing whether the model well reproduces the effect of drought on tree growth.
Collaborators: Maxime Cailleret (IRSTEA France), Nicolas Martin (INRA France), Joannès Guillemot (CIRAD France)

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2. Morin X, Fahse L, Scherer-Lorenzen M, Bugmann H. Tree species richness promotes productivity in temperate forests through strong complementarity between species. Ecol Lett. 2011;14(12):1211–9.
3. Morin X, Fahse L, Jactel H, Scherer-Lorenzen M, García-Valdés R, Bugmann H. Long-term response of forest productivity to climate change is mostly driven by change in tree species composition. Sci Rep [Internet]. 2018 [cited 2018 May 17];8:5627. Available from: www.nature.com/scientificreports
4. Morin X, De Coligny F, Bugmann H, Cailleret M, Limousin JM, Martin-StPaul N, Ourcival, JM, Guillemot J. (*In prep*) Predicting forest productivity with a gap model in temperate, mountain and Mediterranean conditions.