

sDiv working group meeting report

"sTREND"

Working group meeting report

The sTREND working group held its first meeting at the iDiv premises from 8 to 11 July 2025. A total of 14 people were able to attend in person, while two colleagues joined via videoconference from Australia and Ethiopia. The welcoming from the iDiv staff and the working conditions were excellent, allowing us to focus on scientific discussions without worrying about logistics. We would like to thank them once again sincerely.



Members of the sTREND working group at iDiv

The sTREND project aims to understand how the functional traits of trees respond to surrounding tree diversity in forest communities. While functional diversity is known to be a key driver of forest functioning, particularly in terms of productivity and resilience, the reciprocal effect of forest diversity on the functional traits of trees has been less studied. Phenotypic plasticity, which can account for up to 25% of the variation in traits within communities, could therefore be a key, albeit underestimated, mechanism underlying the relationships between forest diversity and ecosystem functioning. The project therefore aims to explore how the diversity of neighbouring trees affects traits and, consequently, ecosystem functions.

The first day of the meeting was devoted to reviewing ecological theories and concepts related to the phenotypic plasticity of tree traits, particularly in the context of mixed forests. The program included presentations by the participants and group discussions focused on how the functional traits of trees respond to the proximity of neighbours of the same or different species through processes of competition or facilitation, and how trait diversity and complementarity are known to influence the functioning of mixed forests. We also discussed functional diversity metrics and how to measure the phenotypic plasticity of functional traits in trees.

On the second day, we divided the group into two subgroups to develop more concrete plans for addressing the central scientific questions of sTREND, based on both the theoretical context and the availability of data.

One of the subgroups focused on how tree traits respond to the diversity of neighbouring trees through ecological mechanisms such as competition or facilitation in the use of resources (light, water, nutrients) and biotic interactions. A quick screening of the available literature on the subject was carried out, building on a recent meta-analysis published by sTREND members.”. It was also discussed that the functional traits of trees were most likely to be influenced by heterospecific neighbours. Sources of information and data on the functional traits of trees were listed, including measurements in TreeDivNet experiments, the FunDivEUROPE and SoilForEUROPE projects, and from international databases such as TRY and GRooT. Methods for estimating the plasticity of traits were also examined.

The other subgroup concentrated on the functional importance of trait plasticity in species-diverse forests, the underlying mechanisms, and how to statistically test the relationships between trait value variability and net biodiversity effects. The differences between the overall plasticity of species traits and the observed variation in traits were highlighted. Current methods used to test the functional response of forests, for example, their productivity, to functional diversity were discussed in order to consider how they could be applied to the new concept of functional plasticity. Data sources were also identified in order to test the hypotheses.

The two subgroups reconvened on the third day to develop concrete plans for data collection and the drafting of the scientific papers. It was decided to start work on three articles. The first article will test the effect of surrounding tree diversity on functional trait expression by comparing mean trait values at the plot level of a given tree species in pure vs mixed plots. A meta-analytical approach will be used to estimate trait response to tree species composition (pure vs mixed), using a log ratio metric. Four types of traits will be targeted: light, water, and nutrient-affected aerial traits and root traits. Several covariates (“moderators” in meta-analysis language) will be tested for their effect on trait response to neighbouring diversity, including characteristics of the target tree species, of the community of neighbouring trees in mixed forest, and the environment (site conditions). The second article will address the same question but at the tree level, taking into account competition indices between focal and neighbouring trees. In addition to mean trait values, the effects of surrounding diversity will be tested on variability of trait values, in order to better estimate trait plasticity response. The third article will test the effect of local trait plasticity (observed trait variation between pure and mixed plots) on net biodiversity effects for plot level productivity, separating complementarity and selection components. The effects of local trait

plasticity (response to neighbouring diversity) on productivity will be tested by comparing the effect of FDis as calculated with traits measured in the corresponding mixed plots, trait values from the monoculture plot, or species-level trait values from databases (e.g., TRY and GRootT).

The fourth day was devoted to refining the list of tree traits to be studied, designing data structure for collecting trait values from different sources, and assigning responsibilities among the working group members. A schedule for the next steps was established. Several online meetings are planned for the two sub-groups in the coming months, and a second on-site general meeting has been scheduled for spring 2026.