Quantified at large scale: Underlying drivers of understory biomass and its allocation

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Biomass or carbon storage in forest ecosystems is generally used to quantify ecosystem productivity and the ability to sequester carbon. Previous efforts have evaluated the relationships between environmental

factors (especially stand structure) and understory root/shoot (R/S) ratio for individual species. However, a knowledge gap remains regarding the patterns of understory biomass and R/S ratio over a broad scale.

In a study published in *Science of the Total Environment*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) and Chengdu Institute of Biology (CIB) of the Chinese Academy of Sciences revealed the large-scale patterns of understory biomass and R/S ratio across climatic regions and forest types, and quantified the underlying drivers of understory biomass and its allocation at a large scale.

By gathering the literature published between 1984 and 2011 from libraries and web databases, the researchers compiled a large database of understory biomass at the community level across China's forests and conducted a meta-analysis.

They found that stand structure (e.g., stand density and stand age) exerted a significant direct effect on understory biomass accumulation at a large scale. The stand density was the pivotal driver of large-scale variation in understory biomass, and understory biomass accumulation decreased with increasing stand density. However, climate exerted an indirect effect on understory biomass accumulation by influencing stand density.

They further found that precipitation was the primary environmental driver in controlling understory biomass allocation. The understory biomass increased with mean annual temperature (MAT) and mean annual precipitation (MAP), but the R/S ratio decreased with MAT and MAP.

Synthetically, the stand structure modulated understory biomass and precipitation modulated R/S ratio.

"To our knowledge, this study provides the first comprehensive assessment of large-scale patterns of understory biomass and R/S ratio, and demonstrates the relative importance of direct and indirect drivers," said Jin Yanqiang of XTBG.

More information: Yanqiang Jin et al, Large-scale patterns of understory biomass and its allocation across China's forests, *Science of The Total Environment* (2021). DOI: 10.1016/j.scitotenv.2021.150169

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