

# INFLUENCE OF CLIMATIC FACTORS ON THE GROWTH DYNAMICS OF STANDS WITH DIFFERENT STRUCTURES AND ITS EFFECT ON THE SOIL

Kománek Martin<sup>1</sup>, Sýkora Petr<sup>1</sup>, Horák Pavel<sup>1</sup>, Volánek Jiří<sup>1</sup>, Vichta Tomáš<sup>1</sup>, Holík Ladislav<sup>1</sup>, Šenfeldr Martin<sup>1</sup>, Jablonická Petra<sup>1</sup>, Žižková Eliška<sup>1</sup>, Knott Robert<sup>1</sup>, David Dušek<sup>2</sup>, Černý Jakub<sup>1,2</sup>

<sup>1</sup>Mendel University in Brno / Faculty of Forestry and Wood Technology;

<sup>2</sup>Forestry and Game Management Research Institute

E-mail: [xkomanek@mendelu.cz](mailto:xkomanek@mendelu.cz)

**Keywords:** Global climate change \* stand structure \* volume production

## PROJECT GOALS

The main objective of this project is to analyse and evaluate the resistance and sensitivity of monocultures, mixed monocultures and structurally differentiated stands and the impacts of these three types of stands on the carbon cycle.

## INTRODUCTION

Due to ongoing global climate change (GCC), forest ecosystems are initially weakened by abiotic factors. Secondary biotic factors damage the debilitated stands. GCC is characterised by increased air temperatures and changes in the annual distribution of precipitation (Cavin et al. 2013). These factors increase the risk of reduced tree growth and mortality in the ecosystem (Adams et al. 2012). Nowadays, mixed stands seem to be a promising adaptation strategy for sustainable management under risky climatic conditions (Pretzsch and Schütze 2021; Pretzsch et al. 2021).

## MATERIAL AND METHODS

In total, seven triplets, always involving three different stand structures (A, B, C) described below, have been established countrywide (Polánky, Hradec Králové, Šumava, Beskydy, Křtiny). The triplets consist of all four main tree species in the CR (i.e. beech, spruce, pine and oak) depending on altitudinal zones. Each triplet area is more extensive than 0.5 ha (individual plots with an area of from 40x40 m to 50x50 m, depending on species and structural diversity), and all three plots (A, B, C) occur at the same site (soil and climate). All trees in each plot were inventoried (DBH, tree height, crown base height, stem positions, and crown projections).



Fig. 1 – Triplet of Norway spruce in the Training Forest Enterprise Masaryk Forest Křtiny – From the left side – Pure Spruce stand; mixed spruce-beech even-aged stand; structural rich stand composed of Norway spruce, European beech and Silver fir

## RESULTS AND DISCUSSION

Preliminary results include the first analyses of the spatial pattern of the stand. Fig. 2 shows the spatial arrangement of the trees in each variant within the triplet (A-C, Polánky). Subsequently, stand structural parameters (Clark-Evans index, Artenprofile index, Shannon index, Gini index, etc.) will be calculated from inventoried data. In Fig. 2, an excellent example of the individual type of mixing, which was one of the main objectives and criteria for selecting the B category, is represented.

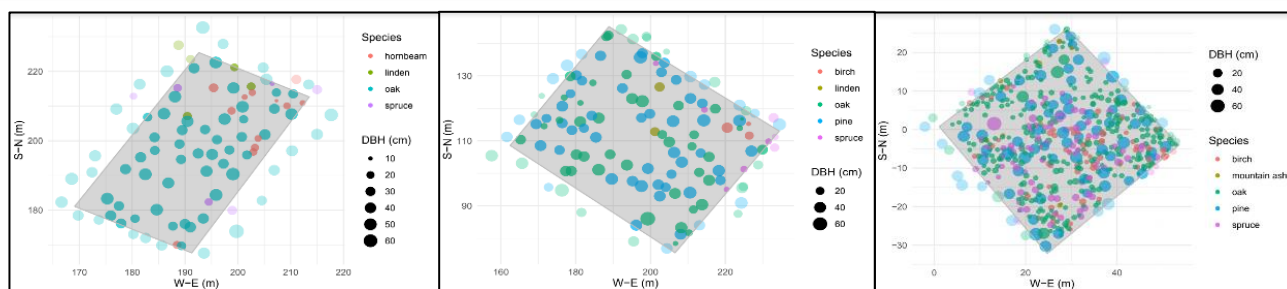


Fig. 2 – Triplet of sessile oak in the locality Polánky – From the left side – Pure sessile oak stand; mixed even-aged stand of sessile oak and Scots pine; and structural rich stand composed of sessile oak, Scots pine and Norway spruce

## CONCLUSION

Based on the first-year data, we can conclude that studied variants within triplet differ in the distribution of diameter classes. However, not all datasets have been analysed yet to generalise preliminary results. In Fig. 2, an excellent example of the individual type of mixing, which was one of the main objectives and criteria for selecting the B category, is represented.

## REFERENCES

- Adams HD et al. (2012) Ecohydrological consequences of drought-and infestation-triggered tree die-off: insights and hypotheses. *Ecohydrology* 5 (2): 145–159.
- Cavin L, Mountford EP, Peterken GF, Jump AS (2013) Extreme drought alters competitive dominance within and between tree species in a mixed forest stand. *Functional Ecology* 27 (6): 1424–1435.
- Pretzsch H, Schütze G (2021) Tree species mixing can increase stand productivity, density and growth efficiency and attenuate the trade-off between density and growth throughout the whole rotation. *Annals of Botany* 128 (6): 767–786.
- Pretzsch H, Steckel M, Heym M et al. (2020) Stand growth and structure of mixed-species and monospecific stands of Scots pine (*Pinus sylvestris* L.) and oak (*Q. robur* L., *Q. petraea* (Matt.) Liebl.) analysed along a productivity gradient through Europe. *European Journal of Forest Research* 139: 349–367.

## ACKNOWLEDGEMENT

The contribution was funded by the Internal Grant Agency MENDELU No. IGA-LDF22TP2-102.

[ldf.mendelu.cz](http://ldf.mendelu.cz)