

## Support for silver fir (*Abies alba* Mill.) in managed forests

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**Historical flashback.** Local names such as “Jedlová, Jedlina, Jedlí, Jedlany”, but also “Jedlá” (see [https://wwwinfo.mfcr.cz/ares/obce/obce\\_abc\\_J.html.cz](https://wwwinfo.mfcr.cz/ares/obce/obce_abc_J.html.cz)) are derived from the Czech genus name “jedle” for silver fir (*Abies alba* Mill.). The number of such names is very small, which corresponds with the very small share of firs in Czech forests. This is also supported by the archive files, dated back to the 12<sup>th</sup> and 13<sup>th</sup> centuries, which report only a few names related to fir (Nožička 1957). Nevertheless, silver fir had been an important component of a woody species mosaic until the support of its regeneration via silvicultural systems of that time ceased (see Dreslerová 2012).

**The issue.** Changes in management and/or air pollution contributed to a species-specific decline, which led to a mere 0.9% share of silver fir in the Czech Republic at the turn of the century (Ministry of Agriculture 2001). Management of the silver fir was rather neglected in the last few decades, which was also attributable to the vulnerability of young firs to frost (Vaněk et al. 2016) or its palatability for cloven-hoofed game (Diaci et al. 2011; Červený 2016; Liška, Šrůtka 2016; Vitasse et al. 2019; van Beeck Calkoen 2022). The silver fir is an ideal component of stand mixtures at suitable sites (Horáček 2016) and belongs among the most universal species capable of functioning as a stand stabilizer (Mauer, Houšková 2016). A limiting factor for renewal success is fencing, which can help establish large patches of regeneration even if only a few parent fir trees are present in the stand (Dobrovolný, Martiník 2016).



Silver fir is a rare species in Central Europe nowadays. Let's learn more about the fir thus helping it cover larger areas of forested land again.

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**Good news and research needs.** The signs of a fir recovery have been observed both in Czechia or abroad since 1990s (Bošela et al. 2014; Dmyterko, Bruchwald 2015). The fir responded positively not only to air pollution reduction but also to the increased temperature in the temperate forest domain (Gazol et al. 2015). Compared to spruce, fir exhibits larger resistance to drought stress (Zang et al. 2015; Gazol, Camarero 2016; Vitali et al. 2017; Dănescu et al. 2018); it can be, therefore, used appropriately in areas of spruce decline (Martiník, Dušek 2015). However, there is a need to pay attention to the biotic pests of silver fir. As the fir share increases in the forested lands of the Czech Republic, one can expect a rising number of pests, of which we have no relevant information except a few records. As for the mutual relationship between the fir and its growing environment, there are still just a few studies dealing with nutrition or litterfall nutrient return. Besides, the published results on the fir foliar nutrients (Dušek et al. 2020) or forest floor of the fir litterfall origin (Třeštík, Podrázský 2017) seemed to differ slightly from Norway spruce. In other words, there is a need to put more pieces in the puzzle as the climate shifts change the growth conditions of the forests, and the species-specific pests feed on them to such an extent that alternative woody species composition proposals are needed.

**Answering some research questions.** Readers will find some answers in this thematic issue of Journal of Forest Science. The authors looked for solutions not only on the species level but also for information on provenances' performance, which would help change the forest management paradigm. The experience with fir in the Moravian Sudetes is presented by Fulín et al. Another project presented by Vejpusťková et al. deals with how the fir coped with drought. Article about the nutrition of fir compared to Norway spruce was written by Novotný and the nutrient return in fir-rowan plantation was the interest of Kacálek et al.

## REFERENCES

- Bošela M., Petras R., Sitková Z., Priwitzer T., Pajtik J., Hlavata H., Sedmák R., Tobin B. (2014): Possible causes of the recent rapid increase in the radial increment of silver fir in the Western Carpathians. *Environmental Pollution*, 184: 211–221.
- Červený M. (2016): Zkušenosti s udržení podílu jedle bělokore při zvyšování druhové pestrosti porostů na revíru Špankov. In: *Jedle bělokora, páteř evropských lesů. Olšina u Horní Plané, Oct 12–13, 2016: 94–109.* (in Czech)
- Dănescu A., Kohnle U., Bauhus J., Sohn J., Albrecht A.T. (2018): Stability of tree increment in relation to episodic drought in uneven structured, mixed stands in southwestern Germany. *Forest Ecology and Management*, 415: 148–159.
- Diaci J., Rozenberger D., Anic I., Mikac S., Saniga M., Kucbel S., Visnjic C., Ballian D. (2011): Structural dynamics and synchronous silver fir decline in mixed old-growth mountain forests in Eastern and Southeastern Europe. *Forestry*, 84: 479–491.
- Dmyterko E., Bruchwald A. (2015): Degree of damage to silver fir stands in the Beskid Niski Mts. *Sylvan*, 159: 893–904.
- Dobrovolný L., Martiník A. (2016): Souhrn některých poznatků k ekologii přirozené obnovy jedle bělokore v podmínkách ŠLP Křtiny. In: *Jedle bělokora, páteř evropských lesů. Olšina u Horní Plané, Oct 12–13, 2016: 121–127.* (in Czech)
- Dreslerová D. (2012): Les v pravěké krajině II. *Archeologické rozhledy*, 64: 199–236. (in Czech)
- Dušek D., Kacálek D., Novák J., Slodičák M. (2020): Obsah živin ve dvou nejmladších ročnících jehlic smrku ztepilého a jedle bělokore původem z přirozené obnovy. *Zprávy lesnického výzkumu*, 65: 146–152. (in Czech)
- Gazol A., Camarero J. (2016): Functional diversity enhances silver fir growth resilience to an extreme drought. *Journal of Ecology*, 104: 1063–1075.
- Gazol A., Camarero J., Gutierrez E., Popa I., Andreu-Hayles L., Motta R., Nola P., Ribas M., Sangüesa-Barreda G., Urbinati C., Carrer M. (2015): Distinct effects of climate warming on populations of silver fir (*Abies alba*) across Europe. *Journal of Biogeography*, 42: 1150–1162.
- Horáček P. (2016): Jedle bělokora (*Abies alba* Mill.) – Vlastnosti dřeva a použití v lesnictví a dřevařství. In: *Jedle bělokora, páteř evropských lesů. Olšina u Horní Plané, Oct 12–13, 2016: 110–114.* (in Czech)
- Liška J., Šrůtka P. (2016): Biotičtí škodliví činitelé jedle bělokore v podmínkách Česka. In: *Jedle bělokora, páteř evropských lesů. Olšina u Horní Plané, Oct 12–13, 2016: 89–93.* (in Czech)
- Martiník A., Dušek D. (2015): Potenciál mladších jedlových porostů (*Abies alba* Mill.) k přirozené obnově pod chřadnoucím smrkem na severní Moravě. *Zprávy lesnického výzkumu*, 60: 267–273. (in Czech)
- Mauer O., Houšková K. (2016): Jedle bělokora jako zpevňující dřevina. In: *Jedle bělokora, páteř evropských lesů. Olšina u Horní Plané, Oct 12–13, 2016: 11–24.*
- Ministry of Agriculture (2001): Zpráva o stavu lesa a lesního hospodářství České republiky k 31. 12. 2001. Prague, Ministry of Agriculture: 104. (in Czech)

- Nožička J. (1957): Přehled vývoje našich lesů. Praha, Státní zemědělské nakladatelství: 459. (in Czech)
- Třeštík M., Podrázský V. (2017): Meliorační funkce jedle bělokoré (*Abies alba* Mill.): Případová studie. Zprávy lesnického výzkumu, 62: 182–188. (in Czech)
- Van Beeck Calkoen S.T.S., Deis M.H., Oeser J., Kuijper D.P.J., Heurich M. (2022): Humans rather than Eurasian lynx (*Lynx lynx*) shape ungulate browsing patterns in a temperate forest. Ecosphere, 13: e3931.
- Vaněk P., Mauer O., Houšková K. (2016): Evaluation of the growth of European beech, Norway spruce and silver fir planted under the stands of European mountain ash. Zprávy lesnického výzkumu, 61: 25–34. (in Czech)
- Vitali V., Büntgen U., Bauhus J. (2017): Silver fir and Douglas fir are more tolerant to extreme droughts than Norway spruce in south-western Germany. Global Change Biology, 23: 5108–5119.
- Vitasse Y., Bottero A., Rebetez M., Conedera M., Augustin S., Brang P., Tinner W. (2019): What is the potential of silver fir to thrive under warmer and drier climate? European Journal of Forest Research, 138: 547–560.
- Zang C., Hartl-Meier C., Dittmar C., Rothe A., Menzel A. (2014): Patterns of drought tolerance in major European temperate forest trees: climatic drivers and levels of variability. Global Change Biology, 20: 3767–3779.