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RESHAPING

The current challenge for Polish foresters is to properly reshape our forests, adapting the species composition to the changing habitat conditions.

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Statistical data on forest management clearly confirm that many years of commercial activity in Polish forests (and in other European countries), including planned or accidental interference in species composition and the spatial configuration of tree stands, has led in some cases to major changes

in forest ecosystems, which these days we consider adverse and undesirable. The greatest example of such decisions made in the past that have led to undesirable consequences, with which we are struggling to this day, is the widespread introduction of artificial tree species, the Scots pine and Norway spruce, as part of replenishment efforts, into habitats that are not appropriate for them (such as habitats typical of fertile deciduous forests). Moreover, this took the form of extensive single-species plantings, or monocultures. Foresters, with their professional knowledge and experience, were well aware of the consequences of this decision, but nevertheless unfortunately acquiesced to the decision-makers and the command-and-control economy, which strove to maximize production

TREE STANDS



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and profits. As a result, the Scots pine significantly increased its dominance in the stands, becoming the undisputed queen of Polish forests (although this is something that probably would have eventually happened anyway).

A genuine contemporary challenge for Polish forests, and thus for forest management, is to find effective and economically acceptable methods of reshaping tree stands in such a way as to adapt their species composition to changing habitat conditions. It should be noted that every species, including trees, has a certain range of tolerance to various ecological factors, and is able to carry out all its life processes only within this range. Reshaping stands is one way to ensure the stability of forests and increase their bi-

ological resistance to adverse environmental factors. Nowadays, with ecology and multifunctional forestry as the foundation of forest management, the productivity of forest stands, although still very important, is no longer a priority.

The Polish Act on Forests imposes an obligation on forest owners to ensure stand “reconstruction.” These days foresters focus more broadly on using natural development processes occurring in stands to manage forests. Numerous scientific publications have proven that natural succession plays an important role in restoring forest plant communities to their natural condition, which can be a decisive factor in the ability of phytocoenoses (and ecosystems in general) to adapt to changing environmental conditions.

Beech plantings
 in a pine stand,
 Tuczno Forest District



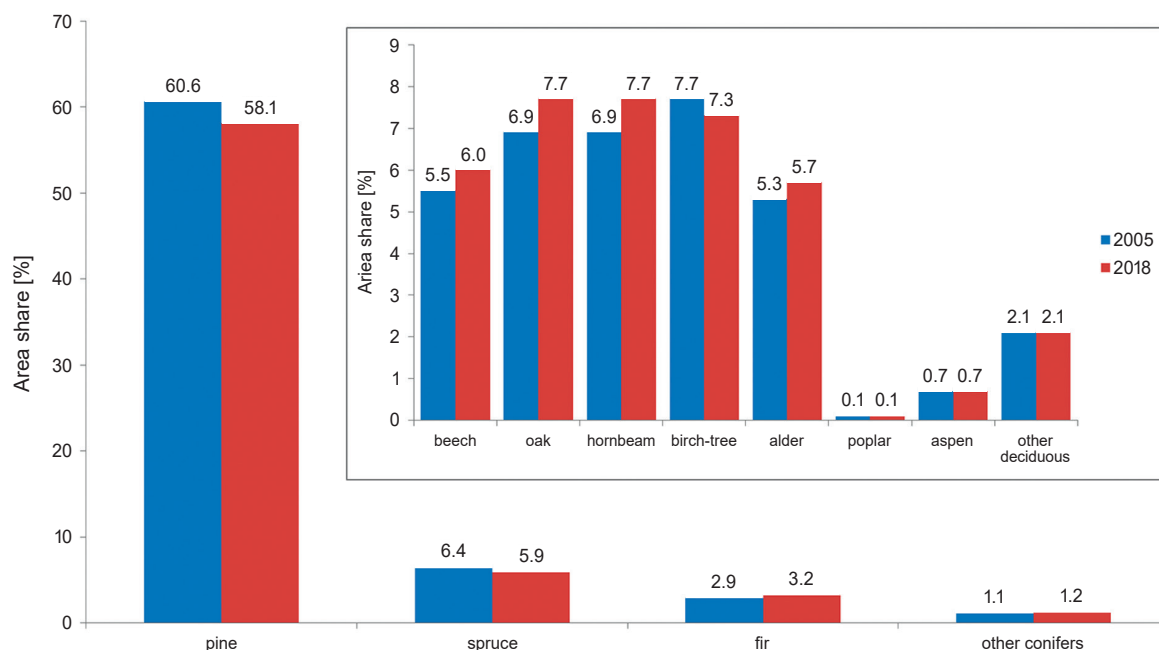
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Statistics show that stand reconstruction in Polish forests is on the rise, and this is in part due to the improved fertility of habitats and better understanding of their production potential.

Reconstructing a stand means altering the current species composition, either completely or partially. Complete reconstruction occurs when the existing stand is completely removed and then replaced by a new stand. For example by cutting down a pine stand growing in an oak-hornbeam forest (fertile deciduous forest) and then planting tree species suitable for fertile deciduous forests, such as oak, linden, hornbeam or maple trees. Partial reconstruction, in turn, only makes certain changes to the current species composition of the stand. For example, in a pine stand growing in a partially fertile habitat, we fell patches (e.g. measuring several hundred m²), and then bring in oak or beech trees, thus creating a pine-oak or pine-beech stand. We have to wait longer for the effects of partial reconstruction than for those of complete reconstruction. Foresters can use a variety of felling or planting measures to manage forests according to the forest management plan (the basic planning document, drafted separately for each forest district every 10 years). These are intentional human activities, but nature itself can initiate and execute the process of reconstructing stands whose species compositions differ from those that would naturally occur there. Such stand reconstruction occurs during natural succession. In Polish forests one can often find pine stands with abundant natural reconstructions of oak, created by jays. Over time, in places where oak trees

had naturally replaced pine, the species composition of the stand will change, significantly reducing the number of pine trees.

Deliberate stand reconstruction takes place in various situations, as laid forth in the “Forest Management Standards” and other documents, including scientific articles. It is necessary when the health and quality of the stand or soil conditions have deteriorated due to improper species composition (e.g. in oak-hornbeam habitats, where falling pine litter strongly acidifies the soil, degrading its physicochemical properties), and when the stands are affected by industrial pollution (emissions), leading to their weakening or death. Stands are also reconstructed in post-hurricane and gradation areas, as well as those significantly damaged by major forest fires. In special cases, stands are reconstructed on post-agricultural land, where stands formed during spontaneous succession (from numerous trees and shrubs abandoned in fields by farmers), or as a result of artificial reconstruction, such as planned afforestation. In such habitats, where forests appear after prolonged agricultural use (in addition to arable land this can also include abandoned meadows or pastures), the biological properties of post-agricultural soil differ significantly from those of forest soil, and the growth conditions for trees are not very favorable. Pathogenic fungi (*Heterobasidion annosum*, or honey fungus) often appear in such places, causing fungal diseases in tree roots, leading to the death of trees and stands. The area of stands growing on former agricultural lands, and thus the potential scale of their reconstruction, can be evidenced by the fact that after



Percentage of tree species prevailing in forests managed by the Polish State Forests National Forest Holding in 2005–2018. Source: original calculations based on 2005–2008 National Forest Inventory data

World War II forests constituted approx. 21% of the country's area, while currently they make up about 30%, which means that a significant proportion of Polish forest stands today grow on former agricultural land and other wasteland.

The effects of stand reconstruction in Poland can be traced through reports of the National Forest Inventory, which shows significant changes over the last several years in the area of land occupied by various tree species in forests managed by the State Forests National Forest Holding. In the years 2005–2018, the percent area of all coniferous species, including the queen of our forests, the Scots pine, has decreased (for pine from 60.6% to 58.1%), while in the case of deciduous tree species, such as beech and oak, this share has significantly increased, largely due to natural stand reconstruction (nature-based), as well as artificial reconstruction (foresters introducing deciduous species, such as oak and beech, in pine monocultures). In the future, the composition and structure of Polish forests will undoubtedly change, in part due to forester activity. The changing global climate conditions also largely influence changes to the species composition of Polish forests, and not just changes in habitats and tree growth conditions. This is also confirmed by studies conducted by scientists from the PAS Institute of Dendrology, who predict that over the next 50 years the main forest-forming species in Poland may lose their optimum climate (not only in Poland but throughout most of Europe), leading to dynamic changes in forest species composition (in the life of trees or stands, 50 years is not very long).

Stand reconstruction, whether resulting from spontaneous processes or planned activity on the part of foresters, will have significant consequences for biodiversity. One just has to imagine how many species of plants, animals or fungi exist which are linked to one host species. If the host dies out, the species dependent on it will also die. Reconstructing the species composition of a stand also fundamentally alters the species composition of the undergrowth plants, insects found in the forest, and mycorrhizal fungi. And so we can conclude: our forests will most likely not be worse off, but they will certainly change, possibly quite fundamentally so.

Stand area during the reconstruction of a partial pine monoculture together with previously introduced patches of deciduous species, Poddębice Forest District



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