

THE ASPEN (*POPULUS TREMULA* L.) FROM THE SOUTHERN CARPATHIANS

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Abstract

Within the Carpathians, the Southern Carpathians are located in the South part and contains the largest number of peaks situated at over 2500 meters altitude. Aspen (*Populus tremula* L.) is a pioneer species with a rapid growth, usually found in the temperate and boreal areas from Eurasia. In our country, the species is present in hill and mountain areas, up to 1600 m in altitude and in mixture forests.

The purpose of this article is to analyze aspen stands from the Southern Carpathians from the point of view of site and growth conditions. In order to achieve this, we have used data from forest management plans realized during 1982 - 2006 for 35 forest districts located in this area. The stand and site characteristics that were analyzed were the following: location, pruning, current growth, production class, structure, slope, exposition, altitude and forest type. The surface occupied by aspen stands in the Southern Carpathians is of 2302 ha, with the majority located in the southeast part. Aspen stands from this area are characterized by a mixt or intimate mixture, low pruning, current growth of 0.4-0.8 m³/year/ha, medium and inferior production classes, and an even-aged, relatively even-aged and relatively uneven-aged structure. They vegetate on fields with a high or very high slope, at average altitudes between 700 and 1100 m, in mountain common beech stands or fir, Norway spruce and common beech mixtures.

Keywords: altitude, aspen, exposition, site conditions, slope

1. INTRODUCTION

The Carpathians are a mountain chain that covers approximately 1.500 km, with half of this surface being present in Romania. These mountains host the most representative forest ecosystem from Europe, numerous endemic plants and animals as well as natural parks and reservations. The main tree species that dominate the Carpathian forests are: common beech (*Fagus sylvatica* L.), Norway spruce (*Picea abies* L.), fir (*Abies alba* Mill.) and *Pinus* species (Bytnerowicz et al., 2002; Vădineanu et al., 2008, Magyari et al., 2012). Some of these stands are very old (Cântar et al., 2019) or are smart forests (Dincă et al., 2019). The Southern Carpathians are located in South Romania and are the highest mountains, having 11 peaks that exceed 2500 m in altitude. The tallest peak (Moldoveanu Peak) is located in Făgăraş Mountains, having an altitude of 2544 m. These mountains are formed on crystalline schist rocks (predominant) and on sedimentary ones at the basis (Kuhleemann et al., 2013; Magori et al., 2017). The climate is levelled, based on altitudes so that the climate is temperate in lower areas and alpine as the altitude increases (Tóth et al., 2015; Necsoiu et al., 2016; Vincze et al., 2017)

Aspen (*Populus tremula* L.) is a pioneer species with a rapid growth and present in temperate and boreal regions from Eurasia (figure 1).

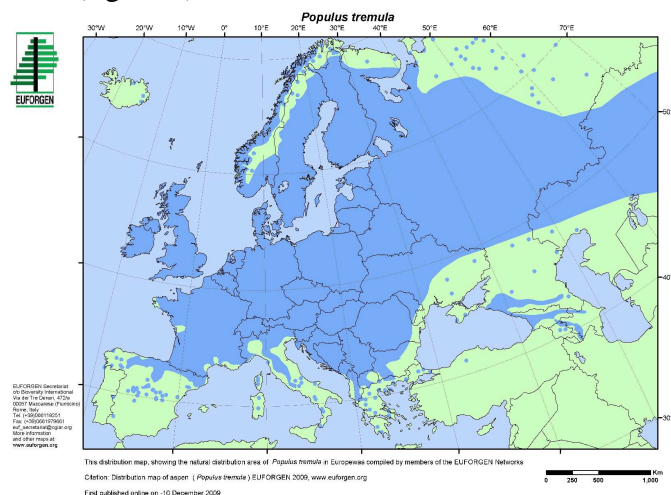


Figure 1. Distribution areal of aspen (<http://www.euforgen.org/species/populus-tremula/>)

The species is present in our country both in the hill area (rarely in the plain one) as well as in the mountain area, up to 1600 m altitudes and in mixture with other species. The aspen can regenerate both vegetatively, by active suckers or through seeds, settling rapidly on fields that lack vegetation. The sucker capacity varies based on the age and site conditions. The species has a high ecologic adaptability, supports well the heath but not drought and it vegetates well on slope fields, on salty soils as well as on soils rich in nutritive substances as well as on poor, oligo basic or acid ones (Suvanto and Latva-Karjanmaa 2005; Şofletea and Curtu 2007; Myking et al., 2011; Caudullo and de Rigo, 2016). Aspen has similar ecological requests with the alder (Blaga et al., 2019), having an important role in the greening of humid fields (Kachova and Dincă, 2015; Constandache et al., 2018; Constandache et al., 2019) or against landslides (Dincă and Achim, 2019).

As such, the purpose of this paper is to analyse aspen stands located in the Southern Carpathians from the point of view of their site and growth conditions.

2. MATERIALS AND METHODS

The material that was used for this article is represented by data from forest management plans for all forest districts located in the Southern Carpathians (35 forest districts) realized during 1982-2006 (older forest management plans were considered as they correspond to a larger forest surface present before retrocession). The total elements of aspen stands are represented by 1244 lines with 53 columns (that represent certain stand or site characteristics). Amongst them, the analysed aspects are referring to: location, mixture, pruning, current growth, production class, structure, slope, exposition, altitude and forest type.

3. RESULTS AND DISCUSSIONS

The spread of aspen stands in the Southern Carpathians: aspen stands are present in all forest districts from this area, with preponderance in Cornet, Polovragi, Brezoi, Valea Cîbinului, Muşăteşti, Bumbuşti, Novaci, Făgăraş, and Arpaş Forest Districts (figure 2). They cover a total surface of 2302 ha, almost a double surface than ash stands from the same area (Dincă et al., 2019).

An increased presence of aspen on the southeast side of the Southern Carpathians can also be observed.

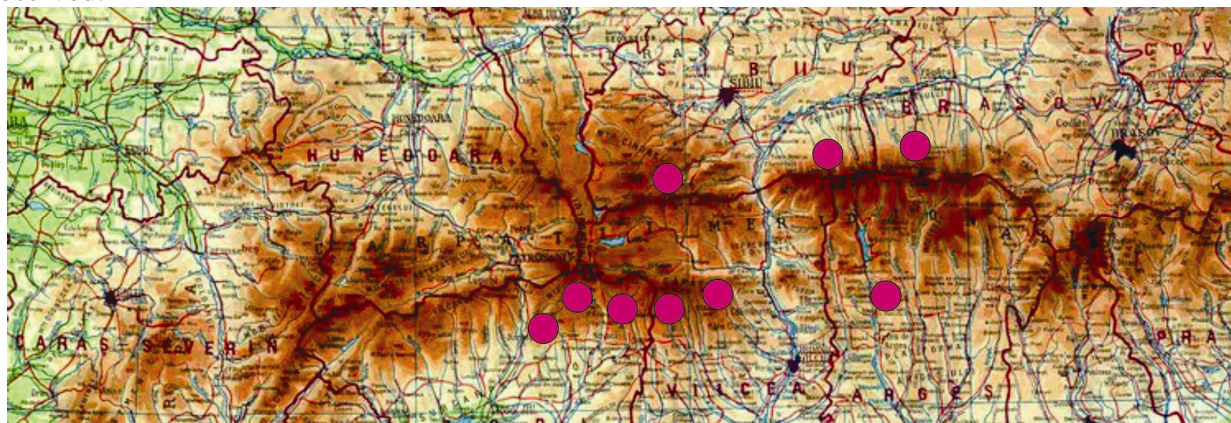


Figure 2. Distribution of aspen stands in the Southern Carpathians

The characteristics of aspen stands from the Southern Carpathians:

The aspen stands have a mixed composition, consisting of the following types of mixture: intimate (1085 ha), in bouquets (1108 ha) and in groups (109 ha).

In Norway aspen is found in intimate mixtures in mixtures with Norway spruce and rather with Scots pine in Scandinavia (Worrell, 1995).

Pruning is the process by which the twigs at the base are removing naturally, thus improving wood quality (Rytter and Jansson, 2009). The majority of aspen trees have a pruning between 0.4 and 0.6 with the exception of very young trees that record lower values (figure 3).

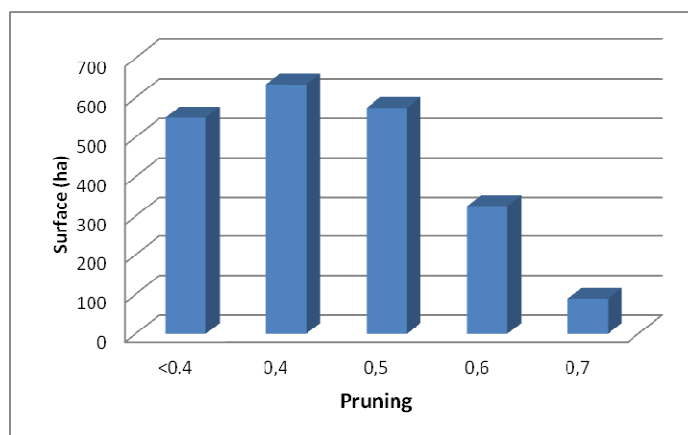


Figure 3. Pruning of aspen trees from the Southern Carpathians

The current growth of aspen strands from this area ranges between 0.1 m³/year/ha and 4.8 m³/year/ha, with the majority of stands recording growths of 0.4-0.8 m³/year/ha (figure 4). Even though it is a pioneer species, aspen does not record significant growths. This aspect is correlated with the fact that the species does not have advanced ages, being usually replaced by main species in the stand's composition.

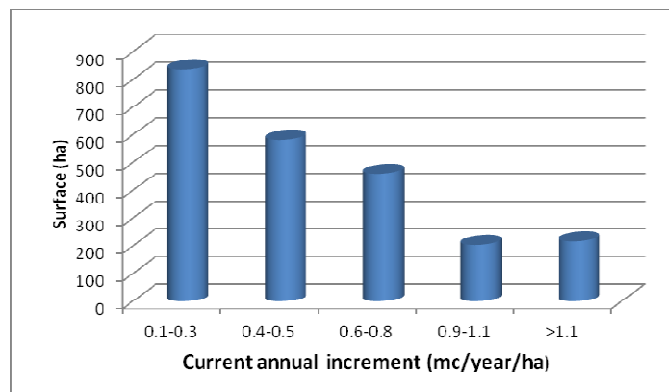


Figure 4. Current growth of aspen stands from the Southern Carpathians

The production class is influenced by the edapho-climatic conditions and represents production capacity of the tree. This category is mainly represented by average (class 3=888 ha) and inferior production classes (class 4=897 ha and class 5=302 ha), while superior production stands occupy only small surfaces (class 1=16 ha and class 2=200 ha) (figure 5).

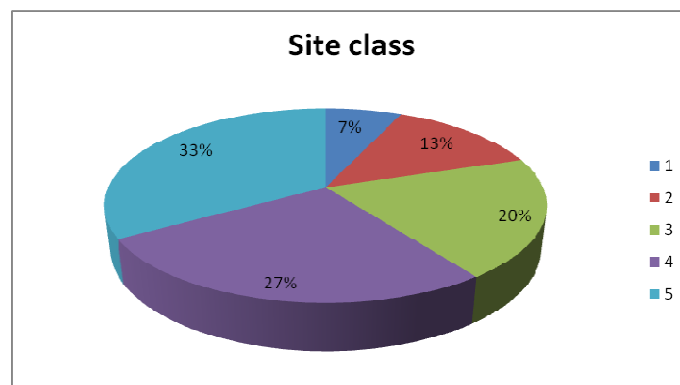


Figure 5. Production class of aspen stands from the Southern Carpathians

The horizontal and vertical distribution of the trees shows the stands structure (Duduman, 2011). In which aspen is integrated is relatively equal between even-aged stands (930 ha), relatively even-aged stands (546 ha) and relatively uneven-aged stands (827 ha) (figure 6).

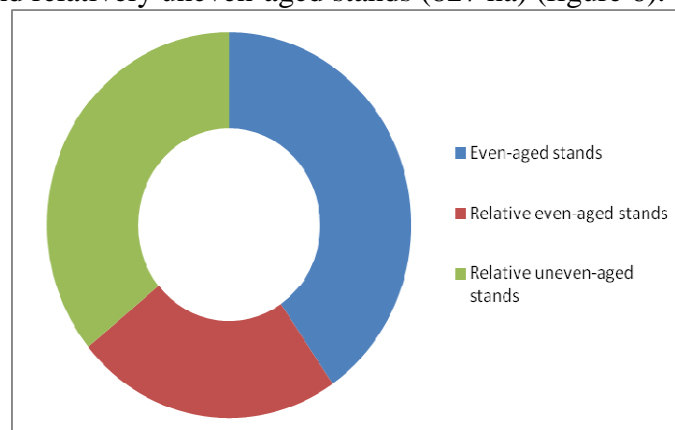


Figure 6. The structure of aspen stands from the Southern Carpathians

Field slope

The aspen is spread out on fields with slopes that range from low 0-20° (394 ha), average 21-30° (458 ha), especially high 31-40° (886 ha) and very high >40°(565 ha) (figure 7).

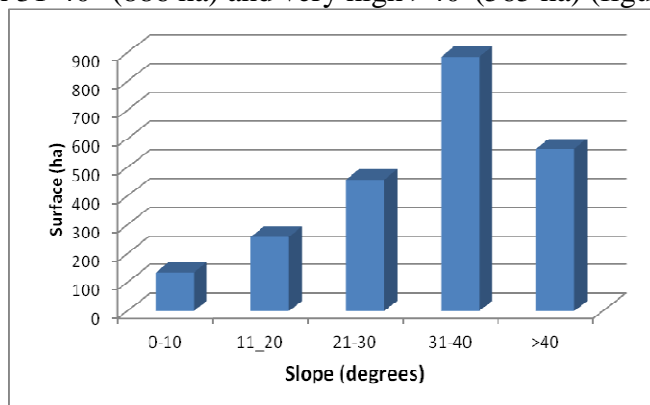


Figure 7. Slopes of aspen stands from the Southern Carpathians

In the case of slope fields with aspen species, the main expositions are SouthEast (445 ha) and NorthEast (368 ha), while the least common are the West (184 ha), North (198 ha) and East ones (199 ha) (figure 8).

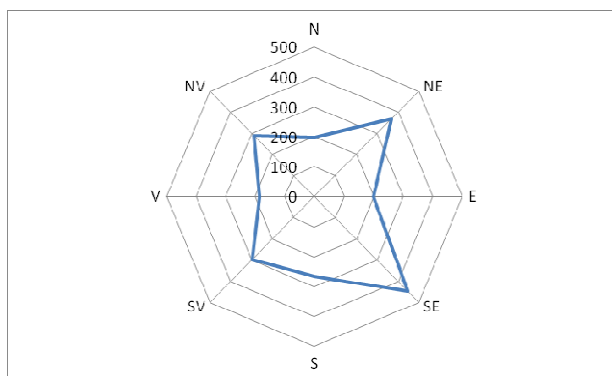


Figure 8. The exposition of aspen stands from the Southern Carpathians

The altitude at which aspen appears in the Southern Carpathians ranges between 270 m at Polovragi and 1550 m at Cornet. The most common altitudes are gathered between 700 and 1100 m (figure 9).

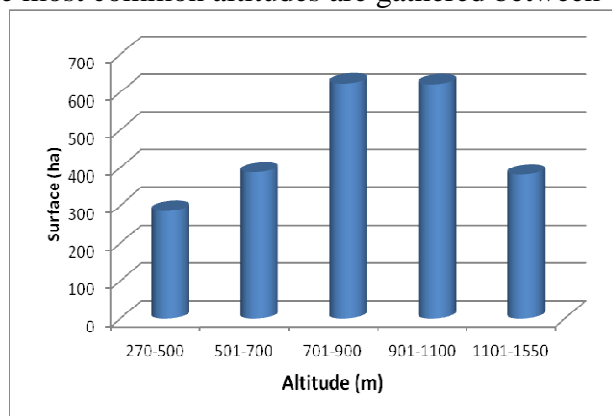


Figure 9. The altitude of aspen stands from the Southern Carpathians

The forest types characteristic for the aspen located in this area are: Mountain common beech stand on skeleton soils with mull flora (476 ha), Mountain common beech with *Luzula luzuloides* (228 ha), Hill common beech on skeleton soils with mull flora (157 ha), and Mixture of fir, Norway spruce and common beech on crystalline cliffs (119 ha).

4. CONCLUSIONS

The characterization of the geomorphology of the studied area was made with the data from forest management plans (mixture, pruning, current growth, production class, structure, slope, exposition, altitude and forest type) for all forest districts located in the Southern Carpathians.

Aspen is one of the species that rapidly installs itself on fields lacking in forest vegetation, having a high ecologic adaptability. Geomorphological conditions such as altitude, terrain slope and exposure do not decisively influence the appearance of these stands.

From the point of view of site conditions, these forests are mainly distributed on South-East and North-East expositions, on fields with high slopes, at altitudes between 700-1100 m, and in common beech forests or mixtures of resinous and broadleaved species.

The majority of stands are situated in average (class 3=888 ha) and inferior production classes (class 4=897 ha and class 5=302 ha). They record an average current growth of 0.4-0.8 m³/an/ha as they don't reach old ages, being replaced by the stand's composition main species.

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