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CONSIDERATION ON THE UPPER FOREST LIMIT IN THE „MUNŢII RODNEI" NATIONAL PARK

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Abstract: In the Rodnei Mountains, human intervention, propelled by the wish to expand the grazing and exploitation area for limiting forests, is reflected at present in the upper limit intensely lowered in comparison with the natural limit, especially in the most accessible areas. The variation in altitude of the superior limit of forests is appreciated at a medium range of 200-300 m, having elevated values on the southern slope where, on several peaks, the superior limit of forests is artificially lowered up to 1,100-1,200 m in altitude.

Key words: anthropic forest upper line, mountain region, protected area

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INTRODUCTION

Situated in the vicinity of the transition area between the forest vegetation and alpine meadows, the limit forest (pre-sub-alpine forest) (Bândiu, Doniţă, 1988) is of a special interest due to its role in ecology. Avoided because its difficult accessibly, the limit forest still has in many places a natural character. In Romanian Carpathians limit forests can be found in all the mountain ranges that exceed 1,500-1,600 m in altitude (Geanana, 1972). They are larger in those mountains that display a developed alpine belt, such as Rodnei, Călimani, Bucegi, Piatra Craiului, Făgăraş, Parâng, Retezat etc.

Literature defines them into two special types of limits for forest vegetation, namely:

- *the natural limit*, where trees are characterized by reduced heights and diameters at all ages. It is considered that the upper limit of the forest is established where the height of the trees is lowered under 8 m (Bândiu, Doniţă, 1988). The natural upper limit of forests in the Romanian Carpathians is generally conditioned by climate and varies according to latitude and altitude, exposure, geo-morphological particularities etc. and

- *the anthropic limit*, affected by man's influence, especially by grazing and wood exploitation, leading to the lowering of the natural limit.

There is also a third category regarding the upper limit of forests – *the potential limit* – but it is much harder to outline and thus, ignored most of the time. The potential limit is the true biological limit (Hapca, 2004) which can only be defined with the help of thorough ecological observations and not by taking into consideration the physiological aspect alone.

STUDY AREA

The "Munţii Rodnei" National Park is a part and parcel of the Rodnei Mountains situated in the north of Romania, approximately in the central part of the Carpathians Chain (47°31'N,

24°45'E) (figure 1). The Park itself at same 1,600 m a.s.l., basically between 700 m and 2,300 m (Pietrosu Peak -2,303), featuring one of the most imposing alpine landscapes in the Romanian Carpathians. The Park displays a multitude of glacial an cryo-nivation traces, glacial lakes –the Iezerul Pietrosului, Iezerul Buhăescului, as well as endo- and exo-karstic forms modeled in crystalline limestone (Bălteanu et al., 2006).

From a total of approximately 32,000 sq km of forest situated in the mountain area of Romania, about 2% lie in Rodnei Mountains and almost 1% in the "Munții Rodnei" National Park. Here, forests represent the main land use category, making up 60% of the park's surface (280 sq km).

Depending on the change in environmental factors, one notices a differentiation in terms of forest layer, as forests are laid in the form of belts and sub-belts. The present delimitations between the belts and sub-belts are not, most of the time, the natural ones, since the anthropic factors greatly influence their elevation and lowering (Coldea, 1990), and have a particular impact regarding the superior limit as well.

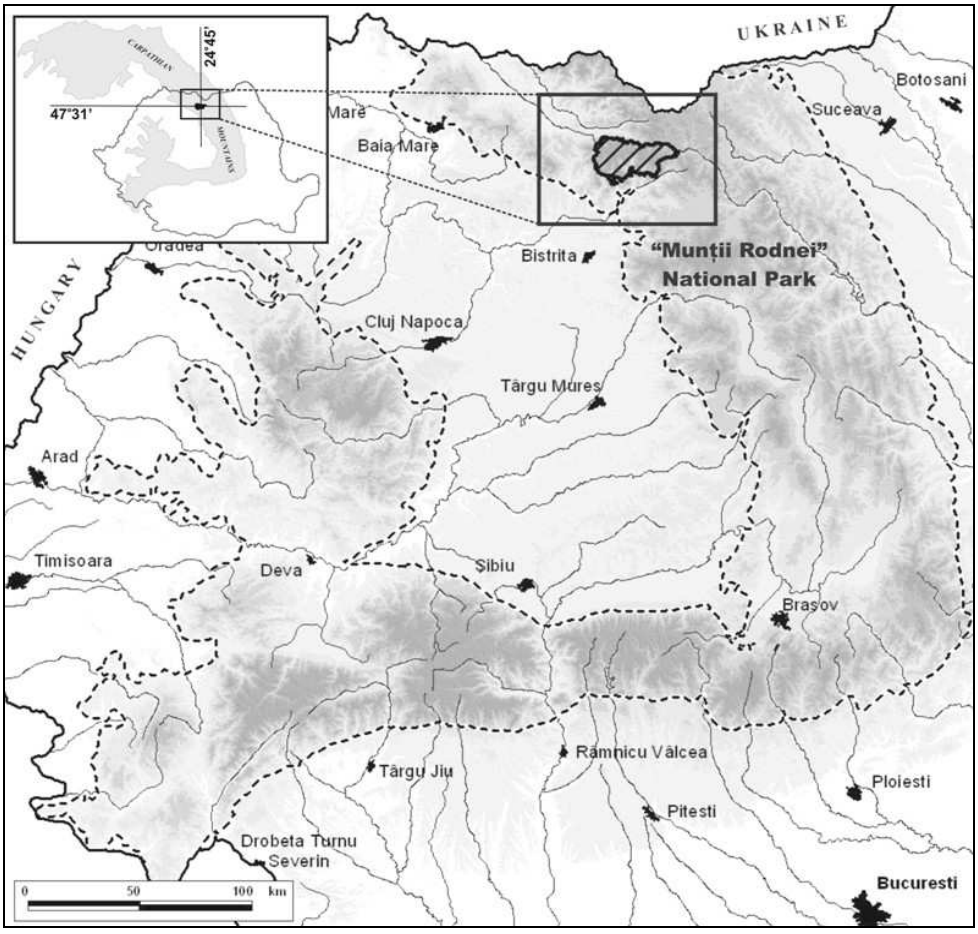

Figure 1. Location of the study area in the Carpathian Mountains

RESULTS

The upper limit of forests in the "Munții Rodnei" National Park

Taking into account the present climatic conditions, the altitude and latitude at which they lie, the conclusion has been reached that in Rodnei Mountains (Geanana, 1972) the natural upper forest limit is situated at 1,800-1,850 m, which is lower on the northern slope by 100-150 m.

In the "Munții Rodnei" National Park the forest species that can be found most often at the upper limit of the forest is the *Picea Abies*. There are situations when the superior limit of the forest is made up of other species as well: the *Fagus sylvatica* (in the south and south-west), the *Sorbus aucuparia*, the *Betula pendula*, and the *Pinus cembra* (in the east).

In most cases, however, the height of limiting trees in Rodnei Mountains exceeds 8-10 m, which gives away the fact that, generally speaking, the present forest is not one to indicate a natural limit.

The forests' upper limit is, mostly, artificially lowered due to the anthropic pressure in the transition area between the forest belt and the sub-alpine belt (figure 2). Here, deforestation activities aiming at the expansion of grazing fields and obtaining wood, conducted mainly throughout the past century, have had a main effect in the destruction of savins and spruce open woods, and in the deforestation of large areas covered in forests. Since spruce forests make up the upper-most belt in Rodnei Mountains, and softwood timber is the main matter destined for the internal and external market, or used in the reinforcing of mining galleries, it is easy to understand the downwards expansion of terrains occupied by sub-alpine and alpine grazing fields following deforestation. Further on, numerous names of settlements found in these areas reflect the activities of grazing and deforestation (Kucsicsa, 2009): nedeie, tomnatic, prelucă, pleș, poiană, arșiță, secătură etc.

The natural limit is usually found where the terrain is not easily accessible, especially on the northern slope of Rodnei Mountains, on the slopes of Hotarului Peak, Curmătura Pietrosului, Piciorul Plescuței Peak, Gaja Mountain etc.

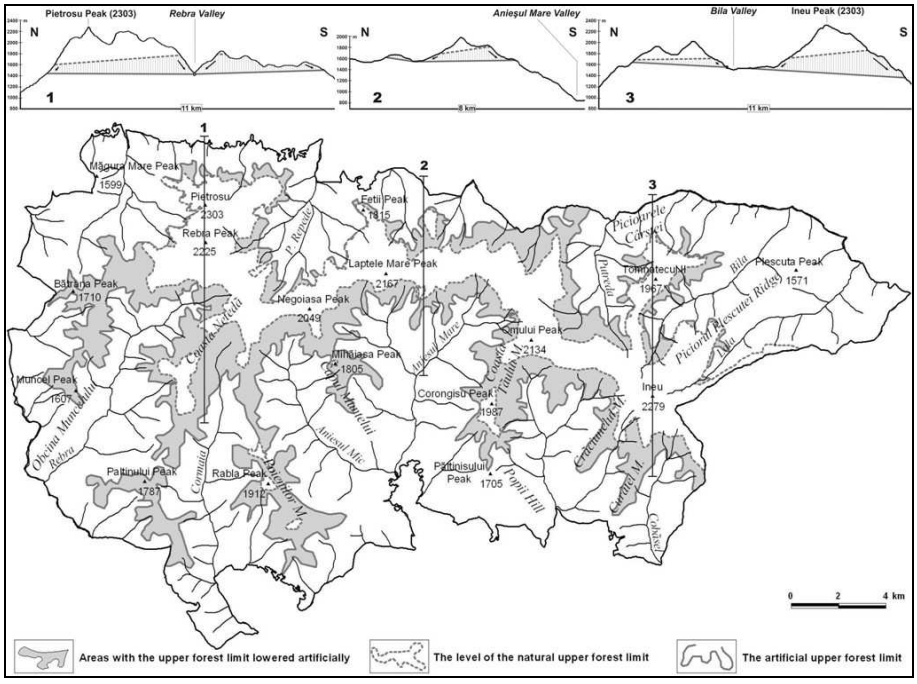

Figure 2. The lowering of the upper forest limit related to the level of the natural upper limit in the "Munții Rodnei" National Park

The variation of the upper forests limit

The present aspect of the forests' upper limit is that of a spread out hand registering great variations in the south and south-west of the park. The upright amplitude is evaluated at 200-300 m. The greatest variations can be found on the slopes located in the south of the park (Coasta

Netedă, Coasta Tăului, Poienilor M., Crăciunelul M., Curățel M.), where the limit is lowered up to 1,100-1,200 m, thus registering a difference of 600-700 m from the natural limit (Kucsicsa, 2009) (figure 3). On the northern slope, notable variations can be found in the hydrographic basins of Repede, Bistricioara, Putreda and Bila.

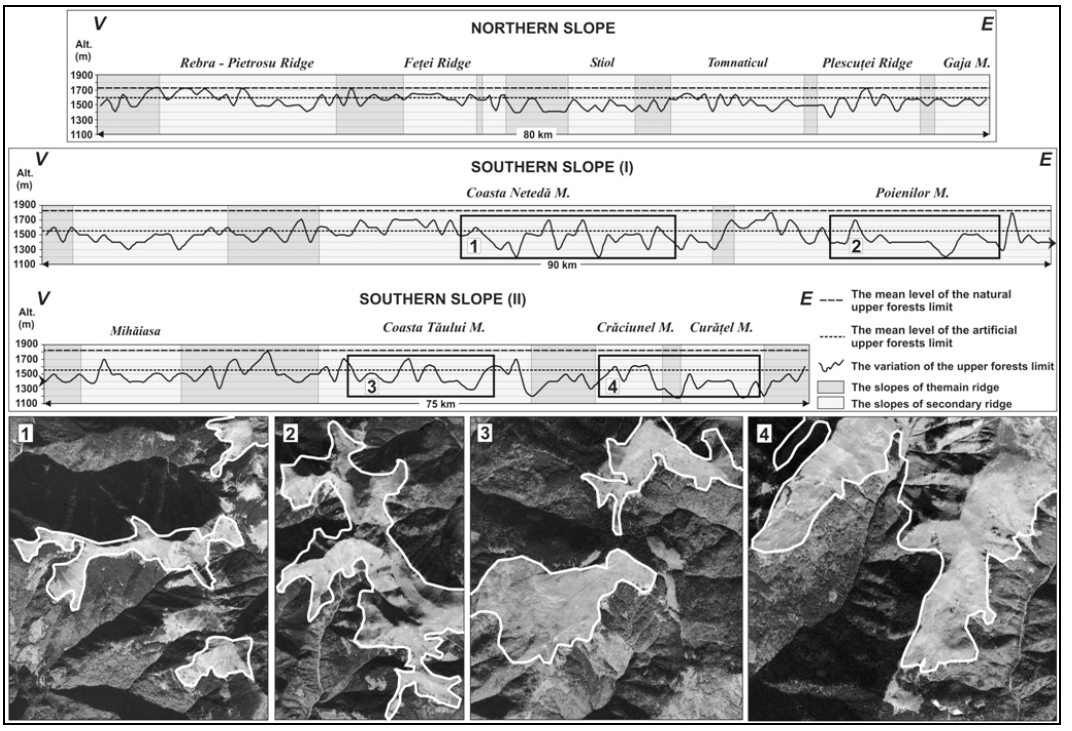

Figure 3. The variation of the forests' upper limit on the slopes of the main ridge and on the slopes of the secondary ridge in "Munții Rodnei" National Park

In relation to the natural upper forest limit, the largest areas affected by deforestation belong to the southern slope (approx. 70%), and are distributed mainly between 1,600 and 1,800 m (35% of them) and 1,400-1,600 m (31% of them) (figure 4). The differences are due not only to the large surface of the slope, but as well to a much larger surface covered in forests as compared to the northern slope and to the slightly more favourable natural factors.

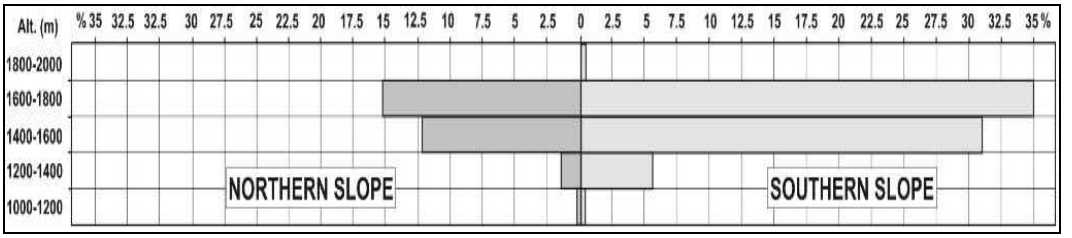

Figure 4. The rate of deforested areas related to the level of the natural upper limit, according to the relief steps in the "Munții Rodnei" National Park

Given the fact that the exploitation of forests and grazing are tightly linked to the terrain's degree of accessibility and to the value of grazing fields, the anthropic pressure on the limiting forests has had a lowered degree of intensity on the northern slope. Here, especially due to more

restricted geomorphological conditions (fragmented relief, large areas with exposed rocks covered in debris, unfavorable exposure), the area of forest exploitation has increased little in altitude, and the grazing activity has been conducted on a reduced scale (Morariu, 1937).

On average, in the "Munții Rodnei" National Park, the present upper forest limit is found at around 1,570 m, with a difference of about 50 m between the two macro-slopes. Thus, on the northern slope the superior limit of the forest is situated at around 1,600 m, and on the southern slope at around 1,550 m, even if the natural upper forest limit is situated 50-100 m higher on the southern slope, compared to the northern one. In correlation with the hypsometry, most limiting forests are situated on the 1,400-1,600 m line (circa 56% of them), followed by the 1,600-1,800 m line (approx. 32%) (figure 5).

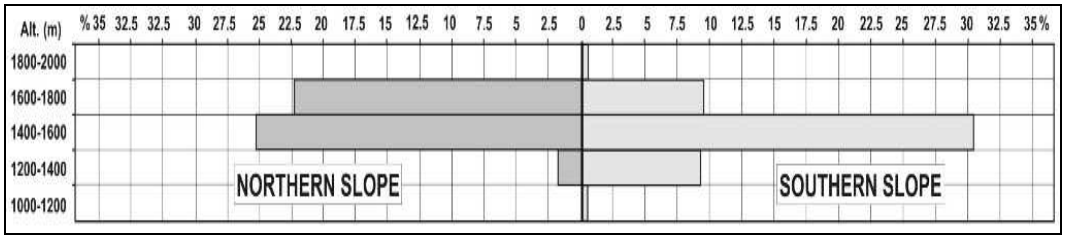

Figure 5. The proportion of the upper forest limit according to relief steps in the "Munții Rodnei" National Park

CONCLUSIONS

The anthropic pressure exerted on the forest vegetation in the "Munții Rodnei" National Park is reflected in fragmented forests in large areas with an upper limit significantly lowered related to its natural one. Notable changes appear especially on the southern mountain slope where, due to the fact that the relief is more accessible and the process of grazing has reached new proportions, deforestation in the transition area between the forest belt and the sub-alpine belt has seen a greater level of intensity than on the northern slope.

In the "Munții Rodnei" National Park, the present upper limit of the forests has a fingered aspect and is situated at approximately 1,570 m, with significant differences at the level of the two macro-slopes.

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