

## NATURAL REGENERATION PROCESSES IN OLD-GROWTH *Pinus peuce* FOREST IN THE NATIONAL PARK "PELISTER" ON MT. BABA

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**Abstract:** It is known that natural regeneration is essential for the sustainability of any forest ecosystem. In most of natural and cultivated forest plantations, where natural factors act harmoniously, regeneration is continuous and without difficulty. But in some cases, the disruption of regeneration process may occur and then silvicultural measures may help restore the stand. A particular challenge for the scientific community when they need to solve specific issues is related to regeneration in particularly significant forests, such as the old-growth *Pinus peuce* forest on Pelister. If we bear in mind that *Pinus peuce* is a Balkan endemic and tertiary relict species, its significance is even greater. This forest is a special symbol of the National Park as it fulfils a number of functions and values of historical, tourist, recreational and scientific character. There are concentrated oldest *Pinus peuce* trees dating back to the time when Grizebah August (August Grisebah) in 1839 first discovered *Pinus peuce* (Gris.) on this site. This species still cherishes the natural environment, but the problems in terms of its natural regeneration are present. Major obstacle appears to be a thick layer of ferns (*Pteridium aquilinum*) and shrubs (*Rubus hirtus*), which stifle the development of *Pinus peuce* regeneration. At some places in the forest, successive natural processes lead to the establishment of fir and beech offspring in the old *Pinus peuce* forest. These species are more successful in competition against undesirable ground vegetation than *Pinus peuce* due to their ability to tolerate shade. If managers do not take measures, it is evident that these forests will gradually be populated with fir and beech, which in the long run will change the forest structure and composition. In this way, old *Pinus peuce* forest can lose its authenticity, characteristics and significance. Therefore, the purpose of this paper is to identify the methods by which, in the optimal and the most natural way, it will be possible to restore the natural regeneration to preserve old *Pinus peuce* forest in its natural environment and to ensure its sustainability in the long term.

**Keywords:** Macedonian pine, natural regeneration, old-growth forest.

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## 1. INTRODUCTION

*Pinus peuce* (Gris.) or Macedonian pine of Mt. Baba massif in Macedonia, locality Begova Češma, was first discovered by the German botanist August Griseb (August Griseb) in 1939. Griseb visited Mt. Baba near Bitola and found a new species of five-needle pine, which had not been discovered on the Balkan Peninsula (Fu k a r e k, P., 1969). Since then, the interest in Macedonian pine (*Pinus peuce* Gris.) in Macedonia has been great and it has intrigued many researchers and scientists who studied and described these forests. Several of its sites were determined in Macedonia: in the watershed of the Šarska Bistrica, mountain massif Rudoka-Šar Planina (K o š a n i n, N., 1912; E m, H., 1963), the western slopes of Korab (E m, H., 1963), on Kožuv (K o š a n i n, N., 1925; R a d u l o v i ć, S., 1936) and Nidže (A n d o n o v s k i, A., 1959). With the discovery of the *Pinus peuce* on Pelister, the interest in this kind of five-needle pines spread to other parts of the Balkan Peninsula. So it was discovered on other sites in Montenegro, Albania, Bulgaria, Greece, and Serbia on Rugovsko-Metohiske Mountains and on the northern slopes of Šar Planina. Given the above, it can be concluded that *Pinus peuce* is widespread on many locations of the Balkan Peninsula, but they are not related. This species meets a variety of climate-vegetation areas, mostly on silicate geological substrate, but in certain places it is found on carbonate bedrock.

*Pinus peuce* (Gris.) is a tertiary relict and Balkan endemic species, which has a limited areal distribution. Therefore, it has been incorporated into the Red Book of Endangered Species, International Organization for Conservation of Nature (IUCN) since 1998.

The largest complex of *Pinus peuce* forests in Macedonia is located on the northern slopes of Mt. Baba and covers an area of about 1700 ha. The largest peak is named Pelister with the altitude of 2601 m. The ground on which *Pinus peuce* forests grow, characterized by a late development stage, is often intersected with numerous waterways. The geological substrate is silicate, built mostly of gneisses and granite. On many places, it is notable that parent rocks emerge to the surface, forming the so-called "stone fields" or "stone rivers", resulting from disintegration of parent rock. In submontane, and partly in the mountain belt, the most prevalent are acid brown forest soils. More humid parts of the mountain belt are the places where mixed forests of *Pinus peuce* and silver fir occur on illimerised soils, while in the subalpine forest belt, *Pinus peuce* forests occur on brown humus-silicate soils.

In the area of the National Park "Pelister", *Pinus peuce* builds pure stands and mixed stands with silver fir. In the submontane belt area, between 800 and 1500 m, the *Pinus peuce* forest forms ass. *Myrtillo-Pinetum peucis* Em (1962), syn. *Gentiano luteae-Pinetum peuces* with a notably large presence of *Vaccinium myrtillus*. In the parts of *Pinus peuce* forest, where it is mixed with fir, it forms subass. *Pteridio-Pinetum peucis abietoum* Em (1962).

Pelister *Pinus peuce* forests are generally spread at the altitude of 1100 - 2200 meters. Recently the expansion of its range has been noticed in the valleys on previously unforested areas at 900 m and it also ranges higher, reaching the altitudes above 2200 m with single trees up to 2400m. On Metohijske Prokletije, *Pinus peuce* builds a pure forest belt in the highest vegetational region up to 2000 m, while single trees reach 2200 m (J a n k o v i ć, M., 1960). If we take into account the fact that in Macedonia there are eight cli-

mate-vegetation-soil areas (Filipovski, *et al.*, 1996) and that *Pinus peuce* on Pelister is prevalent in four of them: cold continental region (900-1100 m), submontane continental-mountain area (1100-1300 m), montane continental-mountainous area (1300-1650 m), and subalpine mountainous area (1650-2250 m), this fact clearly indicates that *Pinus peuce* is a species of high environmental adaptability.

The most important part of the *Pinus peuce* forest is situated on the location Begova Češma, and it is known as the Old *Pinus peuce* Forest. The ground herbaceous vegetation has a significant share of ferns (*Pteridium aquilinum*) and shrubs (*Rubus hirtus*). The shrub layer, which is poorly developed, includes common hazel (*Corylus avellana*), wild roses (*Rosa* sp.), and blue juniper (*Juniperus communis*). Almost in all layers there is a noticeable penetration of fir (*Abies alba*), and somewhat less of beech (*Fagus moesiaca*).

The old *Pinus peuce* forest established as a park also today represents a significant landmark and a symbol because of which the park has a special value. However, certain natural processes, primarily the regeneration of the old *Pinus peuce* forest, are not favourable for *Pinus peuce*. Many parts, especially those exposed to direct solar radiation, are occupied by ferns (*Pteridium aquilinum*) and shrubs (*Rubus hirtus*). They pose a problem for natural regeneration of *Pinus peuce* seedlings. Besides, it has already been observed that ingrowth of fir and beech is taking place in the old-growth *Pinus peuce* forest. These successive natural processes lead to the substitution of the old *Pinus peuce* forest with a mixed forest with fir and beech, and in such a mixture, due to its shade-intolerance, *Pinus peuce* can be extinguished from the site. This would be a loss of natural, but also cultural, historic, scientific, aesthetic, recreational and tourist value. Therefore, this problem presents a challenge to the ways and methods to restore and preserve the old *Pinus peuce* forest in its original form.

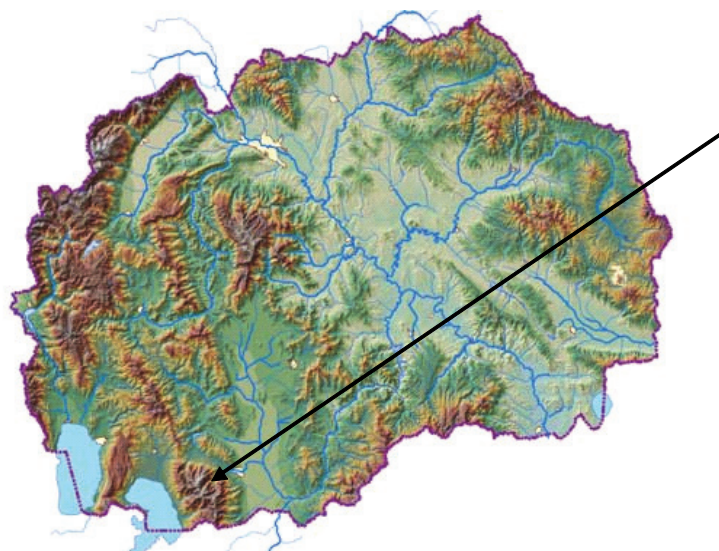
## 2. STUDY SITE AND METHOD

The object of scientific research in this paper was *Pinus peuce* old forest site "Begova Češma" in the National Park "Pelister" - Bitola. We were interested particularly in the regeneration processes occurring in it. The site is located in the southwestern part of the Republic of Macedonia at an altitude of 1120 to 1735 meters. It covers an area of 105.89 ha.

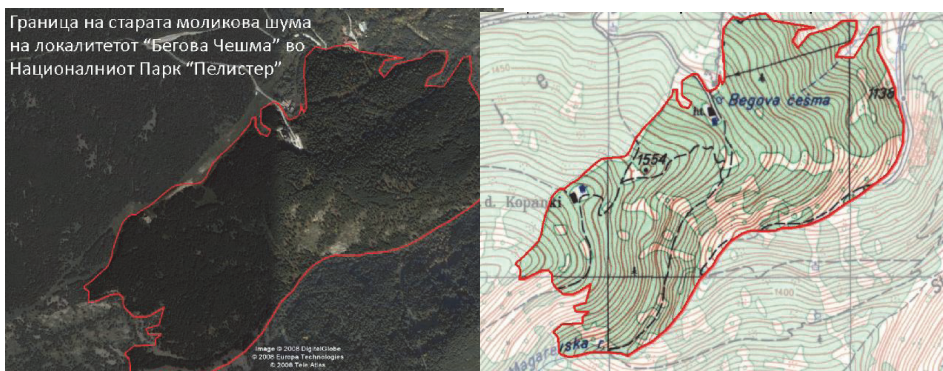
In this area, there are optimal conditions for the development of *Pinus peuce* forests on the slopes of Pelister, i.e. between 1200 and 1500 m (Em, H. *et al.*, 1969). The study site falls into three climate-vegetation-soil areas in the country, including: submontane continental-mountainous area (1100-1300 m), montane continental-mountain area (1300-1650 m), and a small part in subalpine mountainous area (1650-2250 m). Bedrock is silicate, and soil type is sandy loam with a mixture of partly mineralized humus. As for morphological features, the upper layer of the soil is composed of rough forest litter which consists of intact needles and small twigs. Surface horizons are rich in clay, and gravel in deeper horizons. The average annual air temperature ranges from 8.1° C in the area from 1100-1300 m, 6.4° C in the area between 1300-1650 m, to 4.1° C in area between 1650-2250 m. The amount of rainfall ranges from 1000 mm in the lower parts at 1200 m, to 1200 mm in the higher parts around 1735 m.

The study data and material were collected directly from field surveys and observations of regeneration processes, based on which the conclusions are drawn and methods and models are proposed for possible natural recovery of the old old-growth *Pinus peuce* forest without compromising its authenticity and structure.

For determining the inventory elements of the old-growth *Pinus peuce* forest, four sample plots of  $50 \times 40 \text{ m} = 0.20 \text{ ha}$  were set. Data on the number of stems per unit area, dbh, height, age, etc., were collected. These data were further processed and reduced per unit area and the results are presented in the chapter Results. It is a common methodology used for gathering the sample plot data. In the test area, the diameters at breast height were measured of all trees, and the heights were determined by the average diameters of trees for each sample plot, and the mean height was calculated according to Lorey's mean height formula. The age was determined using the so-called Presser's borer, growing stock using volume tables by Schwappach, and current volume increment according to the method of median.



**Figure 1.** Location of the old *Pinus peuce* forest



**Figure 2.** Borders of the old *Pinus peuce* forest at "Begova Češma"

### 3. RESULTS AND DISCUSSION

Regeneration process in a forest begins with seed formation and seed fall to the ground. *Pinus peuce* on Pelister is a species that begins fructification quite early. According to Grisebach, A. (1841), Müller, K. (1929), Penov, A. (1966), it begins with fructification at the age from 10 to 15, and after Nikolovski, T. (1969) it happens much earlier, as early as 6-year-old solitary trees which develop outside forests. The early fructification of *Pinus peuce* trees cannot be treated as biological weakness, as it is the case in other species, but as its normal biological peculiarity, as a mark of its great competitive character. This phenomenon shows that *Pinus peuce* makes such adjustments to its generative regeneration, which is not manifested by other species. Perhaps it is this very characteristic and peculiarity, with high seed production almost every year, that makes *Pinus peuce* on Pelister a very expansive and even aggressive species in terms of winning new areas (Nikolovski, T., 1969).

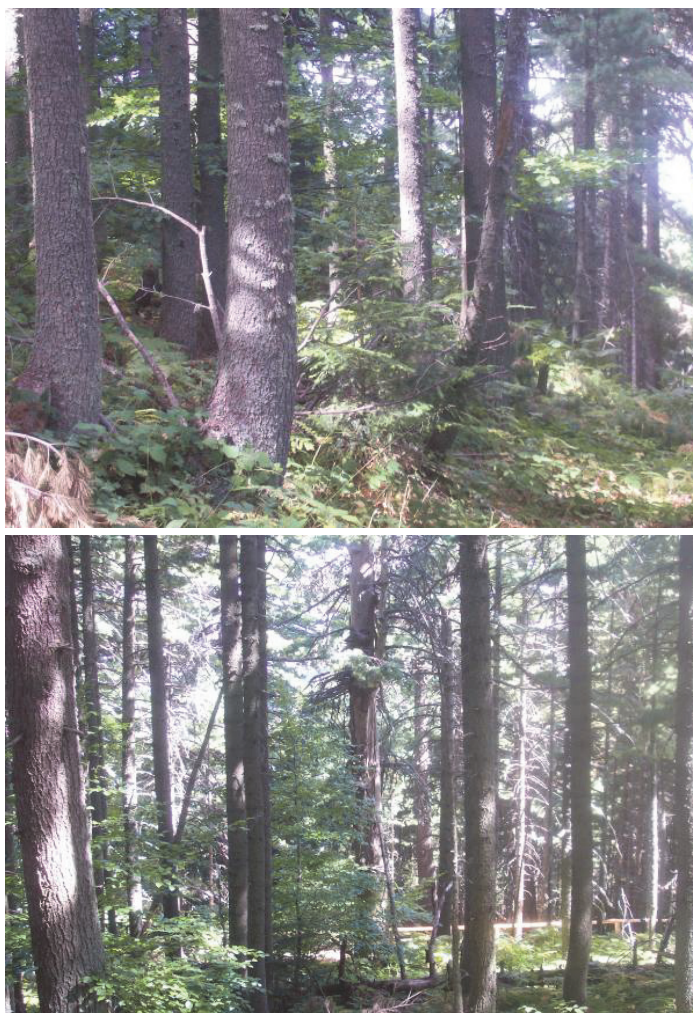
The seeds of Macedonian pine (*Pinus peuce* Gris.) belong to a group of forest seeds, which have a long period of dormancy. Before the appearance of seedlings, the seeds can survive 1 to 1.5 years. The reason for this is the hard seed casing filled with resinous substances, which is an obstacle to the uptake of water and other substances that are necessary for seed germination (Gorjeva, M. et al., 1969).

Therefore, due to full seed production almost every-year by a large number of quality trees and the seeds supplied with well-developed wings, which facilitate the distribution over long distances, there are always enough seeds in the soil for quality natural regeneration. However, regeneration processes in *Pinus peuce* do not occur with the same intensity and success throughout its range. Regeneration related processes in *Pinus peuce* forests on the slopes of Pelister differ in three visible ways. In the first process, *Pinus peuce*, as a strong pioneer species, conquers new areas such as abandoned pastures, and even stony areas such as “stone rivers” or “stone fields”. This is especially evident in the montane and submontane belts between 900 and 1600 m above sea level.

The second characteristic of regeneration process takes place in the subalpine zone of 1600 to 2200 m above sea level, and individual trees appear even above it. In this belt, *Pinus peuce* conquers unforested depressions and mountain communities of low shrubs which are present in the subalpine belt and higher. This process is particularly important for extending the upper limit of forest vegetation, because it takes place in the conditions of a short growing season, weak and poor soils and the impact of harsh climatic conditions.

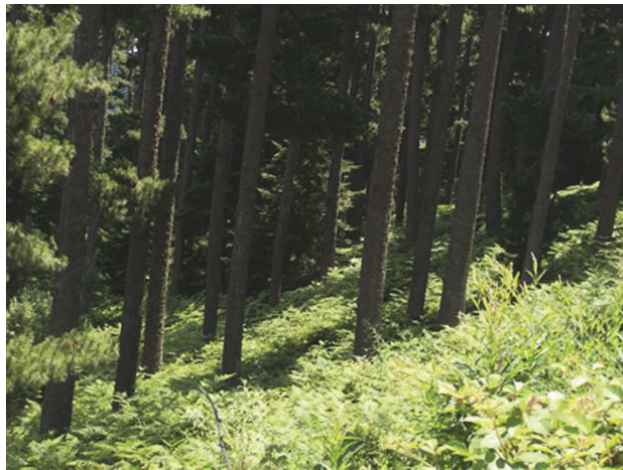
The third characteristic of regeneration process occurs in submontane and montane belts (1100 to 1650 m) in the areas where the oldest *Pinus peuce* forests are widespread. In these parts, there is a noticeably hindered *Pinus peuce* regeneration and a penetration of some shade-tolerant species. These are primarily silver fir (*Abies alba* Mill.) and beech (*Fagus moesiaca* Chezz.). They invade the place in *Pinus peuce* old forests to the extent that poses a danger to the existence of primeval *Pinus peuce* forests, because the process leads to the conversion of a pure *Pinus peuce* forest into a mixed *Pinus peuce*-fir-beech forest, and later on, in such mixture, *Pinus peuce* can be absolutely extinguished.

That is a problem that presents a danger to the existence of the old-growth *Pinus peuce* forest in its indigenous ambience.



**Figures 3 and 4.** Colonization of fir and beech individuals in the old *Pinus peuce* forest

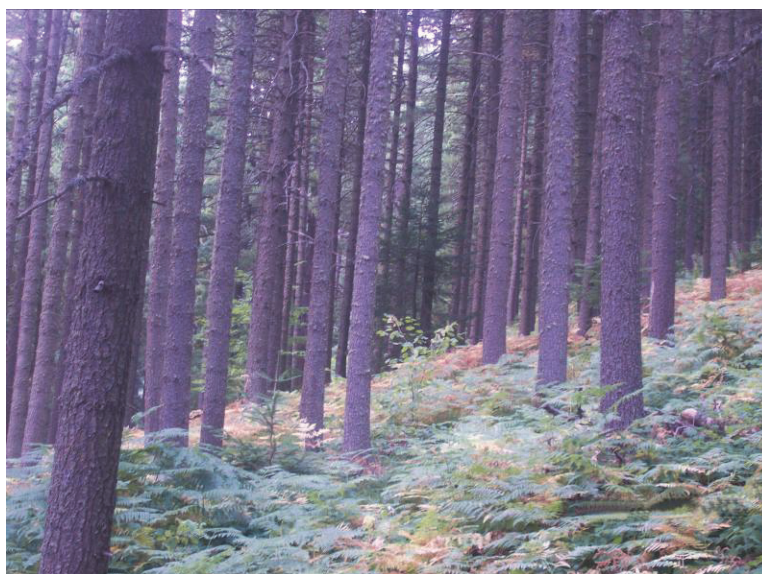
As an aggravating factor in the process of natural recovery of *Pinus peuce* old forest, as it was indicated, there is a lush cover of ferns (*Pteridium aquilinum*) and shrubs (*Rubus hirtus*). Every year in June, ferns reach up to 2 m in height, which due to its density and size does not allow the penetration of sunlight to the soil, which is further below occupied by bountiful presence of blackberries. They dominate the area from May to October, during the time when vegetation activity is the greatest. In such conditions, the seeds of *Pinus peuce* which fall to the ground have unusually difficult conditions for germination. The seeds that germinate and develop into seedlings usually get overtopped and suppressed to death by ferns and bushes. In such natural conditions better adapted silver fir and beech are more resistant as shade-tolerant species, so they increase their participation in the *Pinus peuce* old forest.



**Figures 5 and 6.** Ground vegetation with ferns and shrubs

In terms of sustainability of forest communities in the original form, if adequate silvicultural measures are left out, we can say that the regeneration of *Pinus peuce* trees in the old-growth forest is endangered.

The intense competition between *Pinus peuce* and ferns, blackberries, and fir and beech regeneration, can change the structure of the old-growth *Pinus peuce* forest in the future and convert it into a mixed forest of fir and *Pinus peuce*. If forest managers do not take certain silvicultural measures, the process of natural succession in this forest will result in the conversion of pure *Pinus peuce* into mixed *Pinus peuce*-fir forest. According to Acevski, J., Simovski, B. (2009), natural succession and syndynamic processes that occur in the old *Pinus peuce* forest over a period of time (without anthropogenic influence) will develop towards the substitution of *Pinus peuce* with fir, and subsequently fir will create a community with beech.



**Figure 7.** A part of the old *Pinus peuce* forest without *Pinus peuce* regeneration

The emergence of a large share of ferns and shrubs in some parts of the old *Pinus peuce* forest contributes to an irregular arrangement of trees, which is created due to a lack of appropriate silvicultural measures, which led to large strongly illuminated parts inside the forest that was therefore easily conquered and inhabited by ferns and shrubs. Thus they took up the space of *Pinus peuce* natural regeneration and due to their high density and sizes, they are the main obstacle to the emergence of *Pinus peuce* natural regeneration. In order to determine the current structural characteristics of the old *Pinus peuce* forest, basic inventory measurements were performed in four sample plots of 50x40 m. The data obtained are presented in Table 1.

**Table 1.** Basic data on the study stand

|      | Average age | N/ha | Ds (cm) | Hs (m) | V (m <sup>3</sup> /ha) | Iv (m <sup>3</sup> /ha) |
|------|-------------|------|---------|--------|------------------------|-------------------------|
| PP-1 | 151         | 237  | 47.5    | 25.0   | 490.6                  | 1.9                     |
| PP-2 | 153         | 245  | 46.1    | 23.1   | 443.5                  | 1.8                     |
| PP-3 | 162         | 195  | 51.0    | 27.5   | 508.9                  | 1.4                     |
| PP-4 | 170         | 163  | 55.5    | 28.5   | 531.4                  | 1.2                     |

As it can be seen from the data presented in Table 1, the average age of the old Macedonian pine stands ranges from 151 to 170 years. Number of trees per unit area varies from 163 to 245 per ha, mean diameter from 46.1 to 55.5 cm, mean height from 23.1 to 28.5 m, volume from 443.5 to 535.1 m<sup>3</sup>/ha, and volume increment from 1.2 to 1.9 m<sup>3</sup>/ha.

A characteristic of the old Macedonian pine forest is a relatively small number of trees per unit area. This is a consequence of a number of trees cut in the period before 1948, i.e. before the declaration of the area for the National Park, which has disturbed the spatial distribution of trees and created large lighted openings which were occupied by

ferns and blackberries. In these conditions, it can be said that Macedonian pine trees (*Pinus peuce* Gris.) are characterized by good growth in height and diameter, as they achieve high values of the average diameter and height. Besides that, they also have high productivity, which is more than 500 m<sup>3</sup>/ha. In a number of trees, diameter at breast height is above 70 cm and tree height is above 30 m. Current volume increment is low, which is normal for a mature forest of great age such as the old *Pinus peuce* forest, because it reached the culmination of volume increment long ago.

Macedonian pine trees are full-boled and clean and free from branches up to 1/3 of tree height. However, on a number of trees above the age of 60 years, there are decay processes on the bottom log (Figure 8).

Good quality and production characteristics of *Pinus peuce* decrease rapidly at an altitude of 1500 m and above. With the change in environmental conditions, primarily soil, light and temperature, the trees are smaller in height, the stems are branched and distorted and tapered. In the ecological conditions that are characteristic of the altitudes above 1500 m, and in particular above 1800 m to 2200 m, the *Pinus peuce* forest gets the character of a subalpine forest community. However, its establishment at these habitats indicates that this is a species with a successful adaptation to tougher high-mountain conditions.

In terms of productivity, *Pinus peuce* on Pelister is a highly productive species. Thus, according to P a r i š k o, Ž. (1969), the volume in the mountain belt at the average age of 90 years was 405 m<sup>3</sup>/ha, and in the subalpine belt 191 m<sup>3</sup>/ha. In the *Pinus peuce* forest at the age of 80 years, in the reserve "Jažinačko Jezero" on Šar Planina at the altitude of 1700 m in the most homogeneous part of the stand, T o m a n i ć, L. *et al.* (1998) found the stand volume of 715 m<sup>3</sup>/ha, mean stand diameter 35.7 cm and height 20.8 m. In the mixed *Pinus peuce*, *Pinus heldreichii* and *Pinus nigra* forest on Šar Planina, O s t o j i ć, D., K r s t i ć, M. (1998) found that, at the age of 80 years, the dominant *Pinus peuce* trees reached the diameter of 31 cm and the height of 22 m.

The processes such as forest renewal and the decline of the old forest stands are normal natural processes that take place continually. But they do not always go towards the preservation of significant values of forest stands, such as the old *Pinus peuce* forest on Pelister. Nowadays, the modern society has progressively more needs for such preserved old-growth forests with endemic and relict character, and also with significant cultural, historical, tourist, recreational and scientific values. Therefore, it can be said that they are invaluable, and we should not allow the natural successional processes and the changes in the stand structure which do not contribute to the survival of the old *Pinus peuce* forest, and by which the old *Pinus peuce* forest, as one of the symbols of the National Park Pelister, can be lost.

For this reason, silvicultural measures are needed that will ensure the natural regeneration of forests and thus retain its authenticity and sustainability. This can be achieved by:

1. Support and stimulation of natural regeneration of *Pinus peuce* in places where it is already taking place.
2. Measures to stimulate the appearance of *Pinus peuce* seedlings and its future tending, through protection from the competition of ferns and blackberries.



**Figure 8.** Decay processes on old *Pinus peuce* trees

3. An artificial establishment by planting *Pinus peuce* seedlings or seed sowing on previously prepared and controlled sites.

4. The combination of a number of ways depending on the specific site conditions.

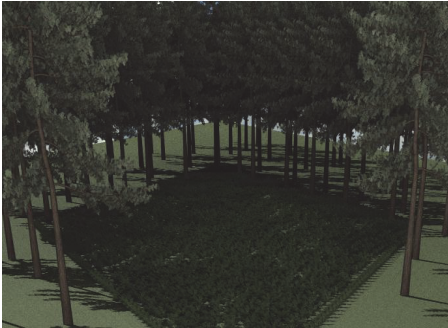
Despite the difficult process of natural regeneration of the old *Pinus peuce* forest, in some small areas there are occurrences of natural regeneration. The forest can survive if it is supported by the removal of the competing vegetation, so that it can develop freely and reach the dimensions that are able to struggle independently and develop without restraint.

If the removal of ferns and blackberries is done regularly in the controlled and lighted areas, the seedlings can emerge from the seeds of the existing mature stands, or from the seeds that were dispersed on the site.

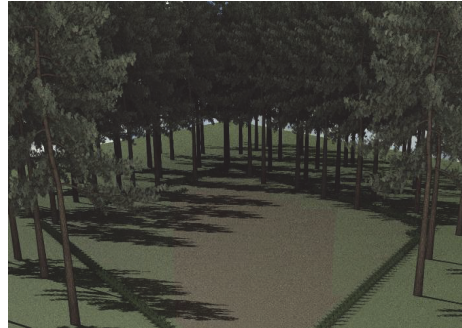
Artificial planting of *Pinus peuce* seedlings obtained from the seeds of the parent gene pool or by seed sowing on previously prepared and controlled grounds is a measure that gives good results, especially in areas where forests are not capable of natural regeneration. For this reason, it is necessary to establish the square or circular sample plots of the sizes equal to the average tree height. The plots should be prepared, i.e. cleaned and then planted with seedlings aged 2+1. Planting density should be high initially, optimally 1x1 m, considering that in this way the seedlings will be able to contend with competitive weed vegetation.

The combined method can give very good results in the conditions of proper application which corresponds to the specific site conditions. In this way, maximal natural potentials for forest regeneration can be used by encouraging the existing natural regeneration on the one hand, and, on the other hand, by artificial methods, by planting the seedlings in controlled conditions on the previously prepared plots.

The method of site preparation on regeneration gaps for direct planting of *Pinus peuce* seedlings is shown in Figures 9, 10, 11 and 12.



**Figure 9.** Unprepared site for regeneration



**Figure 10.** A site prepared for regeneration, free of ferns and blackberries



**Figure 11.** Planted and cultivated *Pinus peuce* seedlings



**Figure 12.** Regeneration gap after 10 years

Maintenance of high initial density, especially in the first years, although it is very important and necessary, will not be sufficient for a successful natural regeneration. It is particularly important not to allow the ferns and blackberries to reach the heights greater than *Pinus peuce* seedlings because the new growth could be overtopped and suppressed. Multiple cleaning of weed vegetation over many years will result in the successful renewal of old-growth *Pinus peuce* forests. The treatments should be repeated until *Pinus peuce* trees attain the heights greater than those achieved by ferns and blackberries.

Regardless of the method of supporting the natural regeneration of the old *Pinus peuce* forest, the multiannual cultivation of seedlings is required, since fern and blackberry emergence is a risk to seedlings despite cleaning methods each year. The tending should continue after the successful regeneration, i.e. measures should be taken for sufficient light in the seedling stage, cleaning in the sapling stage, and thinning. With a consistent and continuous implementation of measures under the expanding gap system, regeneration gaps are created and initial openings are expanded, and thus a long but controlled process can successfully restore the old *Pinus peuce* forest without disturbing its authenticity and structure.

## 4. CONCLUSIONS

The following conclusions can be drawn based on the study results:

As Macedonian pine grows successfully at different altitudes from 800 to 2400 meters, it can be said that it is a species of a large range of altitudinal distribution.

In the *Pinus peuce* forest on Pelister there are three characteristic renewal processes, of which the regeneration of the old *Pinus peuce* forests at the location Begova Češma develops in the negative direction.

The main reason of hindering the natural process of regeneration is dense ground vegetation of ferns and blackberries. It is characterized by high density and height above 2 meters which suppresses the *Pinus peuce* seedlings.

In the old *Pinus peuce* forest, fir and beech have greater possibilities of natural regeneration. Their penetration and natural succession could violate the structure and the authenticity of the *Pinus peuce* forest and, in the longer term, Macedonian pine could be extinguished.

Nowadays, the modern society has progressively more needs for such preserved old-growth forests with endemic and relict character, and also with significant cultural, historical, tourist, recreational and scientific values.

Great significance of the old *Pinus peuce* forest results from its endemic and relict character as it fulfils a number of functions and values of historical, tourist, recreational and scientific character. Therefore it is necessary to apply measures that can ensure its sustainability and authenticity.

To achieve good-quality and continuous regeneration of the old *Pinus peuce* forest, it is necessary to take measures to facilitate the creation of *Pinus peuce* regeneration gaps:

- Measures to stimulate the appearance of *Pinus peuce* seedlings and its future tending, through protection from the competition of ferns and blackberries;
- An artificial establishment by planting *Pinus peuce* seedlings or seed sowing on previously prepared and controlled sites;
- The combination of a number of ways depending on the specific site conditions.

Regeneration gaps should be managed until *Pinus peuce* seedlings are able to struggle independently with the competing ground vegetation, such as ferns and blackberries.

The old *Pinus peuce* forest on the slopes of mountain Pelister has multiple significance both for the National Park "Pelister" Bitola, and for the preservation of biodiversity of vegetation on the Balkan Peninsula and wider. Therefore all the necessary measures should be taken to help the process of its renewal and preservation.

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## ПРОЦЕСИ ПРИРОДНОГ ОБНАВЉАЊА СТАРЕ ШУМЕ МОЛИКЕ У НАЦИОНАЛНОМ ПАРКУ „ПЕЛИСТЕР” НА БАБА ПЛАНИНИ

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### Резиме

Природно обнављање је од суштинског значаја за одрживост сваког шумског екосистема. У већини природних и гајених шумских засада, где природни фактори делују складно, процес обнављања је континуиран и без тешкоћа. Међутим, у неким случајевима, може доћи до поремећаја процеса регенерације и у том случају узгојне мере могу да помогну обнови састојине. Посебан изазов за научну јавност је када треба да се решавају одређена конкретна питања која се односе на проблеме обнављања у посебно значајним шумама, као што је стара шума молике на Пелистеру. Ако се има у виду да је *Pinus peuce* врста која је балкански ендемит и терцијарни реликт, њен значај је утолико већи. Ова шума представља посебан симбол Националног парка Пелитер будући да испуњава бројне функције и вредности које имају историјски, туристички, рекреативни и научни карактер. Поред тога овде се налазе и сконцентрисана најстарија стабла молике која датирају још из времена када је Гризебах Август (August Griseb.) 1839. открио *Pinus peuce* (Gris.) на овом локалитету. Ова врста и даље одржава изворни природни амбијент међутим присутни су проблеми у погледу њеног природног обнављања. Главна препрека за то је густ слој приземне вегетације, састављене углавном од папрати (*Pteridium aquilinum*) и купине (*Rubus hirtus*), који гуше развој природног подмлатка молике. На неким местима у шуми јављају се и природни сукцесивни процеси који доводе до појаве подмлатка јеле и букве у старој шуми молике. Ове врсте су успешније у конкуренцији са нежељеном приземном вегетацијом него молика због њихове способности да подносе засену. Ако се не предузму одређене мере очигледно је да ће ове шуме постепено бити насељене јелом и буквом, што ће на дужи рок променити структуру и састав шума. На овај начин, стара моликова шума може изгубити своју аутентичност, карактеристике и значај. Из тог разлога циљ овог рада је да се идентификују методе којима је, на најприроднији и оптималан начин, могуће да се обнови природно подмлађивање молике и очува стара шума *Pinus peuce* у свом природном амбијенту и да би се дугорочно обезбеди њена одрживост.