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Research on the condition of the stands in Production Unit II Bâltane, Strehaia Forestry District, Mehedinţi Forestry Directorate

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Abstract
The paper *"Studies on the condition of the forest stands in Production Unit II Bâltane, Strehaia Forest District, Mehedinți Forestry Directorate*" analyzes the current state of forest stands in southwestern Romania, considering the local pedological, climatic, and geomorphological conditions. The research employed parcel descriptions, site mapping, and pedological analyses (29 soil profiles), processed using the AS2007 software. Results indicate the predominance of typical and vertic luvisols (86%), characteristic of oak (Quercus) formations, as well as approximately 10% of low-productivity stands requiring ecological reconstruction. The study highlights the multifunctional role of forests, their contribution to biodiversity conservation (particularly within the ROSCI0405 Strehaia–Bâltanele Natura 2000 Site), and the importance of applying sustainable forest management principles to balance the productive and ecological functions of forest ecosystems.

Keywords: forest stands, U.P. II Bâltane, *Quercus cerris*, forest soils, luvisols, forest management plan, biodiversity, sustainable management.

Introduction

The forest management plan designates the Production or Protection Unit (U.P.) as the territorial foundation for sustainable forest resource planning, delineated on both ecological and administrative bases. The regulation of production processes aims to preserve the ecological and economic functions of the forest through the implementation of silvicultural measures down to the stand level. Within this framework, the species *Quercus cerris* (Turkey oak), native and well adapted to thermophilic and xerophytic conditions, stands out for its natural regeneration capacity, rapid growth rate, and longevity. Commonly found in the lowland and hilly regions of Romania, these traits make it a key component in analyzing forest ecosystem structure and functionality.

Production Unit II Bâltane, managed by the Strehaia Forest District under the Mehedinți Forest Directorate, comprises forests and forest lands owned by the Romanian state and registered within the national forest fund. It spans the administrative territories of the communes Breznița-Motru, Dumbrava, Greci, Tâmna, Voloiac, and the town of Strehaia. Geographically, it lies within the northern Bălăcița

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Piedmont and the Coșuștea Hills of the Motru Piedmont to the south. From a phytoclimatic perspective, the forests belong to the hilly oak and mixed deciduous forest zone (FD2), with dominant species including sessile oak, Turkey oak, and Hungarian oak.

The total area of the unit covers 2,906.56 hectares, divided into 27 forest compartments, the largest being Buriceana (866.43 ha), Lunca Banului (386.70 ha), and Valea Cârna (547.88 ha). Within U.P. II Bâltane lies the protected natural area ROSCI0405 Strehaia–Bâltanele Hills (589.24 ha), an integral part of the Natura 2000 ecological network. Territorial boundaries are clearly defined by natural features (rivers, valleys, hills) and artificial demarcations (roads, railways). Accessibility is ensured by proximity to the Strehaia CFR railway station and county roads DE70, DJ606A, and DJ561A.

Geologically, the territory of U.P. II Bâltane is characterized by Pliocene sedimentary formations composed of clays affected by percolation processes, leading to the development of the Bt horizon typical of preluvosols. In areas where parent materials are low in basic minerals, eluviation–illuviation processes result in luvisols with an El horizon depleted in clay and sesquioxides. These soils support forest vegetation typical of the hilly zone, including Turkey oak, Hungarian oak, sessile oak, beech, and mixed oak stands. In regions with Quaternary fluvial deposits, soils support species such as pedunculate oak, ash, poplar, and willow.

Morphologically, the unit is in the northern part of the Bălăcița Piedmont, on Cândești-type hills and knolls formed on weakly consolidated or monocline lacustrine deposits. The terrain is fragmented, with elevations ranging from 130 m to 330 m (average 230 m), and slopes exhibit varied inclinations and multiple exposures. These features influence microclimatic conditions, soil formation processes, and vegetation distribution. Stagnic luvisols dominate the plateaus, while regosols and erodosols occur on slopes, and alluvial soils develop in floodplains and alluvial cones. Sunny exposures enhance evaporation and erosion, affecting tree morphology and stand productivity.

Hydrologically, the forests are located within the Motru River basin and intersected by a dense network of valleys and streams (e.g., Balta Brezniței Valley, Rocșorenilor Valley, Greci Valley), with numerous tributaries. Although the territory is highly fragmented, slopes are generally gentle. During summer, reduced water flow lowers the risk of degradation; however, both surface and deep erosion are common in runoff-prone areas. To maintain hydrological balance and forest multifunctionality, measures such as road maintenance, valley clearing, and the avoidance of concentrated logging are essential.

Climatically, the forests of Production Unit II Bâltane fall within the continental district (II), specifically the region of medium and high forested hills (II.B.p.6), according to the climatic zoning in the *Geographical Monograph of the R.P.R.* Based on the Köppen classification, the area belongs to the D.f.b.x. province, characterized by a temperate continental climate with dry influences.

The thermal regime is moderate, with an average annual temperature of approximately 10 °C and a thermal amplitude of 24.4 °C. The bioactive period lasts around 300–325 days, with cumulative effective temperatures exceeding 4000 °C, favoring oak species development. Late spring frosts, which occur frequently, may damage the seedlings and flowers of sensitive species such as sessile oak, Turkey oak, and Hungarian oak, particularly in years with minimal snow cover.

Precipitation levels are moderate, averaging approximately 661 mm annually, with rainfall relatively evenly distributed and peaking between May and September. Estimated annual evapotranspiration reaches 667 mm, indicating a seasonal water deficit, especially during summer. Snowfall contributes to soil protection and the safeguarding of young plantations, with an average snow cover duration exceeding 40 days. In recent years, fluctuations in precipitation have adversely affected vegetation, particularly sessile oak, though recent trends indicate partial recovery.

The wind regime is dominated by currents from the west, northwest, and northeast, with moderate frequency and low speeds (below 4 Beaufort), posing no significant threat to vegetation. Data are sourced from the Turnu Severin meteorological station and used as reference due to the absence of direct measurements within the area.

Maintaining the phytosanitary condition of forest stands is essential to sustaining the multifunctional roles of the forest and ensuring its economic, ecological, and social viability. Forest ecosystems host a wide array of pathogenic microorganisms and harmful insects whose activity can significantly impair tree vitality and disrupt ecological balance. Defoliators are the primary biotic agents of damage, facilitating the spread of other pathogens and diminishing the forest's capacity to fulfill its protective and productive functions.

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Control of these agents is achieved through preventive measures (vegetation monitoring, proper silvicultural practices, preservation of natural stand structure, and site improvement), quarantine protocols (phytosanitary inspection, isolation, and targeted treatments), and direct intervention (physical–chemical, chemical, or biological methods). The use of organochlorine insecticides is discouraged in favor of biodegradable formulations and growth inhibitors. Biological control methods include the introduction of entomophagous fauna, specific parasites and predators, and the use of entomopathogenic viruses.

In this context, integrated pest management plays a pivotal role by combining conventional control techniques with silvicultural strategies designed to enhance the natural resistance mechanisms of forest stands. These interventions must be applied continuously, from regeneration through to harvest.

Northern red oak exhibits resistance to powdery mildew (*Microsphaera alphitodes* Griff.), beetles, and defoliating caterpillars. However, under conditions of drought and intense solar radiation, cryptogamic diseases with aurigo-like symptoms may develop, leading to partial or complete dieback. The species tolerates atmospheric pollutants but is susceptible to damage from rodents and cervids.

Local soil formation is influenced by climate, topography, and parent materials (loess deposits, sandy clays, alluvium), resulting in a diverse array of genetic soil types. Within U.P. II Bâltane, luvisols predominate (86%), with typical luvisols (44%) and typical preluvosols (20%) being the most widespread. Protisol types (14%) are mainly represented by mollic-vertic alluvial soils, developed in low-lying areas and interior floodplains.

Material and Method

Data collection and processing were carried out in accordance with current technical standards, through compartment-level descriptions and detailed site mapping focused on analyzing site conditions, soils, and forest stands. Site type was determined based on topography, lithological substrate, soil characteristics, climate, and flora, while the fundamental natural forest type was identified using silvicultural classification, specifying its current status.

Mensurational elements were established through measurements in sample plots distributed representatively across the unit. Soil characterization was conducted using 29 primary profiles (one profile per 100.22 ha), strategically located to highlight relationships among soil, substrate, relief, and vegetation. In addition, control soundings were performed in each management unit. Five profiles underwent physical and chemical analyses at the I.N.C.D.S. Brașov laboratory, supplemented by data from the previous forest management cycle.

Information was encoded alphanumerically in compartmental records, and management plans and inventories (excluding afforestation plans) were digitally developed using AS2007 software. The unit volume for stands designated for regeneration was determined through complete inventories and sampling, while for those marked for harvesting, official data provided by the forest district were used.

The forest fund is managed under tailored regimes: high forest for oak and beech stands, conventional high forest for Euro-American poplars, and coppice for black locust and native poplars. Target composition aims to preserve native species in accordance with forest type, site conditions, and assigned functions. Harvestability and silvicultural treatments are adjusted according to stand structure, while the production cycle is defined by the age of economic maturity.

The current structure of the forest fund reflects changes resulting from land restitution, with the area of U.P. II Bâltane reduced from 2,985.50 ha to 2,906.56 ha. Previous management, implemented according to the forest plan, guided stand development in the intended direction, although results fell short of projections, primarily due to the reduction in total area.

Red oak (*Quercus rubra*), with its broad distribution range, thrives under diverse climatic conditions—from tropical influences in the south to harsh continental climates in the north and west. It shows high frost tolerance, and its late vegetative onset protects it from spring frosts; however, it remains vulnerable to early autumn frosts, which may affect trunk formation. Its resistance to low temperatures increases with age.

Quercus rubra demonstrates greater edaphic adaptability than native oak species, growing successfully on acidic sandy soils with minimal clay content as well as on heavy clay-loam or compact clay soils, behaving similarly to Turkey oak and Hungarian oak. It performs best in fertile, moist alluvial soils with a sandy-loam texture but does not tolerate excessive moisture, severe drought, or prolonged flooding.

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Across its wide range, variability in pedoclimatic conditions has led to the formation of distinct ecotypes and local varieties.

It is a large tree, typically reaching 25–30 m in height and 80–100 cm in diameter, with a straight trunk and a low, well-branched crown. The bark remains smooth until around 40 years of age, after which it develops deep fissures. The species exhibits moderate tolerance to lateral shading but is sensitive to vertical shading. Its root system is strong and oblique, and it retains sprouting capacity even at an advanced age.

Growth is rapid: in nurseries, seedlings reach about 50 cm in the first year; in forest stands, they may exceed 6 m by age 10 and 20 m by age 20. Under favorable conditions, at 60 years *Q. rubra* can produce a timber volume equivalent to that of sessile oak at 140 years, making it a highly productive species. While some authors report a sharp decline in growth beyond this age, others indicate that its high productivity potential may persist up to 70 years.

The wood has a reddish-brown heartwood, coarse texture, and is hard, durable, and easy to process. Although inferior to sessile and pedunculate oak, it is notable for its exceptional tensile strength, comparable to that of black locust. It is valued in carpentry, construction, interior design, and for railway ties due to its impregnation capacity. It is unsuitable for alcohol barrels but can be used for oily liquids. The bark contains low levels of tannin and is therefore not suitable for use in the tanning industry.

Results and Discussion

The socio-economic objectives established for the forests of Production Unit II Bâltane reflect a dual functional approach: maximizing timber production for multiple uses while simultaneously conserving the forest ecosystem. The silvicultural strategies outlined in the management plan aim to balance these objectives through practices that preserve ecological interdependencies and mitigate the adverse effects of human activity. A key indicator of treatment effectiveness is the capacity to maintain the structural and functional continuity of forest stands.

The forest fund is qualitatively affected by the presence of 292.98 hectares (10%) of low-productivity stands with inadequate species composition, of which 176.21 hectares consist of artificially established formations with inferior yield. In addition, 116.73 hectares (4%) of naturally occurring low-productivity stands still utilize the site's ecological potential.

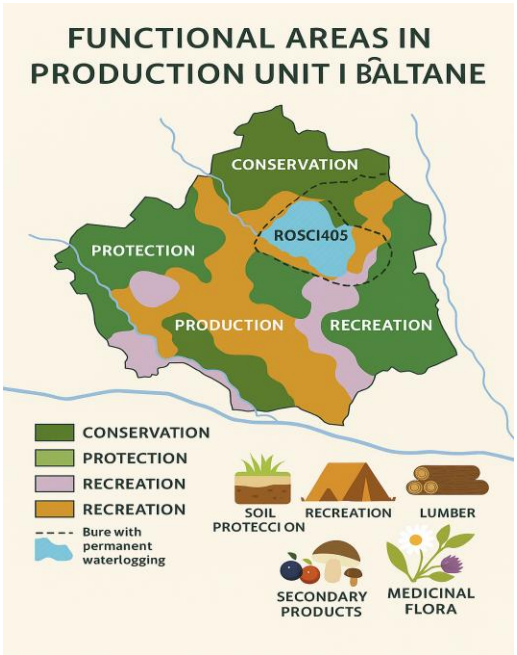

Figure 1. Functional area in Production Unit II Bâltane

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Beyond timber production, the forest provides a wide range of ecosystem services and secondary products. Management at the forest unit level encompasses soil protection functions (in areas with permanent waterlogging), recreational functions (landscape enhancement near the Craiova–Drobeta Turnu Severin Road), scientific functions (seedling production and the conservation of genetic resources and habitats within the ROSCI0405 site), and wood-based production (lumber, pulp, and materials for rural construction).

To support this multifunctional approach, the thematic map developed for Production Unit II Bâltane illustrates the spatial distribution of the main functional zones—timber production, ecological protection, recreation, and genetic conservation—as well as the delineation of the ROSCI0405 protected site and areas with permanent waterlogging. This cartographic representation enhances understanding of the territorial relationships between the forest's ecological and economic functions, facilitating an integrated assessment of its management potential (Figure 1).

The game resources are represented by primary species (roe deer, wild boar) and secondary species (hare, pheasant, partridge), alongside small carnivores such as fox, jackal, weasel, and marten. Management measures include anti-poaching actions, protection of refuge zones, access regulation, and the provision of supplemental feeding.

Forest reproductive material is ensured through 114.64 hectares of stands designated as seed reserves for sessile oak, Hungarian oak, Turkey oak, and black locust. The pedoclimatic conditions are favorable for the harvesting of wild fruits (rose hips, sloe, blackberry, hawthorn) and edible mushrooms (*Boletus edulis*, chanterelle, parasol mushroom), although yields have been negatively affected by drought and improper harvesting practices. The medicinal flora includes species such as chamomile, black locust flowers, and nettle, which hold potential for use in phytotherapy and related industries.

Conclusions

In addition to its protective and timber production functions, the forest provides a valuable range of secondary resources—fruits, mushrooms, medicinal, and melliferous plants—with potential for sustainable use through methods adapted to community needs. Moreover, the game reserve is well represented within the analyzed perimeter, contributing to the functional diversity of the forest ecosystem.

When properly managed, the forest functions as a complex system capable of generating multiple ecological, economic, and social benefits. Through the implementation of a comprehensive set of precautionary and guiding measures—from planting to regeneration—the goal is to maintain stand health, strengthen resistance to destabilizing factors (wind, pollution, diseases, pests, wildlife, snow), increase productivity, optimize regeneration conditions, and ensure the efficient use of timber resources.

Under the previous management plan, the estimated yield of secondary products was 650 m³ per year (578 m³ per year from thinning and 72 m³ per year from cleaning operations). The current estimate indicates a 7% increase, reaching 693 m³ per year, attributed to the regrouping of stands by age class and the fulfillment of conditions necessary for applying specific silvicultural interventions, including in stands previously subjected to sanitary cuttings. It is recommended to intensify site analyses and improve data collection accuracy.

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