

# The Contribution of Forests from Counties Located in Romania's West Plain to The Area's Long Lasting Development

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## Abstract

The present paper reunites in an objective synthesis data from forest management plans realized in the West Plain during 1995-2008. The study focused on stands situated around cities and in their construction perimeter in order to emphasise their contribution to the area's long lasting development. The paper's importance derives from the fact that urban areas are in a continuous development that will incorporate heavily nearby forests. As such, through their functions, forests contribute to the long lasting development of the entire metropolitan area to which they belong. All forests from the West Plain were divided in stand elements (species of a certain age that belong to a forest's composition). The study has taken into account all stand elements from the area that belongs to the forest category from around cities. The large number of these stand elements (2107) offers a solid base for the different realized analyses. The paper's results show that from the entire surface of *forests with recreation functions* located in the West Plain, 4.670 ha are occupied by *Forests from around counties, cities and villages as well as forests located in their construction perimeter*. The most widespread species from this type of stand is pedunculate oak (*Quercus robur* L.), which occupies 2072 ha. Forests from around cities from the West Plain are situated at altitudes between 80 and 400 m. The soils are predominantly common alvisol, while *Arum-Pulmonaria* is the most widespread flora. In the context of the long lasting development of urban areas with implications on nearby forests, the results and discussions of this article represent a first step towards knowing these forests and towards properly managing them in order to successfully fulfil their protection and recreational purposes.

**Keywords:** West Plain, stands, long lasting development, species, cities

## 1. Introduction

West Plain is the Romanian part of Tisa's Plain, belonging to Danube's plain, named by Hungarian and international geographers as "The Grand Hungarian Plain" or "The Pannonia Basin" (fig. 1). The plain covers a length of 375 km and an average width of 45 km. The West Plain is bordered on North by Tur River, on East by the West Hills and Occidental Carpathians, by West by Hungary and Serbia and on South by Serbia. The relief is composed of three levels: plains higher than 100 m (the oldest, dating back to the Pleistocene and located towards the hills), horizontal, smooth plain (presents sand accumulations) and low plain (where rivers tend to create swamps). The climate is continental, with average annual temperatures between 10-12°C. Differences can be observed in the north part (9-10°C) as well as in the south one (10-11°C). Annual average precipitations range between 550-600 mm. Natural vegetation remains only on extremely narrow surfaces. Soils belong to the molisoi class (cernoziom) and intrazonal soils (hydromorphic, halomorph, psamosols in Carei Plain) (<https://ro.wikipedia.org/>).

In regard to human settlements, this area contains 18 urban establishments with 4 being county capitals: Timișoara, Arad, Oradea, Satu Mare. Rural settlements are rare, large (over 3000 inhabitants) and have a geometrisation degree that accentuates from north to south ([www.geocities.com](http://www.geocities.com)).

Satu Mare is the capital of the county with the same name and which is formed of Satu Mare (capital) and Sătmărel. In the past, Satu Mare was the capital of Sătmăre Shire and of Satu Mare County (between the wards). Its population amounted to 102.411 inhabitants in 2011 (Romania's population census, 2011).

Oradea is the capital of Bihor County, being situated in West Romania, on Crișul Repede river, and near Hungary's border. Furthermore, Oradea is the most important city from the historical region of Crișana. In the 2002 census,

the city had 206.614 inhabitants. The metropolitan area, which includes 11 nearby villages, had in 2002 a population of 249.746 inhabitants (www.zmo.ro).

Arad is the capital city of the county with the same name, situated at the limit between Banat and Crişana historical regions. The city is located on both shores of Mureş River in Crişana and Banat. In the 2011 census, Arad had a population of 159.074 inhabitants. Arad municipality is the main entrance gate in Romania, being the most important car and train knot from West Romania. As such, Arad is situated at 17 km from Curtici – the largest train customs point from our country's west part. Arad is located in Romania's West extremity, south of Crişana and north of Banat (Rusu, 2007).

Timişoara is the capital city of Timiş County, situated near the borders with Hungary and Serbia and on Bega River. In 2011, Timişoara had 319.279 inhabitants, being the third city in Romania. Timişoara's municipality area has a population of 468.162 inhabitants (<https://ro.wikipedia.org/>).

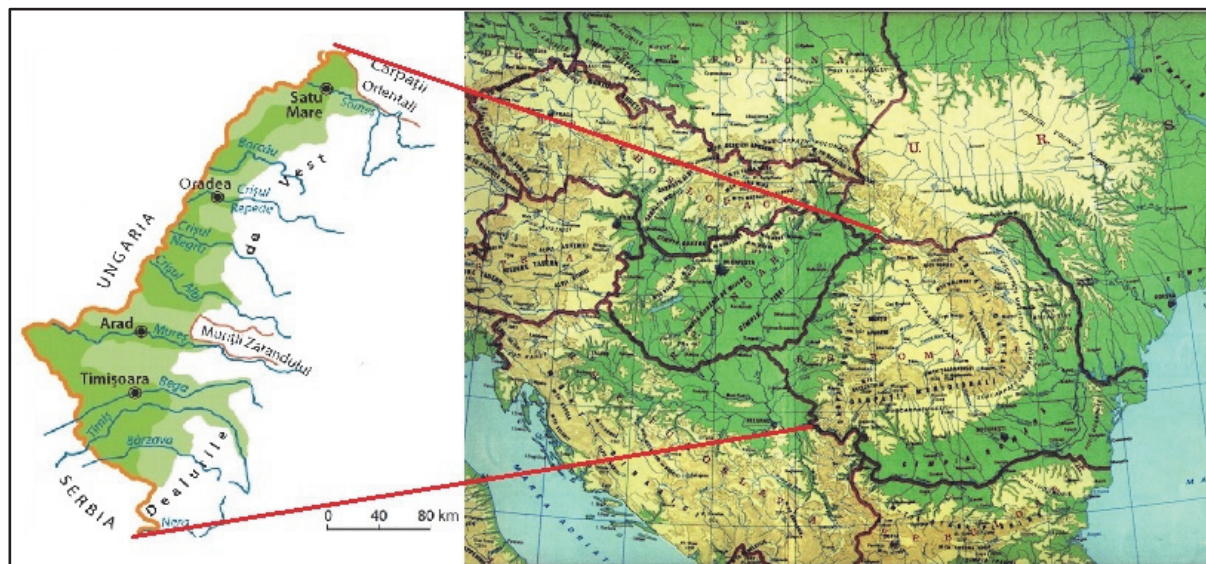


Figure 1. Location of West Plain in Romania and in Europe (Source: www.geotutorials.ro)

The hypothesis of this paper is that the forests in western Romania contribute to the sustainable development of the area from an economic point of view and not only, by increasing activities in the field of wood and non-timber products, increasing the recreational role of forests and tourism in the area and implicitly the increase of the quality of life in the studied area.

It is well known that by assuming the role of active surface, the forest modifies substantially the regime of climate factors from the surface that it occupies, creating its own microclimate. Also known as forest phytoclimate, this climate is different from the region's climate (macroclimate) as well as from the topoclimate (Constandache et al., 2018; Vlad et al., 2019). This function becomes active and assumes the functions exercised by the soils surface from the moment of closing the massive state. Only now, two strongly shaping factors intervene: the leaf (which generates shadow and absorbs part of the solar radiation) and albedo (which rejects a part of this radiation) (Chisăliță, 2001).

The positive role that forest vegetation has in refreshing the air and in regulating the debit of running waters is recognised worldwide (Constandache et al., 2019; Dinca et al., 2019); furthermore, it also represents a shield against wind and noises. Forest vegetation from around industrial units with strong harmful emissions contributes to air purification by neutralising pollutants, retaining powders, preventing the propagation of harmful substances and diminishing noises (Kachova et al., 2015; Popov et al., 2017). The forest increases the irregularity of earthly surfaces, forming obstacles that increase the turbulence of wind currents and the dilution of emissions. Differentiated heating, namely the cooling of forest surfaces during the night, causes vertical movements that lead to replacing damaged air with fresh air. The oxygen eliminated by the forest is transported by air currents at very large distances, refreshing the polluted atmosphere from cities and industrial areas.

Besides these roles of protecting against harmful anthropic factors and creating a specific microclimate, forests have an important recreational and scenery purpose that can be especially valued in forests from around urban centres.

As such, the importance of the present paper is given by the fact that the continuous development from around cities leads to the incorporation of many territories that previously belong to unincorporated areas. As such, forests situated today near large urban centres will represent green oasis for “tomorrow’s” cities and will contribute through their services to the long lasting development of the entire metropolitan area to which they belong.

The objective of this paper is to prove the contribution of forests from counties located in Romania’s West Plain to the area’s long lasting development by highlighting the characteristics of the main periurban forests in the studied area.

## 2. Method

Even from the XVI century, forests have been classified in forests destined to wood production (*production forests*) and forests destined to fulfil certain protection functions (*protection forests*) (Endres, 1922, în Rucăreanu, 1967). Professor Viktor Dieterich (1953) has introduced the theory of forest functions in silviculture, which included production functions, protection functions and social functions (Blum, 2004). Nowadays in Europe, it is considered that forests fulfil the following functions: a. Ecologic: 1. adjusting climate, air quality, aquatic systems and soil potential; 2. protecting against natural risks and noises; 3. conserving biodiversity; b. Economic: production (wood and other wood and non-wood products), activities and services; c. Social: scenery, recreation, educational, cultural and social purposes (Hasanagas, N. D., & Shoemith, R. (2002); Blum, 2004).

According to technical norms for managing forests and to technical norms for choosing and applying treatments, forests are classified in Romania in two functional groups, based on their functions: Group 1: Forests with special protection functions and Group 2: Forests with production and protection functions. In their part, functional group 1 is divided in five subgroups, from which the fourth is named *Forests with recreation functions*. This subgroup was divided in 11 functional categories which include category 1,4B = *Forests from around counties, cities and villages, as well as forests situated in their building perimeter*. The purpose of this study is represented by forests from the West Plain situated in this functional category.

All forests from the West Plain were divided in stand elements (species of a certain age that are part of a forest). The present paper has used all stand elements from this area that belong to the forest category from around cities (\*\*\*) Forest management plans). The very large number of these stand elements (2107) offers a solid base for the different analyses realized. These analyses referred to: forest surface, their distribution areas, altitude, flora, soils, specific forest types, comprising tree species, age, lopping, stand composition and stand structure.

## 3. Results

The surface of forests from *Subgroup 4. Forests with recreation functions* occupy a total surface of 15.899 ha in the West Plain. Amongst them, the functional category 1,4B= *Forests from around counties, cities and villages as well as the forests from their building perimeter* is distributed on 4.670 ha. From the total number of forests situated in subgroup 4, the county forests are situated on the second place (29%) after forests that present an exceptional game interest (1-4J, 55%), (Figure 2).

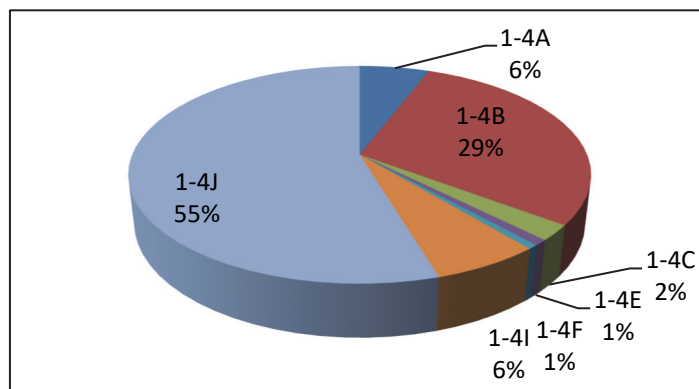


Figure 2. Surface occupied by forest functional categories from the subgroup *Forests with recreation functions* in the West Plain

**The altitude** characteristic for stands from this area ranges between 80 m (Timisului Meadow) and 400 m (Savarsin). The average altitude of these stands is of 110 m and was obtained by calculating the average altitudes of all 2107 analyzed stands.

**The flora** characteristic for these stands is *Arum-Pulmonaria* = 1829 ha and *Erachypodium-Geum-Pulmonaria* = 1053 ha, while the most widespread flora elements are *Carex-Poa pratensis* = 749 ha, *Festuca pseudovina* = 251 ha, followed by *Asperula-Asarum* = 169 ha, *Carex riparia-Iris pseudacorus* = 142 ha, *Genista tinctoria-Poa nemoralis* = 134 ha and *Carex brizoides-Agrostis alba* = 119 ha,

**The soils** most common for these stands are: Common Aluviosol = 883 ha, Red vertic-stagnic preluvosol = 870 ha, Luvosol rodic stagnic = 538 ha, Stagnic luvosol = 480 ha, Clay mollic preluvosol = 376 ha, Red mollic Preluvosol = 264 ha, Common luvosol = 182 ha, Common red Preluvosol = 168 ha, Common Eutricambosol = 146 ha.

**The most representative forest types** are: Meadow tug from our south country's silvosteppe and steppe = 689 ha, Meadow oak tug of average productivity= 522 ha, Plain normal cer= 510 ha, Normal plain oak tug of average productivity=482 ha, Shore and hill plateau oak stand of superior productivity = 456 ha, Plain meadow oak stand= 254 ha, Normal plain oak tug= 104 ha, Plain divagation oak stand= 76 ha.

**The species** with the largest spread in the West Plain that belong to these forests are: pedunculate oak (*Quercus robur* L.) = 2072 ha, turkey oak (*Quercus cerrois* L.) = 753 ha, ash (*Fraxinus excelsior* L.) = 623 ha, black locust (*Robinia pseudoacacia* L.) = 337 ha, hornbeam (*Carpinus betulus* L.) = 217 ha, and sessile oak (*Quercus petraea* L.) = 199 ha (Figure 3).

Other species that can be found in these forests are: field maple (*Acer campestre* L.), Hungarian oak (*Quercus frainetto* L.), black walnut (*Juglans nigra* L.), red oak (*Quercus rubra* L.), beech (*Fagus sylvatica* L.), Norway maple (*Acer platanoides* L.), field elm (*Ulmus minor* Mill.) and lime (*Tilia cordata* Mill.).

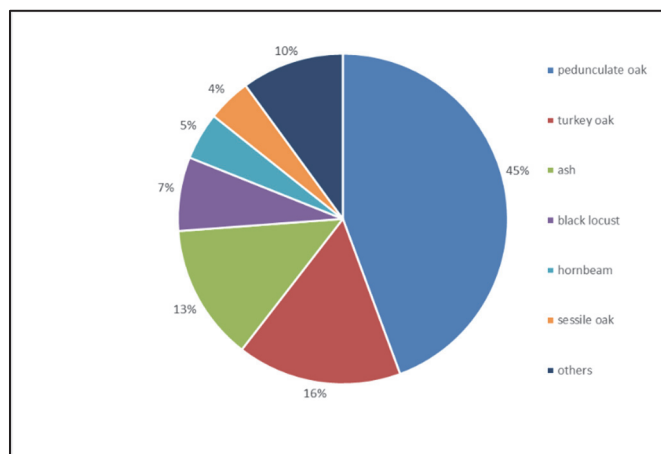


Figure 3. The surface occupied by species in forests from around cities in the West Plain

**The age** of stands that create forests around cities in the West Plain is very varied. The largest surfaces present stand elements situated in the 61-80 years category (Figure 4). Significant surfaces are also occupied by young stands (under 60 years old), as well as by older stands (81-100 years and 101-120 years). Stands older than 120 years occupy reduced surfaces, while the very old ones occupy very few surfaces.

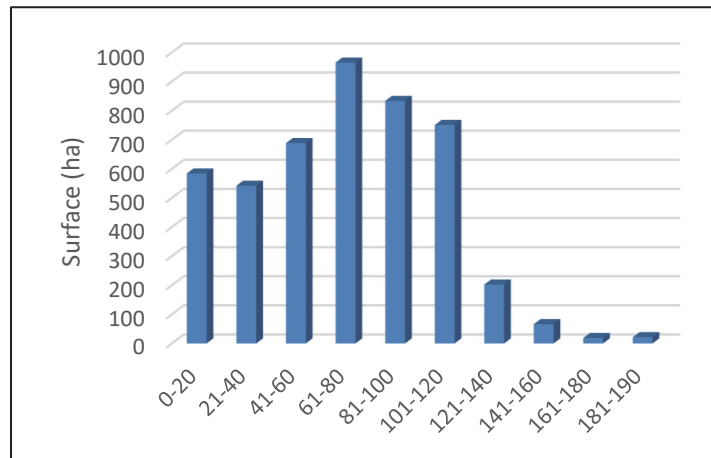


Figure 4. Age of the stands from around cities in the West Plain

The pruning of trees from these stands ranges between 0 and 0.7, with a majority situated between 0.5 and 0.6.

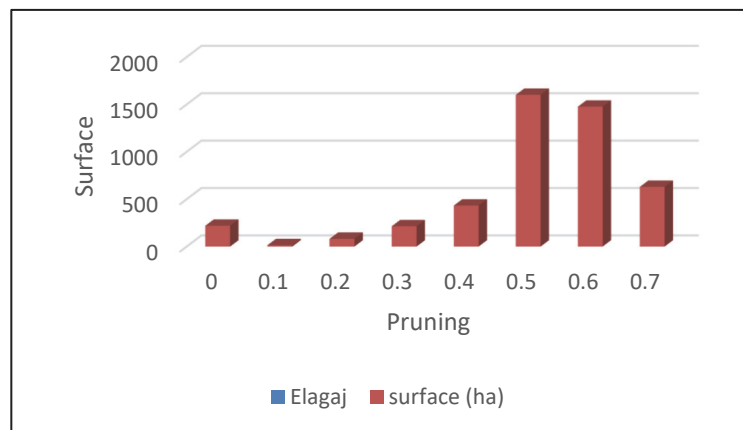


Figure 5. Tree pruning in forests from around cities in the West Plain

#### 4. Discussion

Forests located around cities are widespread in forest districts situated near big cities from the West Plain, such as Lunca Timisului (for Timisoara) = 2672 ha, OS Ceala (for Arad) = 986 ha, OS Oradea = 299 ha, OS Satu Mare = 114 ha, as well as near smaller cities such as OS Tinca = 269 ha, OS Radna = 201 ha, OS Livada = 86 ha, and OS Savarsin = 43 ha. These significant surfaces offer the possibility of integrating these forests in the city's urbanistic and development plans. A long lasting development can be possible in the future by incorporating these forests that can become forests parks for local communities, fulfilling recreational purposes.

The soil types identified in these forests are rich in humus and nutritive elements (Spârchez et al., 2017; Cântar and Dincă, 2018; Dinca et al., 2019; Oneț et al., 2019). As such, they are favourable to forest vegetation (Chisăliță et al., 2015), and have only one impediment, namely water supply during drought periods (Dincă et al., 2018).

Analysing tree species from forests around cities in the West Plain, reveal a very rich range of species that emphasize these forests' recreational and scenery purposes and stand them apart from other national areas (Blaga et al., 2019; Constandache et al., 2019; Murariu et al., 2018).

#### 5. Conclusions

The safety of using these forests in recreational purposes is increased by the small number and few surfaces occupied by old trees which can endanger inhabitants during extreme meteorological phenomenon.

Unlike the flora or soil, where the first two types occupy significant surfaces, the forest types are different. Furthermore, a large number of forest types are recorded (42 types), which indicate a large biodiversity of the

analysed forests, as well as the tree's capacity to form varied association in these climate and relief conditions. As such, biodiversity is beneficial for communities and for their long lasting development.

Both the rich range of species, as well as the age of these stands have a positive effect on the long lasting development of communities for forests located around cities or in their building perimeter. On one hand, they ensure optimum conditions for using these forests in recreational purposes while, on the other hand, they can ensure when needed a handy wood mass on large areas and with different wood essences that can have multiple usages (from fire wood to industrial means).

Tree pruning shows that most of the stands are well pruned (with values between 0.5-0.6), area easy to cover in recreational purposes and have an enjoyable aspect from a scenery point of view.

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