

**RESEARCH ON 5225 FOREST ECOSYSTEM TYPE SESSIL OAK WITH COMMON HORNBEAM AND *CAREX PILOSA* WITHIN THE SEGMENT OF LANDSCAPE SITUATED ON LOW WESTERN HILLS OF TINCA FOREST DISTRICT**

**Moțiu Petrică Tudor\*, Bucur Liviu\*\*, Nistor Stelian\*\***

\* University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: [tudor\\_motiu@yahoo.com](mailto:tudor_motiu@yahoo.com)

\*\* University of Oradea, Faculty of Geography, Tourism and Sport, 1 University St., Oradea, Romania, e-mail: [livibucur@yahoo.com](mailto:livibucur@yahoo.com), [snistor@uoradea.ro](mailto:snistor@uoradea.ro)

**Abstract**

*The identification and description of types of forest ecosystems on smaller geographical units, from the level of landscapes (landschaft), in order to establish the ecological specificity within a certain territorial unit and the establishment of some sustainable management measures, gives the forest typology a strong regional feature.*

**Key words:** forest typology, forest ecosystems, management measures, sustainable forestry.

**INTRODUCTION**

Forest typology have a strong geographic features because different forest types cannot be determined solely on the large areas where the repetability of some biocoenosis is evident, determined according to some species which occupying a certain ecotop.

The aim of the study was to establish the main forest ecosystem type within Tinca Forest District and to establish the state of these ecosystem in order to find the best management solution for a sustainable use but preserving and conservation of the optimum biodiversity of the forest. The aim of the research was also the scientific fundamentation very usefull both in forest management and in applied forestry in order also to find the best management solutions for a sustainable use.

**Study area - physical and bio-geographical conditions**

The Low Hills, situated in the south western part of the study area, have average altitudes of 200-300 m, have reduce vertical fragmentation, with flat or slightly curved interfluves, elongated slopes and mid values inclinations. The valleys are rare, the clay deposits conditioning the formation of heavy soils and on slopes the clay-loam deposits, with alternation of sand and gravel deposits, conditioning the formation of normaly hydric soils.

The relief is fragmented by valleys, the slopes being the main relief form but also extended plateaus. On slopes, the sedimentary formations of

sand, loam, clay, gravel, caused the formation of basic stagnic luvisoil, at most mid basic, with a well balanced hydric regime and on few areas eutric cambisols, more fertile and with a well balanced hydric regime.

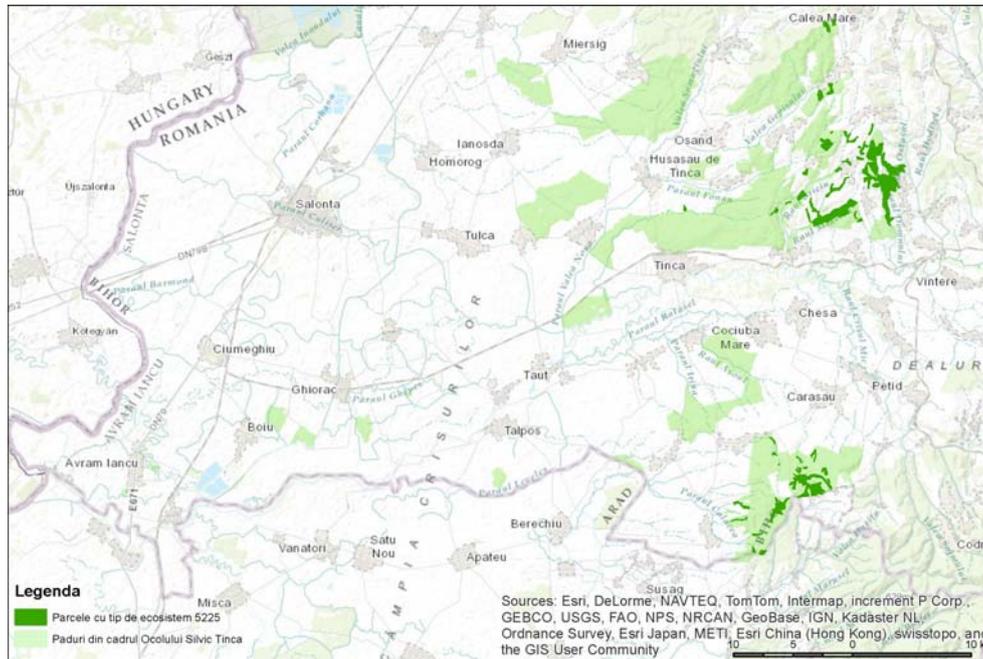


Fig. 1. The territorial repartition of the 5225 forest ecosystem type Sessil oak with common hornbeam with *Carex pilosa* within Tinca Forest District

On the floodplain, the existence of the thick layer of alluvium, the soils are basic evolved alluvial soils with an optimal hydric regime.

The climate is warm and wet (mean average temperatures 9-10 °C, average rainfall of 694.9 mm).

Within these conditions on slopes the most common forest ecosystem is that with sessil oak alone, with turkey oak, with common beech and few ecosystems having as a base the common beech. On the plateaus the forest ecosystems are structured around the turkey oak with pedunculate oak (sessil oak) and in the flood plain pedunculated oak. The types of herbaceous soil indicator on slopes are: *Festuca drymeja*, *Carex pilosa*, *Asperula-Asarum-Stellaria*; on plateaus: *Agrostis-Carex brizoides*, *Poa-Carex praecox*; on floodplains: *Rubus caesius-Aegopodium*.

## MATERIAL AND METHOD

The description of the forest ecosystem was made based on collected field data. In order to analyse the collected data were used different softwares such as Excel, ArcGis.

The forest ecosystems were analysed according to **location** within the study area; **the features of the ecosystem type**: surface area, geographical parameters (average altitude, altitude range); relief forms: types, inclination of the slopes, slope exposition, lithology, soil types and subtypes, ecological limitative factors); the description of the stands, the description of the herbaceous layer; the **correspondance with**: types of forests, types of stations, plant associations, types of habitat, **present state of the stands and management measures (particularities)**: main features, distribution according age classes, the source of main elements, natural regeneration, productivity classes, management measures, variability and succession tendency (forms of type, successional tendencies and forest facies).

## RESULTS AND DISCUSSIONS

**TYPE OF ECOSYSTEM:** 5225 Sessil oak with common hornbeam mid productive, mid-moder, developed on brown luvisc pseudogley, mid and oligomid basic, hydricly well balanced and with alternating profile, with *Carex pilosa* (the regional type with turkey oak and with a highly productive subtype)

**Subtype:** 52251 highly productive subtype;  
52252 mid productive subtype.

**Areal distribution:** this type of forest ecosystem is distributed in the low hills within: U.P.III - Trup Pădurea Gorunului, Trup Gânteii; U.P.IV - Trup Miheleu - Topile, Trup Dumbrava, Trup Valea Mare, Trup Holod - Hodiş, Trup Forosig Trup Cărăndeni, Trup Bicăcel, Trup Miheleu; U.P.V - Trup Hodişel, Trup Măgura.

**The features of the ecosystem within research area:**

**a. Surface:** 787 ha.

**b. Environment:**

- average altitude: 219 m (range 155-280 m);
- relief: according to the shape – mid and low slopes; according to the inclination – mid slopes and highly inclined slopes; according to the slope inclination- mainly shady and partly sunny, rarely sunny slopes;
- type of rock: sand in alternation with sandy clay, clay, sand, gravel;
- soil type and subtype: typical and stagnic luvisol, rarely cambisol and mollic soils;
- ecological limitative factors: on inclined slopes could appear mid edaphic volume, greater compactness of B<sub>tw</sub> horizon, on sunny and partly sunny slopes in the second part of the summer the reduction of the humidity content.

**c. Composition of stands:** within the dominant layer *Quercus petraea* ssp. *polycarpa* (in high proportions), disseminated may occur *Quercus petraea* ssp. *dalechampii*, *Quercus cerris* and *Prunus avium*; within the dominant layer one could find *Carpinus betulus* with a relative moderate distribution of 5% - 80% of the total surface. In some cases, with reduce frequency one could find also *Sorbus torminalis*.

**d. Composition of the underwood layer:** *Crataegus monogyna*, *Rubus hirtus*, *Ligustrum vulgare*; with reduce frequency *Cornus sanguinea* and *Rosa canina*. The underwood is variably spread by the degree of shading of the common hornbeam layer with 5% - 25% of the total surface. *Carpinus betulus* is also present within the underwood layer; in some cases also *Ulmus procera* could be found.

**e. Composition of herbaceous layer:** *Carex pilosa*, *Dactylis polygama*, *Melica uniflora*, *Cruciata laevipes*, *Stellaria holostea*, *Galium schultesii*, *Ajuga reptans*, *Geranium robertianum*, *Stachys sylvatica*, *Mycelis muralis*, *Euphorbia amygdaloides*, *Lapsana communis*, *Veronica officinalis*, *Festuca heterophylla*, *Glechoma hirsuta*, *Carex sylvatica*, *C. divulsa*, *Fragaria vesca*, *Hypericum perforatum*, *Campanula persicifolia*, *Fagopyrum convolvulus*.

Within the underwood species one could find *Chamaecytisus hirsutus* and *Genista tinctoria*.

In some situations one could find also *Viola reichenbachiana*, *Poa nemoralis*, *Festuca drymeja*, *Potentilla micrantha*, *Lychnis coronaria*, *Calamagrostis epigeios*, *Veronica chamaedrys*, *Agrostis stolonifera*, *Lysimachia nummularia*, *L. vulgaris*, *Carex praecox*, *Peucedanum carvifolium*.

The herbaceous layer is unevenly developed, in patches, according to the degree of shading, having an average coverage ratio of 20% - 30%.

**Correspondence with:**

- **types of forest**<sup>1</sup>: **5323** – sessil oak-mixed hardwood stand of mid productivity (m), the situations without lime trees;

- **type of stands**<sup>2</sup>: **6.3.1.1.** – Hilly with oak trees (sessil oak, turkey oak ± hungarian oak) Pm, luvisols, including white luvisols (± **hipostagnic**) mid edaphic, with mid xerophilous gramineae; **6.3.1.2.** – Hilly with oak trees (sessil oak, sessil oak with mixed hardwood stand, hilly hardwood stands with sessil oak ± **turkey oak, hungarian oak**) Ps, luvisols (± **hipostagnic**), highly edaphic, with mid xerophilous gramineae and mull flora.

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<sup>1</sup> Forest types are defined by Doniță N. et al., 2005.

<sup>2</sup> Types of stands are defined by Dănescu F., Costăchescu C., Mihăilă Elena, 2010.

- **plant associations**<sup>3</sup>: *Lathyrus (hallersteinii) - Carpinetum* Coldea '75;

- **type of habitat**<sup>4</sup>: **R4123** – sessil oak forests (*Quercus petraea*), common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus*) with *Carex pilosa*.

**The present state of stands and management measures (particularities):**



Fig. 2. Sessil oak with common hornbeam stand with *Carex pilosa* in u.a. 72B, U.P.V Belfir-Hodişel area (source: Moşiu P.T.)

**f. Structure of stands:** Photo 1 shows the distribution of trees according to the diameter, figure 2 shows the vertical and horizontal structure of stand 72B of the study area.

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<sup>3</sup> Plant associations are defined by Doniță N. et al., 1990, and the new types of ecosystems by Sandală V., Popescu A., Stanciu D.I., 2001.

<sup>4</sup> Types of habitat are defined by Doniță N. et al., 2005.

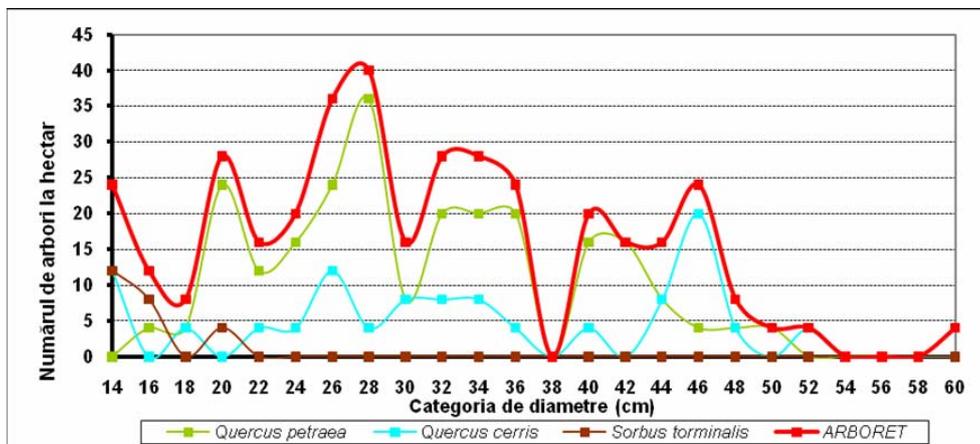
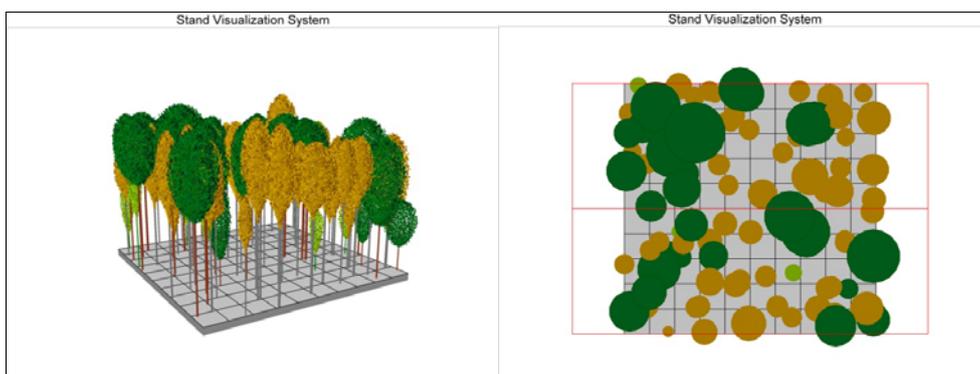


Fig. 3. The distribution of tree numbers per hectare in stand, according to diameter categories and species in u.a. 72B, U.P.V Belfir-Hodisel area



**Legend:**



*Quercus petraea*



*Quercus cerris*



*Sorbus torminalis*

Fig. 4. The diagram of vertical structure (left) and plan projection of the canopy (right) for test plot of 2500 sqm, using SVS software, 3.36 version, in u.a. 72B, U.P.V Belfir-Hodisel area

**g. Distribution according to the age range:** 0-5 years - 1%; 6-10 years - 13%; 11-20 years - 30%; 21-40 years 33%; 41-80 years - 21%; over 80 years - 2%.

**h. The source of main stand elements:** sessil oak – natural seeding 8%, sprouts 33%, plantings 59%, common hornbeam – natural seeding 15%, sprouts 85%.

**i. Productivity class of the main elements of the stand:** sessil oak

III<sup>rd</sup> class, common hornbeam III/IV class, turkey oak III<sup>rd</sup> class.

**j. Natural regeneration:** the sessil oak regenerates very well, the turkey oak and the other species regenerates well, the common hornbeam regenerates abundant; the regeneration of oak trees is hampered by the common hornbeam. There are some situations with a general regeneration of the sessil oak (Moțiu, Bartha, 2006), but the lack of light and the competition of the common hornbeam lead to total elimination of sessil oak seeds.

k. Indicated composition: 7Go 1Ci, Pa 2Ca.

**l. Management measures on age ranges:** 0-5 years – thinning the natural regenerations and-or planting; 6-10 years keeping the vigorous sessil oak trees, of the valuable mixed species by thinning. It is compulsory the preservation of the helpful species (field maple, mountain ash, common hornbeam) in order to create a lower storey; 11-20 years mixture proportioning through thinnings with the preservation of strong and healthy sessil oak trees and helpful species; 21-40 years – the selection of the future seed source trees from the main species but also for the mixed species (sycamore maple, norway maple) in order to increase the biodiversity of the tree layer and thinnings around selected trees; 41-80 – the continuation of above mentioned activities through combined thinnings, keeping closed the rest of the stand; over 80 years - hygiene cuts.

**m. Other management measures: keeping the close state of the stand.** The stand derived from sprouts will be gradually converted as possible through natural regeneration (if the stand is in fruiting period) or by recovery. In case of the presence of non indicated species (black pine, false acacia, red oak) or pioneer species (european aspen, false acacia, common silver birch) is recommended the ecological restoration of the fundamental natural forest ecosystem, replacing the invasive species with autochthonous species according to local conditions. The only exception is the douglas, which, in pure stands, have a very good growth rate and very good quality of wood (Moțiu, 2004). It is also recommended to keep under control, the common hornbeam, extracting it in time (before seeding), the european aspen and the false acacia which tend to eliminate the sessil oak and the other mixed species. In areas where the underwood layer is thick it is recommended the thinning of it helping thus the natural regeneration in the years when the seeding of the sessil oak is abundant.

**n. Variability and successional trends (forms of type, successional and silvo facies):** in case of the presence of Eutricambisols (the lower third of the slope) the sessil oak had an average II<sup>nd</sup> productivity class, this situation being a transitory situation to the 5216 ecosystem type – sessil oak with common hornbeam with *Asperula- Asarum-Stellaria*; the turkey oak is in this case the dominant species.

**o. Observations:** the sessil oak but also the turkey oak could be in the second productivity class, differentiation within this forest ecosystem an highly productive subtype

The **5225** ecosystem type – sessil oak with common hornbeam with *Carex pilosa* is a stable type which regenerates very well thorough natural seeding – stand with total regeneration (Moțiu, Bartha, 2006). Within the researc area a regional type could occur with turkey oak and a highly productive subtype.

## CONCLUSIONS

The typological research using GIS tools is usefull in practical forestry, being the base for sustainable forestry. The variability of general conditions (climatic, geologic) is very high and this variability induces a high variability of forest types. Each geographical unit, either it is about zones – subzones, levels-sublevels, regions-provinces have distinct features which causes the existence of some inventory of types, with strong regional features.

This moment priority is the tendency to establish types of forests on small geographic units, at the level of landscapes (landschafts), the typology having thus a strong regional feature.

Regarding forestry measures by type of forest culture have revealed that there were concerns relating to differentiating normal types but not the present state of the as result of more or less proper management methods. Forester practitioner is forced to differentiate on the basis of this action and the current state of forest types that manages them.

That is why we tried, as the research of this paper to establish ecosystem-based forest type principal existing in a territory smaller but representative low western hills within Tinca Forest District, to state the current status of types and propose appropriate management measures this state and designed to bring a type similar to the natural state.

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