

## DIVERSITY, DISTRIBUTION AND ECOLOGY OF THE FOREST NATURAL HABITATS IN THE BRATOVOEȘTI FOREST, DOLJ COUNTY

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### Abstract

The investigated area is located in Oltenia Plain, in the Valley Jiu at an altitude of 40-60 m.s.m. By the phyto-climatic point of view the Bratovoesti forest is located in the forest Steppe of Oltenia. The Bratovoesti Forest is part of the protected area of community interest ROSCI 0045 Coridorul Jiului, and occupies an area of 904.51 ha. The Bratovoesti forest is located on loess that were formed deep soils with good growth profile: alluvial-soils and luvisols. Also, some areas near shore Jiu, also on sandy rocks (sand and gravel) they have formed shallow soils poor in minerals (entic alluvisols). In the researched area there are the following Natura 2000 forest habitats: 91E0\*-Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*), 91F0-Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (*Ulmion minoris*), 92A0-*Salix alba* and *Populus alba* galleries. Of the rare and vulnerable species found in this forests habitats we can mention: *Vallisneria spiralis*, *Utricularia minor*, *Nymphaea alba*, *Azolla filiculoides*, *Typha minima*, *Orchis purpurea*, *Epipactis palustris*, *Galanthus nivalis*, *Angelica sylvestris*, *Crocus flavus*, *Festuca gigantea*. The biodiversity of the forest natural habitats from this area is endangered because the human impact is very high, although this area it is included in the important protected areas from Romania.

**Key words:** forest habitats, plant communities, Bratovoesti.

### INTRODUCTION

The Bratovoesti Forest is part of the protected area of community interest ROSCI0045 Coridorul Jiului, and occupies an area of 904.51 ha. The investigated area is located on loess that were formed deep soils with good growth profile: alluvial-soils and luvisols. Of the rare and vulnerable species found in this forests habitats we can mention: *Orchis purpurea*, *Epipactis palustris*, *Galanthus nivalis*, *Angelica sylvestris*, *Crocus flavus*, *Festuca gigantea*.

The biodiversity of the forest natural habitats from this area is endangered because the human impact is very high, although this area it is included in the important protected areas from Romania.

The territory occupied by the Bratovoesti forest is located in the north of the Moessice platform which embraces the Romanian Plain and is separated from the Precarpathian Depression through an intermediate area, which occupies the largest part of this territory. From a stationary point of view, we are particularly interested in the upper layer of the lithological

formations that basically influence the genesis and physico-chemical properties of the soil.

In the researched territory, which is practically in the Jiu meadow, more developed aluviosols have been formed on the higher lands that have not been flooded by the Jiu with a forest vegetation such as the "meadow oak-grass", and on the lower places from the Jiu meadow less evolved soils - entic aluviosols, eutric and gley aluviosoil, forest stands of PLA, PLN, SA and PLEA.

On the depressions in the Jiu meadow there were formed hydriosoils - gleisoils, stagnosoils where grows the black alder, the swamp cypress and less the willow.

Regarding the climatic data, the following can be distinguished:

- according to the climatic zoning (Geographical Monograph of R.P.R.), the studied territory is situated in the continental climate, the plain territory, the forest district, the central subdivision of the Romanian Plain (II.A.p.2.), with rainfall of about 500 mm/year and with an amplitude of temperature above 25°C;

- after Kopen, the territory under study is part of the C.f.a.x. sub-province, with the temperature of the warmest month of 22°C and the maximum precipitations at the beginning of the summer.

## MATERIALS AND METHODS

The field data collection was done in accordance with geobotanical guidelines and rules, field trips being made, detailed descriptions and analyzes of phytocoenosis, and the types of plant communities in the forest that underlie the forest habitat edification. For the determination and description of the types of vegetal communities, there have been made surveys with a sample area of 400-1000 m<sup>2</sup>. To identify the habitats we used the Romanian Manual for interpretation of EU habitats and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Annex I (Habitats Directive) and for the classification of the vegetal associations, we have used synthesis papers by Rodwell et al. (2002).

## RESULTS AND DISCUSSIONS

In the researched area there are the following Natura 2000 forest habitats: 91E0\*-Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*), 91F0 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (*Ulmion minoris*), 92A0 - *Salix alba* and *Populus alba* galleries.

**91E0\*-Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)**

Chorology: Jiu Meadow, Georoc Meadow, developed on alluvial soil, reaching a coverage of trees 60-90% and coverage of herbaceous plants 30-60%.

Typical plant communities of this habitat identified in Brotovoesti Forest: *Thelypterido palustris-Alnetum glutinosae* Klika, 1940; *Salicetum fragilis* Passarge, 1957; *Salicetum albae* Issler, 1924.

In the Bratovoesti Forest this plant communities have a rich phytodiversity:

*Angelica sylvestris*, *Aegopodium podagraria*, *Ornithogalum pyrenaicum*, *Urtica dioica*, *Glechoma hirsuta*, *Allium ursinum*, *Fraxinus pallisae*, *Thelypteris palustris*, *Petasites albus*, *Ranunculus ficaria*, *Carex remota*, *C. sylvatica*, *C. riparia*, *C. vulpina*, *Eleocharis palustris*, *Scirpus sylvaticus*, *Mentha aquatica*, *M. longifolia*, *Arum orientale*, *Melica nutans*, *Cardamine impatiens*, *Moehringia trinervia*, *Agrostis stolonifera*, *Bidens tripartita*, *Persicaria (Polygonum) hydropiper*, *Lycopus europaeus*, *Caltha palustris* ssp. *cornuta*, *Festuca gigantea*, *Brachypodium sylvaticum*, *Impatiens noli tangere*, *Leucojum aestivum*, *Lysimachia nummularia*, *Galium palustre*, *Vincetoxicum hirundinaria*, *Geranium phaeum*, *Viola odorata*, *Thalictrum simplex*, *T. minus*, *Cucubalus baccifer*.

In the floristic composition of the phytocoenoses of this natural habitat meet many undesirable species: *Glechoma hederacea*, *G. hirsuta*, *Galium aparine*, *Urtica dioica*, *Alliaria petiolata*. Some species grow very much invading the seedlings and other species of herbaceous layer and undergrowth. The invasive species threaten the conservation status of this habitat: *Phytolaca americana*, *Erigeron annuus*, *Ailanthus altissima*, *Gleditsia triacanthos*, *Acer negundo*.

**91F0 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (*Ulmion minoris*)**

This natural habitat are poorly represented in the Bratovoesti Forest.

Chorology: Jiu meadow and Georoc meadow, developed on alluvial soil and luvisols.

Typical plant communities of this habitat identified: *Fraxino danubialis-Ulmetum* Soó, 1936 corr. 1963; *Quercetum roboris pedunculiflorae* Simon, 1960 (syn.: *Fraxino angustifoliae - Quercetum pedunculiflorae* (Chifu et al., 1998, 2004); *Fraxino pallisae-Quercetum pedunculiflorae* (Popescu et al., 1979; Oprea, 1997).

The floristic composition of the phytocoenoses of these plant communities is made up of a series of species of great value (e.g. orchid species).

The most important species of the phytocoenoses which edified this habitat are: *Quercus robur*, *Ulmus minor*, *Ulmus glabra*,

*Fraxinus excelsior*, *F. angustifolia*, *F. pallisae*, *Populus nigra*, *P. tremula*, *P. alba*, *Salix alba*, *Acer tataricum*, *A. campestre*, *Alnus glutinosa*, *Prunus padus*, *Humulus lupulus*, *Tamus communis*, *Hedera helix*, *Corydalis solida*, *Gagea lutea*, *Cornus sanguinea*, *Sambucus nigra*, *Frangula alnus*, *Ligustrum vulgare*, *Rubus caeius*, *Euonymus europaeus*, *E. verrucosus*, *Clematis vitalba*, *Aeopodium podagraria*, *Galium aparine*, *Carex michelii*, *C. tomentosa*, *C. acutiformis*, *Iris pseudacorus*, *Glechoma hederacea*, *Leucojum aestivum*. In the phytocoenoses of this plant communities we must according particular attention to species: *Vitis vinifera* ssp. *sylvestris*, *Convallaria majalis*. In this habitat are found channels and ponds where these species thrive: *Typha latifolia*, *Elodea canadensis*, *Eleocharis palustris*, *Phalaris arundinacea*, *Bolboschoenus maritimus*, *Lemna trisulca*, *L. minor*, *Ceratophyllum demersum*, *Azolla filiculoides*, *Caltha palustris* ssp. *cornuta*, *Spirodela polyrhiza*, *Vallisneria spiralis*, *Nuphar luteum*, *Utricularia minor*, *Nymphaea alba*.

#### **92A0 - *Salix alba* and *Populus alba* galleries**

This natural habitat are well-represented in the Jiu meadow.

Typical plant community: *Salici-Populetum* Meijer-Drees, 1936.

In the floristic composition of the phytocoenoses of this natural habitat meet numerous mesophyte, meso-hygrophyle and hygrophyle species. These phytocoenoses have a special composition, being characterised by the dominance of the species: *Salix alba*, *Populus alba*, *P. nigra*, *Fraxinus angustifolia*, *Cornus sanguinea*, *Crataegus monogyna*, *Rosa canina*, *Euonymus europaeus*, *Sambucus nigra*, *Prunus spinosa*, *Rubus caeius*, *Vitis vinifera* ssp. *sylvestris*, *Clematis vitalba*, *Humulus lupulus*, *Agrostis stolonifera*, *Althaea officinalis*, *Cicuta virosa*, *Lycopus europaeus*, *Lysimachia nummularia*, *L. vulgaris*, *Physalis alkekengi*, *Ranunculus repens*, *Scutellaria galericulata*, *Solanum dulcamara*, *Asparagus tenuifolius*, *Myosoton aquaticum*, *Poa trivialis*, *Eupatorium cannabinum*, *Bidens tripartita*, *Lythrum salicaria*, *Myosotis scorpioides*, *Equisetum arvense*, *Stachys palustris*, *Agropyron repens*, *Urtica dioica*, *Glechoma hederacea*, *Angelica sylvestris*, *Mentha*

*aquatica*, *Rumex obtusifolius*, *Juncus buffonius*, *Cyperus fuscus*, *Typha latifolia*. The plant communities developed on alluvial soil reaching a coverage of trees 60-80% and coverage of herbaceous plants 20-60%. In the floristic composition of the phytocoenoses of this natural habitat meet many undesirable species: *Rubus caeius* and *Amorpha fruticosa*.

#### **Types of forests included in these natural habitats from Bratovoesti Forest**

Natural forest type and its productivity: 041.4. Medium productivity meadow ash (m); 632.4. Meadow oak-grass of average productivity (m); 632.5. Meadow highroad from the plain of average production (m); 041.1. Meadow ash (s); 632.1. Meadow oak-grass (s); 911.5. Low-productivity white poplar coppice from the meadows of the interior watersheds (i); 911.2. White poplar coppice of medium productivity (m); 921.5. Black poplar coppice of medium productivity (m); 931.2. Coppice mixed by PLA and PLN of average productivity (m); 951.7. Willow coppice from the meadows of the interior watersheds (m); 961.3. Poplar and willow coppice from interior watersheds (m); 931.1. Mixed PLA and PLN coppice of superior productivity (s); 971.1. Alder trees on gleaned soil (s) of high productivity; 972.1. Black alder coppice (s)

Classification guideline: 8.5.1.1. Forestry plain, grassland meadow Pm, brown groundwatery damp gley or semigley, edaphic medium-large; 8.5.1.2. Forestry-meadow grassland plain, Ps, brown groundwatery damp, gley or semigley, edaphic large; 8.5.2.2. Forestry floor, aluvial freative neutral, III; 8.5.2.3. Forestry plain, poplar grassland meadow Pm, humifer moderated alluvial, profoundly groundwatery damp, very rarely shortly flooded; 8.5.2.4. Forestry plain poplar grassland meadow Ps, aluvial intense humifer, groundwatery, frequently and rarely shortly flooded; 8.5.4.2. Forestry plain, deeply depressed by the aldre grove Ps, turbogley and typical turbos.

**Description of the types of stations:** resorts in non-floodable meadow sectors or rarely and shortly flooded meadow areas of medium productivity for oak-grass or meadow grassland, situated on flat and small depressions; the lithologic substrate is made up

of clay-sandy alluviums up to clay-argil ones, sometimes layered, sometimes stratified; soils: eutric aluviosoil, mollic, verticular, gley, gley-eutric with high trophicity, good aeration and moderate consistency; old, high stations in the Jiu meadow or its tributaries in the forest, with eutrophic specific, with eutric aluviosoil, mollic, vertic, gley, gley-euteric alluviosol; the lithologic substrate is made up of clayey and partly sandy alluviums; the subarbus and grassy floor: *Rubus* sp., *Viola* sp., *Poaceae* etc. hygrophyle species; superior productivity stations for oak and meadow glassland; stations located in the Jiu meadow area in the plain region, on high-lying terrain or very rarely and shortly flooded flat land; the lithological substrate consists of sandy or sandy-coarse alluviums; soils: eutric aluviosoil, entic; white poplar low productivity stations; stations located in the Jiu meadow or its tributaries in the forest plain, on high-lying terrains, abandoned river beds, more or less clumped, rarely flooded, with more or less evolved aluviosols, stratified and carbonate formed on the substrate of sandy alluviums with light

texture and moisture-dry humidity summer regime and damp in spring; middle productivity stations for black and white poplar; stations with high productivity with mesophit to ectrophic ecologic specificity, situated in the middle meadow of the Jiu River and its tributaries, in the forest plain, on aluviosol, medium evolved to evolved, stratified or with transition to zonal soils formed on sand substrate with light texture towards middle; eutrophic-specific higher productivity stations situated in the Jiu meadow in the forest plain on gleisols and stagnosols, very poorly salinated on deposits of fine alluviums and clay with heavy texture and humid moisture regime, damp to wet because of the groundwater that reaches to the surface, the land becoming marshy.

### Conservation status and human impact

In the investigated area this habitats is characterized by the following data on the conservation status and human impact, future threats presented in Table 1.

Table 1. Habitats of European interests in the studied area from Bratovoiești Forest

No.	Natural habitats	Natura 2000 code	Palaearctic Hab. code	Conservation status	Human impact current pressures and; future threats
1.	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> )	91E0*	CLAS. PAL.: 44.3, 44.2 and 44.13	favorable up to unfavorably	E01.01 - continuous urbanization; G05.07 - missing or wrongly directed conservation measures; D.06- other forms of transportation and communication; K02 - biocenotic evolution, succession; I01 - invasive non-native species; B07- forestry activities not referred to above; D01- roads, paths and railroads; F04.02 - collection (fungi, lichen, berries etc.); B01.02 - artificial planting on open ground (non-native trees); B02.06 - thinning of tree layer.
2.	Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> along the great rivers ( <i>Ulmion minoris</i> )	91F0	CLAS. PAL.: 44.4	favorable up to unfavorably	E01.01-continuous urbanization; G05.07- missing or wrongly directed conservation measures; D.06- other forms of transportation and communication; B01.02 - artificial planting on open ground (non-native trees); B04- use of biocides, hormones and chemicals (forestry); B07- forestry activities not referred to above; D01- roads, paths and railroads; F04.02 - collection (fungi, lichen, berries etc.); G01-outdoor sports and leisure activities, recreational activities;K02-biocenotic evolution, succession.
3.	<i>Salix alba</i> and <i>Populus alba</i> galleries	92A0	CLAS. PAL.: 44.141, 44.162 and 44.6	from favorable up to unfavorably-inappropriate	E01.01- continuous urbanization; G05.07- missing or wrongly directed conservation measures; D.06- other forms of transportation and communication; G05 - other human intrusions and disturbances; H04 - air pollution, air-borne pollutants; I01 - invasive non-native species; B07- forestry activities not referred to above; D01- roads, paths and railroads; F04.02 - collection (fungi, lichen, berries etc.).

## CONCLUSIONS

Three types of forest natural habitats of Bratovoesti Forest have been identified in the *Oltenia Plain, of the Valley Jiu*.

These natural habitats are represented by plant communities rich in mesophyle, mesohygrophyle and hygrophyle species.

Of the rare and vulnerable species we can mention: *Vallisneria spiralis*, *Utricularia minor*, *Nymphaea alba*, *Azolla filiculoides*, *Typha minima*, *Orchis purpurea*, *Epipactis palustris*, *Galanthus nivalis*, *Angelica sylvestris*, *Crocus flavus*, *Festuca gigantea*. The phytodiversity of the forest natural habitats from Bratovoesti Forest is endangered because the human impact is very high, although this area it is included in the important protected area from Romania. In the floristic composition of the phytocoenoses of this natural habitat meet many undesirable species: *Rubus caesius*, *Amorpha fruticosa*, *Phytolaca americana*, *Erigeron annuus*, *Ailanthus altissima*, *Gleditsia triacanthos*, *Acer negundo*.

Limitational environmental factors and determinants: prolonged drought risks, lowering groundwater level; lowering the groundwater level; the coarse texture of the soil; lowering the level of the groundwater. Management measures imposed by ecological

factors and risk: treatments - progressive cuts, conservation cuts, cuttings, grove cuts.

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