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DISTRIBUTION OF AUTOCHTHONOUS DENDRO-SPECIES IN THE MANAGEMENT UNIT „OZREN“-PETROVO – IMPLEMENTATION OF GIS TECHNOLOGY

Abstract: The paper shows the distribution of autochthonous dendro-species in the Management unit „Ozren“ of the Forest office „Petrovo“ in the northern Bosnia. Species were mapped using the GIS technology, with the square network 1x1 km, which was laid into the National Cartesian coordinate system, in zone 6. In the total of 109 squares, 93 species of trees and shrubs were recorded. Using the GIS software the spatial database was made, which as the main output gave the distribution maps of those species in the research area. This work should contribute to the knowledge of the horology of dendro-species in Bosnia and Herzegovina, as well as to start the unique database, which would, using the method proposed, be filled up by data on distribution of dendro-species in this country.

Keywords: Dendrohorology, distribution maps, GIS mapping, Bosnia and Herzegovina

HOROLOGIJA AUTOHTONIH DRVENASTIH VRSTA NA PODRUČJU GAZDINSKE JEDINICE „OZREN“, ŠUMSKE UPRAVE „PETROVO“ –IMPLEMENTACIJA GIS TEHNOLOGIJE

Izvod: U radu je prikazana horologija autohtonih drvenastih vrsta na području Gazdinske Jedinice „Ozren“, Šumske Uprave „Petrovo“, u sjevernoj Bosni. Vrste su kartirane GIS tehnologijom, pomoću mreže kvadrata veličine 1x1 km, postavljene u Državnom pravouglom koordinatnom sistemu, u šestoj zoni. Na

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ukupno 109 kvadrata zabilježene su 93 vrste drveća i žbunja. U GIS softveru napravljena je prostorna baza podataka, koja je kao glavni izlaz dala karte rasprostranjenja ovih vrsta na području istraživanja. Ovaj rad bi trebao da doprinese poznavanju horologije drvenastih vrsta u Bosni i Hercegovini, kao i da bude začetak jedne jedinstvene baze podataka, koja bi se korišćenjem predloženog metoda dopunjavala podacima o rasprostranjenju drvenastih vrsta u ovoj zemlji.

Ključne riječi: Dendrohorologija, areal karte, GIS kartiranje, Bosna i Hercegovina

1. INTRODUCTION

In the times of evermore intensive utilization of forest resources and increasing anthropogenic influence on the nature, number of virgin and conserved ecosystems is rapidly decreasing throughout the whole planet. As one of the European countries which is at the top of the list when it comes to afforested areas (over 50%), Republic of Srpska (and B&H) is still representing very good experimental field for the numerous ecological, dendrological, botanical and vegetation researches.

Although the Balkan peninsula, as the obverse to the Caucasus massif, floristically and vegetationally, one of the most diverse and interesting parts of Europe, some areas remained partially or completely uninvestigated. Northern slopes of the mountain Ozren in the northern part of Republic of Srpska belong without any doubt to those regions.

Although the serpentine flora and vegetation of B&H was the subject of research in the past, this serpentine giant was omitted from investigations. There was only one scarce observation about the flora of the river Spreča basin, performed by the well known serpentine researcher, Hilda Ritter Studnička, at the midpoint of the last century (Ritter-Studnička, 1970).

Regarding all mentioned above, the need for more detailed investigation of the Management Unit Ozren, and better knowledge of the flora of this region, raised at the Forestry faculty in Banjaluka. Regarding this, the preliminary goal was appointed, to pursue the detailed field research of this area to complete the knowledge of the serpentine dendroflora of the B&H. In the wider sense this will give the contribution to distribution of some dendro-species in the larger area, due to better understanding of their distribution patterns. All wooden species were registered on the square network of 1x1km, which is dense enough, in the scope of the mountain range, not to talk about the country.

The second reason this is the pioneer work in Republic of Srpska (and B&H) is that all research was conducted using the GIS technology. Use of the GIS technology for mapping and other needs in forestry became the need not the luxury (Longley et al. 2001, Korpetta et al. 2004, Radović et al. 2005, Strzelinsk & Wegiel 2006)

2. MATERIAL AND METHODS

Research was conducted on the whole area of the Management Unit "Ozren". Total area of the management unit is 11230 ha. Only autochthonous species of trees and shrubs were registered. Some dwarf shrubs, which don't have clearly differentiated wooden part of the stem were omitted, e.g. *Ononis spinosa*, *Helianthemum nummularium*, *Thymus* sp. etc. On the other hand *Hypericum androsaemum*, *Solanum dulcamara* etc. were considered. Species were determined by modern available literature (Jovanović, 1991, Krüssmann, 1984, Šilić, 2006). Scientific names of the species follow Tutin et al., 1964-1980. Scientific names of syntaxons follow Stefanović, 1986.

Method was separated into two distinguished parts: detailed field research and data gathering, and office data analysis.

Before the field research was undertaken, field maps in scale 1:25000 were prepared. The maps were then overlaid by 1x1 km square network, which coincides with National Cartesian coordinate system, zone 6 (Figure 1). There are 109 squares total. Every square was numbered from 1 to 109. Squares that were mined during the last war, are at the border of management unit, and were not researched nor considered for analysis. Also, the squares which entered the management unit with less than 50% were not considered for the analysis. At the field, data was collected by route method. Regarding the possible heterogeneity of the ecological conditions in some sample squares, the more detailed research of the square was submitted. The route of the movement was calculated in GIS software, and then controlled by the GPS directly in the field. Second part of the research was conducted in the office where the data was submitted for the GIS analysis. After the data analysis in GIS, data were synthesized and obtained through the main output, distribution maps (Figure 2).

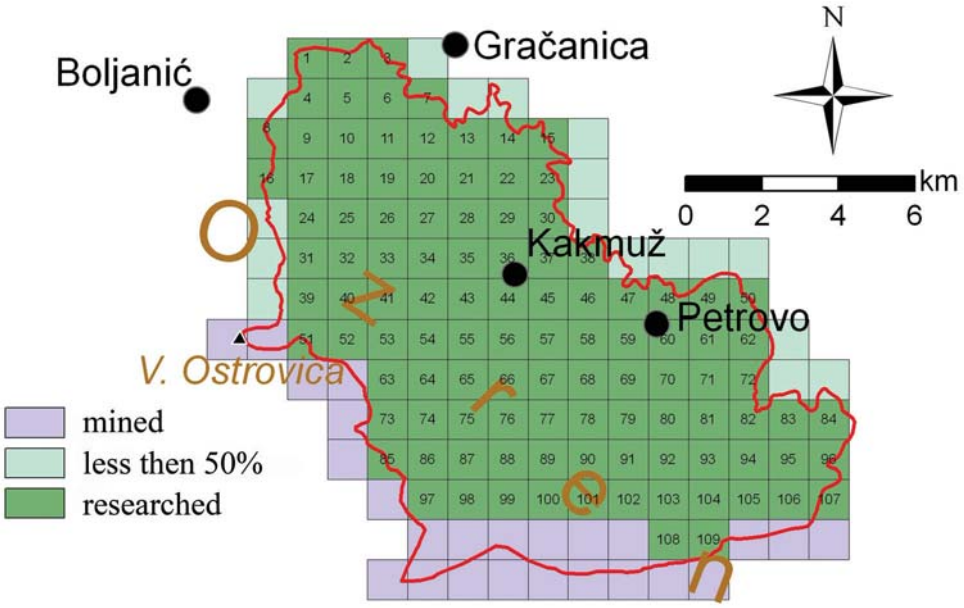

Figure 1: Study area covered with sample squares
Karta br. 1: Područje istraživanja prekriveno kvadratnom mrežom

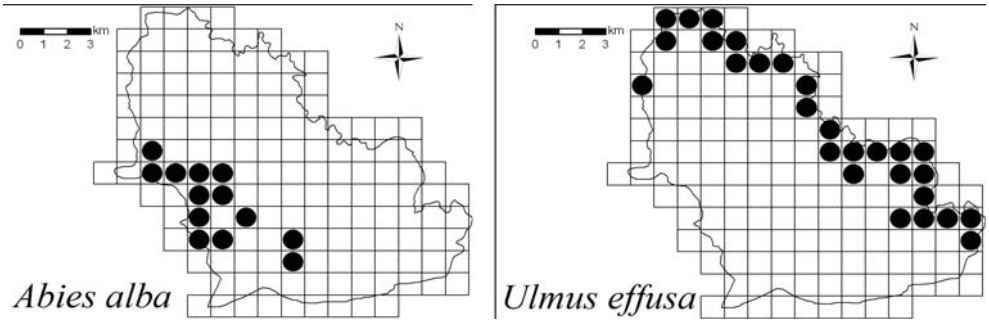

Figure 2: Examples of output distribution maps
Karta br. 2: Primjer izlaznih karata distribucije

3. ECOLOGICAL FEATURES OF THE STUDY AREA

Ozren Mt. is situated in the wider area of River Sava basin on the southern edge of the Pannonian plain (Figure 3). The massif is characterized by a distinctly indented relief with numerous elongated ridges and deeply cut stream valleys. The height distribution is from 153 m in the River Spreča valley in the northeast of the researched area up to 918 m in the southwest (Figure 4). At the northeast relief

gradually becomes milder, and then suddenly opens into the low and flat periodically flooded valley of the River Spreča.

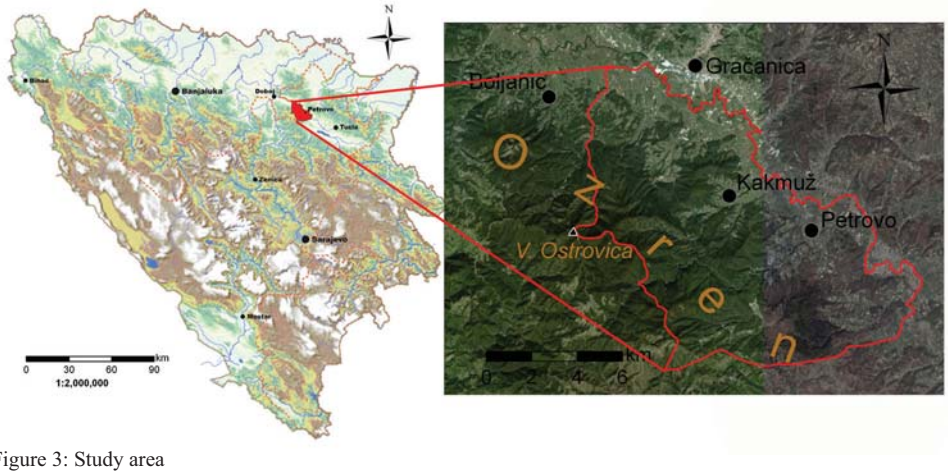

Figure 3: Study area
Karta br. 3: Područje istraživanja

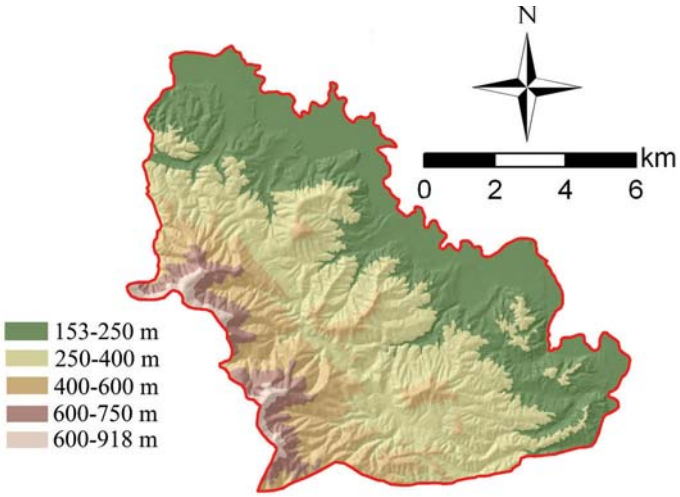

Figure 4: Relief of the study area
Karta br. 4: Reljef područja istraživanja

The majority of massif is covered with the orographycally conditioned mixed pine forests (*Pinetum nigrae-sylvestris*) (Figure 5). Zonal forests of Beech and mixed zonal forests of Beech and Fir are found only fragmentarily on the sites with the deeper soil, and on the higher altitudes. Zonal Oak-Hornbeam forests are developed at the northern mild slopes of Ozren Mt. Those forests as well as edaphically

conditioned forests of white oak are under the strong anthropogenic influence due to their accessibility, so now the belt along the river Spreča is mainly deforested, with the remaining of the hygrophilous vegetation along the river banks. On the dry and warm slopes with acidophilous soil on foothills there is orographically conditioned forest of sessile oak.

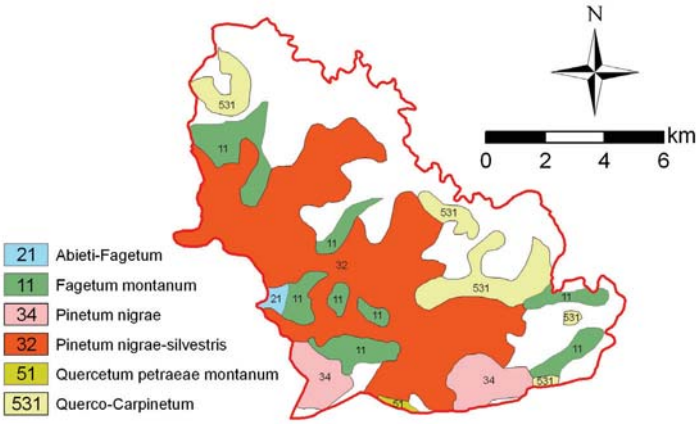

Figure 5: Real vegetation (Stefanović & Beus, 1980)
Karta br. 5: Realna vegetacija (izvor: Stefanović i Beus, 1980.)

The Ozren Mt. is made up mainly of ultramaphic rock (peridotite and serpentinite). The northwestern part of the mountain is made up of the upper Cretaceous sediments, mainly limestone, carbonated flysch and rarely flinstone. In the River Spreča basin there are alluviums. The dominant soil type is eutric cambisol on peridotite. Along the River Spreča there are fluvisols, while at the mild NE slope of Ozren Mt. there is pseudogley. (Figure 6)

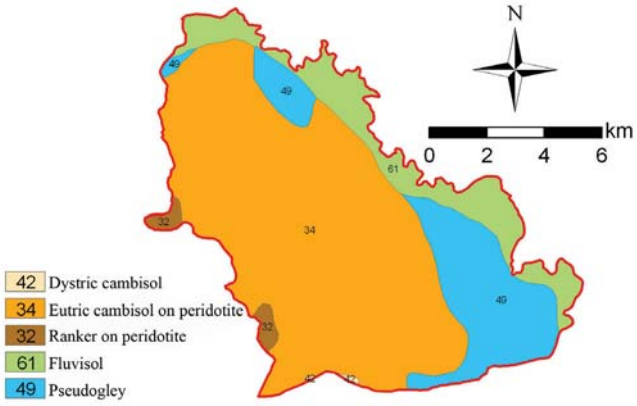

Figure 6: Pedology (Burlica & Vukorep, 1980)
Karta br. 6: Pedologija (izvor: Burlica i Vukorep, 1980.)

Ozren Mt. is located at the meeting point of two large ecological-vegetation units (Stefanović et al., 1983): Peripannonian and area of the inner Dinarids. For the major part of the year this area is under the influence of the changed temperate-continental climate. The ratio beetwean the precipitation and potential evapotranspiration is favourable from the aspect of the forest vegetation. Data for Petrovo Meteorological Station for the period 2001 to 2008 shows that the mean annual air temperature is 9.6°, and the mean air temperature in the vegetation period is 14.9°. The total annual precipitation is 919.2 mm, out of which 585.3 mm, or 63.67 %, occurs in the vegetation period.

4. RESULTS AND DISCUSSION

Field research on 109 squares confirmed total of 93 species of trees and shrubs with different distribution patterns over the researched area. Out of this number, 35 are trees, 52 shrubs, 3 vines, 2 dwarf shrubs and 1 epiphyte. Geobotanical spectrum and phytosociological spectrum for every species were determined.

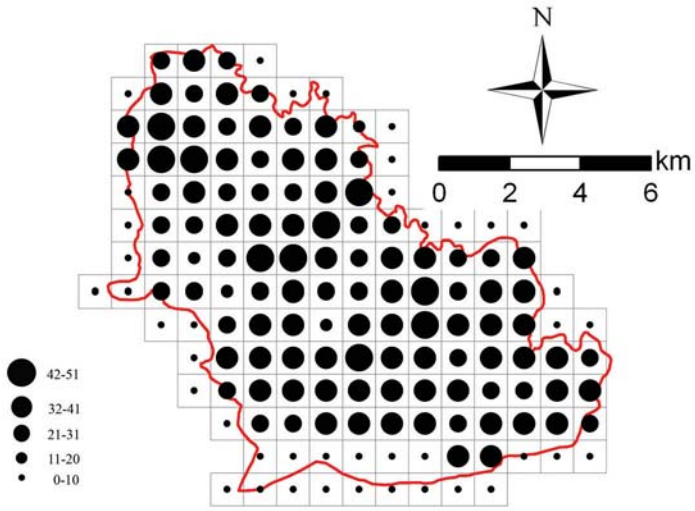

Figure 7: Frequency of recorded species by the sample square
Karta br. 7: Frekvencija pojavljivanja vrsta po kvadratu

4.1. Geobotanical elements spectrum

Geobotanical elements were grouped into higher classes as follows:

Table 1: Geobotanical elements spectrum
Tabela br. 1: Spektar flornih elemenata

Geobotanical element	*No. of species*	*Perc.*
Centraleuropean	38	41%
Euroasian	12	13%
Pontic-Centralasian	13	14%
Atlantic	8	9%
Balkanic	7	8%
Mediterranean and sub-Mediterranean	10	11%
Circumpolar and Cosmopolitan	4	4%
Arctic and Boreal	1	1%

4.2. Phytosociological spectrum

Phytosociological elements were grouped into higher classes as follows:

Table 2: Phytosociological elements spectrum
Tabela br. 2: Spektar cenoelemenata

Group	*No. of species*	*Perc.*
Mesoneutrophilous	25	27%
Chasmophilous	7	8%
Xerothermophilous	11	12%
Hygrophilous	16	17%
Nitrophilous	8	9%
Acidooligophilous	12	13%
Basophilous	11	12%
Frigoriphilous	2	2%
Others	1	1%

4.3. Species recorded

The species recorded are shown from the aspect of their distribution on the study area.

4.3.1. Species with more than 80% of occurrence

Prunus spinosa L. – Heliophilous species of wide ecological amplitude, comes in almost all communities of this area, wherever there is enough light.

Prunus avium L. – Spread in almost all communities of the oak-hornbeam belt.
Crataegus monogyna Jacq. – Xerothermophilous, semiscyophilous species of the wide ecological tolerance. It is very common throughout the whole area of study.
Rubus discolor Weihe & Nees – It is very common in whole area, always around roads, railroads, and on the forest openings.

Acer tataricum L. – Pontic-Pannonian species with its southern boundary in this area. Very common.
Frangula alnus Miller- Hygrophilous species, characteristic for the order *Populetalia albae* Br.-Bl. 1931, species with dubious and poorly investigated ecology. It is very frequent on peridotite and is probably somehow bounded to this substratum, which is interesting because these habitats are very different from those of species typical, which are moist floodplains. Therefore it must be subjected to detailed idio-ecological investigations.

Rubus hirtus Waldst. & Kit.- Very common in all communities of the class *Quercо-Fagetea*, and as the accompanying species widespread in pine forests too. It is not recorded only by the River Spreča.

4.3.2. Species with 70%-80% of occurrence

Sambucus nigra L.- Nitrophilous, mesophilous species, which comes in scrub, forest edges, clearings and burnt areas, habitats which are rich in nitrogen. It wasn't recorded only at the steepest and rockiest parts of area.
Quercus petraea (Mattuschka) Liebl. – Character species of the zonal community of the Oak-Hornbeam forest. It is also edifier in lots of basophilic communities of the alliance *Orno-Ericion* Ht. 1938, as well as in acidophilic communities of the order *Quercetalia roboris-petraeae* R.Tx. (1931) 1937. The species wasn't registered only on few squares in River Spreča basin.

Carpinus betulus L. - Character species of the zonal community of the Oak-Hornbeam woods. In the Pine forests it is very scarcely distributed.
Rubus candicans Weihe ex Reichenb. – Very similar to the species *Rubus discolor*, morphologically and ecologically with which it was found in the study area.

Alnus glutinosa (L.) – Heliophilous, hygrophilous and hydrophilous species, which was found at moist habitats near the Spreča river and along the mountain water streams.
Clematis vitalba L. – Mesophilous species, which is very common in the forests and scrubs of the Oak-Hornbeam and Beech belt. It wasn't registered in Pine forests.
Corylus avellana L. – Mesophilous species common in the forests and scrubs of the Oak-Hornbeam and Beech belt, where the forest canopy is sparse. It wasn't registered in Pine forests.

4.3.3. Species with 60%-70% of occurrence

Cornus sanguinea L. - Mesohygrophilous species which was found in all communities of the studied area.

Pinus nigra Arnold – Xerotermophilous species which finds its optimum on steep slopes and shallow rocky soils. Dominant species of the large part of the studied area.

Fraxinus ornus L. - Character species of xerothermophilous forests of the order *Quercetalia pubescentis*. In the study area it appears on all xerothermophilous stands.
Ligustrum vulgare L. - Mesophilous species, distributed over all mesophilous stands of the Oak-Hornbeam belt.

Pyrus piraster Burgsd. – Found in meso-xerothermophilous stands of the whole study area.

Fagus sylvatica L. - Mesophilous species of the wide ecological amplitude, particularly regards the substratum. Found in all habitats, except for those most xerothermophilous, and hygrophilous.

Salix capraea L. - Heliophilous and nitrophilous pioneer species, common at the forest clearings. It wasn't found only on the driest stands.

Betula pendula Roth. - Heliophilous, acidophilous, pioneer species. It wasn't found only in the driest stands, and those with climax stadium of vegetation.

Erica carnea L. - Basophilous species which in Bosnia comes mostly on serpentinite. Typical species of Pine forests on shallow soil.

Populus tremula L. - Heliophilous, mesophilous, pioneer species that was found in the most of the mesophilous stands.

4.3.4. Species with 50%-60% of occurrence

Euonymus europaeus L. – It was registered in the basin of the Spreča river, as well as in the mesophilic part of the Ozren, up to the montane belt.

Pinus sylvestris L. – Xerophilous, heliophilous species, found along with the *Pinus nigra* for the major part of the study area.

Sorbus torminalis (L.) Crantz – Thermo-mesophilous species which is common in the forests and scrubs of the Oak-Hornbeam and Beech belt.

Rosa canina L. – It is common in lots of sample squares up to the montane belt.

Rosa arvensis Hudson – This species is here common in the thermophilous and mesophilous sessile oak forests, as well as in the mesophilous stands of the Pine belt.

Quercus cerris L.- Character species of the xerothermophilous forests of the order *Quercetalia pubescentis* Br.-Bl. (1931) 1932, in the study area found inside the sessile oak forests of the Ozren foothills.

4.3.5. Species with 40%-50% of occurrence

Chymaecytisus hirsutus (L.) Link – Character species of the order *Quercetalia pubescentis.*

Genista ovata Waldst. & Kit. - Character species of the order *Festucetalia valesiacae* Br.-Bl. et Rtx. 1943

Juniperus communis L. – It was found on dystric cambisols in degraded oak forests, as well as on deeper illuviated soils in Pine forests.

Calluna vulgaris (L.) Hull – Similar distribution as the preceding species.

Malus sylvestris Miller – sporadically found in all mesophilous forests.

Acer campestre L. - Character species of the alliance *Carpinion betuli illyrico-moesiacum*, but it was found in all mesohygrophilous stands of the order *Populetalia albae*.

Fraxinus excelsior L. - Character species of the alliance *Fraxino-Acerion*. However here it was found on the mesohygrophilous habitats of the order *Populetalia albae*, which is at least surprising.

Salix alba L. - Character species of the alliance *Salicion albae*. Distributed on the fluvisols of the Spreča river banks and lower flows of the mountain streams.

4.3.6. Species with 30%-40% of occurrence

Hedera helix L. – Found in the habitats with higher relative air moisture.

Quercus robur L. - Character species of the order *Querco-Fagetea* and lowland periodically flooded forests. It was found in moist habitats of the Spreča river basin, where is anthropogenically very reduced. However its presence is evident in the sessile oak forests of the foothills.

Salix fragilis L. - Character species of the alliance *Salicion albae*. Distributed on the fluvisols of the Spreča river banks and lower flows of the mountain streams.

Rubus caesius L. - Character species of the order *Salicetalia purpuraeae*, hygrophilous, distributed in wet habitats of the Spreča river basin, and additionally spread across the tertiary ecosystems (arable land, ditches etc.).

Juglans regia L. – This species is most probably not autochthonous, but it is sub-spontaneously spread over nitrophilous and shaded habitats.

Solanum dulcamara L. - Character species of the order *Alnetea glutinosae*, mesophilous and hydrophilous species distributed over the moist places up to the 300 m.

Populus nigra L. - Character species of the alliance *Salicion albae*, hygrophilous species distributed in wet habitats of the Spreča river basin.

Species with 20%-30% of occurrence

Viburnum opulus L. – hygrophilous species, in the study area found in the most of wet habitats.

Acer pseudoplatanus L. – Mesoneutrophilous species which in the study area comes on the colder habitats of the Beech-Fir belt.

Salix cinerea L. - Hygrophilous species of the swamp scrubs, which was found in the wet meadows of the Spreča river basin.

Salix purpurea L. - It is distributed along the Spreča river, as well as along the mountain streams up to the mountain belt.

Rubus canescens DC. – Thermophilous species which in this case comes in the Pine forests.

Ulmus laevis Pallas – Only by the Spreča river.

Vitis sylvestris (C. C. Gmelin) Hegi - It is distributed along the Spreča river, as well as along the mountain streams up to the mountain belt.

Prunus cerasifera Ehrh. – Mesophilous and heliophilous species which occupies open sites in the Oak-Hornbeam belt.

Tilia tomentosa Moench – Heliophilous and thermophilous species, most common in warmer forests of the Oak-Hornbeam belt in the Pannonian part of Bosnia, which is the matter in this case too.

4.3.7. Species with 10%-20% of occurrence

Vaccinium myrtillus L. - It was found on the soils with acidic reaction over 700 m, and on the basic substrata wherever the A-horizon holds the raw humus.

Tilia cordata Miller – It was found in the belt of the montane Beech forests as well as in the belt of Oak-Hornbeam.

Populus alba L. – Hygrophilous species that was found rarely only by the Spreča river.

Ulmus glabra Hudson – Mesophilous mountain species which comes most commonly on the colder habitats of the Beech-Fir belt.

Hypericum androsaemum L. – Differential species of the sub-montane beech forests of the *Primulo-Fagenion*, found strictly in the Peri-Pannonian area of the Bosnia. As expected, rare, relict species.

Rosa pendulina L. – In the study area it was found only in the mesophilous Beech-Fir forests of the highest belt.

Abies alba Miller – Mesophilous species which presence in this part of Bosnia corresponds to its distribution on the other Peri-Pannonian mountains of the northern B&H (Kozara, Uzlomac, Trebava i Majevica). Here, its areal is anthropogenically reduced.

Spiraea chamaedryfolia L. – Mesophilous, semi-scyophilous species of rocky habitats, common on the peridotite-serpentinite complexes of the northern Bosnia.

Rubus idaeus L.- Heliophilous species, characteristic for the order *Epilobietalia angustifoliae* R.Tx.et Preising 1950. It is found in the montane and sub-alpine belt which is the case here too.

4.3.8. Species with less than 10% of occurrence

Chamaecytisus austriacus (L.) Link – Character species of the sub-alliance *Orno-Ericenion serpentinicum.* In the study area found on the higher altitudes.

Genista pillosa L. - Heliophilous and xerophilous species. Found in the belt of Sessile oak and Pine, on silicate substrata and warm and dry habitats.

Rubus plicatus Weihe & Nees – Character species of the class *Alnetea glutinosae*.

Rubus macrophyllus Weihe & Nees - Character species of the alliance *Berberidion vulgaris*.

Castanea sativa Miller – Differential species of the acidophilic forests of the alliance *Quercion roboris-petraeae*. Unexpected in this area, found rarely in the Oak-Hornbeam belt, on warmer expositions and deeper soils with acidic reaction.

Ulmus minor Miller – It is referred to as the characteristic species of the xerothermophilous oak woods of the alliances *Aceri tatarici-Quercion* and *Quercion farnetto-cerridis*. Unlike *Ulmus effusa* this species comes on dryer habitats of the lower zone of the study area.

Ruscus hypoglossum L. – Differential species of the association *Abieti-Fagetum praepannonicum*, relict, mesophilous and scyophilous species which in the study area comes in the belt of Beech-Fir woods.

Sorbus aucuparia L. - Comes in the belt of Beech-Fir woods, otherwise, common species on peridotite substratum.

Ruscus aculeatus L. – Xerothermophilous species, common in the Mediterranean woods, and oak woods of Peri-Pannonic area. Found in oak woods in north-western part of the study area.

Viscum album L. – Only in western part of the study area.

Daphne blagayana Freyer – Balkan endemic species, typical species of the pine forests on peridotite of the B&H.

Rosa pimpinellifolia L. – Characteristic species for the order *Erico-Pinetalia*, i.e. scrubs and woods of the pine belt.

Chamaecytisus ciliatus (Wahlenb) Rothm. - Characteristic species for the class *Erico-Pinetea*.

Genista januensis Viv. - Characteristic species for the class *Erico-Pinetea*, found on the rocks of the most xerothermophilous habitats.

Genista tinctoria L. – Found on mesophilic and acidophilic oak habitats at the edge of the River Spreča valley.

Viburnum lantana L. – Xerothermophilous species, found on dry habitats of the northwestern parts of study area.

Cornus mas L. - Xerothermophilous species, found on carbonated flysch.

Cytisus procumbens (Waldst. & Kit. ex Willd.) Sprengel – Acido-xerothermophilous species.

Rosa glutinosa Sibth. & Sm. – Extremely rare species in the study area. Only two specimens were found.

Rubus radula Weihe ex Reichenb. (incl. *R. gizellae*) – It comes rarely along the forest roads and ruderal places along with other species of *Rubus*.

Crataegus laevigata (Poiret) DC. – Found on few places in mesophilous Oak-Hornbeam woods along the edge of the Spreča river valley.

Lembotropis nigricans (L.) Griseb. – Rare species in the study area. Found in several smaller groups in the western part.

Acer platanoides L. – Only one specimen in Beech-Fir wood.

Chamaecytisus supinus (L.) Link – Character species of the order *Calluno-Ulicetalia*. Extremely rare. Found only on acidic soil in degraded sessile oak wood.

Ostrya carpinifolia Scop. – Xerothermophilous species found only in one place on the ridge in the Pine wood belt.

Rosa gallica L. – Heliophilous, basophilous species, found in only one place at steep clearings in the Pine belt.

Rubus bifrons Vest. ex Tratt. – Only one specimen.

Salix eleagnos Scop. – Found on few places along the mountain streams.

Sambucus racemosa L. – Found in one place in Beech-Fir belt.

Staphylea pinnata L. – Differential species of the highly neutrophilous Oak-Hornbeam woods. Found only in one spot at the edge of the Spreča river valley, on carbonated flysch.

5. CONCLUSION

During the field research in the Management Unit “Ozren”, Forest office “Petrovo”, 93 woody species were found, out of which 35 are trees, 52 shrubs, 3 vines, 2 dwarf shrubs and 1 epiphyte.

The species with the highest frequency are those of Centraleuropean geobotanical element (41%) and Eurasian (13%), which was expected. High percent of Pontic-

Centralasian species (14%) is explained by the strong influence of continental climate and exposure of the area to the Pannonian plane. Sub-Mediterranean element which is presented with 11%, speaks about xerotermophilous character of the area, while atlantic element (9%) tells about the confrontation of the three distinct climate types: wet atlantic, dry continental, and warm mediterranean. Share of Balkan element (8%) is significant, while circumpolar and cosmopolitan come with 4%, and arctic and boreal with 1%.
Regarding the phytosociological elements, mesoneutrophilous and hygrophilous species are most frequent and come with 27% and 17% respectively. Bedrock and relief caused the significant number of basophytes 12% and thermoxerophytes 12%, while acido-oligophilous species come with 13%. Presence of chasmophilous and nitrophilous species is significant, 8% and 9%, respectively, while frigoriphilous and others come with 3%.

Presence of the species such as *Rosa glutinosa*, *Castanea sativa*, *Cornus mas*, *Frangula alnus* (at higher altitudes and xerotermophilous sites very common), *Rubus radula* and *Rubus bifrons* is very interesting regarding the ecological conditions. On the other side the absence of the *Tilia platyphyllos* and species of the genus *Lonicera* distinct these Peripannonic forests of the sub-alliance *Primulo-Fagenion* out of the typical dinaric Beech forests of the sub-alliance *Lonicero-Fagenion*. It jumps to focus that *Ostrya carpinifolia*, *Chamaecytisus austriacus* and *Rosa pimpinellifolia* are very rare, although they are very common at the neighboring serpentine mountains (Brujić, 2003).

Daphne blagayana has not been recorded in this area until now, and in this part of Bosnia it reaches its northern limit of distribution.

On the basis of data gathered in the field form 109 square samples, 68 distribution maps of dendro-species for the study area were made. We hope that this will give the contribution to the mapping of the woody species in Republic of Srpska which was our main goal.

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HOROLOGIJA AUTOHTONIH DRVENASTIH VRSTA NA PODRUČJU GAZDINSKE JEDINICE „OZREN“, ŠUMSKE UPRAVE „PETROVO“ – IMPLEMENTACIJA GIS TEHNOLOGIJE

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Rezime

U radu je prikazana horologija autohtonih drvenastih vrsta na području Gazdinske Jedinice „Ozren“, Šumske Uprave „Petrovo“, u sjevernoj Bosni. Vrste su kartirane GIS tehnologijom, pomoću mreže kvadrata veličine 1x1 km, postavljene u Državnom pravouglom koordinatnom sistemu, u šestoj zoni. Na ukupno 109 kvadrata zabilježene su 93 drvenaste vrste od čega je 35 vrsta drveća, 52 žbuna, 3 povijuše, 2 polužbuna i 1 epifita. Najzastupljenije su vrste srednjeevropskog (41%) i evroazijskog (13%) flornog elementa. Visok postotak pontsko-centralnoazijskih vrsta (14%) objašnjen je snažnim uticajem kontinentalne klime i izloženošću područja Panonskoj niziji. Submediteranski i atlantski florni element govore o sukobljavanju tri klimatska tipa: vlažnog atlantskog, suvog kontinentalnog i toplog mediteranskog. Spektar cenoelemenata govori otkriva da su najrasprostranjenije mezoneutrofilne (27%) i higrofilne vrste (17%). Matični supstrat i reljef prouzrokovali su značajan udio bazifita 12% i ksero-termofita (12%), dok su acido-oligofite zastupljene sa 13%. Takođe je značajno i prisustvo hazmofita (8%) i nitrofita (9%). Interesantno je prisustvo vrsta kao što su: Rosa glutinosa, Castanea sativa, Cornus mas, Frangula alnus (uobičajena na toplijim staništima većih nadmorskih visina), Rubus radula i Rubus bifrons jer područje istraživanja ne odgovara njihovim uobičajenim stanišnim uslovima. Uočljivo je da su vrste kao što su: Ostrya carpinifolia, Chamaecytisus austriacus i Rosa pimpinellifolia veoma rijetke, iako su uobičajene na susjednim serpentinskim masivima (Brujić, 2003). Daphne blagayana nije bila do sada zabilježena u ovom području, koje je inače najsjevernije nalazište ove vrste u BiH.

Na osnovu podataka prikupljenih na 109 kvadrata na terenu, napravljeno je 68 areal karata dendro-vrsta na području istraživanja. Nadamo se je ovo istraživanje doprinos kartiranju drvenastih vrsta u Republici Srpskoj (i šire) što je bio naš glavni cilj.