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TOM 61-62

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THE ENDANGERMENT OF THE ECOSYSTEM DIVERSITY OF GRDELICHKA GORGE AND VRANJSKA BASIN OWNING TO THE ANTHROPOGENIC FACTOR

Sonja BRAUNOVIC, Mihailo RATKNIC[1]

Abstract: *This paper presents the ecosystem diversity, demographic and social-economic changes in southeastern Serbia over the period 1948-2010 (Grdelichka Gorge and Vranjska Basin), as well as the analyses of the changes of the ecosystem diversity owning to the anthropogenic factor.*

The following groups of sites were reported in the observed area:

D - mire, bog and fen sites; E- grassland and tall forb sites; F - heathland, scrub and tundra sites; G - forests and forests sites and other reforestated areas; H – inland unvegetated or sparcely vegetated sites; I- regularly or recently cultivated agriculture, horticultural and domestic sites; J - constructed, industrial and other artificial sites.

The migration trends over the oberved period also caused the different degrees of endangerment of the natural sites in this area, for the benefit of the sites formed by the anthropogenic influences. Mire, bog and fen sites, as well as grassland and tall forb sites are particularly endangered.The scrub and forest sites are degraded to a great extent.

Key words: endangerment of the ecosystem, sites, anthropogenic influences, migration trends

1. INTRODUCTION

"The settlements located at the highest altitudes in Chemernik (Procholovci, Jovanovci, Bajinci, Mlachishte, Ostrozub, Dobro Polje, Bistrica, Ruplje, Borovik, Machakatica, Troskach and Vlasinske mahale) have been almost

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deserted over the last thirty or more years, the schools in them have been closed, the life has faded away.

The Vlasinska and Crnotravska villages are empty, the people have moved out. There are no sheep flocks, no cattle herds, no horses. There are no people. The roads are overgrown with the grass. The villages in the lower regions of Grdelichka Gorge and lower coarse of the Vlasina River are still populated". (Petrovic, 2007). It has resulted in the change of the intensity of the effect of the anthropogenic factor on the ecosystems, both terrestrial and aquatic.

2. OBSERVED AREA

Grdelichka Gorge and Vranjska Basin area is located between 42°22' and 42°55' north latitude and between 19°21' and 20°0' eastern longitude. It mainly spreads in the direction southwest-northeast, is about 60 km long, and occupies 173,261 hectares. It is located at the altitudes ranging from 256 to 1,923 meters above the sea level. In the altitudinal zone ranging from 700 to 1,000 meters above the sea level 27 % of the area is located, in the zone above 1,000 meters above the sea level about 25 %, in the zone ranging from 500 to 700 meters above the sea level 24 %, in the zone ranging from 300 to 500 meters above the sea level 23 %, and in the zone up to 300 meters above the sea level about 1% (Braunovic et al, 2010). The area can be divided into three climate zones: the first one refers to Vranjska Basin and wide river valleys, the second one to mountain area, and the third one to Grdelichka Gorge. Vranjska Basin and southern part of the area are exposed to the Mediterranean influences along the Vardar valley, whereas in the regions located at the higher altitudes the mountain climate with very long and severe winters and a great quantity of snow is dominant. Summers are short, with somewhat higher amount of precipitation that in the basin.The annual sum of precipitation ranges from 564.1 (Klenike) to 999.4 mm (Kriva Feja).

3. METHOD

The system of classification of sites in Serbia is based on the EUNIS classification. The sites which are within the EUNIS system kept the same names and codes, whereas the sites which do not occur within the EUNIS system got the new names and codes, thereby mainly keeping the EUNIS logics of naming. The new codes are integrated in EUNIS system of classification. Each site also got the suitable new code, relevant to the national system of classification (Lakushic et al, 2005). The creation of this system is aimed at the establishment of the referential data base on the species, sites and areas, which are the base of the Birds Directive and Habitats Directive for NATURA 2000 network, and EMERALD network of Berne Convention network, which is similar to it and is also used during the development of indicators (EEA Core Set et al.) and creation of the report on the environmental condition. The analysis of the change of the population, altitudinal distribution of settlements and population are based on the data obtained by the censuses from 1948, 1953, 1961, 1971, 1981, 1991, and 2002.

4. RESULTS

The increase in the population of Grdelichka Gorge and Vranjska Basin is typical for all inter-census period up to 1991, and over the last inter-census period (1991-2002), the stagnation was reported in all area. The decrease in the population over this period was reported in the municipalities Bujanovac and Surdulica, and in the part of the area which belongs to the municipalities Leskovac and Crna Trava. The stagnation was reported in the municipality Vladichin Han, whereas there was a constant increase of the population in the municipality Vranje, and the number doubled in 2002 in comparison with 1948 (Braunovic, Ratknic 2010/a).

The data on the population per municipalities and census years are preserved in the Table 1.

Table 1. *The population per municipalities and census years*

Municipality	1948	1953	1961	1971	1981	1991	2002
Leskovac	12776	13070	14063	14242	14055	13229	12366
Crna Trava	2352	2297	2069	1292	727	359	199
V. Han	24946	25927	26074	25231	25441	25253	23710
Surdulica	17305	20057	19467	19662	21098	21260	19738
Vranje	48388	51173	54841	63160	75571	80778	84004
Bujanovac	20841	22185	23630	26915	29929	33137	29324
Total	126608	134709	140144	150502	166821	174016	169341
The analysis of the population was done based on the data for the following municipalities (parts of the municipalities) which belong to the observed area: Leskovac 25 settlements, Crna Trava 7 settlements, Vladičin Han 51 settlements, Surdulica 25 settlements, Vranje 80 settlements and Bujanovac 33 settlements. The data were collected and analyzed for 221 settlements.							

The altitudinal distribution of the settlements directly depends on the topographic characteristics of the area, so in the altitudinal zone above 500 meters 136 settlements (61.5%) are located. The majority of settlements is located in the altitudinal zone ranging from 300 to 500 meters, i.e. 84, which is followed by the altitudinal zones ranging from 500 to 700 meters - 58 settlements, and in the altitudinal zone ranging from 700 to 1,000 meters - 50 settlements.In the altitudinal zone above 1,000 meters 28 settlements are located, and in the zone up to 300 meters only one settlement (Table 2).

Table 2. *Altitudinal distribution of settlements and population*

Altitudinal zone	Number of settlements	%	Population per census years							Projection for 2021
			1948	1953	1961	1971	1981	1991	2002	
Up to 300	1	0.45	11252	13465	17999	28613	44094	51215	55052	61800
300-500	84	38.01	54699	57515	60052	64296	71527	79109	76611	72313
500-700	58	26.24	26335	28129	28462	28289	28858	27912	25532	22107
700-1000	50	22.62	22119	22747	21415	19177	16023	12116	9933	6962
>1000	28	12.67	12203	12853	12216	10127	6319	3664	2213	373
	221	100.00	126608	134709	140144	150502	166821	174016	169341	163555

Due to the intensive processes of depopulation, the greatest changes have occurred in the altitudinal zones up to 300 meters and above 1,000 meters. In the zone up to 300 meters the population until1948 increased by 4.9 times, whereas in the altitudinal zone above 1,000 meters it decreased by 5.51 times. In the altitudinal zone ranging from 700 to 1,000 meters the population decreased by 2.2 times, in the zone ranging from 500 to 700 meters by 0.96 times, and in the zone ranging from 300 to 500 meters the population increased by 1.32 time in comparison with 1948.

The process of redistribution of population has resulted in the increase of the urban and decrease of rural population, creation of the areas of demographic growth (cities) and areas of decline (majority of rural settlements) and in the change of the ways in which the land is used.

Given the fact that Grdelichka Gorge and Vranjska Basin area is one of the most erodible areas in Serbia, in order to alleviate the erosional processes (Law on Soil Protection from 1953), the intensive reforestation by using broadleaf and coniferous species was done, thereby creating the artificial anthropogenic forest ecosystems. Some highly invasive species (Robinia pseudoacacia, Amorfa frutisoca, Ailathus glandulosa, etc.), which by their presence exert additional pressure by spreading into the natural ecosystems, thereby endangering their survival and altering their structure, were used.

Along with the above demographic changes and anthropogenic influence in the observed area, the following sites were reported:

D - MIRE, BOG AND FEN SITES

D2 - Valley mires, poor fens and transition mires

D2.2 - Poor fens

D2.26 - Mires with common cottongrass (Eriophorum angustifolium) - Reported in Vlasinska Plateau, on the siliceous bedrock at the altitudes ranging from 1,200 to 1,900 meters

D2.3 - Transition mires and quaking bogs

D2.37 - Rhynchospora alba quaking mires - Reported in Vlasinska Plateau, Chemernik and Ostrozub, on the siliceous bedrocks and red Permenian sandstone, at the altitudes ranging from 1,200 to 1,520 meters.

D2.3I - Eastern Balkan sphagnum (Sphagnum) quaking bogs

D2.3I1 - Eastern Balkan (Sphagnum) - (Drosera rotundifolia) quaking bogs - Reported in Vlasinska Plateau, Chemernik and Ostrozub, at the altitudes above 900 meters.

E – GRASSLAND AND TALL FORB SITES

E1 - Dry grassland

E1.7 - Non-Mediterranean dry acid and neutral closed grassland

E1.76 - Dry sub-continental silicate steppe grassland

E1.761 - **Dry sub-continental silicate steppe grassland on which Chrysopogon gryllus is dominant** - The relatively frequent type of site on the siliceous bedrock in this area. They were reported in Grdelichka Gorge (Palojce, Sushevljane, Predejane, Lichin dol, Grdelica), in Kukavica, Vardenik (Vrebovo, Sebevranje) and in the hilly regions of Besna kobila. The associations are

developed on the dry siliceous terrains, at the altitudes ranging from 300 to 900 meters, mainly on the flattened terrains or less inclined slopes, acid soils on sandstones, lake clays, crystalline schists, micaschists, marls or daci-andesites. These sites are warm, dry and used to be occupied by the climatogenic associations Quercion frainetto, which have been cleared.

E1.763 - Dry sub-continental silicate steppe grassland dominated by Danthonia calycina - The relatively frequent type of site on the siliceous terrains of Grdelichka Gorge and Ostrozub. These formations are mid-high, closed, floristically rich, herbaceous and steppe-like, dominated by Danthonia calycina. The associations develop at the altitudes ranging from 800 to 1,200 meters, mainly on the flattened terrains or less inclined slopes, on the acid soils, in the moderate-continental climate conditions. These sites are warm, dry and used to be occupied by the climatogenic associations Quercion frainetto, which have been cleared.

E1.9 - Non-Mediterranean dry acid and neutral open grassland, including inland dune grassland

E1.92 - Perennial open siliceous grassland

E1.921 - Dry sub-continental open siliceous steppe grassland. The site was reported in Kukavica. It occurs on the siliceous bedrock, on the different shallow acid soils, at the altitudes ranging from 350 to 1,100 meters.

E1.923 - Dry sub-Mediterranean open siliceous sites on which clovers are dominant. The site was reported in Kukavica on the siliceous bedrocks. It occurs on the different types of shallow acid soils, at the altitudes ranging from 400 to 700 meters.

E3 - Seasonally wet and wet grasslands

E3.3 - Sub-Mediterranean humid meadows

E3,31 - Helleno-Moesian riverine and humid (Trifolium) meadows.

E3.31C - Helleno-Moesian riverine and humid meadows dominated by clovers - The site was reported in Kukavica, on different types of humid soils on the siliceous bedrock. It occurs at the altitudes ranging from 250 to 350 meters.

E3.4 - Moist or wet eutrophic and mesotrophic grassland

E3.41 - Atlantic and Sub-Atlantic humid meadows

E3.411 - Sub-Atlantic humid meadows dominated by Scirpus sylvaticus. The site was reported in Vardenik, Vlasinska Plateau, Ostrozub and Chemernik. It occurs on the different bedrock (silicate, red Permenian sandstones, granodiorites), at the altitudes ranging from 350 to 1,600 meters.

E3.43 - Subcontinental riverine meadows

E3.431 - Subcontinental riverine meadows with (Deschampsia cespitosa). The sites are exposed to the long-lasting floods, and ocassionally susceptible to drying, but the level of the ground waters are constantly high. They occur at the altitudes up to 1,350 meters, on the typically fen soil. They were reported in Vlasinska Plateau.

E4 - Alpine and Sub-Alpine grassland

E4.3 - Acidophilous Alpine and Sub-Alpine grassland

E4.31 - Alpine (Nardus stricta) and related herbaceous associations

E4.312 - Moesian Northern-Scardo-Pindic Sub-Alpine (Nardus stricta) herbaceous associations. The site was reported in Besna Kobila, Stresher

(Vardenik), Chemernik and Ostrozub. These associations mainly develop on the silicates, at the altitudes above 1,100 meters.

E4.39 - Oro-Moesian acidophilous grassland

E4.392 - Moesian -Northern-Scardo-Pindic acidophilous Alpine and Sub-Alpine grassland

E4.3923 - Moesian – Northern-Scardo-Pindic Alpine and Sub-Alpine (Sesleria comosa) grass associations on silicates. The associations mainly develop on silicates, in the Sub-Alpine and Alpine zone at the altitutudes above 1,500 meters. The site was reported in Besna kobila.

E4.3925 - Moesian-Northern-Scardo-Pindic Alpine and Sub-Alpine Festuca paniculata) grass associations on silicates. The associations mainly develop on silicates, at the altitudes above 1,300 meters. The site was reported in the Vlasinska Plateau (Crkvena planina, Plana, Veliki Stresher, Golema Ravnica, Besna Kobila, Prosechenica).

E4.3926 - Moesian-Northern-Scardo-Pindic Alpine and Sub-Alpine (Festuca vallida) grass associations on silicates. They mainly develop on the siliceous bedrocks (micaschits, granite-gneiss), at the altitudes ranging from 1,500 to 1,900 meters. The site was reported in Vlasinska Plateau (Veliki Stresher, Besna Kobila, Ostrozub, Chemernik, Crkvena planina).

E6 - Inland saline sites on which grass and herbaceous plants are dominant

E6.2 - Continental inland saline sites dominated by grass and herbaceous plants

E6.23 - Central Eurasian solonchak grassland dominated by (Crypsis)

E6.231 - Sandy- sladgy saline sites with (Acorellus pannonicus) around saline wells and ponds were reported in Aleksandrovachka Saline (near Vranje). This is slatine vegetation of the ephemeral character. In the late summer the sites become dry, chapped and clear areas devoid of vegetation.

E6.24 – Central Balkan salines and saline steppes. In the observed area the site was reported in many plots (Aleksandrovachka Saline, Neradovachka Saline, salines near Oslar and Bujanovac)

F - HEATHLAND, SCRUB AND TUNDRA SITES

F2 - Arctic, Alpine and Sub-Alpine scrub sites

F2.2 - Evergreen Alpine and Sub-Alpine heaths and scrub sites

F2.23 - Southern-Palaearctic mountain dwarf scrubs with junipers (Juniperus)

F2.231 - Balkan Sub-Alpine scrub land dominated by Siberian juniper and Dwarf Japanese Garden Juniper (Juniperus sibirica) = (Juniperus nana). The site was reported in Besna kobila and Stresher, in the Sub-Alpine zone at the altitudes above 1,500 meters.

F2.26 - (Bruckenthalia) heaths. They were reported in Besna kobila, Mali and Veliki Stresher. The association develops on the siliceous bedrock at the altitudes above 1,500 meters.

F2.27 - Alpide (Arctostaphylos uva-ursi) and (Arctostaphylos alpinus) heaths. These associations develop on limestone or siliceous bedrock at the altitudes above 1,600 meters, and were reported in Besna Kobila, Mali and Veliki Stresher.

F2.2A - Alpide high mountain heaths with dwarf bilberries

F2.2A1 - Balkan high mountain heaths with bog bilberry (Vaccinium uliginosum). These associations develop on the siliceous bedrock (more rarely on limestones), at the altitudes above 1,700 meters, and were reported in Vlasinska Plateau (Veliki Stresher) and Besna kobila.

F3 – Temperate and Mediterranean montane scrub sites

F3.1 - Temperate thickets and scrub sites

F3.17 – Common hazel thickets - Lowland, hilly and mountain tall scrub associations usually with the the dense canopy. The associations are mainly the degradation phases of the different types of forests in the zone of moderate broadleaf forests.

F3.2 – Mediterranean - montane broadleaf deciduous thickets

F3.24 - Subcontinental and continental deciduous thickets

F3.242 - Balkan subcontinental deciduous thickets

F3.242C - Balkan subcontinental broadleaf oriental hornbeam thickets Carpinus orientalis) -Densely groupped, closed or scattered and open 2-3 m tall deciduous thickets. The associations develop on limestone, acid silicated (granite, red sandstone) or serpentinites and peridotites on shallow and poor soils, in the transitional Sub-Mediterranean- Subcontinental climate conditions, at the altitudes up to 1,400 meters.

F3.242E - Balkan subcontinental deciduous hop hornbeam thickets (Ostria carpinifolia). Densely groupped, closed or scattered and open 2-3 m tall deciduous hop hornbeam thickets. These associations are developed on the limestone, and less frequently on the acid silicates, on the shallow and poor soils, in the transitional Sub-Mediterranean-Subcontinental climate. Very porosous limestone bedrock and degraded soil cover enable the undisturbed plunge of the surface water, and thereby increase the degree of drought on the sites. The associations were reported at the altitudes ranging from 500 to 1,400 m.

F9 - River and fen scrubs

F9.1 - Willow scrubs (Salix) near brooks and lakes

F9.11 - Orogenic rosemary willow scrubs (Salix eleagnos). Densely groupped, usually closed, less frequently opean and scattered 2-3 m tall deciduous scrub associations. They occur as the narrow stripes along river cources. They develop on the different types of alluvial deposits, mainly on the limestone bedrock on which gravel and coarse sand are dominant, by the shores of the fast and cold mountain brooks and small rivers in which the level of water is relatively high during the summer months as well, or the level of water siginificantly decreases during the summer months, so the bedrock is to a great extent dry, loose and well-aerated. As a result of of the well-developed hydrographic network of the area, the association is frequently found.

FA - Hedgerows (FA.1 Hedgerows with exotic species, FA.2 Highly-managed hedgerows of native species, FA.3 Hedgerows rich in native species, FA.4 Hedgerows poor in native species)

FB - Shrub plantations (FB.1 Shrub plantations for whole-plant harvesting, FB.2 Shrub plantations for leaf or branch harvesting, FB.3 Shrub plantantions for ornamental purposes or for fruit, other than vineyards, FB.31 Shrub and low-stem tree orhards, FB.32 Ornamental shrub plantations, FB.4 Vineyards).

G - WOODLAND AND FOREST SITES AND OTHER WOODED LAND

G1 - BROADLEAF DECIDUOUS FORES

G1.1 - Riparian willow (Salix), alder (Alnus) and birch (Betula) forests

G1.11 - Riverine willow (Salix) forests

G1.111 - Mid-European white willow forests (Salix alba). Gallery forests with the low tree layer and thinning canopy, or less frequently the tree layer which is almost closed, with the tree height over 20 m. The associations occur on the shores of the hilly rivers, on the recent multi-layered alluvial deposit, or, less frequently on the different developmental phases of the hydromorphic gley soils. The soils have been subject to the long-lasting and intensive floods, and the level of the ground water is by rule very high. The sites occur at the altitudes ranging from 200 to 700 m, and are very frequently found in this area.

G1.116 - Fluvial white poplar (Populus alba) forests. Gallery forests with thinning or almost closed tree layer, with the tree height up to 30 m. The associations of this type occur in the driest riparian parts of the alluvial plains, on the temperately dry and light alluvial deposits and different variants of the moderately humid alluvial pararendzines, at the altitudes up to several hundred meters. If the flooding is still present, it lasts considerably shorter than in any other part of the alluvial plain.The ground water is found at the depth exceeding 2 m, so these soils can be regarded as temperately dry.

G1.117 - Fluvial black poplar forests (Populus nigra) – Gallery forests with thinning or almost closed tree layer, with the tree height up to 30 m. The associations occur on the shores of the lowland and hilly rivers, on the dry gley soils and alluvial pararendzines. The soils were flooded for a longer or shorter time, and the level of the ground water is relatively high, it occurs at the depths ranging from 120 to 180 cm. The sites occur at the altitudes up to 500 above sea level.

G1.6 - Beech (Fagus) forests

G1.69 - Moesian beech (Fagus) forests

G1.691 - Moesian collinar beech (Fagus) forests

G1.6914 - Moesian collinar forests with sessile oak (Quercus petraea). Mixed forests with closed or almost completely closed layer of tall trees. Sessile oak- beech forests occur at the transitional sites between northern exposed shaded hollows and southern exposed cliffs and crests, in oak forest zone. The associations develop on different brown and loessivated brown soils.

G1.692 - Moesian mountain acidophilous beech (Fagus) forests with moss. The site was reported in Ostrozub. These forests are mono-dominant, with thinned or less frequently with almost closed layer of tall trees. They occur as the smaller or bigger stands in beech altitudinal zone, at the altitudes ranging from 700 to 1,400 m. They are found at all exposures, by rule on greatly inclined and well-exposed cliffs, on very acid skeletal, dry and low-productive brown soils

G1.6923 - Moesian mountain beech forests with the bilberry (Vaccinium myrthyllus). The site was reported in Ostrozub.These forests are mono-dominant, with closed or almost completely closed layer of tall trees. They occur as smaller or bigger stands in beech altitudinal zone, at the altitudes ranging from 500 to 1,400 m

and all exposures. They are found on highly inclined cliffs, on very acid skeletal, dry and low-productive soils in the initial phases of podzolisation.

G1.6924 - Moesian mountain beech forests with deer fern (Blechnum spicant). They were reported in Ostrozub. These forests are mono-dominant with thinning, or less frequently with almost completely closed layer of tall trees. They occur as smaller or bigger stands in the beech altitudinal zone, at shaded slopes at the altitudes ranging from 500 to 1,400 m, on very acid brown soils.

G1.694 - Moesian mountain neutrophile (Fagus) forests

G1.6941 - Moesian mono-dominant mountain beech forests. They were reported on several sites (in Ostrozub, Chemernik, Kukavica andVlasinska Plateau). These forests are mono-dominant with closed or almost closed layer of tall trees. They occur at the altitudes from 500 to 1,600 m, always as clearly expressed altitudinal zone, occupying terrains of different inclinations and found at all exposures. Depending on the type of bedrock, these forests develop on different types of automorphic soils. Low-acid brown soils occur on silicates, whereas neutral brown soils or rendzines. Depending on the slope of terrain, age of stands and anthropogenic influences, the soils can be either very deep (60-90, and even up to 120 cm), or very shallow and extremely skeletoid.

G1.6943 - Moesian mountain beech forests with cherry laurel (Prunus laurocerasus). The site was reported in Ostrozub. These forests occur at the altitudes from 1,200 to 1,300 m, as small stands on the peculiar sites in the zone of beech altitudinal range, near mountain brooks, in the places with higher air humidity, small oscillations of humidity and temperature, small influence of the wind, cold and drought. These associations develop on silicates (crystalline schists), on the low acid, by rule very deep brown soils, which are very humid.

G1.695 - Moesian Sub-Alpine beech (Fagus) forests

G1.6951 - Moesian mono-dominant Sub-Alpine beech forests - The site was reported in Besna kobila and Stresher. Sub-Alpine beech forests occur at the altitudes between 1,400 and 1,800 m, always as smaller or bigger stands in spruce altitudinal zone, occupying the terrains of different slopes and at all exposures. Depending on the type of bedrock, these forests develop on different types of automorphic soils. Humus-siliceous or acid brown soils are found on silicates, whereas neutral brown soils or rendzines occur on limestones. The soils are by rule shallow and extremely skeletoidal. They are rarely deeper (up to 70 cm).

G1.7 - Thermophilous broadleaf forests

G1.76 - Balkan-Anatolian thermophilous oak (Quercus) forests

G1.761 - Moesian Hungarian oak (Quercus frainetto) and Turkey oak forests

G1.7611 - Typical Hungarian oak and Turkey oak forest. Well-lit forests, with closed or almost closed layer of trees, mainly found on flat or gently inclined, thermophilous terrains of hilly zone, at the altitudes up to 600 m. The bedrock is mainly silicate, and deep brown soils occur on it.

G1.7614 - Hungarian and Turkey oak with oriental hornbeam (Carpinus orientalis). It was reported in Grdelichka Gorge, the Juzna Morava River area (Kalipanska and Repinska reka) and Kukavica.These forests are well-lit, with closed or almost completely closed layer of trees. The associations mainly occur on gently inclined or steep, thermophilous terrains of hilly zone, at the altitudes up to

700 m. The bedrock is carbonate or siliceous, and different variants of dystric or eutric brown soils, by rule with a high quantity of skeleton, develop on it.

G1.9 - Non-riverine forests with birches (Betula), aspen (Populus tremula), European rowan (Sorbus aucuparia) or common hazel (Corylus avellana)

G1.91 - Birch (Betula) forests on non-marshy terrain

G1.91B – Balkan birch (Betula) forests on non-marshy terrain. The site was reported in Chemernik and Ostrozub. The associations mainly occur on gently inclined, well-exposed terrains, in hilly and lower parts of mountain region, at the altitudes between 700 and 1,300 m. The bedrock is siliceous, and the soils are mainly extremely acid. Birch forests less frequently occur on limestone and eutric soils as well.

G1.2 - Aspen forests (Populus tremula)

G1.922 - Lowland nemoral aspen forests (Populus tremula). Pioneer and sub-climate associations dominated by aspen (Populus tremula). They were located in lowland and hilly areas, on the sites which mainly accompanied acidophilous oak forests.

G1.95 - Aspen (Populus tremula) and birch (Betula) forest with elders (Sambucus). The site was reported in Chemernik and Ostrozub. The associations mainly occur on gently inclined, well-exposed terrains, in hilly and lower parts of mountain regions, at the altitudes between 700 and 1,300 m. The bedrock is siliceous, and the soils are mainly extremely acid.

G1.A - Meso - and eutrophic forests with (Quercus), (Carpinus), (Fraxinus), (Acer), (Tilia), (Ulmus) and related forests

G1.A1 - Oak (Quercus), ash (Fraxinus) and European hornbeam (Carpinus betulus) forests on eutrophic and mesotrophic soils

G1.A1C - Southeastern European oak-European hornbeam (Quercus) – (Carpinus betulus) forests

G1.A1C1 - Moesian sessile oak - European hornbeam (Quercus petraea) - (Carpinus betulus) forests. They were reported in Kukavica (Skobaljic grad, Silje). The associations mainly occur in hilly region (at altitudes between 200 and 700 m), on gently inclined and shaded terrains, always in the zone of thermophilous oak forests. The bedrock is siliceous or carbonate, and acid brown, eutric brown and humus-silicate soils, chernozems and shallow brown soils on limestones develop on it.

G1.A3 - European hornbeam (Carpinus betulus) forests

G1.A32 - Eastern hornbeam (Carpinus betulus) forests. Mid-tall, dark mesophilous forests. The associations mainly occur on gently inclined terrains of hilly region, always in the zone of thermophilous oak forests. The bedrock is alluvium or silicate, on which different types of dystric soils develop.

G1.C - Highly artifical broadleaf forest plantations (G1.C1 - Poplar plantations, G1.CE - Artificially established Turkey oak plantation, G1.D1 - Sweet chestnut plantation (Castanea sativa), G1.CN - Artificially established maple stand, G1.C3 - Black locust plantations (Robinia) used for alleviating erosion on the steep slopes.

G 3 - CONIFEROUS FORESTS

G3.F - Highly atrificial coniferous plantations (G3.F112 - Artificially established spruce stand with the naturally regenerated beech, G3.F13 - Artificially

established fir stand, G3.F14 - Artificially established Austrian pine stand, G3.F14 - Artificially established Scots pine stand, G3.F142 - Artificially established Austrian pine stand with the naturally regenerated beech, G3.F16 - Artificially established Austrian and Scots pine stand, G3.F17 - Artificially established spruce and Austrian pine stand, G3.F19 - Artificially established spruce, Scots and Austrian pine stand, G3.F21 - Artificially established Douglas fir stand (Pseudotsuga mensienzii), G3.F22 - Artificially established eastern white pine (Pinus strobus) stand, G3.F23 - Artificially established European larch (Larix decidua) stand

G5 - Lines of trees, small anthropogenic forests, recently felled forests and coppice forests (G5.1 - Lines of trees, G5.2 - Small broadleaf deciduous anthropogenic forests, G5.4 - Small coniferous anthropogenic forests, G5.5 - Small mixed broadleaf and coniferous anthropogenic forests, G5.6 - Early-stage natural and semi-natural forests and re-grown forests, G5.61 – Deciduous scrub forests, G5.62 - Mixed scrub forests, G5.63 - Coniferous scrub forests, G5.7 - Coppice and early-stage coppices, G5.71 - Coppice forests, G5.72 - Early-stage broadleaf deciduous plantations, G5.74 - Early-stage coniferous plantations, G5.75 - Early-stage broadleaf and coniferous plantations, G5.76 - Tree plantations aimed at early whole-tree harvesting, G5.8 - Recently felled areas, G5.81 - Recently felled areas of the former broadleaf trees

H - INLAND UNVEGETATED OR SPARCELY VEGETATED SITES

H1 - Terrestrial underground caves, cave systems, passages and water bodies (H1.1 - Cave entrances, H1.2 - Cave interiors, H1.3 - Dark underground passages, H1.7 - Used underground mines and tunnels - Vlasina area)

H2 - Screes

H2.3 - Moderate mountain acid silicate screes

H2.33 - Southeastern European high mountain silicate screes - The sites were reported in Besna kobila. It inhabitated silicate, cold and humid screes of Sub-Alpine and Alpine regions. The sites are mainly at the northern exposures (the snow is retained longer). They are frequently made of the very huge pieces of rocks.

H3 - Inland cliffs, rock pavements and flat areas and outcrops

H3.1- Acid siliceous inland cliffs

H3.15 - Helleno-Carpatho- Balkanic siliceous cliffs with (Silene)

H3.152 - Moesian - Northern-Scardo-Pindic siliceous cliffs

H3.1521 - Moesian - Northern- Scardo-Pindic Sub-Alpine (Silene lerchenfeldiana) siliceous cliffs. They were reported in Besna kobila. The vegetation forms the mosaic with the rich vegetation of leech and moss by which stone bedrock is overgrown. The sites inhabits the cracks of siliceous (grano-diorites, red sandstones,quartz rocks) of slopes and massive rocks. Thermophilous, sun-lit sites of mountain (less frequent hilly) and Sub-Alpine region, at the altitudes up to 1,850 m are found. The soils belong to the type of siliceous lithosol, regosol or ranker (in bigger cracks).

H5 - Different inland sites with sparcely developed vegetation (H5.5 - Burnt zone devoid of or with the very sparce vegetation, H5.6 - trampled areas

I - REGULARLY OR RECENTLY RECLAIMED AGRICULTURE, HORTICULTURE OR DOMESTIC SITES

I1 - Arable land and market gardens (I1.1 - Intensive unmixed crops, I1.2 - Mixed crops of market gardens and horticultural gardens, I1.3 – Arable land with unmixed crops grown by low-intensity agricultural methods, I1.5 - Bare tilled, fallow or recently abandoned arable land)

I2 - Cultural areas of gardens or parks (I2.1 - Big gardens with ornamental plants, I2.2 - Small garden areas with ornamental plants or gardens in the very vicinity of households, I2.3 - Weed associations of the recently abandoned gardens)

J - CONSTRUCTED, INDUSTRIAL AND OTHER ARTIFICIAL SITES

J1 - Constructions in cities, towns and villages (J1.1 - Residential buildings of city centres, J1.2 - Residental buildings of villages and urban peripheries, J1.3 - Urban and sub-urban constructions, J1.4 - Urban and sub-urban industrial and commercial sites which have been still actively used, J1.5 - Rural commercial units, J1.6 - Urban and sub-urban constructions and demolition sites, J1.7 -Very dense temporary residential units)

J2 - Rare residential units (J2.1 - Low density residential buildings, J2.2 - Rural public buildings, J2.3 - Rural industrial and commercial sites which have been still actively used, J2.4 - Agricultural constructions, J2.5 - Constructed landmarks, J2.6 - Abandoned rural constructions, J2.7 - Rural buildings and demolition sites)

J3 - Extractive industrial sites (J3.2 - Active opencast mineral extraction sites, including querries, J3.3 - Recently abandoned under-ground spaces of extractive industrial sites)

J4 - Transport networks and other constructed hard-surfaced areas (J4.1 - Weed associations of transport networks and other constructed hard-surfaced areas, J4.2 - Road networks, J4.3 - Rail networks, J4.6 - Pavements and recreation areas, J4.8 - Constructed parts of cemeteries)

J5 - Highly artificial man-made waters and associated structures (J5.3 - Highly artificial non-saline stagnant water, J5.5 - Highly artificial fontanes and cascades)

J6 - Waste deposits (J6.1 - Weed associations of waste deposits, J6.2 - Household waste and landfill sites, J6.3 - Non-agricultural organic waste, J6.4 - Agricultural and horticultural waste, J6.5 - Industrial waste, J6.6 - Waste resulting from building construction or demolition

At southwestern branches of Chermernik over the past thirty years or more the birch has been increasingly present, which had not been the case in the more distant past. As the land has not been cultivated any more, the whole area of villages Mlachishte, Bajinci, Ruplje, Crveni Breg, Machkatica, Troskach, Pavlichina and Bankovci have been transformed into the dense birch plantations. The former roads, arable fields and meadows are overgrown by it, and the landscape has changed its appearance (Braunovic, Ratknic 2010/b).

The migration trends over the analyzed period resulted in the different degrees of endangerment of the natural sites in this area, to the benefit of the sites formed by anthropogenic influences.

5. CONCLUSIONS

The population's abandonment of the rural settlement resulted in the decrease of the number of the active working population and creation of the elderly households. Along with this process the important changes in the way of land use occurred. The most arable land has not been cultivated any longer, so these areas become overgrown with weeds, or re-transformed into the pastures. The small part of the arable areas which have not been cultivated are located in the very vicinity of the settlements, whereas the great areas are in Juzna Morava valley.

Mire, bog and fen sites, as well as grass and tall forb sites, are endangered by the anthropogenic influence. The scrub and forest sites are degraded to a great extent. Their endangerment will be also intensified by the current climate change, which lead to the increase of the mean annual air temperature and change in the precipitation regime.

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