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LANDSCAPE INVESTIGATION IN THE FOREST AREA OF „CENTRAL BALKAN" NATIONAL PARK

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Abstract

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The "Central Balkan" National Park occupies an area of 72021.07 ha. In order to study the presence of naturally occurring potential risk factors in the park – soil enrichment with heavy metals, its forest territory has been divided into relatively homogenous and comparable landscape units. A classification system has been selected where the soil-forming rocks have been adopted as the leading component, which chemical composition, according to some studies, represents a potential risk factor. At the next taxonomic levels the landscape units have been divided according to the terrain characteristics – altitude, slope and exposure. 69 territorially divided relatively homogenous and comparable landscape units have been obtained, which makes them applicable for the purposes of scientific research in the vast park territory.

Keywords: landscape structure, forest, heavy metal, parent material

Abbreviations: national park (NP), forest management plan (FMP)

Introduction

The "Central Balkan" National Park occupies an area of 72021.07 ha and protects self-regulating ecosystems of exceptional biodiversity, communities and habitats of rare and endangered species. The two existing landscape classifications of the country and their maps at the scale of 1:400 000 (Petrov, 1997) are applied most often in order to characterise the forest landscapes. Thus obtained relatively homogenous landscape units (FMP, 2001-2010, pp. 75-76; FMP, 2014-2023, pp. 93-94) are too big and contain a number of other landscapes of lower taxonomic level, in which the homogeneity of the territorial complex is higher due to the performed detailed analysis and synthesis. They are highly informative and constitute a representative sample of large areas such as the territory of the "Central Balkan" National Park. Their analysis and synthesis makes them applicable for the purposes of different studies of homogenous landscape units which can be studied, analysed and assessed at different taxonomic level. Similar homogenous landscape units were used in different studies of the mountainous area of the country – for comparison and evaluation of soil pollution in Sofia Mountain, (Malinova, 1988), for description of the landscape structure of Plana mountain (Dobrinova, 1989), "Bulgarka" National Park, and pollution of different landscape components (Malinova, 2007; Bezlova et al., 2012; Malinova et al., 2010; Tsvetkova et al., 2012), etc.

Some studies on the territory of "Central Balkan" National Park have shown the presence of risk factors of natural and anthropogenic origin which are poorly studied. The natural enrichment of soil-forming rocks with toxic elements, which migrate from the soil to the living organisms and reach humans through the food chain, are referred to the natural risk factors (Mihova et al., 1997 pp. 33-37). The pollution of soils, plants, etc., as a result of the long-lasting activity of the metallurgical plant near the town of Pirdop, is referred to the anthropogenic risk factors (Boneva et al., 1995; Jorova, 1995; Malinova, 1997; Malinova et al., 1997; Malinova, 1998a, 1998b; Bezlova et al., 2001).

The aim of the study is to establish relatively homogenous and comparable landscape units in the forest area of "Central Balkan" National Park, which could be used for analysis and evaluation of the impact of several natural risk factors on certain components of the natural landscapes.

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Materials and Methods

Homogenous landscape units have been established in the forest area of "Central Balkan" National Park. A classification system has been selected and the soil-forming rocks have been adopted as the leading component, which chemical composition represents a potential risk factor of natural origin. At the very first taxonomic level the igneous rocks have been divided into intrusive and effusive; the sedimentary and metamorphic rocks – into silicate and carbonate. The selection is based on the stability in time of this component and the possibility for terrain recognition. The difference in the soil-forming process on silicate and carbonate rock, in which different soil chemical composition is formed and specific conditions for plant nutrition are created, has also been taken into consideration. At the second taxonomic level the landscape units have been established according to the terrain characteristics. This indicator has also been chosen due to its stability in time and the strong influence on the redistribution of nutrients and energy in the landscape. According to the altitude, the landscapes have been established separately in the areas and belts of forest plant zoning of the country (Thracian and Mizian). The third taxonomic rank within their boundaries is formed by the slope. Landscape units, occupying flat (0^o - 4^o), slanting (5^o - 8^o), sloping (9^o - 12^o), steep (13^o - 17^o) and very steep ($\geq 18^o$) terrains, have been established. At the fourth taxonomic level, within the boundaries of the third one, the landscapes have been divided in accordance with their exposure - sunny (south, southeast, southwest and west) and shadowy (north, northwest, northeast and east). The territorial division of the landscape units has been carried out with the help of GIS which uses information from a forest management plan (FMP 2001-2010).

Results

The analysis of the landscape components, selected for the purpose of this study – soil-forming rocks and topography of the forest territory of the "Central Balkan" National Park, has determined a significant diversity of their characteristics. The vast territory of the park occupies parts of the Thracian and Mizia forest vegetation areas and their lower and middle mountain zone. Among the soil-forming rocks there are found magmatic plutonic bodies, sedimentary and metamorphic rocks of different age. Their combination with highly rugged terrain has formed smooth ridges, slope steps, slanting bevels, granite thrust faults, surface and underground karst forms, etc., which have created a number of territorial complexes with different characteristics. The synthesis, carried out in accordance with the accepted in the study evaluation criteria, has shown the presence of 69 landscape units (Figure 1) which are considered relatively homogeneous.

Discussion

The largest area of the park forest territory is characterised by "forest landscape on massive intrusive rocks" - 16498.5 ha. The rock base in it is built of the Balkan granodiorite-granite complex and the main representatives are the Vezhen pluton, South Bulgarian granites from the Karavelovski, Klisurski, Matenishki, Pastrovski pluton, etc. Its horizontal structure is heavily fragmented, divided into two forest vegetation areas - Mizian and Thracian. In the Mizian area it is represented in the middle mountainous belt of the beech and coniferous forests with an area of 8914.3 ha. At the third and fourth taxonomic levels this landscape is divided into territorial units, which homogeneity is determined by the sloped and exposures. The predominant territorial complexes are on very steep terrains with shadowy exposures – 6338.8 ha, followed by the terrains on very steep sunny terrains – 2369.1 ha. The rest of the territory is approximately equally divided into flat, slanting, sloping and steep slopes, shadowy and sunny exposures – a total area of 206.4 ha. The "forest landscape on massive intrusive rocks" in the Thracian area occupies insignificant area of the lower forest vegetation belt. The prevailing landscape units are formed on very steep sunny exposures (69 ha). The territorial complexes with intrusive rocks in the middle mountainous belt of the same area are represented mainly on very steep sunny terrains (4885.7 ha), as well as on very steep shadowy terrains – 2424.3 ha.

The "forest landscape on sedimentary silicate rocks" occupies a total area of 11356.4 ha. The rock base in it is represented by gravelites, siltstones, sandstones, conglomerates, etc. Its biggest part is located in the middle mountainous belt of the Mizia region. The prevailing terrains are very steep and shadowy (6871.1 ha), followed by very steep and sunny (2084 ha), steep and shadowy terrains (48.9 ha), etc. In the Thracian region this landscape occupies a small territory in the lower mountainous belt - a total of 114 ha. In the middle belt the prevailing terrains have steep slopes and sunny exposures (1172.7 ha), very steep terrains with sunny exposures (987.7 ha), followed by steep and sunny terrains (42.8 ha), etc.

The area of the "forest landscape on sedimentary carbonate rocks" is significantly smaller than the area of its silicate analogue - 4043.7 ha. The structure-forming rock types are limestones (sandy, clayey, organogenic, dolomite, etc.), marlstone, etc. Its horizontal structure, similar to the other landscape units, is highly fragmented – in the Mizia and Thracian regions. Larger massifs are observed in the middle belt of

the Thracian region where the established homogenous landscape units are presented mainly on very steep and sunny exposures (1608.8 ha), steep and shadowy exposures (958.3 ha), followed by steep and sunny exposures (16.6 ha), etc.

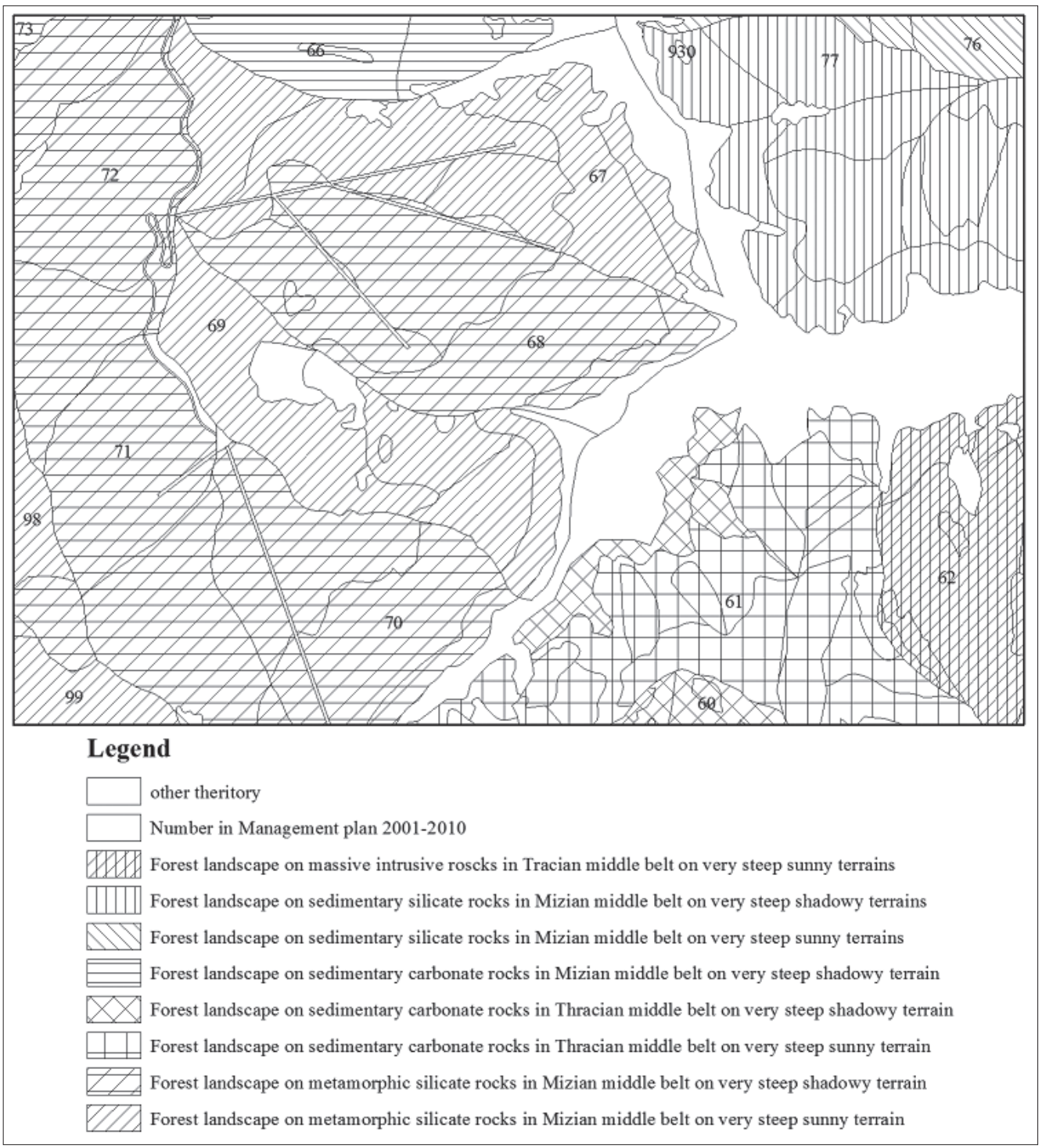

Fig. 1. Landscape units in the forest area of "Central Balkan" National park (part)

A similar arrangement of the landscape units by area is also determined in the middle belt of the Mizia region.

The "forest landscape on metamorphic silicate rocks" occupies a relatively small area – 6265.5 ha. It is composed of gneisses, granite-gneisses, schists, phyllites, etc. The homogeneous landscape units combine rock types mainly with very steep shadowy exposures (1139.4 ha) or sunny exposures (783.3 ha) in the middle belt of the Mizia region. In the Thracian region they occupy areas of 1189.1 ha and 2646.2 ha respectively. The steep terrains and those with less steep slopes have insignificant share, but as seen on Figure 1, they contribute to the diversity of landscape units.

Conclusions

The established landscape units specify the location of areas where environmental risk can be assumed. The high accumulation of Pb, Cd, Cu and As in soils, plants and dairy products, determined in 1997 (Mihova et al., pp. 33-37) was not linked to the influence of specific soil-forming rocks and no coordinates were specified. Despite that the "forest landscape on sedimentary carbonate rocks" can be identified as being at risk due to the well-known fact that carbonate sediments have the property to accumulate heavy metals, as well as the "forest landscape on metamorphic silicate rocks", due to the enrichment of phyllites in the region with Cu and As, determined by Malinova (1997).

The obtained 69 landscape units are territorially divided, but are relatively homogeneous in relation to the rock composition and terrain characteristics, which makes them comparable for the purposes of different studies. In the large park territory they contain specific information about the selected abiotic components and can be used to carry out preliminary analysis for the presence of potential risk factors and their influence on certain landscape components. The performed analysis allows distinguishing the soil catenae of different order with alluvial, transit and accumulative part, to evaluate soil conditions and plant nutrition and hence the potential risk of pollution through the food chain.

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