

The Protection of Flora and Vegetation of the Mountain Jahorina

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ABSTRACT

This paper describes the protection of the flora and vegetation of the Mountain Jahorina. The total area of protected landscape Javorina is 11,546,68 ha. Area of protected landscape Javorina is characterized by its geological structure, hydrogeological and hydrological phenomena and processes, soil types, mezzo and micro-climate, fauna, flora and vegetation. Based on the flora and vegetation as the basic elements and creators of the ecosystem, a number of important habitats have been selected: mountain turfs, crevices of limestone rocks, subalpine dwarf pine community, mountainous parts with preserved communities of mountain maple, frost forests, travertine and peat coal area. After evaluation and categorization the following categories have been determined: Ia - strict nature reservations, Ib - wilderness area, III - natural monument and IV - habitat management area. Zone of I protection degree in the area of protected landscape consists of four separate units: Trijeska, Paloševina, Zlatna dolina javora and Dugo polje. In the zone of II protection degree there is Malo Dvorište and the habitat of the endemic species of Balkan *Acer heldraichii* subsp. *visianii*.

Key words: protected landscape, flora, vegetation, Jahorina.

INTRODUCTION

The Mountain Jahorina (hereinafter Jahorina) is located in the central part of Bosnia and Herzegovina and Republic of Srpska. It belongs to the continental Dinarides (Figure 1). The oldest data relating to the research of flora of Jahorina date back from the works by Fial (1893, 1895), Beck-Mannagetta (1927), Maly (1938, 1939), Bjelčić (1964-1965), Pavlović, Petronić (2004-2006). One of the first researchers of vegetation of Jahorina is Slavnić (1954). Forest vegetation was explored by Fukarek and Stefanović (1958), vegetation of premountain meadows and pastures by Bjelčić (1966) and peatland

ecosystems of the Mountain Ravna by Lakušić et al. (1981). Within preparations for the Winter Olympic Games in 1984, and for the needs of the Spatial and Regulatory Plan for special purposes mapping of vegetation in 10 Sarajevo municipalities was carried out where Jahorina was also included (Lakušić and Mišić 1982). Ruderal flora and vegetation was processed by Petronić (2000 and 2006). In the period from 2004 to 2006 the flora and vegetation of Jahorina was under thorough examination in the context of scientific and technical base for proclamation of Jahorina as protected area on the territory of Republic of Srpska.



Figure 1. The geographical location of Jahorina (Europe-Bosnia and Herzegovina-Jahorina)
https://commons.wikimedia.org/wiki/File:Europe_countries_map_2_hr.svg

MATERIALS AND METHODS

The study of flora and of vegetation was conducted in the period from 2004 to 2006. Transects method is used, and a large number of phytocoenological records in different ecosystems is made by the method Braun-Blanquet (1965). Floristic data were collected during the entire examination on the field at all locations in and outside the area of phytocoenological records. Identification of plant taxa was based on floristic literature (Beck, 1927; Josifović ed. 1970-1977; Javorka et Csapody, 1979). The nomenclature is in line with Flora Europaea (Tutin, et al. 1964-1980), and syntaxonomic review of vegetation is in line with Prodrromusu plant communities of Bosnia and Hercegovina (Lakušiću et al., 1978).

Republic Institute of the Protection of Cultural and Natural Heritage of Republic of Srpska synthesized existing literature data and results of research and performed scientific expert study as the basis for development and categorization of natural and cultural values of the zones and protection regimes. Valuation of area was carried out according to the Law on Nature Protection (Official Gazette of Republic of Srpska, 4/08) and IUCN categorization of protested natural areas.

RESULTS AND DISCUSSION

Area of protected landscape is 11,546,68 ha, ranging from 900-1916 m (Figure 2). Based on the analysis of flora and vegetation of the massif of Jahorina evaluation and categorization have been made. Featured categories are: Ia - strict nature reservations, Ib - wilderness area, III - natural monument and IV - habitat management area.

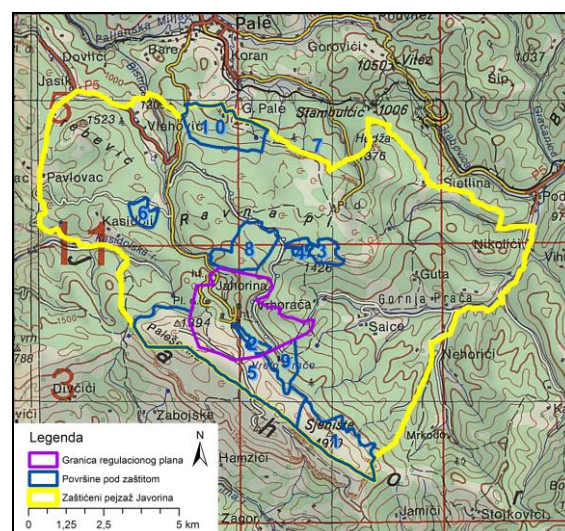


Figure 2. The boundaries of the planned Protected landscapes "Javorina" with the boundaries of special protection area

Within the boundaries of the protected areas regimes of protection I, II and III are proposed. Zone of I protection degree has an area of 976.68 ha, which is 8.34%, the zone of II protection degree has an

area of 976, 68 hectares, or 5.86%, while the zone of III protection degree is the largest one, with the area of 9,144.04 ha, or 79.19%. Out of the total area of the protected landscapes, the Regulatory Plan of the Special areas Jahorina occupies 763.28 ha, or 6.61%. Zone of I protection degree in the area of protected landscape consists of four separate units: Trijeska, Paloševina, Zlatna dolina javora and Dugo polje. In the zone of II protection degree there is Malo Dvorište and the habitat of the endemic species of Balkan *Acer heldraichii* subsp. *visianii*.

Flora of Jahorina consists of 1159 tax, both specific and infraspecific categories in section Lycopodiophyta, Equisetophyta, Pteridophyta, Pinophyta and Magnoliophyta, which makes up more than 20% of the total number of species represented in Bosnia and Herzegovina. Section Bryophytes includes about 180 tax (Grgic, 2009). The overall vegetation of Jahorina in phytocenosis terms differentiates 13 vegetation classes, 19 orders, 28 bonds, 57 associations and 10 sub-associations. A large number of classes, orders, and the bond of association is related to anthropogenic conditioned vegetation which is slightly represented in all zones of the protected area.

Category Ia - strict nature reservations
„Trijeska“

Coordinates according to Gaus Kriger:
East: 4837,364 N and 6551,386 E; West:
4839,112 N and 5648,803E; North:
4840,005 N and 6549,057 E; South:
4837,356 N and 6551,384 E

Size of protected area is 279.20 ha and includes part of Gola Jahorina. Strict nature reservation „Trijeska“ is covered with mountain grasslands that are the center of floristic, vegetation and ecosystem diversity. Around 7.78% of endemic species found refuge in them which is about 35.55% of the total

number of endemic species of Bosnia and Herzegovina.

Vegetation of cracks limestone rocks on Jahorina is marginally represented on the site Trijeska. It belongs to endemic association *Asplenietum fissi* Horv. 1931. The community was poor in species. Important species that are represented are *Saxifraga paniculata* Miller, *Dianthus petraeus* Waldst. & Kit. and *Malcomia illyrica* Hayek, *Iris reichenbachii* Heuffel. They can be found on Preliminary list of endangered species of Bosnia and Herzegovina. Smaller areas covered with dwarf pine, natural rarities and a dominant species of subalpine communities *Pinetum mugo illyricum* Fuk.1958 were present at Trijeska. The largest size of protected areas are covered with vegetation of mountain meadows on limestone class *Elyno-Seslerietea* Br.-Bl. 1948, order *Seslerietalia tenuifoliae* Horv 1930 and endemic alliance *Seslerion tenuifoliae* Ht 1930 Pawl. 1928. Association includes community of Dinaric endemic character *Laeveto-Helianthemum alpestris* Ht 1930. in which frequent species are *Scabiosa silenifolia* Waldst. & Kit., *Helianthemum canum* (L.) Baumg., *Carex kitaibeliana* Degen, *Hieracium villosum* Jacq. etc.

Category Ia - strict nature reservations
„Zlatna dolina javora“

Coordinates according to Gaus Kriger:
East: 4841,786 N and 6547, 945 E; West:
4842,489 N and 6546,692 E; North:
4842,589 N and 6549,762 E; South:
4841,568 N and 6547,464 E

Subalpine forests of beech and maple *Aceri-Fagetm subalpinum* and subalpine forests of spruce *Picetum subalpinum* are developed on an area of 31.92 ha in which there are individual types of *Acer heldraichii* subsp. *visianii*. The main value of population of this region is

young maple sub species *Acer heldreichii* subsp. *visianii*. /Nym. K. Maly./.

Below this level are mixed forests of beech, fir and spruce (*Piceo-Abieti-Fagetum*) with individual trees of maple.

North edge of this maple area is on Jahorina. The presence and distribution of maple is the main reason for the separation of the area in which appropriate protective measures will be implemented to protect and preserve the habitat of this Balkan endemic and relict species. In terms of maintenance, planning and development of natural resource it is allowed to monitor, perform scientific and technical research on the accepted and permitted projects from the competent institution. It is not allowed to carry out activities that would lead to changes in habitat conditions.

Category Ia - strict nature reservations „Dugo polje”

Coordinates according to Gaus Kriger:
East: 4845,135 N and 6549, 336 E;
West: 4845,012 N and 6548,656 E;
North: 4845,200 N and 6549,279 E;
South: 4844,746 N and 6548,954 E

Dugo polje is located at 1380-1400 m above sea level. Geological base of the site make Werfenian sediments with soil type eugley and subtype eugley peat thickness 5-12 cm.

Smaller areas are vegetated with sfgnum peat. The special value of the field is given with the presence of carnivorous *Drosera rotundifolia* L. rare and relict species and the emergence of downy birch *Betula pubescens* represented with individual trees.

For the maintenance and improvement of the natural good, the surface 15,56 ha, it is necessary to monitor, perform scientific and technical research and visit in smaller groups in order to educate them.

Category Ib - wilderness area „Paloševina”

Coordinates according to Gaus Kriger:
East: 4840,067 N and 6549,133 E; West: 4842,466 N and 6543,407 E; North: 4843,165 N and 6544,134 E; South: 4839,112 N and 6548,803 E

Gola Jahorina represents the most deforested part of the mountain, the altitude of about 1660 meters to the highest peak of the mountain (1916 m). Wilderness area Paloševina has area of 553.31 ha overgrown with *Festucion pungentis* Horv. 1930. The most widespread community of this combination are: *Festucetum pungentis* Horv. 1930, *Brometo-Centauretum kotschyanae* Horv. 1960, *Hypochoereto-Festucetum amethystinae* Horvat 1960 and *Anemono-Phleetum alpinae* Bjelčić 1965. These communities build a large number of endemic and rare species from a preliminary Red List of Bosnia and Herzegovina, such as: *Festuca bosniaca* Kummer & Koch, *Dianthus giganteus* D Urv. subsp. *croaticus* (Borbas) Tutin, *Scorsonera purpurea* subsp. *rosea* (Waldst. & Kit.) Nyman, *Pedicularis hoermanniana* K. Maly, *Polygala alpestris* Reichenb. subsp. *croatica* Chodat) Hayek, *Euphorbia montenegrina* (Bald) K. May, *Cerastium moesiacum* Friv., *Gentiana lutea* L. subsp. *symphyandra* (Murb) Hayek, *Hypochoeris illyrica*, *Achillea lingulata* Waldst. & Kit., *Crepis dinarica* Beck, *Lilium bosniacum* (G. Beck) G. Beck, *Ranunculus croaticus* Schott, *Centaurea kotschyana* Heuffel ex Koch, *Hieracium aurantiacum* L., *Botrychium lunaria* (L.) Swartz, *Trollius europaeus* L., *Dactylorhiza sambucina* (L.) Soo, *Nigritela nigra* (L.) Reichenb., a *Pedicularis heterodonta* Pančić and *Viola elegantula* Schott which is on the Red List of Europe (1991).

Endemic communities *Plantago-Barbaretum illyricae* have been

developed on the trampled habitats, while edificator species *Plantago reniformis* and *Barbarea bosniaca* are on the Red List of Europe.

Vegetation of mountain meadows on acid soils occupies less space. Endemic communities *Crepido conyzifoliae-Lilietum bosniacae* Bjelčić 1966 is present on the surfaces within the mountain meadows on limestone. Edificator species *Crepis conyzifolia* (Gouan) A. Kerner and *Lilium bosniacum* (G. Beck) G. Beck are endemic, rare and endangered species.

Category III - natural monument „Malo Dvorište”

Coordinates according to Gaus Kriger:
East: 4846,374 N and 6544,212 E; West: 4846,503 N and 6543,225 E; North: 4846,750 N and 6543,775 E; South: 4845,768 N and 6543,954 E

Natural monument „Malo Dvorište“ occupies area of 58.14 ha. The main value of this area is the presence of the community *Picetum montanum inversum* frosty forests of spruce caused by specific ecological conditions, primarily temperature inversion in relation to the surrounding area. This community is dominated by spruce, and there are individual trees *Pinus sylvestris* and *Abies alba*. Blueberry bushes form a low floor. Of the other plants the following are significantly represented: *Deschampsia flexuosa* (L.) Trin, *Veronica officinalis* L., *Gentiana asclepiadea* L., *Melampyrum hoermannianum* K. Maly, and endemic species *Viola elegantula* Schott Moss makes a well-developed floor. The presence of lichens on trees is significant. Forests of beech, fir and spruce continue on this forest. The lowest parts of the frost areas are covered with meadow communities.

Category IV – IV - habitat management area „Veliki javor”

Coordinates according to Gaus Kriger:
East: 4845,446 N and 6548,214 E; West: 4844,845 N and 6545,912 E; North: 4845,976 N and 6547,170 E; South: 4844,348 N and 6546,854 E

Veliki javor occupies area of 217.93 ha. It is covered by forests of spruce, fir and beech (*Piceto-Abieti-Fagetum*). In these forests there is a significant presence of maple trees in all floors. Floor of herbaceous plants is rich in seedlings and offspring of maple. Numerous offspring need conditions for survival to be ensured with appropriate active measures. In addition to the offspring, there are individual old trees of impressive dimensions. Protection of this type is important for the preservation of biodiversity and the survival of the species in extreme northern boundary of its distribution. It is necessary to monitor the development of mountain maple population, increase the share of renewal of maple seeds or plants and, if necessary, apply biological control against insects and plant causes of disease.

Water protection forest Vrela Prače

Coordinates according to Gaus Kriger:
East: 4841,013 N and 6548,839 E; West: 4841,573 N and 6547,736 E; North: 4842,063 N and 6548,744 E; South: 4840,244 N and 6548,481 E

The area has a surface of 102.94 ha. This area is managed for sustainable use of natural ecosystems. In the scope of water protection zones best preserved beech and fir with spruce grow (*Piceto-Abieti-Fagetum*). In this scope mesophilic mountain meadows alliance Pancicion with two endemic associations were observed *Pancicio-Lilietum bosniacae* Bjelčić and Lakušić 1969 and *Alchemillo-*

Crepidetum bosniacae Bjelčić 1967. In these communities, number and cover effect of rare and endemic species *Pimpinella serbica* (Vis.) Bentham, *Lilium bosniacum* (G. Beck) G. Beck, *Crepis aurea* (L.) Cass., *Knautia dinarica* (Murb.) Borbas, *Alchemilla maly*, *Dactylorhiza cordigera* (Fries) subsp. *bosniaca* (G.Beck) Soo are dominant, while the following species are less numerous *Polygala alpestris* (Reichenb. subsp. *croatica* (Chodat) Hayek.

A significant floristic and vegetation diversity of Jahorina, the presence of a significant number of endemic, rare and endangered species and communities, imposes the necessity of long-term preservation and improvement. This includes adequate legal protection, management expertise, training and involvement of local communities in the protection system.

CONCLUSION

The total area of protected landscape Javorina is 11. 546,68 ha. Within this area there are extremely important landscapes, ecosystems, hydrological facilities, natural rarities and historical and cultural values that are submitted to various forms of protection, harmonized with European standards.

Zone of I protection degree in the area of protected landscape consists of four separate units: Trijeska, Paloševina, Zlatna dolina javora and Dugo polje In the zone of II protection degree there is Malo Dvorište and the habitat of the endemic species of Balkan *Acer heldraichii* subsp. *visianii*. Within the protected landscape Javorina, based on the analysis of flora and vegetation of the massif of Jahorina evaluation and categorization have been made. Featured categories are: Ia - strict nature reservations, Ib - wilderness area, III - natural monument and IV - habitat management area.

Based on the analysis of flora and vegetation of the massif of Jahorina, was allocated a number of important habitats. These are mountain grasslands Gola Jahorina, cracks limestone rocks, subalpine pine community (Sjenište, Trijeska), highlands with preserved forest communities (Mali javor, Veliki javor, Vrelo Prače), frost forests (Mala Dvorišta), peat coal area (Paljanska Miljacka) and travertine (Dugo polje).

The concept of the protection of the protected landscape Javorina is based on the protection, development, planning and management of protected landscape, which includes the preservation and improvement of the overall natural values and resources.

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