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HABITAT TYPES OF EUROPEAN IMPORTANCE IN THE AREA OF WETLANDS GROMIZELJ (BOSNIA AND HERZEGOVINA)

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ABSTRACT

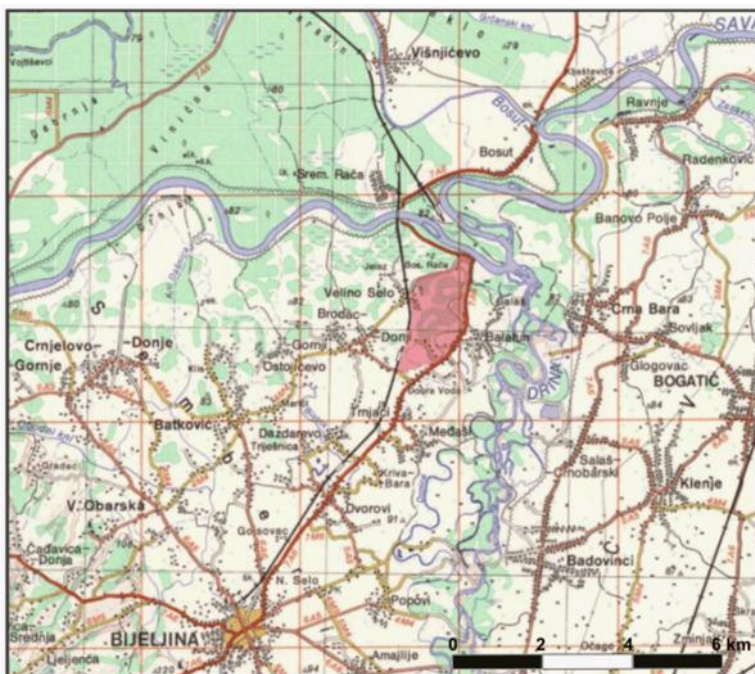
The paper presents the types of wetlands habitat Gromizelj which is of European importance. The review is made on the basis of studies of flora and vegetation and the Guide of the types of habitats according to the European Union (EU) Habitats Directive. Swamp Gromizelj is located in the northeast of Republic of Srpska (RS) and Bosnia and Herzegovina (BiH), in the municipality of Bijeljina. During the research the following habitats have been isolated: 3150 Natural eutrophic lakes with Magnopotamion-or Hydrocharition-vegetation type, 3270 Muddy river banks with Chenopodionrubrip. p. and Bidenton p. p. vegetation, 6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels, Reedbeds, tall sedges and vegetation of Phragmito-Magnocaricetea, 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnionincanae, Salici-onalbae) and 91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *U. minor*, *Fraxinus excelsior* or *F. angustifolia*, along great rivers (*Ulmion minoris*).

Key words: *habitat, wetlands, Gromizelj.*

INTRODUCTION

Connecting protected areas of RS and BiH in the European network of protected areas Natura 2000 is aimed to prevent the loss of biodiversity, preserve the habitat of endangered species and ensure their long term survival. For BiH, WWF MedPO started a project to support the implementation of the European ecological network Natura 2000 in 2007. Based on the literature data, the research of authors, supported by The EU, made the Habitat Types Guide of BiH according to the EU Habitats Directive.

Potentially protected area Gromizelj is located in the northeast of RS in the municipality of Bijeljina and GMT is between 44⁰51'12, 5" and 44⁰53'37" north latitude and 19⁰18'04" and 19⁰20'24" east longitude. Central coordinates of the point with coordinates are 44⁰52'19" north latitude and 19⁰19'15" east longitude. The surface of a natural resource is 831. 3 hectares. The map 1 shows the position of the natural resource.



Map 1. The situation of natural resource (geographical map 1: 200, 000)

The basic value of the natural resource "Gromizelj" is made of wetlands Gromizelj with Laketic sources and partially channelled stream Prugnjava. Laketic source extends from southeast to northwest. According to average annual values issued, the length of the source ranges between 50 and 55 meters with a maximum width of 25 m. Laketic source is located in the area of intensive agricultural production under significant anthropogenic pressure. The area is characterized by specific geological and hydrological phenomena and extraordinary biological diversity. This research was first recorded wetland grill (*Urticaki oviensis*) in BiH. *Urticaki oviensis* on the Red List of Europe in the category of vulnerable species (VU).

MATERIALS AND METHODS

Floristic and vegetation research on areas are carried out from 2009 to 2011. Taking plant material and making phytocoenological recordings were done at different habitats. Identification of species was based on floristic literature (Javorka and Csapody, 1979; Beck, 1903; Beck, 1927; Josifovic ed. 1970-1977; Domac, 1978; Sumatic et al., 1999). Phytocoenologically recordings were made by the method Braun-Blanquet (1965). During allocations European significant habitats in the wetlands Gromizelj used data research of flora and vegetation and Guide to the types of habitats according to the EU Habitats Directive (Milanovic et al., 2015).

RESULTS AND DISCUSSION

Based on explored flora, vegetation and habitats, according to the Review of the Habitats Directive of the EU, isolated habitats are shown in Table 1.

Table 1. Overview of habitat areas of swamp Gromizelj

Code	Name of habitats
3150	Natural eutrophic lakes with <i>Magnopotamnion</i> - or <i>Hydrocharition</i> -type vegetation
3270	Muddy river banks with <i>Chenopo dionrubrip.</i> p. and <i>Bidention</i> p. p. vegetation
6430	Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels
-	Reedbeds, tall sedges and vegetation of <i>Phragmito-Magnocaricetea</i>
91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnionincanae, Salicionalbae)
91F0	Riparian mixed forests of <i>Quercusrobur</i> , <i>Ulmuslaevis</i> and <i>U. minor</i> , <i>Fraxinus excelsior</i> or <i>F. angustifolia</i> , along great rivers (Ulmenionminoris)

3150 Natural eutrophic lakes with *Magnopotamnion*- or *Hydrocharition*-type vegetation

The habitat is characterized by significant biomass production, reduced mineralization and reduced amount of oxygen in the deeper layer of sludge. Natural well is located in the area of intensive agricultural production. In the water of lakes ammonia and nitrate nitrogen, are indicating that manufacturers perform intensive fertilizing arable land with NPK fertilizer. Saprobity index "S" was measured (Pant-Buck, 1955) which shows that the water source Laketic belong to class III and has a "moderate" ecological status. The concentration of dissolved oxygen in water of Laketic source shows the requirements for class V indicating very poor status of water quality. The value of the saturation of water with oxygen is very bad. The water is rich in dissolved bases with a pH above 7 (Water Institute, doo Bijeljina, 2010). Habitat is populated with vegetation of submerged to class Potametea and order Potametalia which is articulated on alliance Magnopotamionaut (submerged plant communities that are not connected to the bottom); Nymphaeionalbae (community of plants with floating leaves) and Hydrocharition. From community of alliance Magnopotamionaut. there is *Ceratophylletumdemersi* belonging to submerged, aquatic vegetation not connected to the bottom and with optimal development achieved during the summer. Species that participate in building of communities are: *Nuphar luteum*, *Myriophyllum spicatum*, *Hottonia-palustris*, *Potamogeton natans* and *Lemna minor*.

Alliance *Nymphaeionalabae* includes community *Hottonietumpalustris* and *Myriophyllo-Numpharetum*. Association *Myriophyllo-Numpharetum* develops in the deepest zone of the source where the water is moderately enriched with organic and mineral substances. The main feature of the floristic community gives a dominant species *Nuphar luteum* and *Myriophyll umverticilatum*. There are also: *Potamo getonnatans*, *Myriophyllum spicatum*, *Certophyllum demersum*.

Monodominant community *Hottonietumpalustris* occurs in Laketic source fragmentary. In the second half of the year, waters receded within forests of alder and ash, on the muddy and wet surfaces with a high level of ground water. After the withdrawal of water *Hottoniapalustris* takes emergent character growing together with species *Nuphar luteum*, *Calthapalustris* and *Siumlatifolium*.

Vegetation of hydrophytanot connected with bottom belongs to class *Lemnetea*, order *Lemnetalia* and alliance *Lemnion minoris* with community *Lemnetum minoris*, *Lemnetum trisulcae* and *Hydrocharidietum morsus-ranae*. This type of vegetation rarely develops in the coastal zone of Laketic source, but it is more frequent in small depressions of swamps Gromizelj and in the part Prugnjacke where water reserves in the first half of the year. At this habitat, intensive processes of decomposition of organic matter occur under the separation of methane, hydrogen sulfide, with a pH value above 7.

Community *Lemnetum minoris* belongs to submerged vegetation not connected to the bottom stands. It mainly develops sporadically along the coast of Laketic source in shallow irrigation canals and in parts Prugnjacke. In that habitat, water is warm and moderately rich in organic matter and water flow is weak or absent. The water depth does not exceed 1 m, the bottom is muddy. Stands of the community are poor of species. In small depressions near Laketic source and the source of the coast stands of communities *Lemnetum trisulcae* were recorded. There are species: *Lemna minor* and *Utricularia vulgaris*. Community of *Hydrocharidietum morsus-ranae* belongs to the type of floating not connected to the bottom aquatic vegetation observed in small depressions of Gromizelj near Laketic source, where the water is calm, standing, shallow, warm and eutrophic. Besides the dominant species *Hydrocharis morsus-healing*, there are also *Ceratophyllum demersum*, *Lemna minor*, *Lemnatisulca* and *Utricularia vulgaris*.

This type of habitat is the most representative in the upper part of the Pliva lakes, coastal zone of Spreca, at Bardaca, Svilaj, Vojskovi, Loncari, Sanicani, Prnjavor, but along the river Savait is largely absent (Redzic and Brudanovic, 2008-2009). This type of habitat is recorded in a number of permanent water surfaces of BiH, ponds, canals and artificial lakes. (Milanovic et al., 2015).

3270 Muddy river banks with *Chenopodium rubrip. p.* and *Bidention p. p.* vegetation

Nitrophilic community of wetland Gromizelj belongs to alliance *Bidention tripartite p. p.*, order *Bidentetalia tripartite* and class *Bidentetea tripartite*. It develops on wet and nitrated anthropogenic fluvisol and eugley. The soils have mainly base reactions. This type of vegetation is typical for autumn.

At the sites Šljunkara and Prugnjava nitrophilous vegetation of muddy and wet habitats alliance *Bidentitiontripartitae* and communities *Polygonohydropiperis-Bidentetumtripartitae* and *Polygonetumlapatifoliae* were recorded. Short belt of flat and slightly inclined coast Šljunkara is covered with association *Polygonohydro-piperis-Bidentetumtripartitae*. This association is well developed in the Prugnjava in the second half of the year, when water is withdrawn, which takes up significant area. In a community, the dominant species are *Polygonumhydropiper* and *Bidenstripartita*. There are also: *Menthaaquatica*, *Alismaplantago-aquatica*, *Veronica becabunga*, *Juncusatriculatus*, *Lycopuseuropaeus*, *Lythrumsalicaria*, *Lycopusexaltatus*, *Agrostis stolonifera*, *Salix alba*, *Eupatorium cannabinum* and others.

Association of *Polygonumlapathifolium* occurs more frequently in the study area by building monodominant stands that take up less surface area.

This vegetation is distributed in the flood zone of the Sava River on lands rich with nitrates. They are very developed along the river backwater. Its dominance increases going upstream towards Bosanska Raca (at the mouth of the Drina River). Nitrated stagnant water is in the wider area of Plivsko jezero, Modrac, Spreca, Gradiska, Sanicani, Prnjavor, Svilaj, Bosanski Samac, Odzak, Orasje, Ukrina, Zabar, Loncari, Raca (Redzic and Brudanovic, 2009).

6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels

The vegetation of tall herbs was developed in the hydrophile forests of alder, willow and poplar, and in the forests of oak and elm. Optimal location is on the wet nitrified soils and the openings of hydrophile land. Depending on the degree of ecological conditions of humidity, shade and nitrified land vegetation of high green two alliance can be differentiated: *Senecionfluviatilis* and *Petasition officinalis*. Alliance *Seneciofluviatilis* includes typical Posavina hydrophilic-nitrophilic community. This vegetation, in ecological terms, continues to vegetation and alliance Magnocaricion and Phragmition. Some of the species that participate in the construction of high green vegetation are: *Angelica sylvestris*, *Barbarea vulgaris*, *Rorippaaustriaca*, *Althea officinalis*, *Potentillareptans*, *Mentha longifolia*, *Glycirhiza echinata* and other.

Vegetation of alliance *Petasition officinalis* is recorded in the vicinity of roads, dykes and settlements, in places rich in nitrates. It often occurs in degraded forests of alder, willow, ash and oak. As characteristic, the species of these habitats are: *Aegopodium podagraria*, *Eupatorium cannabinum*, *Parietaria officinalis*, *Galium aparine*, *Artemisia vulgaris*, *Urticadioica*, *Sambucusebulus*. Those species are involved in building of communities: *Urtico-Aegopodietum*, *Urtico-Sambucetumebuli*, *Eupatorietumcannabini* and *Urtico-Parietarietum*. An important area of habitat is occupied by invasive species *Polygonumcuspidatum* and *Echinocystislobata*.

Reedbeds, tall sedges and vegetation of Phragmito-Magnocaricetea

The belt of aquatic vegetation community builds on floodplains is dominated by emersal hydro-heliophytes of class Phragmitetea, order Phragmitetalia covered with alliance *Phragmition* and *Sparganio-Glycerion*. Alliance *Phragmition* belongs to the community *Scirpo-Phragmidium*, *Typhaetumangustifolia*, *Typhaetumlatifolia*, *Phragmitetumaustralis* and *Sparganietumerecti*. Community of reeds and sedges has an important role in preserving the overall plant and animal diversity of wetland habitats.

Community of *Scirpo-Phragmitetum* inhabits continuously or periodically flooded areas of Laketic source and Sljunkara. The basic characteristic of floristic community types comes from the following species: *Phragmitescommunis* and *Scirpuslacustris*. The narrow coastal strip of Sljunkara is covered with species *Scirpuslacustris* which builds less facies. It was noted that the facies with *Scirpuslacustris* alternately change the community stands of *Typhaetumangustifoliae* and *Typhaetumlatifoliae*. Differences were observed in the floristic composition of communities between Laketic source and Sljunkara. In the community stands *Scirpo-Phragmitetum* of Sljunkara, besides dominant species, there are also: *Lycopuseuropaeus*, *Menthaaquatica*, *Iris pseudacorus*, *Lythrumsalicaria*, *Polygonumlapathifolium*, *Bidenstripartita*. In the community of Laketic source, in a significant number, there are species: *Siumlatifolium* and *Sparganiumeraticum*.

Ass. *Phragmitetumaustralis* is present at the sites Prugnjava, Sljunkara and Citluk where it occupies significant space, a slightly larger area under this community can be found in Buline. The floristic composition is dominated by *Phragmitesaustralis*, which survives in conditions after the withdrawal of water where there is a high level of groundwater. Community of reeds is mainly developed in the forest belt of alder, willow, poplar and ash.

Hygrophilous community *Typhaetumangustifoliae* is recorded at the site Sljunkara. It inhabits shallow water along the coastal part.

Ass. *Sparganio-Glycerietumfluitans* belongs to alliance *Sparganiumglycerion* and it is particularly developed in some parts of Prugnjava. There is a wide ecological valence compared to hydric regime. Significant surface of Prugnjava is covered with community *Sparganietumerecti* which joins with species *Urticakioviensis* and builds a specific community. It is necessary to monitor this "community" with the aim of describing and determining the appropriate status. For the territory of Bosnia and Herzegovina, *Urticakioviensis* was firstly recorded in Laketic source, on december 2008.

Alliance of *Salicioncinerea* includes a community *Salicetumcinerea*. It is present on the coast of Laketic source with permanent flooding during the first half of the year. The community is dominated by wading willow bushes which reaches a height of 2-3 m, and there are species: *Telypterispalustris*, *Urticakioviensis*, *Carexremota*, *Sparganiumerectum*, *Menthaaquatica* and others. Particularly important species *Telypterispalustris*, *Urticakioviensis* are rare species for the area of BiH. The only, so far known, habitat of *Urticakioviensis* in Bosnia and Herzegovina is wetland of Gromizelj and Laketic source, as well as for *Telypterispalustris* in RS.

The habitat of these species is not defined in "Interpretation manual of European Union habitats" but it is necessary to specify it as a literary data. Community of reeds and rushes are distributed along the flood areas of the Sava River and lower parts of its tributaries. Among them, the most important habitats are in the area of fishpond Sanicani, fishpond Bardaca, fishpond Prnjavor, hinterland of lake Modrac, the western part of the large Pliva lakes, backwaters zone in the area Odzak, Svilaj, Velika and Mala Tisina, Loncara. In other places, this vegetation is sporadically developed in the form of small fragments (Redzic and Brudanovic, 2009).

91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnionincanae, Salicionalbae)

Hygrophilous forests with *Alnus glutinosa* (*Alnetum glutinosae*) syntaxonomic belong to the Central European alliance *Alnion glutinosae*, order *Alnetalia glutinosae* and class *Alneteaglutinosae*. They are located in places where there is a high level of ground water throughout the year, mainly on deep fluvisol soils, gleys and pseudogley. Surface water is retained until May when it withdraws. In the area of swamps Gromizelj this community occupies about 10 hectares of the study area. In the floor of the trees there is species with the largest cover value *Alnus glutinosa*. Trees reach a height over 20 meters. From shrubs there are: *Cornus sanguinea*, *Sambucus nigra*, *Ligustrum vulgare*, *Corylus avellana*, *Acer tataricum*, *Viburnum opulus*, *Euonymus europaeus* and other species. In the floor of the herbaceous plants there are: *Stachys palustris*, *Carex longata*, *Carex remota*, *Lysimachia vulgaris*, *Solanum dulcamara*, *Thelypteris palustris*. Forests of *Alnus glutinosa* have an important role in maintaining ecological balance, hydric regime, preservation of groundwater and the existing biodiversity. It should be noted that the communities in this area are well preserved, but there is always a danger of logging and the spread of invasive species *Echinocystis lobata*, *Asclepias siriaca* and *Amorpha fruticosa*. The high importance of the forest ecosystem has resulted in putting habitat in priority in conservation (Annex 1 of the Habitat Directive). Community of *Alnus glutinosa*, alliance *Alnion glutinosae* is widespread in Posavina, and in the coastal zone of large rivers, particularly in their lower courses (Una, Vrbas, Bosna, Drina). The forests of *Alnus glutinosa*, have been developed as azonal vegetation along other waterways in the continental part of BiH (Redzic and Brudanovic, 2009).

Community *Frangulo-Alnetum glutinosae* is on the smaller areas that have the mosaic distribution. Significant cover value in the floor of bushes has species *Frangula alnus*, and there are other species such as: *Viburnum opulus*, *Rhamnus cathartica*, *Thelypteris palustris*, *Glechoma hederacea*, *Salix cinerea*. In the floor of the herbaceous plants there are species: *Solanum dulcamara*, *Symphytum tuberosum*, *Polygonum lapathifolium*, *Stachys palustris*, *Lythrum salicaria*, *Iris pseudacorus*, *Sium latifolium* and other.

A significant feature of alluvial forests vegetation of *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Fraxinetum angustifoliae*) has a high ecosystem importance which is resulting in separation of the community into the category of priority habitat conservation. In the trees floors, the dominant species is *Fraxinus angustifolia* and

there are also: *Populusnigra*, *Populusalba* and *Alnusglutinosa*, and on the higher ground there is *Quercusrobur*. In the floor of shrubs there are species: *Ulmuslaevis*, *Rhamnuscatartica*, *Frangulaalnus*, *Acer campestre*, *Salix fragilis*, and in the floor of herbaceous plants there are: *Leucojumaestivum*, *Ficariaverna*, *Crocus vernus*, *Arum maculatum*, *Lysimachianummularia*, *Menthaaquatica*, *Lycopuseuropaeus* and others. From community of alliance Salicionalbaet here are: *Salicetumalbae-fragilis*, *Populeturnigro-albae*, *Salici-Populeturnigrae*, *Salicetumalbae* and *Salicetumfragilis*. Community of *Salicetumalbaeis* developed on the site Pristalovac and coasts of Prugnjacka. The dominant species in community is *Salix alba* and there are also species: *Salix fragilis*, *Populus alba*, *Populusnigra*, *Ulmuseffusus*, in shrubs there are: *Amorphafruticosa*, *Cornus mas*, *Crataegusmonogyna*. In the floor of herbaceous plants there are: *Menthaaquatica*, *Solanum dulcamara* and others.

Populusalba and *Populusnigra* build special community in smaller areas. Association *Populeturnalbae* is recorded near Prugnjacka and wider area Pristalovca.

91FO Riparian mixed forests of *Quercusrobur*, *Ulmuslaevis* and *U. minor*, *Fraxinus excelsior* or *F. angustifolia*, along great rivers (*Ulmion minoris*)

Alliance of *Alno-Quercionroboris* includes wet swamp lowland forest regions developed over periodically flooded fields or beyond, but a significant role in the maintenance of these forests has the presence of high levels of groundwater. Riparian forests of *Fraxinusangustifolia* are present on some dry habitats but with a high level of ground water. In riparian forests of *Fraxinusangustifolia* community *Leucojo-Fraxinetumangustifoliae* is developed which is registered on the site Ranisavljeva basca, on the surface of about 1 hectare in the depression which is strongly influenced by the flood and groundwater. In the floor of trees the dominated species is *Fraxinusangustifolia*, in the floor of herbaceous plants there are: *Leucojumaestivum*, *Galiumpalustre*, *Lycopuseuropaeus*, *Solanum dulcamara*, *Carexelongata* and others.

On the elevated grounds with short-term flooding or no flooding communities of *Quercusrobur* and *Genistaelata* (*Genistoelatae-Quercetumroboris*) were developed. Community belongs to alliance *Alno-Quercionroboris*, order *Alnetaliaglutinosae* and class *Alneteaglutinosae*. Due to excessive logging of *Quercusrobur* community has significantly changed the original appearance. Ground floor of community abounds with offspring of *Quercusrobur*. This community has a very important role in the preservation of biodiversity of Posavina landscape and deserves special priority in protection.

Mixed forests of *Fraxinusangustifolia* and *Alnusglutinosa* with *Quercus* occupy about 14 hectares of the study area. They occupy most hydrographic positions (beams) where flooding is short and affordable level of groundwater is located at a considerable depth. These forests are the first transition of hydrophilic alluvial vegetation according to climatogenic forests. Only *Quercusrobur* forests in the wide alluvial valleys belong to this type of habitat (Milanovic et al., 2015).

CONCLUSION

Connecting protected areas of RS and BiH in the European network of protected areas Natura 2000 aims to prevent the loss of biodiversity, preserve habitats of endangered species and ensure their long-term survival. For BiH, WWF MedPO started a project to support the implementation of the European ecological network Natura 2000 in 2007.

The paper presents the habitat areas of Gromizelj which is of European importance. During the research and according to Guide to the types of habitats of BiH the following habitats were isolated: 3150 Natural eutrophic lakes with Magnopotamo-nion Hydrocharition-type vegetation, 3270 Muddy river banks with Che-nopodion rubrip. p. and Bidens p. p. vegetation, 6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels, Reedbeds, tall sedges and vegetation of Phragmites-Magnocaricetea, 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicionalbae) and 91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *U. minor*, *Fraxinus excelsior* or *F. angustifolia*, along large rivers (*Ulmion minoris*).

REFERENCES

- Beck, G. (1903). Flora Bosne, Hercegovine i Novopazarskog Sandžaka /Flora of Bosnia, Herzegovina and the Sandjak of Novi Pazar/. First part, I dio, Zemaljska štamparija, Sarajevo.
- Beck, G. (1927). Flora Bosne, Hercegovine i Novopazarskog Sandžaka /Flora of Bosnia, Herzegovina and the Sandjak of Novi Pazar/. second part, II dio, Državna štamparija u Sarajevu, Beograd-Sarajevo.
- Braun-Blanquet, J. (1965). Plant sociology-The study of plant communities. Hefner Publishing Company, New York.
- Josifovi, M. (urednik), (1970). Flora Srbije /Flora of Serbia/. 1-9, SANU, Beograd.
- Javorka, S., Csapody, V. (1975). Iconographie der Florae des Südöstlichen Mitteleuropa. Akademiai Kiado, Budapest.
- Milanovi, ., Bruji, J., ug, S., Muratovi, E., Luki -Bilela, L. (2015). Vodi kroz tipove staništa BiH prema Direktivi o staništima EU /Guide to the types of habitats of Bosnia and Herzegovina to the EU Habitats Directive/. Prospect C&S s. a. Rue du Prince Royal 83, 1050 Brussels, Belgium.
- Redži, S., Barudanovic, S., Traki, S., Kulijer, D (2009). Protection of Biodiversity of the Sava River Basin Flood plains, Center for Ecology and Natural Resources (CEPRES), Bosnia and Herzegovina.