ARTICLES

BIODIVERSITY AND SEQUESTRATION POTENTIALS OF THE PEAT SOILS IN THE AREA OF LIVANJSKO FIELD

AUTHORS
Višnja Bukvić
Faculty of Social Sciences dr.Milenko Brkić, University Herzegovina, Kraljice Mira 3A, 88266, Međugorje, Bosnia and Herzegovina
e-mail: visnjabukvic@net.hr

Nusret Drešković
Department of Geography, Faculty of Science, University of Sarajevo. Zmaja od Bosne 33-35, 71000 Sarajevo, Bosnia and Herzegovina
e-mail: nusret2109@gmail.com

Aldin Boškailo
University Džemal Bijedić of Mostar, Sjeverni logor bb, 88104 Mostar, Bosnia and Herzegovina, e-mail: aldinboskailo@hotmail.com

DOI: 10.35666/23038950.2021.44.09

UDC: 574:676.034.8 (497.6 Livanjsko polje)

ABSTRACT
Biodiversity and sequestration potentials of the peat soils in the area of Livanjsko field
According to its geographical position, Livanjsko field has a number of specific natural features, among which its biodiversity is especially significant, which arose in specific geological and hydro-morphological conditions in its northern, central and southern part. One of the special natural features of this area is the peat pedological substrate which was formed in the conditions of specific paleogeographic conditions that existed in the wider Mediterranean biogeographical region during the Neogene. However, over the last 50 years, various negative anthropogenic pressures have been registered that have a very negative impact on the overall natural heritage of this Ramsar site. The paper investigates the elements of the diversity of recent flora and field vegetation. Special emphasis in these researches was placed on the sequestration potentials of peat pedosubstrate formed in the northern and southern part of Livanjsko field.

KEY WORDS
Biodiversity, soils, Livanjsko field, sequestration potentials.

1. Introduction

Livanjsko field occupies the extreme southwestern part of Bosnia and Herzegovina, i. e. (in a defined scope), it extends within the following astronomical and geographical determinants:

- the most northern point : φ = 44° 06’ 15” N; λ = 16° 36’ 25” E
- the most southern point: φ = 43° 45’ 25” N; λ = 16° 53’ 40” E
- the most western point: φ = 44° 05’ 20” N; λ = 16° 34’ 15” E
- the most eastern point: φ = 43° 49’ 40” N; λ = 17° 00’ 08” E

Among the above coordinates, Livanjsko field has an area of about 295 km2 and an average altitude of about 710 m (Map 1). The length of the field in the northwest - southeast direction is about 45 km and the average width is about 7 km.

From the aspect of general physical-geographical position, i. e. zonal-belt type, it belongs to the south-southeastern part of the southwestern Bosnian-Herzegovinian area of the out-of-valley Bosnian landscape area of the northern subtropical landscape zone.The wider area of the Livanjsko field is dominated by limestone-dolomite deposits of Mesozoic and Cenozoic - Paleogene mostly flysch formations. On such a platform, karst, fluvio-karst and fluvio-denudation destructive type of morphosculpture was predominantly developed, which was formed on the predominant mountain (hill-valley) type of morphostructure. Significantly accumulative, above all fluvial, forms of relief are formed at the bottom of the field, as a consequence of the reduced energy of the relief (Figure 1)

As a consequence of the geographical position and relief specifics of the wider environment, Livanjsko field has a moderate thermal regime with values of annual isotherms from 9.0 °C to 3.0 °C. The pluviometric regime shows altered Mediterranean features with annual isohyetic values ranging from 1150 mm to 1750 mm in the areas of the mountain peaks of Dinara mountain. Analogous to the stated values of the pluvio-thermal regime in the wider area of Livanjsko field, the Mediterranean, foothill and mountain type of climate with mixed maritime and continental influences has changed. The wider area of Livanjsko field belongs to the Cetina river basin, i. e. the Adriatic basin. Due to the predominant limestone-dolomite structure of the parent rock substrate, the surface river network is poorly developed, except along the bottom of the field, which is built of clastic sediments.

Figure 1: Geographical position of Livanjsko field

The hydromorphic division of the soil dominates in the largest part of the area, especially ranker, terra rossa and calcocambisols. Hydromorphic soils, especially fluvisols, have developed along the bottom of river valleys and basins. Biogeographical features of the wider area of Livanjsko field are a consequence of the values of all these elements. Contact mountain morphostructures, within the mid-mountain altitude belt, are biogeographically represented by the biome of supra-Mediterranean forests and shrubs of Quercus pubescens, white hornbeam and black hornbeam of the Mediterranean subregion. The biome of beech and beech-fir forests of the Moesian beech from the Eurosibirsksubregion is connected to them towards the high mountain zone. The highest peaks in the zone of Dinara mountain belong to the biome of mountain ores and high mountain tundra of the Alpine high Dinaric subregion. The area of the bottom of the field is dominated by the biome of moist forests of Quercus roburand field ash (Figure 2).

Regionally and geographically, the wider area of Livanjsko field belongs to the macroregion of the Bosnian-Herzegovinian karst, i. e. the subregion of the mountain ranges, fields and areas of southwestern Bosnia. The nodal-functional center of this subregion is the city of Livno - mesoregional center.

From the administrative aspect, Livanjsko field belongs to Canton 10, i. e. the northern parts belong to the municipality of Bosansko Grahovo, while the central and southern parts (about 2/3 of the total area of the field) belong to the municipality of Livno. According to the 1991 census, there were 26 cadastral municipalities in this area in whole or in part (4 - Bosansko Grahovo municipality, 22 - Livno municipality), with about 32,000 inhabitants, i. e. the average population density in the Livno area was around 65 inhabitants / km2. According to the competent municipal services, today in this area live about 24,000 inhabitants, or about 51 inhabitants / km2.

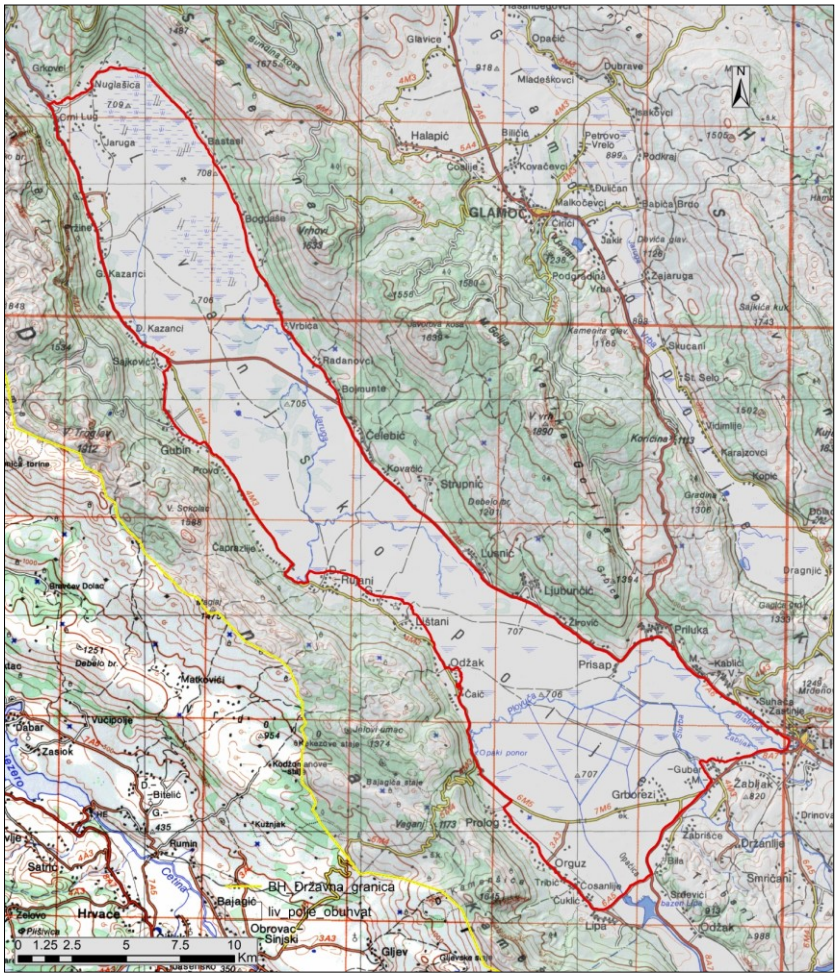

Figure 2: Topographic features of Livanjsko field (Source: TK BH, Paper Split, R = 1:200.000)

2. Biodiversity of flora and vegetation of the Livanjsko field

2.1. Biodiversity of plant communities

The vegetation of the Livanjsko field is extremely rich and diverse. Rooted aquatic vegetation (Red Potamogetonalia W. Koch 1926) from the class Potamogetonetea R. Tx. et Preising 1942 develops here, which consists of plants that take root behind the bottom of a pool or watercourse. Potamion eurosibiricum Koch fresh communities include numerous communities of submerged and floating plants. In a small number of watercourses and reclamation canals that do not dry up during the summer season, communities of this connection have been developed, which are characterized by species from the genera:Potamogeton, Nuphar luteum (Figure 3), Nymphaea alba, Myriophyllum verticillatum, M, spicatum, Hippuris vulgaris, Polygonum amphibium f. natans, Sagittaria sagittifolia var. valisnerifolia. Nutrient-rich waters allow the development of Myriophylleto-Nupharetum Koch association species. Vegetation of lake edges, rivers, streams, eutrophic ponds and wetlands, but also shallow floodplains or areas with high groundwater levels dominated by wetlands, high monocotyledons and dicotyledons, mainly helophytes include communities of reeds, mats, tall spikes and high sedges class Phragmiti-Magnocaricetea Klika in Klika et Novak 1941. These include common reed communities from the association Phragmitetum australis ("vulgaris") Soó 1927 (= Scirpo-Phragmitetum W. Koch 1926 from the association Phragmition australis W. Koch 1926.

Figure 3: Nuphar lutea Sibth. et Sm.

This is one of the most important communities of reed vegetation, which in some places overgrown large areas, sometimes occupies small areas, and also develops in depressions created by anthropogenic interventions, such as drainage channels. It also develops in all those water basins when the water level decreases in the processes of progressive succession. The floristic composition is completely dominated by Phragmites australis, while all other species are represented by a very small degree of cover.

Communities of emergent vegetation of lowland eutrophic freshwater ponds, "lakes", marsh peat bogs and muddy shores of the Phragmition communis Koch. association are represented by the Scirpeto-Phragmitetum Koch. association which is almost exclusively developed in the facies of Scirpo-Phragmitetum schoenoplectosum. Scirpo-Phragmitetumassociation, which is based on the formation and maintenance of a strong leveling effect of water, both aboveground and underground, as an absolutely dominant environmental factor. In terms of floristics, these stands are extremely poor and of great importance are high emery plants such as Phragmites communis and Schoenopiectus lacustris, which dominate the landscape, especially reeds, which is the basic edificator of the community. She is also the builder of a typical subassociation (phragmitetosum) which represents the most striking wetland complexes in the area. The species Scirpus lacustris tolerates prolonged floods and also grows in streams. This species also inhabits depressions filled with water, as well as muddy banks of watercourses and drainage canals. These communities are often joined by the species Typha latifolia, Typha shuttleworthy. Species that tolerate fairly dehydration such as Butomus umbellatus, Alisma plantago aquatica (Fig. 4), Phragmites communis, and Iris pseudocorus (the latter two are often found as a relict of wetland plant stands) have a greater distribution.

Figure 4: Alisma plantago-aquatica L.

Communities of tall sedges (Carex) and spikes (Cyperus) of the order Magnocaricetalia Pignatti 1953 develop at the edges of water basins or overgrow entire shallow depressions, most commonly oligotrophic wetlands. They are often developed on anthropogenically formed biotopes. Communities bind Magnocaricion elatae Koch. are developing in the northeastern part of Ždralovac where there are vast and shallow swamps that mostly dry up during the summer. The wet sedge of the association Caricetum elatae W. Koch 1926 belongs to the association Magnocaricion elatae W. Koch 1926. In the Livanjsko field, the community of wetland sedges has developed in both primary (natural) and secondary (anthropogenic) habitats. This community covers the largest areas of impassable wetlands, while the elements of the association are Caricetum inflato-vesicariae Koch. confined to the edges of wetlands, and in some places to interspaces left by large sods of the species Carex elata (Figure 5). The bladder sedge of the association Caricetum vesicariae Chouard 1924 belongs to the association Magnocaricion elatae W. Koch 1926.A relatively common community of wetland-bubble sedge (which occupies mostly small areas within the lowland vegetation belt) develops in both natural and anthropogenic depressions and shallow edges of the deeper water basins of the Livanjsko field. The floristic composition of this community is dominated by Carex vesicaria, and they often joinCarex rostrata (ass. "Caricetum rostrato-vesicariae"), Carex gracilis, Scutellaria galericulata, Equisetum fluviatile.

Figure 5:Carex elata All.

a) habitus *b)bloom*

In the association dominate the species Carex riparia, C. pseudocyperus, C. acutifolius, and C. prostrata. In the floristic composition of the association Caricetum elatae dominate Carex elata, with Senecio paludosus, Alisma arcuata, Iris pseudacorus, Leucojum aestivum (Figure 6), Galium palustre, Lysimachia vulgaris, Lythrum salicaria, Mentha aquatica, Phragmites australis.

Figure 6: *Leucojum aestivum* L.

a) habitus *b)bloom*

In the area of Livanjsko field there are transitional habitats with elements of tall sedges and spikes of the order Magnocaricetalia Pignatti 1953 and wet meadows of the order Molinietalia W. Koch 1926. An example of such a habitat is the community Carex gracilis-Poa palustris Ilijanić 1962.

Wet meadows of the order Molinietalia W. Koch 1926, include hygrophilous meadows of Central Europe that are spread from lowland to hilly vegetation belt. Illyrian meadows of Molinia caeruleafrom the association Molinietum coeruleae illyricum Horvatić form true meadow stands of the Livanjsko field, within which Horvatić determined the differential species Peucedanum pospichalii and Gladiolus illyricus as early as 1934 (Figure 7).

At the edge of the swamp in Ždralovac, it was developed on humus soil. Salix rosmarinifolia is common on these surfaces. It is also represented in the northeast (1 km from Rujan Lake, and about 2 km from Čaićki abyss).

Figure 7: Gladiolus illyricus W. D. J. Koch – rare and endangered plant in the flora of Livanjsko field and Bosnia and Herzegovina

The transition of wetland stands to Illyrian meadows of common invertebrates is done through a wet sub-association (Molinietum caricetosum paniceae illyricum), dominated by Carex panicea. The characteristic speciesare rare in the flora of Bosnia and Herzegovina: Molinia coerulea, Sanguisorba officinalis, Iris sibirica, and the species Galium boreale, Ophioglossum vulgatum, Allium angulosum, Serratula tinctoria, Orchis palustris, Thalictrum flavum.

Periodically moist meadows bind Deschampsion caespitosae H-ić. 1930 were developed in habitats in which is a significant change of wet and dry phase. They are mainly associated with heavy, clayey, colloidal and impermeable soils. Of the characteristic species of this bind, Gratiola officinalis and Inula brittanica, and Teucrium scordioides have the largest number. This connection in karst fields also contains sub-Mediterranean species that are not found in more northern areas such as Deschampsia media, Chouardia litardierei (Figure 8), Poa silvicola, which due to contact with Molinion and Molinio-Hordeion connections belong to characteristic species of the order.

Figure 8: Chouardia litardierei (Breistr.) – endemic Illyrian species of wet meadows of karst fields (it is also a very valuable gene pool in the flora of Bosnia and Herzegovina)

At the edge of the Livanjsko field, below Ljubunčić, the meadow association Plantaginetum altissimae has developed. Deschampsia communities, associations Deschampsietum caespitosae H-ić. 1930, form the vegetation of wet meadows, for which there is a significant change between the wet and dry phase of the soil, which causes the appearance of special formations on extremely clay soils, which are marked with the name "džombe". Large Deschampsia sods also contribute to this. The floristic composition is dominated by Deschampsia caespitosa, with only a relatively small number of species, e.g.Gratiola officinalis, Juncus effusus, Lychnis flos-cuculi.

The causes of endangerment of the Livanjsko field are the change of the water regime by hydromelioration interventions, partly the transformation into other, more profitable grasslands or arable land; absence of mowing and therefore overgrowth in thickets and forest development. In the area of Ždralovac, between Livno and Bosanski Grahovo, a concession for peat exploitation was approved without a previous environmental impact assessment study, which caused huge damage to this extremely valuable area not only in Bosnia and Herzegovina but also much wider.

2.2. Biodiversity of flora of forest habitats

Recognizing the fact that Livanjsko field is characterized by specific geomorphological, climatic and hydrological conditions, several types of forest habitats that have an azonal character have been formed in this area. More specifically, according to the map of real forest vegetation in Bosnia and Herzegovina, forest habitats in the area of Livanjsko field have been exposed to very intense anthropogenic pressure during the last century, which has resulted in a significant reduction of forest vegetation cover. For this reason, recent forest habitats are spatially significantly reduced and appear in the form of forest groves formed along the bottom of the field. In relation to the degree of their recent endangerment, the most important forest habitats include: field ash forests with Leucojum aestivumand floodplain Quercus roburforests.

FIELD ASH FORESTS WITH Leucojum aestivum
Field ash forests with Leucojum aestivum (Leucoio-Fraxinetum angustifoliae Glavač 1959) in the Livanjsko field they primarily inhabit micro-depths such as ponds and sinkholes, where they are exposed to the long-term effects of flooded groundwater. Therefore, this type of forest communities often forms the marsh forest boundary (as is the case in the Poganovo field zone). Surface water can freeze in winter, with ice pressure and weight can damage the bark and deform young ash trees. For this reason, in Livanjsko field, the ash trees of the initial, optimal and terminal phases of development are different. The ash trees of the initial phase grow on the bog border of the forest. The trunks are deformed at the vein. They are under the most intense influence of flood waters. Ash of the optimal phase implies a typical, pure ash stand with less pronounced habitat deformations. In the terminal phase, the stands of field ash become transient, so that they appear in the habitats together with Quercus robur, Acer campestre, Ulmus sp. and black alder. The stands of the initial and optimal phases grow in typical ponds, and the stands of the terminal phase in arid, transitional habitats from the pond in a row (Anić et al. 2005).

Indicator species in the tree layer are: Fraxinus angustifolia, Ulmus laevis, rarelyAlnus glutinosa and Quercus robur. In the shrub layer there are: Frangula alnus, Salix cinerea, Genista tinctoria ssp. elata. The following species are most common in the ground layer: Leucoium aestivum, Carex vesicaria, Carex elata, Galium palustre, Solanum dulcamara, Lycopus europaeus and ect. The recent ecological condition of field ash forests can be characterized as endangered, especially under adverse influences in water regime changes and intensive spread of invasive species, such as Amorpha fruticosa L. (Figure 9). The degree of endangerment increased especially after the failed natural regeneration, as well as the exposure to damage from wild animals in the younger developmental stages.

Figure 9: Amorpha fruticosa L.

FLOOD FORESTS OF Quercus robur

Flood forests of Quercus robur (Sveza Alno-Quercion Ht. 1938; As. Genisto elatae-Quercetum roboris Ht. 1938) are developed between typical micro-depths (bars) and micro-elevations (morphological beams). These are periodically flooded habitats where the flood lasts shorter or are out of its reach, but are still fresh enough. The most famous Croatian forest stands grow on them, from which the famous Slavonian oak (as. Quercus roburand large yellow oak forest) is obtained. – Genisto elatae-Quercetum roboris Ht. 1938). In transitional habitats towards micro-elevations (beams), a drought variant of these forests grows (subas. Genisto elatae-Quercetum roboris carpinetosum betuli Ht. 1938). Apart from it, subassociations with the trembling sedge have also been developed in this area (subas. Genisto elatae-Quercetum roboris caricetosum brizoides Ht. 1938) and disassembled sedge (Genisto elatae-Quercetum roboris caricetosum remotae Ht. 1938).

The indicator species are in the tree layer are: Quercus robur, Fraxinus angustifolia, Ulmus laevis, Ulmus carpinifolia. In the layer of shrubs: Genista elata, Crataegus oxyacantha, Crataegus monogyna (Figure 10), Prunus spinosa, Pyrus pyraster, Viburnum opulus and others. In a layer of herbaceous plants: Carex remota, Carex strigosa, Rumex sanguineus, Cerastium sylvaticum, Valeriana dioica, Lycopus europaeus and many others.

Figure 10: Crataegus monogyna Jacq.

3. Peat bogs of Livanjsko field

3.1. Low peat bogs

The low peat type of soil was formed under the dominant influences of the fluvial process which causes surplus wetting within the flattened mainly lowland relief, especially in the zone of wide alluvial plateaus of large rivers. The process of shaking the marsh vegetation takes place under the influence of groundwater, the level of which fluctuates significantly during the year. This is reflected in the process of only partial formation of anaerobic conditions, i. e., the decomposition of the organic component is only partial and as such is deposited in a special humus (nH) horizon in the base of which is the basic (usually gley) mineral horizon. The continuous change of drier and wetter periods during the Neogeonian period caused the backfilling of semi-decomposed wetlands with terrigenous material, on which a new process of wetting with marsh vegetation takes place again during the new wet period. In this way, a layered structure is formed, i.e. a larger number of subhorizons within a unique peat pedological profile. The basic physical and chemical characteristics of the humus horizon largely depend on the type of decomposed wetland-marsh vegetation, on which its capacity and production characteristics largely depend.

Low peatlands in Bosnia and Herzrgovina are mainly associated with certain zones along the bottom of karst fields in Herzegovina, among which the most famous are Livanjsko, Hutovo, Glamočko and Kupreško.

Sequestration potentials of peats of Livanjsko field

Peat pedosubstrate in Livanjsko field covers areas that are predominantly represented in the northwestern and southeastern part of the field. The total area of all types of peatlands in the area of Livanjsko field is about 7,017.34 ha (Figure 11).

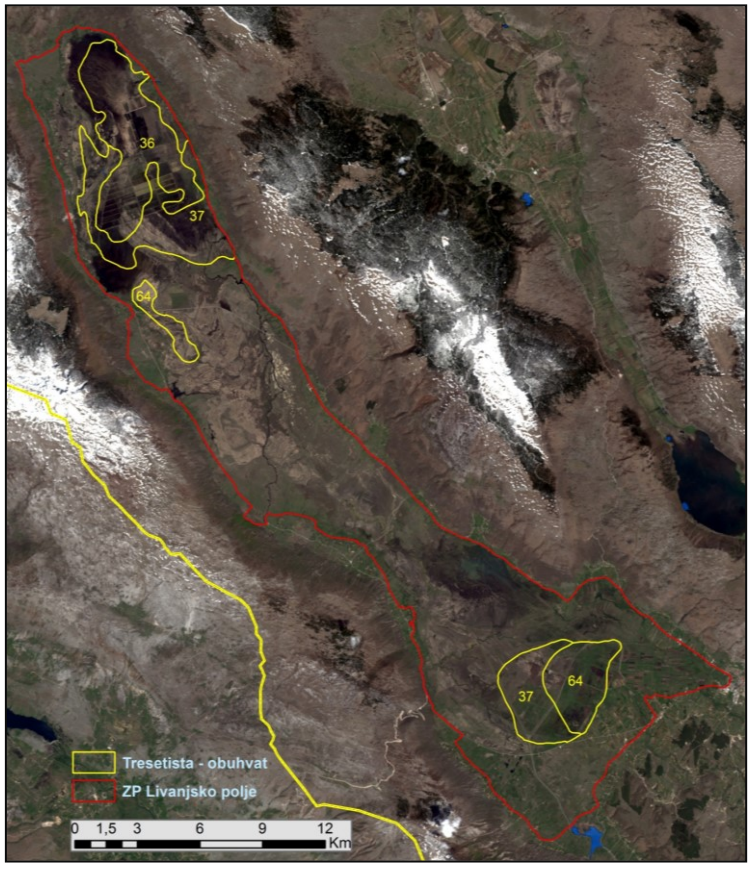

Figure 11: Spatial distribution of low peat (histosol) soil types in Livanjsko field

The largest areas of low peat (histisol) in the area of Livanjsko field are located in its northwestern part, i. e. in the area of Veliki and Mali Ždralovac (Figure 9). Pedologically, it is presented as a flat, lowland, peat acidic soil on alluvial sandy loams that spreads over 2,662.78 ha (code 36). According to the existing available data from the locality of Gornji Ždralovac, on average annually (in the period July - September), about 80,000 m3 of peat is exploited, which results in a net loss of sequestration potential of about 376,000 kg.

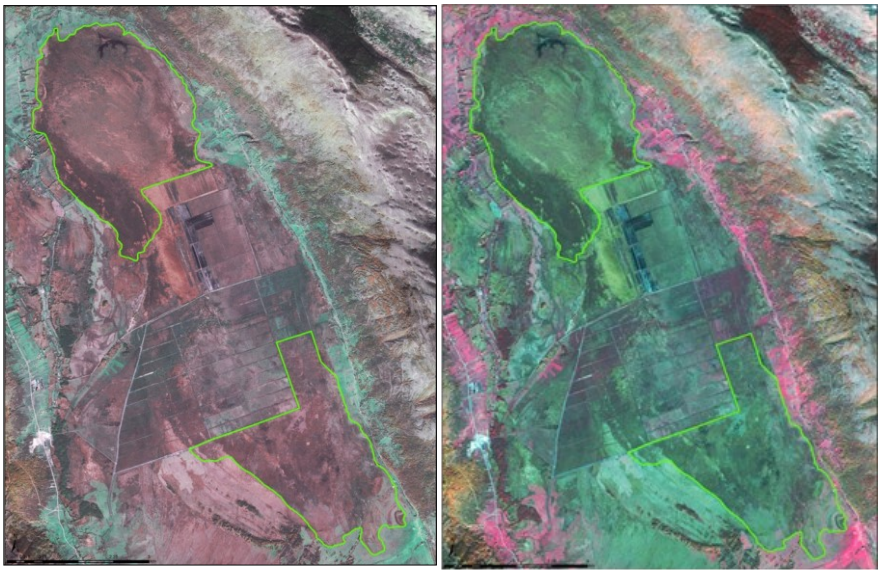

Figure 11: Peat area in the part of Veliki Ždralovac (which is partly exploited - the area in the central part between the plotted polygons of the natural scope of the peat bog) (Video: SPOT 5, Natural color and Red color, 5 m)

The surface continuity of this type of soil towards the southeastern part of the field is represented by peat - gley soil (code 37) which is represented by two isolated areas of different spatial position and spatial coverage. The first area extends along the western and southern rim of the previous type in the wider area of the wetland-marsh system of Mali Ždralovac, Velika Mrtvica and Volarnica. This area practically represents a wider zone of transition into a complex of mineral-wetland gley soil. The total area of this peat area is about 1,952.57 ha.

The second area with peat-gley soil extends in the southeastern part of the field - in the wider zone of the hydro canals Plouča and Foša. The area of this area is about 1,027.56 ha.

The next peat pedocomplex was identified as flat, lowland, peat soil on alluvial sandy loams (code 64). It is presented with two isolated areas with a total area of 1,374.43 ha. The first area is located east of the settlement of Donji Kazanci, in the wider zone of Gradina (326.59 ha). The second and surface area is spread in the southeastern part of the field, along the eastern edge of the peat-gley soil, with an area of 1,047.83 ha.

4. Results and discussion

The paper presents detailed analyzes of the physical-geographical and biogeographical characteristics of the Livanjsko field and the basic characteristics of the peat pedosubstrate. Analysis of flora biodiversity, in addition to defining types, were the basis for assessing the natural environment and conditions of occurrence as well as the general ecological status of the identified types of peatlands of the Livanjsko field. More specifically, the analysis of the results of field research and available literature data showed that the typical peat pedosubstrate of the Livanjsko field area is inhabited by vegetation associations: Caricion davallianae Klika 1934 and Caricion canescentis-fuscae (Table 1). participate in the decomposition of organic material that builds the peat horizon.

Table 1: Syntaxonomic review of low peat vegetation in Livanjsko field.

R.br.	Taxonomic category
1.	**Class *SCHEUZHERO-CARICETEA FUSCAE* (Nordh. 1936) Tx. 1937**
1.1.	**Order *Caricetalia davallianae* Br.-Bl. 1949**
1.1.1.	**Sveza: *Caricion davallianae* Klika 1934**
1.	Ass. *Schoenetum nigricantis*W. Koch. 1926
2.	Ass. *Valeriano-Caricetum buxbaumii*Ritter-Studnička 1972
3.	Ass. *Eriophoro-Caricetum paniceae*Horvat 1964
4.	Ass. *Eriophoro-Caricetum davallianae*Ritter-Studnička 1972
5.	Ass. *Menyanthetum trifoliatae*
1.2.	**Order *Caricetalia fuscae* Koch 1926 em. Br.-Bl. 1949**
2.1.1.	**Sveza: *Caricion canescentis-fuscae***
6.	Ass.*Caricetum fuscae*Br.-Bl. 1915
7.	Ass. *Eleocharetum palustre*

Based on the results of the author's scientific research, the paper creates the necessary data base for defining the sequestration potentials of identified peatland types for greenhouse gas storage in the Livanjsko field area. The largest areas are located in the northwestern part of the field (Veliki and Mali Ždralovac), with flat, lowland, peat acidic soil on alluvial sandy loams accounting for 2,662.78 ha and peat - glay soil 2,049.33 ha.

In the southwestern part of the field in the area of the village of Grborezi, peat - glay soil occupies an area of 1,027.55 ha, while flat, lowland, peat soil on alluvial sandy loams occupies an area of 1,047.83 ha.

In the zone of the settlement of Donji Kazanci, flat, lowland, peat soil on alluvial sandy loams occupies an area of 326.59 ha. In accordance with the highlighted data, the calculated total area of peat pedosubstrate in the area of Livanjsko field is 7,017.34 ha.

The calculation of sequestration potentials of the peat pedosubstrate of Livanjsko field was realized in accordance with the empirical methodology applied within the countries preparing national reports on climate change (including Bosnia and Herzegovina) in accordance with the guidelines of the UNFCCC panel of the United Nations. The proportion of carbon content according to the methodology defined by Cannell et al. (993) is described as a fraction only within organic matter, while most published papers give carbon as a proportion of total dry mass. In essence, according to most methodologies, the carbon content in peatlands is taken to be about 52% of the dry mass. Removing the mineral mass and considering only the organic fraction would lead to an increase in the proportion of carbon relative to non-carbon atoms so that the proportion is closer to 0.54 than 0.5. For this reason, Cannell et al. (1993) recommend a value coefficient of 0.5.

Using these values under the assumption that an area of $1m^2$ has a thickness of only 1 cm, the calculation given by Cannell et al. (1993) obtained:

Carbon content = 10 x 1 cm (thickness) x 0.94 (organicmatter) x 0.5 (carbon proportion)

Based on this, Cannell et al. (1993) conclude that the average carbon density in peat soil is 0.47 kg C m^2 per cm depth, which is equal to 47 kg C as the carbon content in a standard cubic meter of peat.

Based on the data from the above equation, it is possible to estimate the stocks of C u in the peat soils of Livanjsko field, according to the following equation:**7.017,34 ha x 642.90 t/ha C = 4.511.4481 t C**

Unfortunately, during the last 50 years in the area of Mali and Veliki Ždralovac, peat soil has been intensively exploited, as a result of which there is a real danger that a large amount of carbon stored in this part of Livanjsko field will be released in the coming years.

5. References

Abadžić, S., Sarajlić, N. 2014. Floristic values of the Karst Poljes of Bosnia and Herzegovina. In: Sackl P., Durst R., Kotrošan D. & Stumberger B. (eds.). Dinaric Karst Poljes - Floods for Life. EuroNatur, Radolfzell, pp. 45-57.

Bjelčić, Ž. 1969. O rasprostranjenju nekih tresetnih biljaka u Bosni i Hercegovini. Glasnik Zemaljskog Muzeja, N. S. Prirodne nauke, 9: 23-27, Sarajevo.

Drešković, N., Đug, S., Stupar, V., Hamzić, A., Lelo, S., Muratović, E., Lukić-Bilela, L., Brujić, J., Milanović, Đ., Kotrošan, D. 2011. NATURA 2000 u Bosni i Hercegovini (ed. Fejzibegović, S.). U.G. za okolišno održivi razvoj Sarajevo, Sarajevo. pp. 1-459.

Đug, S., Muratović, E., Drešković, E., Boškailo, A., Dudević, S. 2013. Crvena lista flore Federacije Bosne i Hercegovine. Nacrt izvještaja – Prijedlog. Projekat Šumskih i planinskih zaštićenih područja, „NVO Green way" i „Federalnog ministarstva za okoliš i turizam", Sarajevo. pp. 1- 347.

Joosten, H. 2009. The global peatland CO2 picture. Peatland status and drainage associated emissions in all countries of the World. Wetlands International, Ede, the Netherlands.

Krilašević, E., Šehović, A. 2010. Moguće mjere podsticaja zaštite biodiverziteta kroz podsticanje održivog razvoja – Pripremljeno u sklopu projekta: KARST UNDP-GEF Projekat – Integriranje smjernica za očuvanje krških tresetišta u ključne ekonomske sektore. Međunarodni kolokvij 2010. godina bioraznolikost (International colloquium 2010th year of biodiversity), Livno, 13.-15.12.2010, Livno.

Lakušić, R. 1981. Klimatogeni ekosistemi Bosne i Hercegovine (I). Geografski pregled, 25: 41-69, Sarajevo.

Lakušić, R. 1984. Klimatogeni ekosistemi Bosne i Hercegovine (nastavak). Geografski pregled, sv. 26-27 (1982/83), pp. 143-164, Sarajevo.

Stefanović, V., Beus, V., Burlica, Č., Dizdarević, H., Vukorep, I. 1983. Ekološko-vegetacijska rejonizacija Bosne i Hercegovine. Šumarski fakultet, Posebna izdanja, 17: 1-49.