Project Report

"Ecological Data Gap Analysis and Ecological Sensitivity Map Development for the Bregalnica River Watershed"

Dekons-Ema and Macedonian Ecological Society

Book 4

Report on the status of protected areas in Bregalnica watershed

Project coordinator: Slavčo Hristovski

Director: Menka Spirovska

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Editors: Brajanoska Robertina and Slavcho Hristovski

Authors:
Brajanoska Robertina
Slavcho Hristovski
Metodija Velevski
Mitko Kostadinovski
Vlado Matevski
Sonja Ivanovska
Vladimir Dzabirski
Ljupcho Melovski
Valentina Slavevska Stamenkovikj
Nikolcho Velkovski
Zlatko Levkov
Katerina Rusevska
Despina Kitanova
Aleksandar Stojanov
Dime Melovski
Daniela Jovanovska
Vasko Avukatov
Aleksandar Sarov
Bogoljub Sterijovski
Ljiljana Tomovikj
Svetlana Pejovikj
Natalija Melovska
Evgenija Jordanovska

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Dekons-Ema
Environmental Management Associates
Mitropolit Teodosij Gologanov st., 44/4
1000 Skopje
office@ema.com.mk
http://www.ema.com.mk

Macedonian Ecological Society
Vladimir Nazor st., 10
1000 Skopje
contact@mes.org.mk
http://www.mes.org.mk

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Contents

Acronyms

CDEPR	Centre for Development of Eastern Planning Region
GEF	Global Environmental Facility
IUCN	International Union for Conservation of Nature
MEPP	Ministry of Environment and Physical Planning
MN	Monument of Nature
MPA	Multi-Purpose Area
NBSAP	National Biodiversity Strategy with Action Plan
NP	National Park
Ntr.P	Nature Park
SPEMR	Spatial Plan of Eastern Macedonia Region
PE	Public Enterprise
PL	Protected Landscape
RPAN	Representative Protected Areas Network
SNR	Strict Nature Reserve
UNDP	United Nations Development Programme
WA	Wilderness Area

1 Introduction

The Report on the Natural Heritage in Bregalnica Watershed has been developed in the frames of the Project *"Ecological Data Gap Analysis and Ecological Sensitivity Map Development for the Bregalnica River Watershed"*, which is part of the Nature Conservation Programme supported by the Swiss Development and Cooperation Agency. It outlines the state of the current protected areas, includes analysis and results from additional survayes in areas proposed for protection acording to different planning and strategic documents, as well as internationally important areas for plants, birds and butterflies and Emerald sites. This has been used as basis for elaboration of areas proposed for protection in Bregalnica Watershed which should secure protection of the most important habitats and species in the area of interest. We actually address around twenty smaller areas (which are 'core areas') for the purpose of conservation of the most important species and habitats in Bregalnica Watershed, the size of which ranges between 100 and 8000 ha (excluding the proposal for integrated protection of Osogovo Mountains in the category of Protected Landscape, which would cover larger area). Lower categories of protection (mainly Category III - Monument of Nature, Category IV – Nature Park and Category V – Protected Landscape) have been proposed for these areas to secure proper management of natural resources and provide possibility for harmonization with sectoral development plans. Each area is described in brief, with its location, outstanding natural values, proposed boundaries, etc. In addition, 16 small areas are proposed for protection as Natural Rarities.

In the process of the Report elaboration, all stakeholders have been consulted, including Centre for Development of Eastern Planning Region (CDEPR) and Mayors of the municipalities in this region, Spatial Planning Agency (SPA), as well as the Ministry of Environment and Physical Planning (MEPP). The Report will be also beneficial to the Spatial Planning Agency in the elaboration of the Spatial Plan of Eastern Macedonia Region in the domain of natural heritage.

Nevertheless, this document should be perceived as basis for organization of the protection in Bregalnica Watershed and undertaking steps towards designation of individual areas, in case of which the areas would be analyzed in detail to include their internal zoning and manner of future management.

2 Geographical range

The area of interest (Figure 1) covers 4663.3 km^2 and incorporates the area of Bregalnica Watershed and Eastern Planning Region of the Republic of Macedonia. It is situated in the central and eastern parts of the Republic of Macedonia. Bregalnica Watershed occupies an area of 4315.5 km^2 or 16.78% of the territory of the Republic of Macedonia. Eastern Planning Region covers an area of 3548.7 km^2.

The River of Bregalnica rises below Chengino Kale at an altitude of 1690 m, which is at the same time the furthest east part of its watershed area. The boundary of the watershed area on south proceeds along the mountain ridge of Plachkovica, the springs and the valley of the river Kriva Lakavica near the mine Buchim and the town of Radovish. On west, the boundary continues along the lowest slopes of the mountain Konechka Planina, then towards its entry into the river of Vardar and western side of Ovche Pole, i.e. the water course and basin of the river Svetinikolska Reka. On north, the boundary runs along the highest peaks of Osogovo Mountains, up to the state border with Bulgaria near the peak of Ruen. The administrative border with Bulgaria is at the same time natural border of Bregalnica Watershed on east.

The elevation range of the area is between 143 m above sea level at the entry of Bregalnica into Vardar and the peak Mal Ruen on Osogovo Mountains at 2202 m above sea level.

Bregalnica Watershed covers parts of the mountains of Osogovo, Maleshevo, Plachkovica, Konechka Planina, Vlaina Planina, Golak, Obozna, Bejaz Tepe, Gradishtanska Planina, Mangovica, Ovche Pole Valley, Kochansko Pole, Probishtip Valley and the valley of the river Lakavica and Slan Dol. The boundary of the area passes through the highest peaks of the said mountains, namely: Dzami Tepe (1801 m above sea level) on Maleshevo Mountains, Lisec (1754 m above sea level) on Plachkovica, Kadiica on Vlaina Planina Mt. (1932 m above sea level) and the ridge of Osogovo Mountains formed of the peaks Carev Vrv (2084 m above sea level) and Mal Ruen (2202 m above sea level).

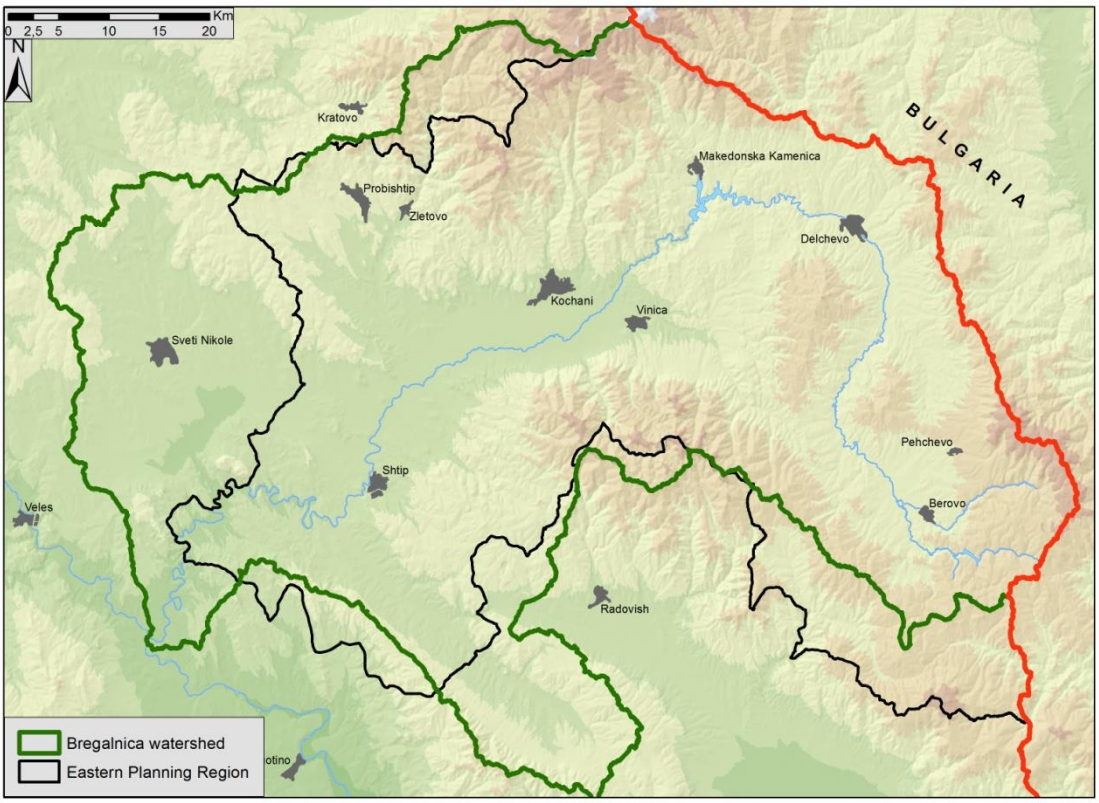


Figure 1 Geographical range of Bregalnica Watershed (area of interest)

The River of Bregalnica is the biggest tributary of Vardar River (with a length of 225 km) and the biggest river in the eastern part of Macedonia. Major tributaries of the river Bregalnica include the following rivers: on the right side–Pehchevska Reka, Zhelevica, Gabrovska Reka, Ochipalska Reka, Lukovichka Reka, Kamenica, Orizarska Reka, Kochanska Reka, Zletovska Reka and Svetinikolska Reka and on left Ratevska Reka, Kamenica, Budinarska Reka, Biglanska Reka, Zarovec, Osojnica, Gradeshka Reka, Zrnovska Reka, rivers Plachkovica, Kozjak, Suva Reka, Otinje and Kriva Lakavica.

There are 10 dams and reservoirs within the boundaries of the watershed, the largest among which are Kalimanci and Berovo Lake (on the river of Bregalnica itself), Gradche on the river Kochanska Reka, hydro system Zletovica (dam Knezhevo) on the river Zletovska Reka, Mantovo on Kriva Lakavica and Topolnica on Topolnichka Reka.

The area of Bregalnica Watershed incorporates the following municipalities: Berovo, Delchevo, Zrnovci, Karbinci, Kochani, Vinica, Makedonska Kamenica, Pehchevo, Probishtip, Cheshinovo - Obleshevo, Shtip, Sveti Nikole, Kratovo, Konche and Lozovo. This area pertains to four planning regions.

3 Biological diversity in Bregalnica Watershed and Eastern Planning Region of the Republic of Macedonia

Bregalnica Watershed and Eastern Planning Region pertain to *Balkan mountain province* as part of Palaearctic. This province actually incorporates the central part of the Balkan Peninsula. According to the classification of the European Environment Agency, major part of Eastern Macedonia, including Bregalnica Watershed, belongs to **continental European biogeographical region**.

Six of the eight climate-vegetation-soil zones in the Republic of Macedonia are found in Bregalnica Watershed. Only submediterranean (modified Mediterranean) area and alpine mountain area do not occur there. However, elements of these two zones can be found in the lowest parts of Bregalnica Watershed and the highest parts of Osogovo Mountains, especially its peak Ruen.

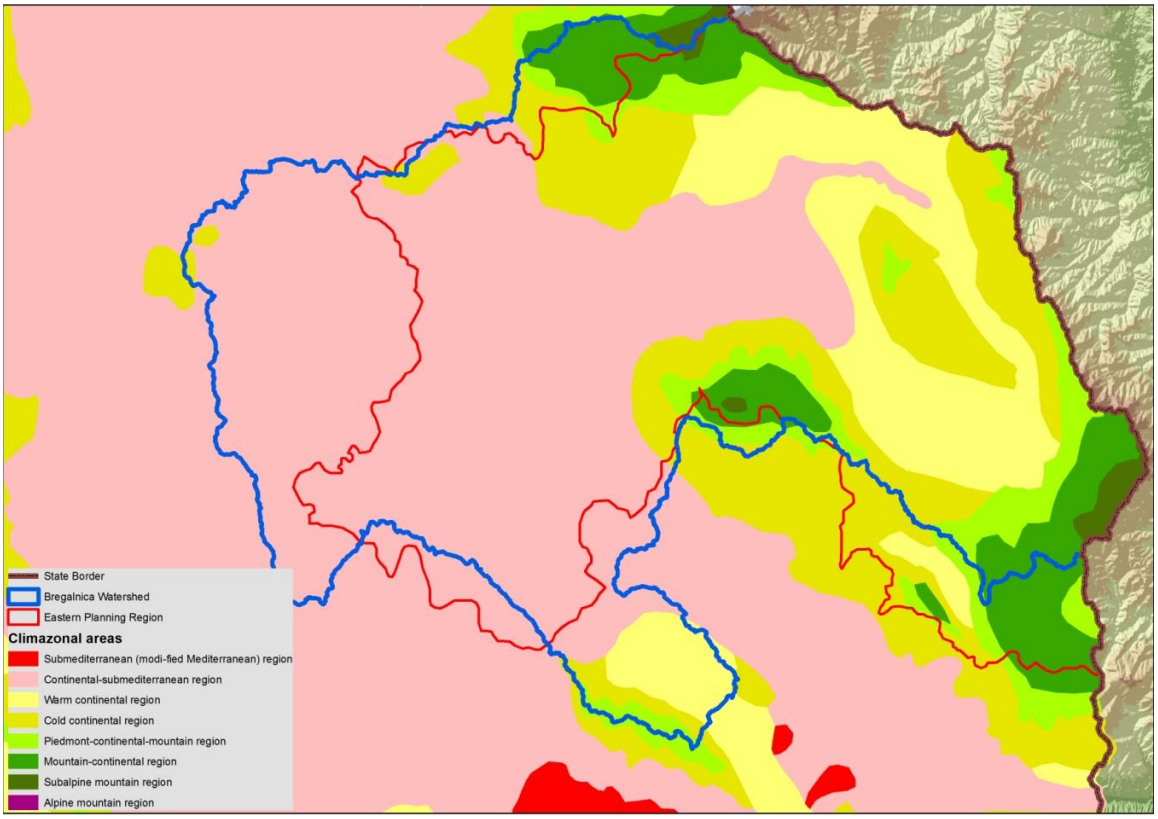


Figure 2 Climate-vegetation-soil zones in Bregalnica Watershed and Eastern Planning Region.

The lowest parts (Ovche Pole, Shtipsko Pole, Kochansko Pole, Mangovica and low parts of the valley of the river Kriva Lakavica) are under thermophilous vegetation where the forests of pubescent oak (*Querco-Carpinetum orientalis*) would potentially dominate and represent continental-submediterranean area. Warm continental area covers a wide belt of the mountains of Osogovo, Maleshevo, Golak, Obozna, Plachkovica, higher parts in the river valley of Kriva Lakavica, etc. The dominant forest communities in this area are Italian and Turkey oak forests (*Quercetum frainetto-cerris*). Cold Mediterranean area (Sessile oak forests) is the most noticeable on the mountains of Plachkovica, Maleshevo, Golak, Obozna, and western parts of Osogovo Mountains. Above these areas, submountane and montane continental areas (submountane and mountane beech forests) and subalpine mountain area alternate in regular belts.

Submontane continental-mountain area occurs in a narrow belt on the mountains of Plachkovica, Maleshevo, Osogovo, Ograzhden and Golak. Mountain-continental area represented by

beech forests of the community *Calamintho grandiflorae-Fagetum*, as well as different communities of coniferous species develop above this area on these mountains. Subalpine mountain area occurs only on the highest parts of the mountains of Osogovo, Plachkovica and Maleshevo.

3.1 Diversity of habitats

The area of Bregalnica Watershed and Eastern Planning Region, especially in lowland part, accommodates one of the most interesting habitats in Macedonia. Total of 60 habitat types has been registered. Habitat spectrum reflects the highest representation of grasslands, inland water bodies and forest habitats.

Habitat complex of inland water bodies includes *surface standing waters*(five larger and several smaller artificial water accumulations for different purposes, as well as temporary ponds), *running waters* (Bregalnica River and entire network of its tributaries, springs, etc.) and *riparian habitats in littoral zone* (belts of reed, sedge and other types of riparian vegetation on lakes, rivers and streams).

Habitat complex of mires and fens includes humid habitats with water above or under the land level, at least for half of the year, such as acid mires (peat bogs on Osogovo Mountains, Judovi Livadi), alkaline mires, sedge and reedbeds. **Habitat complex of grassland communities** incorporates relatively well developed terrestrial grass vegetation (with more than 30% vegetation land cover), which is to a smaller or bigger extent of natural origin: dry grasslands, alpine and subalpine grasslands, natural mesophilous grasslands and meadows, improved meadows, saline steppes and vegetation on fringes and clearings.

Habitat complex of heaths, shrubs and tundra has shrubby vegetation reaching height of five meters and foliage of more than 30%, such as *arctic, alpine and subalpine shrubs* (heaths with *Bruckenthalia*, heaths with blueberries and heaths with *Chamaecytisus absinthoides*), *Mediterranean and moderate mountain shrubs* (habitat with shrubby oriental hornbeam and habitat with Christ's thorn), *garrigues* (with juniper), *riparian shrubs* (shrubby willows and habitat with invasive shrubby species), as well as anthropogenic *hedgerows/hedges* and *vineyards*.

Habitat complex of forests includes *deciduous broadleaf forests, coniferous forests, mixed deciduous-coniferous forests,* as well as *small stands of natural or cultivated tree species.* Deciduous broadleaf forests are represented by habitats of several different habitat units: riparian and gallery woods (with willows, alders and poplars), mixed riparian floodplain and gallery woods, Mediterranean riparian forests, beech forests, thermophilous deciduous forests (with Italian and Turkey oak, with hop hornbeam, with oriental hornbeam and with aquatic hornbeam, acidic oak forests, meso and eutrophic mixed forests with oak, hop hornbeam, European ash, etc., plantations with broadleaf deciduous species and orchards. Coniferous forests are represented by three habitats: forests with black pine, mixed white pine and beech forests and plantations with species from the genus *Pinus* (at many sites on the mountains of Plachkovica, Osogovo, etc.).

Habitat complex of terrestrial habitats without or with sparse vegetation is represented by underground caves, screes, cliffs and rocks, as well as other habitats with sparse vegetation foliage. Apart from the mentioned habitat complexes, different types of anthropogenic habitats are found in the area, too (settlements, agricultural lands, fishponds, parks, industrial facilities, quarries, etc.).

Artificial ponds by the bank of river Kriva Lakavica

Peat bog on the river Pehchevska Reka

Beech forest above the river Ramna Reka (Maleshevo Mountains)

Beech and black pine forest near Ramna Reka (Maleshevo Mountains)

Italian and Turkey oak forests on Obozna

Meadows above the village of Vladimirovo

Steppe-like vegetation near the village Kjoseleri

Halophylous community, Ovche Pole

Grassland habitats on saline soils and riparian vegetation of willow and alder (the last two habitats have priority status under the Habitats Directive) are at considerably high extent of threat. Apart from these habitats, the habitats of Heleno-Balkanic grassland and thermophitic communities, Balkano-Montane communities with *Nardus stricta* and Thracian-Macedonian shrubberies with oriental hornbeam are also outstanding with their significance. Habitats with priority status under Annex 1 of the Habitats Directive also include the following habitats: C1.4: Permanent dystrophic

lakes, ponds and pools, C1.6: Temporary lakes, ponds and pools, C2.21: Epirhithral and metarhithral streams, C2.3: Permanent non-tidal, smooth-flowing watercourses, D2.3: Transition mires and quaking bogs, E4.39: Oro-moesian acidic grassland habitats, E5.572: Moesian communities with tall herb stands, F2.26: [*Bruckenthalia*] heaths, F2.2A2: Balkano-Helenic heaths with low blueberries, F2.2B2: Balkano-Rhodopian[*Chamaecytisus absinthoides*] heaths, G1.691: Southwestern Moesian beech forests, G1.762: Heleno-Moesian forests with *Quercus frainetto*, G1.8: Continental forests with sessile oak [*Quercus petraea*] and H3.152: Carpatho-Balkano-Rhodopian silica cliffs.

Heaths on Chengino Kale

Grasslands and rocky grounds on Ruen

3.2 Diversity of wild species

Flora in Bregalnica Watershed counts more than 1200 species. For the sake of illustration, around 1000 species have been registered on Osogovo Mountains solely. Flora in the lowland part of the basin, where considerable number of rare and endemic plant species occurs, is especially interesting. The locality Judovi Livadi and several other localities on Maleshevo Mountains and Bukovik host the insectivore plant *Drosera rotundifolia*. Diversity of plant species is the most prominent in lowlands. There are well-known sites west of Shtip where rare and endemic plant species (*Hedysarum macedonicum, Onobrychis megalophylla, Ferulago macedonica, Salvia jurisicii*), halophytes (*Artemisia maritima, Krasheninnikovia* (=*Eurotia*) *ceratoides, Camphorosma monspeliaca, Camphorosma annua*) and steppe plant species (*Astragalus parnassi, Morina persica, Convolvulus holosericeus*) *grow*. Some of these species can be found on the slopes of Osogovo Mountains.

There are several important plants in the furthest east part of the area, in mountain parts, namely: *Drosera rotundifolia, Picea abies, Verbascum lesnovoensis, Genista fukarekiana, Lycopodium clavatum, Dryopteris borreri, Festuca thracica* subsp*. violaceo-sordida* var*. osogovoense, Viola orbelica,* etc.

***Salvia jurisicii* near the village Vrsakovo (Ovche Pole)**

***Morina persica*, Bogoslovec**

***Hedysarum macedonicum*, Gladno Pole**

***Blechnum spicant*, Pehchevska Reka**

The overall number of fungi in Bregalnica Watershed is 629. Of those, 301 are lignicolous, 291 are terricolous, two species are underground fungi, and the rest are lichenicolous, humicolous and coprophile species. Around 115 can be used as food, and 16 of them are commercial species (Caesar's mushroom, chanterelle, horn of plenty, negro-head bolete or tanned cep, summer cep, cep or penny bun boletus, common morel, black morel and black more), 70 are toxic, 3 are hallucinogenic, and around 15 species have medicinal properties. The richest diversity of fungi is found in natural forest ecosystems, especially mixed forests of beech, white and black pine. Grasslands and pine stands are poorest in species.

Presence of very rare (56) and rare (44) fungi species is impotent feature of the area. Of those, the following are worth mentioning: *Hericium corraloides, Sparassis crispa, Tephrocybe boudieri, Amaurodon viridis, Leucopaxylus tricolor, Melanogaster broomeianus, Pluteus romellii*, etc. According to the proposed Macedonian Red List of Fungi, the area of interest hosts six endangered - EN (*Amanita cesarea, Endoptychum agaricoides, Ganoderma pfeifferi, Inocybe* cf. *dunensis, Phallus hadrianii, Pleurotus eryngii*), six vulnerable-VU (*Boletus aereus, B. satanas, Clavariadelphus pistillaris, Gyrodon lividus, Omphalina baeospora, Verpa conica*) and seven nearly threatened (NT) fungi species.

***Sparassis crispa* in the locality of the river Trebomirska Reka**

Diatom flora in Bregalnica Watershed is represented by around 430 species. Around 250 species have been identified in river ecosystems, but most of them belong to the group of wide spread species. However, rivers in their upper courses are characterized by oligotrophic flora with presence of rare and endangered species, such as *Eunotia macedonica* Lange-Bertalot, Pavlov & Levkov, *Eunotia atomus* Pavlov & Levkov, *Eunotia tetraodon* Ehrenberg. Peat bogs are characterized with presence of specific flora adapted to longer periods of draught and scarcity of nutrients. This flora is often not very diverse, i.e. the number of species is relatively low. Nevertheless, species are specific and have limited distribution both in Macedonia and beyond. Humid rocks are also regarded as extreme habitats where mostly aerophytic diatomean species develop. The number of species is relatively low, but their distribution is very limited. Such species include: *Luticola osogovoensis* Levkov, Pavlov & Metzeltin, *Luticola quinquenodis* (Grunow) Levkov, Pavlov & Metzeltin, *Achnanthes prominula* Levkov & Tofilovska, *Achnanthes pseudocoarctata* Levkov & Tofilovska. Yet, mineral waters and saline soils are the most interesting from diversity point of view. These habitats are disjunctive and strongly specific and accommodate many rare and endangered species, such as: *Achnanthes secretitaeniata* Toyoda & Tanaka, *Cylindrotheca gracilis* (Brebisson) Grunow, *Denticula subtilis* Grunow, *Entomonies paludosa* (W. Smith) Reimer and *Scoliopleura peisonis* Grunow. It needs to be mentioned that the research of diatomean flora in Macedonia going on for decades has not

resulted in identification of the genres *Cylindrotheca, Entomonies* and *Scoliopleura* and this are the first data on them in Macedonia. In the frames of the research of diatoms in Bregalnica Watershed, at least six species new for the science have been identified and their valid description will follow in near future. Genus gifted with exceptionally high diversity in the investigated area is *Nitzschia* Hassal *sensu lato* with total of 47 identified species or approximately around 2/3 of the overall diversity of this genus known for Macedonia. The highest number of them (more than 30) has been identified in saline soils of Gladno Pole.

Total of 66 different mammalian species out of the overall 85 in Macedonia have been registered in Bregalnica Watershed. Out of those, eight are insectivore mammals (Insectivora), 22 are rodents (Rodentia), one species belongs to rabbits (Lagomorpha), 11 are carnivore mammals (Carnivora), five species are even-toed ungulates (Artiodactyla) and 19 are bats (Chiroptera). With reference to the latter, it is worth to mention the species *Nyctalus lasiopterus* to which the area of Bregalnica Watershed is for the time being the only finds of this bat species in Macedonia. Red deer (*Cervus elaphus*), fallow deer (*Dama dama*) and mouflon (*Ovis aries*) can be found only in the enclosed hunting ground Polaki on Osogovo Mountains. Ocassional presence of brown bear (*Ursus arctos*) has also been observed in the area.

220 species of birds are known for the area of Bregalnica Watershed. Out of the total number, three species (Great Bustard, Little Bustard and Black Vulture) are extinct. Considering the overall number of birds with regular presence in Macedonia (around 250), such high number of registered species is primarily due to diversity of habitats in Bregalnica Watershed (species demanding large aquatic areas and typical mountain species are absent). We should underline the breeding of Egyptian Vultures (*Neophron percnopterus*, globally endangered species), significant population of Imperial Eagle (*Aquila heliaca*, globally sensitive species), two species of flycatchers (*Ficedula parva* and *Ficedula semitorquata*) which are very rare in Macedonia and occur in old beech forests, especially on Plachkovica Mt., as well as considerable number of species with limited distribution and species with unfavourable status of population on global or European level.

Black-winged stilt (*Himantopus himantopus*) in rice fields near Kochani

For the area of Bregalnica Watershed, 11 species of amphibians and 27 species of reptiles have been known. Updating of the data on the natural range of Spur-thighed Tortoise (*Testudo graeca*), listed in all international conservation conventions, also under the IUCN Red list it enjoys status of vulnerable species, is of special importance. The area accommodates species that are typical for high mountain ecosystems, such as Viviparous Lizard (*Zootoca vivipara*) registered in the

highest parts of Osogovo Mountains. However, the highest diversity of reptiles is found in lowland parts of the area (Slan Dol, Dolna Bregalnica, Ovche Pole). In these areas, important species like: *Zamenis situla, Typhlops vermicularis, Eryx jaculus, Platyceps najadum, Testudo graeca, Eurotestudo hermanni, Pelobates syriacus balcanicus,* etc., can be found.

Fire salamander (*Salamandra salamandra*) in beech forests on Kartal (Plachkovica)

Fauna of terrestrial invertebrates in Bregalnica Watershed is characterized with extraordinary diversity. Species typical of Mediterranean ecosystems in the lowland part of the area, mountain ecosystems with certain alpine elements on the peaks of higher mountains (Osogovo Mountains and Plachkovica) can be found in the area. Most specific animal species, such as Macedonian solifuge (*Galeodes elegans*), Mediterranean scorpion (*Mesobuthus gibbosus*), black widow spider (*Latrodectus tredecimguttatus*), termite (*Reticulitermes lucifugus)* and many more species, especially insects, exist in the steppe-like area of the lower course of Bregalnica River. From among the family of ground beetles (Coleoptera, Carabidae) we can list numerous interesting species: *Harpalus metallinus, H. triseriatus, Ophonus brevicollis, Dixus spp., Pachycarus cyaneus*, *Brachinus brevicollis*, *Ditomus clypeatus*, *Poecilus anatolicus, P. puncticollis,* etc. Riverine habitats (sandbanks, poplar belts, ricefields, etc.) host specific species like *Carabus granulatus interstitialis*, *Elaphrus* spp., *Bembidion* spp., *Paratachys* spp., *Dyschirius* spp., etc. Presence of certain halophylous insects was registered on saline soils, among which we can mention *Cephalota turcica* and *Acupalpus elegans*. Forest ecosystems are featured with many species, including certain endemic species: *Molops pieces osogovensis, Molops rufipes denteletus, Tapinopterus balcanicus belasicensis, Myas chalybaeus, Aptinus merditanus*, etc. Apart from endemites, there are also species of special conservation interest in the forests and they are at the same time indicators of the well preserved forest ecosystems: *Carabus intricatus, C. convexus dilatatus, Calosoma sycophanta, Morimus funereus, Rosalia alpina*, etc. In peat bogs and other mountain wetlands, we can find rare species like: *Amara morio nivium, Loricera pilicornis, Pterostichus apfelbecki*. The highest parts of Osogovo Mountains also host certain mountain and “alpine” species like *Amara nigricornis, A. erratica, A. messae, Trechus priapus medius*, as well as endogeic species like *Duvalius beshkovi*.

***Carabus granulatus* in poplar forests by Bregalnica River**

Great diversity of the group of daily butterflies in Macedonia is also notable in Bregalnica Watershed, which is abundant in different types of habitats and ecosystems. It has been concluded that as many as 136 species can be found in this area, representing 66% of the overall number of species in Macedonia or around one fourth of all species in Europe. This number is impressive, especially against the small area of this region. As far as representation of families is concerned, representatives of all six families found in Europe were also registered in the area of Bregalnica. One of the most remarkable representatives which in Macedonia are found only in this area are *Erebia aethiops* and *Minois dryas*, while Large copper (*Lycaena dispar*) is of particular conservation importance. These butterflies together with Marsh fritillary (Euphydryas aurinia) are taken as points in designation of Prime Butterfly Areas in Europe. Parts of Bregalnica Watershed largely deserve this status.

The number of known aquatic macro invertebrate species in the area of Bregalnica Watershed is high and reaches 327 species. Bregalnica Watershed is the only find of the genus *Hydrochus* and species *Hydrobius fuscipes* and *Agabus didymus* in Macedonia. Most of the beetles (Coleoptera-10 species) inhabit saline pools in Ovche Pole, Slan Dol, Kochani Valley and ponds near the river Kriva Lakavica after the water accumulation Mantovo, while *Limnius volcкmari* and *Pomatinus substriatus* are reophile representatives found in the rivers Brbushnica, Pehchevska and Zrnovska.

Fauna review has resulted in identification of macro invertebrates of international and global importance for conservation. At certain localities (Bregalnica after the river Zletovska, village of Dolni Balvan and Bregalnica before entry into Vardar), presence of empty shells of *Unio crassus* (under the IUCN Read List of species under threat, it has a status of Endangered (EN) species at global level) was recorded, which raised the assumption of the presence of mussels, though not the existence of viable populations. *U*. *crassus*is legally protected under Annex II/IV of the Habitats Directive 92/43/EEC, which underlines further the necessity for active protection both of the species and its habitat. Habitats Directive provides for strict legal protection of two more species (under Annex IV): *Austropotamobius torrentium*(stone crayfish) and *Gomphus flavipes*. *A*.*torrentium* occurs in the upper course of the river Bregalnica (Ramna Reka), Zrnovska, Pehchevska and Osojnica (tributaries to Bregalnica), as well as in the waters of Osogovo Mountains (rivers Eshterec, Zelengradska and Mala Reka, above Kochani Lake). The stone crayfish is is of special interest to EU and included in the Annex II list, thus its protection assumes designation of specific areas for conservation. The list of important species for conservation is complemented by Balkan endemites

Paraleptophlebia lacustris (river Kochanska Reka above Kochani Lake and river Orizarska after the confluence of the rivers Crna and Bela) and *Chaetopteryx stankovici* (river Eshterec) and subendemites *Odontocerum hellenicum* and *Rhyacophila armeniaca* (spring area of the river Bregalnica).

Austropotamobius torrentium **(stone crayfish) in Mala Reka on Osogovo Mountain**

From among aquatic macro invertebrates, 39 species of dragonflies have been registered in Bregalnica Watershed, and five of them are important for conservation. Standing waters in the area give significant rise to diversity of dragonflies, though many of them are distributed widely. Running waters in mountain areas are characterized with specific micro habitats, especially important for larvae forms and low numbers of species (5-10) occur here. Nevertheless, presence of rare and endangered species like *Caliaeschna microstigma, Ophiogomphus caecilia* and *Cordulegaster heros* has been confirmed, which indicates well preserved riverine habitats. *Gomphus flavipes* is important species specific to not-tidal waters and it is included in Annex IV of the Habitats Directive and Appendix II of the Bern Convention. Its presence has been recorded in lowland parts of Bregalnica River, where the river is wider, meanders and has alluvial deposits.

Calopteryx virgo **by Bregalnica River**

From among representatives related more with clean waters in mountain parts, only *Ophiogomphus caecilia* has been registered for Dolna Bregalnica. *Coenagrion ornatum* is included in the European Red list and found in Dolna Zletovica, especially at spots with halophytic vegetation. Anthropogenic factor has great impact on the populations of dragonflies, owing primarily to alterations of habitats and intensification of agriculture, but also increasing use of pesticides (especially to destroy mosquitoes in this region) which are posing threat to these insects.

3.3 Forest communities

Diversity of relief, soil, climate and hydrographic conditions in Bregalnica Watershed has contributed to rich forest diversity characterizing this area. Most of the forests in the lowest parts of the area were destroyed in distant past and converted into arable lands and secondary grasslands. These low parts are at the same time the most arid and support overtly xerothermophile vegetation. Forest community of Pubescent oak and Oriental hornbeam (*Phyllireo-Carpinetum orientalis*= *Querco-Carpineum orientalis macedonicum*) spreads climate zonally over these parts, as well as in the valleys and low hills. It occurs in the lower part of the area surrounding Bregalnica and its tributaries up to around 600 meters above sea level, while extrazonally it can also be found at higher altitudes on warmer expositions. In eastern and northeastern parts of the area at altitudes of 400 to 600 m and up to 1100 m on certain parts (Spikovo, Pehchevo area), forests of Italian oak and Turkey oak (*Quercetum frainetto-cerris macedonicum*) spread climate zonally. The community is dominated by Italian oak (*Quercus frainetto*) and Turkey oak (*Quercus cerris*), but there are also other, mainly thermophile species. This community has specific feature of including high number of native species of the wild fruit flora as well (apple, pears, plums, cornel trees, etc.). In certain parts at lower altitudes where this community is found, one can also encounter submediterranean species incorporated in subass. *Carpinetosum orientalis*, while in higher parts we can also find species that are typical for Sessile oak forest belt. Most of this forest community has been undergoing regressive succession due to overexploitation of wood, which is the reason for major portion of forests of generative origin to convert into forests of vegetative origin. At certain spots, forests are coppice and brought to high extent of degradation, at spots transformed into secondary grasslands. Today, upon reduction in livestock in the area, as well as abandonment of hilly and mountain croplands management and reduced exploitation of pastures and meadows, there is notable occurrence of natural settlement of black and white pine in this community. This is typical for the area of Malesh and Pijanec.

Forest community of Sesile oak (ass. *Orno-Quercetum petraeae*) occurs at higher altitudes, mainly between 900 and 1100 m, and up to 1300 m at certain sunny slopes. Elevationally, it proceeds from the forest community of Italian oak and Turkey oak and occupies lower mountain part of the mountains Obozna, Plachkovica, Goten and Osogovo. At warmer expositions and on lower terrains, subassociation of Oriental hornbeam (subass. *carpinetosum*) occurs within this community with significant portion of thermophile elements. Certain azonally conditioned communities also occur in this belt, like: ass. *Querco-Carpinetum betuli macedonicum* (sessile-hornbeam mesophilous forests) in higher parts on deeper shaded terrains with higher air humidity and ass. *Orno-Quercetum cerris* (sessile-turkey oak thermophilous forests) on sunny terrains. Also, parts of this forest community growing on flatter and deeper soils were overexploited and converted into arable land and therefore forest on more accessible terrains is in most part of vegetative origin. On the other side, forests situated at greater distances from populated places and harder to access are better preserved. The area above the forest community of sessile oak in altitude terms proceeds with beech forest belt which spreads from 1100 to 1650 m above sea level. The lowest part of this belt, between 1100 and 1300 m above sea level accommodates climate zonal community of submountain beech forest (ass. *Festuco heterophyllae-Fagetum* Em), which extends further lower into the oak forest belt at certain shaded sites. In certain lower situated and easier to access areas, submountain beech forest was overexploited or converted into pastures, which is the reason for current presence of spots under juniper, hazel, fern and some other species as a stage preceding forest regeneration in this area. High quality submountain pure beech forests, as well as mixed black and white pine forests are found in higher parts. In the region of Malesh, at altitudes of 1100 to 1300

m, ass. *Fagetum submontanum pinetosum nigrae*–submountain beech forest with black pine occurs azonally, and ass. *Fagetum submontanum pinetosum silvestris*–submountain beech forest with black and white pine at altitudes of 1100 to 1400 m. These communities are mostly mesophilous and neutrophilous, but there are also acidophilous beech forests, especially in the region of Osogovo, Malesh and Pijanec. The forest community of mountain beech - ass. *Calamintho grandiflorae-Fagetum* Em – spreads climate zonally in higher parts of the beech forest belt from 1300 to 1650 m above sea level. It is typical mesophilous community dominated by beech. Apart from this, this belt also includes acidophilous beech forests (ass. *Luzulo-Fagetum macedonicum*), as well as mixed beech-pine forests incorporated in communities: (ass. *Fago-Pinetum silvestris*) – forest community of white pine and beech on secondary pastures occurring in the region of Malesh on cold northern expositions at altitudes ranging from 1400 to 1800 m, ass. *Fagetum montanum pinetosum nigrae*–mountain beech forest with black pine, occurring in the region of Malesh at altitudes ranging from 1050 to 1450 m, ass. *Fagetum montanum pinetosum silvestris* - mountain beech forest with white pine, occurring in the region of Malesh at altitudes from1300 to 1700 m, ass. *Fago-Pinetum nigrae*–forest community of black pine and beech on secondary habitats, occurring in the areas of Malesh and Plachkovica at altitudes from 860 to 1725 m, ass. *Pinetum silvestris-nigrae macedonicum*–forest community of black pine on silicate ground occurring on Plachkovica and in the region of Malesh at altitudes from 900 to 1350 m and ass. *Pinetum silvestris-nigrae* – forest community of black and white pine occurring in the region of Malesh above the belt of mountain beech forest.

The best preserved and highest quality forests in the region are situated in the beech forest belt. Untouched and unmanaged beech forests, mixed forests of beech-black pine, beech-white pine, black pine-white pine, beech-fir-spruce-white pine, tall-trunk oak forest enclaves, as well as parts of forests with ancient old trees bear particular value and importance.

Particular value is also attributed to rare forest communities, such as: ass. *Juglando-Tilietum tomentosae,* in the area of Zletovska Reka between 600 and 700 m above sea level above Zletovo. Apart from *Juglans regia* and *Tilia tomentosa,* this community also includes other interesting species, such as: *Ostrya carpinifolia, Tilia platyphyllos, Corylus colurna, Acer intermedium, Malus florentina, Geranium macrorrhizum, Asplenium adianthum-nigrum,* etc., then community ass. *Fago-Aceretum heldreichii*, found in the locality of Crvena Reka in the area of Makedonska Kamenica, covering an area of 10 ha and being a Natural Reserve of mountain acer *(Acer heldreichii),* as well as association *Bruckenthalio-Myrtillo-Fagetum,* situated in the upper watershed of Zrnovska Reka on shaded slopes. Beech forests in this community have acidophilous nature, and at spots with altered soil the beech is stunted, but it incorporates *Bruckenthalia spiculifolia,* a species growing in alpine heaths, as well as *Hypericum rhodopaeum, Deschampisa flexuosa, Calamagrostis arundinacca.* Steep slopes where soil has not been altered support stands of *Betula pendula* and *Populus tremula*.

3.4 Agrobiological diversity

Plant agrobiological diversity in Bregalnica Watershed consists of registered varieties and hybrids of agricultural crops represented in commercial production on large areas and local varieties grown on small plots and intended primarily for personal subsistence of inhabitants. Each village has tradition of maintaining local varieties so that one household grows several crops with 2 or 3 different landraces (pepper, corn, beans). Agrotechnical measures are conducted manually in a traditional way, except with grains where all operations are mechanized. Most of the inhabitants that maintain local varieties are 50-75 years old. Younger inhabitants leave villages massively or turn to commercial agriculture based on modern varieties. This process is fostered by subsidies awarded by the Macedonian Government provided that certified seeds are sown. In rare cases, these

products are intended for local markets. For these reasons, several crops (cotton, hemp, flax) had been lost several decades ago, while the crops grown have lost diversity of local varieties.

The highest diversity of local varieties maintained by inhabitants relates to beans, which are also the oldest and inherited in families for decades. This crop exists with several subspecies (tall, low, multi-flower) with varieties differing in shape, colour, pattern and size of the seed. Similar situation is found with string beans, while other granular crops (broad bean, lentil, chick-pea, peas and Adzuki bean) have minor shares and diversity of their varieties has been almost entirely lost. From among grain crops, old local varieties are maintained only with corn which is also represented by several subspecies (white, yellow and popcorn) with varieties differing in shape, colour and size of corn-cobs and grains. Old local varieties of broomcorn and millet, ryeand oats are dated seven decades ago, while for wheat and barley, inhabitants have maintained old or new commercial varieties. From among vegetable species, the highest diversity with many different varieties has been found with pepper, mostly of two subspecies (long pepper and fefferoni pepper), the most represented of which is the engraved pepper. Tomato and pumpkin are also abundantly represented, but with low diversity of varieties. Watermelon and melon of which old winter varieties can be still found are grown much rarer. Onion, garlic and leek are maintained in almost every household, but with 2 to 3 different varieties, while production of other landraces is almost entirely based on commercial varieties. Industrial crops that are featured with greatest loss in diversity are found sparsely with old varieties of poppy and sunflower and anise in few lowland municipalities. As for forage crops, inhabitants maintain old populations only of alfa-alfa and vetch. Common wetch is grown rarely as a remedy, while other crops (fodder pea, clover, sainfoin) are produced only with commercial varieties.

Diversity of local beans varieties

Biological diversity of domestic animals in Bregalnica region is represented by several preserved native breeds of livestock which are subject of protection under the Law on Livestock Breeding (Official Gazette of the Republic of Macedonia no. 7/2008, 116/2010 and 23/2013), including: cattle - Busha, sheep - Karakachanska, Ovcepolska and Sharplaninska, goats – Balkan goat, pigs – local primitive, bees, chicken, buffalo – domestic buffalo, horse – domestic horse, donkey – domestic donkey and dog – shepherd's dog Sharplaninec. Karakachanska and Sharplaninska sheep breeds, buffalo and pig belong to the group of critical, Ovcepolska sheep breed attributes specific feature to the region and is represented with significant population. Eastern Planning Region is its home breeding area with highest number of registered farms dominated by those sized between 50-300 sheep heads, with approximately equal shares. Farms sized up to 50 sheep heads are most present in Northeastern region, while the most frequent farms in Vardar region count 100-300 sheep heads.

Ovchepolska pramenka with different pigmentation of head (Lisa, Karabasha and irregular form)

4 Protected areas in Macedonia – legal framework

The legal framework for establishing the protected areas network is prescribed in the Law on Nature Protection (adopted in 2004), which prescribes 6 categories of protected areas (Article 66) harmonized with the categorization of the International Union for Conservation of Nature – IUCN, namely:

1) Category I – (Ia) Strict Natural Reserve (SNR);
(Ib) Wilderness Area (WA);
2) Category II – National Park (NP);
3) Category III – Monument of Nature (MN);
4) Category IV – Nature Park (Ntr.P);
5) Category V – Protected Landscape (PL);
6)Category VI – Multi-purpose Area (MPA).

Articles 68-90 of the Law on Nature Protection describe the categories of protected areas, the manner of managing the areas, prohibited activities etc. Furthermore, amendments of the Law on Nature Protection prescribe the procedure of designating and enforcing protection of Natural Rarities (new form of protection), with regard to which the country still does not have any practical experience. The short definition as well as the goals of protecting and managing different categories of protected areas are presented in Table 1.

According to IUCN Guidelines, the area category should be based on the primary goals of the area management, and the main goal of management should be implemented on at least 75% of the protected area. It is recommended that up to 25% of the protected area surface be used for other purposes, provided they are compatible with the main purpose of the protected area management.

The procedure for designating protected areas, the way of managing, financing etc., as well as the obligation to perform a revalorization and re-proclamation of all of the previously protected areas (designated before 2004, under the Law on the Protection of Natural Rarities) is prescribed in the Law on Nature Protection for the purpose of harmonizing it with the new categorization.

The Law on the Protection of Natural Rarities categorized natural rarities as follows:

1. Natural Reserve;
    a. Common Natural Reserves
        i. National Parks (NP)
        ii. Strict Natural Reserves (StNR)
        iii. Scientific-research Natural Reserves (SRNR)
        iv. Landscapes with Outstanding Natural Features (LONF)
        v. Outstanding scenery (OS)
    b. Specific Natural Reserves (SpNR)
2. Individual Plant and Animal Species Outside Natural Reserves (IPAS)
3. Monument of Natures (MN)
4. Memorial Monuments (MM).

Table 1. Categories and goals of protection/management in protected areas

Category of protected area	Goals of protection and management in protected areas
Strict Nature Reserve (SNR)	A protected area possessing outstanding or representative ecosystems and/or species (may also include protection of cultural and spiritual values related to nature). These areas are significant to scientific research, monitoring and educational activities. Preserving biodiversity is achieved through protection without any conscious influence on the habitat's natural processes or species populations, and public access is strictly controlled and limited.
Wilderness Area (WA)	Category of protected area mainly managed due to wilderness protection. It regards a large area with unaltered or mildly altered nature, with preserved natural characteristics, without constant or without significant population presence, being protected and managed in order to preserve its natural processes. There is a possibility to organize a visit of a limited number of people to these areas, and traditional livestock breeding activities (grazing) may be conducted by the local population.
National Park (NP)	A spacious natural area in land or in water encompassing one or more preserved or insignificantly modified ecosystems, with particular multiple natural values, established for protection of ecological processes, as well as species and ecosystem characteristics complementary to that area. It provides the basis for preservation of the original natural and cultural heritage. A National Park has an ecological, scientific-research, cultural, training and educational and tourist-recreational purpose so it can offer different services for visitors.
Monument of Nature (MN)	Protected area mainly managed in order to conserve some specific natural features usually with a smaller surface; an area encompassing one or more specific natural and natural-cultural features that have a special or unique value due to their rarity, representativeness or due to aesthetic and cultural distinctive features.
Nature Park (Ntr.P)	Area possessing one or more original, rare and characteristic components of nature (plant, fungal and animal species and communities, relief forms, hydrological values etc. A Nature Park may be botanical, zoological, geological, geomorphological and hydrological. This category is featured in the national legislation, and according to the management system it corresponds with the fourth category according to IUCN "Habitat/species management area".
Protected Landscape (PL)	Geographically defined area/landscape regulated and managed (with legal or other mechanisms) in order to achieve the specific goals of conserving biodiversity and landscape characteristics. As a matter of fact, interactions people and nature have, over time, formed a landscape with an altered image and significant aesthetic, ecological and/or cultural values, and often with great biodiversity.
Multi-purpose Area (MPA)	Area that is usually spread on a relatively large territory of land and/or water, rich with waters, forests and meadows, and can be used for hunting, fishing or tourism, or reproduction of wild animals. It is established in accordance with the needs for nature protection and conducting activities for sustainable use of natural resources, and especially with the purpose of providing wholeness of the ecological network, as an ecological corridor. According to the projected management regime, this category corresponds with category VI according to IUCN "Managed resource protected area".
Natural Rarity (NR)	Parts of nature that have scientific, aesthetic, health and other significance, cultural, training and educational and tourist-recreational functions. They can be certain rare, endangered and endemic, plant and animal species, their parts and communities, relief forms, geological profiles, paleontological and speleological objects. Or they can be relief forms, geological profiles, paleontological and speleological objects, if their surface is less than 100 hectares. The "Natural Rarity" category is outside the categorization of protected areas encompassed in the abovementioned categories.

The 2014 database for protected areas (CDDA) was used to analyze the protected areas in the region of Bregalnica Watershed and extended to the areas in the East Planning Region. The Ministry of Environment and Physical Planning (MEPP) updates and delivers this database to the European Environmental Agency as well.

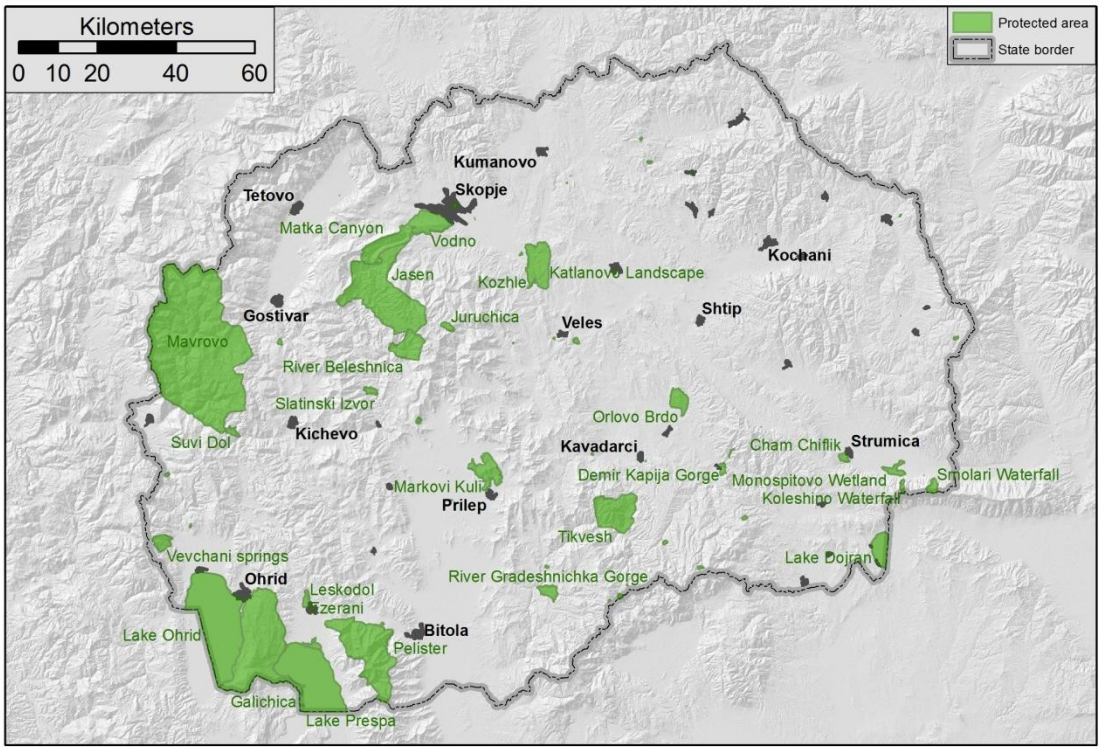


Figure 3. National network of protected areas

The database of protected areas (MEPP, CDDA 2014) currently includes 86 areas with a surface of 230 083 ha or 8.97% of the territory of the Republic of Macedonia. Overlapping of some areas (e.g. Jasen and Matka) was not taken into consideration in the process, meaning the actual surface of protected areas is somewhat smaller. The network of protected areas in Macedonia does not represent a coherent system, or rather it is in a transitional state and includes areas designated at different times, in accordance with different categorizations and having different goals (areas designated according to the old categorization, areas designated according to the new categorization, re-designated areas, areas in a re-proclamation phase, areas in a proclamation phase). There is also a distinct difference in the positioning of protected areas between western and eastern Macedonia, especially in Bregalnica Watershed, where only 7 areas are present, mainly individual or a group of tree trunks (see Chapter 5.2 and 6.1).

5 Strategic and planning documents for nature protection

Enlargement of the network of protected areas and its effective establishment have been set in several national planning and strategic documents. The representativeness of nature protection in Bregalnica Watershed was analyzed using the following documents:

- Spatial Plan of the Eastern Macedonia Region from 1981;
- Spatial Plan of the Republic of Macedonia adopted in 2004, more precisely the Sectoral Study "Conservation of the Natural Heritage" developed in 1999;
- The National Biodiversity Strategy with an Action Plan (adopted in 2004) and the Draft National Biodiversity Strategy with Action Plan (in the process of adoption);
- Reports from the Project Activity "Development of a National Representative Network of Protected Areas", conducted during 2010-2011, as part of the GEF/UNDP/MEPP Protected Areas Project (in the text referred to as "Representative Protected Areas Network");
- The database of protected areas and areas proposed for protection developed in the framework of the GEF/UNDP/MEPP Protected Areas Project, which apart from the proposed boundaries and coordinates includes an overview of significant species and habitats in the area, identified threats, etc.

Based on the mentioned strategic documents, particularly the Spatial Plan and RPAN, a mapping of protected areas and areas proposed for protection presented in Figure 4 was performed.

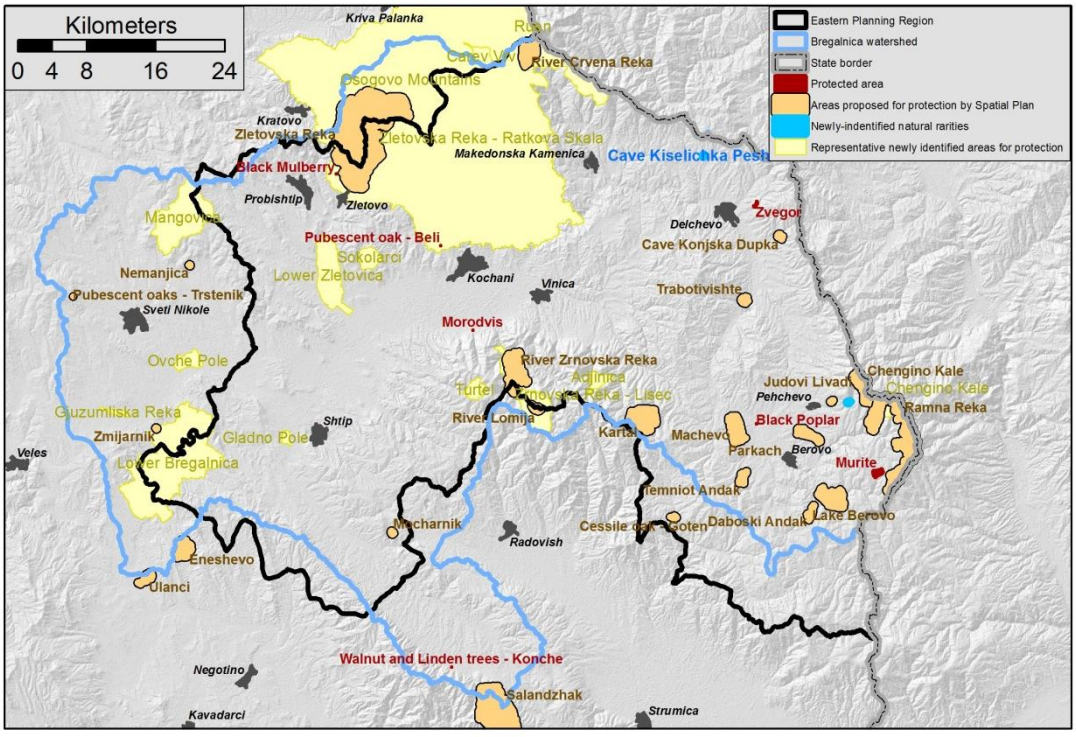


Figure 4. Protected areas and areas proposed for protection in the surveyed area based on available literature data

5.1 Spatial Plan of the Eastern Macedonia Region

Structural planning of natural values and rarities protection for Eastern Macedonia dates back to 1981, when the Spatial Plan of the Eastern Macedonia Region was developed (SPREM). According to the programme and tasks for preparing a plan for organized space planning within SPREM, a Sectoral Study for Protection of Natural Rarities for this region was developed for the first time (1978). The Basic goals of the study were research and recording spaces, areas and objects or phenomena, which should be preserved as significant natural values and rarities. Legislation effective at the time that protection and conservation regimes originated from (Constitution of SFRY, Republic Law on Natural Rarities Protection, but also international documents, as well as the Convention on the Protection of the World Cultural and Natural Heritage) was used in the process.

The research was conducted through the Republic Office for Protection of Cultural, Historical Monuments and Natural Rarities and the working team of the Institute for Spatial Planning. Certain criteria in accordance with the Law on the Protection of Natural Rarities were used in inventory taking, which are: the area or region to have scientific value; to be a rare and exceptional phenomenon or shape; to be a distinctive or typical object or phenomenon, to have additional cultural value and to possess an ecological value.

In defining the categories, the purpose of usage and protection of certain area or object was accordingly determined. The gradation of categories included either a particular purpose or a combination of multiple purposes: a) scientific-research; b) study; c) educational-upbringing; d) ecological; e) cultural-educational; f) spatially shaped purpose; g) recreational and h) economic purpose.

The responsibility for protection and care of natural areas and objects was determined based on the value levels and significance of natural units. Thus, the responsibility could belong to the: I. Republic – a) international value and significance and b) national value and meaning and II. Municipality – a) regional value and b) local value.

According to the abovementioned legislation, criteria and insight in values on the territory in Eastern Macedonia and as a result of the research, analysis and inventory taking of natural values in the region under the Sectoral Study for Natural Rarities, spaces, areas and objects which would be a priority for protection on a national and local level had been proposed. Until then, only one object in the region was under adequate protection, a Monument of Nature "Mulberry (*Morus alba*)" located in the yard of the St. "Gavril Lesnovski" Monastery in the village of Lesnovo.

The 1978 Sectoral Study for Natural Rarities proposed spaces, areas and objects given in categories for protection. The list below presents only the areas belonging to Bregalnica Watershed, or the Eastern Planning Region, and were covered by this separate Study.

I. Natural units possessing natural values
   a. Natural complexes of wider significance
      i. Plachkovica
      ii. Maleshevo Mountains
      iii. Golak with Obozna
      iv. Osogovo Mountains

Parts of Plachkovica and the Maleshevo Mountains, Golak with Obozna and the higher parts of the Osogovo Mountains stand out as complexes of wider significance in Eastern Macedonia, belonging fully or partially to Bregalnica Watershed. Considering the size of the areas as natural

complexes, they cannot be registered as Natural Rarities, and the Study foresees that they are not overlooked but prescribed a management and usage regime not only for their natural values and features, but also for their tourist attractions.

II. Natural rarities
   a. Specific Natural Reserves (no other area is listed apart from Belasica)
   b. Scientific-research reserves
      i. Reserve of the White and Black Pine in the area of the rivers Ramna Reka and Ratevska Reka
         1. Acidophilic pine forests (*Ass. Lathyro-Pinetum nigrae*)
            Pehchevo area, Berovo area, Golak, river Laki (Plachkovica), river Ramna Reka
         2. Acidophilic forests of white pine (*Ass. Digitalis viridiflorae–Pinetum sylvestris*)
            Watersheds Ratevska Reka, Zamajanica and Ramna Reka
      ii. White pine reserve in the upper course of the river Laki
   c. Areas with special natural features
      i. Site Ponikva on Osogovo Mountains
      ii. Site Kosbunar – Shipkovica – Turtel – Lisec on Plachkovica
      iii. Site Breza on Maleshevo Mountains
      iv. Site Shiroki Dol on Maleshevo Mountains
      v. Site Golak
      vi. Site Carev Vrv on Osogovo
      vii. Upper course of the river "Orelska Reka"
      viii. Upper course of the river "Zletovska Reka"
      ix. Upper course of the river "Ratevska Reka"
      x. Upper course of the river "Bregalnichka Reka"
   d. Distinctive scenery
      i. Landscapes of Monastery Gjurishte
      ii. Landsapes of Monastery Lesnovo
      iii. Landscapes of Monastery "Konechki Manastir"
      iv. Lake Gradche
   e. Monument of Natures
      i. Village of Machevo (*Populus alba*, perimeter, 7.20 m)
      ii. Village of Beli (*Quercus pubescens* perimeter, 7.80 m)
      iii. Area Murite - river "Ratevska Reka" (*Picea abies*, remote relic enclave, the only site in eastern Macedonia)
      iv. Village of Lesnovo (*Picea abies* – plantation about 40 years old)
      v. Shtip
      vi. Mineral and thermal water springs

Proposal was made for special protection of the following species found in forest complexes in the Eastern Macedonia Region: *Abies alba, Acer heldreichii, Pinus nigra, Pinus sylvestris, Quercus trojana, Asarum europaeum, Blechnum spicant, Pyrola chlorantha, Symphytum ottomanum*.

Some rare species found only on the territory of Macedonia are also listed: *Staphylea pinnata, Pulsatila halleri, Osmunda regalis* and *Isoetes phrygia*. Of these, only *Pulsatila halleri* is mentioned for Shtip.

5.2 Spatial Plan of the Republic of Macedonia

The Spatial Plan of the Republic of Macedonia (adopted in 2004) is an integral strategic document for spatial development of the country, providing guidelines for the purpose, usage, protection, organization and management of the country's space and includes a separate chapter for protection of natural heritage. It foresees expansion of the network of protected areas (to about 12% of the country's territory) and its efficient establishment until 2020. The Sectoral Study "Conservation of Natural Heritage" (developed in 1999) contains data and brief descriptions of all of the protected areas and areas proposed for protection elaborated in accordance with the old categorization of protected areas (presented in Chapter 4).

Although the Natural Heritage Study was developed in 1999, it elaborated a large part of existing protected areas in Macedonia, because most of them were designated during the 1960s, 1970s and 1980s. So is the case also with the seven existing protected areas in Bregalnica Watershed (Tab. 2), which are elaborated in detail in Chapter 6.1.

Table 2. Protected areas in Bregalnica Watershed.

Ord. no.	Name of area	Year of designation	Category of protection
1	**Murite**	Decision of MC Berovo, to designate a mixed stand of fir, beech, white pine and spruce as a Monument of Nature, Decision no. 08-2659-1/87	MN
2	**Dzvegor**	Decision of MC Delchevo, to designate the geological site Dzvegor as a Monument of Nature, Decision from 21.02.1986	MN
3	**Black poplar, Machevo**	The document with a decision is unavailable, 1983	MN
4	**Oak trunk, village of Beli**	Decision of MC Kochani, to designate an oak trunk near v. Beli as a Monument of Nature, Official Journal of Kochani no. 2/83	MN
5	**Konche**	Decision of MC Radovish, to designate a mixed stand of walnut, linden and plane tree as a Monument of Nature, Decision no. 02-246/86	MN
6	**Morodvis**	Decision of MC Kochani, to designate a group of plane trees near village of Morodvis as a Monument of Nature, Decision from 28.06.1984	MN
7	**Black Mulberry, Lesnovo Monastery**	Decision of the Republic Office for Protection of Monuments of Culture, to designate a black mulberry trunk in the yard of the Lesnovo Monastery as a Monument of Nature, Decision no. 04-49-1/62	MN

Of the 193 proposed areas for protection included in the Spatial Plan of the Republic of Macedonia, only 21 areas are situated in Bregalnica Watershed (Tab. 3, Fig.4) with different proposed categories of protection (in accordance with the old categorization: Scientific-Research Natural Reserve (SRNR), Specific Natural Reserve (SNR), Monument of Nature (MN), or a Landscape with Outstanding Natural Features (LONF). These areas occupy a surface of 11.535 ha or only about 7% of the total surface occupied by areas proposed for protection on the territory of Macedonia.

In the past period, the following areas have lost their natural values and should be therefore omitted from the list of areas proposed for protection:

- **Parkach Area** – it is located 1500 m east of the village of Smojmirovo, Berovo area, with a surface of 50 ha. It was proposed for protection as a Monument of Nature, but due to a big forest fire in 2006, it is burnt and has lost its natural values.
- **Goten Site** – it is located in the forest management unit "Goten – Shiroki dol", Berovo; it was proposed for protection as a Specific Natural Reserve of the sessile oak (*Quercus petraea*) and downy oak (Q*uercus frainetto*). This stand caught fire in 2007, and as a result of the burning, multiple tree trunks have shown desiccation of their tips which has caused for the site to lose its natural values.

Table 3. Areas proposed for protection in the survey area included in the Spatial Plan of the Republic of Macedonia

Ord. no.	Name of area	Surface (ha)	Old category of protection	Corresponding category according to IUCN	Proposed category for protection according to RPAN
1	Zletovska Reka	5235.76	SRNR	StNR	MN
2	Crvena Reka	352.86	SRNR	StNR	MN
3	Machevo	360.47	MN	MN	MN
4	Zrnovska Reka	484.84	SRNR	StNR	NP
5	Maleshevo Mountains	1753.16	-	-	NP
6	Judovi Livadi	5.67	SpNR	NP	NP
7	Kartal	592.79	SRNR	StNR	NP
8	Ramna Reka	372.25	SpNR	NP	NP
9	Salandzhak	1576.99	SpNR	NP	NP
10	Reka Lomija	41.84	SpNR	NP	NP
11	Temniot Andak	47.69	SpNR	NP	NP
12	Berovsko Ezero (Linak)	428.17	LONF	PA	PL
13	Konjska dupka Cave	24.17	MN	MN	Natural Rarity
14	Trabotivishte	46.42	MN	MN	Natural Rarity
15	Mocharnik	11.90	MN	MN	Natural Rarity
16	Nemanjica	3.00	MN	MN	Natural Rarity
17	Zmijarnik	2.76	MN	MN	Natural Rarity
18	Daboski Andak	36.11	SpNR	NP	Natural Rarity
19	Pubescent Oak Trees – Trstenik	0	MN	MN	Natural Rarity
20	Parkach	145.24	MN	MN	Lost values
21	Goten	12.36	SpNR	NP	Lost values

5.3 Representative Protected Areas Network

The Representative Protected Areas Network (RPAN) was developed during 2010-2011, whereby a detailed analysis was performed of all protected areas and areas proposed to be protected included in the Study for Natural Heritage of the Spatial Plan of the Republic of Macedonia, other strategic documents and reports from other initiatives for protection of certain

areas in Macedonia. As a result, a representative national network of protected areas and areas proposed for protection was proposed, involving 99 areas and occupying a surface of 511.265 ha or about 20% of the country's territory. It will contribute towards a more efficient conservation of species, habitats and ecosystems of national and global significance. In the process, the boundaries of every area were precisely defined and a corresponding category of protection according to the applicable Law on Nature Protection (Official Gazette of the Republic of Macedonia, 67/2004) was proposed. In fact, this activity originates from the Law on Nature Protection which prescribes establishing a protected areas system for protection of biodiversity harmonized with the categorization of the International Union for Conservation of Nature (IUCN).

Five of the new areas proposed for protection identified in the framework of RPAN (Tab.4) are in Bregalnica Watershed, among which only the Osogovo Mountains are partially comprised (53.231 ha or about 70%) by the area of interest. Lower categories of protection (category III, IV and V) were proposed for protection of these areas, and according to the proposed boundaries the areas occupy a total surface area of 88048.00 ha.

Table 4. Areas proposed for protection according to RPAN

Ord.no.	Name of area	Surface (ha)	Proposed category for protection
1	Dolna Zletovica	2139.47	PL
2	Dolna Bregalnica	8817.24	MN
3	Ovche Pole	598.76	NP
4	Kukuljeto	97.92	MN
5	Osogovski Planini Mts.	76394.26	PL

5.4 National Biodiversity Strategy with Action Plan

The first National Biodiversity Strategy with Action Plan (NBSAP) (adopted in 2004) includes multiple actions for establishing a network of protected areas (Measure A.2), while Measure A.3 for enlargement of the system of protected areas envisages specific action (A.3.1.10) for protection of saline soils in Ovche Pole.

The Draft National Biodiversity Strategy with Action Plan (in the process of adoption) defines a specific national goal for enlargement of the network of protected areas (to about 15% of the country's territory) and connecting them through ecological corridors. Recommendations for conservation of biodiversity in Bregalnica Watershed and proposals for designation of new protected areas are expected to contribute towards fulfilling the goals for conservation of biodiversity set on national level, and thereby towards achieving globally set biodiversity goals known as the Aichi Targets. The progress in the protection of biodiversity in the last decade is presented in the Fifth National Report to Convention on Biological Diversity (CBD).

6 Proposal for establishing system of protected areas in Bregalnica Watershed and Eastern Planning Region of the Republic of Macedonia

Protection of natural values in Bregalnica Watershed is defined through: a) analysis of existing protected areas, b) proposed areas for protection in existing planning and strategic documents and initiatives, c) internationally identified areas for plants and birds protection, d) the Emerald sites, as well as e) additional research by the expert team involved in developing the ecological sensitivity map for the region. Key areas for conservation of the most significant habitats and species in Bregalnica Watershed presented in this document are the basis for establishing a functional protected areas system, not only in the Eastern Planning Region but on a national level as well. In the future, this system should help in the process of establishing the ecological network Natura 2000, which is an obligation of the Republic of Macedonia in the process of preparing for membership in the European Union. It should be emphasized that the existing network of protected areas is mainly developed in the western part of Macedonia, whereas values in eastern Macedonia have been neglected. It is therefore necessary to make efforts to undertake activities for designating these areas in accordance with the legal procedure. Of course, in order to establish a functional protected areas system, it is necessary to take into consideration the recommendations for establishing ecological corridors given in the Macedonian National Ecological Network (MAK-NEN).

In order to conserve the most significant species and habitats in Bregalnica Watershed, areas for protection with a surface varying from 100 – 800 ha have been proposed (with the exception of the proposal for integral protection of the Osogovo Mountains in the category of Protected Landscape which would occupy a larger surface). Lower categories of protection have been proposed for these areas, such as: category III – Monument of Nature, category IV – Nature Park and category V – Protected Landscape, that should enable proper management of natural resources and give an opportunity for harmonization with the sectoral development plans. There is a brief description for every area with a location of the landscape, outstanding natural values, proposed boundaries etc. Additionally, 16 smaller areas are proposed for protection as Natural Rarities.

Multiple stakeholders were consulted in developing the proposal for establishing a protected areas system, namely representatives of the Development Center of the Eastern Planning Region (DCEPR) and the Mayors of municipalities in this Region, the Spatial Planning Agency as well as the Ministry of Environment and Physical Planning. This Report will provide the necessary information about the natural heritage in Bregalnica Watershed and will be of use to the Spatial Planning Agency in developing the Chapter on natural heritage in the Spatial Plan of the Eastern Planning Region.

The proposed protected areas system in the surveyed area (Tab.5, Fig.5) consists of:

- Existing protected areas – for which there is a legal obligation to be re-designated in accordance with the new national categorization, and
- Areas proposed for protection – whereby all of the proposed areas from different strategic and planning documents, internationally significant areas and recommendations of the expert team were taken into consideration.

The proposed system of protected areas in the surveyed area consists of a total of 36 areas under the first scenario that comprises inclusion of the PA “Osogovski Planini Mts.” or 39 areas under the second scenario that comprises inclusion of four smaller areas in the Osogovo Mountains. Six of them are already protected, and the remaining ones have been proposed for protection. The

total surface of all areas (proposed for protection and protected) is 75.133 ha under the first and 31.880 ha under the second scenario. Of this surface, 75.133 ha (17.4%) under the first scenario and 29.970 ha (6.9%) under the second scenario fall under Bregalnica Watershed. 54.448 ha (15.3%) according to the first scenario or 17.362 ha (4.96%) according to the second scenario fall under the territory of the Eastern Planning Region. It is obvious that the first scenario provides protection of areas larger by size and closer to world trends and recommendations regarding the national percentage of protected areas. The overview of the surface of protected areas within the municipalities is presented in Annex 1.

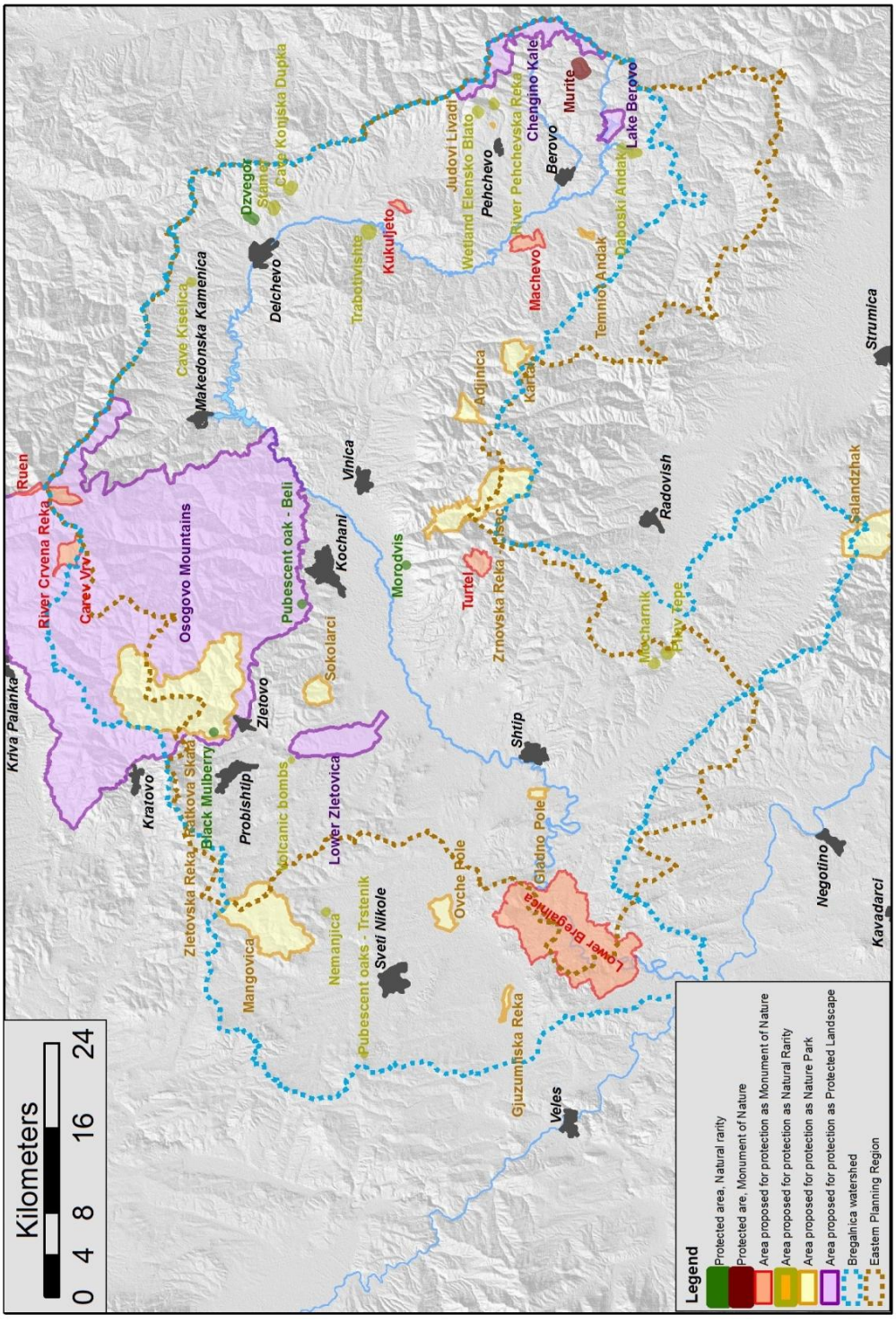


Figure 5. Proposed system of protected areas in Bregalnica Watershed and Eastern Planning Region

Table 5. Proposed system for protected areas in Bregalnica Watershed and the Eastern Planning Region

Ordinal	Area for protection	Category	Status of	Surface	Surface	Surface
1	**Murite**	MN	protected	62.50	62.50	62.50
2	**Machevo**	MN	proposed	360.47	360.47	360.47
3	**Adjinica**	NP	proposed	334.19	334.19	334.19
4	**Berovsko Ezero**	PA	proposed	428.17	428.17	428.17
5	**Gladno Pole**	NP	proposed	136.79	136.79	136.79
6	**Dolna Bregalnica**	MN	proposed	8173.33	8173.33	3978.61
7	**Dolna Zletovica**	PA	proposed	2139.47	2050.71	2050.71
8	**Gjuzumliska Reka**	NP	proposed	144.39	144.39	0
9	**Zrnovska Reka-Lisec**	NP	proposed	2327.56	2317.03	1305.44
10	**Judovi Livadi**	NP	proposed	5.67	5.67	5.67
11	**Kartal**	NP	proposed	592.79	592.79	592.79
12	**Kukuljeto**	MN	proposed	97.92	97.92	97.92
13	**Mangovica**	NP	proposed	3270.61	3269.30	449.04
14	**Ovche Pole**	NP	proposed	502.54	502.54	0
15	**Salandzhak**	NP	proposed	1576.99	298.59	0
16	**Sokolarci**	NP	proposed	503.21	503.21	503.21
17	**Temniot Andak**	NP	proposed	47.69	47.69	47.69
18	**Turtel**	MN	proposed	399.49	399.49	399.49
19	**Chengino Kale**	PA	proposed	2019.65	2019.47	2019.47
20	**Osogovski Planini Mts.**	PA	proposed	74614.91	53181.35	41470.70
20а	**Crvena Reka**	MN	proposed	352.86	352.39	352.86
20б	**Carev Vrv**	MN	proposed	461.05	5.97	3.87
20в	**Ruen**	MN	proposed	75.58	0.51	0
20г	**Zletovska Reka-**	NP	proposed	7659.66	7658.73	4298.53
21	**Dzvegor**	NR	protected	5.35	5.35	5.35
22	**Oak, village Beli**	NR	protected	0.00	0.00	0.00
23	**Morodvis**	NR	protected	0.00	0.00	0.00
24	**Black Mulberry**	NR	protected	0.00	0.00	0.00
25	**Cave Konjska Dupka**	NR	proposed	24.17	24.17	24.17
26	**Trabotivishte**	NR	proposed	46.42	46.42	46.42
27	**Mocharnik**	NR	proposed	11.90	11.90	11.90
28	**Nemanjica**	NR	proposed	3.00	3.00	0
29	**Kiselichka Peshtera**	NR	proposed	3.42	3.42	3.42
30	**Pubescent oak trees –**	NR	proposed	0.00	0.00	0.00
31	**Daboski Andak**	NR	proposed	36.11	36.11	36.11
32	**Pilav Tepe**	NR	proposed	27.95	27.95	27.95
33	**Vulkanski Bombi**	NR	proposed	0.00	0.00	0.00
34	**Stamer**	NR	proposed	27.98	27.98	27.98
35	**Elensko Blato**	NR	proposed	13.35	13.35	13.35
36	**Pehchevska Reka**	NR	proposed	8.22	8.22	8.22
	Total – scenario 1 (with PA "Osogovski Planini Mts.")			**97946.21**	**75133.47**	**54447.73**
	Total – scenario 2 (without PA "Osogovski Planini Mts.", but with smaller areas on the Osogovo Mountains)			**31880.45**	**29969.72**	**17632.29**

This document should serve as a basis for organizing protection in Bregalnica Watershed and taking steps towards designating individual areas, whereby the areas' elaboration would be finalized under the valorization studies in accordance with the content prescribed in the bylaw.

A designation act, defining the exact boundaries of the area, the management manner, the entity responsible for the management and the internal zoning, should be developed in the designation procedure of every individual area. The following zones can be established according to the Law on Nature Protection (Article 93):

1) Strict protection zone;
2) Active management zone;
3) Sustainable use zone and
4) Protection belt.

The activities and work that can be performed in the different zones of a protected area or natural rarity are defined in the Law on Nature Protection and presented in the following table.

Table 6. Definition, significance, management and allowed activities in the protected area zones

Zone	Definition, significance, management and allowed activities in the protected areas zones
Strict protection zone	Represents part of the protected area with highest interest for protection, which is characterized by original, unmodified ecosystem features or has very small changes as a result of traditional management practices. The strict protection zone allows for scientific-research activities provided that they are not in contrast with the primary goals of the area protection. In order to maintain the features of the strict protection zone, the entity that manages the protected area is obliged to provide around-the-clock monitoring.
Active management zone	The active management zone presents a zone of high interest for protection, requiring big management interventions aiming to restore, revitalize and rehabilitate habitats, ecosystems and other area elements. In the Active management zone there can be management activities regarding: 1) habitat manipulation and 2) species manipulation. The active management zone allows for activities of economic nature, such as ecotourism or traditional extensive agriculture that do not negatively influence the primary protection goal. Successful management of this zone, as well as its further sustainable maintenance, may lead to acquiring strict protection zone features.
Sustainable use zone	Represents significant part of the protected area, not possessing high values for protection, where one finds infrastructure objects, objects of cultural heritage, and types of forest plantations not typical for the area, as well as settlements with the surrounding agricultural land. Long-term undertaking of initiatives and measures can lead to acquiring characteristics of an active management zone.
Protection belt	It is, by rule, a surface outside of the protected area and has a role of protecting, where needed, the previously described zones from threats springing from outside the protected area. In conducting economic activities in the framework of the protection belt, measures for protection prescribed in the respective law are mandatory being used. If needed, a protection belt is also established in the framework of the protected area among zones where protection and management regimes are mutually exclusive. The entity managing the protected area is obliged to take care of and undertake adequate measures in the protection belt in order to reduce threats in the protected area.

6.1 Existing protected areas

Of the total of 86 protected areas in the Republic of Macedonia (MEPP, CDDA, 2014), only seven protected areas are located in Bregalnica Watershed (Tab.2, Fig.6), designated in the category Monument of Nature in 1960s and 1980s in accordance with the old legal regulations (Law on the Protection of Natural Rarities, 1973). The total surface occupied by these areas is about 70 ha, representing only 0.03 % of the total protected areas surface in Macedonia. It is mainly a question of individual or groups of tree trunks (black mulberry, oak trunks, walnuts and lindens) or areas with geomorphological and paleontological significance (Dzvegor), with the exception of the site Murite, where mixed beech-fir forests are found and which possesses high natural value. These areas have not undergone the process of re-designation arising, as an obligation, from the Law on Nature Protection (2004). During the evaluation of their values and representativeness (performed in the course of 2011), these areas were proposed for protection as Natural Rarities. The expert team recommends revising the proposed protection which particularly regards:

- the site "Murite" proposed for re-designation in the category *Monument of Nature*, and
- the Monument of Nature "Black Poplar" near the village of Machevo and the Monument of Nature "Walnuts and Lindens" in the village of Konche, which are proposed to be omitted from the protected areas list due to lost values.

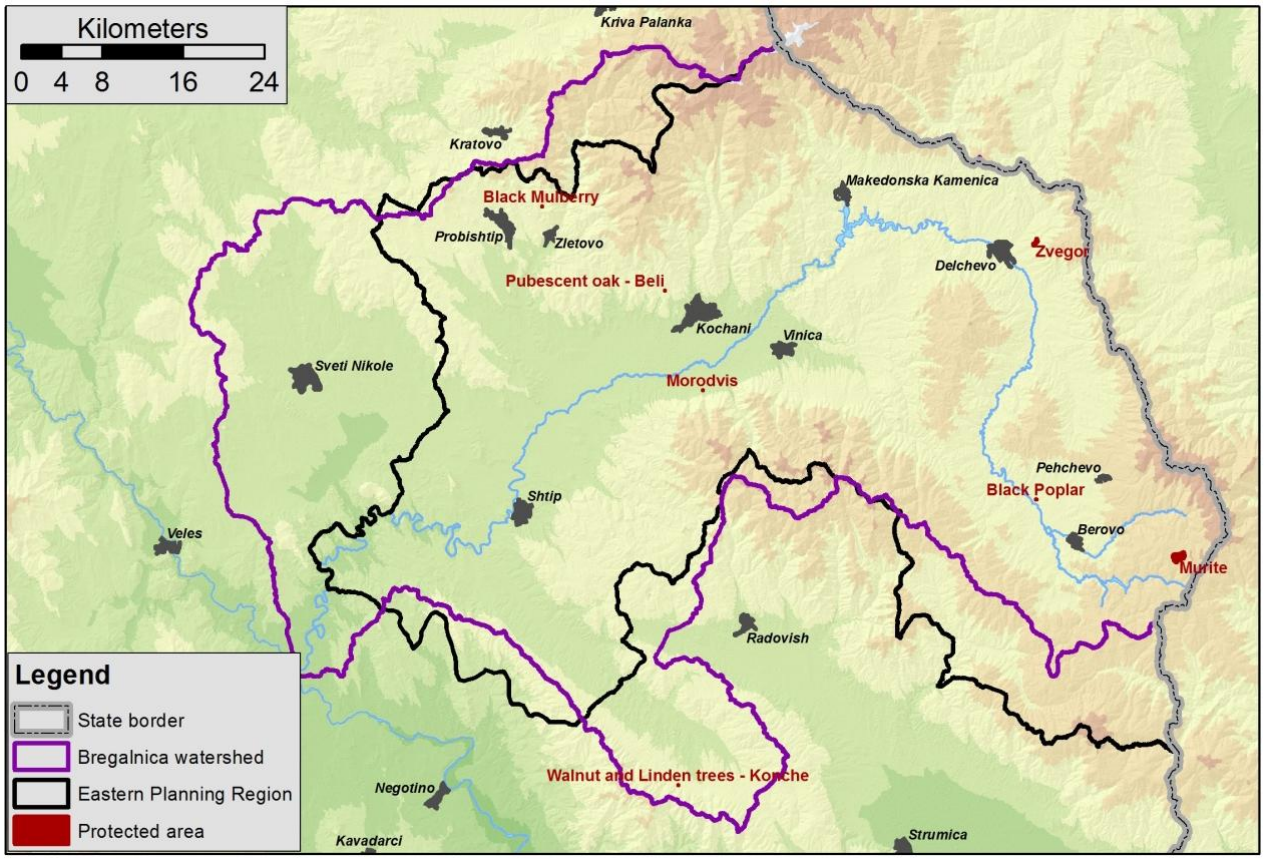


Figure 6. Protected areas in the surveyed area

6.1.1 Monument of Nature "Murite"

The site is located near the locality "Murite", north of Klepalo on Maleshevo Mountains, and is positioned at 1.250 to 1.400 m above sea level. The main reason for designating this protected area is the presence of a mixed stand of fir (*Abies borisii-regis*), beech (*Fagus sylvatica*), white pine (*Pinus sylvestris*) and spruce (*Picea abies*) growing on a ground of porphyroblastic gneiss of two-mica from the Precambrian era. The fir reaches the northernmost natural range in Macedonia. The site is of particular significance because it is the only natural habitat of fir and spruce in eastern Macedonia. The fir and spruce trees are up to 40 m high, with a diameter of more than 60 m. Certain places undergo natural regeneration of fir. Pure and mixed beech forests of generative origin and mixed beech-white pine forests (the following forest communities are found: *Calamintho grandiflorae-Fagetum* and*Pinetum silvestris-nigrae*) are spread around this site. This forest type fulfils the criteria for a forest with high natural value, as it is a rare and endangered ecosystem.

Apart from the significant woody plants and specific plant communities, significant animal species can also be found in the area. So far, few sub endemic species of insects (*Cychrus semigranosus balcanicus, Myas chalybaeus, Tapinopterus balcanicus belasicensis*) have been found. The rare and endangered species Barbastelle bat (*Barbastella barbastellus*) was registered in the forests.

According to the assessment in the Spatial Plan, the stand occupies a surface of about 10 hectares. Conforming to the expert team recommendations during the development of the RPAN (during 2010/2011) and the additional research conducted in 2014/2015, the boundaries of the stand are precisely mapped, so the area occupies a surface of 62.50 ha.

The site was designated a Monument of Nature in 1987 and is part of the Emerald site "Maleshevski Planini Mts.". The RPAN proposes that it should be re-designated as a Natural Rarity. Although regular forest and economic activities with application of group selective and fertilizing wood felling are undertaken in these forests, it still deserves a higher level of protection for the sake of its values and it is recommended that it is **re-designated in category III – Monument of Nature.**

Murite – stand of spruce, fir, beech and white pine

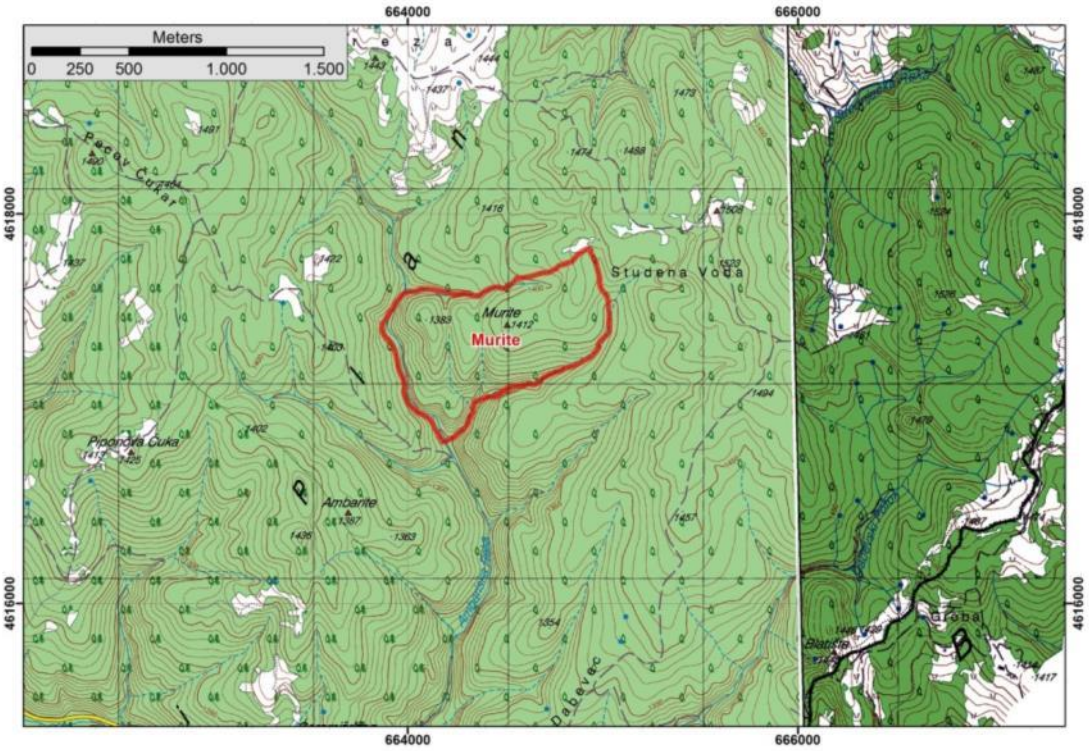


Figure 7. Monument of Nature "Murite"

6.1.2 Natural Rarity "Dzvegor"

The site is located near the village of Dzvegor (locality "Ilin Kamen"), Municipality of Delchevo, near the road to the border crossing with the Republic of Bulgaria, positioned at an altitude of 740-850 m.

It is a distinctive geological profile with registered Triassic limestones onto Palaeogene sediments – flysch and presence of young volcanic breakouts. According to the geological division of the Republic of Macedonia, this area belongs to the regional structure – Serbian-Macedonian mass, occupying a large space on the territory of Serbia, Bulgaria and Macedonia. The significance of fossil fauna sites discovered in the surroundings of Delchevo lies in the fact that this is the first time that a fossil fauna aged between 3 and 7 million years has been discovered on these grounds, which is of exceptional significance for the study of evolutionary processes of the life in general. The fossil material collected was the basis of ascertaining the presence of a lower jaw and scull with tusks of a fossil elephant. Apart from that, the analysis of fragmented parts of a giraffe scull showed they originated from a species never before registered on the territory of Macedonia. It is currently not possible to ascertain the taxonomic classification of this species of fossil giraffe due to lack of more complete remains.

The site was designated as a Monument of Nature in 1986 and occupies a surface of 75 ha. According to the expert team recommendations during the development of the RPAN (during 2010/2011) and the additional research conducted in 2015, the boundaries of the area are precisely mapped and it occupies a surface of 5.35 ha. This area is proposed to be designated as a **Natural Rarity**.

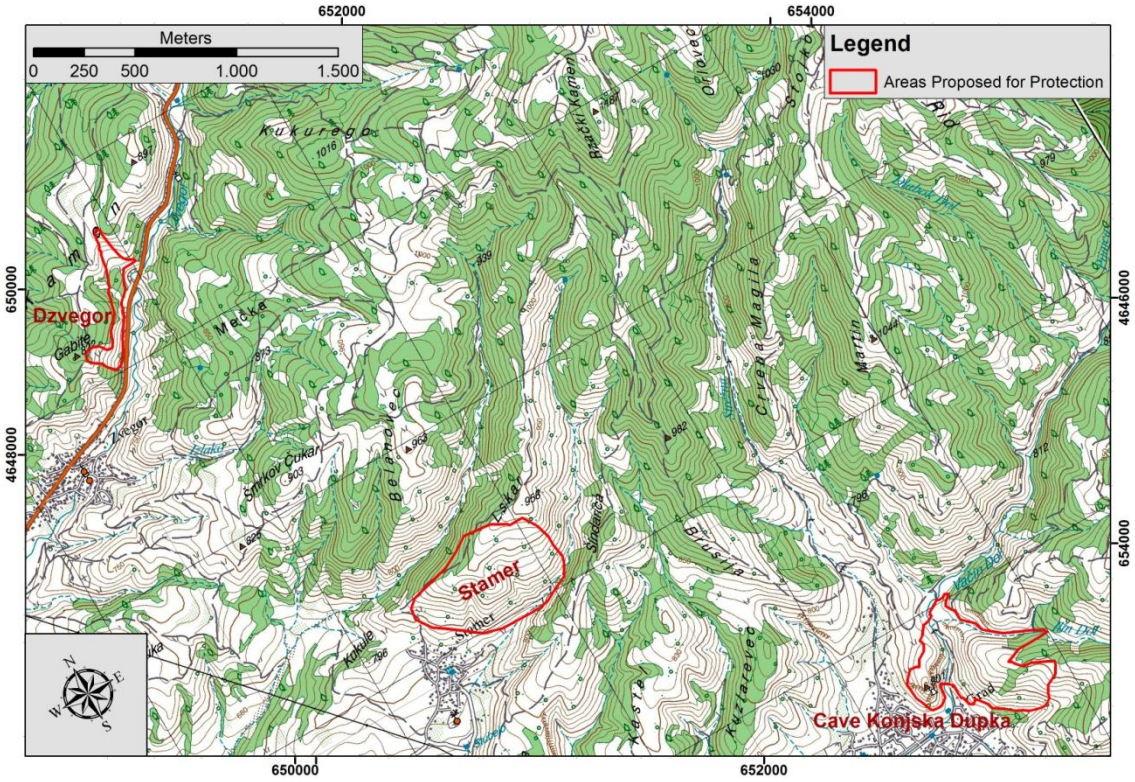


Figure 8. Natural Rarity "Dzvegor"

6.1.3 Natural Rarity "Oak, village of Beli"

The Pubescent oak trunk (*Quercus pubescens*) is located approximately 1 km northwest of the settlement Beli in the yard of the Monastery "St.Ilija", 572 m above sea level. According to the territorial division, the Pubescent oak trunk is located in the Municipality of Kochani.

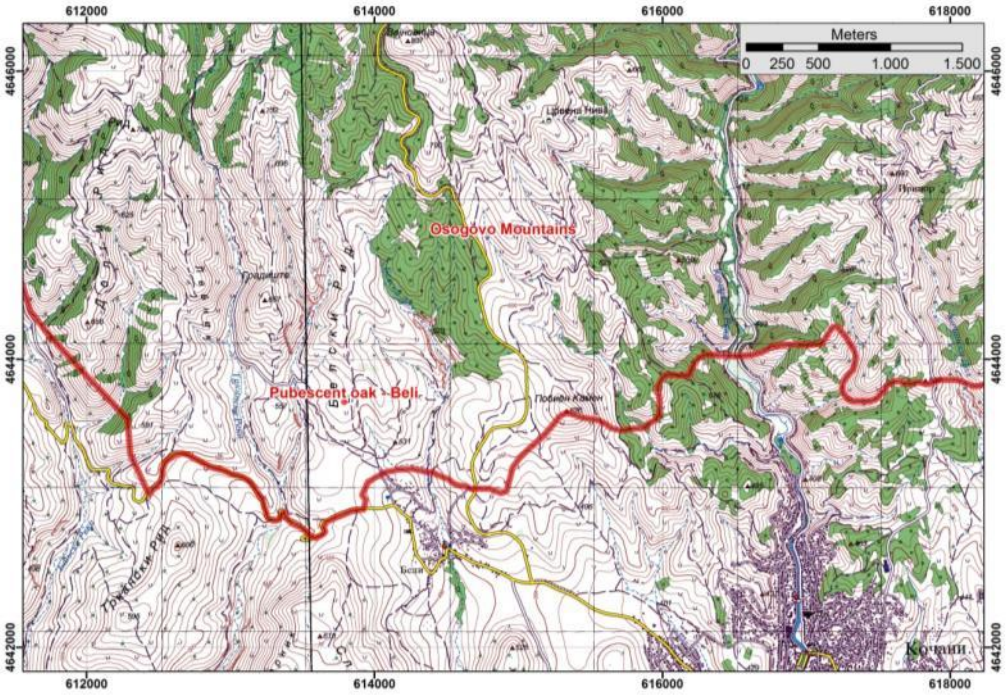


Figure 9. Position of the Natural Rarity "Oak,village of Beli"

The oak tree manifests significant habitual features. The stem height is 17 m, the perimeter at breast height – 5.90, and the crown projection – 21.6 m. Considering the fact that the stem was attacked by various pests in the past few years, it is crucial to undertake urgent protection measures.

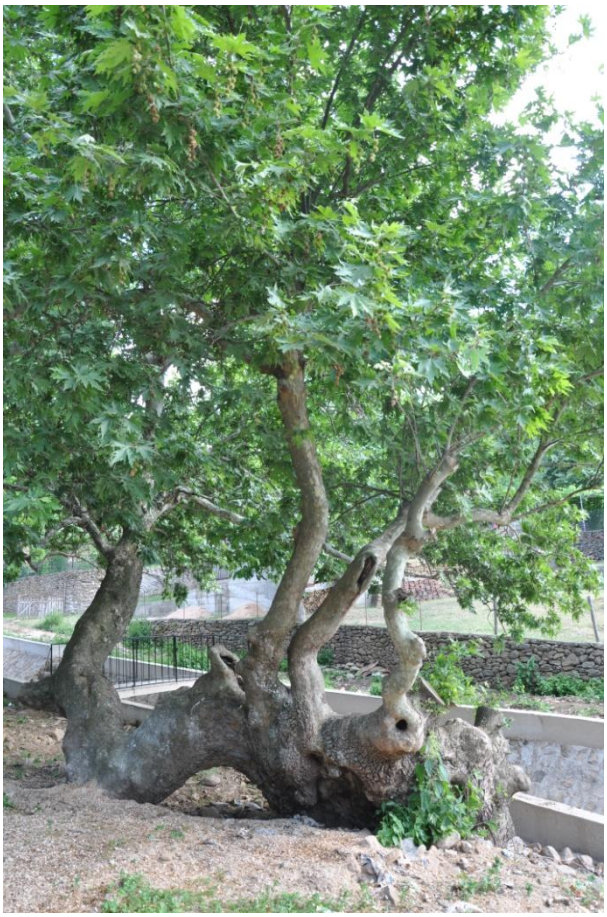
With the Decision of MC Kochani, in 1983, the oak trunk near the village of Beli was designated as Monument of Nature. According to the expert team reccomendations in RPAN form 2010/2011 and the research in the course of 2015, the expert team proposes its designation as a **Natural Rarity**.

6.1.4 Natural Rarity "Morfodvis"

The group of plane tree trunks (*Platanus orientalis*) is located in the center of the settlement Morodvis, 434 m above sea level. The area is characterized by submediterranean influence. In fact, a group of seven trunks are found there, five of which are in the immediate vicinity of the river Moroshka Reka, and two are in the immediate vicinity of the school. This group of trunks is one of the better preserved of its type in the northeastern part of Macedonia, occupying a surface of 0.5 ha.

Plane tree trunks have different age structures. The height of this group of stems varies from 14 to 18 m. The girth at breast height varies from 3.4 to 6.7 m. Data regarding the crown projection cannot be acquired, for it often happens that the trunks are positioned in a group of two to three, and their crowns are intertwined. One of the trunks of this group has visible physical and physiological disorders, while the others are in a rather sound health condition with individual injuries caused by pests and decay. Additional research by the biodiversity expert team conducted in 2015 indicated that the site is not being properly managed, and it is therefore directed towards undertaking measures for improved management.

The site was designated as a Monument of Nature in 1984 with Decision of MC Kochani. During the development of RPAN as well as according to the expert team research in 2015 it is recommended that this site is protected as a **Natural Rarity**.



Plane oak trees (*Platanus orientalis*) in the village of Morodvis

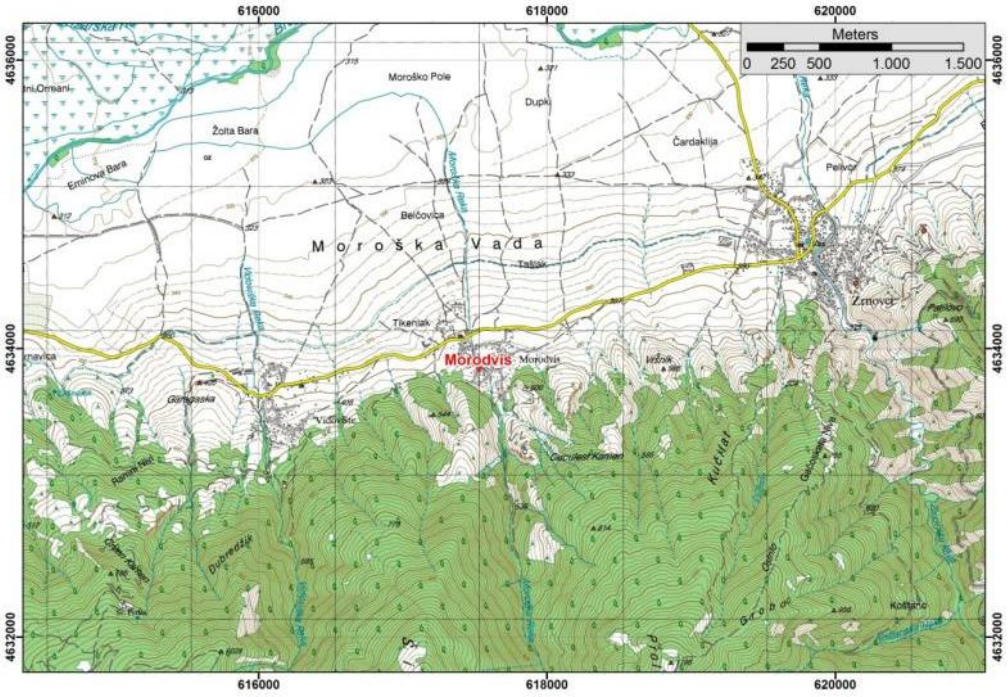


Figure 10. Position of the Natural Rarity "Morodvis"

6.1.5 Natural Rarity "Black Mulberry, Lesnovski Manastir"

The Black Mulberry stem (*Morus nigra*) is located at the entry of the settlement Lesnovo, more precisely in the yard of the Monastery "Saint Gavril Lesnovski". According to the territorial division, it belongs to the Municipality of Probishtip.

The stem grows at an altitude of 876 m. The position of the Black Mulberry stem, the specific and unique growth and development, as well as its significance are the basic reasons for the necessity of initiating a procedure for designating the black mulberry trunk as a Natural Rarity.

The black mulberry trunk (*Morus nigra*) is considered to be the oldest mulberry trunk in Macedonia. It is an allochtonous species. Considering the fact that it is located in the monastery yard, it has excellent protection and is therefore under no threat. The stem itself is twisted and bent down because of its old age.

In 1962, in accordance with the Republic Office for Protection of Monuments of Culture, the black mulberry trunk in the yard of the Lesnovo Monastery was designated as a Monument of Nature. During the development of the RPAN (2010/2011), as well as the research conducted in 2014/2015, the expert team proposed that this site is designated as a Natural Rarity**.**

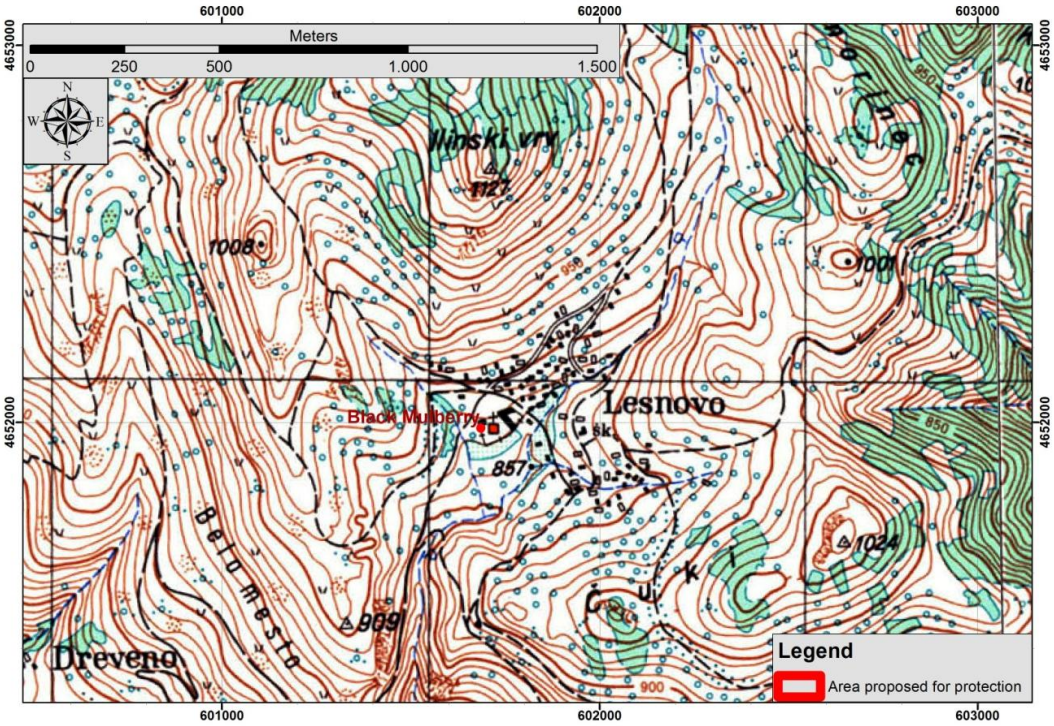


Figure 11. Position of the Natural Rarity "Black Mulberry, Lesnovski Manastir"

* * *

The following two areas are designated as protected, but in the meantime have lost the natural and other values due to which they were designated. These two areas (Black mulberry – Machevo and Konche – walnuts and lindens) are proposed to be omitted from the protected areas cadastre.

6.1.6 Black poplar, Machevo

Poplar (*Populus nigra*) was located 1 km east of the village Machevo and was the biggest trunk in eastern Macedonia (stem height 26 m and stem perimeter 8.30 m). The site was proclaimed as a Monument of Nature in 1983 and in 2011 (according to the recommendations of the expert team during the development of RPAN) was proposed to be re-designated as a Natural Rarity.

According to the latest field research conducted in the course of 2015, it was concluded that the tree was cut down and **should be omitted from the protected areas list**.

6.1.7 Konche (walnuts and lindens)

The site is located in the yard of the church St. Ilija in the village of Konche, at 575 m above sea level, i.e. at the foot of the mountain Gradeshka Planina. It represented a group of ten walnut trunks (*Juglans regia*), four linden trunks (*Tilia platyphyllos*) and one plane trunk (*Platanus orientalis*), occupying a surface of 0.66 ha.

With the decision of the MC of Radovish, the mixed group of walnut, linden and plane trees are designated as a Monument of Nature. During the development of the RPAN in 2010/2011, the expert team proposed for this site to be re-designated as a Natural Rarity.

The latest field research from 2015 concluded that the mentioned group of trees is almost completely destroyed during the reconstruction of the monastery. There is currently only one old plane tree and a few young walnut and linden trunks. Thereby, the stand has lost its values and **it is proposed that this site is omitted from the protected areas list**.

6.2 Areas proposed for protection in Bregalnica region

Based on the Spatial Plan of the Republic of Macedonia, the RPAN and the latest field research, a coherent system of protected areas encompassing the most significant parts of nature and biodiversity in the Bregalnica region was proposed.

The Spatial Plan defines a total of 12 areas. The geographical boundaries of these areas most often follow the suggestions made in the RPAN developed during 2010/2011 (proposed on the basis of the guidelines from the National Spatial Plan). The most significant change was made in the case of the areas "Zrnovska Reka" and "Lomija", integrated in one larger area "Zrnovska Reka-Lisec".

Some corrections of the following areas have also been made:

- altering the name of the area "Maleshevo Mountains" in "Chengino Kale", whereby the higher parts of the area Ramna Reka and the newly identified area Trebomirska Reka have been added;

- the boundaries of the area "Dolna Bregalnica" have been moved i.e. its surface has been reduced due to adjustment with the establishment of the foreseen water accumulation "Jagmular";

- the boundaries of the area "Ovche Pole" were adjusted with the existing and projected economic facilities,

- the boundaries of the site "Pilav-Tepe" were adjusted with the route of the expansion foreseen of the road Shtip-Radovish.

Areas proposed for protection in Bregalnica Watershed are as follows:

1. Monument of Nature "Machevo"
2. Nature Park "Judovi Livadi"
3. Protected Landscape "Chengino Kale"
4. Nature Park "Kartal"
5. Nature Park "Salandzhak"
6. Nature Park "Temniot Andak"
7. Protected Landscape "Berovsko Ezero (Linak)"
8. Nature Park "Zrnovska Reka-Lisec"
9. Protected Landscape "Dolna Zletovica"
10. Monument of Nature "Kukuljeto"
11. Monument of Nature "Dolna Bregalnica"
12. Nature Park "Ovche Pole"

The Osogovo Mountains area should be added to this list, and two approaches have been taken into consideration in this phase with regard to it: the first one is integral protection of the entire space by designating a Protected Landscape "Osogovski Planini Mts." and the second one is designating a network of five smaller protected areas (see Chapter 6.3.).

As a result of recent scientific knowledge and field research, six new areas have been proposed for protection:

1. Monument of Nature “Turtel”
2. Nature Park “Mangovica”
3. Nature Park “Adjiinica”
4. Nature Park “Gjuzumliska Reka”
5. Nature Park “Gladno Pole”
6. Nature Park “Sokolarci”

6.2.1 Monument of Nature “Machevo”

The site is located west of the village Rusinovo and east of the valley of the river Selska Reka at an altitude of 850 to 978 m. The site formations of Precambrian gneisses and mica schists feature numerous quartz crystals, the so-called *mountainous crystal*. These crystals are colorless and transparent with various dimensions, and as mono-crystals they also exist in crystal colonies. The site has scientific-research and educational significance, but is also an attractive tourist area.

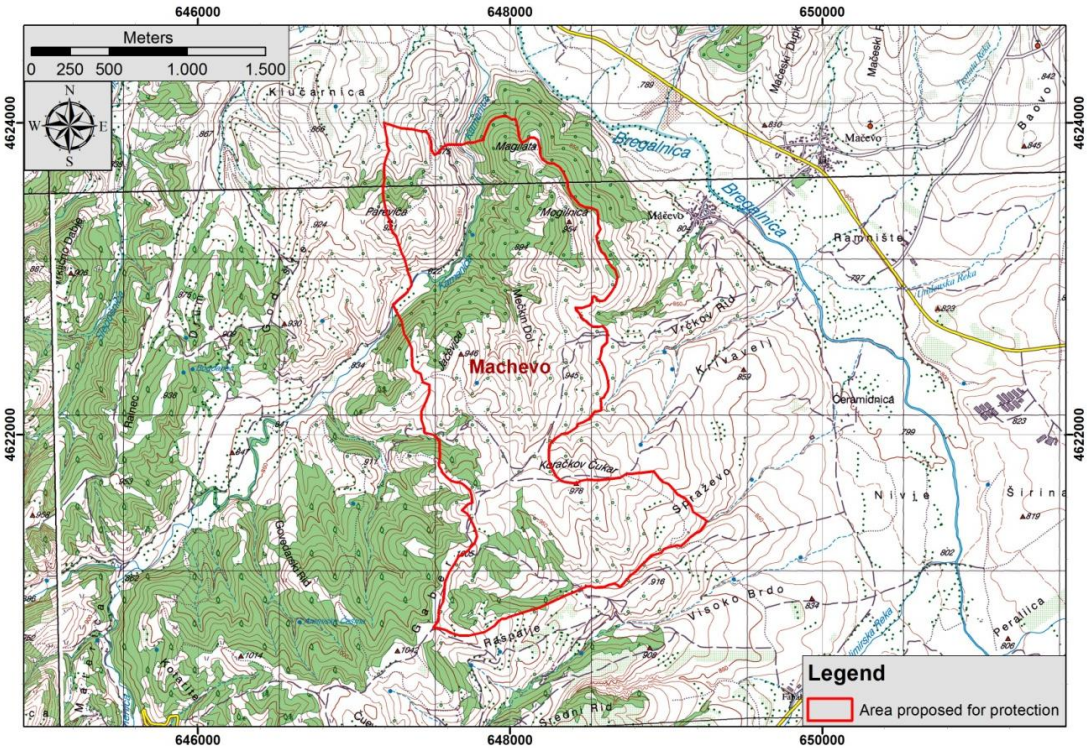


Figure 12. Monument of Nature “Machevo”

According to the Spatial Plan of the Republic of Macedonia, the surface of this site is 200 ha and it has been proposed for protection in the category *Monument of Nature*. During the development of the RPAN (in the course of 2010/2011) and the additional field research, the expert team precisely mapped the quartz phenomena and consequently the boundaries of the site were redefined and it occupies a surface of 360 ha, while the proposed protection category (**Monument of Nature**) remains unchanged.

6.2.2 Nature Park "Judovi Livadi"

The insectivore plant round-leaved sundew (*Drosera rotundifolia)* grows on the peat bogs and humid meadows of Judovi Livadi site. Until 2014, this plant was only known from the site Judovi Livadi, but the latest research showed it also occurred on a few other sites on Maleshevo Mountains and Bukovik. The largest and best preserved population of *Drosera rotundifolia* is found on Judovi Livadi site and that was the basic motivation to propose establishing a protected area.

***Drosera rotundifolia* in the peat bog on Judovi Livadi**

Apart from the flycatcher, the site features significant plant communities, such as a peat bog with *Sphagnum* and a few swamp plants with very limited distribution - *Cetunculus minimus, Juncus capitatus, Juncus tanageia, Blechnum spicant, Dianthus quadrangulus, Ranunculus fontanus,* with very limited distribution in other parts of the territory of the Republic of Macedonia. The site Judovi Livadi is the only habitat in Macedonia of the rare and relict species of ground beetle *Pterostrichus apfelbecki* (Coleoptera, Carabidae) which has a disjunctive distribution in wetlands in Europe and Asia Minor. A few species of amphibians and reptiles are also present. Dragon-flies are featured with few widely distributed species.

In the immediate vicinity of the peat bogs of Judovi Livadi there are old abandoned ore excavations. Their re-exploitation is a potential threat, and so is the possibility of expanding mining activities on Bukovik. So far, multiple project activities have been conducted in order to safeguard and promote the Judovi Livadi site. One of the projects provided for fencing of the peat bog in order to prevent its degradation. But, that prevented the grazing of livestock, which led to its overgrowth with vegetation, so the fence was removed.

This site's surface, according to the Spatial Plan of the Republic of Macedonia is 2.5 ha and is proposed for protection in the category *Specific Nature Reserve*. During the development of the RPAN and the additional field research, the expert team mapped the distribution of the peat bog with Drosera. Thus, the newly defined boundaries of the site occupy a surface of 5.7 ha, while the proposed category for protection of this site is **Nature Park**. The change in protection category was necessary since the strict nature reserves exclude any human intervention. In reality, the locality is used for grazing and tourism.

Judovi Livadi site

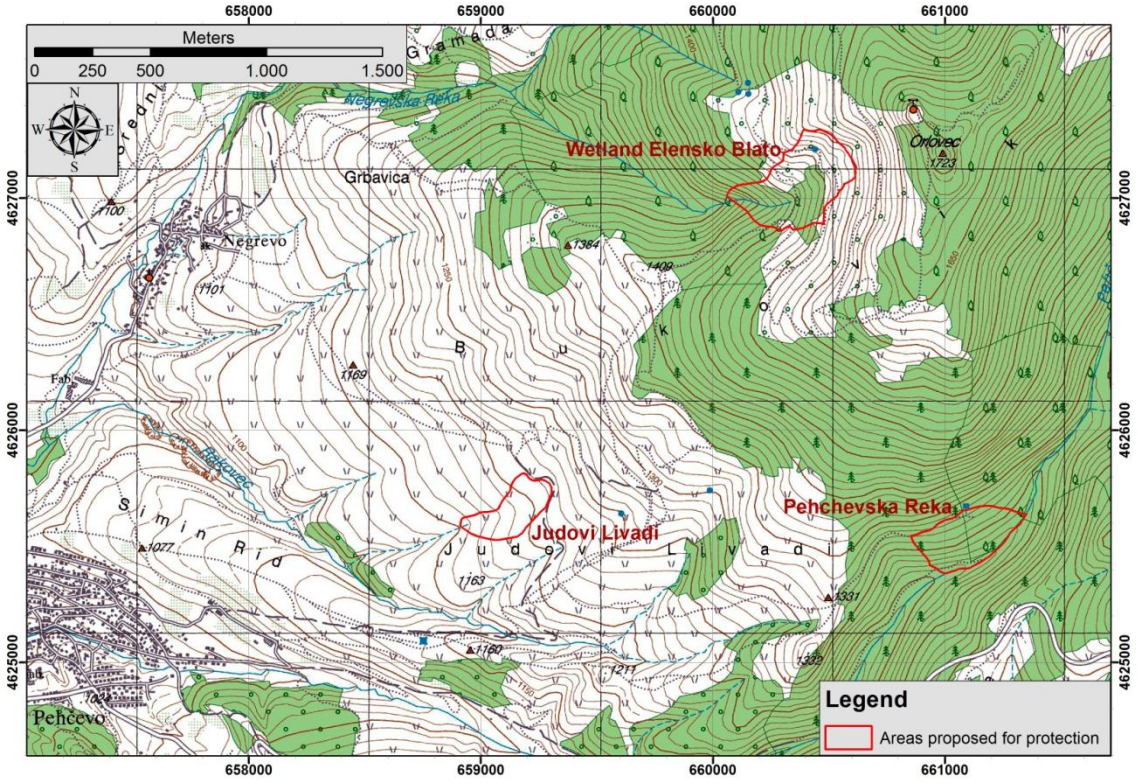


Figure 13. Nature Park "Judovi Livadi" and proposed areas "Elensko Blato" and "Pehchevska Reka"

6.2.3 Protected Landscape "Chengino Kale"

The Spatial Plan of the Republic of Macedonia proposed the area "Malesh" which is insufficiently precisely defined. According to the team research for RPAN in 2010/2011, the area was geographically located in a relatively narrow belt along the Macedonian – Bulgarian border, from Klepalo in the south to the peak Kadiica on Vlaina Mountain in the north, from 1257 to 1932 m above sea level and occupies a surface of 1753 ha. The area was proposed for designation in the category **Protected Landscape**. A change of the name "Maleshevski Planini Mts." was also proposed.

Thus, the area "Maleshevski Planini Mts." (="Malesh") encompasses the mountain grasslands and a very small part of the forests on the Maleshevo Mountains. Still, the name of the area "Maleshevski Planini Mts." refers to a larger space than the area proposed actually occupies. For these reasons, the expert team involved in preparation of this report, proposes to change the name into protected area "Chengino Kale" and extends the area (by annexing the two proposed areas Ramna Reka and Trebomirska Reka elaborated below), so its surface is 2020 ha.

The area is a mosaic of mountain grasslands, white pine and beech forests with high area values. Attractive waterfalls are formed on several small rivers. The higher parts, where the river springs are located, feature peat bogs.

The area is significant due to its high forest coverage which is a result mainly of traditional forest use by private owners and Public Enterprise (PE) "Makedonski Shumi". Some smaller sites have better preserved forest stands (Ramna Reka, Dimlivo Prisoe, Trebomirski Potok, Sredna, Bukva, Dabevec etc.).

Approximately 100 bird species and about 20 amphibian and reptilian species are registered in the area. More significant birds are those specializing in living in old forests: black woodpecker, white woodpecker, hazel grouse. In this context, some xylophagous species and other insects are also significant, such as: *Rosalia alpina, Morimus funereus, Carabus intricatus*, the Balkan endemic butterfly *Colias caucasica balcana* etc. From time to time, Griffon Vultures may appear which have been reintroduced in Kresna gorge (Republic of Bulgaria). This is the area where the presence of the bat *Nyctalus lasiopterus* was registered for the first time in Macedonia.

Numerous significant and rare species of fungi are also found in the area. For example, the rare species *Sparassis crispa* was registered in the surroundings of the river Trebomirska Reka. Speaking of rare species, we should also mention *Pluteus romellii* and *Astraeus hygrometricus.* Apart from those, some commercial species of fungi are also significant: *Boletus aestivalis*, *Macrolepiota procera, Suillus granulatus,* etc.

This area includes the area "Ramna Reka", located east of Pehchevo and occupying the watershed of the river Ramna Reka, a right tributary of the river Bregalnica. According to the Spatial Plan of the Republic of Macedonia, the site was proposed for protection in the category *Specific Natural Reserve.* According to the team's research under RPAN, the area "Ramna Reka" was proposed for protection in the category *Nature Park* due to its dendrological significance and natural white and black pine stands, indicating presence of the association *Fago-Pinetum sylvestris*.

The Municipality of Pehchevo has developed a planning document for this site for development of the tourist settlement Ramna Reka and certain part of the space along the river is partitioned and offered for sale for construction of individual weekend houses. Apart from that, there are ongoing intensive infrastructure constructions that capture water for construction of small hydropower plants. As a result of these development plans of the Municipality of Pehchevo, the boundaries of the proposed area were corrected (the proposed surface has been cut in half) and the expert team proposed including this area as part of the Protected Landscape "Chengino Kale".

The spring area of the river Trebomirska Reka, featuring significant forest communities, is also included in the boundaries of the area Chengino Kale. In one narrow part surrounding the main section of Trebomirska Reka, a beech forest with near virgin character grows, while the remainder of the area proposed for protection features mixed black pine and beech forests, where some of the trunks have imposing dimensions.

Peat bogs and pine forests at Chengino Kale

Old pine forest – Trebomirska Reka

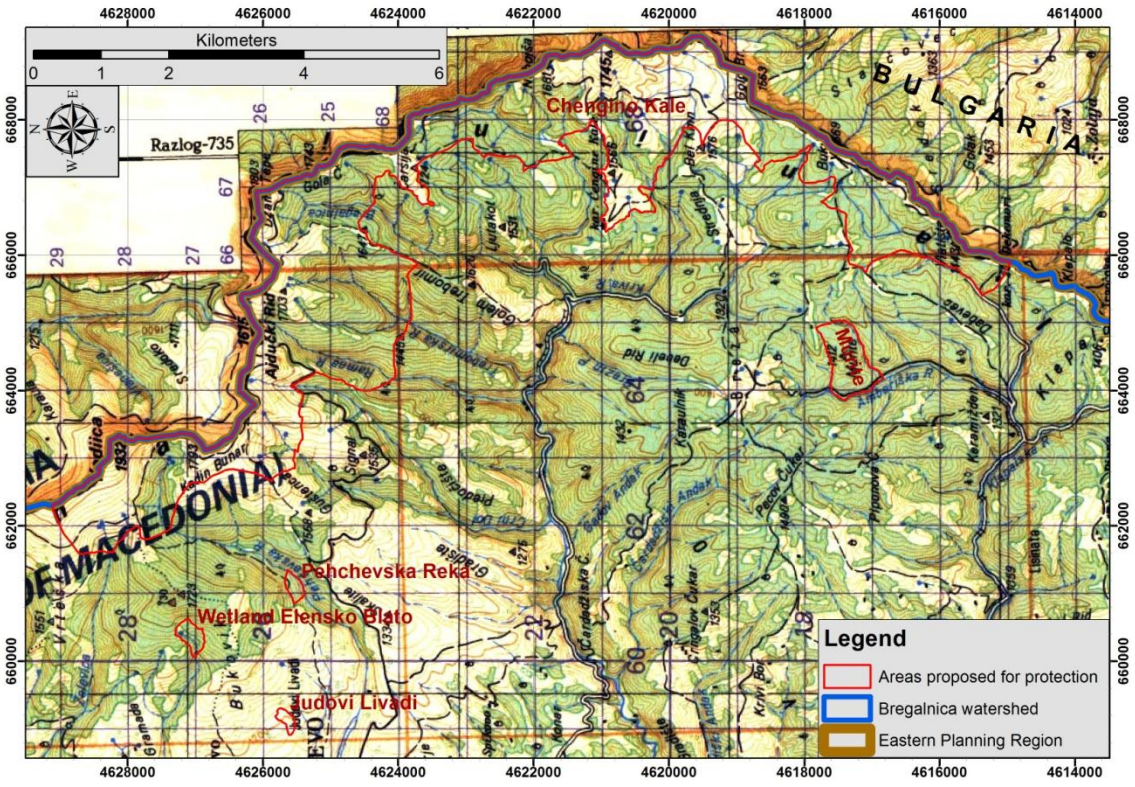


Figure 14. Protected Landscape "Chengino Kale"

6.2.4 Nature Park "Kartal"

It is located on the mountain Plachkovica, in the valley of the river Lom, tributary to the river Selska Reka (village of Laki). According to the Spatial Plan of the Republic of Macedonia, the area encompasses a surface of 10 ha. The research of the team under RPAN and the precise mapping have established that the site in question occupies a larger surface area (593 ha). The area is spread between 925 and 1438 m above sea level.

Variously aged mesophilic forest stand of beech and black pine develops in the area. The association *Fago-Pinetum nigrae* is represented on a northeastern exposition. The stand is on a moderately steep ground 15-20°, on a silicate geological foundation. The soil is dystric cambisol, deep, sandy-loamy, covered with litter layer. The stems are straight, healthy and of high quality. Especially striking are the black pine trees, with big dimensions, heights of about 35 meters and

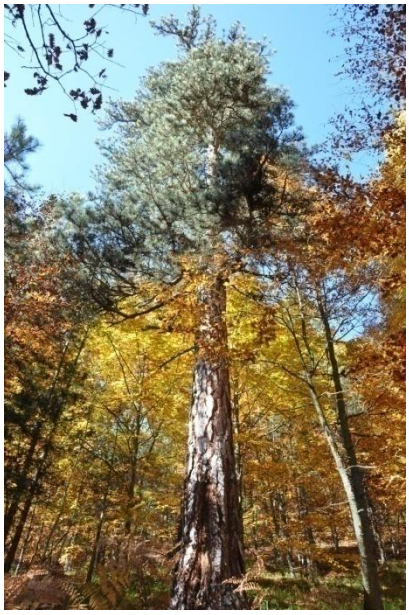
diameters at breast height surpassing 50 cm. At the same time, these forests have the highest quality among the mixed beech-black pine forests in the Republic of Macedonia.

The site has botanical and scientific-research significance, primarily due to the conservation of the native gene fund of the black pine. Apart from its botanical significance, some significant bird species have been registered on the site (flycatchers *Ficedula parva* and *F. semitorquata*, white-backed woodpecker *Dendrocopos leucotos lilfordi* and a higher number of the more common forest species). A few species of insects, related to preserved forests, have also been registered on the site (*Pterostichus vecors*, *Pterostichus brucki, Cychrus semigranosus balcanicus*). The butterfly *Limenitis populi* and some common species of dragon-flies have been registered near the streams. Several species of amphibians (*Rana graeca, R. dalmatina*, *Salamandra salamandra*), as well as the stone crayfish *Austropotamobius torrentium* have been registered in the streams. The Habitat Directive 92/43/EEC (Annex IV) provides for strict protection of *A*. *torrentium*. The stone crayfish is also included in the list of Annex II, it is of particular interest to the Union and in order for it to be preserved and specific areas for protection need to be determined. By its inclusion in Annex III of the Bern Convention on the Conservation of Wildlife and Natural Habitats, the *A*. *torrentium* represents a protected animal species.

Fungi in these forests are represented with high level of diversity. Of the more significant species of fungi the following can be mentioned: *Arcyria denudata, Astreus hygrometricus, Cortinarius elegantissimus, Ischnoderma resinosum, Inocybe fraudans.,* etc.

Regular non-intensive forest activities take place on this site and there are no noticeable disturbances of the natural surroundings. Traces of former resin gathering can be seen on some of the older pine tree stems.

This area is proposed for protection in the Spatial Plan of the Republic of Macedonia, in the category *Scientific-research Natural Reserve,* while the category **Nature Park** was proposed during the development of the RPAN, as well as according to the recommendations of the expert team in 2015.



Beech-black pine forests on Kartal

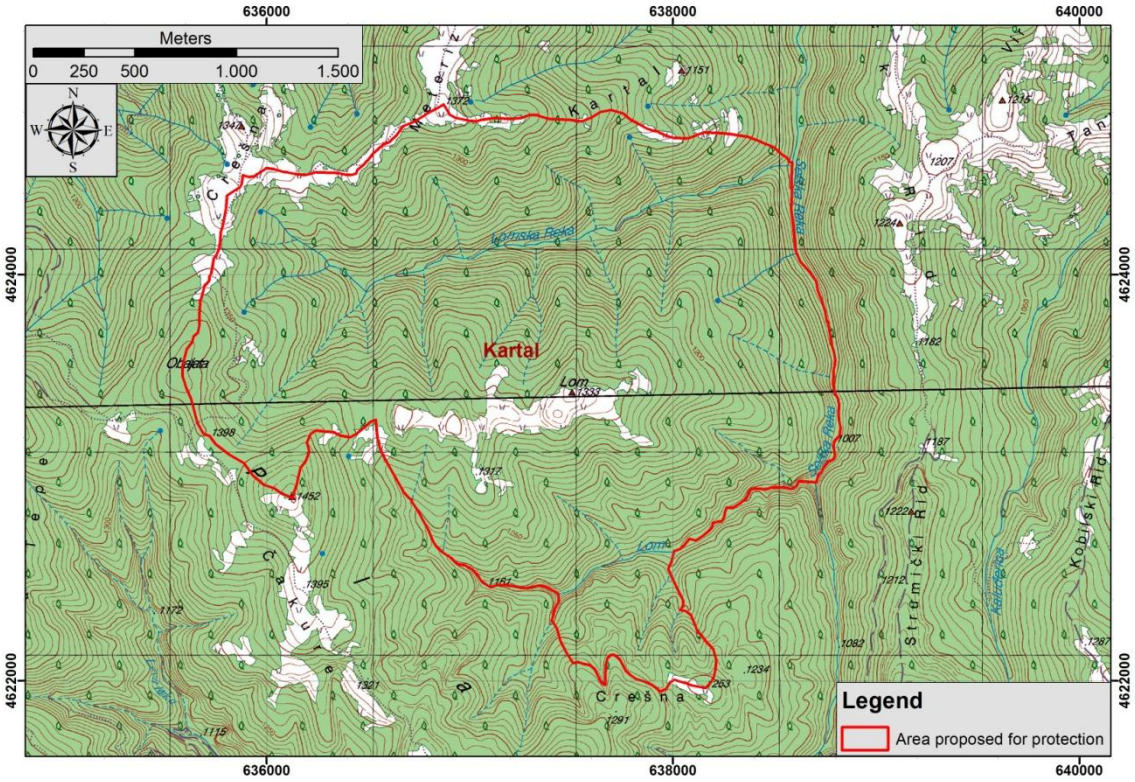


Figure 15. Nature Park "Kartal"

6.2.5 Nature Park "Salandzhak"

The site is located on the highest parts of the mountain Gradeshka Planina (Pozhar, 1003 m), southeast of the settlement Konche. It spreads from 300 to 1000 m above sea level.

It is an interesting site for protection of plant communities and individual species. The association *Aristolochio-Fagetum* is also found here, as well as many other outstanding elements.

The insect fauna is very similar to the fauna on the mountain Belasica. Subendemites *Molops rufipes belasicensis* and *Tapinopterus balcanicus belasicensis* are registered in the refugial beech forest, as well as the species which is rare in Macedonia: *Trechus tristis*. The ornithofauna in the area is not very significant.

According to the assessment of the expert team for RPAN (2010/2011) the site occupies a surface of 1.577 ha. Of this surface area, only a small part of 299 ha (about 19%) belongs to Bregalnica Watershed, and no part of it falls under the Eastern Planning Region.

In the Spatial Plan of the Republic of Macedonia, the site was proposed for protection as a *Specific Natural Reserve*. Its protection in the category **Nature Park** was proposed during the development of the RPAN in 2011.

Salandzhak

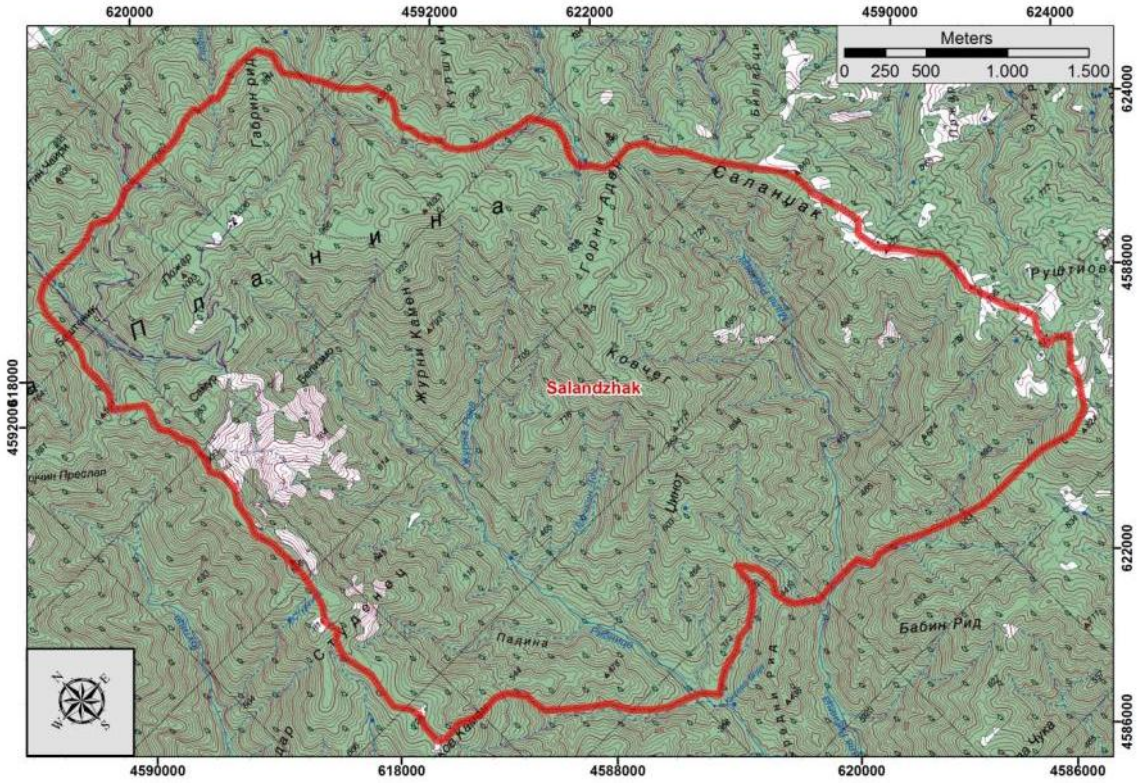


Figure 16. Nature Park “Salandzhak”

6.2.6 Nature Park “Temniot Andak”

The site is located west of the village Rusinovo and east of the valley of the river Selska Reka. It spreads from 913 to 1020 m above sea level.

This reserve of black pine (*Pinus nigra*) is located in the forest management unit “Gubenek-Paruca”, in the western part of Maleshevo Mountains. It is a pure black pine stand in which the pine trees have huge dimensions and are in a very good health condition. Several trunks in the reserve have been noticed to have traces of former resin gathering. It has botanical meaning.

According to the Spatial Plan of the Republic of Macedonia, the site occupies a surface of 56 ha, but upon precise definition of its boundaries (during the development of the RPAN in 2010/2011) it occupies a surface of 48 ha.

The Spatial Plan of the Republic of Macedonia proposed the site for protection as a *Specific Natural Reserve*. During the development of the RPAN, the expert team proposed its designation in the category **Nature Park**.

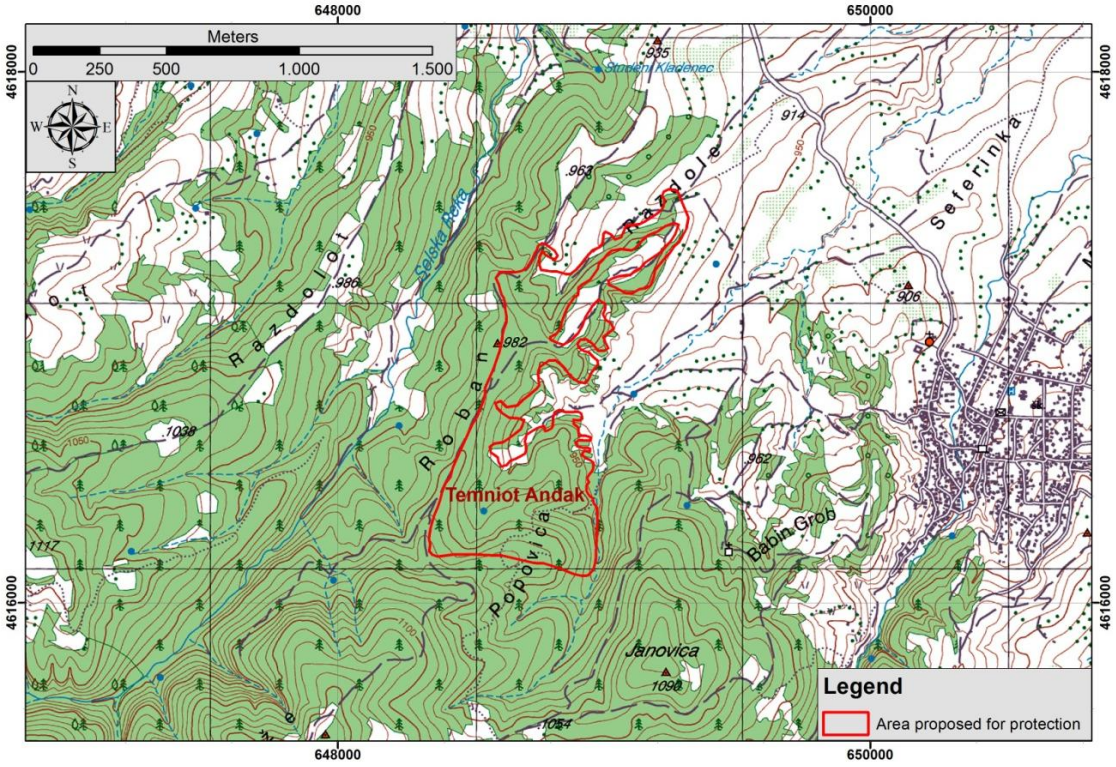


Figure 17. Nature Park "Temniot Andak"

6.2.7 Protected Landscape "Berovsko Ezero (Linak)"

The site includes the artificial water accumulation Berovo Lake and the surrounding forests, at 1000 to 1300 m above sea level. The stand contains forest of beech, white and black pine and elm. Considering the composition and the state of conservation of these forest stands and the presence of artificial accumulation, the area of the proposed Protected Landscape "Berovsko Ezero (Linak)" does not have any particularly high natural significance. The area has tourist and recreational significance. During the past ten years, more new tourist facilities, apart from the already existing, have been built, and some other activities for tourism development are also taking place (information material, pedestrian trails, production of handmade artefacts and local forest fruit products).

During the past several years, desiccation of the white pine stems has been observed. According to the Spatial Plan of the Republic of Macedonia, the site occupies a surface of 300 ha, to increase 428 ha after precise definition during the development of the RPAN (2010/2011). Part of the area (about 40%) overlaps with the Emerald Site "Maleshevo".

According to the Spatial Plan of the Republic of Macedonia, the site is proposed for protection in the category *Landscape with outstanding natural features*. During the development of the RPAN, it was proposed for protection in the category **Protected Landscape**, as the most suitable one.

Berovo Lake and forest landscapes of mixed beech-pine forests

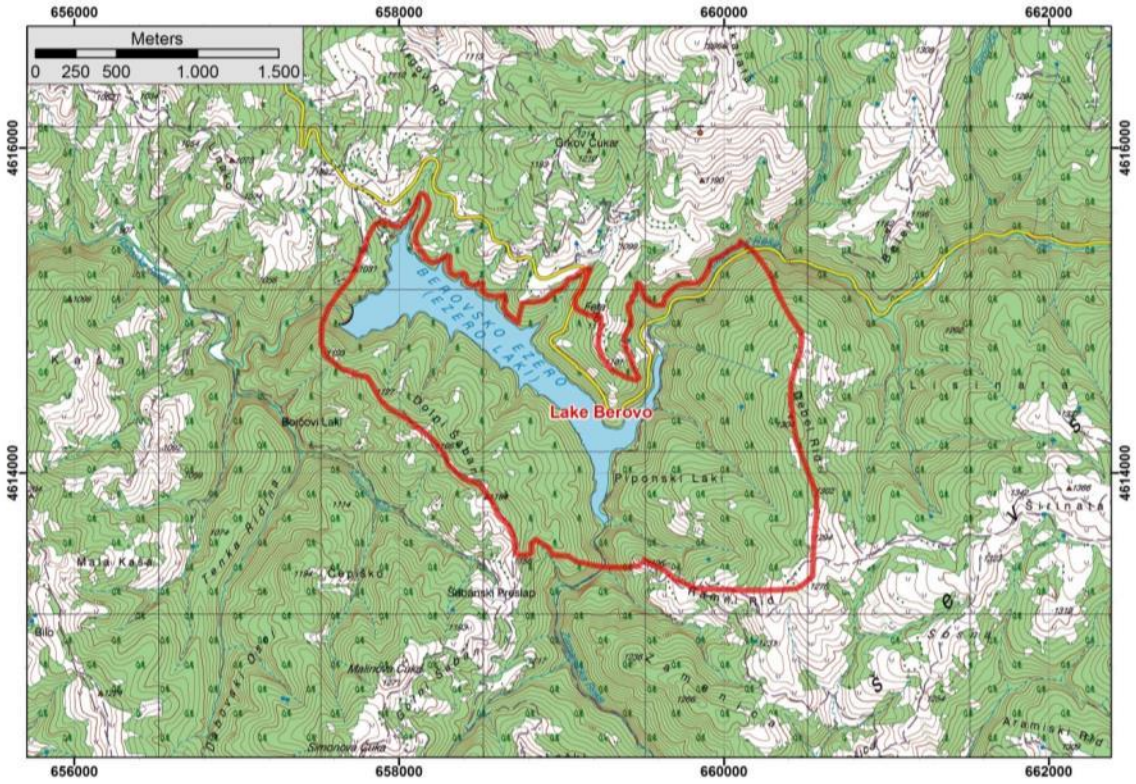


Figure 18. Protected Landscape "Berovsko Ezero"

6.2.8 Nature Park "Zrnovska Reka-Lisec"

The area is located in the watershed of the river Zrnovska Reka and encompasses the highest peak Plachkovica (Lisec, 1754 m). It extends over an altitude of 620 to 1754 m. It comprises the valley of Zrnovska Reka, the valley of the river Lomija and the valleys of several smaller streams.

Submountain and mountain beech forest communities (*Festuco heterophyllae–Fagetum* and *Calamintho grandiflorae-Fagetum*) are dominant in the area with their best stands found along

the course of Zrnovska Reka and its tributaries. In the lowest parts, along the left valley side of Zrnovska Reka, a forest stand of silver linden (*Tilia tomentosa*) grows. Small patches of the association *Bruckenthalio-Myrtillo-Fagetum* have started developing in the higher parts of the watershed area, on an acid soil (especially in the valley of Eden Dere). The highest parts (south of the peak Lisec) feature open spaces with grasslands and scrubs of *Chamaecytisus absinthoides*.

The National Spatial Plan mentions the presence of the subassociation *Festuco heterophyllae–Fagetum castanetosum,* i.e. presence of chestnut and walnut trees in the valley of Zrnovska Reka. According to field research during the past five years and information provided by foresters, these wood species and the above mentioned community are no longer present.

This area proposed for protection is particularly significant due to the presence of old forest communities which are the result of adequate management of forests on the mountain of Plachkovica. These kind of old forests host bird species that appear rarely in Macedonia, such as *Ficedula semitorquata, F. parva, Dendrocopos leucotos, Tetrastes bonasia, Strix aluco, Bubo bubo,* living in aged and preserved forests. The significance of the blue ground beetle (*Carabus intricatus*), beech cutter (*Morimus funereus*) and mountain cutter (*Rosalia alpina*) is similar, as they are globally endangered species due to the disappearance of old beech forests. Significant plant species in the old forests of Plachkovica are the orchids *Epipogium aphyllos* and *Corallorhiza trifida*. Some subendemic insect species (*Myas chalybaeus, Tapinopterus balcanicus*) live in these forests, too.

Zrnovska Reka with well preserved beech forests

The presence of stone crayfish *Austropotamobius torrentium* has been registered in the waters of Zrnovska Reka. The species is legally protected by the Habitats Directive (Annex II/IV) that emphasizes the necessity of a high level of protection, both of the species and its habitat. By its inclusion in Annex III of the Bern Convention on the Conservation of the European Wildlife and Natural Habitats, *A. torrentium* represents a protected animal species. Another significant representative of macroinvertebrates (*Cordulegaster heros*) in larval form is found in the waters of Zrnovska Reka.

Multiple species of fungi have been registered in the area. The most significant one is *Hericium coralloides* (site Djumaja) considered to be a very rare species among fungi in Macedonia

and is near threatened species according to the fungi red list. Apart from it, some edible species of fungi are present: *Pleurotus ostreatus* and *Cantharellus cibarius.*

Significant fauna species are found in Zrnovska Reka and its tributaries as well (*Gomphus flavipes, Coenagrion ornatum, Sabanejewia balcanica, Pachychilon macedonicum, Rana dalmatina, Pelophylax ridibundus, Pseudepidalea viridis, Rana graeca, Salamandra salamandra, Bufo bufo, Hyla arborea*). In open habitats on a lower elevation, we can find *Eurotestudo hermanni, Testudo graeca, Vipera ammodytes, Buteo rufinus, Circaetus gallicus.* The rock partridge (*Alectoris graeca*) is found on rocky grounds around the peak Lisec.

Lisec – the highest peak on Plachkovica Mt. (grasslands, heaths and beech forests)

The proposal for the protected area Zrnovska Reka- Lisec has been developed on the basis of two areas proposed for protection in the Spatial Plan of the Republic of Macedonia: SRNR Zrnovska Reka and (SpNR) Lomija. Under the SP, these two areas are proposed with a surface of 1000 ha and 3 ha, respectively. According to the new proposal to establish a protected area **Nature Park** Zrnovska Reka-Lisec, it occupies a surface of 2.328 ha, resulting mainly from the inclusion of grassland and scrub areas on the southern slopes of Lisec.

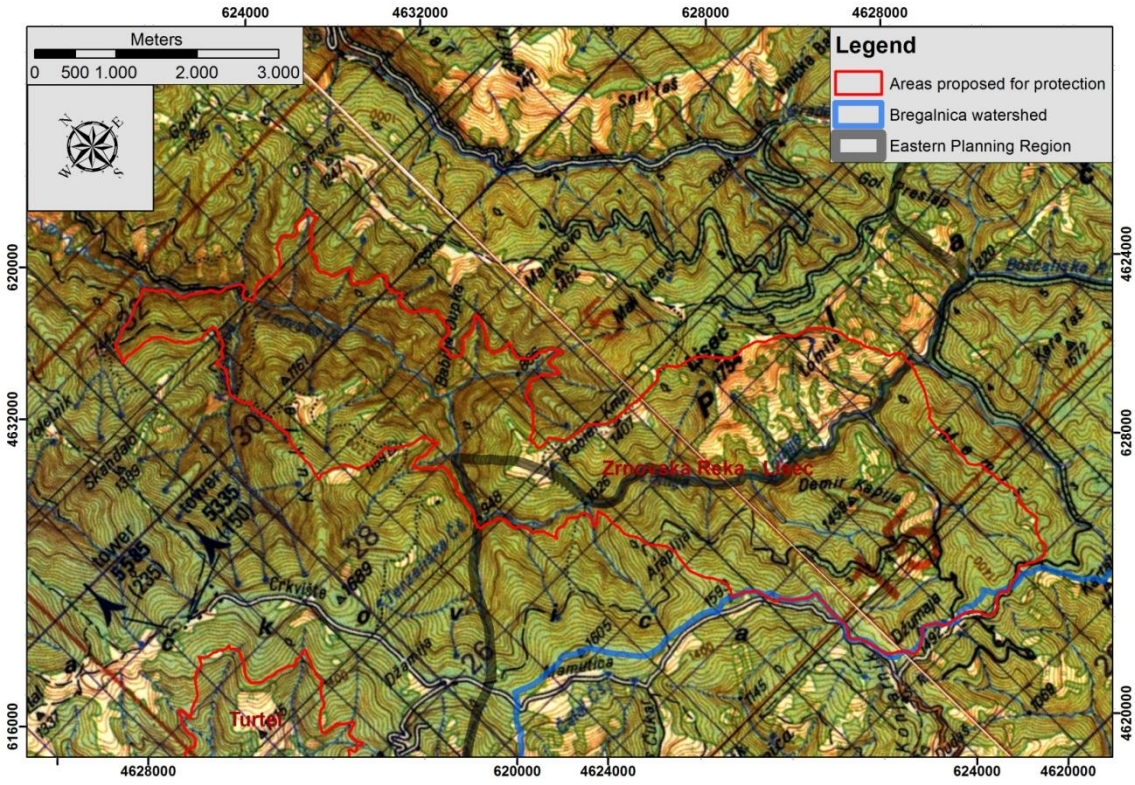


Figure 19. Nature Park "Zrnovska Reka-Lisec"

6.2.9 Monument of Nature "Kukuljeto"

The area is situated southwest of the village of Nov Istevnik (Delchevo area), spreading from the neighbourhood Rupevci to Dzvezdina Chuka, more precisely 1.5 km west of the regional road Delchevo-Berovo, at 770-1105 m above sea level. The site occupies a surface area of about 100 ha.

This site has geomorphological significance. The presence of erosive forms (geomorphological forms) – earth pyramids, positioned on two erosive slopes in a black pine forest is the most significant. Earth pyramids are built in Pliocene sediments, mostly Pliocene sands. A basic precondition for earth pyramids formation are rim-stone deposits protecting the underlying sediment from intensive erosion. Denudation forms, pyramids and rock cuttings existing on the site are of national significance.

The presence of erosion forms in a well developed black pine forest gives the site an attractive appearance which is the main reason for its preparation for tourist visits. Unfortunately, the information panels and the remaining infrastructure were neglected in the course of 2015. Part of the site is also ruined as a consequence of forest roads breaking through.

Apart from geomorphological, the site has other values from a biodiversity point of view. Well preserved black pine forests are significant, and so is the presence of species related to deciduous forests (crested tit *Lophophanes cristatus*, common crossbill *Loxia curvirostra*, nutcracker *Nucifraga caryocatactes*) and other significant species (horned viper *Vipera ammodytes, Carabus intricatus*). Also, significant species related to aquatic ecosystems (mountain rivers and streams) in this area include the following species of dragonflies: *Cordulegaster heros* and *Caliaeschna microstigma.*

This area was proposed for protection by the expert team during the development of RPAN

in 2010/2011 in the category **Monument of Nature**.

Erosion forms on the site Kukuljeto in black pine forest

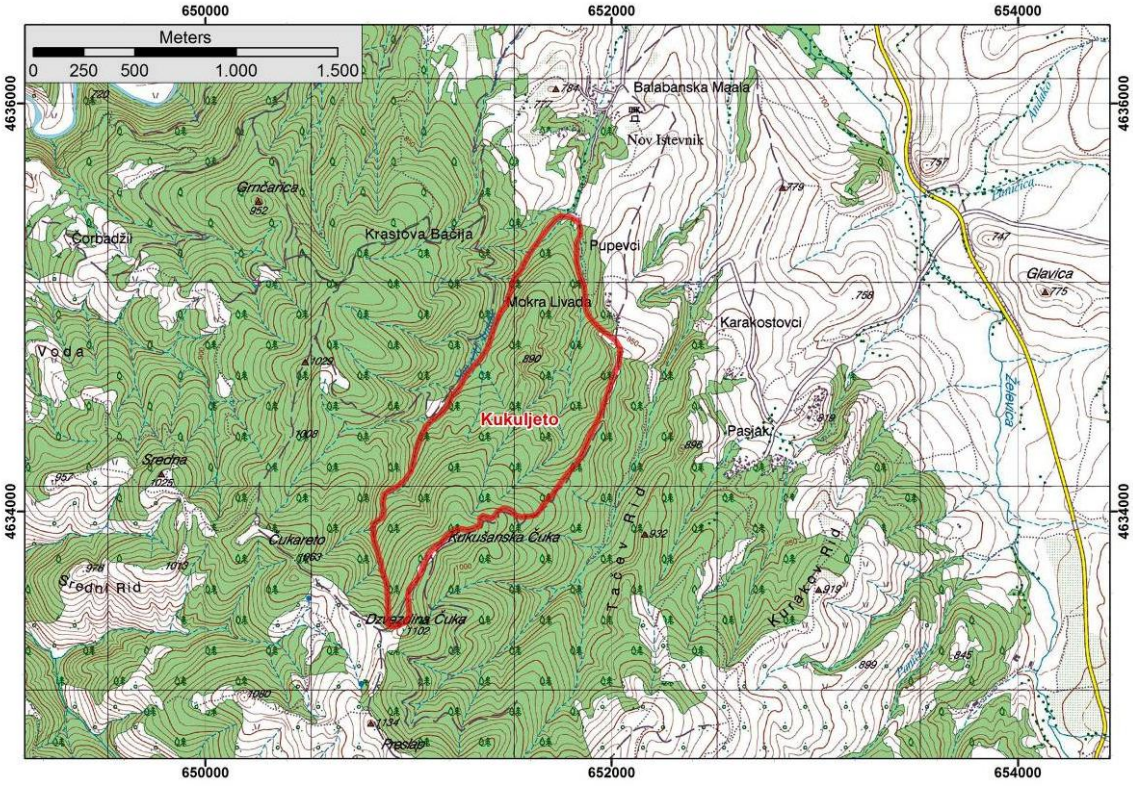


Figure 20. Monument of Nature "Kukuljeto"

6.2.10 Protected Landscape "Dolna Zletovica"

It encompasses the lower course of the river Zletovska Reka, from the village of Tripatanci to below the village of Zhiganci, the surrounding rice fields and lower parts of the Osogovo Mountain. It occupies surface area of 2.140 ha and spreads on an altitude of 310-590 m.

This site is significant for the birds' fauna (the only mixed colony of night heron, grey heron and little egret) and imperial eagles. It occupies a larger part (about 80%) of the significant bird area "Valley of the river Zletovica". Apart from the above mentioned bird species, some other significant species are found here, such as European roller, saker falcon and common harrier. Of the significant mammals, the otter is present in this area. Amphibian and reptilian fauna is diverse and represented with about 15 species, more significant of which are the pond turtle *(Emys orbicularis)*, Hermann's tortoise *(Eurotestudo hermanni)* and horned viper (*Vipera ammodytes)*. Several significant species of dragonflies are found here, too. In the river Zletovska Reka there are fish typical for the lower courses of the Bregalnica watershed: *Alburnus macedonicus, Barbus macedonicus, Chondrostoma vardarense, Vimba melanops* and *Pachychilon macedonicum*. With regard to flora, there is significant presence of the aquatic fern *Marsilea quadrifolia*. The rare fungi *Endoptychum agaricoides* and *Phalus hadrianii* are also found in the area.

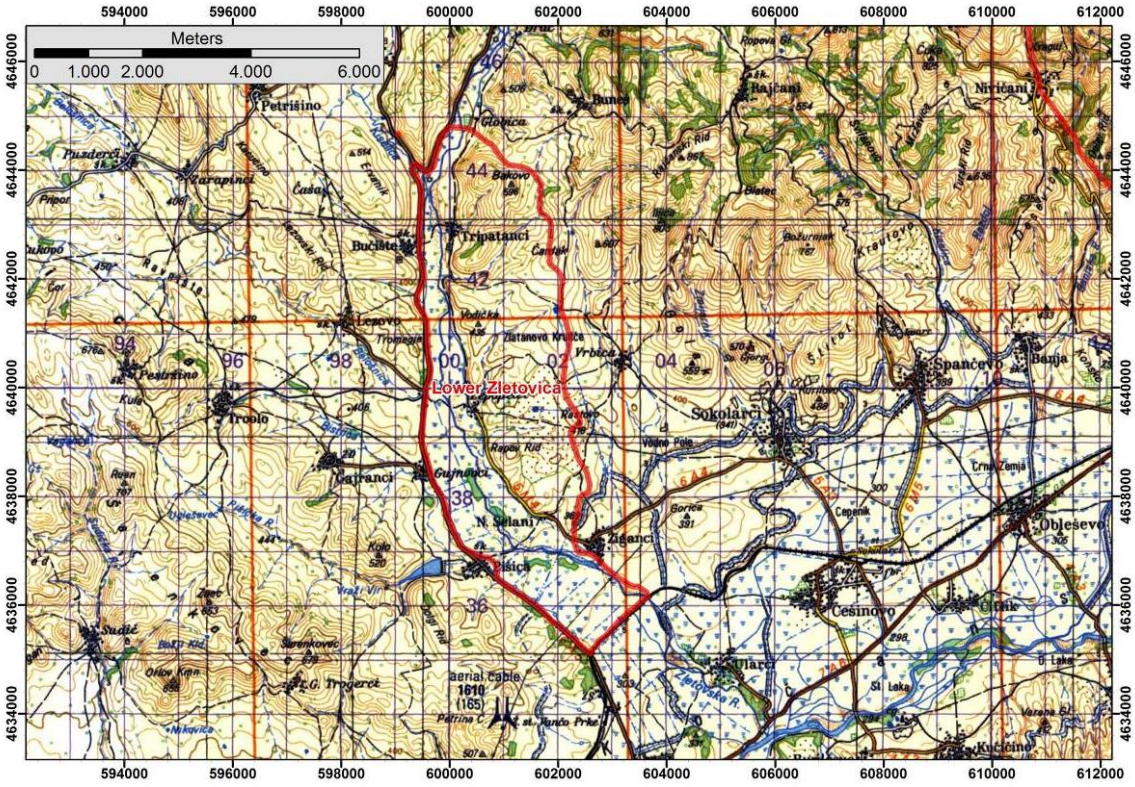


Figure 21. Protected Landscape "Dolna Zletovica"

The diverse landscape comprised of agricultural lands (mainly rice fields), semi-natural habitats and riparian forest belts of poplars and willows along the river Zletovica was the main reason for this area to be proposed for protection in the category **Protected Landscape**.

The space between village Pishica and the railway has been awarded under concession for exploitation of ceramic clay. Rational usage may maintain the trophic conditions for the heron colony near the village of Zhiganci. Nevertheless, the boundaries have been corrected and the above mentioned concessions are outside of the area proposed for protection. The planned gas pipeline will have a minor impact on the area's natural values, provided that adequate measures are undertaken through Environmental Impact Assessment.

6.2.11 Nature Park "Ovche Pole"

It occupies the area between the railway "Ovche Pole" and the villages Amzabegovo, Erdjelija and Kadrifakovo. The area encompasses the most significant halomorphic (saline) soils in Macedonia on which specific halophytic vegetation grows. It should be taken into consideration that the significant halophytic communities occupy small surfaces and they are scattered in the dominant matrix of the agricultural land.

Of the halophytic communities, there is noticeable presence of the dominant communities *Camphorosmetum monspeliacae, Hordeo-Trifolietum parviflori, Suaedetum maritimae, Puccinelietum convolutae* and *Camphorosmetum annuae*, and of the specific plant species: *Camphorosma monspeliaca, Camphorosma annua, Suaeda maritima, Puccinelia convoluta, Hordeum geniculatum, Statice gmelinii, Pholiurus pannonicus, Plantago coronopus,* and some other.

Halophytic species are found among insects as well. Thus, the following species were registered from among the group of ground beetles: *Acupalpus elegans, Harpalus punctatostriatus, H. dispar* etc. The saline ponds on the "Ovche Pole" landscape are habitats of the aquatic beetle *Hydroporus pubescens*, which is an exceptionally rare species in the area of Bregalnica Watershed.

Saline habitats on Ovche Pole

More than 60 bird species have been registered in this area, but due to its small surface, a small number of couples belonging to more common species nest there. More significant herpetofauna species registered in this area include Hermann's tortoise (*Eurotestudo hermanni)* and horned viper (*Vipera ammodytes)*.

The site is under pressure due to conversion into arable land and uncontrolled spreading of the dumpsite near the village of Amzabegovo, along with its drainage.

The proposed area "Ovche Pole" has importance and is included in the Important Bird Area "Ovche Pole", Important Plant Area "Ovche Pole-Bogoslovec" and the Emerald site "Ovche Pole".

According to RPAN, it occupies a surface area of 599 ha and spreads at 238-250 m above sea level. Due to already constructed facilities, as well as plans for construction of other structures, the area's boundaries have been significantly modified and its surface area reduced to 503 ha.

Asphalted road Shtip-Sveti Nikole passes through the middle of this area and there are ongoing activities for its expansion. It is recommended that serious measures are undertaken to mitigate the impact of construction and operation of the new asphalted road.

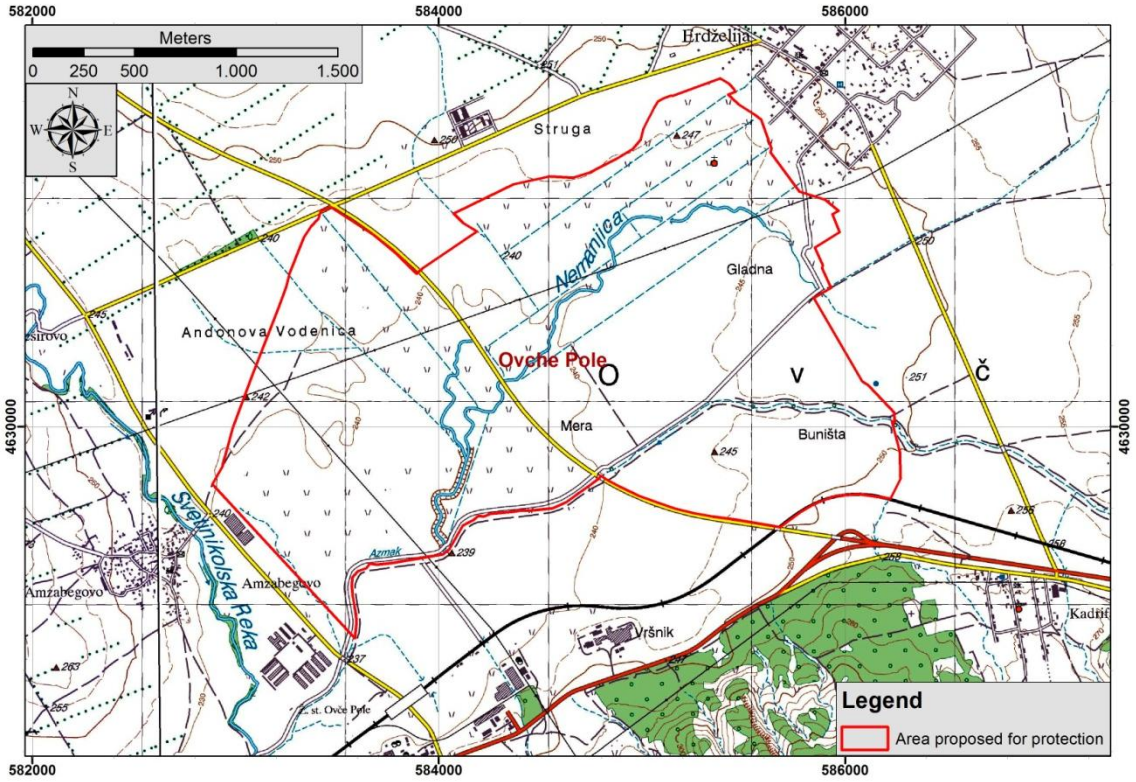


Figure 22. Nature Park "Ovche Pole"

6.2.12 Monument of Nature "Dolna Bregalnica" (Lower Bregalnica)

The area encompasses the course of the river Bregalnica, downstream from the abandoned village Jamularci to the village of Ubogo. It also includes the hill Bogoslovec, meanders and the fossil riverbed of Bregalnica and the surrounding hills with steppe-like vegetation.

The fauna in the area "Dolna Bregalnica" is of exceptional significance, particularly birds and reptiles. Apart from that, significant species of plants and invertebrates are found here. The area has exceptional geomorphological significance due to the presence of the fossil riverbed and meanders of Bregalnica. Different fossils are featured as well, therefore the area has paleontological significance. Parts of the proposed area "Dolna Bregalnica" have international significance and have been identified as Important Bird Area, Important Plant Area and Emerald sites.

The area is particularly significant for bird protection. The following species are found here: lesser kestrel (*Falco naumanni*), lanner falcon (*Falco biarmicus*), Eurasian stone-curlew (*Burhinus oedicnemus*), European roller (*Coracias garrulus*), Egyptian vulture (*Neophron percnopterus*), long-legged buzzard (*Buteo rufinus*), imperial and golden eagle (*Aquila heliaca* and *A. chrysaetos*) and more than 90 other bird species, the majority of which are largely related to steppe-like habitats and Mediterranean rocky grounds. Herpetofauna is represented with multiple significant and unique species: *Zamenis situla, Telescopus fallax, Testudo graeca, Typhlops vermicularis, Vipera ammodytes, Eryx jaculus* and *Elaphe quattuorlineata*.

With regard to invertebrates, the presence of species from the EU Habitats Directive (*Paracaloptenus caloptenoides, Lycaena dispar, Phengaris arion*) is the most significant. Furthermore, the area supports an exceptional number of rare species specific for the steppe area of Macedonia: *Galeodes elegans* (Macedonian solifuge), *Latrodectus tredecimguttatus* (black widow), *Mesobuthus gibbosus* (Mediterranean scorpion), *Saga hellenica*, *Harpalus metallinus*, etc.

Steppe-like habitats and riparian poplar forests near the village of Ubogo

In the frames of macro invertebrates survey in the area territory, presence of endangered species and legally protected species was confirmed. According to IUCN Red List of globally threatened species (2014), the mussel *Unio crassus* has a status of an Endangered (EN) species. Nevertheless, it should be pointed out that only empty mussel shells were registered in Bregalnica river before its entry into Vardar (Ubogo village), which is why only the presence of the species, and not the existence of viable populations, is being assumed. *U*. *Crassus* is under legal protection under the Habitats Directive (Annex II/IV), which additionally emphasizes the need for a high level of protection, both of the species and its habitat - the proposed area "Dolna Bregalnica". Furthermore, the Habitats Directive provides strong legal protection of the dragonflies *Gomphus flavipes* and *Ophiogomphus cecilia* as well. The larva of *G*. *flavipes* inhabits the area where Bregalnica flows into Vardar and is a strictly protected species under the Bern Convention on the Conservation of Wildlife and Natural Habitats in Europe (Annex II). With regard to macroinvertebrates, the presence of the larva *Heptagenia longicauda* (Ephemeroptera) in the waters of Dolna Bregalnica is also significant. This thermophilic mayfly with Pontic origin is a rare species in the country observed only in the middle and lower courses of the river Vardar with exceptionally small-numbered populations. In spite of its omnivalence towards multiple ecological factors, *H*. *Longicauda* has not achieved adaptation to a high degree of anthropogenic pollution in the course of its evolution, which is why this species is in a phase of disappearing from the waters of a number of European countries.

The entire area has an abundance of sea fauna fossils, such as *Cerithium diaboli, Conus* sp., etc.

More significant representatives of the flora include: *Galium rhodopaeum, Artemisia maritima, Alyssum bargalense, Anchusa macedonica, Astragalus parnassii, Phlomis herba-venti* subsp*. pungens, Morina persica, Onobrychis megalophylla, Thymus comptus* and *Salvia jurisicii*.

Some places support halophytic vegetation with typical halophytes such as: *Monspeliaca* and *Eurotia ceratoides*.

In the RPAN (2010/2011), this area was proposed with a surface area of 8,817 ha. But with the boundary alterations due to the planned "Jagmular" accumulation, the newly proposed surface is 8.173 ha. The changes of the boundaries of the protected areas mitigated the possible conflict with the dam of the planned hydrosysem Jagmular. In the framework of this area there are several (already abandoned) villages where livestock breeders and farmers live seasonally.

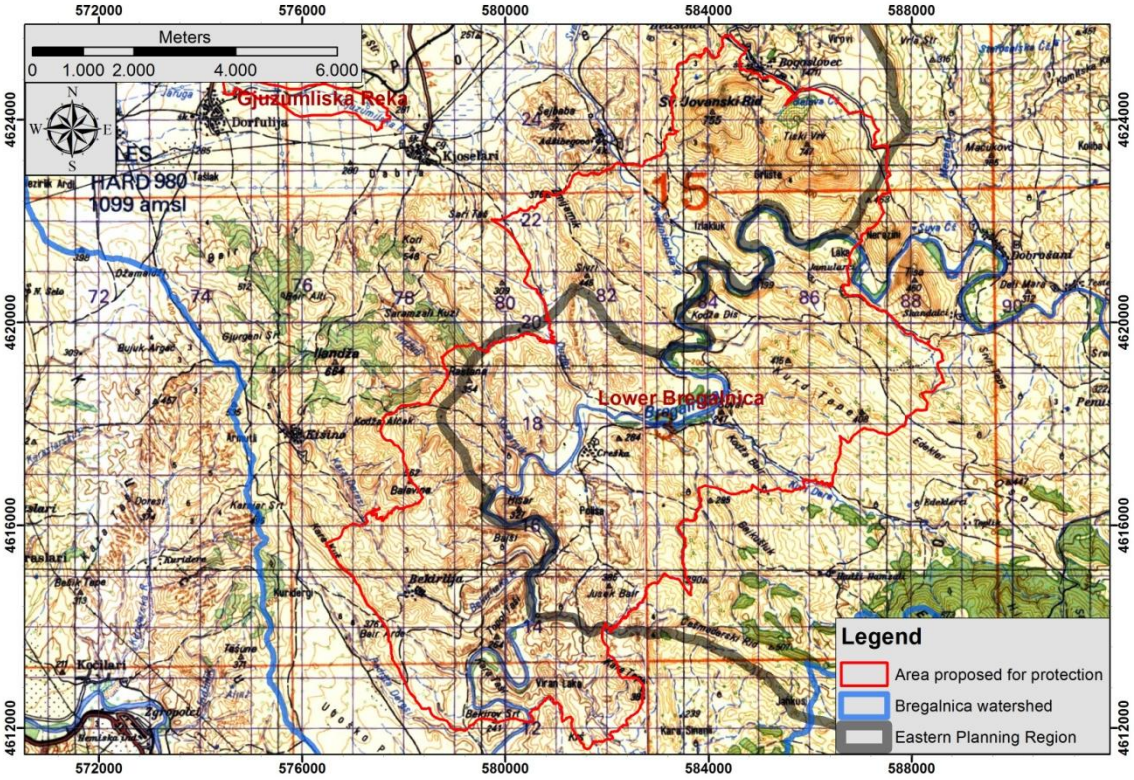


Figure 23. Monument of Nature "Dolna Bregalnica"

The area proposed for protection aa a *Natural Rarity* "Zmijarnik" (RPAN 2011), originally proposed in the category *Monument of Nature* by the Spatial Plan of the Republic of Macedonia, is annexed towards this area. It spreads at 200-780 m above sea level, near the village of Kjoseleri, with a surface area of 2.76 ha. The fossil fauna on this site is rather well preserved and it has shallow water marine character and presence of corresponding fossil genera: *Isastrea, Heliastrea, Ostrea, Cyrena, Cerithium, Meretrix, Natica,* and some other. Numerous representatives of fossil mussels, corrals, urchins, snails etc., typical for the sea environment of the Mediterranean area which existed in the Paleogene-Upper Eocene, have been discovered in flysch sediments (claystones, sandstones, marls) here.

6.2.13 Nature Park "Mangovica"

The area "Mangovica" spreads on the western parts of the mountain Mangovica and occupies a surface area of 3.271 ha. The main goal for protection is the ornitofauna represented in this area by multiple significant bird species, especially birds of pray. The golden eagle (*Aquila chrysaetos*), lanner falcon (*Falco biarmicus*), imperial eagle (*Aquila heliaca*), long-legged buzzard

(*Buteo rufinus*) nest here, and black stork (*Ciconia nigra*) is also present. A significant herpetofauna species registered in this area is the four-lined snake (*Elaphe quatuorlineata)*.

Vegetation in this area is represented by degraded thermophilic oak forests, hill grasslands and rock vegetation.

Construction of a 400 KW long distance transmission line is foreseen through the western part of the area (near the villages Orel and Dolno Gjugjance). This long distance transmission line passes through the most significant part of the area proposed for protection where the golden eagle (*Aquila chrysaetos*), lenner falcon (*Falco biarmicus*), imperial eagle (*Aquila heliaca*) and other endangered bird species nest. It is best for the route of the long distance transmission line to be moved towards east, on the site Brealo towards the peak Mangovica.

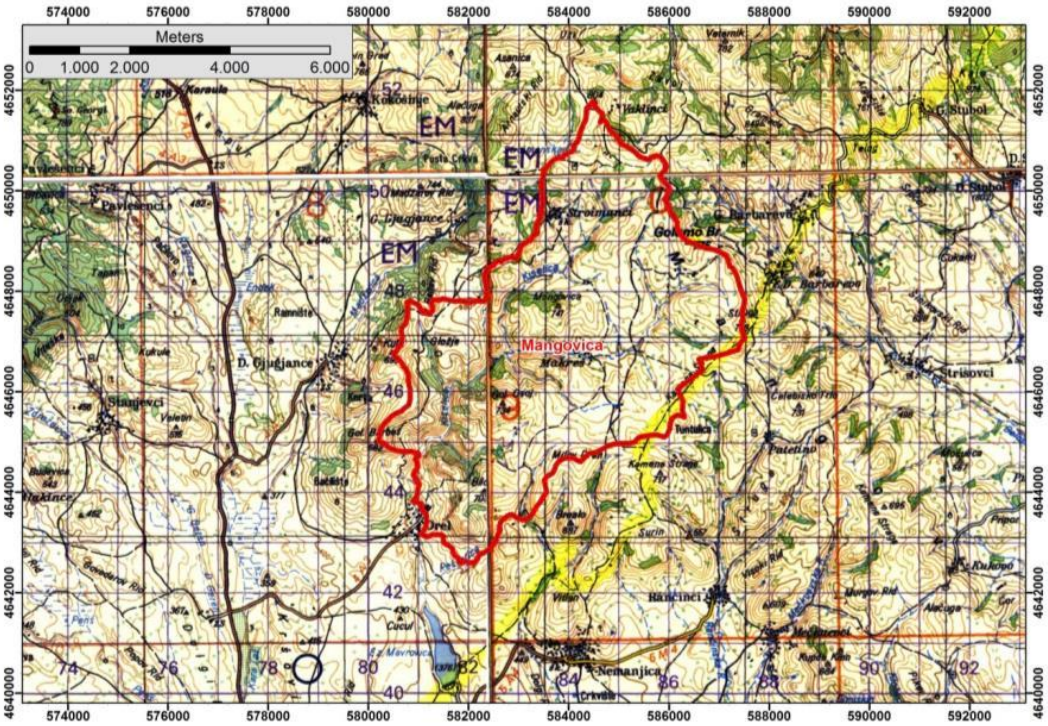


Figure 24. Nature Park "Mangovica"

Mangovica

6.2.14 Nature Park "Adjinica"

The area "Adjinica" is situated on the mountain Plachkovica, above the village of Blatec. It occupies a surface area of 334 ha. The basic feature of this area is the presence of old beech forests enabling the survival of few more interesting bird species such as: *Ficedula semitorquata, F. parva, Dryocopus martius, Dendrocopos leucotos lilfordi* and some other.

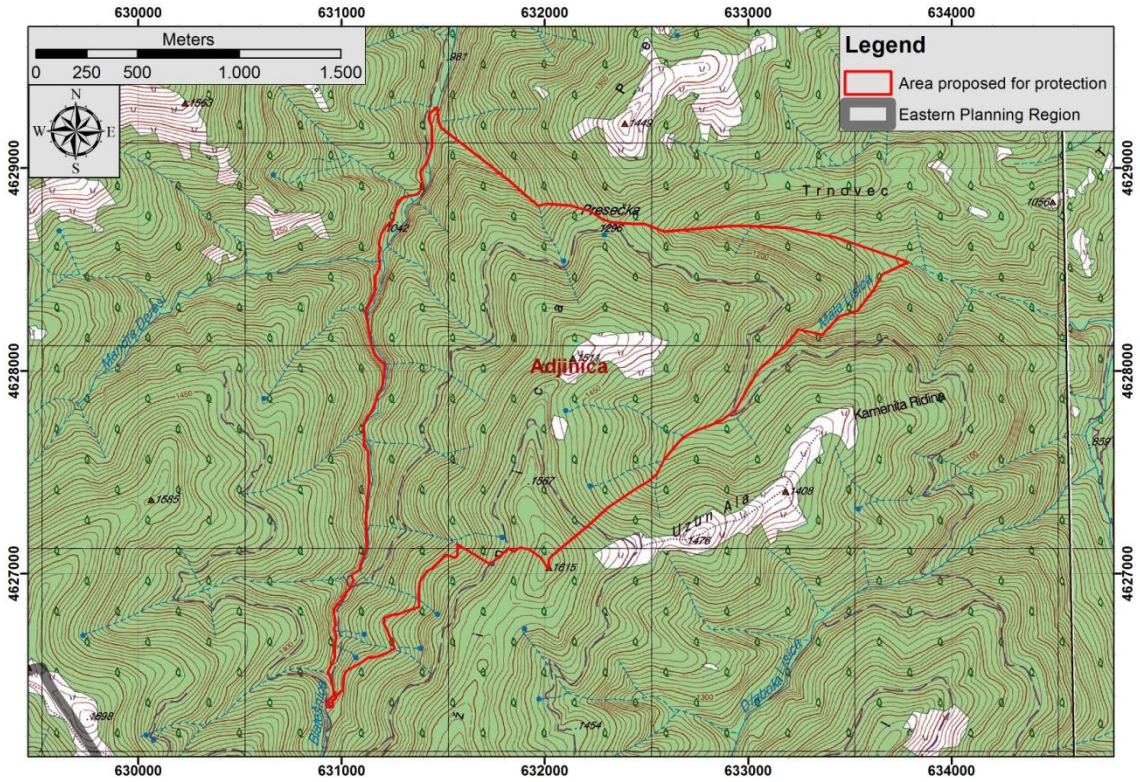


Figure 25. Nature Park "Adjinica"

Well preserved beech forests support numerous fungi species, more significant of which are: *Barlaea constellatio* and *Tephrocybe boudieri.*

Old beech forests supporting a high level of biodiversity in this area have sustained thanks to good management practices. Although intensive forestry presents a potential threat, we maintain that the management practice and forest usage so far will secure their adequate protection.

6.2.15 Nature Park "Gjuzumliska Reka"

The area spreads over an area starting near and east of the village Dorfulija, along Gjuzumliska Reka and the surroundings of the village of Kjoseleri. The basic value of the area proposed for protection – **Nature Park** "Gjuzumliska Reka" is the presence of plane grasslands (humid and mesophilic) that are still used for livestock feed production. Apart from grasslands, the area also encompasses Gjuzumliska Reka with riparian vegetation of willows and canes. In the initial proposal, the area included existing clay excavations near the village of Kjoseleri representing an artificial wetland attracting multiple bird species. Nevertheless, due to the existing concession for clay exploitation, these areas near the village of Kjoseleri have been excluded from the area. Arable lands included in this area support its high level of biodiversity through creation of additional trophic conditions. The area occupies a surface of 145 ha.

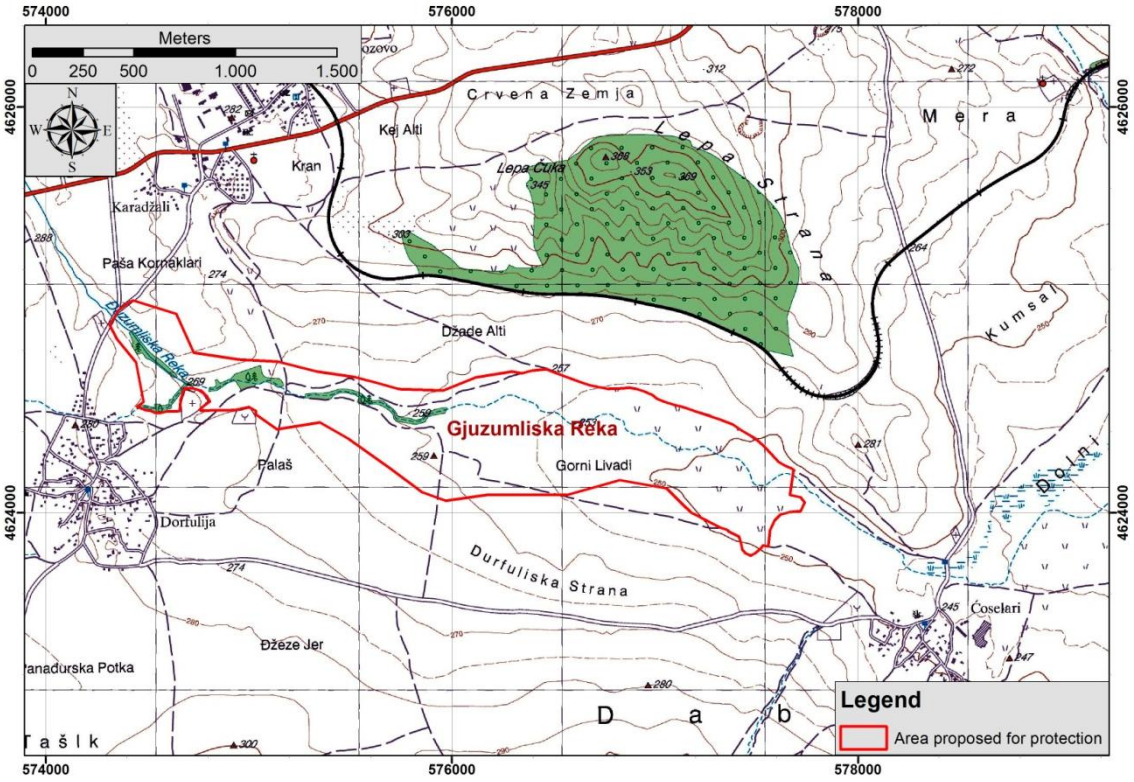


Figure 26. Nature Park "Gjuzumliska Reka"

The grasslands host multiple significant insect species, some of which can be categorized as optional halophiles. Ground beetles *Chlaenius aeneocephalus, Pedius aquanauts*, *Bembidion* (*Philochtus*) spp., *Demetrias atricapillus* are rare in the Macedonian fauna. The following birds species were registered: imperial eagle, common and grassland harrier, few species of egrets and ducks, as well as other frequently appearing species of birds related to aquatic habitats. Multiple species of dragonflies are also present. Of the mammals, the presence of the wild cat was registered.

The basic goal of the proposal for protection of this area is preserving grasslands and their further usage in an extensive manner. In cultivating the remaining agricultural lands, attention should be paid to meadows and the river ecosystem in terms of pollution prevention (rational use of chemical products, fertilizers, etc.).

6.2.16 Nature Park "Gladno Pole"

The area spreads west of the City of Shtip, between the sites Golema Niva and Gladno Pole and is in the immediate vicinity of the regional road Shtip-Radovish. The area occupies surface area of 137 ha.

This area includes saline habitats in depressions, cane habitats and steppe-like communities on mild slopes. Saline habitats are represented with the community *Camphorosmetum monspeliacae* which has a distinctive phisiognomy. Certain halophilic insects have been found in these areas, the most significant of which is the Turkish tiger ground beetle (*Cephalota turcica*). The steppe-like communities support significant plant species such as: *Morina persica, Astragalus parnassi, Camphorosma monspeliaca, Convolvulus holosericeus, Hedysarum macedonicum, Capparis sicula, Alyssum linifolium, Thymus pseudoatticus,* etc.

Saline waters host many interesting species, such as: *Achnanthes secretitaeniata*, *Cylindrotheca gracilis*, *Denticula subtilis*, *Entomonies paludosa* and *Scoliopleura peisonis*. It is necessary to mention that species *Cylindrotheca, Entomonies* and *Scoliopleura* in Macedonia are known only from this site. In the framework of the research of diatoms on this site, at least six species were discovered as new to science and their valid description is going to follow in the near future. An outstanding species of an exceptionally large diversity is *Nitzschia* with more than 30 species. Abundance of sea fossils (*Cerithium diaboli*, *Conus* sp.) is found in marls. A couple of imperial eagles nests in the area.

Camphorosmetum monspeliacae

Sea fossil - *Cerithium diaboli*

Sheepfolds exist near the area and use it for grazing, which does not cause visible significant negative impacts on biodiversity. The main threat in the area would be the envisaged gas pipeline construction, but this threat is easy to avoid by redirecting the pipeline alignment for tens of meters.

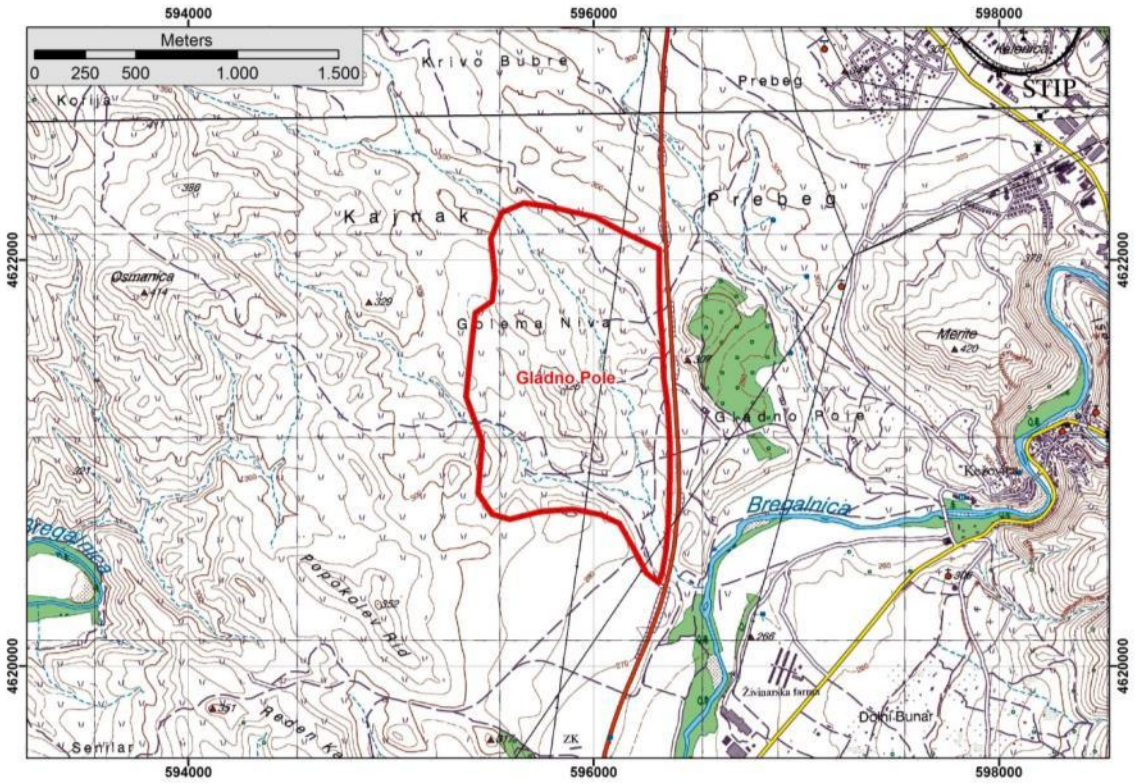


Figure 27. Nature Park "Gladno Pole"

6.2.17 Nature Park "Sokolarci"

The area spreads in the foothills of Osogovo Mountains, above the village of Sokolarci. It occupies a surface area of 503 ha.

Degraded thermophilic oak forests often dominated by the garland thorn (*Paliurus spina-christi*) and hill grasslands are dominant habitats, as well as a river and streams with well developed riparian vegetation, and small arable lands (fields and meadows).

Of the plants, special attention should be paid to the steppe relict – dwarf almond (*Prunus tenella*).

In the area itself, a couple of imperial eagles (*Aquila heliaca*) nests, and other bird species related to steppe-like habitats are present as well. Herpetofauna in this area includes some distinctive species, such as: Greek tortoise *(Testudo graeca),* Hermann's tortoise *(Eurotestudo hermanni),* worm snake *(Typhlops vermicularis),* Aescalupian snake *(Zamenis longissimus),* malpolon grass snake *(Malpolon insignitus),* Dahl's whip snake *(Platyceps najadum),* smooth snake *(Coronella austriaca)* and horned viper *(Vipera ammodytes)*.

Of the invertebrates, the presence of the spider black widow (*Latrodectus tredecimguttatus*) is striking. From among rare insect species, the following can be mentioned: *Carabus scabriusculus bulgarus, Brachinus plagiatus, B. psophia,* etc.

Sokolarci

Protection of this area in the category **Nature Park** is proposed for the purpose of maintaining the corridor of steppe-like biocenoses.

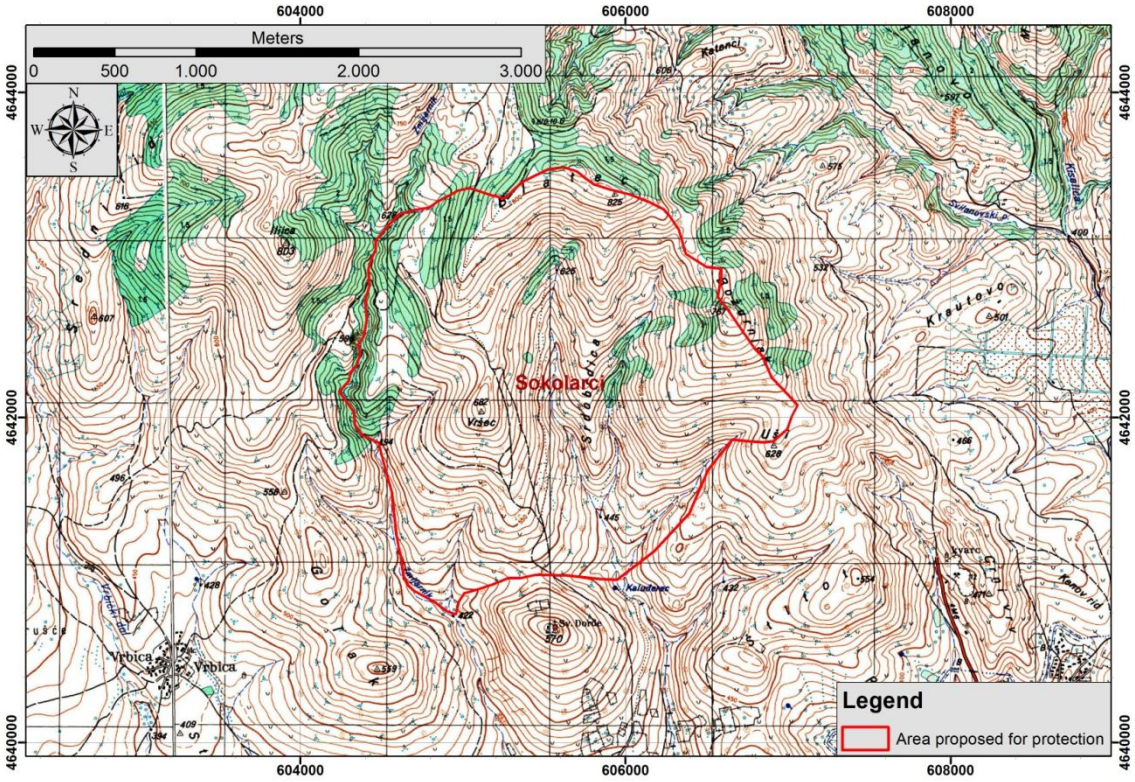


Figure 28. Nature Park "Sokolarci"

6.2.18 Monument of Nature "Turtel"

The area is located on Plachkovica Mt., on the site Turtelo, between 1200 and 1500 m above sea level and occupies surface area of 400 ha. Its geological ground is carbonate which conditioned the formation of caves and other karst forms. Also, the geological ground has conditioned the development of specific flora and vegetation differing from the vegetation in the surrounding area.

The area has five caves in total: Kjup, Golema Peshtera, Turtelska Peshtera, Mlechna Peshtera and Ponor. Some of these caves have entrance preventing gates. Remains of electric installation due to the attempt to adapt the cave for tourist visits can be noticed in the Kjup cave. The caves possess geomorphological values i.e. various cave decorations. Cave fauna has also been registered in these caves.

Entrance in the Kjup cave

Vegetation in this area is represented by beech and oak forests, but also carbonate specific vegetation. The presence of species such as *Morina persica*, *Astragalus angustifolius*, the rare species *Arabis procurrens,* etc., is considerable.

The area was already identified as significant in the Spatial Plan of East Macedonia: an area with specific natural characteristics Kosbunar - Shipkovica - Turtel - Lisec on Plachkovica.

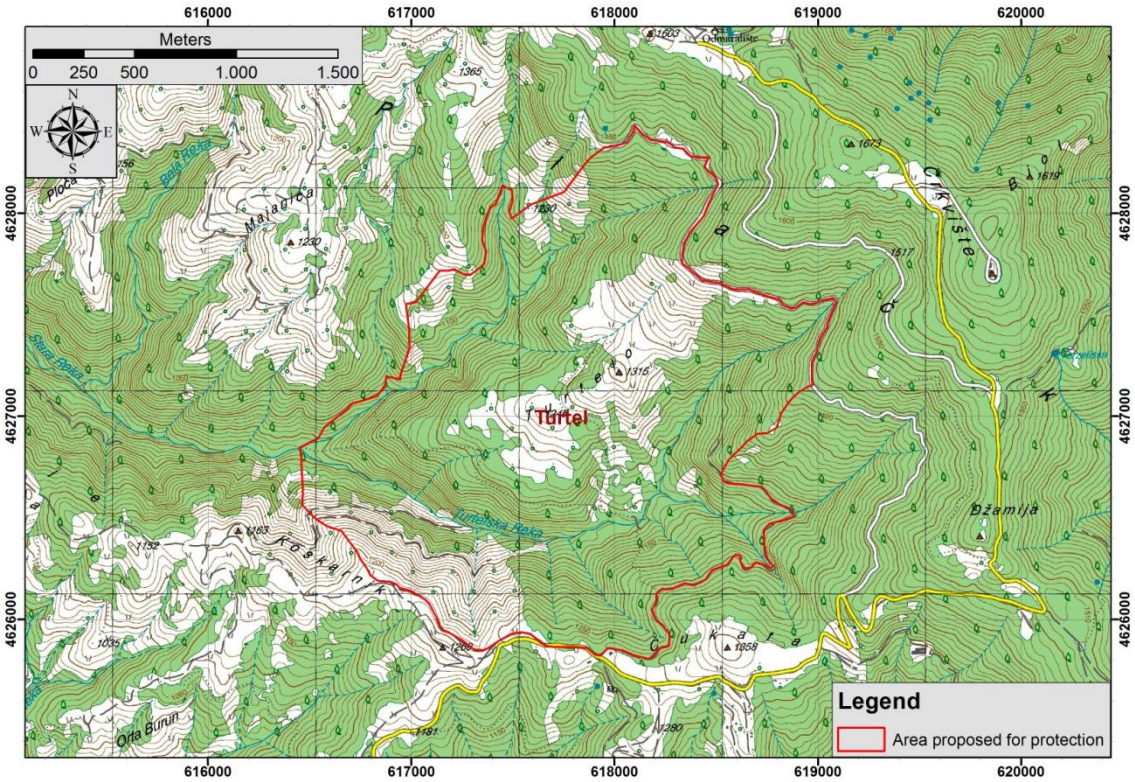


Figure 29. Monument of Nature "Turtel"

6.3 Areas proposed for protection on Osogovski Planini Mts.

The importance of natural values and rarities of Osogovo Mountains was recognized as early as during the preparation of the first Spatial Plan for Eastern Macedonia back in 1981, where this massif was defined as **complexes of wider importance** on national and regional level. Particular accent is placed on the importance of certain parts of Osogovo Mountains such as: Site Ponikva, Site Carev Vrv and Upper course of the river Zletovska Reka included in the category **landscapes with outstanding natural features.** The category **outstanding scenery** includes the sites of Lesnovo Monastery and Gradche Lake, while the Oak near the village Beli (*Quercus pubescens*) is proposed as Monument of Nature. Until then, only one item was under appropriate protection – Black Mulberry (*Morus nigra*) located in the yard of the Monastery St. "Gavril Lesnovski" in the village of Lesnovo.

Based on international criteria and standards, parts of Osogovo Mountains have been identified as **Emerald Sites, Important Plant Area "Osogovski Planini", Important Bird Areas, Pan-European Network, National Ecological Network (MAK-NEN)** and is part of the **European Green Belt.**

According to the Spatial Plan of the Republic of Macedonia, several sites on Osogovo Mountains have been identified as Natural Rarities: Oak – village Beli, Karshi Bavchi- Kratovo, Black Mulberry – Lesnovo and two Natural Reserves (rivers Zletovska Reka and Crvena Reka). In September 2009, the Ministry of Environment and Physical Planning raised initiative towards designation of the site Ratkova Skala in the category Monument of Nature (with an area of around 11 500 ha).

Activities for valorization of the natural values of Osogovski Planini Mts. were carried out in the period 2007-2014 by the Macedonian Ecological Society and proposal for establishment of protected area in the category *Protected Landscape* was developed as a result. The process was managed in cooperation with municipalities and other local stakeholders. Nevertheless, the proposal for protected area establishment did not gain wide support and the process recommended focusing on smaller areas for Osogovo Mts. protection. Therefore, in the text below, we propose two possible scenarios for appropriate protection of nature and biological diversity on Osogovski Planini Mts.

The first scenario involves designation of wider area "Osogovski Planini Mts." in low category of protection – *Protected Landscape.* The main reason for this scenario is the landscape diversity of Osogovski Planini Mts. which assumes high biological diversity and most diverse extensive traditional economic activities. Other economic activities like forests exploitation, mining, development of tourism and tourist settlements, development of energy, road infrastructure, water supply, etc., easily fit in this scenario. This scenario is suitable because designating larger protected area enables its easier and integrated management, requires less funding, and facilitates uniting of different regional initiatives and branding the region. At the same time, the Republic of Macedonia will manage the objective of enlarging the surface area under protected areas (obligation deriving from several international documents, especially Convention on Biological Diversity).

The second scenario is aimed at designating several protected areas based on the Spatial Plan of the Republic of Macedonia, but also taking into account local and national initiatives (e.g. establishment of protected area "Zletovska Reka"). In practice, these smaller protected areas would overlap to a considerable extent with the most prominent areas from the first scenario (Protected Landscape "Osogovski Planini Mts.") which would need to be awarded status of strict protection in the frames of the Protected Landscape.

These two scenarios should be considered accurately by the relevant ministries, public enterprises and other state institutions, as well as local authorities, stakeholders and especially local population.

6.3.1 Scenario 1: Establishment of integrated protected area – Protected Landscape "Osogovski Planini Mts."

Geographic position of Osogovo is a precondition for the richness in natural habitats and biological diversity. This area is in the climate transition between continental and transitional Mediterranean climate influence. Osogovo is a high mountain and on its slopes we can find almost all vertical vegetation belts, such as: specific xerophilous oak forests (especially on southern slopes), beech forests, subalpine herbaceous communities and shrubs, and even alpine herbaceous communities.

The lowest southeastern parts of Osogovo Mountains are under thermophilous vegetation, where forests of Pubescent oak (*Phyllireo-Carpinetum orientalis*) dominate. Warm continental area covers a broad belt with domination of Italian-Turkey oak forests (*Quercettum frainetto-cerris*). Cold continental area (Sessile oak forests) is notable around Makedonska Kamenica. Above those, sub-mountain and mountain continental areas represented by beech forest communities (*Festuco heterophyllae-Fagetum* and *Calamintho grandiflorae-Fagetum*) and subalpine mountain area (grasslands on the highest parts of Osogovo Mountains) alternate in regular belts.

While determining the category and the boundaries of the Protected Landscape "Osogovski Planini Mts.", the main challenge was the integration of local interests for development and provision of conditions for sustainable economic development. In consultation and cooperation with local and national institutions and authorities, the interests for development were considered and incorporated and scenario for the future management of the area was designed. This proposal was prepared in accordance with the applicable national legislation on protected areas designation and submitted to MEPP as initiative (February 2013) together with the "Valorization Study and proposal for establishment of Protected Landscape – Osogovski Planini Mts.".

View towards southern slopes of Osogovski Planini Mts.

Mixed forest on Sinkovica (hunting ground Polaki)

The area proposed for protection - Protected Landscape "Osogovski Planini Mts." covers the area of Osogovo Mountains in their natural boundaries the river Kriva Reka on north, fields Kochansko Pole on south, border with the Republic of Bulgaria on east), without the valley of the river Kamenichka Reka, without furthest east low parts near Probishtip and low northwestern parts near villages Krilatica, Opila, Odreno and it covers a surface area of 74615 ha. In administrative

terms, the proposed area spreads on the territory of seven municipalities (Kriva Palanka, Rankovce, Kratovo, Probishtip, Cheshinovo-Obleshevo, Kochani and Makedonska Kamenica).

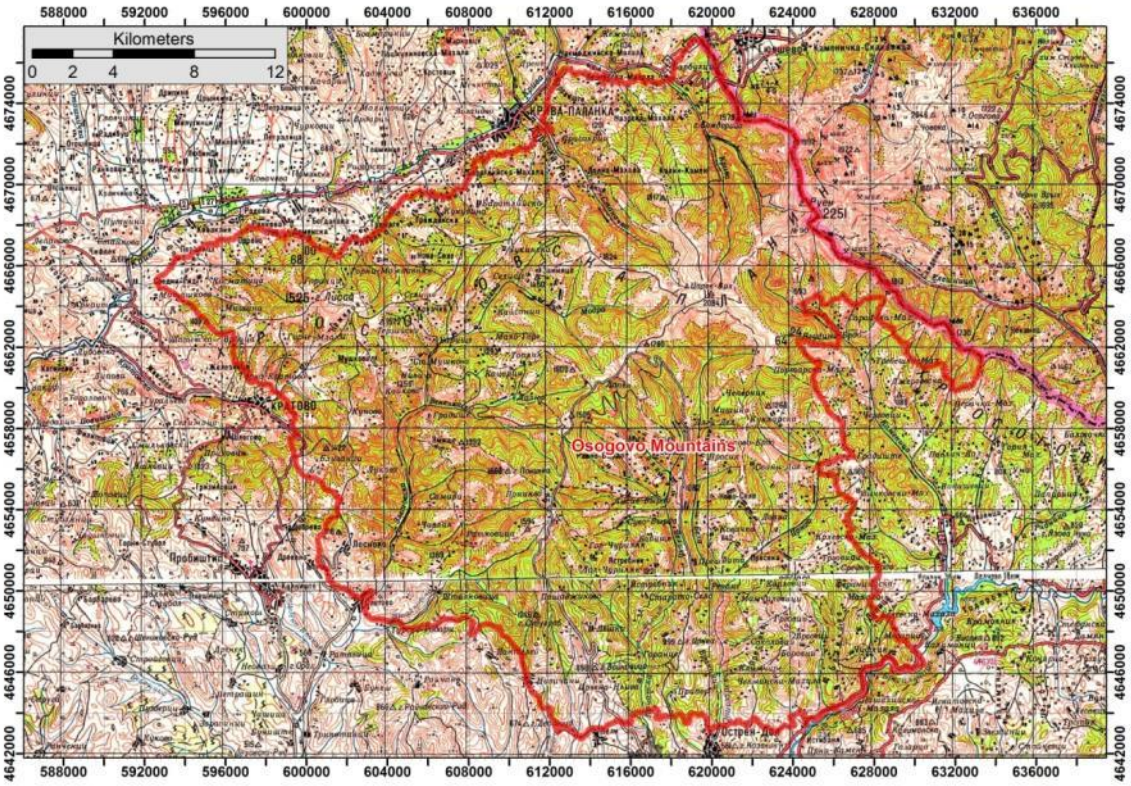


Figure 30. Boundaries of the proposed area Protected Landscape "Osogovski Planini Mts."

Within the boundaries of the area proposed for protection - Protected Landscape "Osogovski Planini Mts.", important habitats have been identified in accordance to national, regional and global criteria. Total of 22 habitats has been registered, and five of them are determined as priority under the Habitats Directive: pseudo-steppes under grasslands and annual plants of the class *Thero-Brachypodietea*, grasslands with *Nardus* rich in species on silicate ground in mountain areas, sub-continental peri-Pannonic shrubs, woodlands with white willow and white poplar and riverine woodlands with alder and white ash. Peat bogs can be identified as important habitats as well considering their limited distribution in Macedonia.

Osogovo Mountains are interesting because their flora and fauna re mixture of 1) species more typical of central parts of Europe, 2) species typical of Mediterranean area reaching Osogovo Mts. mainly through the valleys of the rivers Vardar and Bregalnica, as well as 3) species typical of alpine areas and northern parts of Europe. Besides those, Osogovo Mountains also hold series of Balkan and local endemic species which attribute specific feature to this interesting area. Well preserved ecosystems on Osogovo Mountains enable the survival of species that are under strong anthropogenic pressure in other parts of Europe. Around 1100 species and subspecies of higher plants have been registered. Species meeting the criteria for identification of Important Plant Areas are among the most prominent, such as: *Fritillaria gussichiae, Ranunculus pseudomontanus, Dianthus microlepis, Dryopteris carthusiana, Lycopodium clavatum, Viola dacica, Potentilla haynaldiana, Thymus balcanus, Crepis conyzifolia, Aquilegia aurea, Genista fukarekiana, Sempervivum erythraeum* and *Bruckenthalia spiculifolia*.

More than 240 algae species have been identified, mostly in inland water bodies – rivers, streams, marshes, etc. Fungi are represented by 258 species on Osogovo and it has been found out that beech is the most important ecosystem on Osogovo for their growth – around half (48%) of the identified species are found in these forests.

So far, 450 species of spiders have been identified on the Macedonian side, while around 590 species are known for the whole massif. Special feature of arachnofauna on Osogovo Mountains is attributed by species which are local endemites, some described in the last several years: *Harpactea mariae, Harpactea bulgarica* and *Typhochrestus penevi*.

Total of 37 species of snails are known for Osogovo Mountains. Around 20 species of dragonflies have been registered on Osogovo Mountains. They are important from conservation point of view due to the presence of several species of international importance. Important species of dragonfly present on Osogovo are most often inhabitants of clean mountain rivers. Surveys on Osogovski Planini Mts. indicate presence of more than 120 species of daily butterflies. The species *Erebia aethiops, Coenonympha glycerion* and *Minois dryas* which are known only from Osogovo Mountains, are of particular significance for Macedonian fauna of butterflies.

Orthopterans are represented by 83 species (grasshoppers and crickets - 77, mantids - 4, dermapterans - 1 and cockroach - 4). The highest number of species is found in thermophilous and mesophilous open habitats (grasslands and shrubs), as well as in ruderal habitats. Mountain grasslands are the poorest in species. Six species (*Phaneroptera falcata, Metrioptera arnoldi, Pholidoptera rhodopensis, Pholidoptera frivaldskyi, Myrmecophilus nonveilleri, Chorthippus oschei*) and one subspecies (*Psorodonotus fieberi*) are known only on Osogovo Mountains in Macedonian fauna.

The total number of beetle species on Osogovo Mountains is around 280, of which nearly 240 are found on Macedonian side. The highest number of species lives in mountain pastures, meadows, beech forests, humid meadows, dry grasslands, riparian habitats, bogs, Sessile oak forests, etc. The highest parts of Osogovo Mountains are specific for the presence of high number of continental species, such as *Amara nigricornis, A. morio nivium*. Thermophilous Mediterranean species occur on the low parts of southern and southeastern slopes of Osogovo Mountains, distributes along the valley of the river Vardar and in Kochansko Pole reaching the northern boundary of their natural range (*Acinopus megacephalus, Zuphium olens, Ophonus oblongus, Gynandromorphus etruscus, Carabus graecus morio, Pachycarus cyaneus*). Osogovo Mountains also host three glacial relicts (*Nebria jockischi jockischi, Amara morio nivium* and *Amara erratica*) which are at the same time stenotopic.

The fauna of rivers is represented by species belonging to different groups. The richest in species are mayflies and caddisflies. Rivers on Osogovo Mountains (Eshterac, Zelengradska and Mala Reka, above Kochani Lake) are habitats of *Austropotamobius torrentium*. Stone crayfish inhabits clean and cold mountain rivers and it is sensitive to pollution and changes in habitats.

Ichtyofauna is represented by great diversity and importance. Total of 14 fish species has been registered, among which the following are specific: *Rutilus macedonicus*, *Leuciscus cephalus vardarensis*, *Chondrostoma nasus vardarensis*, *Barbus barbus macedonicus*, *Barbus meridionalis petenyi*, *Gobio kessleri*, *Alburnus alburnus macedonicus*.

Surveys of herpetofauna on Osogovo Mountains revealed presence of 31 species (10 – amphibians and 21 - reptiles). The lowest parts are characterized with great richness of

herpetofauna species, i.e. 87 % of all species on Osogovo or 59 % of all species in Macedonia are found here. The highest peaks host the species Viviparous lizard (*Zootoca vivipara*) being the furthest east point of the natural range of distribution in our country.

Total of 133 species of birds has been registered on Osogovo Mountains, which indicates that ornitofauna of Osogovo Mountains is rich in species and has great conservation importance. The composition of ornithofauna is very interesting, with presence of representatives typical for Mediterranean areas, but also species from continental and mountain areas. Most of the birds are nesting (54.1%) and roosting (34.6%) species. The highest number of species (95) has been registered in oak forests, 56 species have been found in beech forests, 43 in populated places and 39 in each hilly and mountain pastures. Rocky terrains and mesophilous forests are the most important habitats for birds' conservation on Osogovo. From ornithological point of view, the most important areas include the wider region of Ratkova Skala (from the river Zletovska Reka to Sinkovica and Ponikva), close surroundings of the village of Lesnovo and foothills of the mountain between the villages Tripatanci and Sokolarci.

The number of mammals known on Osogovo Mountains is 41. The most frequent big mammalian species on Osogovo Mts. include wolf, fox, badger, pine marten, western polecat, weasel (from among beasts) and wild boar, roe deer and hare (from among herbivores). Red deer, fallow deer and mouflon are bred in the fenced area of the hunting ground “Polaki”. From among bats, we should mention the presence of Savi's Pipistrelle (*Hypsugo savii*), Parti-coloured Bat (*Vespertilio murinus*) and Whiskered Bat (*Myotis mystacinus*). Bears occur on Osogovo Mountains from time to time.

Based on all species of flora, fauna and fungia, completed valorization of species diversity has indicated presence of 77 species that have certain international importance. Of those, one species belongs to the group of silicate algae, one is plant species (*Fritillaria gussichiae*), two are fungi (according to the preliminary Red List of Fungi of Macedonia), and 73 are animal species. In terms of conservation, species categorized as sensitive under the IUCN Global Red List deserve particular attention, these being: *Aquila heliaca, Streptopelia turtur, Metrioptera domogledi, Cobitis meridionalis, Cyprinus carpio, Testudo graeca*. Besides these five species, dragonfly *Sympetrum depressiusculum* categorized as vulnerable in the European Red List should be taken into account, too. Egyptian Vulture (*Neophron percnopterus*) is endangered species under the Global Red List, and European Red List includes the butterfly *Phengaris arion* in this category. In the process of planning of the future protected management, appropriate measures should be designed for these species, concerning their direct protection or conservation of their habitats. Imperial Eagle (*Aquila heliaca*) is represented by 1-2 couples, while Egyptian Vulture with one couple. Besides endangered and vulnerable species, Global Red List includes seven more species categorized as near threatened (*Alectoris graeca, Carabus intricatus, Phengaris arion, Cordulegaster bidentata, Lutra lutra, Elaphe quattuorlineata* and *Zootoca vivipara*). Here, we should also add five species of the same category under the European Red List: *Coenagrion ornatum, Caliaeschna microstigma, Cordulegaster heros* and *Eurotestudo hermanni*.

Analysis of endangered, vulnerable and near threatened species indicates that most of them are bound to aquatic habitats (fish, dragonflies and otter), part to forest habitats (*Ficedula semitorquata, Carabus intricatus*), while for the rest, open habitats are important (rocks, subalpine and alpine pastures).

Besides the mentioned bird species, other species of importance under other international documents occur in the area. Two couples of Lanner Falcon (*Falco biarmicus*) are found in the area on two mutually close localities, which has constituted the basis for its designation as Important Bird Area. This area is also a nesting site for Egyptian Vulture, Black Stork, Eagle Owl, Long-legged Buzzard and three couples of Peregrine falcons. There are also 27 nesting birds in the area listed in Annex I of the Birds Directive (it is necessary to designate special protected areas (SPA) for these species). It

should be noted that populations of these species on Osogovo Mountains are not significant. However, for several species (*Picus canus, Dryocopus martius, Dendrocopos medius, Dendrocopos leucotos, Ficedula parva* and *Ficedula semitorquata*) establishment of protected area will be efficient measure towards their conservation. Mesophilic oak and beech forests are of particular importance for these species conservation.

Presence of *Austropotamobius torrentium* has been recorded in the waters of the rivers Eshterac, Zelengradska and Mala Reka above Kochani Lake. Habitats Directive (Annex II/IV) provides for legal protection of the stone crayfish, while its inclusion in Appendix III of the Bern Convention makes A. torrentium a protected animal species.

When it comes to amphibians and reptiles (herpetofauna) on Osogovo Mountains, we may conclude that low number of endangered species is found here. These are dice snake (*Natrix tesselata*) – near threatened species and Greek tortoise (*Testudo graeca*) – vulnerable species. However, most of the species are important under the Bern Convention and Habitat Directive of the European Union. Sand boa (*Eryx jaculus*), along with Greek and Herman's tortoise, are species addressed by the Convention on International Trade in Endangered Species (CITES).

The group of dragonflies (Odonata) is represented by four species of international importance. *Calliaeschna microstigma* and *Cordulegaster heros* are vulnerable under the IUCN Global Red List. These species are closely related to river habitats, which imposes appropriate conservation of the rivers on Osogovo Mountains.

Around 90 endemic and more than 120 rare species are known for Osogovo Mountains. Local (Osogovo) endemites carry special richness and so far 7 species have been registered as such. Osogovo Mountains are characterized with the presence of endemic species the portion of which in the overall flora, fauna and fungia exceeds the one of the Central European Mountains, but is lower that the percentage on western Macedonian mountains.

With reference to flora, two steno-endemic species are known: *Genista fukarekiana* and *Verbascum lesnovoensis*. Other 22 species belong to the group of subendemic species. Endemic species are not found among mammals and birds. Herpetofauna is represented by several subendemic species (2) or subspecies (4): *Bombina variegata scabra, Rana graeca, Eurotestudo hermanni boettgeri, Podarcis erhardii* and *Vipera berus bosniensis*. Ihtiofauna of Macedonia is characterized by the presence of high number of endemic species (some are still of unclear taxonomic status). Similar situation occurs with watercourse on Osogovo Mountains, where four subendemic taxa have been known: *Barbus barbus macedonicus, Chondrostoma nasus vardarensis, Leuciscus cephalus vardarensis* and *Rutilus macedonicus*.

The highest number of endemic species belongs to the group of invertebrates. Thus, the family of beetles (Carabidae, Coleoptera) incorporates 20 endemic species, 16 of which are Balkan subendemites, one is steno-endemite and three are exclusive (local) Osogovo endemites (*Duvalius beshkovi, Molops rufipes denteletus* and *Molops piceus osogovensis*). Around 20 endemites have been known from among spiders. Grasshoppers are represented by three steno-endemic species and three more subendemites (Balkan endemites). Terrestrial snails also include high percentage (~26 %) of endemic species.

Rare species of the flora are represented by 64 taxa occurring on the territory of Macedonia only on Osogovo or Osogovo being one of 2-10 localities they occur on in Macedonia. Among fungi, 46 species have been recorded as rare, several of which have been proposed in the National Red List of fungi. From among herpetofauna, three species have been distinguished as rare: *Zootoca vivipara, Typhlops vermicularis* and *Eryx jaculus*. 30 rare species are found in the group of beetles, spiders - 10, daily butterflies - 5, snails - 1 (Bulgarica vetusta) and grasshoppers - 9 (besides rare species, species of regional conservation importance occur here, too). Relict species on Osogovo Mountains occur among representatives of the genre Erebia (*Erebia medusa, Erebia euryale, Erebia ottomana,*

Erebia cassioides, Erebia ligea and *Erebia oeme*). From among beetles, we know of three glacial relict species: *Amara erratica, Amara morio nivium* and *Nebria jockischi jockischi*.

Besides important values from biodiversity point of view, Osogovski Planini Mts. are also featured by geomorphological rarities and Paleo volcanic relief, such as: volcanic stooks, calderas (one of the well represented calderas is found in the area of the village Lesnovo), deeply protruded river valleys with specific falls and cascades and several waterfalls. The Mountains of Osogovo possess recognized historical and cultural values reflected in high number of archeological sites and artefacts found in this area. For centuries lasting human-nature interaction has created specific appearance and function of landscapes on Osogovo Mountains, on which traditional activities have been practiced. The area possesses other locally and nationally important social and economic values as well, such as well developed mining, developed livestock breeding, water and forest resources offering numerous ecosystem services and direct economic benefits both on local and national levels.

6.3.2 Scenario 2: proposal for establishment of smaller size protected areas on Osogovo Mountains

The Spatial Plan of the Republic of Macedonia and initiatives concerning conservation of natural values define several areas in the Osogovo Mountains of priority for conservation and some have been already designated, such as Oak – Beli and Black Mulberry – Lesnovski Manastir (Monastery of Lesnovo). In consideration of existing initiatives and values of the region, as well as conditions in the area, the expert team involved in the elaboration of the Study has proposed 7 areas for protection, namely:

1. Monument of Nature “Carev Vrv”
2. Monument of Nature “Ruen”
3. Monument of Nature “Crvena Reka”
4. Nature Park “Ratkova Skala – Zletovska Reka”
5. Monument of Nature “Oak Beli” (description given in Chapter 6.*1. Existing protected areas in Bregalnica region, 6.1.4. Natural Rarity “Oak, village of Beli”*)
6. Natural rarity “Black Mulberry” (description given in Chapter 6.*1. Existing protected areas in Bregalnica region, 6.1.4. Natural Rarity* “Black Mulberry-*Lesnovski Manastir”*)

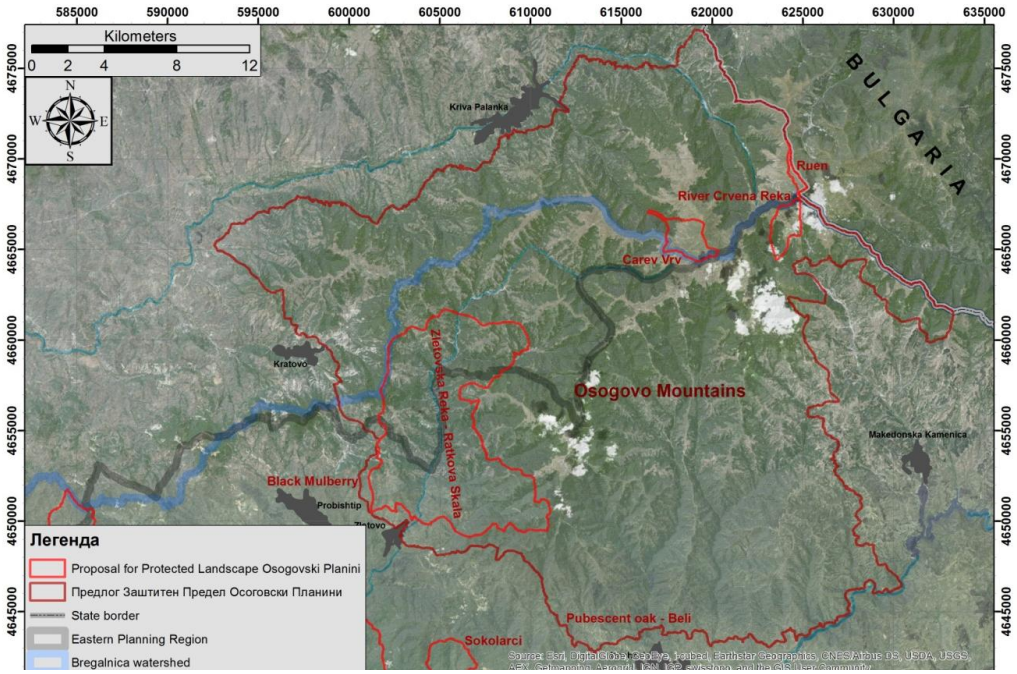


Figure 31. Boundaries of smaller areas proposed for protection on Osogovo Mountains

6.3.2.1 Monument of Nature "Crvena Reka"

The reserve of mountain maple (*Acer heldreichii*) is situated southwest of the peak Ruen (2252 m) on Osogovo Mountains, south of the peak Sokol and spring area of the river Crvena Reka on the territory of Makedonska Kamenica, at an altitude of 1272-2154 meters. The association of *Fago-Aceretum heldreichii* is represented on the site. Apart from interesting forest communities and species, the area also hosts two species of fern very rare in Macedonia: *Lycopodium clavatum* and *Dryopteris vilarii*. From among fungi, we could mention: *Aleuria aurantia, Boletus aestivalis, B. erythropus, Mycena pelianthina, Russula cyanoxantha, Amanita rubescens* and *Pleurotus ostreatus P. pulmonarius* as prominent.

Concession for mineral resources exploitation in this area is awarded to Sasa mine. Considering that the exploitation takes place in underground quarry, we may expect low impact on the area proposed for conservation. Furthermore, forest road passes through the proposed area "Crvena Reka" connecting Makedonska Kamenica and Kriva Palanka (Toranica). There are plans to asphalt this road and of course increase the traffic rate. During the road construction, care should be taken of natural characteristics of the area and appropriate measures need to be taken to avoid and mitigate the impacts. The most significant impact for the area proposed for conservation could originate from the construction of skiing centre. Several skiing paths have been envisaged in the area and this assumes cutting and destroying of valuable forest ecosystems.

According to the Spatial Plan of the Republic of Macedonia, the surface area of this site is 10 ha and it is proposed for protection in the category SRNR (corresponding with IUCN category Ia). According to the recommendations of the expert team resulting from the elaboration of the RPAN (during 2010/2011) and additional surveys carried out during 2015, its boundary has been expanded to cover a surface area of 353 ha with proposal for conservation in Category III – **Monument of Nature**.

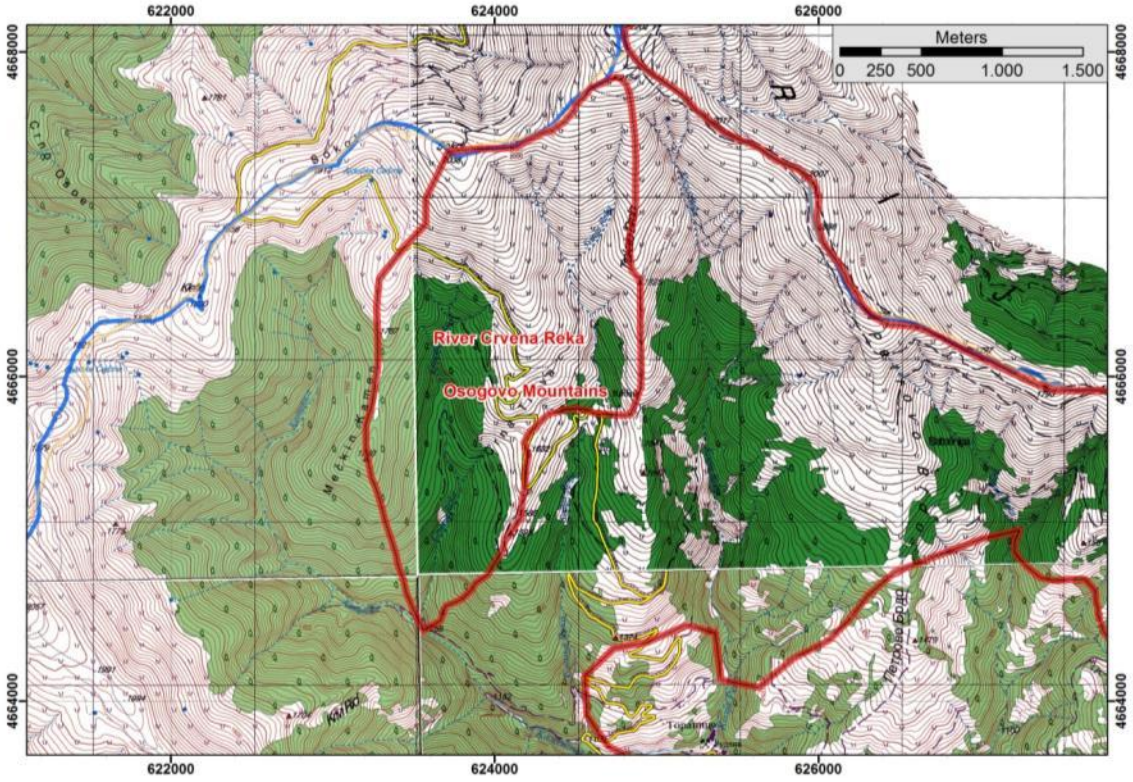


Figure 32. Monument of Nature "Crvena Reka"

6.3.2.2 Monument of Nature "Carev Vrv"

The area is important from floristic point of view, considering that steno-endemic plant *Genista fukarekiana* is found in the area of Carev Vrv. Peat bogs on Osogovo are well developed and located exactly around high peaks. This area incorporates peat bogs near Slana Bara and small size peat bogs on Kalin Kamen, while southern slope accommodates peat bogs that constitute the springs site of the river Kamenichka Reka. Carev Vrv is the only find of an important herpetofauna species in eastern Macedonia - viviparous lizard (*Zootoca vivipara*). Peat bogs include certain interesting ground beetle species, such as: *Amara morio nivium, Bembidion stephensi, Bradycellus caucasicus, Carabus cavernosus, Carabus intricatus, Carabus violaceus azurescens, Cychrus semigranosus balcanicus, Loricera pilicornis pilicornis, Molops rufipes denteletus, Myas chalybaeus, Notiophilus germinyi, Pterostichus brucki, Pterostichus diligens, Tapinopterus balcanicus, Xenion ignitum* and *Zabrus rhodopensis*.

The area proposed for conservation Monument of Nature "Carev Vrv" is situated on northern slopes of Osogovo Mountains and minor part crosses in Eastern Planning Region. It occupies a surface area of 461 ha. The area has been traditionally used for collection of blueberries and medicinal herbs. Existing threat is posed by numerous roads used intensively for off-road driving. Also, the area borders the locality envisaged for construction of skiing centre (on the territory of Municipalities Makedonska Kamenica and Kochani). Special measures should be implemented for the protection of the typical site (*locus classicus*) of the endemic plant *Genista fukarekiana* during the construction of the ski-center.

Slana Bara below Carev Vrv

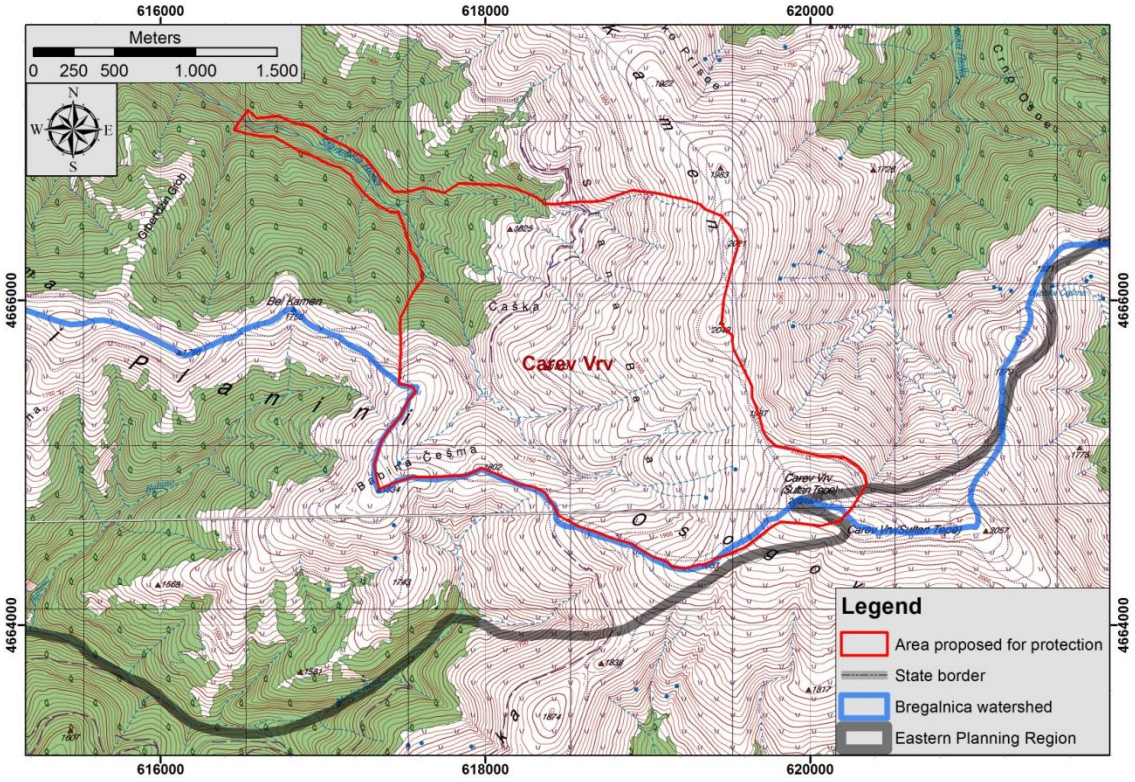


Figure 33. Monument of Nature "Carev Vrv"

6.3.2.3 Monument of Nature "Ruen"

The peak of Ruen with small area around the peak itself has been included in this area due to the presence of rare or endemic plant and insect species. Ruen is one of the two localities in the Republic of Macedonia where one can find the plants *Aquilegia aurea, Viola orbelica, Festuca*

airoides and the only locality where *Chamaecytisus absinthoides* var. *grandiflorus* can be found. Ruen is the only known locality in Macedonia for the grasshopper *Psorodonotus fieberi fieberi,* as well as *Metrioptera domogledi,* species included in IUCN Red List. Local endemite *Duvalius beshkovi* (Carabidae) has been registered on the peak of Ruen, formerly known only from one cave in the Bulgarian part of Osogovo Mountains. Besides this species, other ground beetle species occur on the peak of Ruen, specific for alpine zone of Osogovo: *Amara nigricornis, Bembidion caucasicum, Carabus cavernosus, Carabus violaceus azurescens, Cychrus semigranosus balcanicus, Molops rufipes denteletus, Notiophilus germinyi, Pterostichus brucki, Tapinopterus balcanicus* and *Zabrus rhodopensis.*

The area proposed for protection as **Monument of Nature** "Ruen" covers an area of 76 ha.

Grasslands on the peak of Ruen

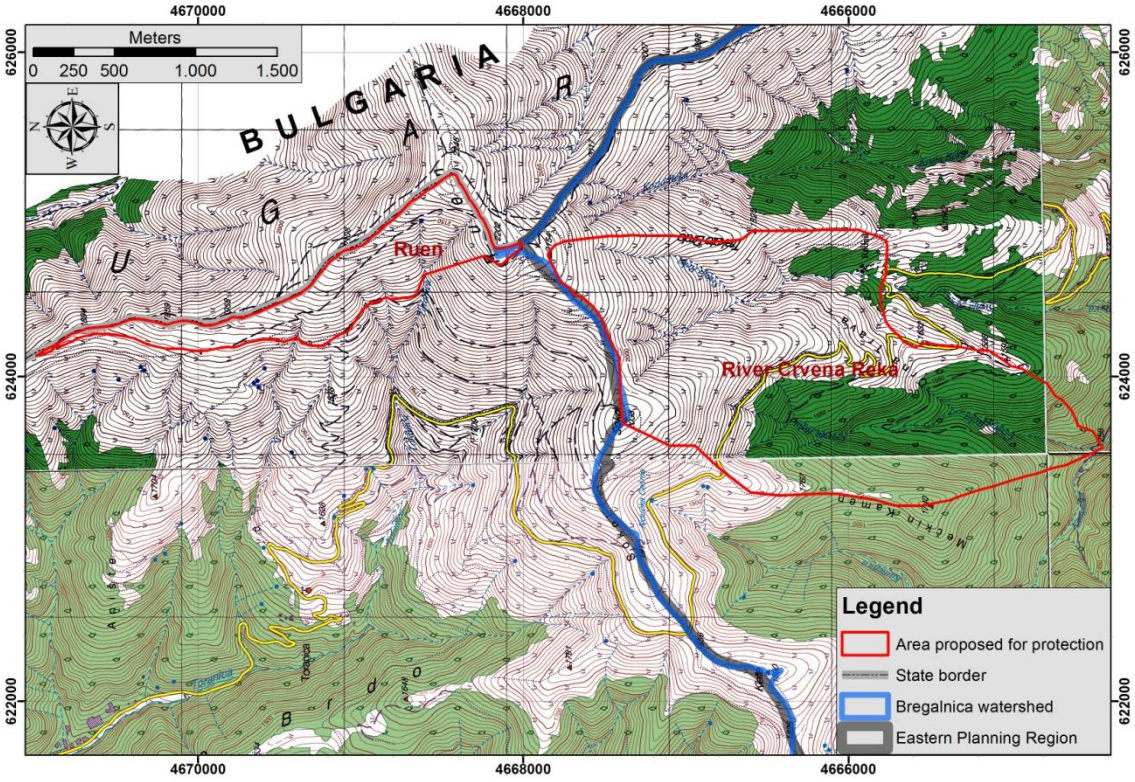


Figure 34. Monument of Nature "Ruen" (and Crvena Reka)

6.3.2.4 Nature Park "Ratkova Skala – Zletovska Reka"

Under the Spatial Plan of the Republic of Macedonia, the valley of the river Zletovska Reka has been proposed as area of interest for conservation in the category of Natural Reserve. The MEPP's initiative dated 2009 for re-designation of the area of Ratkova Skala in the category Monument of Nature (with surface area of 11 500 ha) overlaps in part with the proposed area "Zletovska Reka". Natural values and the initiative raised by MEPP are the main reasons for the subject proposal: merging the areas "Zletovska Reka" and "Ratkova Skala" proposed for protection into one integral area for conservation – "Nature Park "Ratkova Skala – Zletovska Reka", to cover surface area of 7660 ha.

Valley of Zletovska Reka

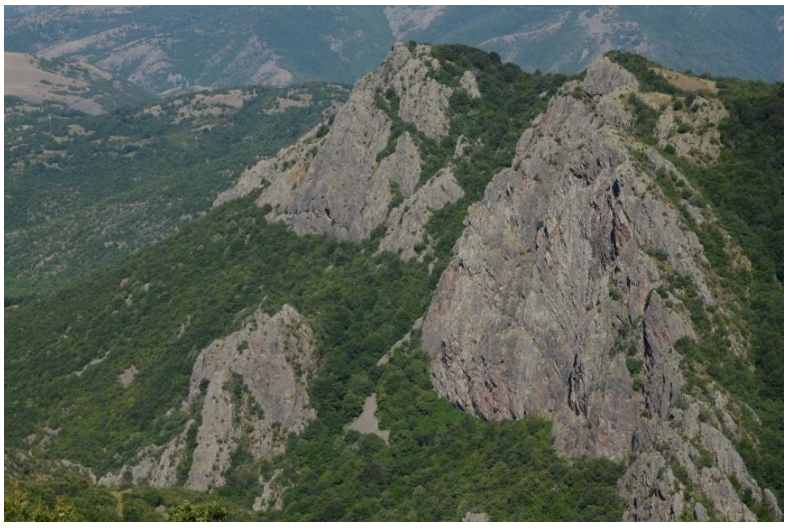
Zletovska Reka is right tributary of the river Bregalnica. It originates from the northern side of Lopensko Bilo on Osogovo, at an altitude of 1.620 m, and enters into the river Bregalnica below the village Ularci at 293 meters above sea level.

The site Ratkova Skala is situated in southwestern part of Osogovo Mountains, between the village Ratkovica and locality of Sinkovica. It occupies the valley of the river Shtalkovichka Reka (left tributary of Zletovska Reka) in its upper course, covering an area of around 2.4 km^2. Here, as a result of the local occurrence of quartzites which erode at much slower rate compared to surrounding crystal-like rocks, the relief has interesting physiognomy which deviates from the gentleness of the rest of the massif. Namely, owing to delayed almost vertical protrusion of the river Shtalkovichka Reka through quartzites, in a length of around 1.5 km its valley looks like canyon with slopes as deep as 400 m. In fact, valley sides near the village of Ratkovica are at places large stair-like ordered rock outbreaks as high as 200 m, which is why the locality has been named "Ratkova Skala" (the latter term means "stair" in Macedonian, *interpreter's note).* The biggest outbreaks are positioned on the right valley side where they extend over a length of 1.2 km, and slightly smaller on the left valley side with a height up to 130 m and length to 0.5 km. This kind of rock outbreaks of smaller dimensions created through the same process of selective erosion also occur in the locality of Sinkovica. Besides rock outbreaks, taluses and denudation forms created through quartzites disintegration, as well as rapids and minor waterfalls in the riverbed of Shtalkovichka Reka are other interesting phenomena in this area.

Association *Juglando-Tilietum tomentosae* is found in the area and the following plant species are represented: *Juglans regia, Ostrya carpinifolia, Tilia tomentosa, Tilia platyphyllos, Corylus colurna, Acer hyrcanum* subsp. *intemedium, Malus florentina, Marsilea quadrifolia, Verbascum lesnovoensis, Geranium macrorrhizum, Asplenium adianthum-nigrum*.

The site is a shelter of rare species. Certain endemic and rare species of coleopteran are found in the forests of Zletovska Reka watershed, such as: *Molops rufipes denteletus, M. piceus osogovensis, Loricera pilicornis, Xenion ignitum* and *Pterostichus brucki*. *Phengaris arion* is important daily butterfly species included in IUCN Global Red List, Appendix II of the Bern Convention and Annex IV of Habitats Directive and at the same time a target species by which Prime Butterfly Areas in Macedonia are determined. The following species are found in the upper course of Zletovska Reka: *Ophiogomphus cecilia* and *Caliaeschna microstigma* (important Mediterranean Odonata species) and *Cordulegaster heros,* all important under the European Red List. In the lower course of Zletovska Reka before its entry into the river Bregalnica, well standing populations of another important species *Coenagrion ornatum* are found. According to Fishery Master Plan for Bregalnica River, two natural spawning locations have been defined on Zletovska Reka – the first location covers the waters where warmwater fish species spawn starting from the village of Pishica to Zletovska Reka entry into Bregalnica and the second one is the locality where Macedonian trout spawns, from the springs to Zletovo. Important species include *Vimba melanops, Chondrostoma vardarense* and *Sabanejewia balcanica,* all subendemic, among which Nase has conservation status of near threatened species. The following amphibian (*Bufo bufo, Pseudepidalea viridis, Bombina variegata, Hyla arborea, Pelophylax ridibunda, Rana graeca)* and reptilian species (*Elaphe quatuorlineata, Ablepharus kitaibelii, Testudo graeca, Vipera ammodytes, Eurotestudo hermanni*) occur in the area. From among birds, the following species are important: *Dendrocopos medius, Caprimulgus europaeus, Bubo bubo, Alectoris graeca, Falco peregrinus, Circaetus gallicus.*

Surveys in this region during the last years have shown that the area has lost some of its values due to the ongoing infrastructure interventions on the terrain (construction of Knezhevo Dam, construction of small hydro power plant on the river Eshterec, awarding of new concessions for surface quarries, etc.). Therefore, the expert team view is that the category *Natural Reserve* is not appropriate for the defined area of Zletovska Reka. With reference to biodiversity conservation, rehabilitation of habitats in the gorge of Zletovska Reka is needed more to improve the condition of degraded oak and beech forests and adequate management of the watershed. Part of the problems related to the basin are regulated by the Law on Waters with reference to the newly constructed dam Knezhevo.



Rocky sections in the locality of Ratkova Skala.

Ratkova Skala is a site of exceptional importance because of the presence of globally endangered bird species, like Egyptian Vulture *(Neophron percnopterus),* internationally important, like Lanner Falcon (*Falco biarmicus*) and Peregrine Falcon (*Falco peregrinus*), then rare species of birds, like Black Stork (*Ciconia nigra*). High number of herpetofauna species is present, two of which

are Mediterranean species *Ablepharus kitaibelii* and *Typhlops vermicularis,* rarely found in Macedonia. This locality is one of the two finds in Macedonia for the plant Houseleeks (*Sempervivum erythraeum*). Interesting aerophytic diatomean species grown on humid rocks with relatively low number of species, though with very restricted distribution (*Luticola osogovoensis*, *Luticola quinquenodis*, *Achnanthes prominula*, *Achnanthes pseudocoarctata*). In the area of Ratkova Skala, we can also find Roe Deer (*Capreolus capreolus*), protected under the Bern Convention. From among bats, presence of Whiskered Bat (*Myotis mystacinus*), Savi's Pipistrelle (*Hypsugo savii*), Nathusius' Pipistrelle (*Pipistrellus nathusii*) and Kuhl's Pipistrelle (*Pipistrellus kuhlii*) has been registered, which except by Bern Convention, are also protected by the EU Habitats Directive. For these reasons, the site of Ratkova Skala has been proposed for protection as an area of special conservation interest where initially conditions should be secured for the survival of the mentioned species.

Within the frames of the riparian habitat around the river, presence of two rare for Macedonia butterfly species has been observed: *Erebia ligea и Pseudophilotes vicrama*. Several endemic and internationally important ground beetle species have been known, too: *Carabus violaceus azurescens, Elaphrus aureus, Harpalus triseriatus, Loricera pilicornis, Pterostichus vecors, Tapinopterus balcanicus* and *Zabrus rhodopensis*. Presence of important and endangered dragonfly species (*Caliaeshna microstigma, Cordulegaster heros* and *Ophiogomphus cecilia*) has been known and their habitats have been protected under the Habitats Directive and listed presence of *Austropotamobius torrentium* has been registered in the tributaries of Zletovska Reka (rivers Eshterec, Zelengradska). Habitats Directive (Annex II/IV) provides legal protection of the Stone Crayfish. Important for conservation macro invertebrates include Balkan endemite *Chaetopteryx stankovici* (Trichoptera) which occurs in the waters of the river Eshterac. Otter (*Lutra lutra*), which is nearly threatened species under the IUCN Global red list, included in Appendix I to CITES, Appendix II of the Bern Convention, Annexes II and IV of EU Habitats Directive, registered in the gorge of Zletovska Reka. Natural range of distribution is in decline generally and the decline in the otter population is alarming. The greatest threat to its survival is posed by degradation or alteration of their natural habitat, i.e. inappropriate management of aquatic ecosystems, contamination of waters, clearing or degradation of riverine vegetation, poaching, etc.

The area also includes Lesnovska Kupa, which is one of the best preserved Paleo volcanic stooks in Kratovo-Zletovo area and in the Republic of Macedonia in general, covering an area 12 km^2 and diameter of 4 km. The stook has steep sides and rises by 400 m above the surrounding relief. Morphologically, it is especially clearly articulated on the southern and southwestern side. On the eastern side, it is cut by the valley of Zletovska Reka and by the valley of the river Dobrevska Reka on the western. The top of the Lesnovska Kupa is an impressive, well preserved caldera (eroded crater) with a diameter of 1.5 km and depth of the middle part of 150 - 200 m. The centre of the caldera (once crater) is surrounded by 78 ring-like arranged stook-shaped heaps, i.e. volcanic necks (rocky peaks). Among them, northern neck Ilin Krst (1127 m) is the most remarkable and it was probably the main volcanic hot-spot from where the biggest amount of lava and volcano clastic material erupted. Three more well articulated necks occur on southern and eastern sides, namely: Sv. Troica (1012 m), Nusheva Chuka or Gorno Brdo (1025 m) and Gumichki Rid (1048 m). Lesnovska Kupa is a residue of Oligocene volcanic activity in this part of Kratovo-Zletovo Paleo volcanic area. During eruptions, huge amounts of dacite lava and volcano clastic material was thrown up. Since then until present, due to the long period, this volcanic structure has been rather eroded and lowered down. Today, dacite rocks are exposed at erosive processes and numerous small denudation forms have been created in the area (rock cuttings, glasses, footprints, etc.). The area also encompasses the village of Lesnovo and the Monastery of Lesnovo (St. Gavril of Lesnovo) which contribute to the values of this area.

Figure 35. Nature Park "Ratkova Skala – Zletovska Reka"

6.4 Sites proposed for conservation as Natural Rarities

Based on the guidelines contained in RPAN (2011), as well as recommendations of the expert team involved in the analysis of natural values and development of map of sensitivity in the area of Bregalnica Watershed, total of 16 sites has been proposed for protection as Natural Rarities (Figure 36), four of which from among existing protected areas (Dzvegor, Oak trunk-village Beli, Morodvis and Mulberry - Lesnovo Monastery) explained in chapter 6.1. Other 12 sites proposed for designation as natural rarities are as follows: Konjska Dupka Cave, Trabotivishte, Mocharnik, Nemanjica, Daboski Andak, Pubescent Oak - Trstenik, Pilav Tepe, Volcanic Bombs, Stamer, Elensko Blato (*swamp*), Kiselica Cave and Pehchevo River. It should be also considered that the site "Ulanci" proposed as Natural Rarity is located at the very boundary of Bregalnica Watershed.

The above listed sites are mainly areas with rare, endangered and endemic plant and animal species, important habitats, as well as relief forms, geological profiles, paleontological and speleological objects (provided that their surface area is smaller than 100 ha) which as objects of nature, due to their scientific, aesthetic, health and other significance, cultural, training and educational and tourist and recreational functions, enjoy special protection by the state. On the occasion of the development of RPAN, total of 91 sites were proposed for designation as Natural Rarities. However, these have not been designated yet, except the Cave of Dona Dupka near the village of Rasche, Skopje.

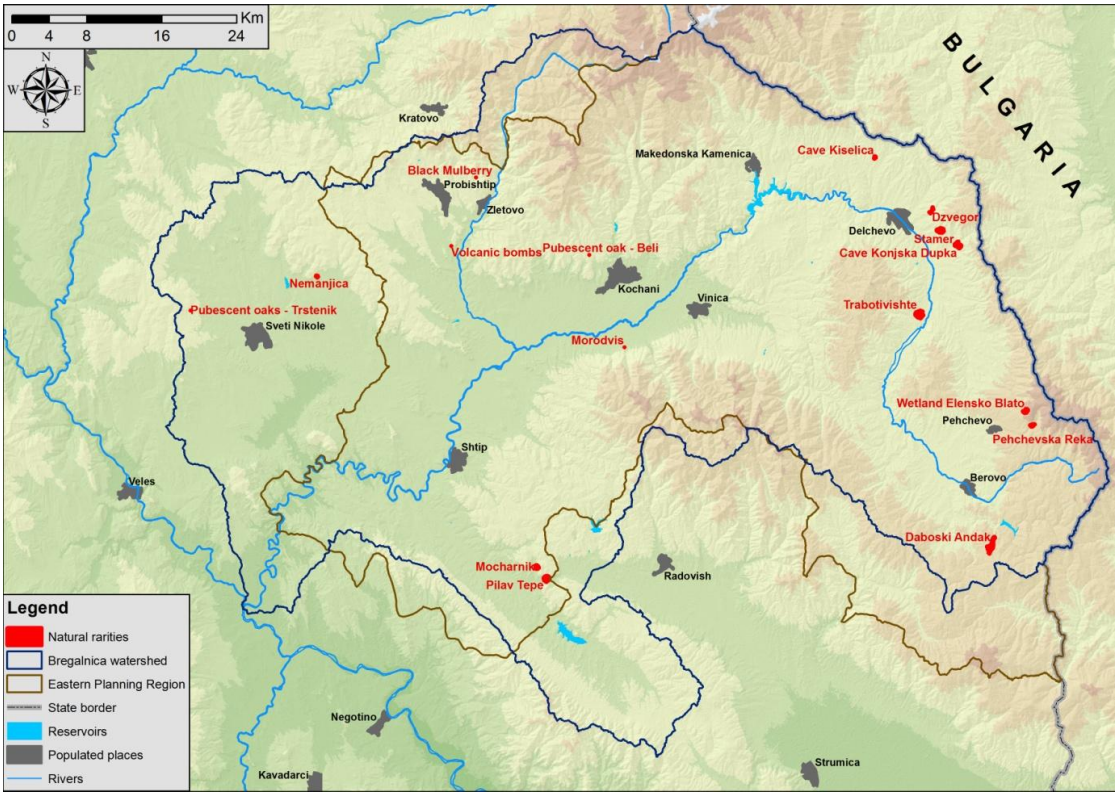


Figure 36. Sites proposed for conservation as Natural Rarities

6.4.1 Natural Rarity "Konjska Dupka Cave"

The site is located in the foothills of the mountain Vlaina, immediately next to the village Grad, east of it on the left side of Vachin Dol and extends at an altitude of 800-853 m. It is calcareous complex unique in the wider area, destroyed to a great extent by quarry opening. It incorporates the cave Konjska Dupka and part of the surrounding calcareous rocky grounds and cliffs. In the course of 2010/2011, in the frames of RPAN development, the boundaries of this site were determined precisely and it covers a surface area of 24ha.

The total leng of the Cave Konjska Dupka is 70 m. There is orderly access road to the cave for visitors. The cave itself is not attractive as it has little or poorly developed cave decorations. Yet, its importance derives from the fact that it is one for the few caves in the eastern part of Macedonia.

Entrance of the Cave Konjska Dupka

Troglophile insects (*Laemostenus terricola punctatus* and *Trechus* cf. *subnotatus*), and several trogloxenes were registered in the cave. From among bats, only Geoffroy's bat (*Myotis emarginated*) was registered and only individual specimens were found. It has zoological and geomorphological importance.

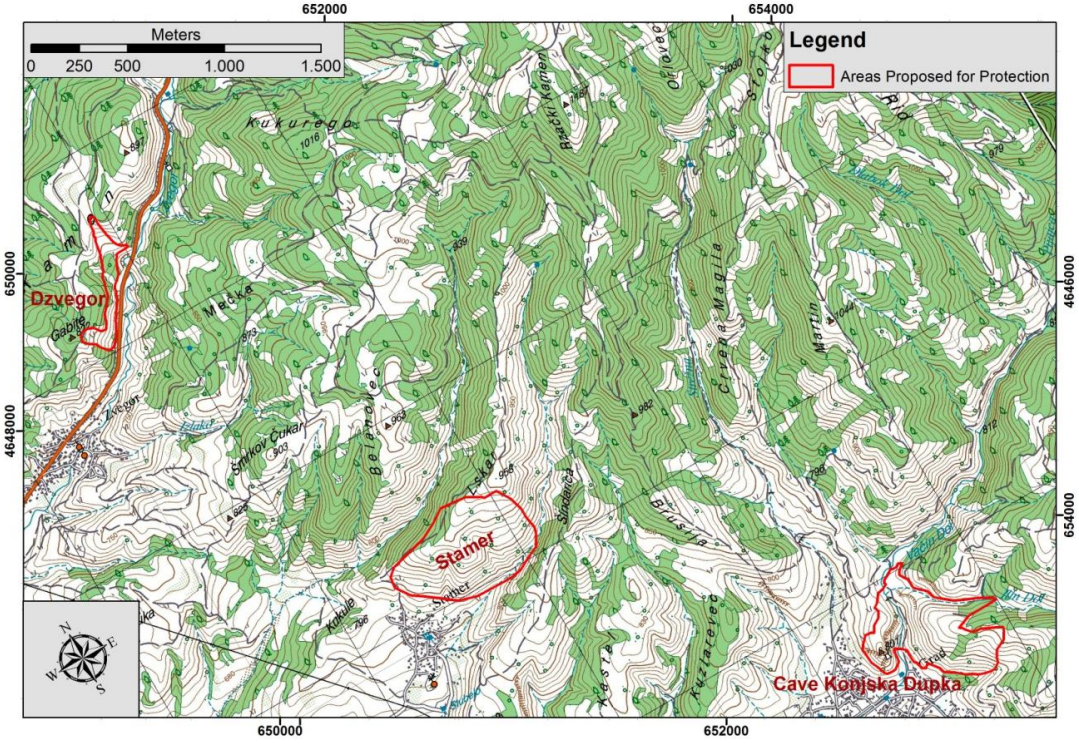


Figure 37 Natural rarity "Konjska Dupka" and Natural rarity "Stamer"

In the Spatial Plan of the Republic of Macedonia, the site is proposed for protection as *Monument of Nature*. However, in the process of elaboration of RPAN (2011) and researches in Bregalnica Watershed (2014-2015), the expert team proposed its designation as **Natural Rarity**.

6.4.2 Natural Rarity „Stamer"

The site Stamer is located near the village of Stamer in Delchevo region. It is paleontological site positioned east of the village of Stamer at an altitude of 760-935 m. The boundary of the site was delineated during the elaboration of the RPAN and it covers a surface area of 28 ha. The site has paleontological importance.

This locality was identified during the elaboration of the RPAN and proposed for protection as Natural Rarity.

Site Stamer

6.4.3 Natural Rarity "Trabotivishte"

The site is located in the area of "Loshana" at an altitude of 687-820 m, close to the village of Trabotivishte. According to RPAN, it covers a surface area of 46.42ha.

It is a site with erosive forms in a form of columns, towers and trenches created in Neogene poorly bound sediments (lake sediments deposited in the final stage of Pliocene lake existence). This is the reason for its geomorphological importance.

In the Spatial Plan of the Republic of Macedonia, the site is proposed for protection in the category of Monument of Nature. However, in the process of elaboration of RPAN (2011) and additional researches during 2014-2015, the expert team proposed its designation as Natural Rarity.

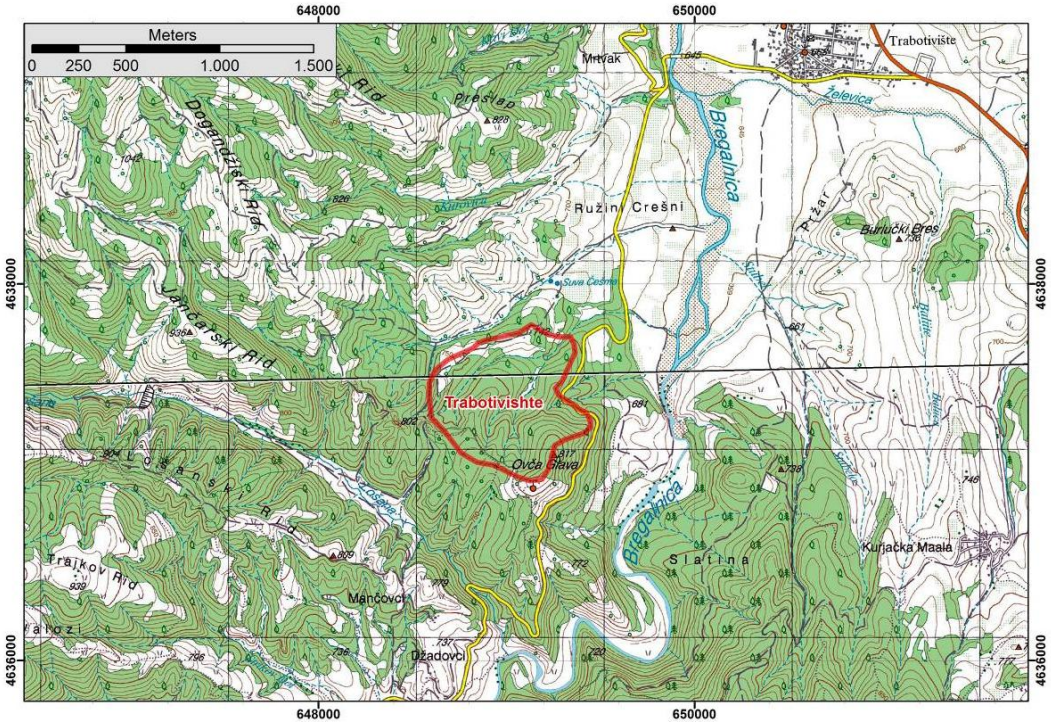


Figure 38. Natural Rarity "Trabotivishte"

6.4.4 Natural Rarity "Mocharnik"

The site is positioned north of Derven Gorge between Radovish and Kriva Lakavica valleys, in the valley of the river Duboka Reka at around 6 km north of the village Shopur, and it is accessible via the local road to the village from the regional section Shtip-Strumica. According to the estimates of the RPAN team, it covers a surface area of 11.9 ha and extends at an altitude of 470-610 m.

The site has paleontological importance. From regional geological point of view, the area is positioned in the furthest border part of Vardar zone towards Serbia-Macedonian mass. The find was revealed in upper chalk formation of Alb-cenoman age, in a facia of sandstones, claystones, marls and limestones, from where rich marine fauna was collected and determined, including *Puzosia, Phylloceras, Natica, Plicatula*, typical for Alb from lower Jurassic and Cenoman from Upper Jurassic at regional scale. It is a geological profile of clastic-carbonate sediments rich in marine fauna – ammonites, shells, snails, etc.

Owing to diverse fossil fauna from Lower and Upper Chalk, as rare find in Macedonia, the site has an important status for scientific research activity and education in the spheres of stratigraphy, palaeontology and paleology. Existence of marine fauna from early and late chalk age is of national importance. The site has not been under threat in the past period and it should be considered in case of construction of infrastructure and other facilities in the area.

In the Spatial Plan of the Republic of Macedonia, the site was proposed for protection in the category of *Monument of Nature*. However, in the process of elaboration of RPAN (2010/2011) and additional field surveys, the expert team proposed its designation as **Natural Rarity**.

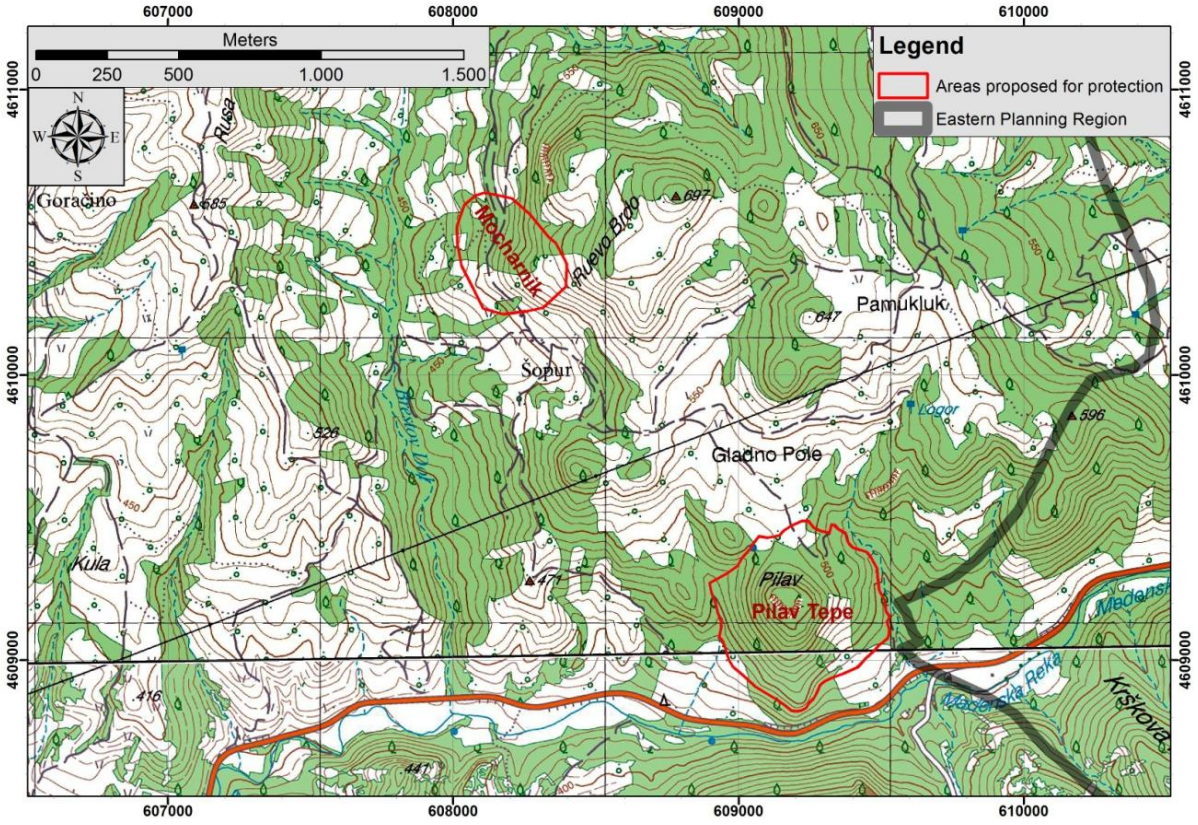


Figure 39. Natural Rarity "Mocharnik"

6.4.5 Natural rarity "Pilav Tepe"

In the valley of the river Medenska Reka (right tributary of Lakavica), on the right side of the gorge part (Derven Gorge), along the road Radovish–Shtip, there is a remarkable hilly highland – Paleovolcanic antheap shaped -Pilav Tepe (601 m). The site covers a surface area of 28 ha and extends at an altitude of 400-600 m.

Pilav Tepe

The site has geomorphological importance. Volcanic stook Pilav Tepe is morphologically the most reflective phenomenon of Tertiary (Upper Eocene) magmatism in the area of Buchim – Damjan. The following important species have been registered in this site: *Aquila chrysaetos, Falco peregrinus, Pseudepidalea viridis, Bufo bufo, Zamenis situla, Vipera ammodytes, Testudo graeca, Eurotestudo hermanni.*

This site was identified during the elaboration of RPAN (2011) and proposed for designation as Natural Rarity, with slight correction of the boundary because of the planned expansion of the road Shtip-Radovish.

6.4.6 Natural Rarity "Nemanjica"

The site is situated in the eastern part of Ovche Pole basin, north-east of Sveti Nikole near the village of Nemanjica. The area belongs to the eastern rim of Vardar zone towards Zletovo-Kratovo volcanic formation and in narrower terms it is part of Upper Eocene flysch complex. Geological profile of Paleogene flysch series was revealed on the site where sandstone horizon is rich in fossil flora and fauna. Fauna is marine, typical for Upper Eocene, while flora indicates existence of tropical climate conditions. Determined fossil fauna is typical of the development of this geological period and consists of the same species determined in other localities within flysch formation, in which shallow aquatic and sandbar organisms prevail*: Cardium, Spondylus, Meretrix, Ostrea, Ceritium, Natica, Conus*, various corals, etc.

The locality is paleonthologically important and also carries significant scientific, research and educational importance, especially given the fact that it is comparable with other finds in Central Europe and Dinarides. Presence of marine fauna from late Eocene has national importance. The site is not under threat by anthropogenic activities.

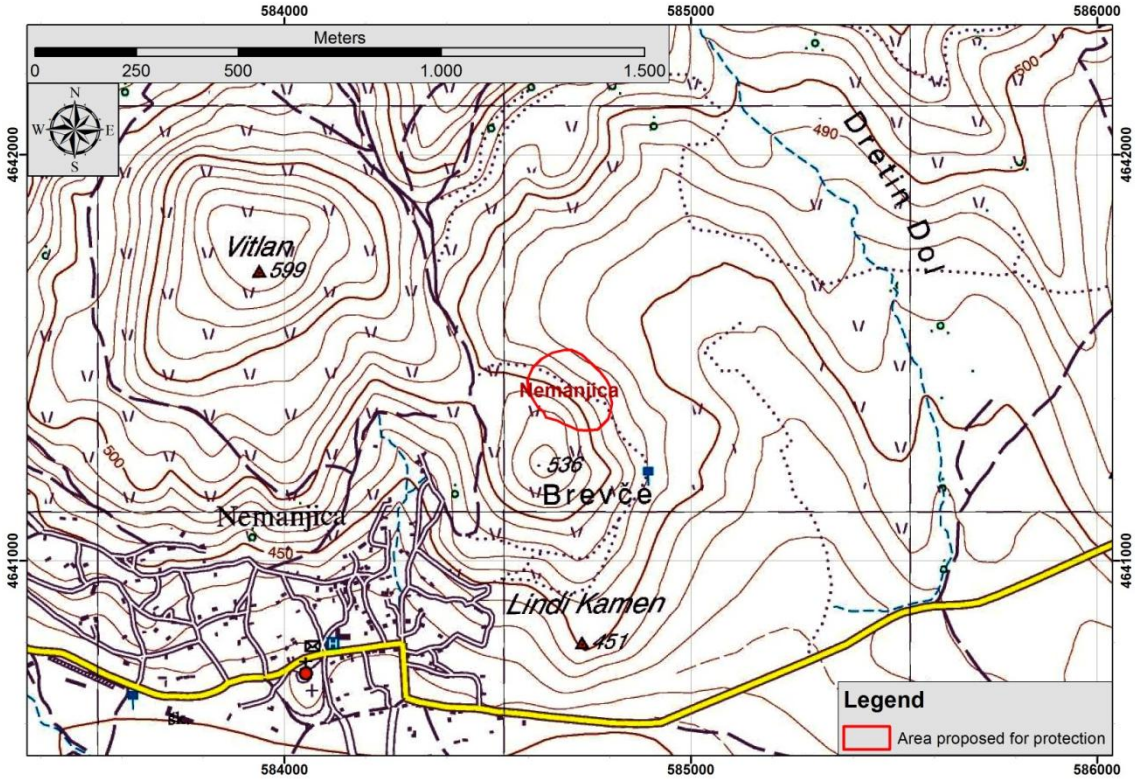


Figure 40. Natural Rarity "Nemanjica"

According to the estimates in the Spatial Plan of the Republic of Macedonia, the area of the site is 2 ha, while accurate delineation of the boundary (RPAN, 2010/2011) resulted in its surface area of 3 ha. It extends at an altitude of 475-525 m.

In the Spatial Plan of the Republic of Macedonia, the site was proposed for protection in the category of *Monument of Nature*. However, in the process of elaboration of RPAN (2010/2011) and field surveys in 2014/2015, the expert team proposed its designation as **Natural Rarity**.

6.4.7 Natural Rarity "Kiselica Cave"

Kiselica Cave is situated on north-east of Delchevo near the village Kiselica. From the entrance to Kiselica Cave which is rather broad ((1.5 m), you pass through a narrow entry canal expanded into the cave hall with a diameter of 3-4 m. Three more canals continue in the furthest parts of the hall. The cave is dry, with slightly more intensive dripping in edge parts of the canals, where very small stalactites form. Other cave ornaments have not been observed. Although it lacks certain especially attractive properties (except the greenish colour of canals and early stalactites), Kiselica Cave is interesting by its position, considering the fact that karstic forms and typical caves are real rarities in this extreme eastern part of Macedonia.

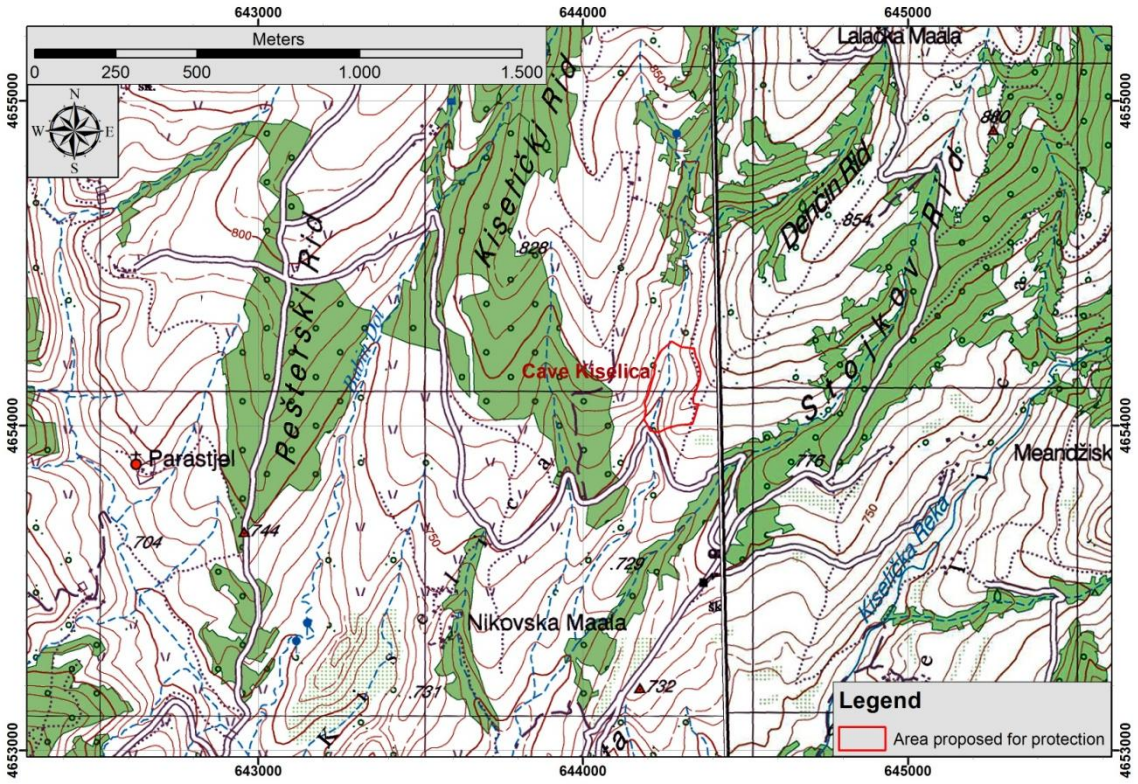


Figure 41. Natural Rarity "Kiselica Cave"

Rhinolophus ferrumequinum (Greater Horseshoe Bat), which is Emerald species, included in Annexes 2 and 4 of EU Habitats Directive, Appendix 2 of Bern Convention and Appendix 2 of Bonn Convention is registered in Kiselica Cave.

6.4.8 Natural rarity "Pubescent Oaks – Trstenik"

Pubescent Oak trees *(Quercus pubescens)* in the village of Trstenik, on the right side of the road Sveti Nikole–Gjurishte are located in the Municipality of Sveti Nikole, and belong to continental biogeographical region. Trees grow on an altitude of 650 m. The site has dendrological importance and the trees are in good condition.

With regard to morphological characteristics, the trunks height is 18 m of the first, 3.70 m of the second and 20 m of the third, with diameters at breast height of the trunk of 3.20m, 2.60 m and 3.70 m, respectively.

In the Spatial Plan of the Republic of Macedonia, the site was proposed for protection in the category of *Monument of Nature*. However, in the process of elaboration of RPAN (2010/2011) and field surveys in 2015, the expert team proposed its designation as **Natural Rarity**.

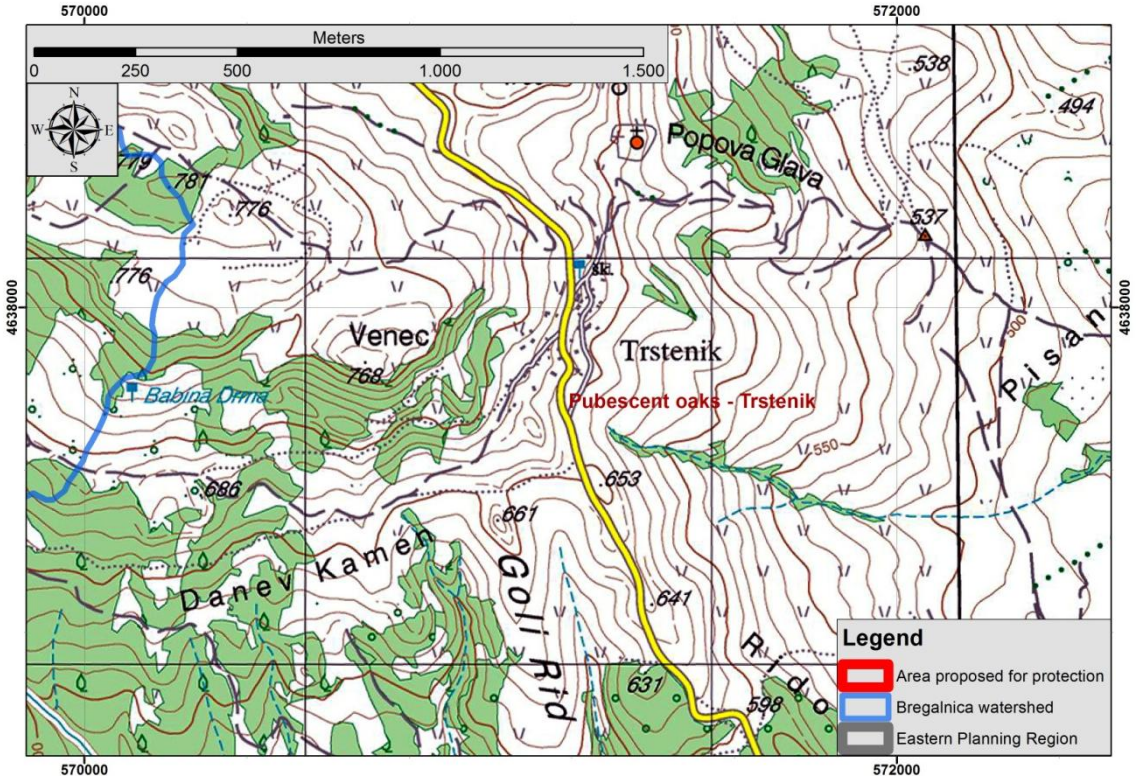


Figure 42. Natural Rarity "Pubescent Oaks – Trstenik"

6.4.9 Natural Rarity "Daboski Andak"

Mixed forest stand of black pine (*Pinus nigra*) and beech (*Fagus sylvatica*) in the area called "Daboski Andak" on Maleshevski Planini Mts., at an altitude of 1000 to 1245 m. Black pine makes the upper storey of the forest stand, and beech the lower one. The terrain is temperately steep to 20°, on silicate geological ground. The soil is dystric cambisol, with a thick layer of humus and litter layer. The stand is partially opened with forest roads.

Black pine trees are healthy, with a height exceeding 25m. Certain stems reach diameters at breast height of more than 60 cm. Beech is of smaller dimensions, up to 20 m in height and to 40 cm diameters at breast height. A number of steams are twisted and branchy. The stand has abundant natural regeneration of beech and only at certain intensively sunny spots of black pine as well. Parts of this stand are privately owned. Some wood felling, primarily of old black pine trees, has been carried out, though with weak intensity. No wood cutting or other activities have taken place in other parts of the stand and it is natural and anthropogenically unaltered environment, but still an area where processes of natural succession of black pine and beech has been observed.

The stand is interesting for scientific research and observation of the processes of natural black pine and beech regeneration in conditions of mixed forest stand.

Under the Spatial Plan of the Republic of Macedonia, the area covers 54 ha, while accurate delineation of the boundary during the elaboration of RPAN resulted in its surface area of 36 ha.

In the Spatial Plan of the Republic of Macedonia, the site was proposed for protection in the category of *Specific Natural Reserve*. However, in the process of elaboration of RPAN and field surveys in the course of 2014- 2015, it was proposed to designate it as **Natural Rarity**.

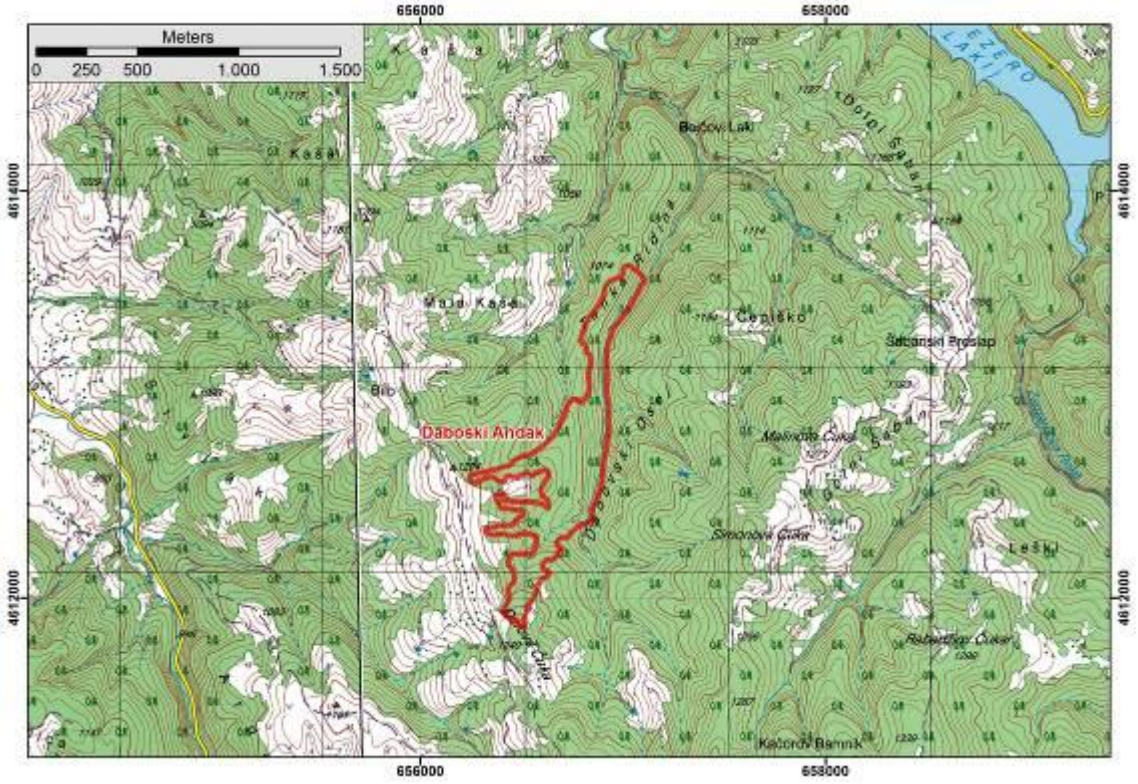


Figure 43. Natural Rarity "Daboski Andak"

6.4.10 Natural Rarity "Vulkanski Bombi"

Volcanic bombs as part of Kratovo-Zletovo volcanism have been registered on the left valley side of the river Kiselica (right tributary of Zletovska Reka) or along the road itself, at its cutting, on the right side towards Probishtip. Geographically, it belongs to the Municipality of Probishtip. The site is positioned at an altitude of 440 m.

The site has geomorphological importance. It is classical example of the phenomenon of volcanic pyroclastic material or in this specific case appearance of volcanic bombs. Volcanic bombs are fragments of lava ejected in red heated or plastic condition with a diameter ranging between 60 and 100 cm. Volcanic bombs had been ejected by former volcanoes in Kratovo-Zletovo volcanic area to a height reaching up to 1.000 m, and reached the ground close to volcanoes, not further than 5 - 7 km.

This site was identified during the elaboration of RPAN (2010/2011) and proposed for designation as **Natural Rarity**.

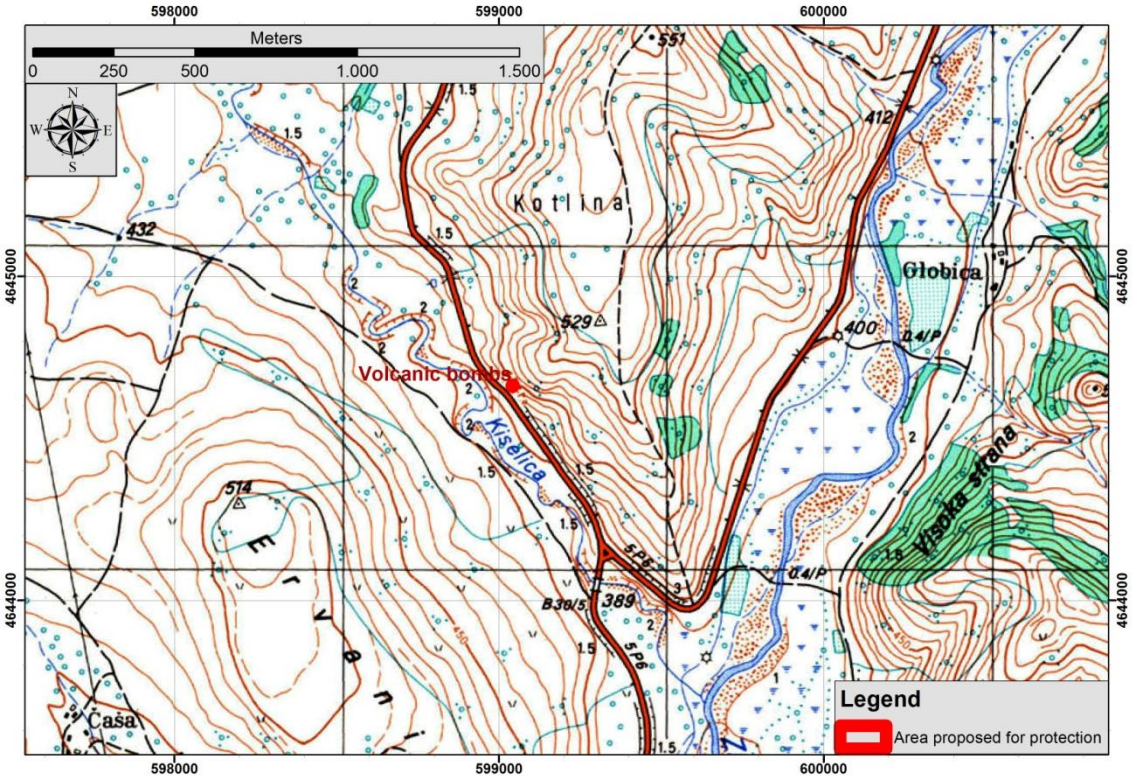


Figure 44. Natural Rarity "Vulkanski bombi (Volcanic bombs)"

6.4.11 Natural Rarity "Elensko Blato"

The site is positioned on the massif of Bukovikj, below the peak Orlovec, north of Pehchevo. It is small sphagnum peat bog in beech forest. The area extends at an altitude of 1320-1500 m. The boundary of the site was delineated during the elaboration of RPAN and covers an area of 13.4 ha.

Site Elensko Blato

The site has botanical importance. The following important species have been registered in this site: *Drosera rotundifolia, Pelophylax ridibunda, Salamandra salamandra, Pseudepidalea viridis, Bufo bufo, Bombina variegata.*

The site is destroyed in part due to small water intakes and formation of waterhole, as well as opening of forest road. Exploitation of mineral resources has been planned in the wider area.

This site was identified during the elaboration of RPAN and proposed for designation as **Natural Rarity**.

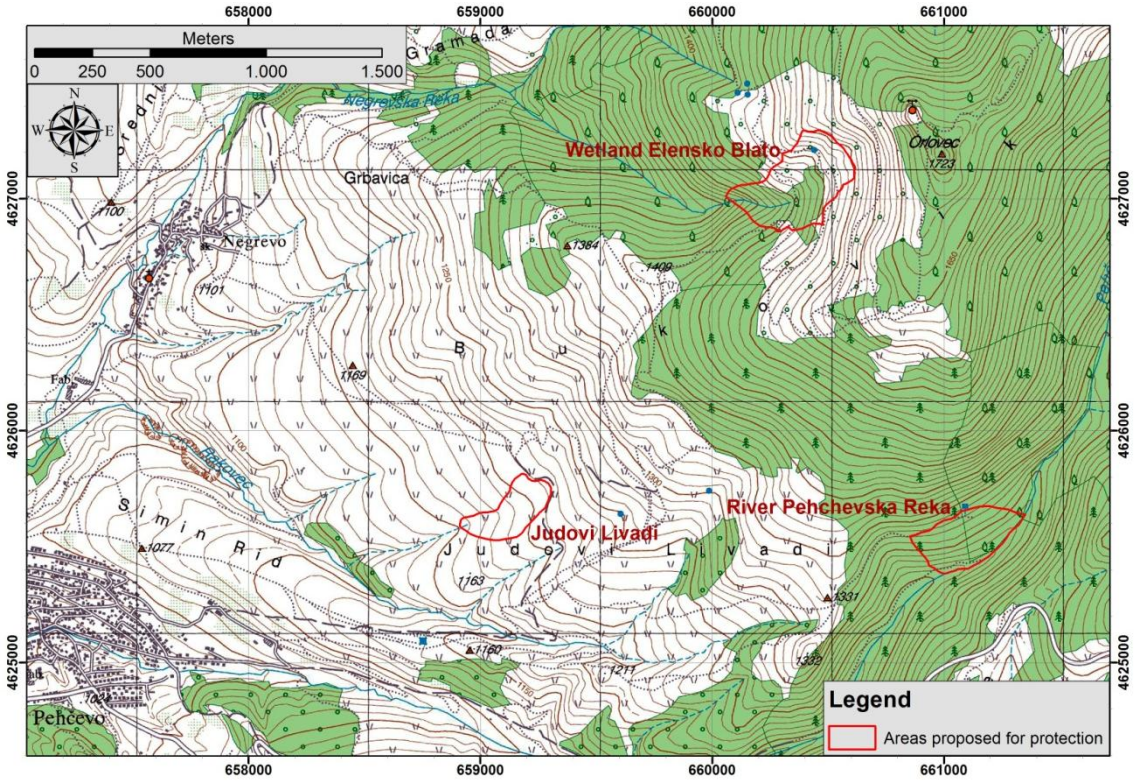


Figure 45. Natural Rarities "Elensko Blato" and "Pehchevo River"

6.4.12 Natural Rarity "Pehchevo River"

The main importance of this site comes from the presence of Round-leaved Sundew (*Drosera rotundifolia*) and *Sphagnum* peatbog. Besides Round-leaved Sundew, rare fern species *Blechnum spicant* and rare fungi *Rickenella mellea* develop in the bog. Other interesting fungi species also occur in beech forest, such as: *Marasmius bulliardii,* Pseudocraterellus sinuosus, *Ramaria bataillei* and *Tricholoma inamoenum.* The area covers a surface area of around 8 ha.

Pehchevo River is inhabited by Stone Crayfish *Austropotamobius torrentium*, species of international and European conservation importance.

The peat bog itself evolves along forest road and therefore it is necessary to establish physical protection (fence) along the road.

Peat bog in the proposed Natural Rarity "Pehchevo River"

7 Areas of international importance in Bregalnica region

It is evident that the area of Bregalnica Watershed is of great international importance owing to the presence of internationally important areas (Table 7), namely: five areas included in the national Emerald network, seven areas designated as Important Bird Areas (IBAs), five areas designated as Important Plant Areas (IPAs) and one Prime Butterfly Area (these areas are entirely or partially covered by the area of interest (Figure 46). In addition to this, the initiative for preparation of the documentation for nomination of Osogovski Planini Mts. as transboundary biosphere reserve under the UNESCO's Programme "Man and Biosphere". Part of these areas overlap or include flora and fauna species that are of international importance for conservation (e.g. Osogovo, Ovche Pole, Bogoslovec).

Considering the fact that only minor part of these internationally important areas is integrated in the existing network of protected areas and areas proposed for protection in Macedonia, they have been taken into consideration in the definition of the proposals for protected areas in Bregalnica Watershed.

Table 7. Areas of international importance in Bregalnica Watershed

Ordinal no.	**Emerald areas**	**Important Bird Areas**	**Important Plant Areas**	**Prime Butterfly Areas**
1	Osogovski Planini	Osogovski Planini	Osogovski Planini	Ograzhden
2	Ovche Pole	Ovche Pole	Ovche Pole - Bogoslovec	
3	Bogoslovec	Preod – Gjugjance	Krivolak (Orlovo Brdo Solen Dol - Serta)	
4	Gorge of Bregalnica River	Zletovska Reka Valley	Pehchevo–Judovi Livadi	
5	Maleshevo	Kochani ricefields	Plachkovica	
6		Mantovo accumulation - Lakavica		
7		Topolka – Babuna - Bregalnica		

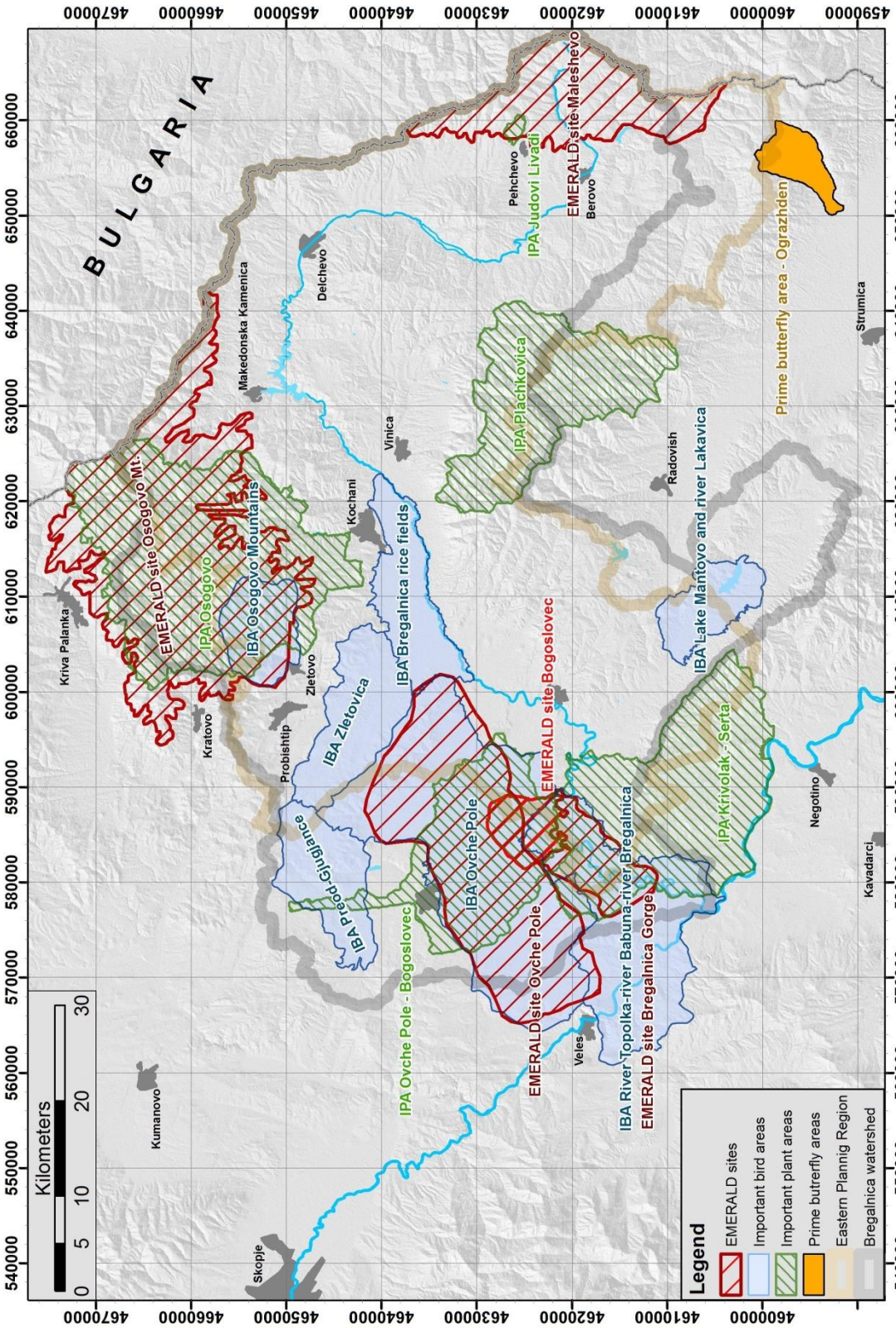


Figure 46. Internationally important areas in the investigated area

7.1 Important Plant Areas

The main goal of the Programme for Important Plant Areas (IPAs) is to identify and protect priority areas for plants throughout Europe, by applying appropriate criteria developed by PlantLife International. Identification of the areas is carried out against globally applicable criteria based on the presence of: A – threatened species, B – botanical richness, C – threatened habitats. This Programme is a good tool for implementation of Global Strategy for Plants Protection.

Table 8. Important Plant Areas in the investigated area

Name	Criterion	Year of designation	Area (ha)	Overlapping with Bregalnica Watershed (ha, %)	Overlapping with Eastern Planning Region (ha, %)
Krivolak (Orlovo Brdo – Solen Dol - Serta)	IPA (Aii); IPA (Aiii); IPA (Aiv); IPA (Ci); IPA (Cii)	2004	39367	16715 (42.5%)	16513 (41.9)
Osogovski PLanini Mts.	IPA (Aii); IPA (Aiv); IPA (Cii)	2004	50543	41494 (82.1%)	30082 (59.5%)
Ovche Pole - Bogoslovec	IPA (Aii); IPA (Aiii); IPA (Aiv); IPA (Ci); IPA (Cii)	2004	25458	25458 (100%)	3933 (15.5%)
Pehchevo–Judovi Livadi	IPA (Cii)	2004	388	388 (100%)	388 (100%)
Plachkovica	IPA (Aii); IPA (Ci); IPA (Cii)	2004	26543	15245 (57.4%)	13287 (50.1%)

Out of the total of 42 identified Important Plant Areas in the Republic of Macedonia (Melovski at al. 2010), which occupy an area of 459425 ha (around 18% of the territory of the Republic of Macedonia), Bregalnica Watershed incorporates (entirely or partially) five areas: Osogovo (partially 82.1%), Ovche Pole – Bogoslovec (entirely), Judovi Livadi (entirely), Krivolak – Serta (partially 42.46%) and Plachkovica (partially 57.43%). Collectively, they occupy surface area of 99299.95 ha or 23.01% of Bregalnica Watershed (Figure38). The surface area of Important Plant Areas in Bregalnica Watershed and criteria for their identification are presented in Table 8.

7.1.1 IPA Pehchevo–Judovi Livadi

Important Plant Area "Pehchevo – Judovi Livadi" is situated in the furthest eastern part of Macedonia, at an altitude of 1050 to 1380 m. It covers areas mostly under peat bogs. This is the locality hosting the biggest population of insectivore plant *Drosera rotundifolia*. IPA "Pehchevo – Judovi Livadi" belongs to Middle European bio-geographic region. IPA "Pehchevo – Judovi Livadi" does not contain species of criterion **A**, while ***Illyrian-moesian acidic fens*** (D2.28) is the only important habitat in European context under the EUNIS classification, categorized as habitat meeting C2 Category of **C** criterion**. Prominent plants that could be used to apply criterion B are as follows**: *Drosera rotundifolia, Cetunculus minimus, Juncus capitatus, Ranunculus fontanus, Sphagnum sp.* and *Juncus tanageia*.

The whole land in the region is state owned. Livestock breading is the main activity in this small area. Threats to this IPA are related mainly to utilization of water potential/sewage/management, which might lead to biotope drying out and consequently degradation of this locality in Macedonia.

7.1.2 IPA Krivolak (Orlovo Brdo-Solen Dol-Serta)

The area of Krivolak is situated in the central part of Macedonia, at an altitude of 200 to 800 m. There is a small protected area in the region – Monument of Nature "Orlovo Brdo", but no conservation measures are implemented in the area, although several stenoendemic and endemic plant species grow there. It occupies areas mostly under herbaceous vegetation – grasslands on Paleogene sediments and is part of steppe-like area in Macedonia (*Heleno-Balkan steppes).* Remains of thermophilous oak forests are found on higher spots. IPA Krivolak includes six species of criterion A: *Galium rhodopeum, Hedysarum macedonicum, Astragalus cernjavskii, Tulipa marianae, Salvia jurisicii, Anchusa macedonica*.

Land ownership in the region is mixed, but larger part of the land in the IPA Krivolak itself is state owned. The main type of land use is livestock breeding (winter pastures) and forestry to a lesser extent. The main occupation of people in lowland parts is agriculture. Large part of the territory of IPA Krivolak is intended for military purposes. Polygon Krivolak is most probably the biggest military polygon on the Balkans.

The main threat for the region is illegal wood felling; it is a threat even for steppe communities because illegal paths are dig exactly through the populations of all species of criterion A. Another problem is the abandonment of winter sheep grazing in the polygon which leads to steppe habitats overgrowth. So far, army activities have not proven as threat to vegetation; on the contrary, inaccessibility of major part of the territory has contributed to nature conservation.

7.1.3 IPA Ovche Pole - Bogoslovec

The area "Ovche Pole-Bogoslovec" is situated in the central part of Macedonia. It extends at an altitude of around 280 to 755 m.

It covers areas under grasslands on Paleogene sediments – steppe-like vegetation, as well as habitats with halophytic vegetation (Continental inland habitats with halophytic (salt) herbs and herbaceous plants - E6.2) and Pannonic salt steppes and saltmarshes - E6.21 and Helleno-Balkanic savory steppes [*Satureja montana*] – E1.21). Saline soils in Macedonia are represented in this area in considerable amount. Therefore, vegetation in this IPA has great national importance. IPA „Ovche Pole-Bogoslovec" includes four species of criterion A, namely *Galium rhodopeum, Hedysarum macedonicum, Salvia jurisicii* and *Anchusa macedonica*.

Ownership of the land in the region is mixed (state and private). The main type of land use is livestock breeding (grasslands) and used as arable land to a lesser extent, while forest areas are negligible.

Threats for this area are related to potential intensification of agriculture which may cause conversion or degradation of habitats on saline soils as biotope; forestry (illegal wood felling and development) and transport e.g. planned cargo airport near Erdzelija-Mustafino).

7.1.4 IPA Osogovo

The area of "Osogovo" is situated in northeastern part of Macedonia. It extends at altitudes of around 400 to 2252 meters.

It occupies areas with subalpine and alpine pastures. Also, areas under beech forests and peat bogs are present. In some of the lower parts of such defined IPA, significant areas under thermophilous and mesophilous oak forests develop. Prominent habitats under the EUNIS classification include: Illyrian-moesian acidic fens, heaths, alpine dwarf heaths, moesian beech forests, etc.

IPA "Osogovo" includes three criterion A species, of which one plant (*Fritillaria gussichiae*) and two fungi (*Hericium erinaceus, Amaurodon* viridis). Other important species in terms of conservation on national level are the following: *Dryopteris borreri, Lycopodium clavatum, Genista fukarekiana, Ranunculus pseudomontanus, Dianthus microlepis, Viola biflora, Dryopteris carthusiana, Viola dacica, Moneses uniflora, Potentilla haynaldiana, Sedum erythraeum, Thymus balcanus, Senecio carpatica, Veronica bellidioides, Crepis conyzifolia, Aquillegia aurea*, *Sempervivum erythraeum*. They also include national and Balkan endemites.

Land ownership is of mixed nature – state and private. The main type of land use is forestry. Other human activities are of lesser scale with agriculture – livestock breeding (summer pastures), farming, minerals (ores) extraction and collection of wild plants and fungi as the most significant.

Several threats have been identified for this IPA: abandonment of land/insufficient and improper land management; forestry – intensification; development – industry (mining); utilization of hydro potential/sewerage/management; construction of dams and small hydro power plants (energy sector); uncontrolled urbanization in lower parts, as well as overexploitation and other kind of unsustainable use of plant resources (medicinal and other edible plants) and fungi which may seriously disturb vitality of certain plant species.

7.1.5 IPA Plachkovica

The area of "Plachkovica" is situated in the eastern part of Macedonia at altitudes of around 1000 to 1754 m, and much lower at places. It covers areas under beech and thermophilous oak forests. Minor part of this area is covered by dry grasslands.

IPA "Plachkovica" includes one criterion A species - *Fritillaria graeca*. Other important plant species in terms of conservation are as follows: *Romulea bulbocodium, Epipogium aphyllum*, *Viola dacica.*

Land ownership is mostly state. The main activities are forestry and to a lesser extent agriculture (livestock breeding and farming). Although no severe threats have been identified for this IPA, potential threats that might be detrimental for habitats and species include: abandonment and poor management of land; inappropriate afforestation; intensification and bare cuts in forestry and development-recreation-tourism.

7.2 Important Bird Areas

The purpose of the Programme for Important Bird Areas is to secure conservation of areas that are important for conservation of globally endangered species of birds and species of European interest for conservation, areas for migratory birds gathering in high numbers, areas for birds specific to small regions and areas enabling life of small groups of species specific to certain biome. This initiative is implemented by BirdLife International at global level.

Bregalnica Watershed encompasses seven (7) Important Bird Areas out of the total of 24 areas identified on the territory of the Republic of Macedonia which cover an area of 670900 ha or around 27% of the national territory (Velevski et al. 2010). Criteria for the areas identification, total surface area and surface area of these areas in Bregalnica Watershed (surveyed area) are presented in Table 9. The total surface area of Important Bird Area in Bregalnica Watershed is 106040 ha and they take 24.57% of the basin.

Table 9. Important Bird Areas in Bregalnica Watershed

Name	Criterion	Area (ha)	Overlapping with Bregalnica Watershed (ha, %)	Overlapping with Eastern Planning Region (ha, %)
Accumulation Mantovo-Lakavica	IBA A1, IBA B2	6920	6920; 100%	3728; 54%
Osogovski Planini Mts.	IBA A1, IBA B2	7530	7530; 100%	6855; 91%
Ovche Pole	IBA A1; IBA B2	48183	42964; 100%	11808; 24.5%
Zletovska Reka Valley	IBA A1, IBA B2	12687	12687; 100%	12604; 99.3%
Topolka –Babuna - Bregalnica	IBA A1; IBA A3; IBA B2	27648	13858; 50.12%	4623; 17%
Kochani ricefields	IBA B2	11192	11192; 100%	11192; 100%
Preod-Gjugjance	IBA A1, IBA B2	10893	10888; 100%	988; 9%

7.2.1 IBA "Zletovska Reka Valley"

This IBA is situated entirely in Bregalnica Watershed and incorporates lowland parts of the river valley (north of the villages Pishica and Novoselani) and slopes of Mangovica and Osogovski Planini Mts. gravitating towards the valley. The area has been identified due to the breeding of 3-4 couples of Imperial Eagle, and other important species include Montagu's Harrier *Circus pygargus*, Stone Curlew *Burhinus oedicnemus* and European Roller *Coracias garrulus*. Several species related to steppe-like inhabitants are found on the slopes of Osogovo and Mangovica and several species of heron find feeding and breeding conditions in ricefields along Bregalnica River.

7.2.2 IPA "Preod Gjugjance"

The area is located north of the villages Preod and Nemanjica (Sveti Nikole area) and extends northwards to the villages Kokoshinje and Gorno Barbaevo on Mangovica. It is fully encompassed in Bregalnica Watershed. It has been identified for the presence of 2-3 couples of Imperial Eagle and 30-50 couples of Lesser Kestrel *Falco naumanni*. After the identification, population of Lesser Kestrel has declined significantly, although tens of birds can be observed in this area in August and September before autumn migration. Golden Eagle nesting near village Orel), probably breeding of Lanner Falcon *Falco biarmicus*, Black Stork *Ciconia nigra*, Long-legged Buzzard *Buteo rufinus* and other bird species rarer in Macedonia were registered in the area. Migrating flocks of several species of ducks and snipes were observed in and along the valley of the stream Karatash.

7.2.3 IBA "Osogovski Planini Mts."

The area is situated on the western slopes of Osogovski Planini Mts., in upper courses of the rivers Zletovska Reka, Stara Reka and stream Eshterec, or between Lesnovo, Lukovo and Ponikva, delineating the rocky parts of Osogovski Planini Mts. at the complex of Ratkova Skala (by Orlov Kamen, Vchki Kamen and Sinkovica). Breeding of Egyptian Vulture, Black Stork, Long-legged Buzzard, Lanner Falcon, Peregrine, Eagle Owl, Golden Eagle, Short-toed Eagle, Rock Partridge and other bird species has been observed in the area. There are also fragments of well preserved oak forests, where several species of woodpeckers and probably flycatchers are breeding. The area is historical breeding site of Griffon and Black Vulture.

7.2.4 IBA "Ovche Pole"

This large IBA occupies flatland parts of Ovche Pole area and hilly lower parts of Gradishtanska Planina Mt., Kuchukol and Mangovica. Eastern parts support big and very important population of Imperial Eagle (10-12 couples), and western slopes support important population of Lesser Kestrel, for which great drop in the number of breeding couples has been observed. Apart from these, the area supports big populations of several steppe species (Short-toed Lark, *Calandra* Lark, Steppe Pipit, Stone Curlew), other important and/or rare bird species (Roller, Rock Partridge, Lesser Grey Shrike, Masked Shrike), and Griffon and Egyptian Vultures and numerous individuals of different species of prey birds can be seen in search for food.

7.2.5 IBA "Rivers Topolka – Babuna – Bregalnica"

Only part of this area is located in Bregalnica Watershed (Lower Bregalnica), from the villages Bogoslovec and Dobroshane on north, and then to the village Ulanci on south. The area has been identified for the presence of several couples of each Egyptian Vulture, Lanner Falcon, Long-legged Buzzard, Golden Eagle, Roller and other rare bird species of interest for conservation. Dense populations of Mediterranean bird species (Olive-tree Warbler, Masked Shrike, Black-eared wheatear, Rock Nuthatch, Black-headed Bunting, Blue Rock Thrush, etc.) are also found. Stone Curlew, Peregrine, Eagle Owl, White-tailed Eagle, etc., have been registered, too. Griffon Vultures used to breed in this locality up to around 2000.

7.2.6 IBA "Mantovo Lake and Kriva Lakavica"

The area covers the basin area of the river Kriva Lakavica and vicinity of Mantovo water accumulation. It has been identified for the breeding of European rollers (in northern parts) and Masked Shrikes, but also breeding of Golden Eagle, Lanner Falcon and Peregrine, Black Stork and other species has been confirmed. It seems that Mantovo Lake is of importance for migratory species of aquatic birds because preliminary research has confirmed the presence of several species of migratory birds, such as Avocet, Glossy Ibis, Ferruginous Duck, several species of ducks, herons and snipes, Osprey eagles and other bird species.

7.2.7 IBA "Kochani ricefields"

The area has been identified because of the most dense population of stork in Macedonia which depends on the maintenance of rice fields. Besides this, breeding of mixed colony of herons was registered in poplar belts near the village Zhiganci, and colonies of Grey Herons have been found in the villages Ularci and Sokolarci as well. Other confirmed species in the area include Imperial Eagle and European Roller, while several species of ducks, herons and other aquatic bird species have been observed during winter and spring migration.

7.3 Prime Butterfly Areas

Prime Butterfly Areas (PBA) are in initial phase of selection, focusing on target species which are priority for conservation in Europe. Three main criteria are used to identify Prime Butterfly Areas, namely: global distribution of species is restricted to Europe; species is listed in Appendix II of the Bern Convention and/or Habitats Directive and species is endangered according to available data from the Reed Book of European Butterflies. On the basis of at least two of the three criteria, 34 target butterfly species have been identified for nomination of these areas and five of these are found in Macedonia (van Swaay et al. 2003).

On the basis of the five target species, eight Prime Butterfly Areas have been identified in Macedonia, but they do not represent exhaustive list. Project activity for identification of new Prime Butterfly Areas in border areas with Serbia and Bulgaria (Micevski & Micevski 2008) was carried out in the course of 2007, but the results with potentially new proposals are not available. One Primer Butterfly Area has been identified in the area of interest - Ograzhden.

7.3.1 Prime Butterfly Area "Ograzhden"

The area covers part of the mountain Ograzhden or more precisely the area from the village of Ilovica up to the peak of Ograzhden (1745 m above sea level),with a surface area of 3916hectares. Although the whole area falls within the boundaries of the Eastern Planning Region, only small part (on north) belongs to the watershed area of Bregalnica River.

Prime Butterfly Area "Ograzhden" has been designated on the basis of the presence of two target species (*Maculinea arion* and *Parnassius apollo*). Besides the two said species, other important butterfly species that can be found here include: *Carcharodus orientalis, Erynnis marloyi, Tarucus balcanicus, Libythea celtis* and *Thecla betulae*.

7.4 National Emerald network

Emerald network is a network of areas of special conservation interest identified by the Republic of Macedonia as part of the obligations and criteria deriving from the Bern Convention in the period 2002-2008. Out of the total of 35 identified Emerald sites (with an area of 752223 ha or around 29% of the national territory), Bregalnica Watershed encompasses five sites shown on Figure 46 and Table 10: Osogovski Planini Mts. (71.94%), Ovche Pole (87.75%), Bogoslovec (entirely), Bregalnica River Gorge (entirely) and Maleshevo (89.07%). They cover 14.07% of the overall national Emerald network or 24.52% of Bregalnica Watershed, or 24.03% considering the overlaps between Emerald sites.

Table 10. Emerald sites in Bregalnica Watershed

International code	Name of the area	Year of designation	Area (ha)	Overlapping with Bregalnica Watershed (ha, %)	Overlapping with Eastern Planning Region (ha, %)
MK0000010	Bogoslovec	2006	4503.5	4503.5; 100%	987; 22%
MK0000031	Bregalnica River Gorge	2008	7171.2	7171.2; 100%	4270; 59.5%
MK0000033	Maleshevo	2008	19160.7	17066.2; 89%	19065; 99.5%
MK0000026	Osogovski Planini Mts.	2008	56674.75	40772; 72%	29069; 51.3%
MK0000035	Ovche Pole	2008	41365.91	36300; 88%	9307; 22.5%

7.4.1 Emerald site "Bogoslovec"

Bogoslovec site is situated in the central part of Macedonia at 10 km west of Shtip, between the river Bregalnica on south and its tributary Azmak on north. The highest peak is Sveti Jovanski Rid (formerly known as Bogoslovec) with an altitude of 755 m. From geological point of view, the hill is built of old Palaeozoic metamorphized rocks: quartz-porphyry, quartz-porphyry tuffs and mica shales

protruded with serpentinites and gabbro rocks. Bogoslovec is known by the exploitation of asbestos by the middle of the 20th century. The hill is bare, without forest vegetation and rather poor in surface waters. Intensive ground erosion is developed. The proposed Emerald site covers an area of 4500 ha and has been proposed for conservation of species and habitats (type "C").

Predominant habitat types on Bogoslovec are represented by dry grasslands(65%), salt marshes, salt grasslands, salt steppes (7%) and broadleaf deciduous forests (18%).

The following Resolution 4 habitat types are present in the area:

!15.115 Continental habitats with Salicornia europaea
!15.A Continental salt steppes and salt marshes
!41.7 Thermophilous and supramediterranean oak forests
34.3 Dense perennial grasslands and middle European steppes

Other important habitat type (under the Palaearctic classification) present in the area is Thracio-Macedonian dwarf habitats with oriental hornbeam thickets (31.8B311).

In the area, no plant species under Resolution 4 has been identified, but there are local endemites (*Salvia jurisicii* and *Alyssum bargalense*), as well as species with limited natural range in Macedonia, such as: *Hedysarum macedonicum, Galium rhodopaeum, Anchusa macedonica, Camphorosma annua, Allium maritimum, Hesperis tristis, Spergularia media, Stachys milani, Suaeda maritima, Alyssum hirsutum, Coriandrum sativum, Brassica elongata* ssp*. integrifolia, Potentilla tridentula, Neotortularia torulosa, Rochelia disperma, Onobrychis hypargyrea, Astragalus parnassi, Morina persica,* etc.

Important feature of the fauna on Bogoslovec is its richness and heterogeneity – Mediterranean species are found along with species typical of steppe and semisteppe areas. Resolution 6 under the Bern Convention includes: 3 species of invertebrates, 3 fish species, 2 amphibian species, 5 reptile species, 15 bird species and 8 mammalian species.

7.4.2 Emerald site "Bregalnica River Gorge"

Emerald site "Bregalnica River Gorge" has been identified for conservation of bird species included in Resolution 6 (type "A") and its ornithological (and other) values are presented in the section on the proposed Monument of Nature "DolnaBregalnica".

7.4.3 Emerald site "Maleshevski Planini Mts."

Emerald site "Maleshevski Planini Mts." is situated in the eastern part of Macedonia along the border with the Republic of Bulgaria and covers a surface area of 19160 ha. The area has been proposed for species and habitats conservation (type "C").

The following habitat types under Resolution 4 covering around 80% of the site are present in the area:

41.1 Beech forests
41.7 Thermophilous and supra-Mediterannean oak woods
42.62 Western Balkan Pinus nigra forests

Data on the presence of Resolution 6 species in this area, entered in the standard form for Emerald site, have been exceeded with the research during the preparation of the RPAN, as well as latest researches during 2014 and 2015, based on which the site "Chengino Kale" has been proposed for conservation.

7.4.4 Emerald site "Osogovski Planini Mts."

Emerald site Osogovski Planini Mts. covers a surface area of 56630 ha and overlaps to a great extent with the landscape "Osogovski Planini Mts." proposed for protection. The area has been proposed for species and habitats conservation (type "C").

The following habitat types under Resolution 4 are present in the area:

31.46 *Bruckenthalia* heaths
41.1 Beech forests
41.7 Thermophilous and supra-Mediterannean oak woods
54.2 Rich fens

Data on the presence of Resolution 6 species in this area, entered in the standard form for Emerald site, have been exceeded with the research during the implementation of the Project "Osogovski Planini Mts. In Balkan Green Belt" and researches during 2014 and 2015.

7.4.5 Emerald site "Ovche Pole"

Emerald site "Ovche Pole" has been identified for conservation of bird species included in Resolution 6 (type "A") and its ornithological values are described in the section on Important Bird Area "Ovche Pole".

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Annex 1

Table 11. Intersection between the proposed protected areas and municipalities

No	Area for protection	Category	Status of the area	Surface (ha)	Intersection with municipality	Surface of intersection (ha)	Percentage of the protected area (%)
1	**Murite**	MN	protected	62.50	Berovo	62.50	100
2	**Machevo**	MN	proposal	360.47	Berovo	360.47	100
3	**Adjinica**	SpNR	proposal	334.19	Vinica	334.19	100
4	**Berovsko Ezero**	PA	proposal	428.17	Berovo	428.17	100
5	**Gladno Pole**	SpNR	proposal	136.79	Shtip	136.79	100
6.1	**Dolna Bregalnica**	MN	proposal	8173.33	Gradsko	561.9	6.7
6.2		MN	proposal	8173.33	Lozovo	2580.68	31.57
63		MN	proposal	8173.33	Sveti Nikole	1022.57	12.51
6.4		MN	proposal	8173.33	Shtip	4008.19	49
7.1	**Dolna Zletovica**	PA	proposal	2139.47	Probishtip	1120.34	54.63
7.2		PA	proposal	2139.47	Cheshinovo-Obleshevo	930.37	45.37
8	**Gjuzumliska Reka**	SpNR	proposal	144.39	Lozovo	144.39	100
9.1	**Zrnovska Reka-Lisec**	SpNR	proposal	2327.56	Vinica	1060.27	45.55
9.2		SpNR	proposal	2327.56	Zrnovci	252.76	10.86
9.3		SpNR	proposal	2327.56	Karbinci	9.95	0.43
9.4		SpNR	proposal	2327.56	Radovish	1004.58	43.16
10	**Judovi Livadi**	SpNR	proposal	5.67	Pehchevo	5.67	100
11.1	**Kartal**	SpNR	proposal	592.79	Berovo	11,9	2
11.2		SpNR	proposal	592.79	Vinica	580.9	98
12	**Kukuljeto**	MN	proposal	97.92	Delchevo	97.92	100
13.1	**Mangovica**	SpNR	proposal	3270.61	Probishtip	438.28	13.19
13.2		SpNR	proposal	3270.61	Sveti Nikole	2839.32	86.81

14	**Ovche Pole**	SpNR	proposal	502.54	Sveti Nikole	502.54	100
15.1	**Salandzhak**	SpNR	proposal	1576.99	Valandovo	959.62	60.85
15.2		SpNR	proposal	1576.99	Konche	614.45	38.96
15.3		SpNR	proposal	1576.99	Strumica	2.92	0.19
16.1	**Sokolarci**	SpNR	proposal	503.21	Kochani	2.15	0.43
16.2		SpNR	proposal	503.21	Cheshinovo-Obleshevo	501.06	99.57
17	**Temniot Andak**	SpNR	proposal	47.69	Berovo	47.69	100
18	**Turtel**	MN	proposal	399.49	Karbinci	399.49	100
19.1	**Chengino Kale**	PA	proposal	2019.65	Berovo	257.46	12.75
19.2		PA	proposal	2019.65	Pehchevo	1748.92	86.60
20.1	**Osogovski Planini Mts.**	PA	proposal	74614.91	Vinica	1033.76	1.39
20.2		PA	proposal	74614.91	Kochani	26310.00	35.26
20.3		PA	proposal	74614.91	Kratovo	13188.91	17.68
20.4		PA	proposal	74614.91	Kriva Palanka	17553.00	23.52
20.5		PA	proposal	74614.91	Makedonska Kamenica	6085.02	8.16
20.6		PA	proposal	74614.91	Probishtip	7604.93	10.19
20.7		PA	proposal	74614.91	Rankovce	2837.15	3.8
20а.1	**Crvena Reka**	MN	proposal	352.86	Kriva Palanka	14.31	4.06
20а.2		MN	proposal	352.86	Makedonska Kamenica	338.55	95.94
20б	**Carev Vrv**	MN	proposal	461.05	Kriva Palanka	3.87	100
20в	**Ruen**	MN	proposal	75.58	Kriva Palanka	75.58	100

20г.1	**Zletovska Reka-Ratkova Skala**	SpNR	proposal	7659.66	Kochani	238.6	3.12
20г.2		SpNR	proposal	7659.66	Kratovo	3480.86	45.44
20г.3		SpNR	proposal	7659.66	Kratovo	3940.20	51.44
21	**Dzvegor**	NR	protected	5.35	Delchevo	5.35	100
22	**Oak, village Beli**	NR	protected	0.00	Kochani	-	-
23	**Morodvis**	NR	protected	0.00	Zrnovci	0.00	-
24	**Black Mulberry**	NR	protected	0.00	Probishtip	0.00	-
25	**Cave Konjska Dupka**	NR	proposal	24.17	Delchevo	24.17	100
26	**Trabotivishte**	NR	proposal	46.42	Delchevo	46.42	100
27	**Mocharnik**	NR	proposal	11.90	Shtip	11.90	100
28	**Nemanjica**	NR	proposal	3.00	Sveti Nikole	3.00	100
29	**Kiselichka Peshtera**	NR	proposal	3.42	Delchevo	3.42	100
30	**Pubescent oak trees – Trstenik**	NR	proposal	0.00	Sveti Nikole	-	-
31	**Daboski Andak**	NR	proposal	36.11	Berovo	36.11	100
32	**Pilav Tepe**	NR	proposal	27.95	Shtip	27.95	100
33	**Vulkanski Bombi**	NR	proposal	0.00	Probishtip	-	-
34	**Stamer**	NR	proposal	27.98	Delchevo	27.98	100
35	**Elensko Blato**	NR	proposal	13.35	Berovo	13.35	100
36	**Pehchevska Reka**	NR	proposal	8.22	Berovo	8.22	100