

ASPECTS REGARDING PROTECTED AREAS IN MUREȘ COUNTY

ASPECTE PRIVIND ZONELE PROTEJATE DIN JUDEȚUL MUREȘ

*PARASCHIV Nicoleta Luminița*¹, *BALAN I.*¹, *CHELARIU Elena-Liliana*^{1*}

*Corresponding author e-mail: julia@uaiasi.ro

Abstract. *The present work highlights the knowledge of certain endangered plants and animals from the reserves of Mureș County. They are of particular importance due to their role in maintaining the balance of natural ecosystems.*

Also, an important aspect of the knowledge of the diversity of the plant and animal world, but also the knowledge of the legislation in the field of the protection of endangered species, involves the responsibility of man in terms of reducing the imbalances caused by him.

Key words: Mureș, nature protection, protected areas

Rezumat. *Lucrarea de față scoate în evidență cunoașterea anumitor plante și animale periclitare din rezervațiile județului Mureș. Acestea au o deosebită importanță prin rolul lor în păstrarea echilibrului ecosistemelor naturale.*

De asemenea, un aspect important al cunoașterii diversității lumii vegetale și animale, dar și cunoașterea legislației în domeniul ocrotirii speciilor periclitare, implică responsabilizarea omului în ceea ce privește diminuarea dezechilibrelor provocate de acesta.

Cuvinte cheie: Mureș, ocrotirea naturii, arii protejate

INTRODUCTION

Mureș County, located in the heart of Transylvania, represents a region rich in history, culture, and natural resources. With a privileged geographical position and remarkable landscape diversity, it becomes the subject of a synthesis that aims to highlight the distinct features of this region, focusing on its protected areas. From fertile plains suited for agriculture, such as the Transylvanian Plain, to hills and the peaks of the Călimani Mountains, Mureș presents itself as a mosaic of landforms. The Upper Mureș Valley, with its spectacular gorges, offers an impressive landscape, while the Lipova Hills and the Gurghiu Mountains add to the natural diversity of the region. Additionally, the river of the same name holds tremendous importance: historical, cultural, economic, and recreational (fishing, navigation, and other leisure activities). The Mureș River has borne witness to notable events and personalities in Transylvanian history. The reflections of leaders like Burebista, Decebal, Iancu of Hunedoara, Michael the Brave, Horea, and Avram Iancu have mirrored in its waters. Here took place the 1848 Assembly in Blaj and the 1918

¹“Ion Ionescu de la Brad” University of Life Sciences, Iasi, Romania

Assembly in Alba Iulia. Mureș has inspired numerous geographical and historical studies conducted by scientists, served as a subject in poets' verses, been portrayed in artists' works, and celebrated in traditional songs and ballads. Thus, this place becomes a cultural and natural treasure, filled with historical and artistic wealth (Netea, 2006).

MATERIAL AND METHOD

Nature conservation is a current issue of great interest. The research material consists of the protected areas within Mureș County.

In Mureș County, protected areas are divided into three main categories: botanical (Zau de Câmpie Peony Reserve, Vălenii de Mureș Fritillary Reserve, Gurghiu Narcissus Glade), forest (the *Chamaecyparis lawsoniana* Arboretum at Sângeorgiu de Pădure, the Resonant Spruce in Lăpușna Forest, Mociar Forest, the Ancient Oaks at Breite, Downy Oak Reserve), and mixed (Deda - Toplița Gorge, Fărăgău Lake, Ursu Lake, Călimani National Park, and Săbed Forest).

For the development of this paper, documentation, analysis, and case studies were used as methods.

RESULTS AND DISCUSSIONS

This paper presents the most important aspects related to the protected areas in Mureș County.

Mureș County impresses with the beauty of its three botanical reserves: Zau de Câmpie Peony Reserve, Vălenii de Mureș Fritillary Reserve, and Gurghiu Narcissus Glade.

The Zau de Câmpie Peony Nature Reserve (fig.1) is located in the westernmost part of Mureș County, near the border with Cluj County, within the hydrographic basin of the Câmpie Creek. It lies within the administrative territories of the Zau de Câmpie and Valea Largă communes, in the central area of the Transylvanian Hills Depression. This reserve is a botanical treasure with an impressive history and a fascinating, mysterious legend. Established in 1932 by the academician Alexandru Borza, considered a pioneer of Romanian botany, the reserve was declared a natural monument the same year. With a remarkable history, the steppe peony (*Paeonia tenuifolia* L.) stands as a rare and protected species of exceptional beauty.

Initially founded on a modest area of 2.5 hectares, the reserve was saved from destruction in 1944 and expanded to 3.5 hectares due to the efforts of Marcu Sâncrăian. Marcu Sâncrăian's connection to this reserve began long ago, when he was only 10 years old. Inspired by Alexandru Borza's speech on the importance of peony conservation, given before the local farmers, Marcu took on this heavy responsibility at a very young age. Through his 60 years of dedication, Marcu Sâncrăian, along with his apprentice Octavian Călugăr, made substantial contributions to the development and preservation of this unique reserve, until his passing in 2008, as noted by the current custodian, Ciprian Cenan.

The reserve is divided into two distinct plots. Plot A was declared a botanical garden in 1932, and Plot B, covering an area of one hectare, was designated as a botanical garden in 1959–1960. With its light green, finely textured foliage and shrubs that reach heights of 10–30 cm, occasionally up to 50 cm, *Paeonia tenuifolia* stands out easily from other peony species. The flowering period occurs in the latter part of April and the first decade of May, lasting approximately 10 days. The flowers are solitary, about 5–7 cm in diameter, and range in color from blood-red to deep red, with an androecium consisting of yellow stamens (fig.2) (Buta *et al.*, 2009).



Fig.1. Zau de Câmpie Peony Reserve
<https://th.bing.com/th/id/R.123d1918a4c0a932b857c6476223978a?rik=GGRpcEiAVoWmQg&riu=http%3a%2f%2fstatic4.libertatea.ro%2fwp-content%2fuploads%2f2016%2f04%2fbujori-mare.jpg&ehk=jud9HN5yAatdY5lsSkCbhCVewR1piaxFR4ZjB%2fnmwFU%3d&risl=&pid=ImgRaw&r=0>



Fig.2. *Paeonia tenuifolia* – stamens
 (https://ardealnews.ro/wp-content/uploads/2017/04/bujori-1024x515.jpg)

The local legend adds a layer of mystery and romance, claiming that these peonies were born from the blood-red tears of a forester's daughter (hence the flowers' deep red color) who mourned her lost lover in a tragic love story.

Today, the reserve is cared for by honorary custodian Ciprian Cenan, who continues the tradition of protecting and developing this invaluable corner of nature. With a growing population, from under 10,000 individuals before 1950 to over 50,000 today, the Zau de Câmpie steppe peony is not only a botanical marvel but also a cultural treasure and a living expression of the bond between nature and local legend.

Beyond the beauty of these plants, recent studies show that the petals are rich in phenolic acids and flavonoids, and thus aqueous extracts from *P. tenuifolia* petals may be effectively used in therapeutic skin treatments (Čutović *et al.*, 2022).

A significant issue affecting this species is the attack of the pest *Epicometis hirta* (fig.3) from the order *Coleoptera*, family *Scarabaeidae*, also known as the hairy beetle, a polyphagous phytophagous species that feeds on the reproductive organs of a wide variety of species, including *Paeonia tenuifolia* (Vîrteiu *et al.*, 2022).



Fig.3. *Epicometis hirta*,

(https://www.zin.ru/ANIMALIA/Coleoptera/images/original/pristrem_2013_1_1.jpg)

The Gurghiu Narcissus Meadow is a protected area covering 3 hectares at the western foothills of the Gurghiu Mountains, within the administrative territory of Gurghiu commune. In this meadow, which predominantly features a mesohygrophilous hayfield, there are no less than 164 species of plants, including *Narcissus stellaris*, known as the star daffodil, for which this area was declared a reserve in 1993 (National Center for Information and Promotion of Tourism REGHIN).

From a scientific and phytosociological perspective, the reserve, due to its large number of continental species, belongs to the Junco-Molinietum type, according to Preising's classification from 1954. The picturesque landscape of this meadow is not solely defined by daffodils but also by the abundance of other flowers such as *Achillea ptarmica*, *Fritillaria meleagris*, *Gentiana pneumonanthe*, *Gladiolus imbricatus*, *Iris sibirica*, *Sanguisorba officinalis*, and *Succisa pratensis*. These elements contribute to a diverse palette of colors and shapes, giving the reserve a unique beauty and representing a natural treasure in the landscape of the Gurghiu Valley (Sămărghișan, 2002).



Fig.4. *Narcissus stellaris*

(http://turismreghin.ro/wp-content/uploads/2015/12/04_poiana_narciselor-f0233e0ab6443d0a068dd5e4e5f0bbec.jpg)

Vălenii de Mureș Fritillary Reserve represents a natural area of interest located in the Transylvanian Plain, at the northern edge of Mureș County, near the border with Bistrița-Năsăud County. This protected area is situated within the administrative territory of Brâncovenești commune, in the village of Vălenii de Mureș. The protected zone is characterized by a natural meadow with high humidity, located on the right bank of the Mureș River. Its specific habitat provides favorable conditions for the development of rare hydrophilic plant species, among which *Fritillaria meleagris* (snake's head or guinea-hen flower, guinea flower, leper lily) (fig.5), *Lychnis flos-cuculi* (ragged-robin), *Ranunculus repens*, and *Deschampsia caespitosa* (tufted hairgrass or tussock grass) stand out.

Fritillary (*Fritillaria meleagris*) is declared a natural monument and is a protected species. It is a perennial bulbous plant belonging to the family *Liliaceae*, with the genus *Fritillaria* containing 140 species worldwide; however, *Fritillaria meleagris* L. is the type species of this genus. It features distinct botanical characteristics, such as a semi-tunicate bulb, whitish adventitious roots, an erect unbranched stem, waxy and glabrous leaves, as well as terminal cup-shaped or bowl-shaped flowers with a checkered perianth in colors of purple, cream, or white. The ovary is superior, the capsule is loculicidal, and the seeds are flat, triangular, and curved (Tatarenko et al., 2022). The recognition of the fritillary as a natural monument highlights the importance of protecting and conserving this species. This reserve represents a distinct habitat, contributing to the conservation of local biodiversity by protecting and maintaining rare plant species adapted to the specific wet environment of the area. The establishment of this protected area ensures the preservation of the ecological balance and the natural beauty of this part of the Transylvanian Plain.



Fig.5. *Fritillaria meleagris*,

(https://th.bing.com/th/id/R.65c6699b11d7f57a07eb6f668d1db67c?rik=hSm4hlcPC5hBTg&riu=http%3a%2f%2f2.bp.blogspot.com%2f_BEaBUki7RnQ%2fTM6NTckN5SI%2fAAAAAAAABs%2fYiYPFUJm8%2fw1200-h630-p-k-no-nu%2fLuncaLaleaPestrita.jpg&ehk=2ZqaALCFQPvjeahO%2f2Oqg1zV/on5DFZf25xMKMJfok%3d&risl=&pid=ImgRaw&r=0)

The Mureș County encompasses a total of four mixed-type reserves: the Deda-Toplița Gorge, Lake Fărăgău, Lake Ursu, and Săbed Forest. These sites captivate with their remarkable biodiversity, hosting species recognized as natural monuments and exhibiting rare phenomena, some of which have led to world records.

The Upper Mureș Gorge, also known as the Mureș Gorge or the Toplița-Deda Gorge (fig.6), extends from the village of Vângani, a part of the Municipality of Toplița, to Bistra Mureșului. Within this gorge, particularly in the Toplița-Deda area, permanent grasslands support a rich diversity of flora, featuring approximately 74 species of cormophytes. Associations such as *Agrostetum stoloniferae* and *Poo-Trisetetum* are among the most diverse, while others like *Ranunculus repentis - Alopecuretum pratensis* are represented to a lesser extent. Vegetation coverage reaches 89%, with forage species accounting for 69% of the total, while detrimental species comprise 20% (Marușca, 2022).



Fig.6. Deda - Toplița Gorge,

(<https://th.bing.com/th/id/OIP.CdtX9I7GYRegkEfh7j7ggHaFB?rs=1&pid=ImgDetMain>)

As a mixed reserve, the gorge also features geological formations such as the "Scaunul Domnului" Natural Reserve, characterized by trapezoidal stone plateaus and impressive cliffs, the Gălăoia Sphinx, and the pseudokarst phenomenon of the "mold caves," which were discovered accidentally in 1988 by researcher More Karoly. Additionally, the gorge hosts three hunting grounds managed by the Mureș Forestry Directorate, providing hunting opportunities for species such as red deer, bear, capercaillie, and wild boar (Crăciun, 2019). Since 2007, this natural reserve has been included in the Upper Mureș Gorge Natural Park, covering a total area of 9,156 hectares. This park spans the communes of Stânceni, Lunca Bradului, Răstolița, and Deda, over a length of 33 kilometers.

Within the park lies an area of avifaunal importance that shelters bird species endangered at the European Union level, including *Aegolius funereus* (Boreal Owl) (fig.7), *Tetrastes bonasia* or *Bonasa bonasia* (Hazel Grouse) (fig.8), *Picoides tridactylus* (Eurasian Three-toed Woodpecker) (fig.9), *Dryocopus martius* (Black Woodpecker)

(fig.10), *Ficedula parva* (Red-breasted Flycatcher) (fig.11), and *Tetrao urogallus* (Western Capercaillie).

The etymology of these bird species' scientific names is quite intriguing. For instance, both the genus (*Bonasa*) and species name (*bonasia*) derive from the Latin name for the hazel grouse, with *bona* meaning "good" and *assum* referring to roasted meat, alluding to the species' game interest. The genus name *Dryocopus* combines the Greek words "dryos" (tree or oak) and "koptos" (cut or chopped), reflecting the birds' strong wood-chipping ability when they drill into trees. The species name *martius* is derived from the Latin "martius," meaning "crested," in reference to the red crest on the bird's head. As for the Red-breasted Flycatcher, the genus *Ficedula* has interesting origins, being the name of a small, fig-eating bird species, while *parva* derives from the Latin word meaning "small". Historically, the Toplița-Deda Gorge held a defining strategic significance during World War I. It was immediately subjected to engineering works following the Romanian army's decision to cross the borders into Transylvania. These works included trenches and military outposts, transforming the gorge into a preparation and defense site for Romanian forces. This strategic effort was essential in facilitating troop movement and securing control over this key area (Bogoșel, 2020).



Fig.7. *Aegolius funereus*

(https://pasaridinromania.sor.ro/resized/data/2021/07/29/aeg-fun-gal-laszlojpg_file_61026ddb2440f.jpg?w=2000)



Fig.8. *Tetrastes bonasia*,

(https://pasaridinromania.sor.ro/resized/data/2023/01/12/ierunca-alexandra-ionjpg_file_63bfb58ac1789.jpg?w=2000)

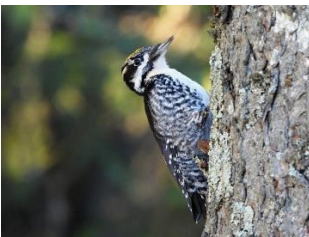


Fig.9. *Picoides tridactylus*

(https://pasaridinromania.sor.ro/resized/data/2021/06/09/pic-tri-helen-beatricejpg_file_60c09584b661f.jpg?w=2000)



Fig.10. *Dryocopus martius*

(https://pasaridinromania.sor.ro/resized/data/2021/06/09/dry-mar-marius-ianajpg_file_60c0b64718dcb.jpg?w=2000)



Fig.11. *Ficedula parva* (https://pasaridinromania.sor.ro/resized/data/2021/01/29/fic-par-marius-ianajpg_file_6014012e6e548.jpg?w=2000)

Lake Fărăgău, located in Mureș County within the Șar Stream basin, is a natural gem with exceptional ornithological and ecological significance. This 38-hectare aquatic area was declared a nature reserve in 1990 due to its remarkable diversity of plant and animal species. The reserve is internationally recognized, being included in the Ramsar List of Wetlands of International Importance, along with the entire chain of lakes along the Șar Stream. A distinctive feature of this area is its flora, particularly the associations formed by *Sphagnum* moss and the fern *Dryopteris thelypteris*. Noteworthy within the flora is *Lathyrus palustris*, a rare species in the *Fabaceae* family. Lake Fărăgău also hosts rare faunal species, such as *Darwinula zimmeri*, an ostracod crustacean, and the amphibian *Rana arvalis*, remarkable for its ability to freeze and then resume activity upon thawing. The lake is especially important for the presence of over 180 bird species, of which 40 are breeding, making it an essential habitat for local avifauna. Fishing restrictions, with sport fishing allowed only during certain periods, are in place during the nesting season to protect colonies of the rare *Nycticorax nycticorax* (night heron). Lake Fărăgău offers a unique opportunity for observing birds and aquatic life while contributing to the ecological balance of the ecosystem (Voicu, 2010).



Fig.12. *Darwinula sp.*
(<https://th.bing.com/th/id/OIP.Ba1Lpez3tNLRKC8wmXcltWHaD3?rs=1&pid=ImgDetMain>)



Fig.13. *Rana arvalis*
(<https://th.bing.com/th/id/OIP.VRvQEscp8h9PMbBGgeSXmgHaGL?rs=1&pid=ImgDetMain>)



Fig.14. *Nycticorax nycticorax*,
(<https://1.bp.blogspot.com/-Qi4H2VzERLg/Xvi8wnAlOII/AAAAAAAAA760/N0Dn761hshANGXN4gzBCykBX24ukQmidxwCLcBGA5YHQ/s1600/DSCN5848.JPG>)



Fig.15 A. Lake Făgăraș,
(<https://turismreghin.ro/item/lacul-faragau/#>)



Fig.15 B. Lake Făgăraș,
(https://th.bing.com/th/id/R.3807ddfab70d82229f673a8cc55d25ce?rik=OaiIdCs%2b4gwOxw&riu=http%3a%2f%2fturismreghin.ro%2fwp-content%2fuploads%2f2015%2f12%2f05b_lacul_faragau.jpg&ehk=d6KikaTNiqTBm5j2fyJkfn6hcENM8x1n469YM4fRF0E%3d&risl=&pid=ImgRaw&r=0)

Lake Ursu (fig.16 A and B) and the associated salt-tolerant forests constitute a natural reserve designated as a natural monument, located in Sovata commune. The lake's current outline was finalized in 1881 following the reactivation of some landslides. The name "Lake Ursu" was given by locals who noted that, when viewed from above, the lake resembles a stretched bear skin. In 1873, a prosperous local entrepreneur, I. Vereș, built a basin for cold baths and six cabins for hot baths downstream along the Sărat River. After Vereș's death, the balneary facilities were somewhat neglected due to inheritance disputes, and following the collapse of the site, Lake Ursu was formed. It is the only natural lake whose exact date of formation is known, earning it a world record. Lake Ursu was created following the collapse of a salt mining area on May 27, 1875. On that day, two salt guardians were gathering hay in the area when, at 11:00 a.m., a torrential rain perfectly filled the resulting collapse hole, thus forming the lake. This sudden and unexpected event led to the creation of Lake Ursu in its present form, as recorded by historian Jozsa Andras.



Fig.16. A. Lake Ursu,
(<https://instatravel.ro/wp-content/uploads/2023/07/incollage-save-73.jpg>)



Fig.16. B. Lake Ursu,
(https://planiada.ro/www/uploads/834/120.Lacul_Ursu_3.jpg)

In this depression, the Toplița and Auriu streams contributed to the formation of Lake Ursu (Voicu, 2010; Șerban et al., 2007). Lake Ursu features dual stratification, both saline and thermal, making it the largest heliothermal lake in Europe—a fact that has earned it a world record. Heliothermy was first observed by L. Ilieș in 1893. This phenomenon is defined by the vertical stratification of the temperature in the saltwater, whereby solar heat is concentrated and stored in the saline gradient area, a process further studied by Prof. Dr. Marius Sturza. The lake's water and mud have significant health benefits. The therapeutic value of the mud is also enhanced by the presence of *Artemia salina* (fig. 17), a primitive, salt-loving arthropod that, after its decomposition, leads to the formation of sapropelic mud with active mineral components. This mud has beneficial effects on locomotor system conditions, such as spinal deformities (scoliosis, kyphosis), osteoporosis prevention, and various types of rheumatism. Other health conditions positively impacted include respiratory issues (except for TB and acute stages): allergic rhinitis, bronchial asthma, asthma predisposition, pulmonary fibrosis, as well as gynecological issues like infertility, recurrent spontaneous abortion, uterine preparation for in vitro fertilization, and dermatological conditions (Munteanu et al., 2012; Șerban et al., 2006).

The flora within the scientific reserve "Lake Ursu and Saltwater Forests" showcases remarkable diversity, hosting 330 species of vascular plants belonging to 66 different botanical families, earning the lake a third world record. The most common families, with significant representation, include *Asteraceae* at 10.30%, *Poaceae* at 7.27%, *Fabaceae* at 6.66%, *Lamiaceae* at 5.45%, and *Rosaceae* at 5.15%. Particularly significant from a phytogeographical perspective are Carpathian endemic and subendemic species, such as *Aconitum lycoctonum subsp. moldavicum*, *Cardamine glanduligera*, and *Crocus banaticus*. The reserve also shelters protected species like *Cypripedium calceolus*, *Galanthus nivalis*, and *Narcissus poëticus subsp. radiiflorus*, listed in the European Red List of Vascular Plants. Given the saline environment, halophytic species are also present, such as *Aster tripolium*, *Plantago cornuti*, *P. maritima*, *Puccinellia distans subsp. distans*, *Puccinellia distans subsp. limosa*, *Salicornia europaea*, and *Triglochin maritima* (Frink et al., 2013).

The fauna comprises 301 animal species, of which 68 are legally protected. Extensive research covering all seasons addressed breeding, post-breeding, migration, and wintering periods. Of the 301 species, 118 are invertebrates and 184 are vertebrates. Strictly protected species include *Cerambyx cerdo*, *Lucanus cervus*, *Morimus funereus*, and *Rosalia alpina*. The avifauna is diverse, with species of *Passeriformes*, *Piciformes* (woodpeckers), and large predatory birds such as *Aquila pomarina*, *Bubo bubo*, and *Pernis apivorus* (Máthé et al., 2013).



Fig.17. *Artemia salina*

(<https://cdn.thinglink.me/api/image/646377259027922944/1024/10/scaletowidth/0/0/1/1/false/true?wait=true>)

Located in the commune of Ceaușu de Câmpie, Mureș County, Săbed Forest (fig. 18) was planted between 1892 and 1899, covering a total area of 59 hectares and serving both dendrological and ornithological purposes. Regarding the flora, the inventory of woody species conducted in 1993 lists 75 species. The area falls within the phytoclimatic level of *Quercus robur* (oak) and *Quercus petraea* (sessile oak, irish oak or durmast oak,) forests. This richly vegetated zone supports highly diversified fauna. Among large mammals, *Capreolus capreolus* (roe deer) find shelter in dense shrubs, as well as *Sus scrofa* (wild boar). Predators in the area include *Vulpes vulpes* (fox), ermine, and *Mustela nivalis* (weasel). The avian fauna is also well represented; between 1960 and 1969, 105 bird species were inventoried (<https://www.apmms.ro/>).



Fig.18. Săbed Forest, (<https://www.skytrip.ro/images/obiective/judet/Mures/bigs/Rezervatia-naturala-Padurea-Sabed-20110311141629.jpg>)

Forest-type reserves are the most common, with each reserve centered around a predominant species. Thus, we have five reserves named as follows: the *Chamaecyparis lawsoniana* Arboretum at Sângeorgiu de Pădure, Resonance Spruce in Lăpușna Forest, Mociar Forest, the Ancient Oaks of Breite, and the Downy Oak Reserve.

The natural area is located in the southeastern part of Mureș County, near the border with Harghita County, and spans the administrative territory of Fântânele commune, in the village of Roua. This reserve is situated in the hilly depression of Transylvania, in the river basin of the Târnava Mică. The forest hosting the California cypress (*Chamaecyparis lawsoniana*) (fig. 19) is situated within the forest belt of hill

beech forests and represents a medium-production artificial forest with *Asperula-Asarum*-type flora. This forest is also of scientific interest and is classified as seed reserve I-240-I. The California cypress, now over 75 years old, grows in a protected area and coexists with naturally regenerating *Fagus sylvatica* (beech), aged between 30 and 60 years, and *Carpinus betulus* (hornbeam).

The forest is not natural, as *Chamaecyparis lawsoniana* is a long-lived conifer native to northwest California and southwest Oregon. This species has become a notable presence in horticulture, quickly spreading throughout North America and beyond, even reaching Romania. Known for its ornamental beauty, the California cypress is valued for its distinctive characteristics, making it a popular choice in landscaping. Besides its decorative role, researchers have highlighted numerous uses, such as its insecticidal activity, especially against termites. The seed extracts of this species have also shown juvenile activity against the yellow mealworm *Tenebrio molitor*. Leaf extracts from *Chamaecyparis lawsoniana* have demonstrated antiviral activity against herpes simplex virus type 2, while immature cones (fig. 20) exhibit antibacterial effects (Smith et al., 2007).

From a fauna perspective, this natural area does not stand out for scientific interest, adopting characteristics specific to deciduous forests in the hilly region. Nevertheless, the diversity of wildlife contributes to the delicate balance of the local ecosystem (APM Mureș, 2010).



Fig.19. *Chamaecyparis lawsoniana*

(https://th.bing.com/th/id/R.8d0a25b5d50561af1cd95928daa62980?rik=d9G91G%2b84yTgmA&riu=http%3a%2f%2fgardenbr.eizh.org%2fmodules%2fpix%2fcache%2fphotos_600000%2fG BPIX_photo_606521.jpg&ehk=iiTF13kO3%2biuhpXGsKKRg%2b7ETPMcAYQFzvK1S4WHQj4%3d&risl=&pid=ImgRaw&r=0)



Fig.20. Strobili, (https://www.pepinieres-bazainville.fr/adm/images/33_actualites4a894472d995e.jpg)

The “Ancient Oaks of Breite” Reserve, located in the Târnava Plateau near the border between Mureș and Sibiu counties, covers an area of 70 hectares and is managed by the town of Sighișoara. This reserve is particularly known for the impressive presence of ancient oaks, though the diversity of herbaceous vegetation, comprising 476 species and subspecies of vascular plants, also significantly contributes to the overall biodiversity of the area. The origins of the Ancient Oaks of Breite Reserve date back to a long tradition of grazing, as suggested by historical documents and the area’s name, “Breite” (meaning “width” in German). Although the first documented mentions date back to 1721, there is indirect evidence indicating that grazing occurred in this area as early as the 16th century, a period when grazing in legally owned forests began to be regulated. This centuries-old grazing tradition has significantly contributed to forming the distinctive forest-pasture landscape of Breite. Breite is an open area containing over 630 mature oaks, scattered or locally grouped. The species found include *Quercus robur* (fig. 21) and *Q. petraea*, of which approximately 400 are several centuries old (400-600 years), marking a significant presence in this area. The forest is of a mixed type, including hornbeam (*Carpinus betulus*) and beech (*Fagus sylvatica*). Information from the Mihai Eminescu Trust indicates that this wooded pasture partially originated through the opening of the surrounding forest, protecting natural regeneration, and planting trees. These trees were subjected to crown cutting practices to encourage the development of a larger and denser crown. These traditional land management methods have been used to maintain these specific habitats in Europe and the Transylvania region since the Middle Ages.

According to the classification used by Anastasiu and Negrean (2009), the species can be grouped based on their frequency in the reserve, with common species such as *Erigeron annuus subsp. annuus*, *Erigeron annuus subsp. strigosus*, *Galinsoga parviflora*, and *Juncus tenuis*. Widespread species include *Amaranthus powellii*, *Amaranthus retroflexus*, *Chamomilla suaveolens*, *Erechtites hieracifolia*; rare species include *Acer negundo*, *Asclepias syriaca*, *Conyza canadensis*, *Oxalis fontana*, *Oxalis stricta*, and locally abundant species include *Rudbeckia laciniata*, *Solidago canadensis*, *Solidago gigantea subsp. serotina*. To limit their future presence and spread in the herbaceous layer, individuals of the following species have been manually removed (including roots): *Asclepias syriaca*, *Rudbeckia laciniata*, *Solidago canadensis*, *Solidago gigantea subsp. serotina*. Among the species, only three are included in the European Red List of Vascular Plants, namely: *Dactylorhiza incarnata* (fig. 22), *Gymnadenia conopsea* (fig. 23), and *Platanthera bifolia* (fig. 24), and none are listed in the Red Book of Vascular Plants of Romania (Öllerer, 2012, 2013).

The reserve is divided into six zones (fig. 25), three of which benefit from strict protection (D, E, F). This reflects a careful and specific approach to environmental conservation and protection.



Fig.21. *Quercus robur* (<http://lh6.ggpht.com/-0L3NCXYZ-5M/S4-0Lgul4h/AAAAAAAAAFDU/Vh5TM4WfMWM/DSCF1409.JPG?imgmax=912>)



Fig.22. *Dactylorhiza incarnata*,

(https://th.bing.com/th/id/R.f202a931af33ec6e44f2d4325a230b79?rik=kZ4qZqdBMHpzGQ&riu=http%3a%2f%2fwww.plantsystematics.org%2fusers%2fsuneholt%2f7_13_18_s%2f9.jpg&ehk=52dpzULjPYGTEksC2NxqL4MeCwKqdiNLRpeQv2ReGZE%3d&risl=&pid=ImgRaw&r=)



Fig.23. *Gymnadenia conopsea*, (<https://newfs.s3.amazonaws.com/taxon-images-1000s1000/Orchidaceae/gymnadenia-conopsea-ha-bhamlin.jpg>)



Fig.24. *Platanthera bifolia*, (https://www.i-flora.com/fileadmin/website/daten/tax_otos/Platanthera_bifolia.jpg)



Fig. 25. Reservation areas, (<http://lh6.ggpht.com/-VsKd1fbj2ic/S5XDNiVoYEI/AAAAAAAAAFRA/wfRcYoltrG4/harta-breite.jpg?imgmax=912>)

Mociar Forest (fig. 26), located in the Gurghiu Valley, has been a focus of conservation efforts since the interwar period. The establishment of the Commission for Natural Monuments in 1930 coincided with the first measures to

protect forest ecosystems in this area, and Mociar Forest was recognized as a natural monument in 1932. At that time, Professor Al. Borza highlighted the scientific importance of the oaks in Mociar Forest, which were threatened with destruction. In 1932, the Commission for Natural Monuments declared this area a natural monument, covering an area of 48 hectares and 8,200 square meters, with permanent protection instituted by the Journal of the Council of Ministers (JCM) 1149/1932. Mociar Forest represents a site of significant scientific importance, with a population of oaks aged between 400 and 500 years and a density of 10 centuries-old oaks per hectare. However, most of these trees are dry, and numerous studies have addressed this issue, while artificial regeneration poses risks to the survival of the remaining oaks. The Mociar Forest ecosystem is listed in the IUCN records, belonging to the Palearctic realm and the Central European Forest Province. This reserve has notable floristic diversity, including endangered, vulnerable, or rare species from Romania's red lists of higher plants, such as *Achillea ptarmica*, *Fritillaria meleagris*, *Gentiana pneumonanthe*, *Narcissus radiiflorus*, *Epipactis helleborine*, *Monotropa hypopitys*, and *Platanthera bifolia* (Sămărghișan, 2002). One of the main causes analyzed for the drying of the oaks was an examination of the physical and chemical properties of the soil. The study proposes creating nine soil profiles located in areas considered representative of the studied region and identifying key physical and chemical parameters in the laboratory (soil pH, nitrogen content, total humus, and the C ratio). The study's conclusions indicate that GIS (Geographic Information Systems) spatial interpolation techniques allow for the identification of soil parameter variations over relatively small areas. Spatial analysis identified favorable and unfavorable areas for the existence and development of forest species. In light of the forest's poor health, sustained measures are recommended to improve vegetation conditions, continuously monitor forest health, and promptly adopt measures to counteract negative effects (Mîndru et al., 2017).

The Downy Oak Reserve (fig. 27) is a nationally protected natural spot located in the heart of Transylvania, in Mureș County. Located in the Târnava Plateau, near the border with Sibiu County, in the commune of Daneș (Criș village), this reserve covers approximately 11.90 hectares and is distinguished by its picturesque landscapes. The Downy Oak Reserve is part of the Sighișoara - Târnava Mare Community Site and is notable for its forests of Downy Oak (*Quercus pubescens*), where xerophytic herbaceous vegetation develops on steep slopes, sometimes with an incline of up to 45 degrees and southern exposure. These topographic conditions provide ample sunlight, thus supporting the development of this distinctive habitat. Situated in the Criș area, the reserve is also known as the Stejarul Natural Reserve. Alongside it, other notable species include *Cornus sanguinea* and *Ligustrum vulgare*, adding to the local biodiversity's distinct character (Stanciu et al., 2012).



Fig.26. Mociar Forest

(<https://editiadedimineata.ro/wp-content/uploads/2019/05/padure-reprez.jpg>)



Fig. 27. Oak Reserve

(<https://www.skytrip.ro/images/obiective/judet/Mures/biggs/Rezervatia-de-stejar-pufos--Sighisoara-20101202141420.jpg>)

The Resonance Spruce in Lăpușna Forest (fig. 28) is a protected area of particular significance, part of the Călimani - Gurghiu Community Site. Located in the easternmost part of Mureș County, in the Gurghiu Mountains, this forested area hosts tree species such as spruce (*Picea abies*) over 170 years old, representing 90% of the total, and beech (*Fagus sylvatica*) accounting for 10%. The area is administratively part of Ibănești commune, Lăpușna village (fig. 29) (Olga Băltescu, 2009). Resonance spruce is especially sought after in the musical instrument industry for products such as violins, guitars, and pianos. This wood provides superior acoustic quality due to its unique resonance properties. For instance, in violin construction, two main wood types are used: resonance spruce and maple (Stanciu et al., 2020).

This reserve is not only an exceptional forest environment but also a vibrant habitat for diverse fauna. It is home to various mammals and birds, some of which are protected under the European Council Directive or are listed in the IUCN Red List. Notable examples include the brown bear, deer, roe deer, gray wolf, red fox, Eurasian lynx, wildcat, pine marten, and capercaillie. This biological diversity contributes to a remarkable ecological balance and underscores the importance of conserving this valuable ecosystem (Neagu et al., 2012).



Fig.28. Lăpușna Forest

(<https://th.bing.com/th/id/R.b5593dfb4fdd1e40009a40ccff0db4bf?rik=vBXZi3b1JctNYg&riu=http%3a%2f%2ffromanianturism.com%2fwp-content%2fuploads%2f2013%2f09%2flapusna1.jpg&ehk=uWDpNYgpVF%2fS%2fEVgloTF3Gir5WdQQ2RB1tH9WT5v5fE%3d&risl=&pid=ImgRaw&r=0>)

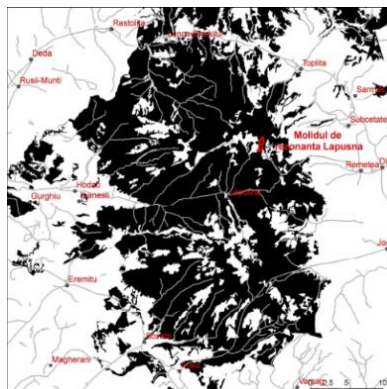


Fig.29. Location of the reserve (Olga Băltescu, 2009)

In the territory of Mureș County, as well as in three other counties—Suceava, Harghita, and Bistrița-Năsăud—lies the Călimani National Park. The mountainous area of the Călimani represents the largest extinct volcano in the Carpathian chain, spanning an immense area of over 24,000 hectares, and has held National Park status since 2002 (Chirita, 2012). The county also includes a natural park, called the Upper Mureș Gorge Natural Park, which was presented previously.

CONCLUSIONS

In Mureș County, there are three large categories of protected areas, namely: botanical, forest and mixed.

The botanical reserves are: Zau de Câmpie peony reserve, Vălenii de Mureș variegated tulip reserve, Gurghiu daffodil glade.

There are five forest-type protected areas, namely: the *Chamaecyparis lawsoniana* Sângeorgiu de Pădure grove, the resonance spruce of the Lăpușna Forest, the Mociar Forest, the secular oaks of Breite, the downy oak reserve.

The mixed types are: Dede - Toplița Gorge, Farăgău Lake, Ursu Lake, Călimani National Park, Săbed Forest.

The importance of knowing these protected areas contributes to maintaining the balance of the ecosystem and reducing the negative effects on nature.

REFERENCES

1. **Băltescu Olga, 2009** - *Le rôle de l'infrastructure de transport dans la fragmentation des paysages naturels des réserves naturelles l'épicéa de résonance de Lăpușna (les Carpaties Orientales) et les Hauts de Chartreuse (les Alpes françaises)*. Rev. Roum. Géogr./Rom. Journ. Geogr., 54(2):171–179, București.
2. **Bogoșel C., Persu T. H. A., 2020** - *Military elites in the battles in the upper mureș valley between 1916-1918, the dialogue of multicultural discourses*, Section: History, Political Sciences, International Relations, p. 165.
3. **Chirita V., Matei D., 2012** - *The relational articulation between communities and protected areas in the Dorna-Calimani mountain area (the eastern Carpathians of Romania)*. International Multidisciplinary Scientific GeoConference: SGEM, 4, p. 1177.
4. **Crăciun A. M., 2019** - *Natural tourist potential in the superior gorge of Mureș-Mureș county*. Multiculturalism through the lenses of literary discourse, p. 306.
5. **Čutović N., Marković T., Kostić M., Gašić U., Prijčić Ž., Ren X., Bugarski B., 2022** - *Chemical Profile and Skin-Beneficial Activities of the Petal Extracts of *Paeonia tenuifolia* L. from Serbia*. Pharmaceuticals, 15(12):1537.
6. **Buta Erzsebet, Cantor Maria, Zaharaia D., Dumitraș Adelina, Zaharia A., Sabo Georgeta, Buta M., 2009** - *Description of some Spontaneous Species and the Possibilities of Use Them in the Rocky Gardens*. Journal of Plant Development, 16: 81-86
7. **Frink J. P., Balázs E., Máthé I., 2013** - *Floristic surveys in the Lake Ursu Nature Reserve and adjacent areas (Sovata, Transylvania, Romania)*. Bruckenthal Acta Musei, 8(3):531-546.
8. **Marușca T., Oroian S., Dragoș M. M., Porr C., 2022** - *Contributions to the assessment of grassland habitats productivity in the Mureș Gorge*. Academy of Romanian Scientists Series on Agriculture, Silviculture and Veterinary Medicine Sciences, 11(2): 29-43.

9. Máthé I., Sándor A. D., Balázs E., Domșa C., 2013 - *Contribution to the knowledge of the vertebrate and invertebrate fauna of Sovata area*. Brukenthal. Acta Musei, VIII. 3:517-530.
10. Mîndru M., Păcurar I., Roșca S., Bilașco Ș., Păcurar H., 2017 - *Research Regarding the Soil Characteristics and their Influence on Forest Productivity in the Mociar Forest, Mureș County*. Bulletin UASVM Horticulture, 74(2):155-163
11. Munteanu C., Munteanu D., 2012 - *Ape terapeutice clorurate–sodice*. Editura Balneară, Bucharest
12. Neagu M. L., Irimuş I. A., 2011 - *Windthrows and snow breaks in the forests of the morphohydrographic Gurghiu basin*. Studia Universitatis Babeş-Bolyai, Geographia, (2).
13. Netea V., 2006 - *Mureșul superior-vatră de cultură românească*. Editura CUVÎNTUL, Bucharest
14. Öllerer K., 2012 - *The flora of the Breite wood pasture (Sighișoara, Romania)*. Brukenthal Acta Musei, 7(3), p. 589-604.
15. Öllerer K., 2013 - *The vegetation of the Breite woodpasture (Sighișoara, Romania)- history, current status and prospects*. Brukenthal Acta Musei, 8(3), p. 547-566.
16. Sămărghișan Mihaela, 2002- *Realizări în domeniul ocrotirii naturii pe Valea Gurghiului*. 23., Revista ECOS Magazine, www.ecos-magazine.com
17. Serban G., Alexe M., 2006 - *The capitalization of sovata salt lakes in the context of the investments made by "Danubius" international concern*. In Forum Geografic, 5, p.83.
18. Smith E. C., Williamson E. M., Wareham N., Kaatz G. W., Gibbons S., 2007 - *Antibacterials and modulators of bacterial resistance from the immature cones of Chamaecyparis lawsoniana*. Phytochemistry, 68(2), p. 210-217.
19. Stanciu Mirela, Ciortea G., Sand Camelia, Tănase Maria, Blaj R., 2012 - *Study on the capitalization in a tourism purpose of the zoo-pastoral heritage of the protected areas Natura 2000*. Journal of Horticulture, Forestry and Biotechnology, 16(3), p. 108-111.
20. Stanciu M. D., Dinulica F., Gliga V. G., Câmpean M., 2020 - *Structural patterns of resonance wood used in violin constructions*. Transilvania University Press of Brașov
21. Șerban G., Alexe M., Touchart L., 2007 - *La gestion durable des lacs salés de Sovata ((Transylvanie, Roumanie)*. In Dialogues Européens d'Evian
22. Tatarenko I., Walker K., Dyson M., 2022 - *Biological Flora of Britain and Ireland: Fritillaria meleagris*. Journal of Ecology, 110(7), p. 1704-1726.
23. Vîrteiu A. M., Rof M., Grozea I., 2022 - *Analytical study of the colored traps effectiveness in monitoring epicometis hirta (PODA, 1761) in rapeseed crops*. Romanian Journal for Plant Protection, 15.
24. Voicu D., 2010 - *Valorificarea turistică a lacurilor din județul Mureș*. <https://www.limnology.ro/water2010/Proceedings/60.pdf>