

VEGETATION MAP OF THE NORTHERN SLOPE OF THE VLĂDEASA MOUNTAIN (APUSENI MOUNTAINS, ROMANIA)

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Abstract: The present vegetation study was elaborated on the basis of geo-referenced phytocoenological relevés carried out in 2007–2010 on the northern slope of the Vlădeasa Mountain. 150 representative relevés for the woody and herbaceous vegetation were selected from a total of 387. These were grouped in 16 plant associations, based on their coenotic affinity and ecological requirements, and represented in a large-scale vegetation map. Of these, six scrub and forest associations were grouped in the class *Vaccinio-Picetea* and four forest associations in the class *Carpino-Fagetea*. Among the six herbaceous associations included in the classes *Nardetea strictae* and *Molinio-Arrhenatheretea*, only the association *Potentillo aureae-Festucetum supinae* has a primary character.

Key words: Apuseni Mountains, phytosociological relevé, spatial distribution, syntaxonomic classification

Introduction

Present (current) vegetation maps based on syntaxa distribution within a territory have both scientific and economic importance. Apart from the spatial distribution of syntaxa (plant associations), they are an expression of the variation of the floristic composition and biodiversity at the coenotic level [3, 10]. Current vegetation maps provide the scientific basis for periodic monitoring of habitat types in the studied territory and, at the same time, they can reveal the syndynamics of phytocoenoses determined by the change in climatic conditions and the zoo-anthropogenic pressure in the area [5]. Large-scale vegetation maps facilitate protection of rare taxa by unravelling fluctuations that occurred over time in the areas where they live and the environmental conditions that generate these changes [8]. From the economic point of view, the vegetation maps provide grasslands scientists and forest managers valuable data clear for assessing the bioproductivity of natural ecosystems and increasing their productivity through appropriate techniques. The geobotanical mapping of grasslands in different regions of Romania [1, 14, 19] has aimed to represent their typology and group them according to their productivity, in order to elaborate measures of improvement. In forestry, mapping of forest formations was initially based on the floristic structure of forest types [9]. The ecosystem concept of forest typology was adopted in the second half of the 20th century and applied in the monograph "Types of forest ecosystems in Romania" [7].

Based on the geobotanical research carried out in the Vlădeasa Mountain between 2007 and 2010, corroborated with some previously published data [12, 13, 15], we aimed at elaborating the large-scale vegetation map of the northern slope of the Vlădeasa Mountain, covering the territory between the Drăganului and Săcuieului Valleys. The map will be useful, equally, to local administrations for an appropriate land management and to researchers for monitoring some rare syntaxa and habitats in the area.

Material and Methods

The territory under investigation is located between Drăganului Valley (West), Săcuieului Valley (East), Vlădeasa Peak (1836 m) (South) and Bologa (520 m) (North) and is partly included in the ROSPA0081 Munții Apuseni-Vlădeasa Special Protection Area (Fig. 1). Other localities situated within this territory are Rogojel, Vişagu, Săcuieu, Tranişu, Lunca Vişagului and Valea Drăganului. In recent decades these localities have depopulated continuously, although the economic potential of the grasslands in the area offers favourable conditions for developing animal husbandry.

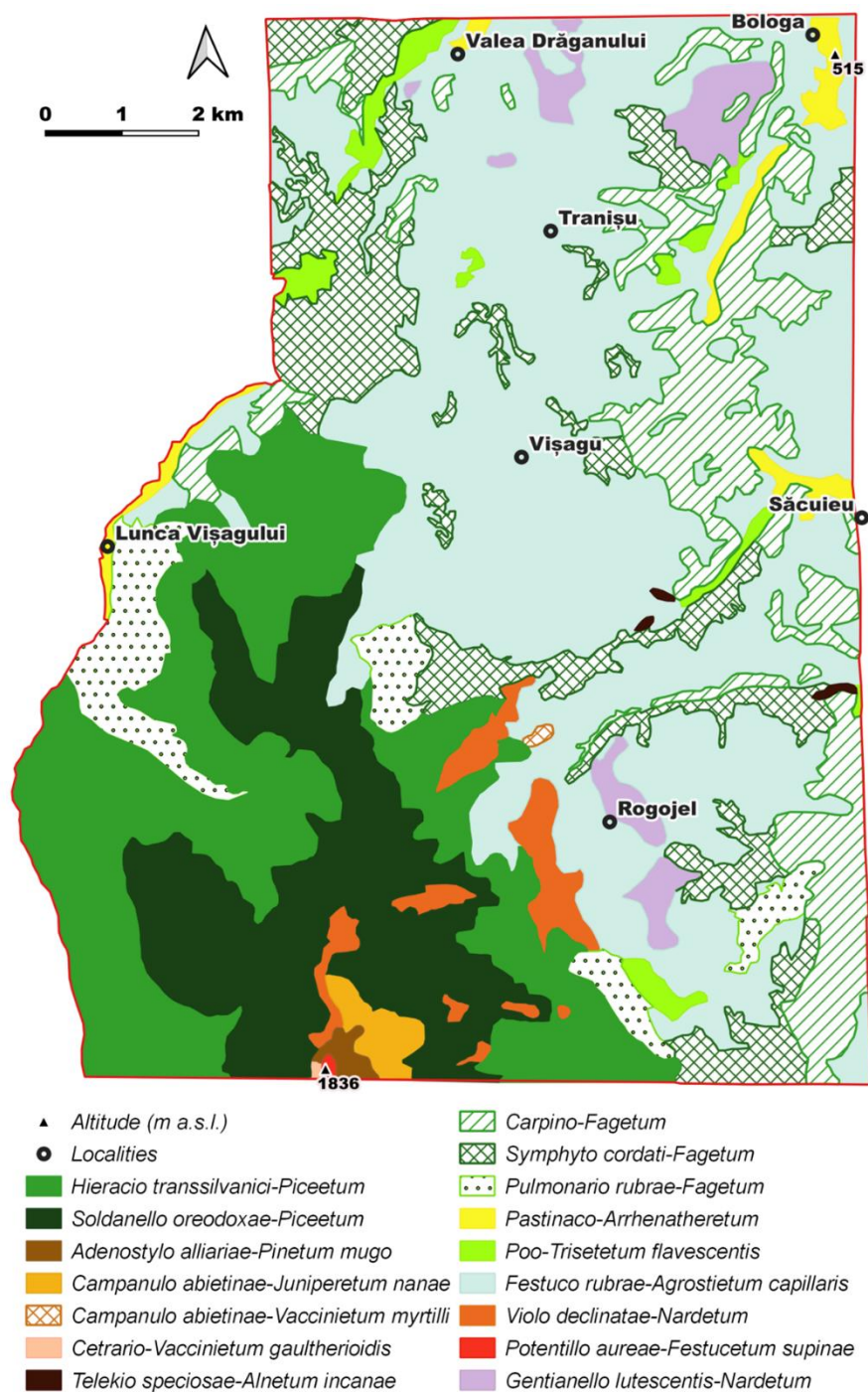


Fig. 1: Vegetation map of the northern slope of the Vlădeasa Mountain

The relevé method of Braun-Blanquet (1964) [2] was used to sample the vegetation. Vegetation relevés were carried out in 1 km² grid cells. The area of vegetation plots was 25 m², 100 m² and 400 m² respectively for grasslands, shrubs and forests. The taxonomy and nomenclature of plant species followed Sârbu et al. (2013) [16]. We grouped the relevés into plant associations (syntaxa) based on characteristic and differential species. Since several associations were published in the last century from the studied area, with names non-conforming with the nomenclature code [12, 14], we updated their names according to the 4th edition of the International Code of Phytosociological Nomenclature [18]. The large-scale vegetation map represents the distribution of plant associations. Each mappable association is floristically characterized by at least 5 relevés and the species frequencies by plant association is presented in a separate column in three synthetic tables. The boundaries of vegetation units were digitized in QGIS Geographic Information System [11], taking into account the georeferenced phytosociological relevés.

Results and Discussion

The plant associations (syntaxa) distinguished were classified into 4 distinct vegetation classes, according to the following scheme:

I. Cls. *Vaccinio-Piceetea* Br.-Bl. in Br. -Bl. et al. 1939 (Tabel 1)

Ord. *Piceetalia* Pawl. in Pawl. et al. 1928

All. *Piceion abietis* Pawl. et al. 1928

1. Ass. *Hieracio transsilvanici-Piceetum* Pawl. et Br. -Bl. 1939

(Syn.: *Piceetum montanum* subas. *austro-carpaticum* Borza 1959)

2. Ass. *Soldanello oreodoxae-Piceetum* Coldea et Wagner 2015

(Syn.: *Piceetum subalpinum* Resmeriță 1970)

(Syn.: *Vaccinio-Junipero-Piceetum subalpinum* Rațiu et Gergely 1970)

Ord. *Junipero-Pinetalia mugo* Boșcaiu 1971

All. *Pinion mugo* Pawl. in Pawl. et al. 1928

3. Ass. *Adenostylo alliariae-Pinetum mugo* (Sillinger 1933) Šoltésová 1974

All. *Junipero-Bruckenthalion* (Horvat 1949) Boșcaiu 1971

4. Ass. *Campanulo abietinae-Juniperetum nanae* Simon 1966

5. Ass. *Campanulo abietinae-Vaccinietum myrtili* Boșcaiu ex. Coldea 1991

All. *Loiseleurio-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926

6. Ass. *Cetrario-Vaccinietum gaultherioidis* Hdač ex Šibík et al. 2007

II. Cls. *Carpino-Fagetea* Jakucs ex Passarge 1968 (Tabel 2)

Ord. *Fagetalia sylvaticae* Pawl. 1928

All. *Alnion incanae* Pawl. 1928

7. Ass. *Telekio speciosae-Alnetum incanae* Coldea 1990

All. *Lathyro hallersteinii-Carpinion* (Soó 1964) Boșcaiu 1979

8. As. *Carpino-Fagetum* Paucă 1941

All. *Symphyto cordati-Fagion* (Vida 1963) Tauber 1987

9. Ass. *Symphyto cordati-Fagetum* Vida 1959

10. Ass. *Pulmonario rubrae-Fagetum* (Soó 1964) Tauber 1987

(Syn.: *Pulmonario-Abieti-Fagetum* Soó 1964)

III. Cls. *Molinio-Arrhenatheretea* Tx. 1937 (Tabel 3)

- Ord. *Arrhenatheretalia elatioris* Pawl. 1928
 All. *Arrhenatherion elatioris* W. Koch 1926
 11. Ass. *Pastinaco-Arrhenatheretum* Pass. 1964
 12. Ass. *Poo-Trisetetum flavescens* (Knapp 1951) Oberd. 1957
 All. *Cynosurion* Tx. 1947
 13. Ass. *Festuco rubrae-Agrostietum capillaris* Horv. 1951
 IV. Cls. *Nardetea strictae* Rivas Goday in Rivas Goday et Rivas Mart. 1963 (Tabel 3)
 Ord. *Nardetalia strictae* Oberd. ex Preisig 1949
 All. *Nardo-Agrostion tenuis* Sillinger 1933
 14. Ass. *Violo declinatae-Nardetum* Simon 1966
 (Syn.: *Nardetum strictae montanum* Resmeriță et Csürös 1963)
 15. Ass. *Potentillo aureae-Festucetum supinae* Resmeriță 1970 corr. h. l.
 All. *Violion caninae* Schwickerath 1944
 16. Ass. *Gentianello lutescentis-Nardetum* Coldea et al. 2008

Table 1: Floristic composition of coniferous forests and subalpine shrubs in the studied area (HtP-*Hieracio transsilvanici-Piceetum*; SoP-*Soldanella oreodoxae-Piceetum*; AnPm- *Adenostylo alliariae-Pinetum mugo*; CaJ- *Campanulo abietinae-Juniperetum nanae*; CaV- *Campanulo abietinae-Vaccinietum myrtilli*; CV-*Cetrario-Vaccinietum gaultherioidis*)

Name of the association	HtP	SoP	AnPm	CaJ	CaV	CV
No. of relevés	7	5	5	6	5	5
Altitude (m a.s.l.)	800- 1100	1200- 1500	1700- 1800	1500- 1800	1600- 1800	1700- 1830
Species frequency (cover)	%	%	%	%	%	%
Char. ass.						
<i>Hieracium transsilvanicum</i>	86 ¹	20	-	-	-	-
<i>Euphorbia carniolica</i>	29	-	-	-	-	-
<i>Soldanella oreodoxa</i>	-	80	20	100	33	60
<i>Laserpitium krapfii</i>	-	80	40	17	20	60
<i>Adenostyles alliariae</i>	-	-	40	-	-	-
<i>Aconitum variegatum</i>	-	-	60	33	-	-
<i>Campanula abietina</i>	43	80	40	50	80	-
<i>Calamagrostis villosa</i>	-	40	100	83 ²	60	-
<i>Festuca supina</i>	-	-	-	-	20	100
<i>Cetraria islandica</i>	-	-	40	100	20	100
<i>Vaccinium gaultherioides</i>	-	-	-	-	-	100 ³
<u>Piceion et Junipero-Bruckenthalion</u>						
<i>Pinus mugo</i>	-	-	100 ⁴	-	-	-
<i>Luzula sylvatica</i>	57 ²	100	60	33	50	-
<i>Vaccinium myrtillus</i>	71	100	100	100 ¹	100 ⁵	60
<i>Lycopodium annotinum</i>	43	20	20	17	-	-
<i>Homogyne alpina</i>	71	80	100	50	50	60
<i>Phegopteris connectilis</i>	43	-	-	-	-	-
<i>Vaccinium vitis-idaea</i>	14	40	60	100 ¹	100 ¹	100
<i>Athyrium filix-femina</i>	43	60	-	-	-	-
<i>Coralliorhiza trifida</i>	14	-	-	-	-	-
<i>Juniperus communis</i> ssp. <i>alpina</i>	14	80	80	100 ⁴	17	40
<u>Vaccinio-Picetalia (incl. V.-Piceetea)</u>						
<i>Picea abies</i>	100 ⁵	100 ⁴	40	83	17	-
<i>Abies alba</i>	29	-	-	-	-	-
<i>Oxalis acetosella</i>	86	40	20	33	-	-
<i>Deschampsia flexuosa</i>	43	60	100	100 ¹	100 ²	100
<i>Dryopteris dilatata</i>	57	20	40	17	-	-

<i>Hylocomium splendens</i>	43	80	100	100 ³	17	80 ²
<i>Pleurozium schreberi</i>	29	40	20	50	-	17
<i>Dicranum scoparium</i>	71	40	20	50	60 ²	60 ²
<i>Polytrichum commune</i>	-	-	-	50	60 ¹	60
<u>Companions</u>						
<i>Acer pseudoplatanus</i>	14	-	-	-	-	-
<i>Fagus sylvatica</i>	14	-	-	-	-	-
<i>Paris quadrifolia</i>	29	-	-	-	-	-
<i>Calamagrostis arundinacea</i>	71	20	-	-	40	-
<i>Lamium galeobdolon</i>	43	40	-	-	-	-
<i>Dryopteris filix-mas</i>	29	-	-	-	-	-
<i>Rubus hirtus</i>	43	-	-	-	-	-
<i>Gentiana asclepiadea</i>	29	20	20	17	-	-
<i>Luzula luzuloides</i>	29	40	60	83	100 ¹	-
<i>Symphytum cordatum</i>	29	-	-	-	-	-
<i>Pulmonaria rubra</i>	29	-	-	-	-	-
<i>Polygonatum verticillatum</i>	29	-	-	-	-	-
<i>Doronicum austriacum</i>	43	20	-	-	-	-
<i>Veronica montana</i>	14	-	-	-	-	-
<i>Senecio ovatus</i>	29	20	-	-	-	-
<i>Rubus idaeus</i>	14	40	-	17	17	-
<i>Dryopteris carthusiana</i>	14	-	-	-	-	-
<i>Cardamine glanduligera</i>	14	-	-	-	-	-
<i>Potentilla aurea</i>	-	60	40	50	17	80
<i>Nardus stricta</i>	-	40	-	17	60	60
<i>Mycelis muralis</i>	14	-	-	-	-	-
<i>Rhytidiadelphus triquetrus</i>	14	60	-	-	-	-
<i>Hypericum maculatum</i>	-	40	-	33	40	-
<i>Polytrichum formosum</i>	20	80	-	50	-	60
<i>Orthilia secunda</i>	14	60	-	-	-	-
<i>Luzula sudetica</i>	-	-	60	-	-	60
<i>Phleum alpinum</i>	-	-	60	33	-	-
<i>Geum rivale</i>	-	20	20	-	-	-
<i>Athyrium distentifolium</i>	-	20	40	17	-	-
<i>Ligusticum mutellina</i>	-	-	20	17	-	-
<i>Festuca nigrescens</i>	-	-	-	33	40	-
<i>Anthoxanthum alpinum</i>	-	-	-	17	-	40
<i>Campanula serrata</i>	-	-	-	-	40	-
<i>Cladonia rangiferina</i>	-	-	-	-	-	60
<i>Thamnolia vermicularis</i>	-	-	-	-	-	60
<i>Anthennaria dioica</i>	-	-	-	-	-	60
<i>Pilosella officinarum</i>	-	-	-	-	-	20
<i>Crocus vernus</i>	-	-	-	-	-	20

Location of relevees: **HtP:**Rogojel, Zârna Valley, Răcad Valley; **SoP:**Vlădeasa Peak, Plaiului Peak, Frântura; **AnPm:**Vlădeasa Peak, Brișeilor Peak; **CaJ:**Plaiului Peak, Prislopu Hill; **CaV:**Târnișii Hill, Prislopu Hill, Plaiului Peak; **CV:**Vlădeasa Peak.

Table 2: Floristic composition of deciduous montane forests in the studied area (TA- *Telekia speciosae*-*Alnetum incanae*; CF-*Carpino-Fagetum*; SF-*Symphyto cordati*-*Fagetum*; PF- *Pulmonario rubrae*-*Fagetum*)

Name of the association	TA	CF	SF	PF
No. of relevés	5	5	7	5
Altitude (m a.s.l.)	550-700	530-820	800-1050	950-1100
Species frequency (cover)	%	%	%	%
Char. ass.				
<i>Telekia speciosa</i>	40	-	-	-
<i>Lathyrus hallersteini</i>	-	60	-	-
<i>Galium schultesii</i>	20	80	60	40
<i>Symphytum cordatum</i>	20	40	60	20

<i>Pulmonaria rubra</i>	-	-	-	40
<u><i>Alnion incanae</i></u>				
<i>Alnus incana</i>	100 ⁴	-	-	-
<i>Alnus glutinosa</i>	20	-	-	-
<i>Stachys sylvatica</i>	60	-	-	-
<i>Aegopodium podagraria</i>	100 ¹	-	-	-
<i>Urtica dioica</i>	80	-	-	-
<i>Glechoma hederacea</i>	100	40	43	-
<i>Geum urbanum</i>	80	20	14	20
<i>Rubus caesius</i>	60	40	29	20
<i>Elymus caninus</i>	40	-	-	-
<u><i>Lathyro hallersteinii</i>-Carpinion et Symphyto cordati-Fagion</u>				
<i>Carpinus betulus</i>	20	100 ³	20	-
<i>Tilia cordata</i>	-	40	14	-
<i>Dactylis polygama</i>	20	40	43	-
<i>Helleborus purpurascens</i>	-	40	29	-
<i>Lathyrus vernus</i>	-	40	43	-
<i>Pulmonaria officinalis</i>	-	40	71	61
<i>Melica uniflora</i>	-	60	57	20
<i>Carex Pilosa</i>	20	20	14	-
<i>Cardamine glanduligera</i>	-	60	57	20
<i>Festuca drymeja</i>	-	60	71	40
<i>Aconitum lycoctonum</i> subsp. <i>moldavicum</i>	-	40	29	-
<i>Hieracium transsilvanicum</i>	-	40	14	20
<u><i>Fagetalia et Querco-Fagetea</i></u>				
<i>Fagus sylvatica</i>	-	100 ²	100 ⁵	100 ⁴
<i>Acer pseudoplatanus</i>	-	40	14	20
<i>Abies alba</i>	-	-	29	60 ¹
<i>Acer platanoides</i>	-	20	14	-
<i>Fraxinus excelsior</i>	20	20	14	-
<i>Corylus avellana</i>	-	40	57	40
<i>Viola reichenbachiana</i>	-	60	71	60
<i>Mercurialis perennis</i>	-	80	86	40
<i>Asarum europaeum</i>	-	80	86	20
<i>Galeobdolon luteum</i>	-	80	100	60
<i>Actaea spicata</i>	-	40	71	20
<i>Mycelis muralis</i>	-	80	86	60
<i>Hieracium murorum</i>	-	40	29	40
<i>Poa nemoralis</i>	-	80	71	80
<i>Geranium robertianum</i>	20	60	57	20
<i>Moehringia trinervia</i>	-	40	43	60
<i>Dryopteris filix-mas</i>	-	40	43	60
<i>Galium odoratum</i>	-	100	100	100
<i>Anemone nemorosa</i>	-	80	100	40
<i>Adoxa moschatellina</i>	-	20	29	20
<i>Veronica urticifolia</i>	-	40	57	80
<i>Scrophularia nodosa</i>	40	40	43	20
<i>Sanicula europaea</i>	-	60	57	40
<i>Euphorbia amygdaloides</i>	-	80	86	20
<i>Oxalis acetosella</i>	-	40	43	40
<i>Luzula luzuloides</i>	-	40	60	60
<i>Daphne mezereum</i>	-	20	14	20
<u><i>Companions</i></u>				
<i>Anthriscus sylvestris</i>	20	-	29	-
<i>Stellaria nemorum</i>	40	20	14	-
<i>Galeopsis speciosa</i>	60	20	29	-
<i>Silene latifolia</i> subsp. <i>alba</i>	20	-	14	-
<i>Potentilla reptans</i>	60	-	-	-
<i>Lycopus europaeus</i>	60	-	-	-
<i>Cardamine impatiens</i>	40	40	43	20

<i>Ranunculus repens</i>	60	40	14	60
<i>Salvia glutinosa</i>	40	20	43	-
<i>Geranium phaeum</i>	20	-	-	-
<i>Galium aparine</i>	40	-	-	-
<i>Poa trivialis</i>	80	-	-	-
<i>Impatiens noli-tangere</i>	40	-	-	-
<i>Lysimachia nummularia</i>	80	-	-	-
<i>Lapsana communis</i>	80	20	29	20
<i>Festuca gigantea</i>	60	-	-	-
<i>Milium effusum</i>	20	-	-	-
<i>Filipendula ulmaria</i>	20	-	43	-
<i>Calamagrostis arundinacea</i>	-	-	20	40
<i>Ajuga reptans</i>	-	-	14	40
<i>Campanula persicifolia</i>	20	-	43	20
<i>Angelica sylvestris</i>	40	-	-	-
<i>Carex digitata</i>	-	-	29	20
<i>Fragaria vesca</i>	-	20	14	40
<i>Polygonatum verticillatum</i>	-	-	14	40
<i>Epilobium montanum</i>	-	-	40	40
<i>Veronica officinalis</i>	-	-	-	20
<i>Solidago virgaurea</i>	-	-	14	20
<i>Vicia sylvatica</i>	-	-	14	20
<i>Rubus idaeus</i>	-	-	29	40
<i>Doronicum austriacum</i>	-	20	20	-
<i>Veronica chamaedrys</i>	-	20	20	-
<i>Sorbus aucuparia</i>	-	-	-	20

Location of relevees: TA:Vişagului Valley, Săcuieului Valley; CF:Bologa, Săcuieu, Rogojel, Horaiţi, Cornu, Vârtoapele; SF:Traniş, Rogojel, Măgura Vişagului, Răcadului Valley, Săcuieu; PF:Dosu Răcadului, Rogojel, Orzeştilor Hill, Frântura, Piatra Bănişorului

Table 3: Floristic composition of grassland associations in the studied area (FrA-Festuco rubrae-Agrostietum capillaris; PA-Pastinaco-Arrhenatheretum; PT-Poo-Trisetum flavescentis; VdN-Violo declinatae-Nardetum; GIN-Gentianello lutescentis-Nardetum; PF-Potentillo aureae-Festucetum supinae)

Name of the association	FrA	PA	PT	VdN	GIN	PF
No. of relevés	48	5	25	7	5	5
Altitude (m a.s.l.)	580-1300	550-610	540-1000	1000-1500	670-1100	1750-1820
Species frequency (cover)	%	%	%	%	%	%
Char. ass.						
<i>Agrostis capillaris</i>	100 ³⁻⁴	-	66 ¹	86	60 ¹	20
<i>Festuca rubra</i>	98 ³	20 ⁺	75	71	80 ¹	20
<i>Arrhenatherum elatius</i>	-	100 ⁴	42	-	-	-
<i>Galium album</i>	23	40	-	-	-	-
<i>Trisetum flavescentis</i>	33	40	100 ³	-	-	-
<i>Poa pratensis</i>	10	70	72 ²	-	-	-
<i>Nardus stricta</i>	56	-	17	100 ³	100 ³	40
<i>Viola declinata</i>	4	-	8	71	-	40
<i>Gentiana lutescens</i>	12	-	-	-	20	-
<i>Festuca supina</i>	-	-	-	-	-	100 ⁴
<u>Cynosurion et Arrhenatherion</u>						
<i>Cynosurus cristatus</i>	54	20	67	-	-	-
<i>Bellis perennis</i>	4	20	-	-	-	-
<i>Leontodon autumnalis</i>	13	-	17	43	20	-
<i>Lolium perenne</i>	2	-	8	-	-	-
<i>Prunella vulgaris</i>	52	20	83	14	40	-
<i>Trifolium repens</i>	65	60	91	29	20	-
<i>Veronica serpyllifolia</i>	2	20	17	14	-	-
<i>Campanula patula</i>	46	40	83	-	-	-

<i>Crepis biennis</i>	15	40	42	-	-	-
<i>Daucus carota</i>	8	20	8	-	-	-
<i>Carum carvi</i>	8	60	25	-	-	-
<i>Lotus corniculatus</i>	83	40	92	-	40	-
<i>Knautia arvensis</i>	50	20	33	-	20	-
<i>Hypochoeris radicata</i>	37	-	17	29	-	-
<u>Molinio-Arrhenatheretea</u>						
<i>Achillea millefolium</i>	85	80	83	29	60	-
<i>Ajuga reptans</i>	21	20	8	-	-	-
<i>Alchemilla vulgaris</i>	4	20	-	14	-	-
<i>Alopecurus pratensis</i>	21	20	-	-	-	-
<i>Anthriscus sylvestris</i>	4	60	-	-	-	-
<i>Centaurea jacea</i>	21	20	80	-	-	-
<i>Cerastium fontanum</i>	4	20	33	-	-	-
<i>Dactylis glomerata</i>	21	80	75	-	-	-
<i>Deschampsia caespitosa</i>	4	-	8	-	-	-
<i>Festuca pratensis</i>	2	-	17	-	-	-
<i>Heracleum sphondylium</i>						
<i>Lathyrus pratensis</i>	2	40	17	-	-	-
<i>Leucanthemum vulgare</i>	83	20	67	57	60	-
<i>Lychnis flos-cuculi</i>	15	60	25	14	-	-
<i>Plantago lanceolata</i>	88	60	92	57	80	-
<i>Ranunculus acris</i>	19	80	58	-	20	-
<i>Ranunculus repens</i>	2	60	17	-	-	-
<i>Rhinanthus minor</i>	73	80	92	29	60	-
<i>Rumex acetosa</i>	52	100	92	14	20	-
<i>Stellaria graminea</i>	52	20	83	14	40	-
<i>Taraxacum officinale</i>	21	100	75	14	-	-
<i>Tragopogon pratensis</i>	10	40	33	-	-	-
<i>Trifolium pratense</i>	81	100	92	43	40	-
<i>Vicia cracca</i>	44	60	17	43	-	-
<u>Violion caninae et Nardetalia</u>						
<i>Viola canina</i>	50	-	33	71	80	-
<i>Polygala vulgaris</i>	55	20	25	57	100	-
<i>Potentilla erecta</i>	33	-	17	71	60	-
<i>Carex pallescens</i>	33	40	33	71	100	-
<i>Hypericum maculatum</i>	12	20	16	71	80	-
<i>Pilosella officinarum</i>	18	-	8	29	20	-
<i>Deschampsia flexuosa</i>	4	-	8	57	20	100 ²
<i>Potentilla aurea</i>	2	-	-	29	20	100 ²
<i>Luzula luzuloides</i>	18	-	8	57	20	20
<i>Vaccinium myrtillus</i>	2	-	-	100	20	100
<i>Vaccinium vitis-idaea</i>	-	-	-	86	20	100
<i>Campanula serrata</i>	10	-	16	29	40	-
<i>Cruciata glabra</i>	37	20	66	43	80	-
<i>Arnica montana</i>	4	-	8	86	20	-
<i>Genista tinctoria</i>	43	-	-	29	40	-
<i>Genista sagittalis</i>	12	-	-	57	60	-
<i>Veronica officinalis</i>	10	-	8	14	20	-
<i>Danthonia decumbens</i>	35	-	-	14	40	-
<i>Luzula campestris</i>	73	80	83	29	20	20
<i>Campanula abietina</i>	2	-	-	14	20	-
<u>Companions</u>						
<i>Achillea distans</i>	4	-	8	43	-	-
<i>Aegopodium podagraria</i>	-	20	8	-	-	-
<i>Ajuga genevensis</i>	8	20	16	29	-	-
<i>Alchemilla crinita</i>	-	-	8	-	20	-
<i>Antennaria dioica</i>	2	-	-	-	40	40
<i>Anthoxanthum odoratum</i>	90 ¹	80	75	57	80	-
<i>Anthyllis vulneraria</i>	60	-	25	14	29	-

<i>Arenaria serpyllifolia</i>	-	20	8	-	-	-
<i>Asperula cynanchica</i>	20	-	-	-	20	-
<i>Avenula pubescens</i>	4	-	-	14	-	-
<i>Briza media</i>	77	20	50	29	80	-
<i>Bromus hordeaceus</i>	2	60	50	-	-	-
<i>Bunias orientalis</i>	12	40	-	-	40	-
<i>Campanula rotundifolia</i>	4	-	-	29	-	-
<i>Cardamine pratensis</i>	4	20	-	-	-	-
<i>Cardaminopsis arenosa</i>	4	40	8	14	20	-
<i>Carex caryophylla</i>	40	-	33	14	40	-
<i>Carex hirta</i>	2	40	8	-	-	-
<i>Carex leporine</i>	6	60	8	14	-	20
<i>Carlina acaulis</i>	56	-	16	43	80	-
<i>Centaurea phrygia</i>	83	20	92	43	100	-
<i>Cerastium fontanum</i>	4	20	33	-	-	-
<i>Coronilla varia</i>	25	-	8	-	-	-
<i>Cytisus nigricans</i>	23	-	-	14	40	-
<i>Dianthus carthusianorum</i>	45	-	8	-	40	-
<i>Galium verum</i>	44	-	17	14	80	-
<i>Gymnadenia conopsea</i>	17	-	8	29	60	-
<i>Helianthemum nummularium</i>	21	-	-	14	60	-
<i>Pilosella lactucella</i>	25	-	-	14	20	-
<i>Holcus lanatus</i>	75	90	83	-	20	-
<i>Hypericum perforatum</i>	4	20	-	-	-	-
<i>Knautia dipsacifolia</i>	-	-	8	29	20	-
<i>Leontodon danubialis</i>	60	-	50	-	40	-
<i>Lychnis viscaria</i>	19	-	33	-	40	-
<i>Medicago lupulina</i>	21	60	42	-	-	-
<i>Orchis morio</i>	2	-	-	-	20	-
<i>Platanthera bifolia</i>	13	-	17	-	20	-
<i>Primula elatior</i>	4	-	-	-	-	20
<i>Ranunculus polyanthemos</i>	52	20	42	14	40	-
<i>Rorippa pyrenaica</i>	12	40	25	-	-	-
<i>Rumex acetosella</i>	17	-	25	14	-	-
<i>Rumex crispus</i>	-	60	17	-	-	-
<i>Sanguisorba minor</i>	13	20	-	-	20	-
<i>Scabiosa ochroleuca</i>	27	-	8	-	-	-
<i>Scabiosa columbaria</i>	2	-	-	14	-	-
<i>Symphytum officinale</i>	2	40	8	-	-	-
<i>Thymus bihoriensis</i>	6	-	-	14	-	-
<i>Thymus glabrescens</i>	48	-	17	14	60	-
<i>Thymus pulegioides</i>	4	-	-	29	20	-
<i>Traunsteinera globosa</i>	-	-	-	14	20	-
<i>Trifolium alpestre</i>	23	-	-	14	40	-
<i>Trifolium montanum</i>	58	-	17	29	100	-
<i>Trifolium pannonicum</i>	10	-	-	-	20	-
<i>Veronica arvensis</i>	2	20	8	-	-	-
<i>Veronica chamaedrys</i>	40	60	67	14	20	-
<i>Veronica serpyllifolia</i>	-	20	17	-	-	-
<i>Vicia sepium</i>	6	20	17	-	-	-
<i>Viola tricolor</i>	2	40	17	-	-	-
<i>Cetraria islandica</i>	-	-	-	-	-	100

Location of releves: **FrA:**Rogojel, Răcad, Vișagu, Săcuieu, Măgura Vișagului, Poiana Frânturii, Piatra Bănișorului, Traniș, Fundătura; **PA:**Bologa, Săcuieu, Hențului Valley, Drăganului Valley; **PT:**Traniș, Rogojel, Bologa, Hențului Valley, Săcuieu, Drăganului Valley; **VdN:**Drăganului Valley, Măgura Tranișului, Rugii Hill, Rogojel, Rosteștilor Hill; **GIN:**Rogojel, Vișagu, Bănișorului Hill; **PF:**Vlădeasa Peak

The vegetation of the northern slope of the Vlădeasa Mountain (Fig. 2) is rather diverse, although the geological substratum is mainly composed of eruptive rocks and crystalline schists.

The phytocoenotic diversity is determined especially by landforms, the elevation range (680 to 1836 m) and soil properties, the latter also altered under zoo-anthropogenic influences. The primary herbaceous and woody phytocoenoses, specific to the subalpine vegetation belt, occur on the Vlădeasa Peak and its surroundings, down to 1400 m altitude. We classified such phytocoenoses into two herbaceous associations (*Potentillo aureae-Festucetum supinae*, *Violo declinatae-Nardetum*) and four woody associations (*Cetrario-Vaccinietum gaultherioidis*, *Campanulo-Juniperetum nanae*, *Adenostylo-Pinetum mugo* and *Soldanello oreodoxae-Piceetum*). Although these associations occupy smaller areas in the territory, their structure and physiognomy give authenticity to the subalpine plant cover. Several regional Carpathian and Carpathian-Balkan species are present in the floristic composition of these associations (Table 1), which differentiates them from the syntaxa described in the neighbouring regions. As an example, we mention *Soldanella oreodoxa* and *Campanula abietina*, species designated as characteristic for the subalpine spruce forests and dwarf juniper scrub in the Apuseni Mountains [4, 17]. The characteristic woody vegetation for the montane vegetation belt, namely the primary spruce and beech forests, occurs only on steep and rocky slopes, where roads are absent. Carpathian and Carpathian-Balkan species such as *Hieracium transsilvanicum*, *Euphorbia carniolica*, *Symphytum cordatum*, *Pulmonaria rubra*, *Cardamine glanduligera*, *Festuca drymeja* and *Aconitum lycoctonum* subsp. *moldavicum* are also present in the herbaceous layer, rendering a South-Eastern Carpathian floristic peculiarity to these forest phytocoenoses [4, 6]. Continuous deforestation since the last century has favoured the establishment of mesophilous grasslands on plateaux and moderately steep slopes. Secondary grasslands dominated by *Nardus stricta*, established in the deforested areas with superficial cryptopodzolic soils, were grouped into the associations *Violo declinatae-Nardetum* Simon 1966 and *Gentianello lutescentis-Nardetum* Coldea et al. 2008 (Table 3). The floristic composition of these associations also includes the regional species *Campanula serrata*, *Campanula abietina* and *Thymus bihoriensis*. Mesophilous grasslands co-dominated by *Agrostis capillaris* and *Festuca rubra*, established on acidic brown and eumesobasic soils, developed in large beech and beech-fir forest clearings. Nowadays, they cover the largest area and are used as hay-meadows and pastures. Due to depopulation and continuous reduction of livestock, these grasslands are mainly used as pastures in spring and summer. The fresh plant biomass production varies between 6.5 and 8.7 tons/ha [15]. The phytocoenoses of the association *Poo-Trisetetum flavescens* (Knapp 1951) Oberd. 1957 are present on small areas in the hilly vegetation belt, especially around settlements with active population. Such mesophilous grasslands originate/succeed from those of *Agrostis capillaris* and *Festuca rubra* through periodic application of organic fertilizers. The grasslands of the association *Pastinaco-Arrhenatheretum elatioris* Passarge 1964 are present in intramontane valleys (Hențu and Săcuieu Valleys) with wet, alluvial soils, where organic fertilizers were applied (Table 3). The dominance of *Poaceae* and *Fabaceae* species in this association demonstrates the good quality of fodder. The plant biomass production of these grasslands is about 35% higher than those with *Festuca rubra* and *Agrostis capillaris*.

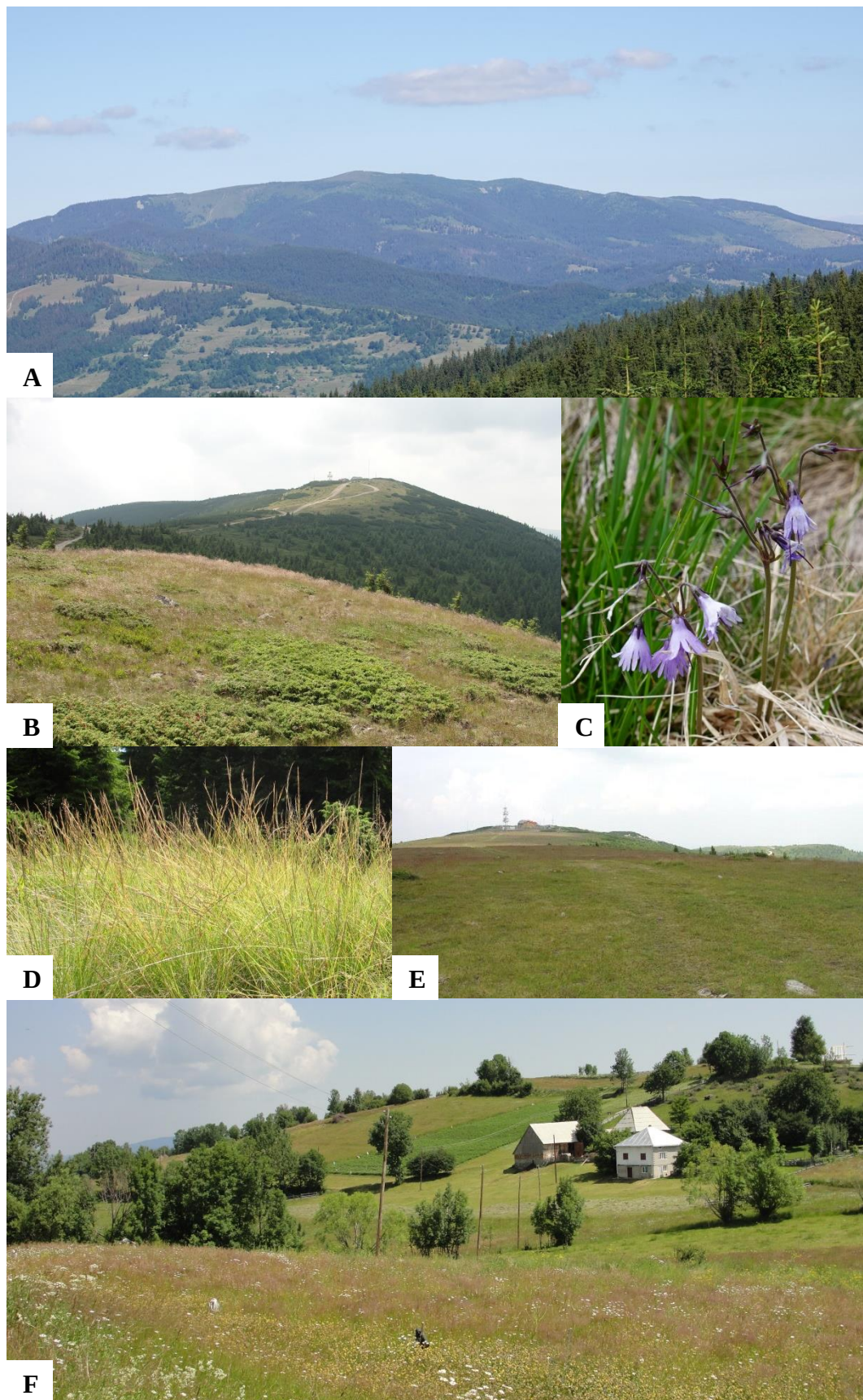


Fig. 2: A:General view of the Vlădeasa Mt.; B:Dwarf juniper scrub; C:*Soldanella oreodoxa*; D:*Nardus stricta*; E:Vlădeasa Peak area; F: Rogojel village

Conclusions

The classical phytosociological map, representing the distribution of plant associations in the study territory, reveals a relatively high diversity of secondary plant community types. This is due to both variation in topographic/pedo-climatic and human activities.

This large-scale vegetation map will prove to be very useful as a reference base in the monitoring of plant communities in terms of their dynamics at spatial and temporal level.

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HARTA DE VEGETAȚIE DE PE VERSANTUL NORDIC AL MUNTelui VLĂDEASA (MUNȚII APUSENI, ROMÂNIA)

(Rezumat)

Prezenta lucrare a fost elaborată pe baza releveelor fitocenologice georeferențiate efectuate pe versantul nordic al Muntelui Vlădeasa, în perioada 2007-2010. Din cele 387 relevee realizate în teritoriu, au fost selectate 150 relevee reprezentative pentru vegetația lemnoasă și ierboasă actuală din zonă. Aceste relevee selectate au fost grupate, pe baza afinității lor cenotice și a cerințelor ecologice, în 16 asociații vegetale, reprezentate pe o hartă de vegetație la scară mare. Dintre acestea, 6 asociații lemnoase sunt grupate în clasa *Vaccinio-Picetea* și 4 asociații în clasa *Carpino-Fagetea*. Dintre cele 6 asociații ierboase, încadrate în clasele *Nardetea strictae* și *Molinio-Arrhenatheretea*, doar asociația *Potentillo aureae-Festucetum supinae* are caracter primar

Received: 1.11.2022; Accepted: 24.11.2022