

Geobotanical zoning of Karabakh and East Zangezur

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The article discusses the features and characteristics of vegetation Karabakh and East Zangezur region. There are 6 geobotanical areas and 6 geobotanical districts. Taking into account the types of vegetation, a brief geobotanical description of the regions and geobotanical districts is carried out. The region is characterized by desert, semi-desert, wetland, steppe, meadow, shrub, forest and rock-talus vegetation types. This diversity is associated with vertical zonation, which originates from the lowland and rises to the nival belt. The main representatives of the flora of the region are also indicated.

Keywords: *Geobotanical zoning, vegetation, plant species, height above sea level*

In connection with the liberation of Karabakh and East Zangezur region from 30 years of occupation, these and the territories in contact with it are of particular interest on issues related to natural resources and, in particular, floristic and plant diversity (Ibadullayeva, Huseynova, 2021). In this sense, it becomes important to systematize the vegetation cover of the region, which at this stage, for known reasons, is possible through a cartographic inventory (Hajiyev 2007; Prilipko, 1963; Khalilov et al., 2014), literary (Prilipko, 1973) material and limited field research. In Azerbaijan, the main principles of systematization of vegetation cover include floristic, botanical-geographical and geobotanical, zoning systems. These zoning systems have the goal of establishing the geographical features of flora and vegetation cover. V.B.Sochava (1966), E.M.Gurbanov (2021) characterizing the features of geobotanical and botanical-geographical zoning systems, indicates that these systems have the goal of classifying the territory by vegetation cover. At the same time, the territorial structure of vegetation cover comes to the fore, reflecting the relationship of vegetation with environmental factors, and in regions with vertical zoning, zoning is characterized by special

specificity and "... obeys its own laws." In this work, as the initial stage of inventorying the vegetation cover of Karabakh, we consider the geobotanical zoning of its territory. In our understanding, geobotanical zoning is a generalization of material on the vegetation of a certain territory, taking into account the totality of characteristic or zonal plant communities common in this territory. This takes into account phytocoenotic (combination of zonal and intrazonal types of vegetation, type of geographical landscape, vertical zonality) and floristic characteristics (dominant composition of zonal vegetation or groups of species with the same general distribution associated with a certain territory). In the hierarchical ladder of division, we adopted geobotanical areas and geobotanical districts. By the term "geobotanical area" we mean the leading zonal landscape type of vegetation characteristic of the region, taking into account the height above sea level. In the name of formations, we have chosen ecological-phytocoenotic from existing vegetation classification systems (Neshataev, 2001; Movsumova, 2005; Gurbanov, 2007), since until now, the systematization of vegetation by Caucasian researchers, including

Azerbaijani ones, has been carried out following this principle. In addition, this approach facilitates the comparative analysis of current plant communities with communities of previous years. By the term “geobotanical district” we mean an administrative-geographical unit in which a given zonal type of vegetation is observed. Plant names are given in accordance with “Flora of Azerbaijan” (1950-1961) and “The World Flora Online”.

Since the distribution of vegetation in the territory is closely related to physical and geographical conditions, below we provide a description of the main natural indicators of Karabakh and East Zangezur region (Khalilov et al., 2014). Karabakh belongs to the southeastern part of the Lesser Caucasus. According to the botanical and geographical division of Azerbaijan, it includes 2 areas - Lesser Caucasus Central (LC central) and the Lesser Caucasus South (LC South). The relief is mostly mountainous. The highest point is Mount Gamish (3724 m), the others are Mount Gizgala (2843 m), Mount Kirkhgiz (2827 m), Mount Big Kirs (2725 m). The Murovdagh and Karabakh ridges are divided into several side branches descending to the Karabakh and Mil plains. The geological structure of the secondary tectonic elements of the Lesser Caucasus is occupied by the Murovdagh, Karabakh, Aghdam anticlinoriums and the rivers Toragaychay and Khojavend synclinoriums separating them from each other. The river network is formed by the main River Araz. The high mountain peaks located here form a watershed between the basins of the Rivers Araz, Tartar, Arpachay, and Bazarchay. The Rivers Tartarchay, Khachinchay, Gargarchay, Hakarichay, Okchuchay, flowing along the southeastern slope of the Lesser Caucasus, are of great importance in irrigating the Mil and Karabakh plains. The river network crossing the territory created deep and steep valleys. In terms of climate, in the highlands, the annual precipitation exceeds 800-900 mm. The high peaks of the Murovdagh ridge are covered with snow all year round. The river network of the territory is represented by the Kura River with tributaries of the Rivers Tartar, Khachin, Gargar and Araz, Ondalanchay, Guruchay, Gozluchay, etc. Soils vary from chestnut, light chestnut, mountain-dark chestnut, brown mountain forest, mountain meadow to lowland grey-brown, brown

saline. Flora and vegetation are subject to vertical zoning (Gurbanov, 2018).

In Karabakh and East Zangezur, there are 6 geobotanical regions and 6 geobotanical districts (Table 1).

Table 1. Classification of geobotanical areas of Karabakh and East Zangezur region

Area	Geobotanical area	Zonal vegetation types
Lesser Caucasus Plain	South Karabakh	Desert, semi-desert, dry steppe
Lesser Caucasus lowland forest	Barda	Lowland forest, shrubby, lowland meadow, wetland
Lesser Caucasus foothill lower-mid-mountain xerophytic, shrub-forest	Aghoghlan	Arid woodlands, steppe, shrub
Lesser Caucasus lower-mid mountain forest	Lesser Caucasus	Forest, shrubby
Lesser Caucasus high mountain forest, meadow, steppe	Hinaldagh-Dalidagh	Forest, meadow, steppe
Lesser Caucasus nival		Meadow

Geobotanical division and brief description of vegetation cover of Karabakh and East Zangezur region (Figure):

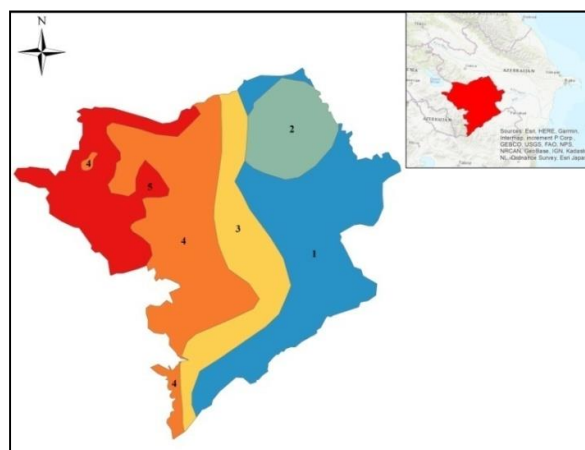


Fig. Distribution of geobotanical areas of Karabakh and East Zangezur region:
 1 - South Karabakh; 2 - Barda; 3 - Aghoghlan;
 4 - Lesser Caucasus; 5 - Hinaldagh-Dalidagh.

1. Lesser Caucasus plain area. The largest area of the region, covering almost 1/3 of the territory. It includes the South-Karabakh geobotanical area, which includes the Aghdam, Aghjabadi, Beylagan, as well as the Tartar, Khojavend, Fuzuli, Jabrayil, Zangilan administrative districts. This part of Karabakh is characterized by lowland, flat terrain. In this regard, the term “aran” was introduced into its name, i.e. lowland, flat. Most part of this area is in contact with the neighboring Kura-Araz lowland, which belongs to the Kura-Araz geobotanical area of the same name. The Upper Karabakh water channel and the Mil Karabakh collector pass through the territory of the area, the operation of which at one time led to the secondary salinization of nearby territories. The area is zonally represented by saltwort desert and semi-desert shrub, subshrub, semi-shrub, semi-subshrub vegetation with dominance of *Salsola dendroides* Pall., *S. ericoides* M.Bieb., *S. nodulosa* (Moq.) Iljin, *Kalidium caspicum* (L.) Ung.-Sternb., *Halocnemum strobilaceum* (Pall.) M.Bieb., annual saltwort with the participation of *Petrosimonia brachiata* (Pall.) Bunge, *Salsola crassa* M.Bieb, wormwood with the dominance of *Seridiphidium fragrans* (Willd.) Poljakov (= *Artemisia fragrans* Willd.), as well as wormwood-saltwort (*Artemiseto - Salsoleta*) vegetation with intrazonal lowland meadow-like groups (*Glycyrrhiza glabra* L., *Cynodon dactylon* (L.) Pers., *Spergularia diandra* (Guss.) Heldr.), as well as semi-desert wormwood-forb, wormwood-saltwort and dry-steppe communities (*Bothriochloeta*).

2. Lesser Caucasus area of lowland forests. This area is represented by one Barda geobotanical area and is located on the territory of Barda, partly Aghdam, Tartar administrative districts. The area is characterized by broad-leaved light oak (*Querceta iberica*) and oak-elm (*Querceto - Ulmeta*) forests. Alder forests (*Alneta*) predominate in humid lowland areas. It should be noted that over the past decades, the range of lowland forests has decreased, which requires their inventory. In post-forest places, secondary shrub and forb-grass meadow vegetation develops (*Herbeta*). In swampy areas, swampy meadow vegetation (*Phragmiteta*) with the participation of *Stuckenia pectinata* (L.) Börner, *Calamagrostis*

epigeios (L.) Roth) is observed. This area borders the South Karabakh area, which in a certain way leaves an imprint on the vegetation of the border areas of the Barda district, i.e. representatives of the semi-desert can be found in ecotone areas.

3. Lesser Caucasus area of foothill, lower mid-mountain xerophytic shrub and forest vegetation. This area in Karabakh is represented by the Aghoghlan geobotanical area. Administratively, it belongs to the Shusha, Khankendi, partially Tartar, Jabrayil, Zangilan districts. A narrow strip stretches from the borders of Naftalan, through Khojali, Khankendi and Shusha to Zangilan, ending at the border with Iran. The area is characterized by a predominance of arid vegetation. This includes mountain steppes, steppe meadows, semi-steppes, arid woodlands and communities of mountain xerophytes. In the lower and mid-mountain zones there are communities of broad-leaved forests (*Querceto - Carpineta*) with tree species *Quercus iberica* M. Bieb., *Carpinus betulus* L., *Fagus orientalis* Lipsky, *Fraxinus excelsior* L. Representatives of conifers can also be found here *Pinus sylvestris* ssp. *hamata* (Steven) Fomin (= *Pinus kochiana* Klotzsch ex K. Koch), *Taxus baccata* L., *Juniperus polycarpos* K. Koch., *J. foetidissima* Willd.

4. Lesser Caucasus area of mountain forests with Lesser Caucasus geobotanical area. The area includes vast territories of the Lachin and Gubadli districts, as well as the partially adjacent Zangilan and Shusha districts. The Lesser Caucasus geobotanical area is represented by broad-leaved light and shade forests dominated by oak and hornbeam. In areas of damaged forest, deciduous, drought-resistant shrubs and low-growing trees are observed as secondary vegetation. The zonal representative of shiblyak is *Paliurus spina-christi* Mill. The forests of this area are characterized by such tree species as *Q. iberica*, *F. orientalis*, *C. betulus*, *Fraxinus angustifolia* subsp. *oxycarpa* (Willd.) Franco ex Rocha Afonso (= *Fraxinus oxycarpa* Willd.), as well as wild fruit plants – medlar (*Mespilus germanica* L.), rosehip (*Rosa zangezura* Jarosch.), plum (*Prunus divaricata* L.), cherry (*Prunus mahaleb* L., *P. incana* (Pall.) Batsch). Representatives of conifers *P. sylvestris* ssp. *hamata*, *T. baccata*, *Sorbus torminalis* (L.) Griatz, species of juniper, as well as forb-legume-cereal meadow, meadow-steppe

herbaceous vegetation, with periodically changing dominants, secondary vegetation formed at the place of clearings and shrubs can also be found here.

5. Lesser Caucasus area of high mountain vegetation. Administratively, it includes the Kalbajar district, where the famous healing spring Istisu is located. In Karabakh, this area includes the Hinaldagh-Dalidagh geobotanical area. This area is characterized by zonal meadow, steppe meadow, meadow-steppe vegetation. Intrazonally there is primitive vegetation of rocks, as well as shrub groups with the participation of *P. spinachristi*, almond (*Prunus fenzliana* Fritsch, and species of hawthorn genus (*C.pentagyna* Waldst. & Kit. ex Willd., *C.orientalis* (Mill.) M. Bieb., blackberry (*Rubussaxatilis*L.) ash berry (*Sorbus caucasica* Zinserl), bird cherry (*Prunus padus* L.), *Rosa tomentosa* Sm. (= *Rosa cuspidata* M. Bieb.), etc. Against the background of zonal cereal-grass meadow subalpine and alpine vegetation with the participation of *Alchemilla caucasica* Buser, *Betonica macrantha* K. Koch, *Carum caucasicum* Boiss., *Pentanema germanicum* (L.) D. Gut. Larr. Santos-Vicente, Andreb, E.Rico & M.M.Mart. Ort., *Heracleum trachyloma* Fisch. & C.A.Mey, *Sibbaldia parviflora* Willd., *Campanula sibirica* sbsp. *hohenackeri* (Fisch. & C.A.Mey) Damboldt, high-mountain steppes and steppe meadows (*Stipa szovitsiana* (Griseb.) Trin., *Festuca ovina* L., *F. varia* Hack) are developed. In the same area, high-mountain subalpine forest groups of orientalis oak (*Quercus macranthera* Fisch. & C.A.Mey), *F. orientalis*, *P. sylvestris* ssp. *hamata*, *Sorbus caucasica* and birch (*Betula pendula* Roth), and maple (*Acer campestre* L.) occur intrazonally. The post-forest slopes are occupied by meadow vegetation (species of the genera *Calamagrostis* Adans., *Poa* L., *Vicia*L., etc.), in some places by upland xerophytes with the participation of representatives of low-growing and evergreen shrubs (garigue), low-growing xeromorphic shrubs and subshrubs (phrigana) with representatives of the main genera *Acantholimon* Boiss., *Astragalus* L., *Onobrychis* Mill., *Thymus* L., *Ziziphora* L., etc.

6. Lesser Caucasus nival area. Since the subnival and nival zones are in terms of vertical zonation and climatic conditions and, accordingly, species composition differs from the subalpine and alpine zones, we considered it logical to distinguish

the vegetation of these zones into a separate area. In Karabakh, it is represented by the Hinaldagh-Dalidagh geobotanical area. The vegetation of this belt is characterized by the participation of petrophytes (species of the genera *Woodsia* R.Br., *Saxifraga* L., *Ranunculus* L., etc.), as well as the intrazonal participation of some cold-resistant representatives characteristic of the upper boundary of the alpine belt (*Potentilla aegaea* Boiss., *Nepeta somchetica* O. Capeller).

It is necessary to note the role of rock-talus, stony and pebble vegetation. Despite the presence of rocks, in the upper high-mountain and nival zones, this vegetation in Azerbaijan and in particular in Karabakh is also found on the rocks of the middle and upper mountain zones). In his work "Vegetation Cover of the Caucasus" (1948) A.A. Grosseim notes that the composition and nature of rock-talus vegetation can vary depending on the location of the area above sea level, the type of climate against which a given area of rock-talus vegetation develops, the forms of rock weathering, and the chemical composition of the rock. The first two provisions confirm our opinion about the intrazonality of both this and rocky and pebble vegetation.

As noted above, for objective reasons, there are currently some difficulties in fully studying the vegetation cover of the region. This especially applies to forest vegetation, which has been subjected to the most severe impact. Despite this, in the future, in specific locations of the described part of the region, a complete geobotanical revision of vegetation will be carried out. Despite this, researchers of the Institute of Botany, MSE RA began re-inventorying the flora of the region. In 2023, monitoring was carried out on plants distributed in the Fuzuli, Jabrayil, Zangilan, and Gubadli territories of Azerbaijan liberated from occupation and in many villages included in those territories. As a result of monitoring, the species such as *C. orientalis*, *Datura stramonium* L., *Cuscuta campestris* Yunck., *Veronica anagallis-aquatica* L., *Lythrum salicaria*L., *Capparis spinosa* L., *Cirsium arvense* (L.) Scop., *Epilobium hirsutum* L., *Convolvulus arvensis* L., *Achillea micrantha* Willd., *Robinia pseudoacacia* L., *Populus alba* L., *Celtis caucasica* Willd., *Punica granatum* L., *Platanus orientalis* L., *Fraxinus excelsior* L., *Salix alba* L., *Ficus carica*

L., *Gleditsia triacanthos* L., *Tribulus terrestris* L., *Ailanthus altissima* (Mill.) Swingle, *P. spinachristi* are still found in liberated lands. Rare and endangered species such as *P. orientalis*, *P. granatum*, *J. foetidissima*, *Ficus carica* L. and many species are sparsely distributed in forest clearings and meadows. The species *Bidenstripartita* L. included in the IUCN Red List was also found in the Guydzhak village of the Jabrayil district.

CONCLUSIONS

Currently, throughout Azerbaijan, changes in natural conditions and the negative impact of human activity (development of agriculture, industry, urbanization, recreation, grazing, organization of recreation areas, cutting down trees) lead to changes in the boundaries of plant landscapes, the emergence of rare plant communities, an increased number of alien plants, the disappearance and reduction of a large number of plant species, the redistribution of the dominant species composition of many plant communities, accordingly, a change in the structure of the latter. In this regard, local botanists plan to inventory and systematize vegetation and flora using new scientific methodological approaches.

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