



## **TUSHETI FOREST BIODIVERSITY AND ITS ECOLOGICAL CONDITION**

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<p><b>Received:</b> August 30<sup>th</sup> 2021 <b>Accepted:</b> September 30<sup>th</sup> 2021 <b>Published:</b> November 9<sup>th</sup> 2021</p>	<p>Tusheti is located on the southern slopes of the northern (opposite) ridge of the greater Caucasus main ridge, on the northern slopes of the Greater Caucasus main ridge and in the Tusheti basin between them. Unique pine trees occupy a large part of the total area of Tusheti protected landscape. Subalpine birch and pine forests are also common in small areas. Vital populations of large mammals, a variety of communities including predator-victim systems, can exist in Tusheti protected areas. Tusheti Protected Areas are an important part of the large biological corridor of the Caucasus Mountains. It is especially important for endemic species such as Caucasian tur, Caucasian grouse and partridge.</p> <p>In terms of flora and vegetation, Tusheti is one of the richest places in Georgia. Of the more than 1,000 vascular species of 92 families distributed here, 231 are endemic to the Caucasus. Tusheti vegetation includes forests, subalpine forests and shrubs, subalpine and alpine meadows, subnival and deciduous floristic complexes. Each of these basic cenoses, in turn, is still represented by many private variants that differ from each other in structure and species composition.</p>

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The region is also characterized by a diversity of mammals and birds. According to unconfirmed data, there are about 60 species of mammals and up to 120 species of birds. Especially noteworthy is the community of ungulates, which includes species such as: Mountain goat (*Capra aegagrus*), East Caucasian tur (*Capra cylindricornis*), Chamois (*Rupicapra rupicapra*), noble deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and boar (*Sus scrofa*). The community of large predators is also important: brown bear (*Ursus arctos*), wolf (*Canis lupus*), lynx (*Lynx lynx*) and leopard (*Panthera pardus*). The degree of ecosystem naturalness varies across the region depending on the specific location and habitat [1,2].

In Tusheti, pristine unique forests, meadows, shrubs or ruins with characteristic floristic complexes are preserved. However, the modern distribution of forests is largely due to centuries of human agriculture (it is important to graze cattle; mainly forests were cut down to free arable land). Pine trees occupy a large area. However, it is believed that pine trees (including subalpine pine trees) have been much more

widespread in the historical past. Forests were particularly intensively deforested in the upper forest line and subalpine zone, where the terrain, temperature regime, and soil conditions were best for farming [3].

In the last century plowing was ceased, but reforestation was impossible due to intensive grazing of cattle. In these areas, secondary meadows are formed today, which are low productivity pastures. Much of the subalpine and alpine meadows have been significantly altered today due to overgrazing. Strong erosion and landslides are expressed in many places. The structure and species composition of cenosis are violated. In some places, these processes have reached catastrophic results and the soil layer has been completely removed [4].

Due to strong anthropogenic impacts, the numbers of many species of mammals, especially large mammals, are significantly lower than natural (implied habitat capacity). The spatial distribution of these species is also quite far from natural. For example, in other parts of Georgia, the Caucasian tur usually



occupies a vertical zone above 2000 meters. While in Tusheti during the summer (when the disturbance is strong) the turs almost do not come down below 3000 meters. It seems that at this time of year, turs are forced to hide in relatively high, hard-to-reach places.

We meet many rare species in Tusheti. Most of them are endangered species both nationally and internationally. Particularly noteworthy are the species of large mammals: mountain goat, noble deer, roe deer, chamois, boar, lynx, wolf, bear, leopard and Caucasian endemic tur. Of these species, the Caucasian subspecies of lynx, tur, leopard and chamois are included in the International Union for Conservation of Nature (IUCN) Red List as endangered species globally. The flora of Tusheti contains many rare species. The new red list of Georgia includes 4 species: black or *Betula raddeana*, *Silene marcowiczii*, *Silene pigmaea*, Caucasian elm (*Ulmus glabra*) [5].

Rare species are also found in Tusheti, which grow in isolation in the Caucasus from their world area. The flora of Tusheti contains 11 endemic species of Georgia and 231 endemic to the Caucasus, which means that 22.5% of the plant species distributed in Tusheti are endemic to Georgia or the Caucasus, in addition, at least 8 of them belong to the category of very rare species.

Among the birds are three endemics of the Caucasus (Caucasian warbler, grouse and partridge). Among the large mammals are the East Caucasian tur and the Caucasian endemic subspecies of chamois. Any interference with forests can result in serious changes in the distribution of unique pine forests and birches. In the event of deforestation, their self-recovery is hard to imagine without strict protection measures, first and foremost, protection from grazing. Subalpine and alpine meadows are very sensitive to grazing. Excessive grazing can cause serious changes in the natural structure and species composition. However, the impact of overgrazing can be even more serious in terms of physical degradation, or erosion, of the area. Soils are the most vulnerable component of the abiotic environment in Tusheti. Heavy erosion and landslide processes are observed in previously arable lands, which are currently used as pastures. The soil cover is not only degraded in some places, but also completely disappeared. Grazing has a negative impact on the environment, which is primarily reflected in the restriction of habitat use by wild ungulates. For example, seeing the Caucasian turs below 3000 m in summer is a rarity. These animals take refuge in the upper zone of the alpine line (on the border of the subnival). It is likely that poaching has a much greater

impact on the spatial distribution of wild ungulates than sheep breeding [6,7].

Soil degradation is the main environmental problem in Tusheti. Severe erosive processes are observed in many places. In some places, the soil layer is completely destroyed. In many cases, erosion is caused by overgrazing, which occurs after the traditional pasture zoning and pasture rotation has been abolished. Arable lands are intensively used for grazing, and in these areas today, due to excessive grazing, there are heavily eroded low-productivity pastures. Among anthropogenic factors, poaching is the most important. It has a great influence on the number and spatial distribution of species. Also, deforestation / firewood collection; At least 58% of Tusheti is currently covered with pine forest. In the past, pine trees occupied a much larger area, but most of them were cut down to free up arable land.

#### **CONCLUSION:**

Unsustainable use of pastures and forests in Tusheti protected areas leads to erosion, degradation, desertification and loss of biodiversity. Tusheti ecosystems are experiencing a process of degradation caused by anthropogenic factors. Excessive grazing occurs, replacement of autochthonous plant species by non-autochthonous and soil erosion caused by technogenic causes. As a result, the biodiversity of Tusheti ecosystems is reduced. Desertification increases and fertile soil layers are reduced due to erosive events. In some places the forests have been deforested and the natural structure of cenosis has been altered.

Although cattle grazing is a major traditional activity for Tusheti, it also poses a significant threat to the landscape, habitats and biodiversity. Consequently, pasture degradation and erosion are significant ecological problems for the protected landscape of Tusheti.

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