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LANDSCAPE DIFFERENTIATION TERRITORIES OF THE SUNZHA RIVER BASIN

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Abstract. *The landscape differentiation of the territory of the Sunzha River basin was carried out on the basis of landscape mapping and geoinformation analysis using data from the geological structure and vegetation cover. Classes, subclasses, types, subtypes, and groups of landscapes are highlighted. The landscapes of the mountainous and foothill parts of the Sunzha River basin differ sharply from each other, which is associated with the high-altitude zonation characteristic of the basin and long-term anthropogenic activity, which increases the stress on natural complexes.*

Key Words: *landscape mapping, anthropogenic activities, high-altitude zones.*

The basin of the Sunzha River with an area of about 12,000 km2 is located on the territory of four subjects of the Russian Federation (North Ossetia-Alania, Ingushetia, the Chechen Republic and Dagestan) and part of the adjacent territory of Georgia, in the highlands [8] This work continues the detailing of mesoscale landscape mapping, which was started earlier [1, 2, 5]. When writing the article, we used field materials and data obtained during the North Caucasian landscape expeditions (2014-2020) [6, 7], as well as the results of studying individual components and, first of all, vegetation cover in key areas [3, 4].

Landscape mapping and geoinformation analysis using data from the geological structure and vegetation cover made it possible to carry out landscape differentiation of the study area with the allocation of classes, subclasses, types, subtypes, and groups of landscapes. The division into classes corresponds to the accepted approach in landscape science of dividing mountains and plains into two large classes. There are only mountain landscapes in the study area. The foothill-plain hydromorphic complexes should be considered transitional from mountainous to lowland (Fig. 1, Table 1). In the case of landscape groups, their generalized regional variants are identified, taking into account major differences in relief and geological structure. In general, the landscape structure was formed at the intersection of two main factors of landscape differentiation.

The tectonic features and geological diversity of the region have led to the formation of various altitudinal zones in the Sunzha River basin, characterized, from south to north, by the following landscape subclasses: high-mountain, mid-mountain, low-mountain, foothill, and foothill-plain. High-mountain landscapes encompass the upper tiers of the Bokovoy and Main, or Watershed, Ranges, at elevations above 2,500 m. Slope processes are highly active here, and small areas of glaciation exist in the upper reaches of the Argun. Mid-mountain landscapes occupy the altitude range from 1,000 to 2,500 m. An important feature of the mid-mountain relief is the presence of widened valley sections in the Jurassic Depression. In these areas, the climate is relatively dry due to the formation of a rain shadow and the development of foehn processes. Low-mountain areas (up to 1,000 m), on the other hand, receive the bulk of the precipitation. Already in the foothills, characterized by a relatively monotonous flat topography, precipitation drops sharply. Hydromorphic conditions are observed in the floodplain-terrace complexes of the Sunzha River in its lower reaches, and particularly near its confluence with the Terek River.

Altitudinal and zonal differences in the ratio of heat and moisture underlie the formation of landscape types and subtypes-altitude zones and belts (subzones). The highest absolute elevations of the high-mountain subclass are occupied by nival-glacial landscapes from 3,000 to 3,500 m above sea level, represented by the rock-snow and glacial subtypes.

Mid-mountain (mountain-forest and mountain-steppe) landscapes developed primarily at elevations of up to 1800-2000 m and rise to 2400-2500 m on southern-facing slopes. Mountain-forest landscapes are further subdivided into small-leaved (combined with coniferous-small-leaved) and cultivated forest-meadow landscapes, while mountain-steppe landscapes are divided into shrub- and meadow-steppe landscapes with cultivated modifications. Mid-mountain forests predominantly occupy steep slopes and poorly accessible areas, while gentle slopes and relatively accessible areas are characterized by forest-meadow landscapes, a variant of anthropogenic modification formed as a result of long-term grazing.

Table 1. Landscape organization of the Sunzha basin

Subclasses of landscapes (high-altitude tiers)	Types of landscapes/zones (altitude-zonal ratio of heat and moisture)	Subtypes of landscapes /subzones/belts (Variations in the ratio of heat and moisture within the altitude zone)	Generalized groups of landscapes			
			Slopes composed of Jurassic sediments	Slopes composed of chalk deposits.	Slopes and foothill plains, less often, river terraces composed of Paleogene-Neogene sediments.	Slopes, intermountain depressions, and river floodplain-terrace complexes composed of Quaternary sediments
High mountain	Nival-glacial	Rock-snow and glacial	1			
	Mountain meadows	Subnival-alpine	2			
		Subalpine steppe	3			
Mid-mountain	Mountain forest	Small-leaved and coniferous-small-leaved	4			
		Forest meadow modifications	5			
	Mountain-steppe	Shrubs	6			
		Meadow-steppe cultivated modifications	7			
Lowland	Mountain forest	Broadleaf		8		
		Small-wheeled			9	
		forest-meadow-steppe cultivated modifications			10	
	Mountain forest-steppe	Cultivated modifications			11	
Foothill	Forest-steppe	Cultivated modifications			12	
		Forest modified			13	
	Steppe	Cultivated modifications				14
Foothill-plain	Hydromorphic	Floodplain-terrace modified				15
		Bayrachny				16

Within the lowlands, two types and three subtypes of landscapes are distinguished. Mountain-forest broadleaf landscapes are confined to the northern macroslope, forming a large area of forested Black Mountains. Within the Black Mountains, mountain-forest-meadow-steppe cultivated landscapes have developed on flattened areas and slopes of southern mesoexposures. Mountain-forest-steppe landscapes have developed on the slopes of the Front Ranges.

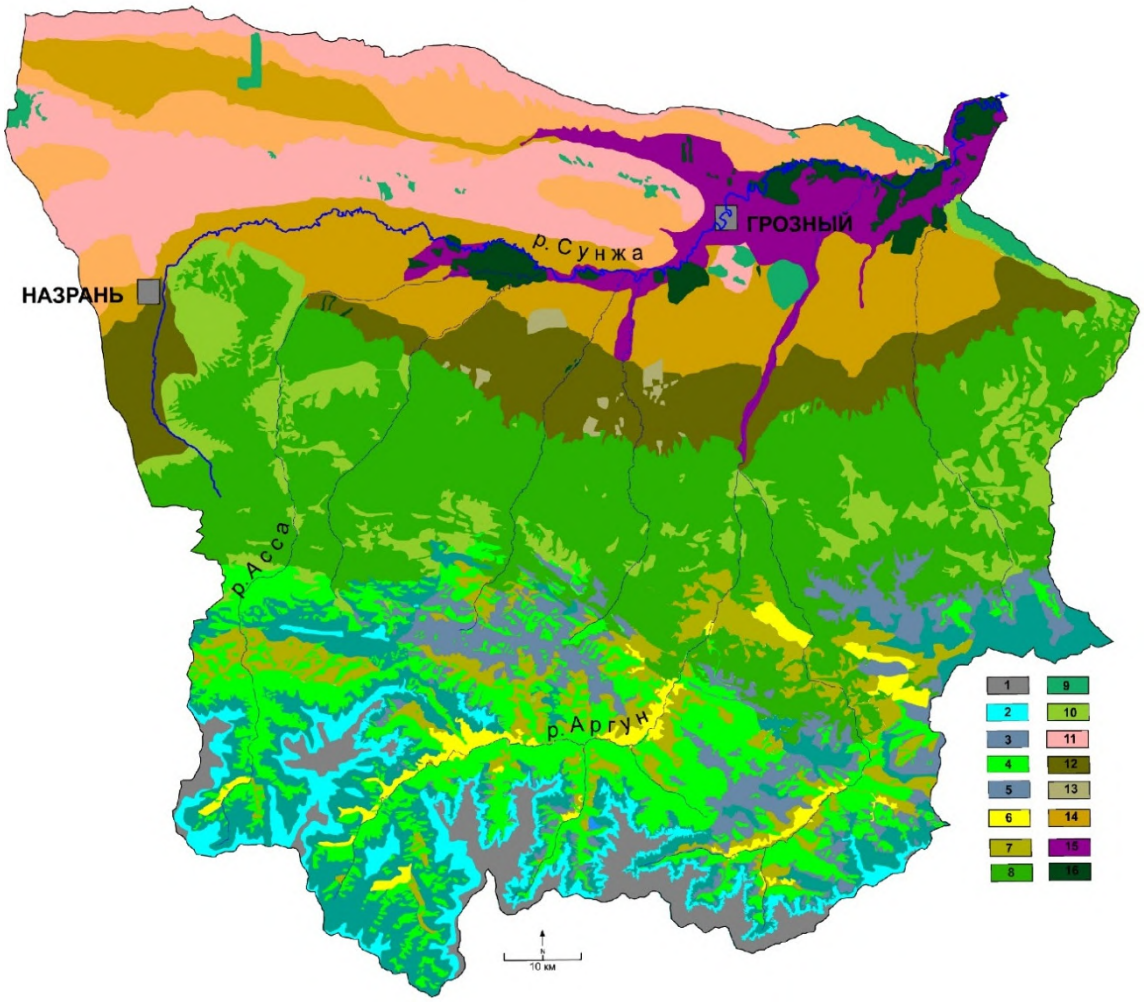

Fig. 1. Landscape structure of the Sunzha River basin.
The numbers show generalized groups of landscapes (see Table 1).

The foothill subclass includes forest-steppe and steppe landscapes, which dominate the Chechen Plain and have been largely cultivated by long-term human activity. Forested areas remain only fragmentarily, providing a glimpse into the forests that once existed here. In the foothill-plain subclass, transitional between mountains and plains, hydromorphic landscapes have developed on low terraces and in the Terek River floodplain, consisting of a complex of ravine forests with alternating meadow and wetland areas.

An analysis of the conducted studies reveals that landscape types do not always change in a strict sequence with elevation. This is due to the uneven distribution of heat and moisture ratios in the mesoclimate of the terrain. Furthermore, the rock types that compose them play a significant role in landscape differentiation. The combination of altitudinal climatic, vegetation, and geological-geomorphological conditions, coupled with anthropogenic activity, has led to the formation of 16 main landscape groups.

High-mountain nival-glacial rock-snow and glacial landscapes (1).
High-mountain mountain-meadow (subnival-alpine) landscapes (2).
High-mountain mountain-meadow (subalpine), locally steppe-like landscapes (3).
Mid-mountain mountain-forest landscapes with small-leaved and coniferous-small-leaved vegetation (4).
Mid-mountain forest-meadow landscapes (5).
Mid-mountain mountain-steppe shrub landscapes (6).
Mid-mountain mountain-steppe landscapes of cultivated meadow-steppe modification (7).
Low-mountain mountain-forest (with broad-leaved and mixed forests) landscapes (8).
Low-mountain mountain-forest (small-leaved) landscapes (9).
Low-mountain forest-meadow-steppe (residential and cultivated) landscapes (10).
Low-mountain forest-steppe landscapes of the Terek-Sunzha Upland (11).
Cultivated foothill-forest-steppe landscapes (12).

In some elevated areas of the Chechen Plain, forest patches have been preserved within the foothill-forest-steppe landscapes (13).

Cultivated foothill steppe landscapes with residential and industrial areas (14).

Foothill plain hydromorphic floodplain landscapes (15 and 16) are represented by ravine forests of floodplain terraces (16) and floodplain residential landscapes used for croplands and pastures (15).

Thus, the landscape differentiation of the river basin territory. The Sunzha basin is characterized by altitudinal-zonal and aspectual contrasts, as well as by the asymmetry of its basin structure, with the Sunzha's right tributaries predominating on the northern-facing slope. Eight altitudinal-zonal landscape types, one azonal landscape type, and sixteen main landscape groups are distinguished here.

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