

# INFLUENCE OF NATURAL-ANTHROPOGENIC FACTORS ON THE FORMATION OF PINE FORESTS OF LANDSCAPES OF THE CHECHEN REPUBLIC

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## Abstract

*The analysis of the influence of natural and anthropogenic factors on the formation of the biomass of oak forests in the Chechen Republic allowed us to assess the current state of these geobiocenoses. The territories of oak forests with various anthropogenic disturbances show a clear connection with certain physical and geographical conditions of mountain and forest landscapes that affect the rate of organic recovery. Here, the geomorphological factor in the placement of certain directions of mountain ranges and the steepness of the slopes comes to the fore. In the northern slopes, where they receive more solar heat and drop out, a significant amount of moisture, the growth of phytomass goes much faster than on the southern slopes of the rain shadow.*

**Keywords:** Chechen Republic, oak, pine, phytomass, organic matter

## I. Introduction

The study of the influence of both natural and anthropogenic influences on the formation of organic matter in various landscape complexes, due to the fact that our planet today is experiencing the influence of actively ongoing processes of climate warming and this is directly related to human activity. The situation in mountain and forest landscapes has worsened since the second half of the 20<sup>th</sup> century, when large areas of loess were cut down by continuous logging, which led to soil depletion, changes in water regime, activation of landslide and erosion processes led to a significant change in the nature of matter flows (mainly carbon and energy).

Due to the close attention of the world community to the problem of climate change and the problems associated with it, they are of great scientific interest, aiming to study not only qualitative, but quantitative descriptions of objects and processes occurring in landscapes.

## II. Materials and Methods

The ecosystem is widespread in the Argun basin and its tributaries Meshe–Hi, Basty–Hi, Gekhi–Chu, Manst–HI, Kerigo, Khorachoy, Zaterki, and is not widespread. It is formed within the northern macroscline of the Lateral, rarely the southern macroscline of the Rocky Ridges, in the Argun, Assi and Fortanga basins [1]. Basically, the ecosystem is widespread and is formed at altitudes from 700 to 1600 m mainly on the north-western, north-eastern, western, rarely eastern and northern slopes. On the slopes of the north-western and north-eastern orientations, phytocenoses of fresh oak-pine snowdrift can be found from 700 m to 1500 m, being replaced above by a moist lime-pine snowdrift. Slightly higher (up to 1600 m) rises along the slopes of the

western orientation. A small high-altitude zone of the ecosystem forms on the slopes of the eastern exposure (1450-1600 m), where it acts as a transition from dry oak-pine subori to fresh pine subori. On the slopes of the northern exposure, the ecosystem is formed by fragments at altitudes from 700 to 1300 m, timed exclusively to well-lit and heated ridges. The steepness of the slopes is from 10 to 500.

The litter is composed of the fall of woody vegetation, loose, poorly decomposing, the transition to the soil is gradual. Due to the development of erosion processes on the slopes, it is distributed extremely unevenly. Usually not solid, often completely washed away, accumulates at obstacles with a layer of up to 7 cm. The ecosystem develops on mountain-podzolic soils, underlain by carbonate-free black clay shales and sandstones. Profile depth is 30-50 cm (from 20 to 80 cm). The profile is weakly divided into horizons. It is characteristic that the soils are strongly crushed from the surface, the deeper, the more. Already at a depth of 20-40 cm, the protection reaches 70-90%. Sometimes trees stand on the bottom of clay shales, which is associated with severe erosion that began after logging, or excessive thinning of stands. Such sites are currently closer to the suborns in terms of soil and soil conditions.

The main forest-forming breed is the pine of Sosnovsky, the indigenous stands are two-tiered with the dominance of pine in the first. The tier of hardwoods mainly forms petiolate oak, in admixture you can find common ash, birch, mountain ash, hornbeam, rock oak, Caucasian linden. Rock oak appears in admixture in areas transitioning to a dry oak-pine subori. The participation of Caucasian linden, mountain ash and Litvinov birch increases at the junctions with moist lime-pine snowdrift. It is difficult to judge the productivity of virgin oak and pine stands, since they have not been preserved. According to the 72ubrovn with other pine snowdrifts, it can be assumed that the productivity of pine in the ecosystem should have been no lower than II -III bonus. Only insignificant areas of indigenous stands in hard-to-reach places have been preserved, but they are also heavily overgrown; oak-pine and pine-oak stands are sparse on heavily eroded elephants.

### III. Results and discussions

The obtained results showed that unchanged and very slightly altered landscapes do not exceed 15% of the territory area. Natural landscapes have been preserved in the highlands and in hard-to-reach places of the middle and low mountains. The steppe, forest-steppe and semi-desert landscapes located within the terraced inclined plains are most strongly changed: the Terek River Valley, the Nadterechnaya Plain, the Alkhan-Churt Valley, the Chechen Plain and the Gudermess plane. Within these landscapes, arable land, deposits, gardens and vegetable gardens occupy more than 74%, hayfields – 7%, residential areas – 15%, hydraulic structures – 3% and roads – 1% [2,3,4].

The analysis of the current state of the landscapes made it possible to zone the landscapes of the republic according to the degree of anthropogenic disturbance (Fig.1).

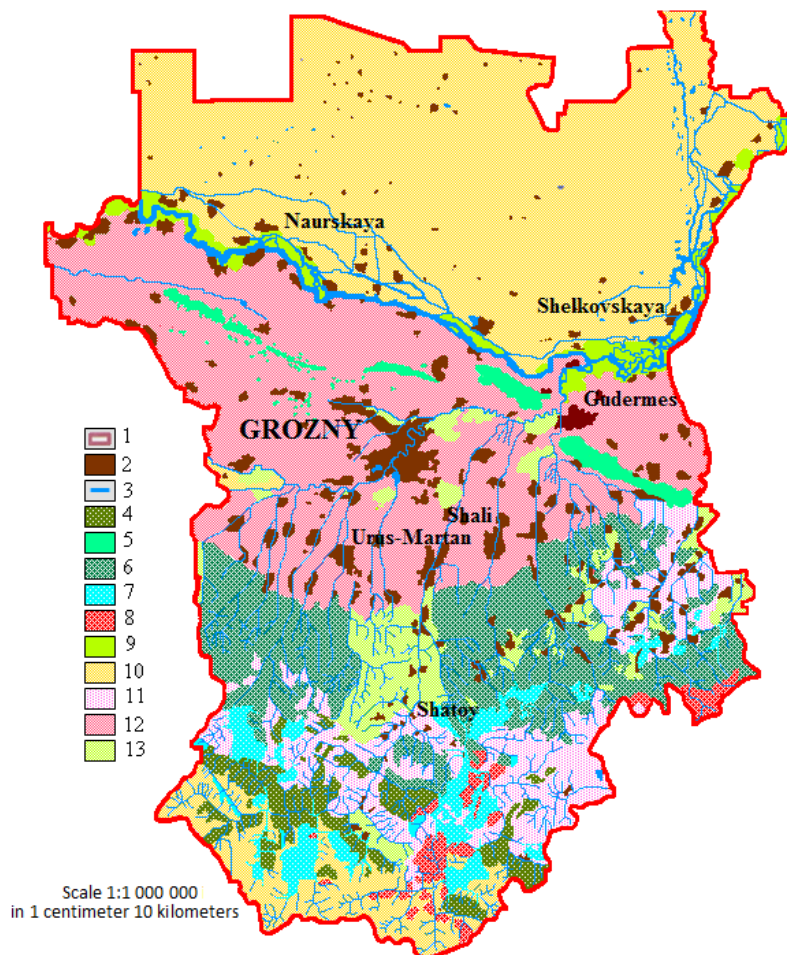
As a result of unsystematic logging in the past, as well as due to the extremely strong ability of oak to renew vegetatively, about 85-90% of the indigenous stands were replaced by derived oak trees.

Derived oak trees are single-tiered, overwhelmingly overgrown, mainly at the age of 20-50 years, bonitet III -IV, closeness 0.4-0.8.

Young oak trees are characterized by a nesting arrangement of trunks, characterized by strong curvature, low-drooping crown and poor cleanness from twigs.

The undergrowth is developed unevenly, with the closeness of the woody hollow 0.8 and higher, it is represented by single specimens. In low-canopy oak forests (0.3-0.6), shrubs can form a canopy with a closeness of 0.2 to 0.7. Azalea dominates, the amount of which increases as the degree of illumination of the slopes increases. Hazel rarely prevails. From other shrub species, rosehip, dogwood, warty and European birch bark, svidina, rarely goat willow, long-leaved juniper, Caucasian honeysuckle, gordovina, hawthorn, round-leaved irga are noted [4].

The herbaceous cover is uneven, the degree of coverage varies from 1 to 100% depending on the closeness of the tree–shrub canopy and the erosion of the slopes. There are more than 115 species in the composition of the cover, cereals always dominate. The most constant are wild strawberries, volodushka multi-leaved, large-leaved flower, three-pronged astration, blood-red geranium, medicinal herb, willow-leaved lily of the valley, Transcaucasian lily of the valley, whitish psephellus, valantiiform bedstraw, millipede, forest bluegrass, almond-shaped milkweed, horned lyadvenets, hairy knuckle, mountain clover, golden rod, oregano ordinary, vika Balanza.



**Figure 1:** Anthropogenic disturbance of forests Chechen Republic. Symbols for the map: 1 – the border of the republic; 2 – settlements; 3 – rivers and lakes; 4 – pine forests; 5 – oak forests; 6–beech forests; 7 – birch forests and woodlands; 8 – shrubby vegetation; 9 – vegetation of floodplains; 10 – treeless spaces; 11 – forests reduced in the 20<sup>th</sup> century; 12–forests reduced in the 19<sup>th</sup> century; 13 – forests reduced by military actions and unauthorized logging.

Less permanent are the Alpine scythe, Caucasian feather grass, cruciform bedstraw, gentian veronica, sparrow, Alpine clover, segmented bedstraw, red pollen, pink pyrethrum, purple-blue, fluffy geranium, purple 73ubrovnik, St. John’s wort, short-legged forest, Caucasian kemulariella, white vole, five-leaved sickle, veinik reed-like, large-flowered beech, flat-leaved geranium, medium wart, Caucasian cupena, lipolistnaya valerian, three-part albovia, etc.

It is difficult to judge the course of natural seed renewal of pine and its companions in the indigenous stands of the ecosystem. In the described preserved pine forests, on which the imprint of human activity has been deposited, the pine tree resumes unsatisfactorily. The number of undergrowth, as a rule, ranges from 0.5-1 to 4-8 thousand per 1 ha, in some cases 22-44 thousand are noted. The undergrowth of pine almost always prevails over the seed stock of hardwoods. In the second tier, petiolate oak, hornbeam and linden are renewed mainly by overgrowth.

The stands of the ecosystem currently have no operational significance, they perform a protective and water-regulating role.

#### IV. Conclusions

It is necessary to continue in-depth studies based on complexity (geographical, botanical, climatic, geo-economic), which will determine the course of growth of rocks in the forest ecosystem, will make it possible to establish local characteristics of growth and development with the goals of optimizing rational forest management based on the sustainability of the development of forest ecosystems, while preserving the natural environment.

The analysis of the dynamics of the mountain forest allowed us to draw the following conclusions:

1. The state of the mountain forest ecosystem complex of the Chechen Republic is directly dependent on climatic and anthropogenic factors, which lead to a significant weakening of their geo-economic functions. The importance of their conservation and reproduction, as the basis of the raw material base that provided the demand for valuable wood, but, of course, as the most important environmental-forming natural component from the standpoint of optimal and non-depletion use of forest resources are important for the economy.

2. Ecosystems of beech forests occupy at least 75% of the forest-covered area of the Chechen Republic. For the development of the beech ecosystem, a lot of moisture is needed.

3. During forestry development in the ecosystems of the mountain forest, adjacent to the upper aisles of the forest, should be directed to the formation of a landscape complex.

4. The implementation of the task of improving the geoecological condition of forests will preserve their biological diversity, requiring the improvement of economic activities in forest ecosystems that are subject to degradation, significantly increasing biological measures to combat numerous factors of forest pests.

5. A significant part of the forest areas with growing conditions favorable for hard deciduous and coniferous species began to be mastered by soft deciduous species, which are not indigenous forest-forming species, but transitional. Currently, there is a gradual replacement of transitional rocks by indigenous ones. Under the canopy of aspen, birch, gray-alder plantations, an undergrowth of coniferous and hardwoods appears. It should be noted that the change of breeds naturally can take hundreds of years. Therefore, it is necessary to carry out various reforestation measures depending on the specific conditions of each allotment, promoting natural renewal, contributing to the reconstruction of low-value plantings and the creation of valuable forest crops.

6. Forests suffer significantly from the economic activities of road users. By removing gravel material in floodplains and floodplain terraces of the Argun, Sunzhi, Hulkhulau rivers, and laying highways along them, they uproot thickets of valuable fruit and medicinal shrub – sea buckthorn. The population of the Chechen Republic also contributes to the destruction of sea buckthorn plantings. They harvest berries in the most predatory way by pruning branches and continuous cutting.

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